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SUGARCANE

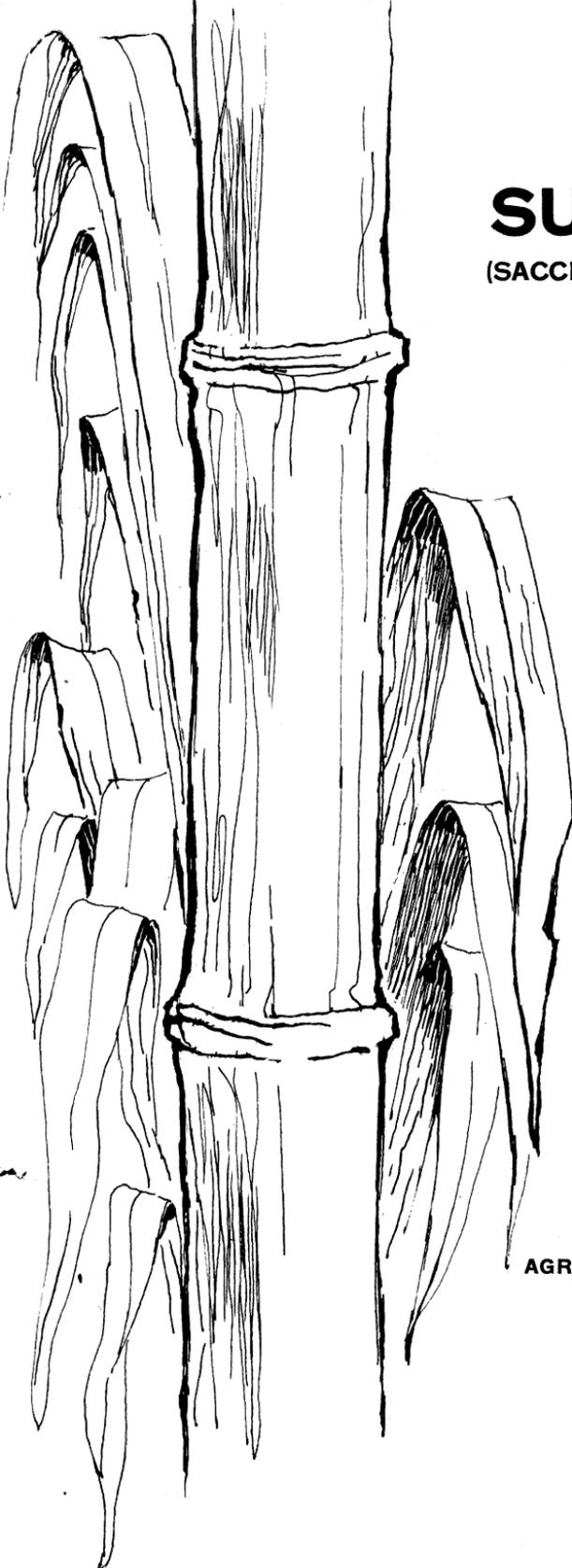
(SACCHARUM OFFICINARUM L.)

ORIGIN
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AGRICULTURE HANDBOOK NO. 122

UNITED STATES DEPARTMENT OF AGRICULTURE



SUGARCANE

(*SACCHARUM OFFICINARUM* L.)

ORIGIN

CLASSIFICATION

CHARACTERISTICS

AND DESCRIPTIONS

OF REPRESENTATIVE

CLONES

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AGRICULTURE HANDBOOK No. 122

The garden sugarcanes of Melanesia constitute the original base from which our present-day varieties of sugarcane derive. Varietal descriptions of the Melanesian garden canes and their derivatives are drawn from a living collection and are here placed on record. As background material and to promote fullest interest in use of this extensive store of germ plasm, what is known or what logically may be inferred concerning the history, value, and use of these varieties as a group and their interrelationships with other varietal groups in the genus is given.

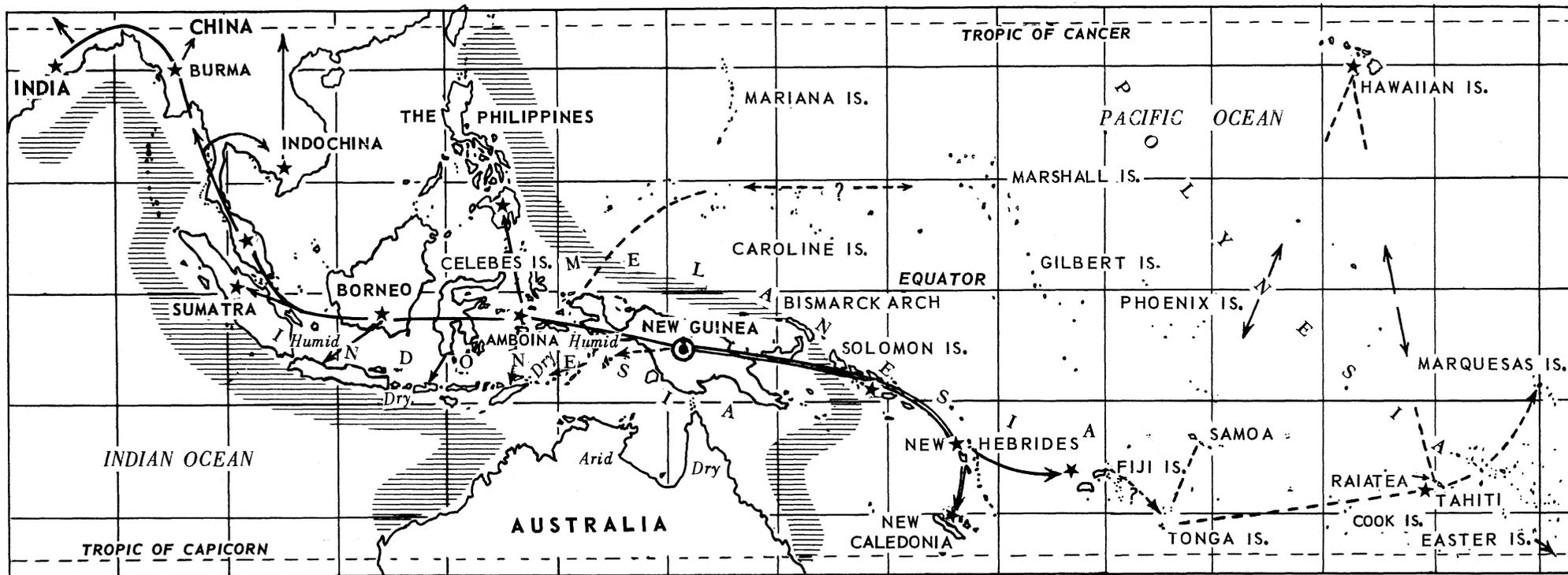
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Washington, D. C.

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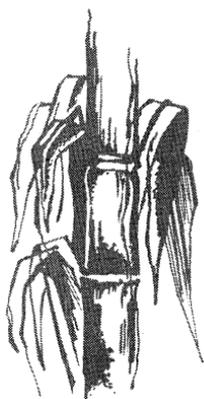
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Origin, migration, and diversification centers of noble sugarcane:

- 
 is the location of the origin of *Saccharum officinarum*, derived from *S. robustum*, which occurred 8000 to 15000 B. C.
- 
 shows first track of migration of *S. officinarum*, beginning about 8000 B. C.
- 
 shows second tracks of migration, beginning about 6000 B. C.
- 
 shows third tracks of migration, about 500 to 1100 A. D.
- 
 indicates satellite centers of diversity along tracks of migration.
- Shaded portion of map indicates outline of the former great Asiatic-Australian Continent.

SUGARCANE (*Saccharum officinarum* L.):



ORIGIN, CLASSIFICATION
CHARACTERISTICS, AND DESCRIPTIONS
OF REPRESENTATIVE CLONES¹

ORIGIN, CLASSIFICATION AND CHARACTERISTICS²

A field reconnaissance of the Old World tropics in 1922–23 to collect sugarcane and a critical review of available data on sugarcane groups motivated the systematic search for domesticated *Saccharum* forms and their near relatives in the presumptive area of their origin, Melanesia. This search also included the areas of their early dispersal—Indonesia, southeastern Asia, and Polynesia.

The map (frontispiece) reconstructs the postulated origin of domesticated sugarcane by selection from wild canes in New Guinea and their migrations prehistorically (transported as stem cuttings by man) to various centers of diversity. At these centers some canes were further modified by natural hybridization with other wild grasses. The shaded portion of the map indicates the outline of the former great Asiatic-Australian Continent. The continent in an earlier geologic epoch (Cretaceous) afforded a land bridge by which some Asiatic types of cane apparently found their way unaided by man to what is now Melanesia. Subsequently, when isolated by water barriers and under different conditions, a different wild cane evolved in Melanesia than in Asia or other islands of the archipelago. The phytogeographic studies of Merrill (35)³ suggest this hypothesis.

¹ Submitted for publication January 14, 1957.

² Introductory section by E. W. Brandes, formerly head pathologist in charge, Sugar Crops Investigations, U. S. Department of Agriculture.

³ Italic numbers in parentheses refer to Literature Cited, p. 260.

This explanation covers both the presence of *Saccharum* in Melanesia and the restricted range of the large wild cane, *S. robustum* Brandes & Jeswiet ex Grassl, recently found in New Guinea.

The present handbook, describing vegetative characteristics of a kindred aggregation of *Saccharum* forms, here designated as garden sugarcanes of Melanesia and their derivatives, and variously called "thick-stemmed tropical," "original," or "noble" sugarcanes, also broadly interpreted as the horticultural species *S. officinarum* L. (29),⁴ is the fourteenth technical contribution stemming from a comprehensive sugarcane project. The purpose of this project was to gather a world reference collection of ancestral or precursor wild and domesticated cane varieties and was begun in 1922. The contributions include separate treatments of the more or less discrete segments of the reference collection on the subjects of comparative morphology (1-7, 29), disease reactions (16, 18), geographic origins based on the ranges of wild forms and centers of diversity of domesticated forms related to them (13, 18, 19), ecological diversity and adaptation (14), and practical cane breeding (16, 18), which is the central theme of the project.

The conception of the overall project grew out of the need for locally adapted, disease-resistant genotypes. In general, groups of the original *Saccharum* forms that are related morphologically and particularly groups of individuals related both in form and in geographic origin are apt to have functional characteristics in common (16). In other terms, the mode of the phenotype often but not invariably reflects the mode of the genotype in physiological qualities, including such puzzling characteristics as group adaptability to alien environments and even group reactions to infections. In fact, observations on the group reactions of morphologically related *Saccharum* forms to sugarcane mosaic virus (12, 16) stimulated the gathering of all cultivated and wild groups of *Saccharum* and *Saccharum* relatives from their primary, isolated areas of origin and the assembling of them for comparative study at each of several stations at different latitudes in the New World. Duplicating the collection in that manner was for the purpose of studying adaptability and insuring the production of normal specimens. The expectation was that every variety in the collection would be found naturally adapted

⁴ Although no type specimens exist, there is good evidence that Linnaeus based his species *officinarum* on the only sugarcane readily available to him, now known as Creole. The clone gradually disappeared from extensive cultivation between 100 and 150 years ago. Much historical and botanical study has been devoted to the clone by Deerr (24), Bremer (21), Grassl (29), and others, but there remains some confusion as to its identity and synonymy. Creole is an odd sterile hybrid type with $2n=81$ chromosomes. By an unusually fortunate circumstance the United States Patent Office published in 1849 (28) a contemporary series of technically correct and beautifully executed drawings of Creole made by Charles L. Fleischmann of Philadelphia. Fleischmann was assisted in this work which includes enlargements of microscopic features of the clone "Otahaite," by the internationally famous Czech botanist Corda. Corda was recommended for this scientific investigation by Baron Alexander von Humboldt. The morphological characteristics of Creole, a short, relatively thick-stemmed greenish-yellow cane with erect leaves, are quite distinctive. The clone proved to be extremely susceptible to mosaic and is practically extinct. These excellent drawings of Creole showed that our own specimens from Santo Domingo and Spain, which had to be destroyed because of mosaic infection, were authentic.

to the photoperiod and as far as practicable to other elements of the environment in at least one station (14).

The practical purpose of the overall project was to try to provide a broader base of knowledge for applied research on the improvement of sugarcane by breeding, taking into account the elementary characteristics of the plant groups that could be determined by observation, tests, or planned experiments. Regarding the particular group under reference in this handbook, it is part of our purpose to direct attention to the exploited and still unexploited values in the largely untapped reservoir of garden canes.

IMPORTANCE OF SACCHARUM OFFICINARUM

The indispensable sugar-bearing component of essentially all the numerous and widespread varieties of domesticated sugarcane, which form a complex of polyploid hybrids, is provided by a few selected representatives of the tropical, thick-stemmed horticultural species *Saccharum officinarum*. The high weight per cane, self-thrashing of the cane, and the high tonnage per acre of the crop are also directly endowed by the same selected representatives of the tropical garden canes under reference in this handbook. Less generally recognized but nevertheless important qualities found within the species are resistance to some formidable diseases and, considering the tropical origin, a surprising degree of adaptability to harsh alien climates. In addition to these cultural qualities, practically all qualities that facilitate the processing of sugarcane in mills—low fiber content, high purity of juice, i. e., a high proportion of sucrose in the total solids of the parenchyma (storage) cells and a low proportion of invert sugar, starch, etc.—are found in the *S. officinarum* genotype. In short, the *S. officinarum* parent provides all the characteristics esteemed in field and factory that establish sugarcane in adapted areas of the Tropics and Subtropics as an economic plant par excellence for production of sugar. Of necessity in breeding sugarcane for better adaptation to Temperate Zone conditions and for resistance to maladies like mosaic and root rot, *S. officinarum* forms have been hybridized with other species, notably the resistant *S. spontaneum* L. In the days before planned hybridization such crosses apparently took place under natural conditions. It is fortunate that in the one-sided doubling of chromosomes that has been known to occur in the hybrids of *S. officinarum* \times *S. spontaneum*, it is the *S. officinarum* chromosome complement that doubles (2C). Some of the resulting seedlings are not only resistant to certain diseases and better adapted to some Temperate Zone environments fringing the Tropics, but they also possess almost undiminished the desirable qualities of *S. officinarum*.

COLLOQUIAL NAMES

In comparatively recent years several collective names descriptive of the origin, appearance, or use of the numerous and variable varieties, or more properly clones, of *Saccharum officinarum* have found their way into sugarcane literature. These collective names, coined during the early decades of the present century, are convenient and

reasonably definitive, although, as often happens, more and more restricted or extended meanings have been attached to them as they gained currency in the writings of later authors.

In the former Netherlands East Indies the clones of *S. officinarum* have been referred to as the original sugarcane varieties (oorspronkelijke Rietsoorten), in distinction from the new seedling varieties produced in prodigious numbers by planned cane breeding at modern experiment stations. Jeswiet (30) and Posthumus (37) made clear that in using the term they referred to the domesticated tropical sugarcanes selected and cultivated for chewing by the indigenous peoples of the Malay Archipelago. Posthumus took pains to explain that the term "original" did not necessarily imply "ancient," or that this category of canes is not enlarged also at the present time in Indonesia, however inconspicuously, by continued selection of chance seedlings. The distinction between original sugarcane varieties and other categories of varieties seemed valid and useful. Extension by Bremer (21) of the term "original" to include another category of domesticated canes, namely, the predecessors in northern India of the Coimbatore and other modern seedling varieties, is logical but confusing. The evidence makes clear that these canes also were not created by purposeful hybridization but represented selections from chance natural hybrids. Bremer modified the term "original" by adding a place name, calling them the "oorspronkelijke Britsch-Indisch Suikerrietsoorten" (original British-Indian sugarcane varieties). Further modification of the place name by eliminating "Britsch" is now obviously necessary. Carried to its logical conclusion, the extension of meaning as used by Bremer would result in a long series of related but more or less discrete original sugarcane groups that came into existence prehistorically by promiscuous hybridization or selfing along the track of the migrating original sugarcanes from the Melanesian archipelago.

Another widely accepted alternative name for the varieties of *S. officinarum*, coined or adopted from the English language by the Netherlands in Java about 1920, is noble canes, an obvious reference to their flamboyant colors and large size in striking contrast with the drab colors and unprepossessing appearance of most canes of other species. Unlike the term "original," the term "noble" carried no implication of the precursory nature of *S. officinarum* relative to all domesticated sugarcanes, but the identity of the group referred to is fairly well understood and there is little likelihood that the word will be misappropriated for other groups of cane. There is in sugarcane literature a lack of unanimity among writers in the use and meaning of cognates derived from the expression "noble canes," i. e., nobilize, nobilization, etc. As first used, the sense of nobilize was simply to improve or ennoble the wild *S. spontaneum* forms or forms of other groups by hybridizing them with *S. officinarum*. In recent literature, e. g., contributions by H. W. Li (34), nobilize implies more specifically the increase in chromosome numbers of species hybrids resulting from the one-sided doubling of the *S. officinarum* complement.

The few individuals who have collected *S. officinarum* varieties firsthand in the New Hebrides, Solomon Islands, New Guinea, and adjacent smaller islands of Melanesia are inclined to use the collec-

tive name, "native garden sugarcane of Melanesia," or simply "native" sugarcanes of this or that island. They are in fact the only "native" domesticated sugarcanes in the sense that among the world's array of cultivated sugarcanes they are the only ones that were wholly developed, in place, from indigenous wild ancestral forms. The concept of *S. officinarum sensu* Jeswiet does not exclude the numerous forms derived from and closely resembling the native garden sugarcanes of Melanesia, which had long been established in native cultures of Indonesia, Indochina, the Philippines, and Polynesia. In fact, the majority of individual clones listed by Jeswiet (31) in 1925 as typical of *S. officinarum* belong to that category, a circumstance attributable no doubt to the fact that until 1928 Jeswiet was unfamiliar with the far richer assortment of forms in New Guinea. All the collective names mentioned are suggestive of one or more characteristics peculiar to the *S. officinarum* type of cane. When used colloquially with discrimination, they identify the type of cane referred to.

Reconciling the synonymy of the numerous colloquial and vernacular names of the multitude of individual clones of *S. officinarum* presents almost insurmountable difficulties. The difficulties are of two sorts: (1) The occasional use of the same name for several different clones; and (2) the almost universal and unavoidable renaming of the same clone times without number if it happened to be an adaptable, globe-girdling sort. The practice of renaming has been most active since 1850, but, with more penetrating retrospection, it is safe to infer that the renaming habit was very old a century ago.

Inferentially, let us trace from the beginning the renaming of a clone. When an individual clone comes into existence, for instance, on some riverbank in New Guinea near a garden from which the seed has blown, and is selected for some good quality and established as an entity, an identifying name is given to it in the dialect of the village. If the variety proves exceptionally desirable, it is carefully weeded and cuttings may be taken to a daughter village of the same clan or tribe. Eventually the variety finds its way to a village in the next valley where the language is different. Step by step over a long period of time it completes a journey to the coast. Meanwhile the variety has been renamed innumerable times for various reasons. Sugarcane is among the recognized spoils of tribal warfare, and in the confusion of a typical retaliatory raid, usually in the darkness before dawn, the booty is seized but of course the identifying name is lost. It is characteristic of sugarcane varieties the world over that they do not long remain nameless. Perhaps the next stage in the wanderings and rechristenings of our variety is when it is taken by Malay prau from the coast to the nearby Aru Islands or Amboina, both ancient trading and distribution centers; thence, in the course of time possibly to Celebes or Borneo.

If our hypothetical variety started the second stage of its long migration during the past four centuries, it encountered not only dialects of entirely different families of native languages in these islands but several Chinese and European languages as well. The variety, being an exceptionally desirable one, had been increased long since to large proportions. Its progress into new territory would be represented on a chart like the branches of a tree rather than by a single line. This

normal development generated confusion, and in the far-flung islands of Indonesia the variety had many names at the same time. The names at this time usually represented the last stopping places on its multiple pathways, a fact easily verifiable by studying the local vernacular names transliterated into Dutch. This fact also tends to prove that the variety was not indigenous at its place name. The authentic indigenous names never refer to places. Bandjermasin hitam-riet did not originate at Bandjermasin nor Zwart Cheribon at Cheribon. The natural *S. officinarum* × local *S. spontaneum* hybrid Kassoer (not a place name) apparently did originate near Cheribon, a stopping place on the pathway of the *officinarum* parent.

European infiltration of the archipelago contributed to the plurality of names of our variety, when Spaniards, Portuguese, Netherlanders, Frenchmen, Britons, and others ushered in the epoch of the variety's grand tours to the New World. The hazards of transportation in relatively modern sailing vessels prompted some of the renaming; identification tags were often molded, mutilated, or lost in shipments. Louisiana Purple, a rather stable (but not immutable) clone, very likely has had more than 100 names since some aboriginal horticulturist thrust a leafy top-cutting from a purple riverbank seedling into his garden soil.

Most of the name changing of the old migratory *S. officinarum* varieties was unavoidable or at least understandable. Some of it was arbitrary and inexcusable. A flagrant example is afforded by the wholesale renaming by De Greslan of 60 original varieties of New Caledonia about 1866 and cited by Sagot and Raoul (38). According to Sagot, De Greslan prepared an excellently illustrated monograph on the varieties with locations and indigenous names and later "named each of these canes after a well-known person of New Caledonia." Sagot published an abstract of the monograph prepared at his request by De Greslan himself, but Sagot deplored the new names and did not repeat them in his book. Some of them, however, persist. F. S. Earle published an annotated list of 1,700 names that have been applied to cane varieties (27), of which nearly 1,500 appear to relate to the *S. officinarum* garden sugarcanes. Unquestionably, he says, many of the names are synonyms, owing to the pernicious custom of renaming varieties. We have endeavored to show in the foregoing paragraphs that in the past most renaming was caused by force of circumstances and no amount of admonishment could have prevented it.

Fortunately, improved communications today will help to retard the duplicating of names for the same clones, but the problem of cane variety synonymy remains. Solution of the problem can be advanced only by careful standardized taxonomic studies such as those in progress on fairly large samplings of the *S. officinarum* clones at the present time. The clones important because of outstanding superiority and adaptability, which should be given priority in such studies, represent only a small proportion of the total number. The outstanding clones nevertheless present the greatest problem, as they have been given the largest number of names.

RELATIVE POSITION OF SACCHARUM OFFICINARUM IN THE GENUS

The question of speciation in the genus *Saccharum* is too complex and specialized to be discussed at length, but a few observations on plant genetics may help to explain some of the barriers preventing clear-cut separation of *S. officinarum* varieties from those of other species. Conversely, their assumed genetic history may explain the existence of some characteristics of these varieties that help to distinguish them from others.

A comparison with other kinds of plants (for example, the near-relative *Sorghum*) in which there is more normal, clear-cut separation of a genus into several species will help to make plain the barriers referred to. To emphasize the comparison we take liberty to simplify and idealize the facility of separating species into the kinds of plants used for comparison. In simplest terms such plants in common with all plants and animals exhibit diversity or small variations among the individuals (the basis for organic evolution), but they also exhibit discontinuity of variation. Instead of a continuous series of small variations, clear-cut separations will occur in which the variation may be abrupt and pronounced, followed on a different level by resumption of the small variations between individuals, then by another abrupt separation, and so on. This is typical of plants that reproduce regularly by seeds resulting from frequent interpollination (sexual exchange of genes) between the closely similar individuals of each level but not between the less closely related individuals of different levels.

Cytogeneticists have explained the incompatibility between levels (species) on the basis of nature's devices called "isolating mechanisms," which prevent the consummation of mating between the different strata (39). Up to the present, eight categories of reproductive isolation have been described. Isolation by different reproductive seasons at a given locality may be cited as one of nature's devices that a few sugarcane breeders have circumvented by carrying the pollen on airplanes to flowering mother plants perhaps 2,000 miles away (17). In general the species are maintained and kept separate by mutual exchange of genes entirely within the isolated pool of genes governing the hereditary characteristics of the particular species. The plasticity of a species, i. e., its store of potential variants and its ability to adjust gradually to changing external conditions, is not impaired by this arrangement nor is there impairment of discontinuous variability.

The fact of discontinuity of variation in sexually reproducing organisms is apparent to anyone who has observed the similar yet undeniably different species of bears in a zoo, and the fact can be accepted without going into the prolix explanation.

Taxonomists have made use of the discontinuity of variation to create an elaborate system for natural classification of plants, separating them into races, species, genera, tribes, families, etc., in an

ascending hierarchical order of relationships based on morphology of the flowers.

Nature, however, has provided some exceptions not fitting entirely or precisely into the natural classification system. Modification of sexuality or substitutions in whole or in part for the typical sexual method of reproduction are found in some familiar plant groups, including sugarcane. Sugarcane is made up of an aggregation of facultatively asexual and obligatorily asexual members complicated by potentialities in some members for wide hybridization. To a greater or lesser extent, some of the reproductive aberrations tend to obscure the normal discontinuity of variation and therefore confuse the boundaries of species.

The conditions preventing clear-cut separations between some species of *Saccharum* are more puzzling in the cultivated groups, or "species," *S. officinarum*, *S. sinense* Hassk., and *S. barberi* Jeswiet, than in the wild-growing species, *S. spontaneum* and *S. robustum*. The sexual conditions or deviations are several, including (1) high polyploidy, which makes possible in nature some species interbreeding and, rarely, wide hybridization even with grasses of other genera, (2) self-fertilization, (3) vegetative propagation of cultivated varieties, or clones, for centuries with attendant mutations in many unstable clones, (4) male sterility, (5) incompatibility of the male and female gametes, and (6), in many clones, absence of floral organs because of abortive or completely lacking inflorescences, making vegetative reproduction obligatory. We refer to nonflowering due to innate sterility, as well as the more common failure to flower of some migrant forms in alien uncongenial environments.

The consequences of this combination of deviations from typical sexuality, i. e., frequent random matings in closed systems, are, in the domesticated original sugarcanes, the development of a miscellaneous assortment of moderately definable groups, each composed of individuals with some characteristics in common and the development of more numerous odd or intergrading forms interspersed in and between them. Individuals of fairly well-defined groups of sugarcane owe their homologies partly to spatial or geographic isolation of long duration following prehistoric migrations of *S. officinarum* to islands; for example, extensions into New Caledonia, certain islands of Indonesia, Hawaiian Islands, and the Philippines, all more or less remote from the rather restricted natural range in Melanesia of the assumed principal ancestral form, *S. robustum*. Separated from the wild ancestral form, a part of the evolutionary plasticity was lost to these groups. Together with the numerous odd forms, the groups constitute a complex of highly polyploid mutants and hybrids.

In attempting to erect species like those found in sexual groups for the accommodation of all members of this sugarcane complex, taxonomists have not been able to agree in the past even on generic separations. With gradual accumulation of living and herbarium plant material and continued careful study in field plots, there have been revisions of the genus *Saccharum*. The last and most generally acceptable revision is that of Jeswiet (31), which rejects many species and sets up *S. barberi* as a new species. In the following key translated from Jeswiet's 1925 paper are given the characters on which the separation of the species is founded:

Key to the Species of Saccharum

- A. Main axis of inflorescence and cluster axes with long hairs. Glumes always 4. Lodicules either ciliate or not. If the spikelets of the same pair do not flower simultaneously, the pedicellate one always blooms first. Culms green, grayish green, greenish bronze, ivory, or white.
1. Lodicules ciliate. Long subterranean runners present, growing wild
S. spontaneum L.
 2. Lodicules not ciliate. Subterranean runners short. Sugar-producing, cultivated plants.
 - a. Leaves broad (to 50 mm.). Tall cane species, nodes all bobbin-shaped, greenish bronze (among others, Uba cane)
S. sinense Roxb. amend. Jeswiet.
 - b. Leaves narrow, short inconspicuous cane species. Nodes usually cylindrical, grayish green, white, or ivory. Rather limited to India and Pakistan (among others, Chunnee cane)-----*S. barberi* Jeswiet.
- B. Main axis of the inflorescence never having long hairs, often glabrate; rachis nodes glabrate or with very few hairs. Glumes generally 3, sometimes 4. Lodicules not ciliate. If the spikelets of the same pair bloom at different times, the sessile one always is the first. Culms differing in color from pale or dark green to dark yellow, dark red, violet, often striped. Cultivated plant-----*S. officinarum* L.
1. Fourth glume present. Vigorous plants with low sugar percentage. Types: Among others, Fidji, Ardjoeno, Groen Duitsch Nieuw Guinea.
 2. Fourth glume wanting. Plants generally with a high percentage of sugar. Types: Among others, Cheribon, Batjan, Borneo, Bändjermasin, Preanger.

Jeswiet was no doubt aware that he was dealing with a complex of facultatively and obligatorily asexual groups. He attempted to draw the natural species and race boundaries or artificial boundaries of the cultivated forms where most convenient, using a minimum of diagnostic characters. He recognized that although the systematic treatment had to rest primarily on comparative morphology it was helpful to add a physiological character, synthesis and storage of sugar. His key recognizes close relationship of *S. sinense* and *S. barberi* and their joint relationship with the wild *S. spontaneum*. Phylogenetic relationship of *S. officinarum* with the other three species is indicated as somewhat more remote. Separation of *S. officinarum* into groups is recognized. After nearly 30 years there has been no revision of the genus but considerably more evidence of relationships has accumulated, not the least of which was the not unexpected discovery in New Guinea by Jeswiet of the large feral cane species *S. robustum*, the closest wild relative of *S. officinarum* (13).

Theoretically, *S. robustum*, as the direct or cognate sexual ancestor of *S. officinarum*, provides a means of approaching more closely the ideal selection of key characters for use in identifying and separating naturally or artificially its direct or hybrid derivatives. These derivatives include all the groups of cultivated forms. It is assumed here that *S. robustum* is involved in a principal role in the ancestry of all economic sugarcane. As in the case of *S. robustum* the same opportunity exists for selection and use of key characters of other putative ancestors of *S. officinarum*, among them *Erianthus maximus* Brongn. A penetrating analysis of the roles of *S. robustum* and *E. maximus* in development of the noble cane complex is provided by Grassl (29), who described in detail the morphology of *S. robustum* and deposited type specimens in the United States National Herbarium. He suggested on the basis of morphological, geographical, and cytological evidence that noble sugarcanes are most closely related to these two species. A key char-

acter found by Grassl in certain segments of the noble sugarcane group, awned third glume, traces back to *E. maximus*. The secondary importance of *E. maximus* as a component of the noble group, in the inclusive sense, is recognized by Grassl. The noble sugarcane are readily distinguished from the small wild cane *S. spontaneum* on the basis of taxonomic characters of the inflorescence and, although they can be made to hybridize, relationship is distant. Dr. Jeswiet believed that certain offtype noble canes like Loethers evidenced some small admixture of *S. spontaneum*, partly on morphological grounds and partly because of the resistance of Loethers to sereh. Similarly, the susceptibility of Loethers and a few other offtype clones to the fungus parasite *Ustilago scitaminea* Syd., the cause of smut in *S. spontaneum*, might be caused by limited introgressive hybridization involving *S. spontaneum*.

In summarizing the observations on speciation of *Saccharum* and the relative position of *S. officinarum* in the genus, it seems clear that separation of all variants in terms of definitive species names is beset with difficulties and is particularly misleading in the case of the cultivated forms. A more factual systematic treatment would be to exclude from the genus as species all but *S. spontaneum* and *S. robustum* and recognize the other variants as horticultural species, divided into two classes if necessary in the future, to distinguish between those derived by mutation and selection from a single ancestral sexual form and those derived from two or more such ancestral forms.

Until such drastic revision is made by competent authorities the needs of classification and convenience are reasonably well met by Dr. Jeswiet's classification, amended by the addition of *S. robustum* and *S. edule* Hassk. as follows:

Revision of Part "B" of the Key to the Species of Saccharum

- B. Main axis of the inflorescence never having long hairs, often glabrate; rachis nodes glabrate or with very few hairs. Glumes generally 3, sometimes 4. Lodicules not ciliate. If the spikelets of the same pair bloom at different times, the sessile one always is the first. Culms differing in color from pale or dark green to dark yellow, dark red, violet.
1. Wild plants up to 10 m. tall, culms with relatively high fiber and low sucrose content, generally riverbank perennials.....*S. robustum*.
 2. Cultivated plants.
 - a. Inflorescences aborted, leaves more or less pubescent.....*S. edule*.
 - b. Inflorescences normal, culms with relatively low fiber and high sucrose content.....*S. officinarum*.

This minor revision is provisional and is proposed to correct the omission of *S. robustum* and *S. edule*, pending more formal revision when the essential morphological and cytogenetic evidence is at hand. The deficiencies of this combination of naturally and arbitrarily drawn species boundaries do not defeat or even seriously impair the convenience and practical usefulness of the systematic arrangement. Only the intergrades will present difficulties. An experienced observer can with fair assurance say that a given specimen falls into one of the six species. No doubt the homogeneity of individuals in groups *sinense* and *barberi* resulted from sexual isolation somewhat different from the spatial, insular type mentioned as explaining homogeneity in the New Caledonian and Hawaiian noble groups, but basically the principles are the same. Relatively few noble canes found their way

from the primary center of origin and diversity south of the Equator to the shifting center in India, where they were modified by hybridization with *S. spontaneum* forms and subsequently were extended northward. In northern India, which became by far the largest sugar-producing area, flowering was suppressed. Even in the absence of inflorescences, the majority of individuals can be identified to the species or group.

Mention was made of the possibility that the assumed genetic history of some of the groups may explain the existence of certain functional as well as morphological characters of individuals in each of these groups. Conversely, these characters, little used in taxonomy, might be useful in suggesting the relationships and derivation of groups. It is known that all hereditary characters in sugarcane are the expression of self-reproducing particles called genes derived from their ancestors. The characters in question are of different sorts; some of them are gross morphological characters, some anatomical, some physiological, and some not measurable except in terms of visible or detectable reactions of the sugarcane plant. In the last-mentioned category are reactions to disease organisms, cold, photo-period—all conceded to be derived from parental stock. The numbers and structures of the chromosomes themselves may be considered taxonomic characters.

The use of these hereditary characters, or some of them, is not new. According to the South African botanist, De Wet (25, p. 204):

Very early in the history of the taxonomy of grasses some investigators realized that the fundamentally important question of phylogenetic relationships may not be answered by a study of gross morphology alone. In a search for evidence bearing on this problem, Duval-Jouve (1875) and Pee-Laby (1898) studied the leaf anatomy of different grass genera and came to the conclusion that anatomical characters might be used taxonomically. Additional evidence was presented by Hartz (1880) from a study of the types of starch grains in the Gramineae, and also by Grob (1896) from an examination of the histology of the epidermal surfaces of the leaves.

In more recent times these aids and additional ones have been used successfully as adjuncts to conventional comparative morphology in sugarcane taxonomy. Until more is learned about the genetic history of the different cane groups and until agreement can be reached as to what constitutes a sugarcane species, they will continue to be a main reliance as useful adjuncts to classification. Examples of these unconventional taxonomic and physiologic characters will illustrate their usefulness.

EXAMPLES OF USEFUL SUPPLEMENTAL CHARACTERS.—Kinds and amounts of carbohydrates synthesized and stored in sugarcane, particularly sucrose and starch, corroborate to a surprising degree the boundaries of species and racial groups based on taxonomic characters. It is realized that selection by man rather than natural selection accounts for high sugar percentage in the cultivated forms, and therefore the significance of this character phylogenetically should not be overemphasized. Percentage of sugar, however, was found convenient and useful by Jeswiet in separating groups of *Saccharum officinarum*. The starch percentage on the other hand is not only useful but, as the amount of starch was a secondary consideration in selection by primitive man, it is much more significant than sugar in suggesting phylogenetic relationships. A recent paper by Dutt and Narasimhan

(26) reports on the progressive accumulation of starch in different stem parts of 215 wild and cultivated varieties. Results showed practically no starch, or traces only, in *S. robustum* and the 78 tested varieties of *S. officinarum*. The 26 varieties of *S. spontaneum*, 25 of *S. sinense*, and 85 of *S. barberi* showed fair to large accumulations of starch, but the quantity appeared to be somewhat less in *S. sinense* than in *S. barberi*. *S. sinense* and *S. barberi* are believed by Parthasarathy (36) to have arisen in tropical India by promiscuous hybridization of *S. officinarum* × *S. spontaneum*. It seems probable that *S. spontaneum* may have imparted this character to the hybrid offspring. Under "Geographic Origin and Dispersal" the theory of Parthasarathy and the slight difference between *S. sinense* and *S. barberi* in percentage of starch will again be referred to.

On the basis of comparative morphology and use of vegetative characters only, Barber (9, 10) classified a large segment of the northern Indian cultivated canes in 5 groups, Sunabile, Mungo, Nagori, Saretha, and Pansahi. In Jeswiet's revision (31) of *Saccharum* he singles out as *S. sinense* the members of the Pansahi group and lumps the others as *S. barberi*, named after Barber. Ample testimony of Barber's discernment and good judgment is afforded by the cytological studies of Bremer (21), which essentially corroborated the validity of Barber's groups. With a few exceptions the individual clones of each group were found to have diploid chromosome numbers in common. The chromosome number per se is not a taxonomic character, but in the circumstances described its corroborative value is impressive. Bremer intimated that the total number of northern Indian cultivated canes actually studied and classified by Barber was not complete, having in mind no doubt the possibility of "unclassifiable" intergrades.

Parenthetically, Bremer objects with some justification to the lumping of four of Barber's separable groups into one species, *S. barberi*, but his suggestion that this name be given only to the forms of one group, Saretha, seems even less desirable. None of the five groups forms a species by any presently acceptable rule. It is believed that ultimately these clones will be classified in aggregations of lower than species rank. Under the circumstances the shuffling of species names now applied to horticultural groups seems premature or immaterial. The significant fact is that the validity of Barber's classification of an array of subtropical sugarcane, now believed to be species hybrids, was corroborated in a large measure by the testimony of Bremer's chromosome counts.

In a comparatively recent publication, 1915, Barber (8) stated that all previous classifications of sugarcane known to him made use of stem color for separation of canes into the "main divisions." He pointed out (pp. 15-16) that reliance upon color for primary separation of groups was unsatisfactory, "but colour is, none the less, an important character, and the * * * canes assume quite definite tints which are of use in rapidly separating them at the mill. * * * Colour is therefore always carefully noted." Barber's comment on previous unconventional and amateurish classifications overlooked some fragments of conventional taxonomic contributions long available in the literature and well summarized by W. Krüger (33) in "Das Zuckerrohr" in 1899. Barber's observation directed attention to the

convenience of stem color as a useful supplemental character in distinguishing individual varieties or clones. It is significant that his experience was limited essentially to the cultivated canes of northern India in which stem color is relatively inconspicuous. With the gradual accumulation of a broader knowledge of sugarcane phylogeny we may resurrect stem color as an adjunct of morphology in providing evidence of lines of descent. In other words a broad separation of the main divisions, or species and groups, can be supported by stem color. Reference has been made herein to the wide range of striking, flamboyant colors of *S. officinarum*, the tropical garden canes of New Guinea and adjacent islands of Melanesia, and their derivatives elsewhere. The wild ancestral species *S. robustum* includes forms with identical pigments and the same wide range of conspicuous stem colors—green, yellow, brown, red, and deep purple. In great contrast the forms of *S. spontaneum* have green stems except for irregular reddish blotches that appear on stems of some forms with exposure to sunlight. Stems of the slender domesticated sugarcanes of northern India studied by Barber, provisionally retained as *S. sinense* and *S. barberi*, are either green or faintly tinted with the same colors as found in *S. officinarum* and *S. robustum*, but in comparison with them are rather drab in color. With a few possible exceptions in the primitive Saretha group, these northern Indian cultivated forms are considered to be hybrids between *S. officinarum* and *S. spontaneum*. The intermediate stem colors do not conflict with the idea of promiscuous natural hybridization of *S. officinarum* and *S. spontaneum* announced by Parthasarathy (36).

The color of the stem, or culm, is a useful adjunct to morphological characters in the identification of individual sugarcane clones, but color must be used with understanding of its limitations. The striking range of colors in the domesticated sugarcane clones (*S. officinarum*) described in this handbook represents different combinations and concentrations of two series of pigments, the chlorophylls and the anthocyanins, and, to a lesser extent, the carotenoids and zanthophylls. Even in *S. officinarum* forms color is subject to various internal and external influences and is only relatively constant. Recognition of causes of color variation found in different specimens of the same clone and in different parts of the same stem is essential to practical utilization of the color characteristic. Ultimate causes of the variations have not been adequately studied, but the observed variations may be classified. They are mainly of four sorts: (1) Those correlated with age of the internodes, i. e., juvenile v. mature internodes; (2) those correlated with environment, i. e., exposed to sunlight or protected by leaf sheaths or otherwise in shade (and possibly influenced by nutrition or other environmental factors); (3) those correlated with inner morphology, which dictates the variable width of stripes; and (4) those correlated with somatic aberrations or mutations, the often observed but little understood color sports or variants.

In observing color variants in a large collection for many years, one is impressed by the evidence that some clones are prone to vary and also to revert in a typical manner, i. e., to produce wholly green or wholly red sports from a green-red striped form and then revert to the striped form with no apparent change in the original combination

and concentration of basic pigments. As judged by Finlay color photographs made about 1925, the great majority of clones remain as they were when collected, with no color variation except the mentioned progressive color changes in juvenile to mature internodes, the transitory changes caused by environmental factors, and the variable width of stripes in the ribbon canes. For these reasons the stem color, when used judiciously, is an aid in distinguishing between forms of *S. officinarum*. The large sooty patches frequently seen on the stem epidermis of sugarcane near the point of attachment of leaf sheaths are the dense, thin stromata of *Meliola*, a black nonparasitic fungus that feeds on sugary exudates of the cane or on the honeydew excreted by sucking insects like mealy bugs.

Of the numerous environmental elements that influence the annually recurring time of flowering of *S. officinarum*, the basic one is photoperiod, or the unvarying progressive changes during the year in relative lengths of days and nights at a given place. Nonstatical elements such as temperature and water relationships, which vary somewhat in different years in a given place and at different elevations in a given area, and also the translocating of the species by man farther from or closer to the Equator than its center of origin may modify or even prevent flowering periods but do not obliterate the innate mechanism of response to photoperiod. That phenomenon is definitely a genetic character varying in the different species or original great groups of *Saccharum*. In their periods of flowering, according to our experience, hybrids between the basic great groups are intergrading and always intermediate between their parents, suggesting that the character is heritable in accordance with the multiple-factor hypothesis. The flowering of *S. robustum* and *S. officinarum* is identically responsive to photoperiod and all known forms are "short-day" plants. In New Guinea the average period of flowering of the two species is the same, late March to the end of June with a few straggling flowers later. When they are displaced to points north of the Equator, the flowering time is found to respond to the reversed seasons and takes place in the shortening days from October to late December or on into January.

As would be expected, the different forms of the more ancient *S. spontaneum* with larger, more varied natural ranges, extending from 9° S. to 40° N., show considerable variation in response to day length, but most of them belong to the intermediate class of plants that flower less readily or not at all when the days are too long or too short. In sharp contrast the *spontaneum* forms in the Turanian Depression east of the Caspian Sea, 40° N., are distinctly long-day plants. Flower initiation takes place from early June to July. Flowering of these plants is entirely suppressed in the lower latitudes (14). In New Guinea and in islands about the same numbers of degrees as New Guinea from the Equator, the *spontaneum* forms thus far observed are intermediates, flowering earlier than *S. robustum* and *S. officinarum*. In that area species hybrids of *S. robustum* or *S. officinarum* crossed naturally with *S. spontaneum*, such as Kassoer and Toledo (*officinarum* × *spontaneum*), are relatively rare and are more apt to occur at the higher elevations to which both *S. robustum* and *S. officinarum* appear to have been transported by man. Attempts to duplicate the *S. officinarum* × *S. spontaneum* cross in Java proved

difficult because of the different flowering times (32). In the majority of places in the world that are alien to one or the other parent (or both parents), it is usually necessary in attempting such crosses to use laggard flowers of *S. spontaneum* and the earliest flowers of *S. officinarum*. There are a few places where synchronization of *S. officinarum* flowering period and that of at least some forms of *S. spontaneum* is achieved, notably Coimbatore, India. I have not observed or seen reference to definitely restricted short-day forms of the species *S. spontaneum* under natural, undisturbed conditions. Day-neutral flowering forms unresponsive to photoperiod have not been reported in the genus *Saccharum*. The similar flowering periods of *S. robustum* and *S. officinarum* are consonant with close relationship.

As in the Andropogoneae generally, the basic chromosome number, x , of both the cultivated *S. officinarum* and the primitive *S. robustum* appears to be 10. The primitive diploid, $2x=20$, has not been found and may be extinct. All *S. robustum* forms examined cytologically thus far are high polyploids and aneuploids. Related members of a polyploid species are usually found in series with chromosome numbers that are multiples of the basic number. Represented in *S. robustum* all multiples of 10 from $2n=60$ to $2n=120$ have been reported by one or another investigator (29). Relatively few variants of that species, sometimes only a single specimen, have been established in the collections of most institutions, and it can be said therefore that only a reconnaissance chromosome survey of *S. robustum* has been made.⁵ The majority of forms studied, including the type 28 N. G. 251, are octoploids, $2n=80$. The 28 N. G. 251 was originally announced as having $2n=84$ (18). That has been corrected in our recent studies, which indicated also that the type of *S. robustum* forma *sanguineum* probably is a hexaploid (unpublished). Because of erratic flowering in southern Florida, only root tip and shoot meristematic cells were available for study on the latter form, but the somatic chromosome number appeared to be near 60. The few studies of meiosis in *S. robustum* and *S. robustum* hybrids made by various competent cytologists provide a fairly well defined picture of regularity in the process. Normally the 40 bivalents, with no univalents or multivalents, are formed in the octoploid forms and this is true of 28 N. G. 251. However, in *S. officinarum* \times *S. robustum* hybrids an increase in chromosome numbers beyond the sum of the monoploid numbers of the parents has been reported (18), but such increase may be exceptional. The consensus is that in such crosses including reciprocal crosses reduced gametes function on both sides and thus imply a close relationship of *S. robustum* and *S. officinarum*. Most crosses of *S. officinarum* and *S. spontaneum*, on the other hand, are characterized by unreduced gametes or doubling of the chromosome complement on the *officinarum* side, which has been taken to mean a more distant genetic relationship (36). The solitary exception to

⁵ As part of cooperative research of the Sugar Crops Section, U. S. Department of Agriculture, and the Experiment Station of the Hawaiian Sugar Planters' Association on cytogenetics of sugarcane, in effect since 1954, Samuel Price, Plant Geneticist, Sugar Crops Section, Crops Research Division, ARS, USDA, already has studied a hundred or more variants of *S. robustum* and hybrids resulting from planned hybridizations. Thus, for the first time, a serious and sustained effort is being made to shed light on the cytogenetics of these interesting forms.

the general rule of unreduced gametes on the *S. officinarum* side thus far known, judging from a study of the literature, is here recorded. In late August 1952, the writer and H. G. Sorensen gathered and carried dried, refrigerated pollen of *S. spontaneum* var. Mandalay from southern Florida to southern Colombia (lat. 3° N.) where noble canes were then in flower and dusted the pollen the following day on pistils of *S. officinarum* var. Cana Blanca. A small but vigorous progeny of 7 hybrid seedlings was obtained by the writer for cytological study. The following year, in cooperation with H. W. Li, 6 of the seedlings were found to have inherited the typical $2n(80)+n(48)$ complement of chromosomes, but 1 seedling (Palm Beach 52-1-3) inherited the atypical $n(40)+n(48)$ complement.

When the range of chromosome numbers in *S. robustum* and in the large group of *S. officinarum* garden canes described later in this handbook is considered, the predominant number in both cases is $2n=80$.

If every part of all original sugarcanes in the world, both domesticated and wild, could be made to disappear by some magic, leaving visible only the fungus, bacterial, and virus parasites to present ghostly outlines of root, stem, leaves, inflorescence, and internal tissues, it would be possible to lump the unseen canes into groups approximately as they are now classified according to conventional taxonomic characteristics. This is owing to the high degree of biological specialization in some cane parasites that makes obligatory their association with certain kinds of sugarcane. Such discriminating selectivity is not characteristic of all cane parasites, but the phenomenon is common. For various reasons other kinds of cane are uncongenial to the same parasites; hence, they are called resistant or immune.

It happens that the uncongeniality or resistance is heritable and at least some offspring are endowed with it. Controlled inheritance of disease resistance in sugarcane was first demonstrated in 1897 by J. D. Kobus, who crossed the noble cane Black Cheribon that was susceptible to sereh with sereh-resistant Chunnee in Java and obtained a progeny with some economically useful clones that were resistant to sereh. In the preparation for that work the assembling of great numbers of cane varieties by Kobus from many countries for resistance tests was indiscriminate as to species and racial groups. Because sereh was known only in Java, varieties gathered elsewhere for testing had to be selected more or less at random.

The conception of racial susceptibility or resistance to disease in sugarcane was a gradual development, obscured very often by limited evidence and limited vision. Modern technical literature on sugarcane is still cluttered with observations that the tropical noble canes are "susceptible to disease" and that, for example, *S. spontaneum* is "disease resistant." These offhand references many times are generalizations and do not specify which one of the hundred or more cane diseases, if any, is in the mind of the observer.

Not until the worldwide spread of mosaic in the decade 1915-25 directed careful attention to innumerable varieties of all types of cane, did the idea of sugarcane racial reaction to disease crystallize and emerge as one of the useful tools in cane breeding (12, 16). The rare occurrence of natural mass exposure of sugarcane to a particular disease agency and the deterrents and difficulties standing in the way

of controlled mass exposure to diseases still remain as obstacles that retard the accumulation of desired precise knowledge. Enough is known, however, to provide significant examples of obligate selectivity in the consorting of particular cane races and disease agencies. The illustration will be limited to two major diseases.

1. All forms of *S. robustum* tested for reaction to the virus of mosaic, including *S. robustum* Brandes & Jeswiet f. *sanguineum* Grassl, were found readily susceptible with evidence of deleterious effects; all forms of its derivative, *S. officinarum*, so far as they have been tested or observed, are also susceptible and as a rule are much injured—an added confirmation of close relationship between *S. robustum* and *S. officinarum*. In contrast, the forms of *S. spontaneum* are immune to mosaic or at least are so highly resistant that detection of the disease by outward signs is not possible with certainty—an indication of remote relationship with *S. officinarum*.⁶ The hybrid race *S. sinense* (*S. officinarum* × *S. spontaneum* if we follow Parthasarathy) is susceptible, but all forms are extremely tolerant of the effects of infection. Similarly, the *S. officinarum* × *S. spontaneum* race *S. barberi* is also susceptible; moreover, so far as observation has been possible, its members show readily detectable outward signs and are somewhat more injured than those of *S. sinense*. This may be an indication of different clones of *S. officinarum* × *S. spontaneum* involved in the parentage of the two races, or possibly of the same combination in reciprocal crosses. The fact remains that a range of intermediates between *S. officinarum* and *S. spontaneum* is found in the two races (*S. sinense* and *S. barberi*) so far as susceptibility and extent of injury are concerned.⁷

2. *S. spontaneum* is very susceptible to attack by the pernicious fungus parasite *Ustilago scitaminea* that causes the smut disease so named because it transforms the growing point of the stems or floral initials into a sooty, whiplike appendage emerging from the top of the plant. On *S. spontaneum*, smut is known in India, Turkestan, Indonesia, and the Philippines, and probably is present but unrecorded in other oriental countries.

The *S. officinarum* varieties are singularly free from attack by *U. scitaminea*, although it has been reported sporadically and at long intervals on a few of the clones like Loethers in Java, Luzon White in the Philippines, and perhaps a few others. These are offtype *S.*

⁶ The occasional occurrence of pronounced symptoms in *S. spontaneum* has been noted. In a selfed progeny of 300 *S. spontaneum* Mandalay seedlings produced at the Palm Beach Research Farm (Florida) in 1952, 5 individuals became infected with mosaic, and sharply conspicuous leaf markings were observed. Parthasarathy's theory of promiscuous natural hybridization, *S. officinarum* × *S. spontaneum*, could account for wild-growing hybrid forms closely resembling *S. spontaneum* as readily as for selected domesticated forms with characters resembling *S. officinarum*.

⁷ A puzzling attribute of sugarcane mosaic virus or of the defense mechanisms of grasses in general was the early discovery that, although the entire range from extreme susceptibility to immunity is found within the genus *Saccharum*, certain grasses in other tribes can become infected transiently by artificial inoculation or even by the natural insect vector if the grasses are growing in the vicinity of infected cane (15). There is no evidence that the disease persists for long in the grasses remotely related to sugarcane. Sugarcane itself is known to recover, but the evidence is more convincing for varieties known to have some *S. spontaneum* genes (40).

officinarum, possibly with a limited admixture of *S. spontaneum*. The situation as regards susceptibility and resistance to smut is seen to be the reverse of that just described for mosaic, in which *S. officinarum* is susceptible and *S. spontaneum* resistant. The hybrid races *S. sinense* × *S. barberi* and *S. officinarum* × *S. spontaneum* are notoriously susceptible to smut in India, where it has long been regarded as a major disease. The improved Coimbatore varieties, which are recent combinations of *S. officinarum* and *S. spontaneum*, are carefully tested for reaction to smut before they are released for cultivation. The majority of seedlings are discarded. Fortunately, owing to this screening process, some of the survivors are listed as tolerant, or even resistant, but most of them are susceptible to smut. In this reversal of character where *S. officinarum* plays the part of the parent endowing resistance to its offspring and, on the other hand, *S. spontaneum* is the one conferring susceptibility, we see some curious and significant implications. Up to the time of the mosaic epiphytotic the commercial sugar industries of the New World were based exclusively on *S. officinarum*, and smut was unknown. Now the same industries are firmly based on hybrid varieties with an admixture of *S. spontaneum* for protection against mosaic, but vulnerable to smut. The inevitable pursuit, and overtaking, of the host by the highly specialized parasite has now happened. How it arrived is not known but for the first time in history smut was recently reported in northern Argentina and rapidly moved into southeastern Brazil. The presence of *S. spontaneum*, even though somewhat diluted in the commercial canes of the Americas, could make itself known sans host plants by the ghostly outline formed by the parasite.

GEOGRAPHIC ORIGIN AND DISPERSAL

In foregoing sections we have endeavored to define the complex group of original noble sugarcane and to describe their economically useful qualities that have made them indispensable in the evolution of all cultivated sugarcane. Of equal importance in a practical sense is the geographic center of origin and dispersal that necessarily involves the genetic origin of these forms.

ORIGIN

In the introduction of a recent book dedicated to N. I. Vavilov, Darlington (23, p. 29) says:

A description in terms of formal species names and a single process is likewise misleading as applied to the origin of the sugar cane. Here we are concerned with a complex of wild forms of *Saccharum* with chromosome numbers between 48 and 112, classified under the names *spontaneum* and *robustum* and distributed between Turkestan and Polynesia. These forms, by selection for size and sugar content, and of course increase of chromosome number, have given rise to the cultivated species called *barberi* in India, *sinensis* in China, and *officinarum* in Java and the Pacific. In recent years these have all been crossed together and with the wild forms and, with further increase in chromosome number have finally given us the prodigies of Passeroën and Coimbatore.

Although one may agree with the first sentence, the statement is otherwise so diffuse that it is likewise misleading and might better have been omitted. A discriminating review and selection from the litera-

ture, particularly since 1928, would have made possible an unambiguous concise statement in less words; e. g., one wild *Saccharum* species localized in New Guinea, *S. robustum*, gave rise by the occurrence of polyploidy and selection to a group of tropical cultivated canes, *S. officinarum*; and, as a much later second step, migrating forms of *S. officinarum* in southeastern Asia hybridized with forms of the widely distributed wild *S. spontaneum* and gave rise to several groups of subtropical cultivated canes, among them *S. sinense* and *S. barberi*.

Compared with nature's evolutionary role and the achievements of untutored or at least unlettered and forgotten men who selected *S. officinarum*, the reference to modern cane varieties bred at modern experiment stations as "prodigies" is overdrawn. For adaptability and yield in tropical countries the long-term records of the old Cristalina and Cheribon canes stand comparison very well. Much to their credit, cane breeders have made dramatic advances in correcting environmental misfits. For example, workers in the United States Department of Agriculture have recently bred new canes to fit conditions in southern United States. The tropical *S. officinarum* forms cultivated there for more than a century were out of their element and were replaced with species hybrids well adapted to the climate. Also to their great credit, as current production statistics verify, sugarcane breeders have a little more than held the line against the challenge of disease and other adversities. Without exception every significant advance in cane improvement, including the doubling of chromosomes of the valuable *S. officinarum* gamete, has been patterned after the guiding inscriptions of nature in the area of origin. Some of these guides, like the natural species hybrid Kassoer, were brilliantly interpreted. It is a worthwhile privilege for an observer to traverse that area and try to interpret the inscriptions, however time-ravaged some of the tablets may be.

The origin of sugarcane is not so cryptic as the origin of many other cultivated plants in which ancestral forms are wanting; resort therefore is necessary to circumstantial evidence, questionable human records, or the testimony of paleontology. The basic wild forms of sugarcane or their recognizable polyploid cognates are extant. However, the morphological boundaries of the cultivated forms derived from them, thanks to a measure of biological isolation, are still fairly discernible.

It is still possible, and this is important, to reach back and recapture from the wild progenitors and original cultivated groups some genes useful in holding the line against adversities like diseases. This circumstance is the chief justification for the effort of collecting and maintaining for study generous samplings of the wild and early cultivated species, or great groups, of sugarcane. With them, and with them only, a cane breeder commands the full range of sugarcane diversity and potentialities. One can make a cross and predict with some degree of confidence that the progeny will include among the individuals a few with the desired basic qualities. Among these qualities are adaptability to given environmental factors, reasonably high sucrose percentage, low fiber percentage, resistance to one or another of the known disease organisms (which in themselves exchange genes and mutate), and other heritable qualities known by experience to reside in the particular parents. If the confusion visualized by

Darlington (23), or at least by the casual reader of his paragraph, were literally true, not much would be left of planned cane breeding except the use by a cane breeder of his favorite "proven parents," which in general are valuable only temporarily and usually for a particular producing area. Most proven parents represent only small arcs in the full circle of sugarcane diversity.

The centers of diversity of sugarcane may or may not be the geographic center of origin. Fixing the authentic center of origin depends on confirmatory evidence, chiefly the coexistence in the area of proved or credible, putative ancestral forms, as well as the complete range of diversity. With the domesticated sugarcane the evidence since 1928 (18) is exceptionally trustworthy in establishing New Guinea as the geographic center of origin of the original noble canes and *S. robustum* variants as the sole or principal ancestral forms. Also, on good evidence several shifting or satellite centers of diversity, involving hybridization with other grasses, have been established, notably Polynesia (29) and northern India (36), and on collateral evidence numerous other satellite centers. In contrast with most ancient cultivated plants, the singular advantage facilitating studies of sugarcane origin lies in the fact that at that center organic evolution of the principal component of sugarcane continues to operate under natural conditions. Certainly persevering artificial selection and solicitous care by Neolithic horticulturists continue to operate much as they undoubtedly operated thousands or tens of thousands of years ago (13).

Varieties similar to those described in this publication continue to evolve there today by unceasing natural backcrossing of the selected forms with the wild *S. robustum*. As the closest wild relative of the noble sugarcane, found exclusively in the area where numbers and diversity of noble canes are incomparably greatest, we take for granted the parental role of *S. robustum*. Irrespective of whether or not the diploid ancestor of *S. robustum* still exists, the impact of that wild species continues to create greater diversity. The considerable number of obviously recent natural backcrosses found carefully tended in village gardens during 1928 testifies that the process of evolution and selection, however slow or in whatever direction, is unabated.

This explains the far greater scope in diversity of the New Guinea original forms as compared with the migrant forms of original nobles carried in past millennia by man to the sites of potential satellite centers of diversity. These forms had to be limited in numbers because of the great difficulties and hazards of travel and represented only selected small segments of the boundless variants available at the primary center. There is some evidence that the initial migrant clones were prudently selected from the higher levels of quality as chewing canes. On the average they are softer and higher in sucrose percentage. After they multiplied where conditions favored seedling production in their new homes and were reselected, the limited heterogeneity is evidenced by greater uniformity as compared with the wider heterogeneity and diversity of the larger primary group in New Guinea. In Polynesia, for example, where land areas are small and close relatives of the migrant noble canes are scanty, the continued evolution of wide variants was suppressed. The same is true of New Caledonia. New Guinea on the other hand possesses the requirements of vast size, diverse climates, and numerous inhabitants and

may be described as a proving ground for sugarcane where mutations in Mendelian populations had and perhaps still have full play.⁸ As we know, nature has not endowed its creations with a providential ability to produce only mutations beneficial to exploiters like man. Many chance seedlings were picked up by primitive man in New Guinea, which after periods of trial in the gardens were found to be inferior and were discarded. Some of these inferior garden forms are in our collections.

DISPERSAL

The dispersal of *Saccharum officinarum* forms from New Guinea and its eastern outlier islands began in prehistoric times and still continues. The evidence on early pathways of the migrants is clear enough, and even the relative times of migrations radiating outward in several directions from the center can be postulated with fair assurance. However, the absolute time when the movement outward started is more obscure. The most that can be said on present evidence is that initial migrations must have begun many thousands of years ago, long before the presence of man in Polynesia, and were, in order of time, southeastward to the compactly grouped islands of Melanesia, westward to Indonesia, and northwestward to continental Asia and the Philippines. Migrations eastward to the far-flung islands of the "Polynesian Triangle" were comparatively recent; i. e., beginning not earlier than about 500 A. D. Obviously, in the absence of documentation, reliance must be placed mainly upon botanical evidence, which is well supported, however, by ethnographical evidence. Legends, ancient history, and philology are frail reeds upon which to reconstruct the place of origin and dispersal of an ancient cultivated plant like sugarcane.

There was no possibility of *S. officinarum* dispersal by natural means; the character of the propagating material—stem cuttings—and also the indispensable need for weeding and care of the plants by man prevented natural dispersal. Natural dispersal by seeds of the wild progenitor *S. robustum* was effectively limited by water barriers. There is some evidence, however, that typical *S. robustum* was carried as a minor economic plant by the Papuans to the smaller fringing islands of New Guinea and southeastward as far as the New Hebrides. The durable stems are used today in constructing garden fences for protection against wallabies and pigs, for roof parts of their amazingly large and elaborate houses, and to some extent as shafts for assagai-like throwing spears. For arrow shafts the more slender stems of *Miscanthus* sp. and *S. spontaneum* are preferred.

This reference to the warlike character and the material culture of the Melanesians, particularly the Papuans, is not a digression from the subject. Papuans are and presumably have been from time immemorial the traditional bitter enemies of their close neighbors to the west, the Indonesians. As late as 1860, according to Alfred Russel Wallace (41), the Indonesians had good reason to avoid the coast of New Guinea and its aggressive, untrustworthy inhabitants. The Papuans of many remote interior areas of New Guinea can be so described today. Although conceding that the Papuans are violent

⁸ See p. 81 for summary characterization of each group of clones.

and cruel, Wallace rated them intellectually higher than the more civilized Indonesians. It is obvious that occasional contacts and in a small way even barter between these distinctly different races of people took place, but always, as Wallace described it, on neutral ground such as the Aru Islands, where the resident Papuans were less truculent than those of the main island. There is no reason to doubt that variations of the barter between sworn enemies may be very old.⁹ Thus, in what was essentially a state of armed truce and through intermediaries, some of the products of New Guinea, including sugarcane, were funneled to Indonesia.

It is rather significant to note that in his long account of observations during 6 years of actual travel from island to island of the Malay Archipelago, the naturalist Wallace took no notice of sugarcane until his narrative reached the point of describing the Aru Islands off the south coast of New Guinea. There he was indeed impressed with the dietary importance of sugarcane as a direct consumptive product of the garden. In Wallace's words (*41, p. 350*):

The sugar-cane was finer than any I had ever seen. The canes brought to the boat were often ten and even twelve feet long, and thick in proportion, with short joints throughout, swelling between the knots with the abundance of the rich juice. At Dobbo [the trading village] they get a high price for it, 1d. to 3d. a stick, and there is an insatiable demand among the crews of the praus and the Baba fishermen. Here they [the Papuans] eat it continually. They half live on it, and sometimes feed their pigs with it. Near every house are great heaps of the refuse cane; and large wicker-baskets to contain this refuse as it is produced form a regular part of the furniture of a house. Whatever time of the day you enter, you are sure to find three or four people with a yard of cane in one hand, a knife in the other, and a basket between their legs, hacking, paring, chewing, and basket-filling, with a persevering assiduity which reminds one of a hungry cow grazing, or of a caterpillar eating up a leaf.

Mr. Wallace's account of cane-chewing 100 years ago is no doubt unintentionally exaggerated. Although I have seen a young pig being suckled by a Papuan woman, the grown pigs, according to my own observations, ordinarily are denied the fresh unchewed cane. They must make shift with the expectorated frass or "chewings."

The story is quoted because I know of no better way to illustrate the difference in long-established eating habits of Indonesians and Papuans and the incomparably greater importance and antiquity of sugarcane in the diet of the Papuans. For ages the Indonesians, like their relatives of Indochina and China, have been rice eaters. Some of them chew sugarcane occasionally as an esteemed confection. The carbohydrate food of Papuans for ages has been obtained from swamp sago palms (starch) and from taro, yams, and sugarcane (starch and sugar) cultivated in rain-forest clearings. The sugarcane is invariably present in the untold thousands of diminutive mixed gardens in the forests tended by the two million or more part-time gardeners constituting essentially the entire population of New Guinea and its outlying isles. How did they learn to eat cane?

⁹ In 1928, in the upper reaches of the Kikori River, we encountered a curious "sight unseen" method of barter between hostile tribes of Papuans. The delta swamp dwellers carried conch shells up the river and left them on neutral ground for the hill tribe, returning later for products (which we were unable to identify) left by the hill people. Males of the hill tribe used the shells as a pubic apron, or sheath, supported from a rattan belt.

It has been said that in times of famine primitive man would eat bark, roots, or anything he could chew and swallow. Discovery of even small amounts of sustaining sweet carbohydrate food within the hickory-hard rind of stems of wild *S. robustum* would send a hungry hard-pressed Papuan of long ago searching for other and possibly softer specimens. In my own experiments on the practicality of chewing and taste-testing *S. robustum* clones, I discovered much variation in hardness and sweetness. Some, however, including the very hard red-fleshed *S. robustum* f. *sanguineum*, were highly unmanageable.

In our explorations and studies of sugarcane collected in the area of origin and early dispersal, we were impressed by the fact that the hard wild canes of *robustum* type have been found together with the soft garden canes along only one pathway of migration. This is the arc of densely distributed islands extending southeastward from the Bismarck Archipelago to the New Hebrides. Up to the present time, feral *robustum*-type sugarcane has not been reported elsewhere. On this evidence we postulate that the first migrant sugarcane transported from New Guinea followed this pathway. Corroborative evidence is found in the fact that this area almost precisely marks the range of the Papuans, or Melanesians. Anthropologists have evidence that Melanesians also reached North Island of New Zealand before the Polynesian migrations to New Zealand, but because of climatic limitations sugarcane was not important there.

In connection with the first cane migration, mention should be made also of another hard-stemmed sugarcane type domesticated and used extensively by the Papuans. This cane, according to the evidence of its vegetative characteristics, doubtless was selected from *S. robustum*. This is the odd *S. edule* with abortive, cauliflowerlike panicles extensively used as food along the first track of migration. Clones of *S. edule*, being completely sterile, survive only under domestication, and the processes of evolution are effectively arrested. These peculiar garden forms may therefore be very old and could have arisen from *S. robustum* earlier than the soft-stemmed chewing canes. Together with the latter cultigen, specimens of *S. edule* are found on the Indonesian Islands west of New Guinea, probably the second pathway of migration.

The second pathway of migration and by all odds the most important was westward to islands of Indonesia, Philippines, the Malay Peninsula, Indochina, and the arc around the Bay of Bengal. The importance of that migration lies in the fact that it laid the foundation for exploitation long afterward, in tropical India, of sugarcane as raw material in the manufacture of sugar. This marked the transition of sugarcane cultivation from a horticultural routine to a field crop operation.

The discovery of practical sugar-making methods ushered in the period during which first mentions of sugar and sugarcane were made in recorded history. In his painstaking bibliographic research (24) Noel Deerr makes the assumption that the knowledge of sugarcane and sugar displayed in the Indian literature of two or three centuries on both sides of the beginning of the Christian era and the reference to sugar by soldiers of Alexander the Great returning from western India (325 B. C.), point to the presence there of the sugarcane for a period long prior to the time of these earliest records. In our problem

of locating paths of migration and shifting centers of diversity of *S. officinarum*, it is necessary still to rely on the botanical evidence, but these early records, both Indian and Chinese, are useful in several details beyond merely establishing more accurately the time and place of migrations.

The reference to soft and "thick" canes (and thus inferentially to hard and thin ones) and to peeling and chewing sugarcane as a confection suggests that only our migrant noble cane could have been meant. The noble canes do not grow normally and produce flowers in India above the Tropics. For an explanation of the presence of the relatively thinner and harder sugarcanes *S. sinense* and *S. barberi* in subtropical northern India and corresponding parts of China, it is necessary to return to the safer ground of botanical evidence.

For many years Barber (9, 10) believed the slender cultivated canes of northern India to have been derived from the indigenous *S. spontaneum*, but he found some similarities between these cultivated canes and the tropical noble canes that led him to suggest the possibility that both types may have had a common origin in *S. spontaneum*. Parenthetically, before the discovery in 1928 of *S. robustum* in New Guinea, this belief was held generally but vaguely by botanists. In 1920 Barber (11) was driven to conclude that the tropical noble canes must have had a separate origin in some species other than *S. spontaneum*—a species "now lost in the wild state." He did not attempt to reconcile the anomaly of intermediate *S. spontaneum* and tropical noble cane pulvinal and rhizome characteristics that he had noted previously in the northern Indian cultivated sugarcanes.

It was left for Parthasarathy, in the light of cytological and taxonomic evidence accumulated since 1920 and the concept of tropical noble cane origin since 1928, to construct an ingenious and acceptable explanation of subtropical Indian cane origin; namely, the promiscuous natural hybridization of tropical noble (*S. officinarum*) forms and indigenous subtropical (*S. spontaneum*) forms (36). In the selective processes by early agriculturists the hybrids were singled out as better suited to the rigorous climatic conditions northward and became predominant there. In a later brief publication of the origin of *S. officinarum*, not cited, Parthasarathy adduced cytological evidence to show that *S. officinarum* may have a basic complement of genes in common with other fairly close relatives of the Andropogoneae widely distributed in India. This relationship is obviously quite possible and readily can be reconciled with our theory of *S. officinarum* origin. The obvious purport of the brief paper, however—that *S. officinarum* may have originated in India—is not well supported by such evidence.

Although *S. spontaneum* is found in the islands of Melanesia and Indonesia, no corresponding need for climatic adaptation had to be met by early horticulturists and the small wild cane played a minor role, if any, in the final steps of development of the tropical noble garden cane.

The documented history of sugarcane in northern India, together with reasonable inferences on the lapse of time between arrival of the migrant garden cane and the dates of first documentation in India, takes us back about 3,000 years. If we consider the perishable nature of sugarcane propagating material and the hazards of transporting it long ago, it is not unreasonable to allow an equivalent span of years

for the slow and interrupted journey from Papuan gardens to Bengal and Indochina. It is true that the relatively short distances between the islands ranging westward and northwestward from the island of New Guinea and the favorable climatic conditions did not impose a single effective barrier, but barriers imposed by man were formidable.

Even in the Mediterranean countries of those days the lonely stranger was rare, suspect, and endangered. In New Guinea one may observe today among Neolithic-age men in the still uncontrolled parts of the deep interior a projection back to prehistoric conditions that probably existed on the track of sugarcane migration 6,000 years ago. If for any reason a man took a walk beyond the area of his tribal community, he risked his life and therefore he carried very little except his weapons, his betel-nut chewing equipment, and his fire-making apparatus conveniently worn as a belt. He was alert, stealthy, and constantly poised for flight. It cannot be assumed that much of the early dispersal of cane was accomplished by individuals going about in that manner. Small mass movements of men to nearby new territory, as when population pressure and the food quest or intratribal disagreement forced the setting up of a daughter village, were a more probable method.

Obviously, the establishing of outpost villages by primitive men would involve extension of their material culture, including domesticated plants. Except under occasional extraordinary circumstances that could force involuntary small mass movements of men by water, the encroachment of sugarcane into new territory must have been as slow, but in the fullness of time as inexorable, as the flow of cooling lava. If we allow 3,000 generations of cane, propagated annually by cuttings, for the measure of time on the second track of migration, it is probably an underestimate. Since conditions at many places along the track were favorable as potential centers of diversity and reselection, it is not to be wondered that only a few of the clones in the present study listed as "miscellaneous nobles," i. e., scattered nobles obtained from various institutions with no authentic information on place of origin, are identical with existing New Guinea nobles. The wonder is that a fair number of them actually are identical with or barely distinguishable from clones recently found in New Guinea.

With regard to the types of curiosities or oddities among the noble canes, it is significant that not a single oddity collected or reported from the principal satellite centers of diversity like Indonesia, Malay Peninsula, Indochina, New Caledonia, and Hawaii is missing from the aggregation of highly diversified forms collected in New Guinea. These oddities include the striking purple-leaved form sometimes used as an ornamental, the "rat" cane with a felt of hairs on the stem resembling fur, the "suede glove" canes with dull, chamoislike stem epidermis, the gigas type called elephant cane, and the "egg" cane with zigzag ovoid internodes. In addition there is the primitive "fish-roe" cane with cauliflowerlike abortive inflorescence previously mentioned as probably an earlier mutation from *S. robustum*.

By no stretch of available botanical evidence or of human credulity is it possible to make the assumption that these varied forms of conventional nobles and the botanical "jokes" flowed inward to a vortex or were drawn from all quarters as by a magnet to New Guinea. That

would be against all probability in the statistical sense and irrational in plain horse sense—something like carrying coals to Newcastle.

On the basis of the evidence we are led to believe that sugarcanes, i. e., the domesticated noble canes, had their origin in New Guinea and by successive impacts radiated outward. This pyramiding of evidence on origin and dispersal of the sugarcane may seem to be pressing the point unnecessarily. However, since every work of reference and the introduction of every book on sugarcane prominently display misinformation or a hedging vagueness on the subject, it seems appropriate to present what firsthand evidence we have assembled in a long experience covering all areas mentioned, supplemented by such interpretations as seem valid.

The last of the classic trails of migration of the noble garden canes was blazed by those incomparable mariners, the Polynesians. There is no botanical evidence in the nature of indigenous wild *Saccharum* forms in the flora of the Polynesian Islands that could support the view, formerly held by a number of botanists, that garden chewing canes originated in those islands. These loosely verified opinions were held before the discovery of *S. robustum* in New Guinea. Good evidence has been presented by Grassl supporting the theory that the Hawaiian original sugarcanes, or some of them, represent segregates resulting from natural crosses of the imported Melanesian garden canes and *Erianthus maximus*, which is indigenous in New Caledonia, Fiji, and many Polynesian Islands (29). Where or how the roving Polynesians picked up the garden sugarcanes from the Melanesians is not known, but from the evidence of anthropologists on "race" migration it is plain that transportation of the cane eastward began not more than 1,000 to 1,500 years ago, or at least 1,500 years after arrival of the cane on its long journey northwestward to the province of Bengal.

Beginning in 1768 Tahiti became a contributing source of cane varieties, few in number but important in their impact upon the sugar industries, particularly in the "sugar colonies" of the New World. The subsequent complex history of modern cane migration during the next century from these islands and from all the other early centers of diversity is well summarized by Deerr (24).

The most important and extensive distributions of original noble canes during that century were from Java and other islands of Indonesia. In small groups, or even singly, a large number of varieties were carried at different times to Mauritius and the New World sugar colonies, to South Africa, to Australia, and to European settlements in southeastern Asia. Most of the identifiable noble canes in India today trace back to shipments of that period. Soon after the sugar experiment stations were established in Java about 1880, a great backwash of sugarcane varieties to Indonesia occurred from all sugar-producing countries, stimulated by the frantic search for varieties resistant to sereh.¹⁰ Although hundreds of names were attached to the noble

¹⁰ Emphasis was given to the assembling of the tropical garden canes. It is significant that although wild *Saccharum* forms were not collected, the primitive domesticated canes of northern India were included and their resistance to sereh generated an interest in wild canes as breeding material.

forms retrieved from other countries and to those gathered by intensive search in other islands of Indonesia, it appears from the careful studies of Jeswiet (30) and Posthumus (37) that less than 50 separable forms were involved. Since in some cases these included the usual 3-color variants of otherwise identical clones, the actual number of distinctly different noble forms readily available for procurement and testing at that time was considerably under 50.

In summarizing the evidence on geographic origin, phylogeny, and dispersal of the original, domesticated sugarcane (by common consent referred to as *S. officinarum*), we have mentioned:

1. Existence in New Guinea of great numbers and wide diversity of these cultivated garden forms in contrast with relatively few numbers and greater homogeneity of forms in other centers of diversity scattered from India to eastern Polynesia. Types of botanical oddities among the garden forms are found singly or sparsely in the other centers of diversity. Representatives of all types are found in New Guinea.
2. The discovery in diverse forms and great abundance of a large wild sugarcane, *S. robustum*, limited in known range to New Guinea and adjacent islands of Melanesia. The small wild cane *S. spontaneum*, which was also found in New Guinea, has a wide range extending from eastern Africa to Melanesia.
3. The close relationship of *S. robustum* to the domesticated garden forms and the more distant relationship of *S. spontaneum*, as indicated in the revised key to the species of *Saccharum*. Corroborating the taxonomic evidence, we pointed out a number of physiological affinities between *S. robustum* and *S. officinarum* and a number of physiological differences between *S. spontaneum* and *S. officinarum*.
4. The postulated pathways of prehistoric migrations of the domesticated sugarcane, transported by man, and relative times of these migrations radiating from New Guinea, based partly on botanical evidence and on anthropological and ethnographical evidence.
5. Modification, usually in slight degree, of the domesticated sugarcane at various centers of diversity along the pathways of migration by natural hybridization with other grasses, including *Erianthus maximus* and *S. spontaneum*. Modification by hybridization with *S. spontaneum* in the higher altitudes of the Tropics was extreme and resulted in the small, thin-stemmed cultivated sugarcanes of northern India and southwestern China adapted to the subtropics. There is good circumstantial evidence that Linnaeus based his species *S. officinarum* on an odd, sterile hybrid type with $2n=81$ chromosomes grown during his time to the exclusion of other kinds in the Mediterranean countries and the New World and, more recently, known in Spain as Algarobena and in the New World sugar colonies as Creole. Being extremely susceptible to injury by mosaic, the clone is almost extinct.

To this evidence on phylogeny and migration of the domesticated sugarcane may be added a note on the probable course of the much earlier migration of wild, primitive *Saccharum* to New Guinea from the continent of Asia unaided by man, and the subsequent isolation

in New Guinea by water barriers of *S. robustum* or other evolutionary forms developed there exclusively. This involves the geophysical evidence interpreted by geologists and the floristic studies of phytogeographers. In the latter field of work we are indebted chiefly to E. D. Merrill (35), whose classic studies of island floras from Asia to Australia and whose interpretations of plants in the area give the clue to our own interpretations of ancient migrations and modifications of wild *Saccharum* under conditions undisturbed by man.

The towering, mountainous island of New Guinea is unique among equatorial islands. At all times torrential mountain streams feed the broad, meandering rivers of the coastal and lake plains. Among island land masses it is second in size to Greenland. Reminiscent of Greenland, great fields of "perpetual" snow and ice reside on the highest peaks of the central chain, a condition found on the Equator only in eastern Africa and western South America. New Guinea rests on a continental shelf now submerged only 30 to 40 fathoms, with parts of the shelf including Australia to the south and nearby Halmahera to the northwest. Another continental shelf extends from southeastern Asia to include Sumatra, Borneo, and Java. In a deep sea trough, or basin, between these two stable regions is an area of instability that includes the Philippines, eastern Celebes, and the Spice Islands. In the Cretaceous age all these islands were part of the great Asiatic-Australian Continent, and apparently some Asiatic types of plants found their way to New Guinea by that land bridge; but, subsequently, archipelagic conditions prevailed, and New Guinea has remained insular except for intermittent land connections with Australia. Theoretically it was possible for primitive *Saccharum* to reach New Guinea from Asia and undergo modification that did not occur elsewhere. It is clear that the modified wild forms, including diverse forms of *S. robustum*, have been isolated by water barriers for a long time.

COLLECTING EXPEDITIONS, 1853-1951

Firsthand collecting of original sugarcane varieties on an ambitious scale within the area of earliest dispersal began soon after the annexation of New Caledonia by France in 1853. Colonists from Reunion in the Indian Ocean who were familiar with commercial cane cultivation on that island and Mauritius were much impressed by the wealth of colorful, sweet varieties cultivated by the Melanesian aborigines of New Caledonia and nearby islands of the New Hebrides. An active commerce sprang up between these islands and Reunion, conducted at first by sailing vessels. Colonists came in increasing numbers from Reunion, bringing with them skilled laborers, sugar-making machinery, and the arts of sugar fabrication. During the next two decades some of them returned to Reunion with sizable collections of the handsome garden canes from Tanna and New Caledonia.¹¹ Added to the collection of Caldwell taken from the same area to Mauritius in 1870 (24), the large numbers of Melanesian garden

¹¹ Oral communication from the late M. Huet, a resident of Noumea since 1869.

canes carried to Reunion and Mauritius augmented the already established reputations of those two islands as important sources of sugarcane varieties. Some of these Melanesian garden canes under the names Tanna, Caledonia Queen, Caledonia Ribbon, Yellow Caledonia, and Kava-rangri (Cavengerie), enjoyed longer or shorter periods of popularity as important commercial varieties in a number of sugarcane-producing countries.

Vieillard and Deplanche listed and described very briefly 40 garden canes of northern New Caledonia in 1863 (38). In 1884 De Greslan similarly described 60 different cane varieties cultivated in gardens throughout New Caledonia. Notes on their flowering tendencies were prepared by De Greslan and later published by Sagot (38). At the time of publication (1893), Sagot stated that the recent introduction of cattle and the reckless manner of pasturing by the colonists had brought about the disappearance of many varieties listed by De Greslan and by Vieillard and Deplanche. The numbers of garden cane varieties had been reduced by other events. The continuous series of violent insurrections by the Melanesians from 1853 to 1884, and, in the neighboring New Hebrides, the exploitation and debauchery of the primitive island people by swarms of lawless labor recruiters decimated both garden canes and gardeners. The present 40,000 population of the New Hebrides is but a handful compared with what it was. The wonder is that, after such violent disturbance of an ancient way of life on the southernmost islands of Melanesia, the fears of Sagot regarding extinction of the small cane gardens have not materialized. In 1935 I visited villages of 18 Melanesian tribes in New Hebrides and New Caledonia and collected 126 clones of garden canes, together with specimens of wild-growing relatives, including *S. robustum* in Efate and *Erianthus maximus* in New Caledonia.

Parenthetically, *E. maximus* is without question the tall grass collected in Tahiti by botanists who accompanied Capt. James Cook to that island in 1769 and 1772 and which was misnamed *S. spontaneum* by J. G. Forster, botanist of the second voyage. Later collectors have never confirmed the presence of *S. spontaneum* in Polynesia. This error stimulated the assertion, untenable on botanical evidence but accepted by De Candolle, Sagot (38), and others, that domesticated sugarcane was derived from *S. spontaneum* in the Polynesian Islands. Dangling from his main premise, Sagot made the concession that the sugarcane might also be derived from *S. spontaneum* at high elevations in mountainous islands of Malaya, thus encompassing as the place of origin a considerable part of the earth's surface. I have myself collected *E. maximus* in Tahiti and Raiatea of the Society Islands as well as in New Caledonia, these representing the eastern and western extremities of the natural range as known today. I have not encountered *S. spontaneum* (or *S. robustum*) in the Pacific east of the Papuanian group of islands, despite a 35-year reconnaissance covering all major groups of mountainous islands. Exploring the low islands, i. e., atolls and reefs, for cane would be an impossible as well as an unrewarding task. The ecological conditions of such islands are unsuitable for the garden canes and their close wild relatives as well. Garden canes can be made to grow when well tended, however, on coral atolls like Tongatabu.

The handsome group of Hawaiian garden canes appear not to have been distributed elsewhere for commercial exploitation during the 19th century as extensively as were the canes of New Caledonia and New Hebrides. Some of them must have been used locally for sugar-making during the early years of the modern sugar industry, but most of the Hawaiian canes were soon displaced by varieties from Tanna, New Caledonia, Tahiti, and Indonesia. The early published records do not clearly recognize or distinguish different Hawaiian varieties, although such distinction must have been important to the indigenous Hawaiians. During the second half of the 19th century Hawaiian cane names began to appear on lists of varieties in other countries. There is of record a formal request by the U. S. Secretary of Agriculture for Hawaiian sugarcanes during the reign of Kalakaua, 1879-91. These were intended for the Louisiana sugar experiment station established in 1885 at New Orleans as part of the State land-grant college sponsored by the Federal Government. Seven varieties, listed as Ko Kea, Manulote, Uwala, Ohia, Akilolo, Honuaula, and Papaa, were duly received by the American consul at Honolulu in 1887 from Wm. G. Irwin & Co., and were transmitted to New Orleans. The 30 or more Hawaiian garden canes described herein represent 2 shipments sent to the U. S. Department of Agriculture by courtesy of the Hawaiian Sugar Planters' Association. According to advice from the association, the second shipment was sent to remedy mislabeling of varieties in the initial shipment. They were originally assembled as a collection for study on the island of Maui; the collection was initiated in 1920 by W. G. Moir and Edward L. Caum. As part of the World Reference Collection the fairly homogeneous group from Hawaii has been further studied in relation to other groups and has provided some of the evidence leading to interpretations in preceding sections of this handbook on the origin, dispersal, modification, and diversity of the noble canes.

The second series of large-scale collecting expeditions to Melanesia began in 1892 when the Queensland Department of Agriculture commissioned Ebenezer Cowley to collect economic plants, including sugarcane, in British New Guinea. The Queensland Acclimatization Society previously had been active in obtaining cane varieties from Mauritius and Indonesia for the expanding sugar industry. In some ways the collecting of cane varieties in New Guinea for Queensland paralleled the variety collecting in New Caledonia and New Hebrides for Reunion several decades earlier. Both followed immediately the formal annexation of new territory and both were sponsored in part by government and in part by private enterprise. Although the journey from coastal New Guinea to Queensland is much shorter than the corresponding voyage from New Caledonia across the Indian Ocean to Reunion, the problems of seed-cane survival were formidable, because of the immense size and rough surface features of New Guinea and other surprising difficulties of interior travel. A walk across central New Guinea is an undertaking of almost a half year; needless to say, the first sugarcane collectors did not operate far from the coast, although the Colonial Sugar Refining Co. expedition under A. M. Carne crossed the narrow but mountainous eastern peninsula in 1914.

Success of the collecting projects has varied. The pioneer venture of the Queensland Department of Agriculture under Mr. Cowley in 1892-93 met the fate of many pioneers. Not a single variety was established in Queensland. The buds were either dead on arrival or were killed by fumigation. A second trip by Mr. Cowley in 1893 resulted in establishing 11 varieties at the Mackay State Nursery. Without question these experiences were of value in opening the eyes of the competent authorities to the need of careful planning, and the Department's next expedition under Henry Tryon in 1895 was better organized.

Mr. Tryon was a trained entomologist, botanist, and phytopathologist. Thirty-three years after his noteworthy collecting, I had the privilege of meeting Mr. Tryon in Brisbane. A small, white-whiskered, taciturn individual, he impressed one as a meticulously careful man who could be trusted to anticipate the needs and to work out beforehand the requirements in a difficult job of collecting perishable cane cuttings. With two other officers of the Department he chartered a cutter at Thursday Island and prudently limited his operations to a short stretch of the southeastern coast, emphasizing the procurement of propagating material of each variety in superabundance. In about 4 months cane plants and packing material weighing more than 7 tons were collected and taken by cutter to Cooktown in northern Queensland, thence to Cairns, the railhead, thence by special train to final destinations. With careful planning and good luck, except for a storm that drove the cutter west to the Gulf of Papua, only 200 pounds of cane plants were lost because of unavoidable delay in handling. Sixty-six varieties were carefully nursed from New Guinea to Queensland and New South Wales, among them the famous Badila, which paid for the cost of the expedition and probably for much of the subsequent research of the department for the next half century.

An enlightening historical account of Tryon's and the other sugarcane collecting expeditions to New Guinea, together with an excellent narrative of their own expedition in 1951, has been given by Buzacott and Hughes (22). All told there have been 10 collecting ventures, 5 by the Queensland Department of Agriculture (1892, 1893, 1895, 1912, 1951), 3 by the Colonial Sugar Refining Co. (1908, 1914, 1921), 1 by the U. S. Department of Agriculture (1928), and 1 by the Hawaiian Sugar Planters' Association (1937).

Up to and including the 1921 collecting in New Guinea, the chief objective was to discover better garden canes, *S. officinarum*, for direct exploitation in plantations. No interest had been taken in wild *Saccharum* forms and, in fact, there were no authentic records at that time of the existence of such wild forms in New Guinea.

Renewed interest in the New Guinea garden canes, and in particular an active curiosity concerning their phylogeny, which stimulated the next collecting expedition in 1928, was brought about indirectly by a disease epidemic. For several years prior to 1921 and continuing thereafter, the ominous virus disease, mosaic, long endemic in the highland native gardens of Java, had been encroaching on the sugar-producing countries of the New World one by one, beginning in

Argentina where the disease was first introduced inadvertently on noble \times *barberi* hybrid canes directly from Java.¹² Like the garden canes themselves, this virus disease must have originated in New Guinea, where it is endemic but rather rare because the tiny gardens are widely spaced and buffered by dense forests, which are obstacles for the insect vector. It is characteristic of sugarcane mosaic that it becomes epidemic, accompanied by sharply diminishing crop returns, only in humid, grassy areas where sugarcane is a monoculture crop. Waves of epidemics under such conditions are dictated by the character of seasons that influence populations of the insect vector, *Aphis maidis* Fitch, and also the development and flights of their winged generations.

As early as 1919 evidence of group reactions to infection of three taxonomically separable classes of sugarcanes was observed (12), and objectives for control of mosaic gradually became defined, involving extensive taxonomic studies of noble, primitive, and wild-growing sugarcanes. There was precedent in the old sereh investigations for the anomaly that basically important botanical studies were supported incidentally as an adjunct of pathological studies. In 1922 and 1923 I searched for mosaic-resistant noble and wild forms and their hybrids in the western Pacific and Far Eastern countries, and always, as in the case of the variety Toledo (16), a component of wild cane appeared or was suspected in the ancestry of resistant forms. Variations in the severity of reactions of noble canes to the virus prolonged our hope that resistance might be found in them also. The global spread of mosaic and the accumulating evidence on susceptibility of all *S. officinarum* forms, reaching almost to the saturation point (16, 40) in humid areas, prompted the idea of the World Reference Collection of original sugarcane varieties described in the first paragraphs of this handbook. Obviously the rich assortment of Melanesian canes, including feral forms that we confidently expected to find in New Guinea, could not be excluded.

A strong effort was made to launch the New Guinea phase of the collecting in 1924, first as an independent Federal Government expedition and later in the same year as part of a private plant-hunting expedition to the Far East. Both efforts failed and that important phase of the collecting did not come off until more than 3 years later, in 1928 (13).

These setbacks proved rewarding in two ways. More time was provided for (1) consideration of the logistics involved in covering an immense area to collect perishable plant material and (2) study of what reasonably might be predicted in the way of finding primitive precursors of garden sugarcanes in New Guinea. As to solution of the

¹² When the sugar experiment station at Tucuman, Argentina, was established, the directorship was offered to Jan Kobus. As a herald of his coming Dr. Kobus sent from Java the Cheribon \times Chunnee hybrids P.O.J. 33, 36, 105, 139, 213, and 234, but the negotiations broke down and he did not follow. From Tucuman, cuttings of these hybrids were sent later to Puerto Rico, where in 1919 they were found to be 100 percent infected with the "new" disease, mosaic. Reaction to the disease by these hybrids, however, was mild compared with the severe reaction of the noble canes then grown commercially, a circumstance that interested me in their ancestry.

first problem, it became plain that despite the complete absence of charted airways and gasoline depots in New Guinea, a large seaplane was preferable to a boat; better even than the boat we had hoped to use in late 1924, a specially designed one equipped with deck greenhouses.

The second problem of what feral forms reasonably might be predicted called for persevering study on the more quiet front of library research. Essentially, there was no technical literature in the abbreviated language of science and no herbaria with Papuan collections worthy of the title. The most prolific reporters on New Guinea and practically the sole representatives of science were, in those days, the anthropologists. Physical geography, including weather and brief comments on flora, had to be dug up and interpreted from voluminous printed, typewritten, and even handwritten manuscripts mostly on other subjects by nonspecialists, including those of an assortment of adventurers with cameras and guns who were attracted by the unknown even as dedicated scientists were attracted. There is a surprising amount of literature of that type on New Guinea, some of it going back to the closing quarter of the 19th century. Searching for particular fragments significant in our inquiry and testing their credibility may be likened to reading right through the unabridged dictionary from A to Z to find a few significant words and more or less enlightening definitions.

"Wild cane" and "wild sugar cane" had been mentioned in a vague and casual manner for 40 years or more in reports and books by missionaries, explorers, government patrol officers, and the government anthropologists. In the majority of these casual references to wild canes, it is impossible to determine whether a grass or a palm (rattan) is meant. In other cases there is no doubt that reference was to a fairly tall wild grass. In still others a careful study of the references in context, especially where repeated several times with allusions to the environment, extent, and compactness of the colonies of plants, the labor of hacking a path slowly through the growth with a cutlass, and the attendant great danger of accidental fire, gradually unfolds a picture that practically proclaims, "I am *Saccharum*."

To one experienced in the observation of *S. spontaneum* in its gregarious and more or less extensive associations in natural habitats of the Philippines and Indonesia, there could be little doubt that *S. spontaneum* was the plant referred to in some of the more vivid writings. *S. spontaneum* was not only present, but apparently was present in both wet and xerophytic associations. The payoff for voracious reading of botanically sterile matter came with several brief allusions to "wild sugar cane," much taller, and with inch-thick stems so tough that in a thicket, without room for a full swing, the cutlass rebounded like peas from a tight drumhead. The thick pure stands were mentioned incidentally as bordering watercourses in the highlands and, in more extensive gregarious associations on the banks of broad, meandering flood-plain rivers, where it could be assumed they were subjected to periodic inundation only. These pioneering bush-whackers' brief commentaries fitted the concept of wild, and large, *Saccharum*, and together with the theoretical considerations

described under "geographic origin and dispersal" they helped to corroborate that in New Guinea, if anywhere, one should seek the ancestral forms of the domesticated sugarcane. New Guinea became, so to speak, the bull's-eye of the target and to New Guinea in 1928 we directed our steps. Upon my strong urging Jakob Jeswiet had accepted temporary employment and had agreed to accompany me. He had previously expressed himself as convinced that direct derivation of *S. officinarum* from *S. spontaneum* was impossible (32), but regarding the place of origin of *S. officinarum* he agreed with Sagot (32, 38), whose vague, inclusive theories favoring Polynesia as the most probable place of origin we have already mentioned in this section.

I communicated the results of the library research to Dr. Jeswiet and, while enroute to New Guinea via Australia, I discussed with him the possibility of finding a second wild *Saccharum* species. He fell into the habit of referring in press interviews to "the possibility of there being more than one species which has been crossed to produce the noble varieties," and this remark was quoted in Australian newspapers before we departed from Australia for New Guinea.

The same forecast was written into supporting papers of the formal letter of authorization for the expedition, issued to me a month or more before leaving Washington. These details should be given as an example of predicting the existence of a new *Saccharum* species ancestral to the noble canes at a time when most botanists were content with the old one, *S. spontaneum*. They also explain my reference in a previous section of this introduction to the "not unexpected discovery" of *S. robustum*. My devout hope that we might discover in the new, primitive New Guinea species genes transmitting resistance to mosaic was doomed to failure. *S. robustum* is just too close, physiologically, to the noble canes and consequently is heir to the diseases that afflict *S. officinarum*.

The relative disease resistance or susceptibility of *S. robustum* and its derivatives to other serious diseases may prove to be quite the reverse. Reference has been made herein to the significant fact that in the hybrids now constituting the world's commercial varieties, recent invasions by the fungus *Ustilago* are accountable through the *S. spontaneum* line, and such evidence as we have at present indicates that the same is true of ratoon stunting. In our reference collection of groups, all of which are subjected to the same field exposure, the *S. robustum* and *S. officinarum* groups are markedly less affected. At present this is merely a projection, and therefore extensive, carefully controlled inoculation experiments are indicated.

The collections of 1928 in New Guinea comprised 164 *Saccharum* clones classified as 141 *officinarum*, 10 *robustum*, 7 *spontaneum*, 5 (recent) hybrids of *officinarum-robustum*, and 1 *robustum-spontaneum*. The accessions were carried by air from widespread places in the Territory of Papua, Territory of New Guinea, and Netherlands New Guinea at irregular intervals in lots of 5 to 25 to Port Moresby. There the cuttings were treated in bordeaux mixture, the ends dipped in paraffin, and stored at 45° F., some of them for as long as 65 days, before being carried to a quarantine greenhouse of the Colonial Sugar

Refining Co., at Sydney. There was 10 to 15 percent loss of clones. In addition to the 1928 collections, we received by courtesy of the Bureau of Sugar Experiment Stations, Brisbane, and the Colonial Sugar Refining Co., Sydney, all surviving clones of their previous New Guinea collections of noble clones. Most of these clones were eventually established during the next 2 years in greenhouse quarantine near Washington, D. C., and at Djamba Gedeh, Java, and, of course, in Queensland. Some of the wild forms that were difficult to ship successfully required two or three successive shipments.

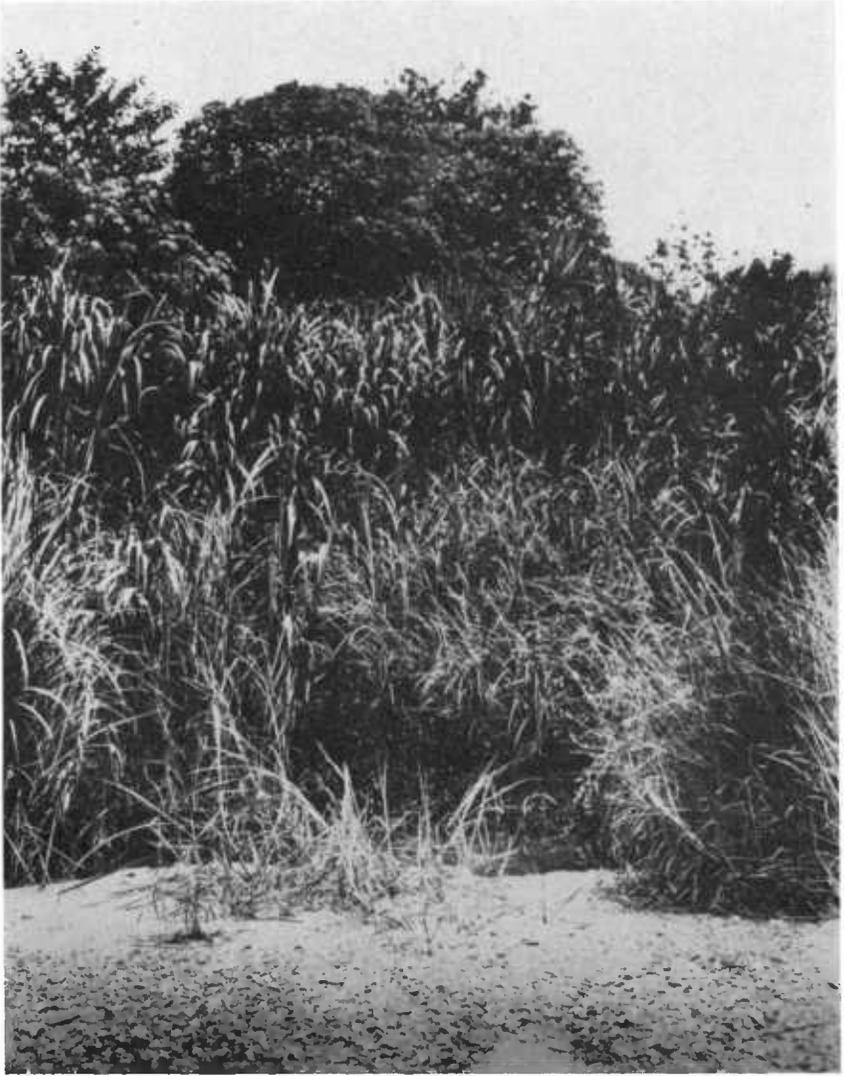
Three important clones, including *S. robustum* f. *sanguineum*, which I discovered on the banks of Sepik River 500 miles from its mouth, were lost and required re-collecting on special trips back to the natural habitats by collaborating missionaries and government patrol officers. The last of the three was finally established after 9 years of effort, a fair measure of the difficulties of terrain and remoteness of these habitats.

An illustrated narrative account of the cane collecting, with maps showing a few territorial features discovered from the air, was published in the National Geographic Magazine (13). The text and the approximately 100 photographic illustrations in that magazine graphically portray a study of the natural history background of sugarcane evolution in New Guinea in much greater detail than is permissible in the present publication. The illustrations covered a restricted range of natural-history subjects including geology and physical geography, flora, plant ecology, and ethnology, i. e., the material culture of the Stone Age gardeners of the island. All these subjects are pertinent, and indispensable to development of our theory of the geographic center or origin of *S. robustum* and the origin of *S. officinarum* by artificial selection of variants of *S. robustum*. In the present handbook a limited selection of photographs is presented. Among them are illustrations of variant forms of the wild *S. robustum* in their native habitats and, for comparison, views of the same clones under cultivation in Florida during the crop year of 1956-57 (figs. 1 to 9).



PN-227

FIGURE 1.—*Saccharum robustum* 28 N.G. 251, the type of the species in the type locality, left bank of the Laloki River, 18 miles northeast of Port Moresby, Territory of Papua. This relatively long-jointed, broad-leaved clone discovered by J. Jeswiet is greenish yellow when young, becoming bright yellow.



PN-228

FIGURE 2.—*Saccharum spontaneum* in the foreground on a stony midland in the Laloki River and extending to the muddy bank of the river, middle background, where it is in competition with the broad-leaved *S. robustum*.



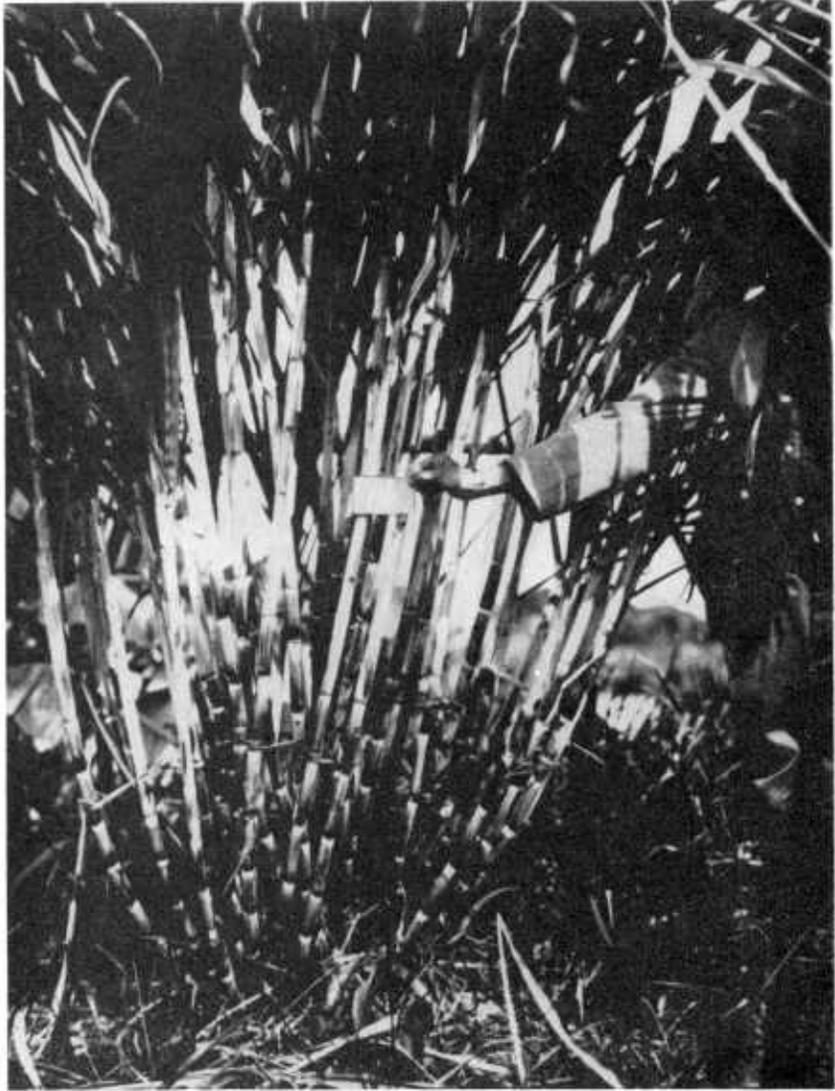
PN-229

FIGURE 3.—A canebrake of *Saccharum robustum* in the last stage of a losing struggle with forest trees and other vegetation. With the building up of silt from the river which is gradually changing its course and moving toward the camera, the *S. robustum* is no longer in the flood waters and is unable to compete with the slowly encroaching trees.



PN-230

FIGURE 4.—A typical sugarcane garden community. Tree house dwellings and gardens of Negritos are about 8 miles west of the right bank of the Ok-tedi River, a high tributary of the Fly River 40 to 50 miles south of the Victor Emanuel Range.



PN-231

FIGURE 5.—External morphological characteristics of the stem in 28 N.G. 25, a soft-stemmed *Saccharum officinarum* chewing cane collected in the garden of a pygmy village near the upper Ok-Birak (Fly) River, illustrate the close external resemblance of these forms to the assumed ancestral forms such as 28 N.G. 219 and 28 N.G. 219A, the *S. robustum* variants found on the Sepik River. Note the thickness of stems, progressive change in relative lengths of internodes from base to apex, and the pronounced wax ring just below the nodes, in comparison with 28 N.G. 219 shown in figure 6.



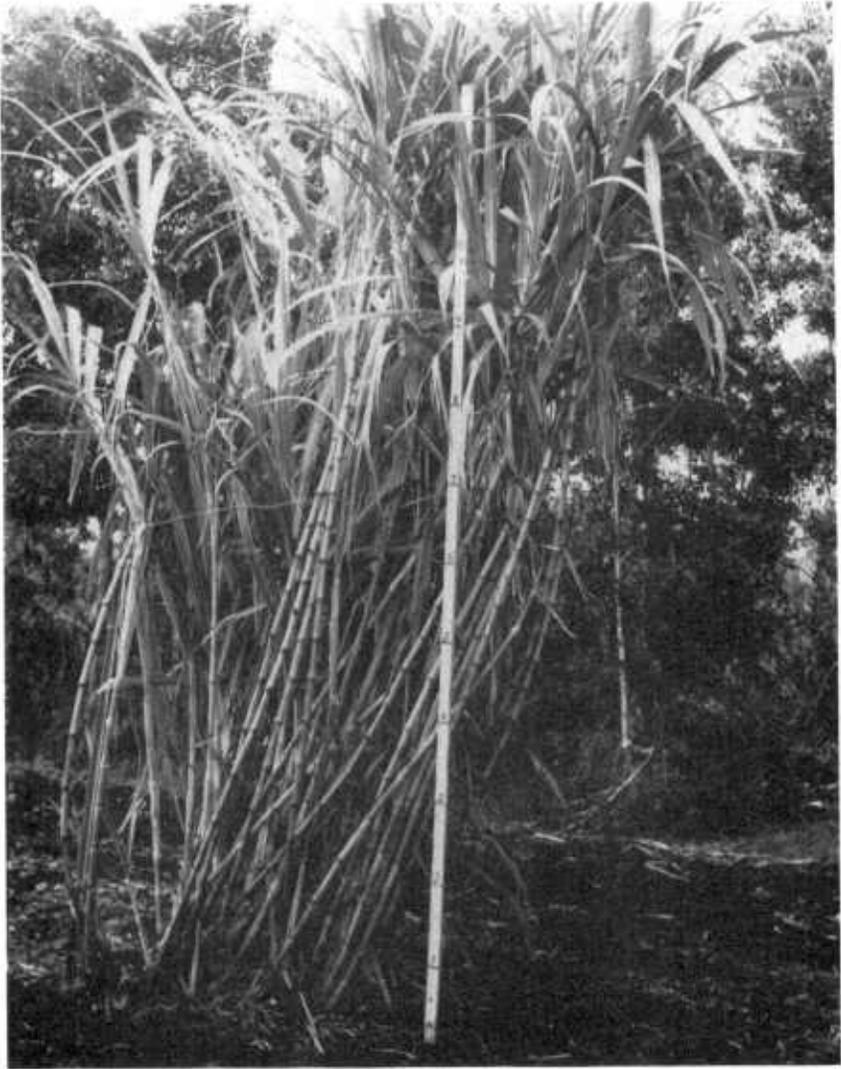
PN-232

FIGURE 6.—The large wild *Saccharum robustum* 28 N.G. 219 growing in peat soil at Canal Point, Fla. The external stem characteristics of this very hard-stemmed *S. robustum* strikingly resemble those of the soft-stemmed *S. officinarum* shown in figure 5. Stems of both clones when 5 or 6 months old, as shown, are deep vinaceous purple.



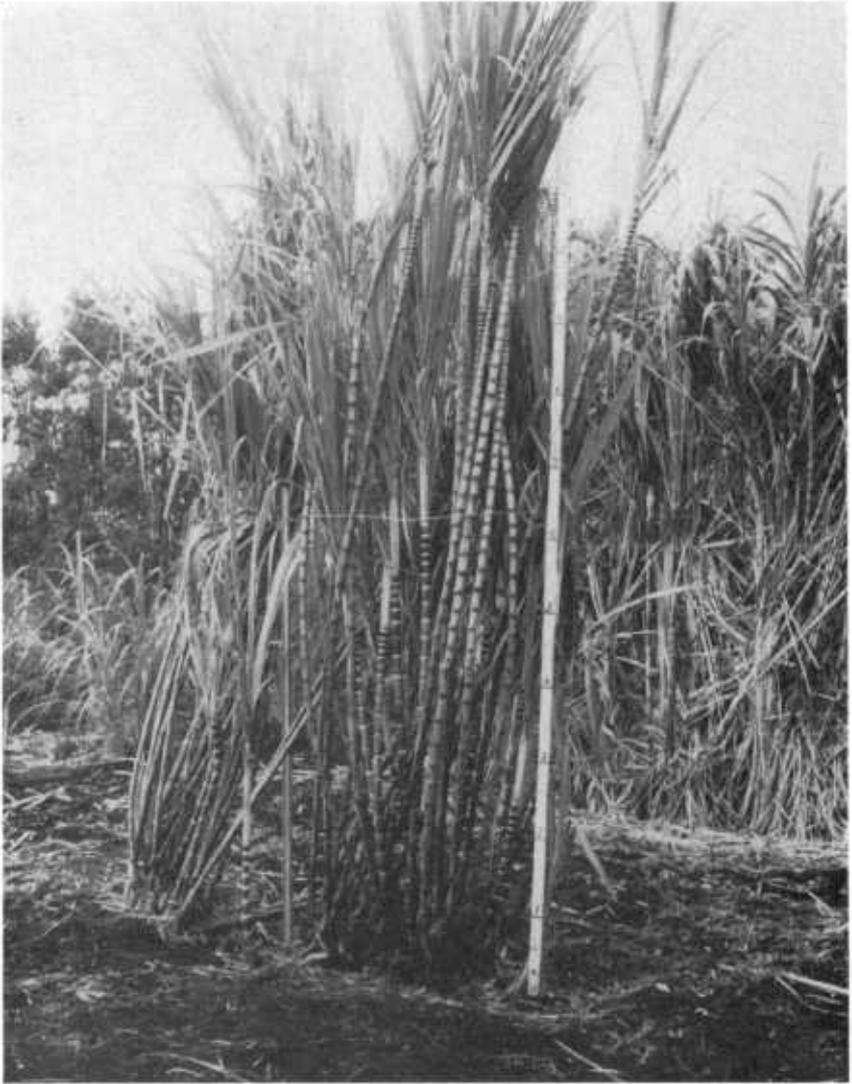
PN-233

FIGURE 7.—A Papuo-Melanesian garden of the highlands inland from Rigo on the south coast. In gross morphology the two long-jointed *Saccharum officinarum* clones in left foreground somewhat resemble *S. robustum* 28 N.G. 105 shown in figure 8. The clone in center background, near the small boy on scaffold, one of the numerous *Badila* relatives, strikingly resembles *S. robustum* 28 N.G. 219 shown in figure 9.



FN-234

FIGURE 8.—*Saccharum robustum* clone 28 $\frac{1}{2}$ N.G. 105, growing at Canal Point, Fla. When grown in well-drained situations there is a marked shortening of internodes and complete absence of the extraordinarily long stolons developed in its native habitat. This abrupt modification of characters in a clone of *S. robustum* due to environmental change is significant in the story of *S. officinarum* origin from *S. robustum*. The *S. officinarum* forms do not have stolons, or rhizomes.



FN-235

FIGURE 9.—*Saccharum robustum* 28 N.G. 219 at Canal Point, Fla., age 14 months, the same clone as shown in figure 6. Note the progressive shortening of internodes apically. Incidentally, the shortening of internodes when *S. robustum* is removed from the natural riverbank habitat in New Guinea is noticeable when it is transplanted for use as garden barricades by the Papuans.

VEGETATIVE CHARACTERS USED IN THE DESCRIPTION AND CLASSIFICATION OF NOBLE CANES¹³

MATERIALS AND METHODS

Materials for sugarcane study came from the United States Sugar Crops Field Station at Canal Point, Fla., and were gathered since 1920, largely by E. W. Brandes, from numerous islands of Melanesia, Indonesia, and Polynesia (table 1). All characters were studied and illustrations were prepared from fresh material.¹⁴

The stem epidermis was removed with the aid of Schulze's fluid. For this purpose a small piece of outer stem material was placed in a test tube containing several crystals of potassium chlorate and a few cubic centimeters of concentrated nitric acid. The mixture was carefully brought to a boil, and as soon as the epidermis separated off in the form of a thin pellicle the content of the test tube was emptied into a petri dish partially filled with water. The epidermis was then mounted on a slide and stained with chloroiodide of zinc.

The epidermis of the leaf was removed in a similar manner, but the nitric acid was slightly diluted and the potassium chlorate omitted. Staining of the preparation was not necessary.

TABLE 1.—Accession numbers with corresponding importation numbers, clonal designations, and taxonomic group No.

Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. ¹	Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. 1
1	707	28 N. G. X	9	26	535	28 N. G. 33	31
2	626	1	23	27	536	34	10
3	627	2	21	28	482	35	33
4	520	3	25	29	476	36	24
5	628	4	8	31	638	37	14
6	629	5	6	32	368	39	23
7	630	6	6	34	481	40	28, 36
8	863	11	21	35	484	42	22
9	523	12	32	36	537	43	14
10	632	13	34	37	478	44	7
11	524	14	23	38	485	45	26
12	525	15	23	40	486	46	23
14	526	17	35	41	538	47	7
14a	483	18	37	43	540	51	32
15	475	20	28	44	379	52	1
16	527	21	23	45	642	54	11
17	633	22	7	46	643	55	14
18	528	23	20	47	488	56	12
19	634	24	6	48	487	59	36
20	529	25	5	49	644	62	18
21	530	26	20	50	645	63	13
22	635	27	33	51	512	65	2
23	636	30	30	51a	517	68	33
24	637	31	1	53	646	78	27
25	463	32	30	54	402	80	

¹ See table 4 for diagnostic characters of taxonomic groups.

¹³ This section was prepared by Ernst Artschwager. Dr. Artschwager died June 20, 1957.

¹⁴ The authors are greatly indebted to B. A. Belcher, in charge of the field station, and to Edwin R. Rice, of the station staff, for assistance in preparing the material for study and for taking field notes. Mr. Rice also determined the epidermal pattern for many of the canes. The drawings are by Mrs. Eugenia Artschwager.

TABLE 1.—*Accession numbers with corresponding importation numbers, clonal designations, and taxonomic group No.*—Continued

Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. ¹	Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. ¹
56	648	28 N. G. 83	6	127	327	21 N. G. 21	2
57	649	84	19	128	328	22	2
58	409	87	33	129	329	23	22
60	516	89	3	130	332	29	4
61	518	90	6	131	333	30	18
62	650	93	28	132	334	31	13
63	505	96	17	133	335	32	22
64	418	97	32	134	336	33	35
66	504	98	6	135	337	34	20
67	651	99	32	136	338	35	26
69	508	106	24	137	339	36	18
70	427	107	11	137a	340	37	23
71	507	109	13	138	341	44	28
72	510	110	18	139	342	49	25
73	506	202	33	140	344	51	25
74	655	203	7, 28	141	347	54	25
75	656	204	14	142	348	55	25
76	499	206	15	143	350	57	25
77	501	207	32	144	351	58	13
78	498	208	25	145	246	96 N. G. 14	12
79	657	209	28	146	228	15	33
80	658	210	23	147	247	16	7
81	502	211	35	148	249	22	26
82	541	212	6	149	227	24	3
83	659	213	31	150	226	24a	35
84	660	214	26	151	624	14 N. G. 124	29
85	542	215	6	152	625	190	18
86	661	216	7	153	623	241	29
87	662	217	26	154	1035	37 N. G. 6	8
88	495	220	32	156	879	New Caledonia 5	7
89	706	221	20	157	880	11	8
90	664	222	20	158	881	15	7
91	864	223	29	159	882	17	7
92	980	224	20	160	883	18	6
93	665	256	33	161	884	19	6
94	666	257	7	162	885	20	2
95	545	259	7	163	886	21	7
96	494	260	37	164	887	24	2
97	500	261	30	165	888	25	6
98	493	262	37	166	889	29	3
98a	492	263	33	167	890	30	3
99	667	264	28	168	891	31	8
100	546	265	37	169	892	32	1
101	547	266	37	170	893	33	6
102	548	267	17	171	896	39	3
103	668	268	31	172	897	40	3
104	977	269	23	173	898	42	2
105	671	273	24	174	900	49	6
106	672	274	7	175	902	50	2
107	673	279	35	176	894	51	8
108	674	280	28	177	895	53	6
109	675	282	19	178	901	64	2
110	551	284	23	179	903	74	2
111	552	285	27	180	904	76	8
111a	676	287	23	181	905	78	8
112	554	288	23	182	906	80	8
113	308	21 N. G. 1	28	183	908	81	8
114	309	2	27	184	910	83	2
115	310	3	2	185	911	90	8
116	311	4	17	186	912	91	5
117	312	5	5	187	913	92	4
118	313	6	17	188	914	93	4
119	314	7	5	189	915	94	4
120	315	9	3	190	917	99	8
121	316	10	3	192	919	104	8
122	317	11	19	193	907	116	2, 6
122a	318	12	21	194	909	117	7
123	319	13	22	195	916	130	7
124	320	14	25	196	825	Hawaiian Original 6	3, 6
124a	322	16	24	197	827	24	3
124b	321	15	23	198	828	26	3
125	323	17	34	199	831	36	3
126	326	20	1	200	832	38	2, 3

¹ See table 4 for diagnostic characters of taxonomic groups.

TABLE 1.—Accession numbers with corresponding importation numbers, clonal designations, and taxonomic group No.—Continued

Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. ¹	Ac- ces- sion No.	Im- por- ta- tion No.	Clone	Taxo- nom- ic group No. ¹
201	833	Hawaiian Original 39	2	272	767	Green Striped Preanger	14
202	835	41	6	273	989	Gros Genoux	10
203	836	43	6	274	180	Haak Kwat Che	22
204	838	52	2	275	1290	HVA 124	15
205	842	71	3	276	1060	Hitam Broewang	23
206	727	Akilolo 20	2, 3	277	1570	Horne	15
207	826	Akoki 22	5	278	1062	Ireng Malang	6
208	728	Awela 68	6	280	182	Kam Shaan Che	18
209	729	Halalii 32	7	281	565	Kara-Kara-Wa [32-C-73]	14
210	730	Hinahina 18	8	285	1584	Listada	18
212	829	Iiopua 29	5	286	5	Louisiana Purple	13
213	731	Kea 31	6	287	1422	Louisiana Striped	14
213a	830	Kea 31	8	288	1293	Luzon White	22
214	733	Lahi 7	8	289	1553	Mia Do	20
215	735	Laukoma 15	8	290	1068	Malagache	6
216	736	Lehu 75	1	291	1294	Mani	16
217	822	Maikoiko 73	7	293	1585	Manteiga	19
218	738	Maikoiko 74	7	294	1295	Manteiga	19
219	744	Manulele 27	3	296	1069	Meligel	11
220	745	Mikiol 44	8	297	1070	Menado Rood	17
221	837	Moano 48	7	298	1071	Monjet Gayam	9
222	834	Nanahu 40	3	299	184	Muk Che	22
223	823	Ohia 1	8	300	1072	Muntok Java	17, 20
224	747	Opukea 34	6	301	1179	Negrta	6
225	824	Pakaweli 2	6	302	1073	Oedang Amboina	3
226	839	Pilimai 60	3	304	466	Otaheite	16
227	749	Pohina 51	7	305	1085	Padangsche, Dark Red	13
228	795	Uahi-a-pele 50	3	306	1067	Padangsche, Light Red	13
229	840	Uala 61	6	307	1586	Pelo de Moca	1
230	841	Uluhui 67	2	308	1585	Pitu	14
231	1047	Aboe	6	309	1074	Poethi Borneo	23
232	1580	Anoman	8	311	759	Pundia	2
235	952	Ashy Mauritius	13	312	1075	Ra Cha	77
236	765	Bacoya	7	313	854	Raratonga 1	17
237	1187	Badlia Fiji	6	314	855	Raratonga 2	8
237a	1633	Balghat Thin	6	315	856	Raratonga 3	6
238	757	Bamboo Blanca	6	316	990	Rat Gros Ventre	1
239	768	Bamboo Morada	13	317	9	Rayada	4
240	1049	Bandjarmasin Hitam	15	318	737	Red Cavengerie	15
241	1050	Banteng	6	319	762	Red Preanger	15
242	698	Barbados White	17	320	773	Red Tip	15
243	1237	Batee Lupog	15	321	1077	Rood Djapara	20
244	771	Batjan	7	322	104	Rood Egyptisch	15
245	770	Batjan Green Sport	7	323	1318	Selim, Bali	6
245a	1627	Black Cheribon	15	324	1560	Sawoe Kroepoek	20
246	697	Black Fiji	9	325	1424	Simpson	16
247	1568	Black Tanna	17	326	1556	Soerat Soembawa Wit	22
248	1055	Branche Blanche	12	327	105	Spaansch	13
249	1051	Boengaja	4	328	611	Striped Tip	9
250	1550	Boeton Lichtgroen	13	329	850	Tahiti 3	18
251	1052	Boetota Bilatoo	6	330	1081	Tamarin, Reunion	11
252	1054	Bourbonriet	16	332	1082	Teboe Pohina	3
253	988	Branchue	12	334	758	Tibbo Mird	15
254	766	Brava de Perico	11	335	1083	Tijing, Bali	23
255	1582	Caiara	14	336	1551	Timor Riet	7
256	194	Cana Blanca	16	337	1089	Tomohon Wit	8
257	1239	Caledonia Ribbon	17	338	1088	Tjemeng Payaman	13
258	696	Cavengerie	6	339	1090	Tomohon Zwart	7, 8
259	972	Cavengerie Sangre de Toro	6	340	925	Tongatabu 5	4
260	1241	Cebu Light Purple	2	341	926	Tongatabu 6	5
262	1076	Ceram Red	2	342	1348	Vellal	16
263a	1632	Chittan	14	343	1588	Vespertina	21
264	1583	Creoula	6	344	1093	Wit Manila	2
266	10	Crystalina	15	345	211	Wit Ceram	22
267	70	Fiji	23	346	1558	Wit Djapara	20
268	1058	Geel Muntok	16	347	769	Yellow Bamboo	17
269	71	Gestreet Preanger	14	348	1177	Yellow Caledonia	12
270	210	Green German New Guinea	13	349	1095	Zwart Borneo	15
271	31	Green Ribbon	16	350	1096	Zwart Manila	22

¹ See table 4 for diagnostic characters of taxonomic groups.

Ligules were stripped off the blade joint by first detaching the central part with the blade joint only partly open (5); next, one flange was detached clear at its insertion point, then the other. The detached ligule was then placed for a few minutes into an alcoholic solution of chromotrope, dried on filter paper, and mounted on a glass slide or index card, transparent scotch tape being used as a sealer. Permanent mounts of young auricles were obtained in a similar manner.

VEGETATIVE CHARACTERS

INTERNODE

Shape.—The internodes of a culm are alined or zigzagged, round or oval, in cross section. The most common forms (fig. 10) are cylindrical, bobbin-shaped, tumescent, conoidal, obconoidal, and concave-convex. Often there is a bulge or shoulder directly above the growth ring on the side opposite the bud, and frequently a sharp constriction in the region of the wax band. Form, length, and thickness of the internode are greatly influenced by environmental conditions. The shape to a certain extent shows considerable variation within the limits of the clone.

Color.—The color of the culm or stem is a useful morphological characteristic in the identification of sugarcane clones, but color must be used with understanding of its limitations. Separation of *Saccharum spontaneum* forms or the forms of other groups in which the range of color is chiefly the expression of different concentrations of chlorophyll is not very practicable. Essentially the range is confined to shades of green in such groups. In the more colorful forms of *S. robustum* or *S. officinarum*, particularly when combinations of colors are present in longitudinal strips as in the so-called ribbon canes, the stem color is more useful as a distinguishing character. The striking range of colors in the domesticated sugarcane clones (*S. officinarum*) dealt with here represents different combinations and concentrations of two series of pigments, the chlorophylls and the anthocyanins, and to a lesser extent the carotenoids and xanthophylls. Even in *S. officinarum* forms, color is subject to various external and internal influences and is only relatively constant.

Recognition of causes of color variation found in different specimens of the same clone and in different parts of the same stem is essential to practical utilization of the color characteristic. Ultimate causes of the variations have not been adequately studied, but the observed variations may be classified to advantage. They are mainly of four kinds: (1) Those correlated with age of the internodes, i. e., juvenile v. mature internodes; (2) those correlated with environment, i. e., exposed to sunlight or protected by leaf sheaths or otherwise in shade (and possibly influenced by nutrition or other environmental factors); (3) those correlated with inner morphology that dictates the variable width of stripes; and (4), those correlated with somatic aberrations or mutations, the often observed but little understood color sports or variants.

In observing color variants in a large collection for many years, one is impressed by the evidence that some clones are prone to vary and also to revert in a typical manner, i. e., they produce entirely green

or entirely red sports from a green-red striped form and then revert to the striped form with no apparent change in the original combination and concentration of basic pigments. As judged by Finlay color photographs made about 1925, the great majority of clones remain as they were when collected, with no color variations except the men-

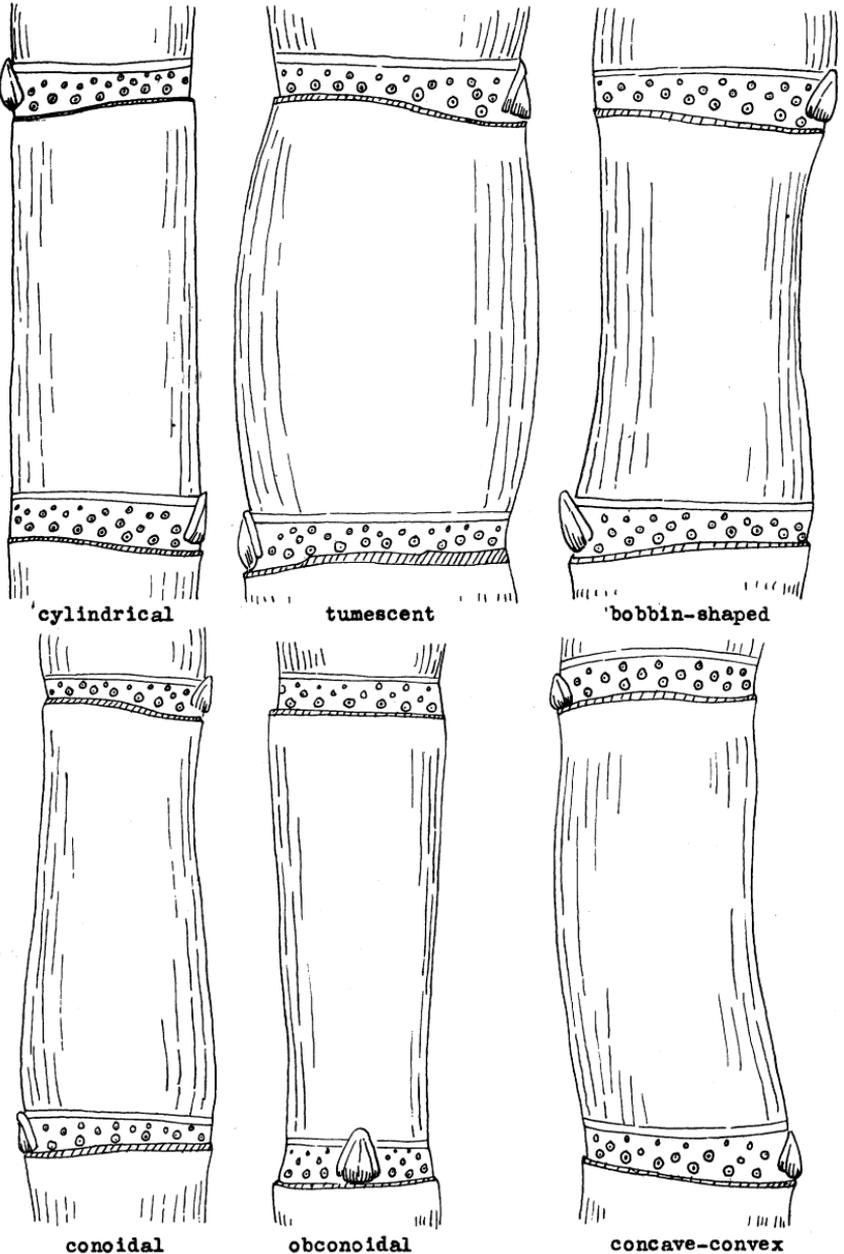


FIGURE 10.—Types of internodes.

tioned progressive color changes in juvenile to mature internodes, the transitory changes caused by environmental factors, and the variable width of stripes in the ribbon canes. For these reasons the stem color, when used judiciously, is an aid in distinguishing between forms of *S. officinarum*. The conspicuous large sooty patches frequently seen on the stem epidermis of sugarcane near the point of attachment of leaf sheaths are the dense, thin stromata of *Meliola*, a black, non-parasitic fungus that feeds on sugary exudates of the cane or on the honeydew excreted by sucking insects like mealy bugs. The color of the culm as seen in freshly cut cross sections may be uniform to the very center, but usually the outer zone is of a deeper shade.

Wax.—All parts of the culm except the growth ring are covered with bloom, or wax. Many clones have a heavy wax deposit, while in others the bloom is thin and shiny. A thicker layer is present just below the leaf scar, forming a conspicuous ring—the wax band. If the bloom is very heavy, it is usually confluent with the wax band. In clones with little bloom the wax band, whether broad or narrow, stands out very prominently. Heavy wax deposits greatly influence the color of the culm, and subsequent discoloration of the wax enhances the color changes already in progress.

Corky cracks.—The surface of the culm is smooth, but in certain varieties corky cracks (fig. 11, *A*) in the nature of small longitudinal crevices cause a roughening of the stem epidermis. At times the cracks in localized areas become confluent to form corky patches. Occasionally there is progressive stem discoloration, giving the surface the appearance of dead stalks.

Growth cracks.—Deeper longitudinal fissures, so-called growth cracks (fig. 11, *A*), may be present, alone or in association with corky cracks.

Hairs.—A distinct pubescence of the culms was observed in 1.7 per cent of the varieties studied. The hairs are long and unicellular, and take the place of the silica cells in the short-cell groups of the stem epidermis.

Bud furrow.—The bud furrow or eye groove (fig. 11, *A*) is a depression in the stalk extending from the bud upward. It may be broad or narrow, deep or shallow, short or long. It often fades out soon after its inception, and in many varieties the bud furrow is entirely wanting. It is subject to much variation within culm limits.

Growth ring.—It is a narrow zone separating the root band from the internode above. It runs horizontally but often curves slightly upward above the bud (fig. 11, *A*). In old internodes it often protrudes, but in young material it is always slightly depressed or flush, and usually of a pale color. In mill cane the growth ring is normally concolorous with the internode above and with the root band.

Root band.—Morphologically, the root band forms the basal part of the internode and contains the bud and several rows of root primordia. It may be tall, medium broad, or narrow; cylindrical, conoidal (fig. 11, *D*), obconoidal (fig. 11, *E*), constricted (fig. 11, *C*), or tumescent. The band is usually somewhat taller on the side of the bud than on the opposite side. Frequently it is straight-sided in the bud region and obconoidal on the opposite side (fig. 11, *B*). It is almost colorless in young stems but concolorous with the rest of the culm in mill cane. As the name implies, the root band bears the root

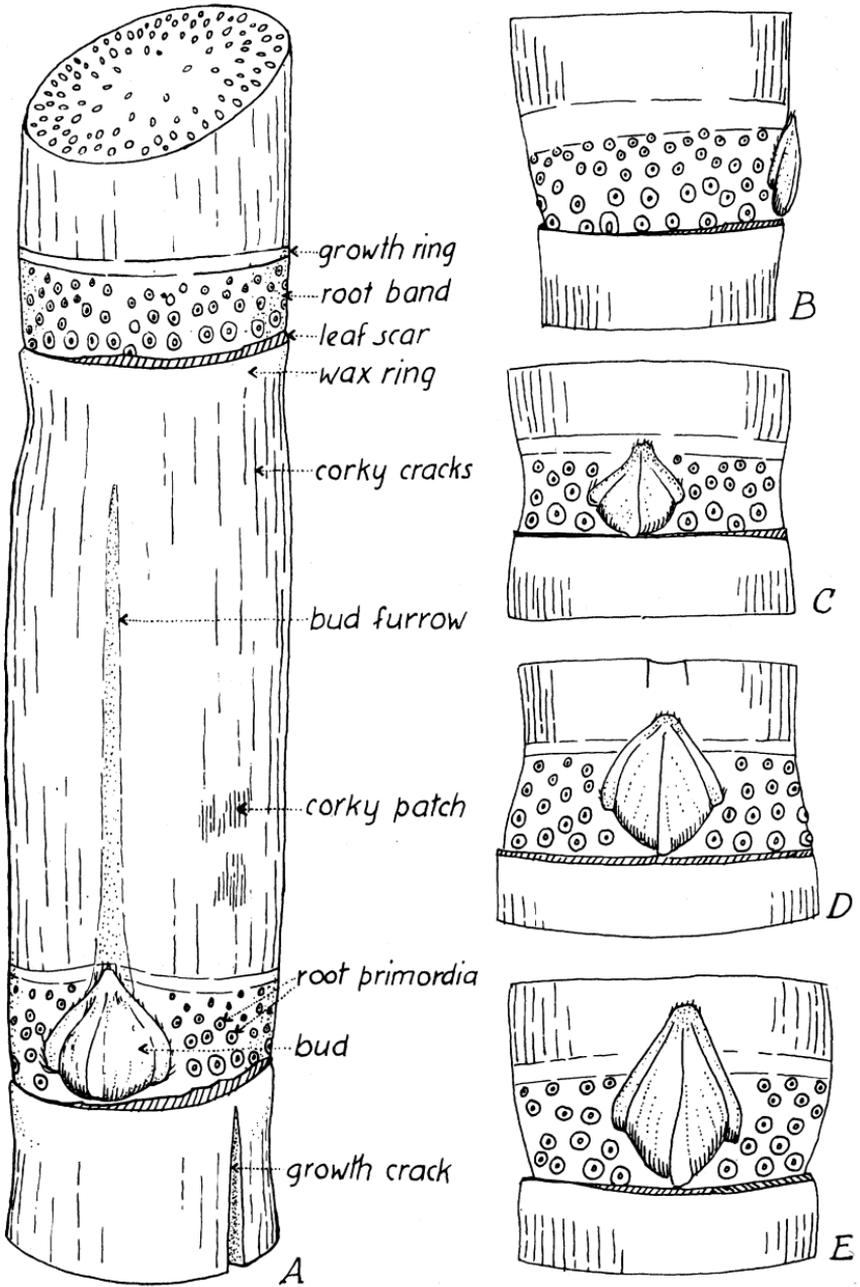


FIGURE 11.—Internode and nodes; *A*, Diagrammatic drawing of node and internode; *B*, tall root band with many rows of root primordia; *C*, narrow constricted root band; *D*, conoidal root band; *E*, obconoidal root band with bud projecting above growth ring.

primordia. The latter are arranged in regular or staggered rows; the primordia of the bottom row are often larger and more widely spaced than those in the upper row. The root primordia remain dormant in many varieties, but in some they show a tendency to sprout while the stalks are still actively growing in the field.

Stem epidermis.—The stem epidermis is a valuable diagnostic character. It consists of long cells alternating with short-cell groups made up of cork cells and silica cells (fig. 12). Cork and silica cells occur in single or multiple pairs. The silica cells always have the characteristic biscuit form, but the cork cells may be long or short, squarish, rhomboid, or pointed. The epidermal pattern, described below and illustrated in figure 12, may be used singly or in combination. Seven patterns are recognized as follows:

Type 1.—Cork and silica cells in single pairs alternating with long cells.

Type 2.—Silica cells wanting or very few in number; cork cells solitary or in groups, squarish, rhomboid, or pointed.

Type 3.—Silica cells wanting in about 50 percent of the short-cell groups.

Type 4.—Most of the cork cells are short- or long-pointed. The long cells are often curved and their endwalls pointed. There is much variation in the width of the cells.

Type 5.—The cells are rather narrow, and the elongate-rectangular type of cork cell predominates, occurring singly or in short connected rows.

Type 6.—The short-cell groups are usually numerous, and occur in multiple pairs.

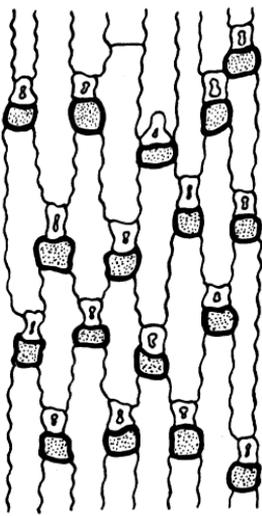
Type 7.—The short-cell groups are usually made up of one silica cell and two cork cells.

Combination patterns.—Usually combination groupings are more diagnostic than single patterns. The first number of such a combination formula (for example 1+4+6) characterizes the type; additional numbers (in this case 4 and 6) are auxiliary. The formula indicates that the epidermis consists primarily of single pairs of short-cell groups alternating with long cells, but that pointed cork cells (as indicated by 4) and multiple pairs of short-cell groups (as indicated by 6) are also present.

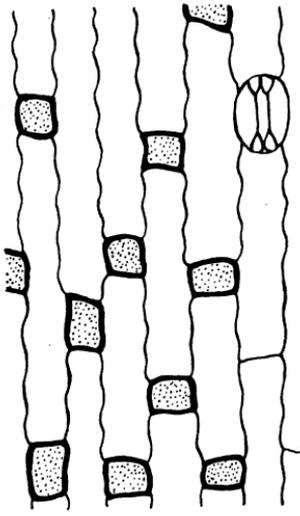
BUD

General characteristics.—The eyes, or buds, of sugarcane are inserted in the tissue of the root band usually immediately above the leaf scar (fig. 11, *A*), occasionally higher. The tip may extend some distance above the growth ring (fig. 11, *E*) or stop short of it. The buds may be large or small, long or short, flat or plump. All young buds and many mature ones are flat and appressed. They become plump on maturity and often protrude, pointing away from the stalk at an oblique angle. The color of the mature bud approximates that of the culm. Contrasting colors often occur in young buds, which frequently have a reddish tint in the tip and upper wing region.

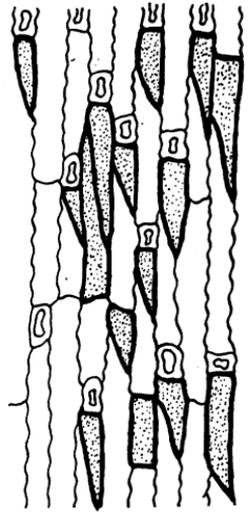
Sugarcane buds exhibit a diversity of morphological forms. Of these the more frequently recurring types are illustrated in figure 13. The visible part of the bud is the outermost bud scale or prophyll, which is made up of a central disk, or sides, and the wing. The boundary line between side and wing, the so-called juncture, is not always clearly marked, and in some varieties with narrow wings the sides merge imperceptibly with the wing region. The wing is usually membranaceous and of uniform width. However, in a number of varieties the wing is broader at the base and often irregularly lobed. Sometimes the basal lobes are so large as to stimulate small secondary wings (fig. 13, *N*). In some broad-winged forms the tip region of the



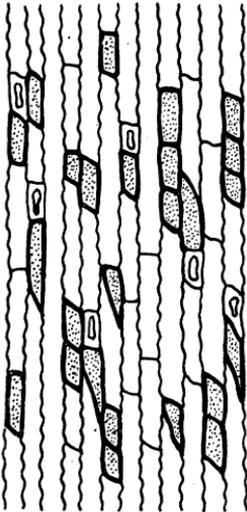
Type 1



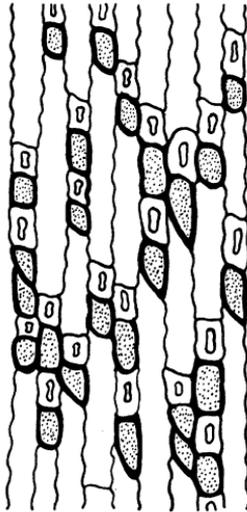
Type 2



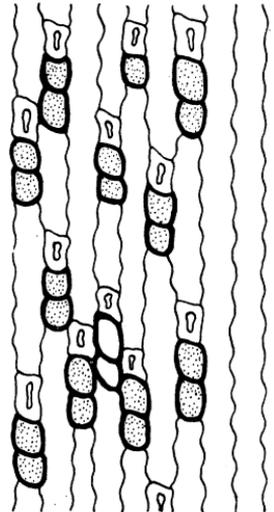
Type 4



Type 5



Type 6



Type 7

FIGURE 12.—Types of stem epidermis.

wing is flat and serrate, and occasionally altogether wanting. Such buds have the typical crawfish shape. Now and then the wing is narrow at the base and broadens toward the apex (fig. 13, *D*). The germ pore, the place where the growing shoot pushes through the protecting bud scales, is usually located near the tip, but in round buds with radial venation the germ pore is more or less central.

Pubescence.—The buds of many varieties are only slightly hairy, while others have a prominent localized or general pubescence. Of the 32 hair groups recognized by Jeswiet (30), some are still considered

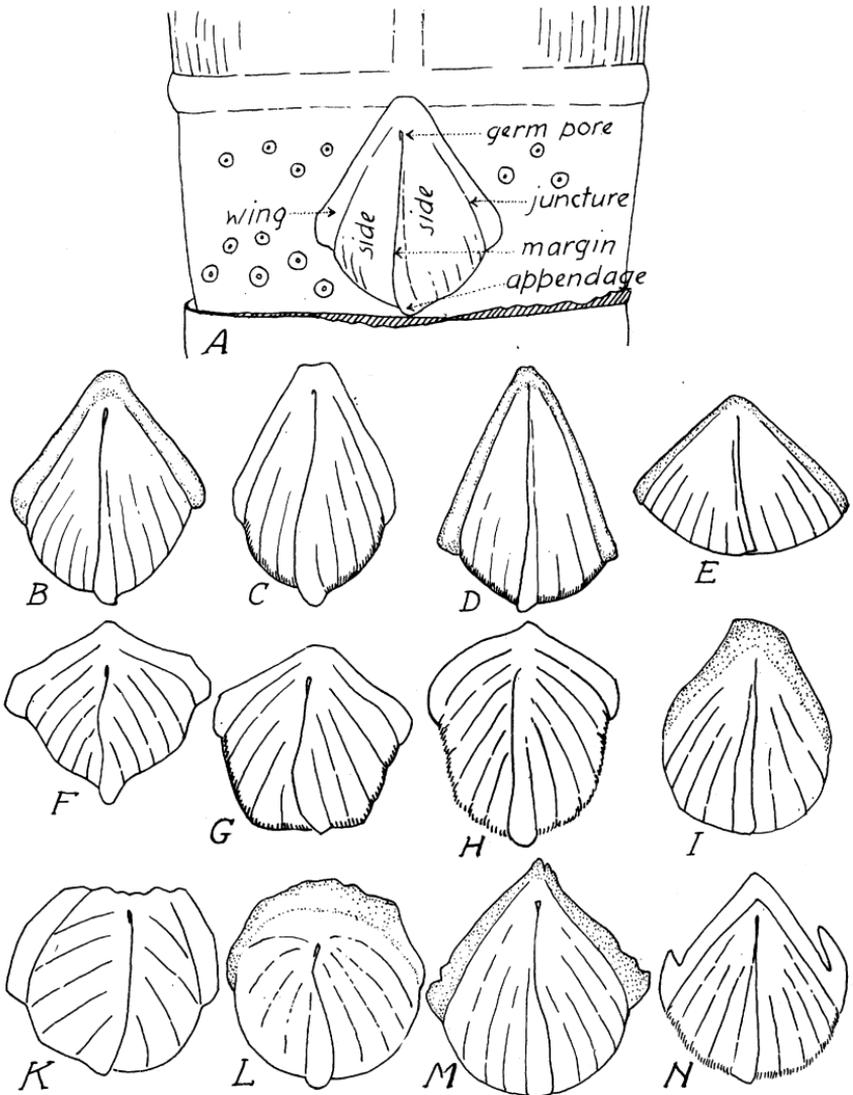


FIGURE 13.—Structure of root band and bud: *A*, Root band with bud; *B*, ovate bud; *C*, narrow ovate bud; *D*, tall deltoid bud; *E*, short deltoid bud; *F*, squat rhomboid bud; *G*, pentagonal bud; *H*, squarish pentagonal bud with wing inserted high; *I*, narrow ovate bud with wing broadening toward apex; *K*, roundish bud with crawfish-type wing; *L*, round bud with central germ pore; *M*, bud with emarginate basal wing region; *N*, ovate bud with secondary wings.

to have diagnostic value, whereas others have been relegated to a minor position or entirely omitted. A condensed form of Jeswiet's original descriptions of the more important hair groups is given below and their location on the prophyll is indicated in figure 14.

(1) Lateral basal groups of long white hairs on anterior sides.

(2) Lateral basal groups of short hairs, often interspersed with long hairs.

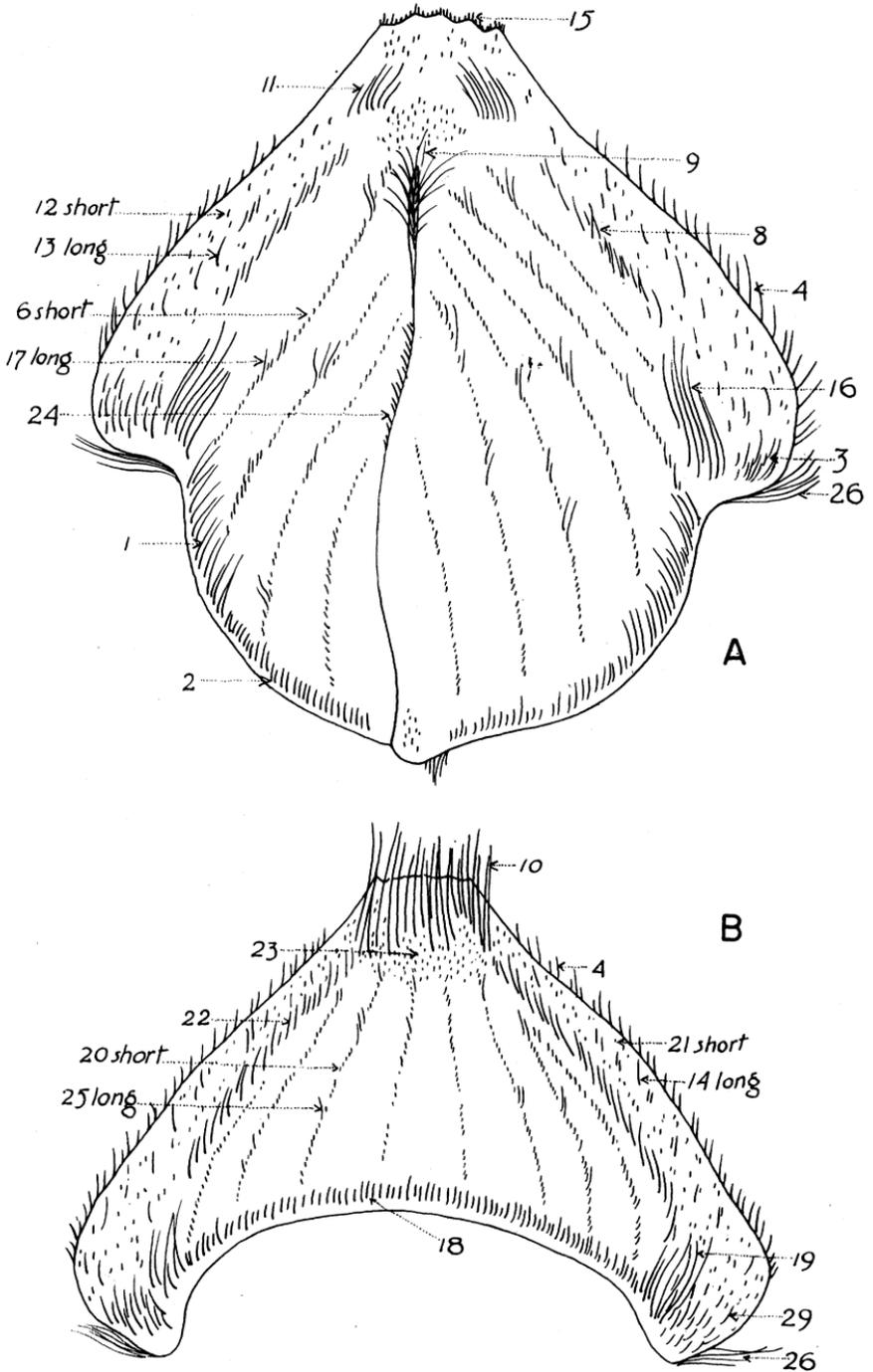


FIGURE 14.—Hair groups on prophyll: A, anterior side; B, posterior side.

- (3) Long white hairs on basal wing region on anterior side.
- (4) Long white lashes on edge of wing.
- (6) Bands of short brown hairs between the veins of anterior sides.
- (8) Long appressed hairs in anterior juncture.
- (9) Long lashes implanted in the germ pore.
- (10) Brush of long hairs implanted on posterior tip.
- (11) Long white hairs implanted in juncture just below wing tip.
- (12) Short brown or black hairs on anterior wing surface.
- (13) Long appressed hairs on anterior wing surface.
- (14) Long white hairs on posterior wing surface.
- (15) Short lashes at tip of wing (part of group 4).
- (16) Pointed group of long white hairs in basal depression of anterior juncture.
- (17) Long white hairs between the veins of anterior sides.
- (18) Long or short white hairs along basal edge of posterior sides.
- (19) Triangular group of long white hairs in basal depression of posterior juncture.
- (20) Short brown hairs between veins of posterior sides.
- (21) Short brown hairs on posterior wing surface.
- (22) Long appressed hairs in posterior juncture.
- (23) Short brown hairs on tip of posterior sides.
- (24) Short fringe on overlying membranaceous margin of anterior sides.
- (25) Long white hairs between veins of posterior sides.
- (26) Long lashes in corners of wing.
- (29) Long white hairs on base of posterior wing surface.

LEAF

The leaves are borne on the culm in two ranks, one at each node. As new leaves unfold, old ones are shed, so that the number remains approximately constant throughout the life of a stalk.

Each leaf consists of sheath and blade. At the juncture of sheath and blade is the blade joint with its specialized regions, while at the base of the sheath where the leaf joins the stalk, there is a distinct swelling—the leaf sheath node or sheath base.

BLADE

The blade is erect, erect with drooping tip, ascending, curved, or drooping. The top is compact or open.

Color of the blade.—The color varies from light to dark green; in some varieties young leaves are decidedly reddish or purplish, and there are striped and variegated forms.

Size.—The blades may be long and narrow or relatively broad. Length and width may vary greatly, but the ratio of length to width, the so-called leaf module, is relatively constant and constitutes a reliable character.

Texture.—Some leaves appear thin, others thick; some feel smooth, others rough to the touch; some leaves are leathery, others appear succulent.

Pubescence.—The blade is edged with spinelike hairs pointing upward; directly above the dewlaps these hairs are long and soft. In many clones of *Saccharum robustum* the surface of the blade is covered with a soft velvety pubescence (hair group 67). This group has not been observed in any of the noble canes.

LEAF SHEATH

The leaf sheath is inserted in the tissue of the node and forms an open tube with the margins overlapping. It varies greatly in length, waxiness, and pubescence in the different varieties.

Color.—The sheath is usually light green, sometimes flushed with red or purple. The basal region often has a purplish hue on the inside. In some striped canes the color pattern extends into the sheath and sometimes into the lamina. Wax deposits may be light or heavy and show variation locally and with age.

Base.—Immediately above the line of insertion of the leaf sheath is the sheath base or leaf sheath node. The sheath in this region often bulges saclike where it covers the bud. The overlying edge of the sheath in this region may be slightly decurrent and sometimes terminates in a more or less prominent appendage.

Scar.—In self-cleaning canes, when the leaves drop off, a scar remains that may run horizontally or obliquely to the axis of the culm.

In some varieties the scar is flush with the stalk; in others it sags and spreads under the bud.

Pubescence.—In some clones the sheath is smooth; in others it is densely pubescent. Most often, however, the hairs are concentrated regionally in more or less well-defined groups. The groups themselves may be prominent, medium well developed, or inconspicuous. If the groups are sparse and poorly defined, there is usually variation within culm limits. Also, frequently the degree of pubescence varies with age; older sheaths may appear smooth, whereas young ones are distinctly hairy. The pubescence of the sheath base is often present only in the basal leaves of young plants, and absent higher up.

Groups 57 and 60.—Group 57, known as the dorsal field, is found in many cane varieties. The group may be implanted low, medium, or high; its shape is linear, lenticular, or irregular. The hairs may be sharp and spinelike or short and inconspicuous, appressed, oblique, and often almost erect, especially in the region just below the blade joint. The group is often very small and recognizable only in young sheaths.

Occasionally, two linear hair groups or lateral fields are found on the sides of the leaf sheath, more especially the underlying sheath margin. Occasionally the lateral fields coalesce with the dorsal field or become confluent with group 56 (fig. 15) of the overlying sheath margin. The hairs of group 60 are in general character like those of the dorsal field.

Group 56.—The upper sheath margin may be smooth or fringed, with the fringe completely marginal or in the form of a narrow marginal ledge. Vertically the group may be very short and continuous with the marginal cilia of the auricle. Occasionally the group descends for

a distance of 5 cm. or more. In hairy sheaths, with well-developed lateral fields, group 56, when in the form of a narrow ledge, becomes confluent with the sheath pubescence in general, more especially the hairs of the lateral fields.

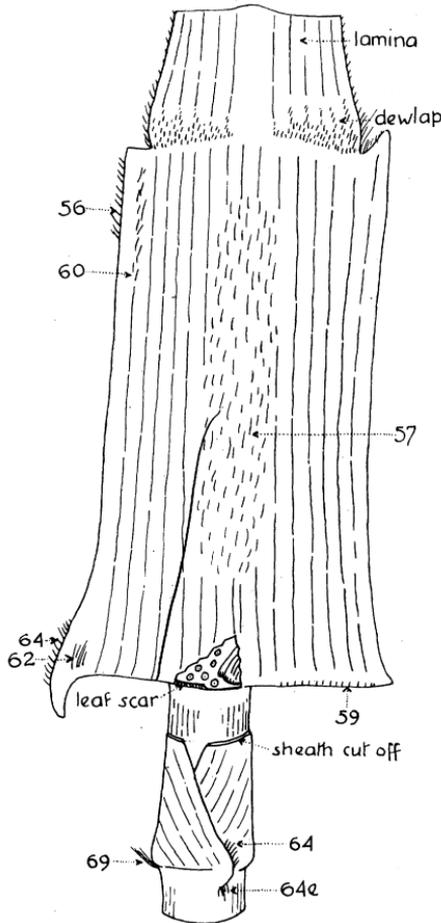


FIGURE 15.—Sheath base and surface view of sheath, showing location of hair groups.

Groups 59 and 69.—The pubescence of the sheath base (fig. 16, *B*) is restricted to a narrow fringe which in its entirety, or sectorially, forms group 59. When sharply delimited and subtending the bud, the hairs are referred to as group 69.

Groups 62, 64, and 64e.—The overlying sheath margin in the region of the sheath base is occasionally hairy. The hairs are usually long and silky; the surface hairs constitute group 62 and the marginal lashes group 64 (fig. 15). Both hair groups are rare. If the sheath margin is decurrent, a small group of cilia is often present just above the insertion of the basal appendage and is referred to as group 64e.

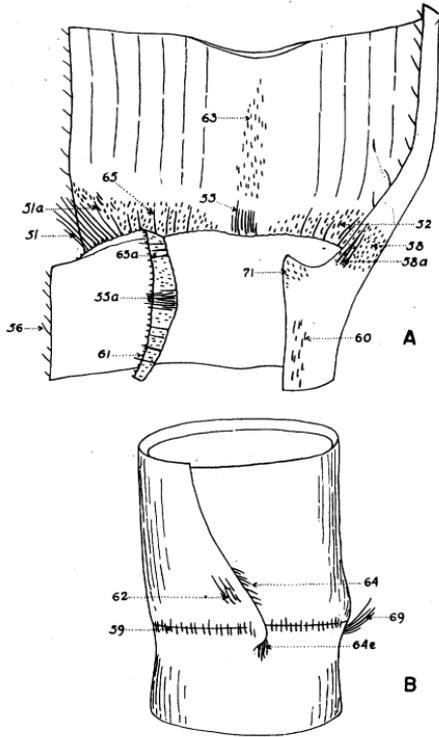


FIGURE 16.—Blade joint and sheath base: *A*, Detailed structure of blade joint, showing location of the various hair groups; *B*, structure of sheath base, showing location of hair groups.

AURICLES

Auricles are appendages of the leaf sheath. They are usually asymmetrical, often weakly developed, and occasionally altogether wanting (fig. 17, *A*).

Types.—Noble canes exhibit three types of auricle development: (1) Clones with two well-developed auricles but with the inner one the larger (fig. 17, *D*); (2) clones in which only the inner auricle is well developed, while the outer one is a transitional structure (fig. 17, *C*); and (3) clones in which both outer and inner auricles are of the transitional type (fig. 17, *B*). Canes with the transitional type of auricle are very common. There are three subtypes: (1) Sloping-transitional, (2) horizontal-transitional, and (3) ascending-transitional, represented by figure 17, *F*, *G*, and *H*, respectively. Other auricle types in an ascending order of prominence are illustrated in figure 17, *I*–*P*.

Insertion.—The insertion point of the auricle usually coincides with the termination of the ligule, but in canes with steeply sloping ligules the inner auricle, usually in the form of a deltoid hook, is inserted lower down the sheath margin (fig. 17, *E*).

Hair group 54.—The free upper edge of the auricle is smooth or ciliate. Transitional auricles are usually prominently fringed, but the

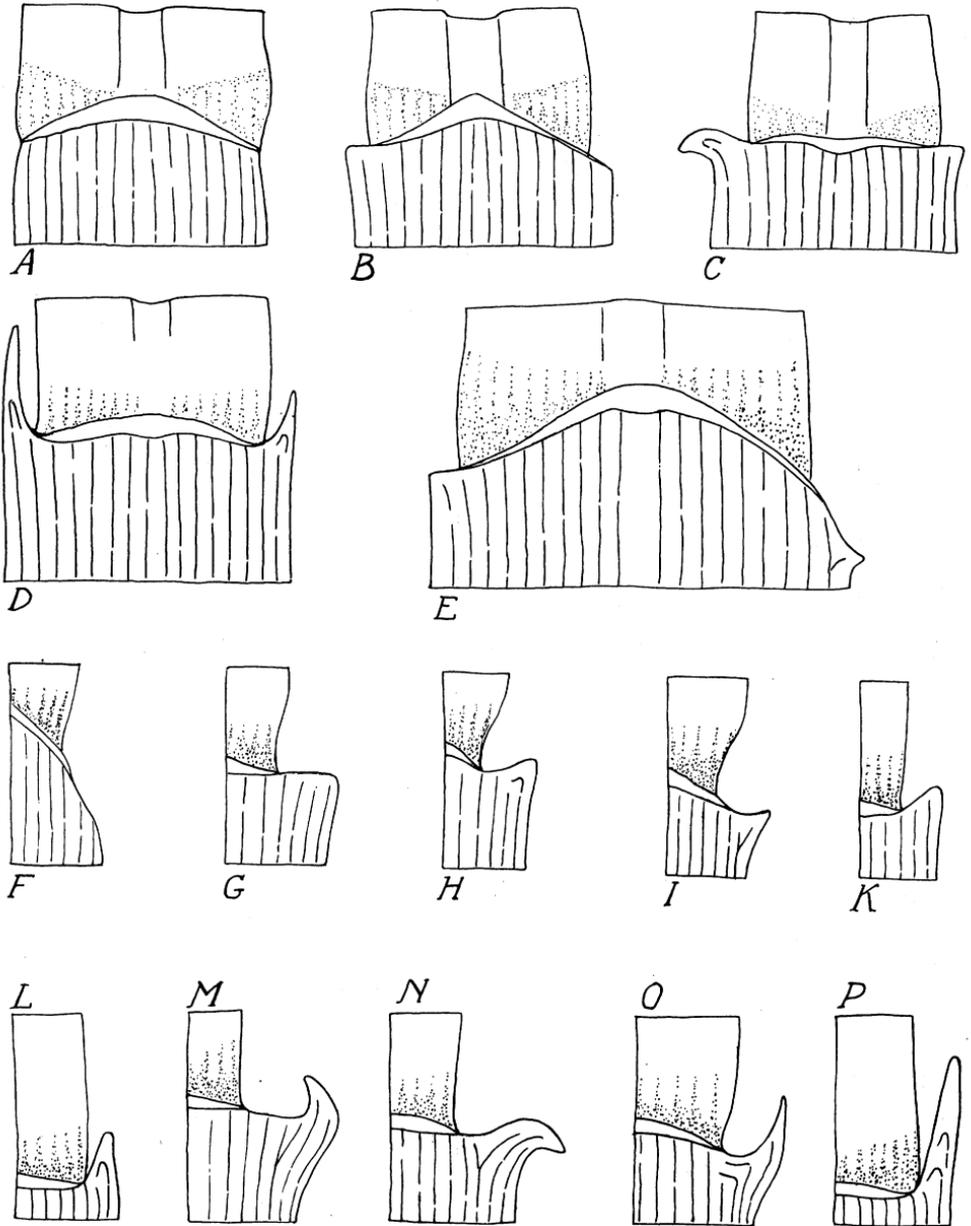


FIGURE 17.—Types of auricles: *A*, Auricles absent; *B*, auricles transitional; *C*, inner auricle calcarate; *D*, both auricles lanceolate; *E*, both auricles transitional but inner one with small deltoid hook inserted low; *F*, sloping transitional auricle; *G*, straight transitional; *H*, ascending transitional; *I*, deltoid; *K*, deltoid; *L*, short lanceolate; *M*, unciform; *N*, calcarate; *O*, falcate; *P*, long lanceolate.

larger types may be smooth or sparingly to prominently ciliate, in their entire length or in the basal region only.

Groups 70 and 71.—The outer surface of the auricular apex occasionally bears a small group of hairs. When occurring on the inner auricle, the group is known as 71 (fig. 17, A); when on the outer auricle, it constitutes group 70.

LIGULE

The ligule of sugarcane is a membranaceous appendage attached at the junction of lamina and sheath. In its young state it is translucent; later it becomes dry, locally discolored, and brokenly indented.

Types.—Four fundamental types are recognized: Deltoid, linear, crescentiform, and arcuate. The latter two often form intermediate types that differ from each other by the height and shape of the midrib sector and the slope and taper of the flanges. The frequently recurring types of ligules are illustrated in figure 18.

Pubescence.—The pubescence of the ligule is restricted to the dorsal surface and the free margin.

Hair group 61.—This group, comprising the cilia along the free margin of the ligule, is invariably present, though in most varieties the cilia are very short and inconspicuous. Sometimes the cilia are short in the midrib region and somewhat longer at the flanges. Some clones have very long cilia and may be identified by this character alone.

Group 66.—The side of the ligule next to the leaf is covered by inconspicuous semiadnate appressed hairs with thick walls; occasionally this group is very prominent.

Group 55a.—In certain clones there is a bunching of long hairs in the central part of the ligule (figs. 16, A, and 18). The hairs are inserted at the basal part of the ligule, and are not adnate.

Group 65a.—Occasionally there is found, either laterally connected with group 55a, or independent, a row of tall more or less widely spaced hairs inserted along the base of the ligular flanges (fig. 18). Sometimes this group is restricted to the terminal flange zone and may be present when a general dorsal pubescence is lacking. The hairs project far above the free margin of the ligule.

DEWLAPS

The dewlaps consist of two deltoid or squarish areas that differ in color and internal structure from the lamina; they form the hinge of the blade joint. There is a certain amount of variation in the form and the surface markings of the dewlaps, but on the whole the pattern is clone-limited. Immature dewlaps are apt to be more asymmetrical than those of fully grown leaves. The one associated with the overlying sheath margin is usually taller and less steeply sloping than the other.

Types.—There are three basic patterns: the rectangular type, the deltoid type, and the ligular type. Many intermediate forms tend to bridge the difference between the three patterns (fig. 19, A-Q).

Color.—Young dewlaps are concolorous with the lamina, usually a pale green; in some clones they are bright red or edged with yellow

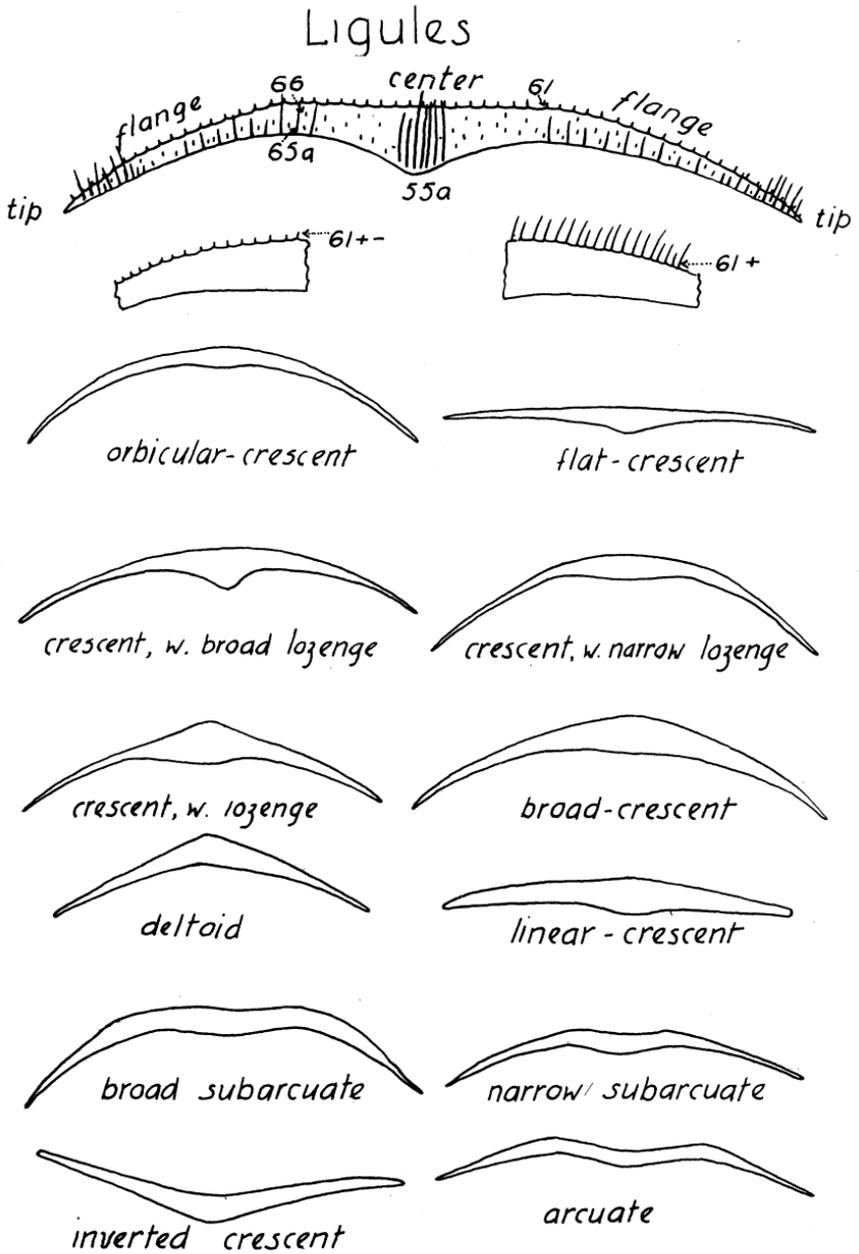


FIGURE 18.—Types of ligules.

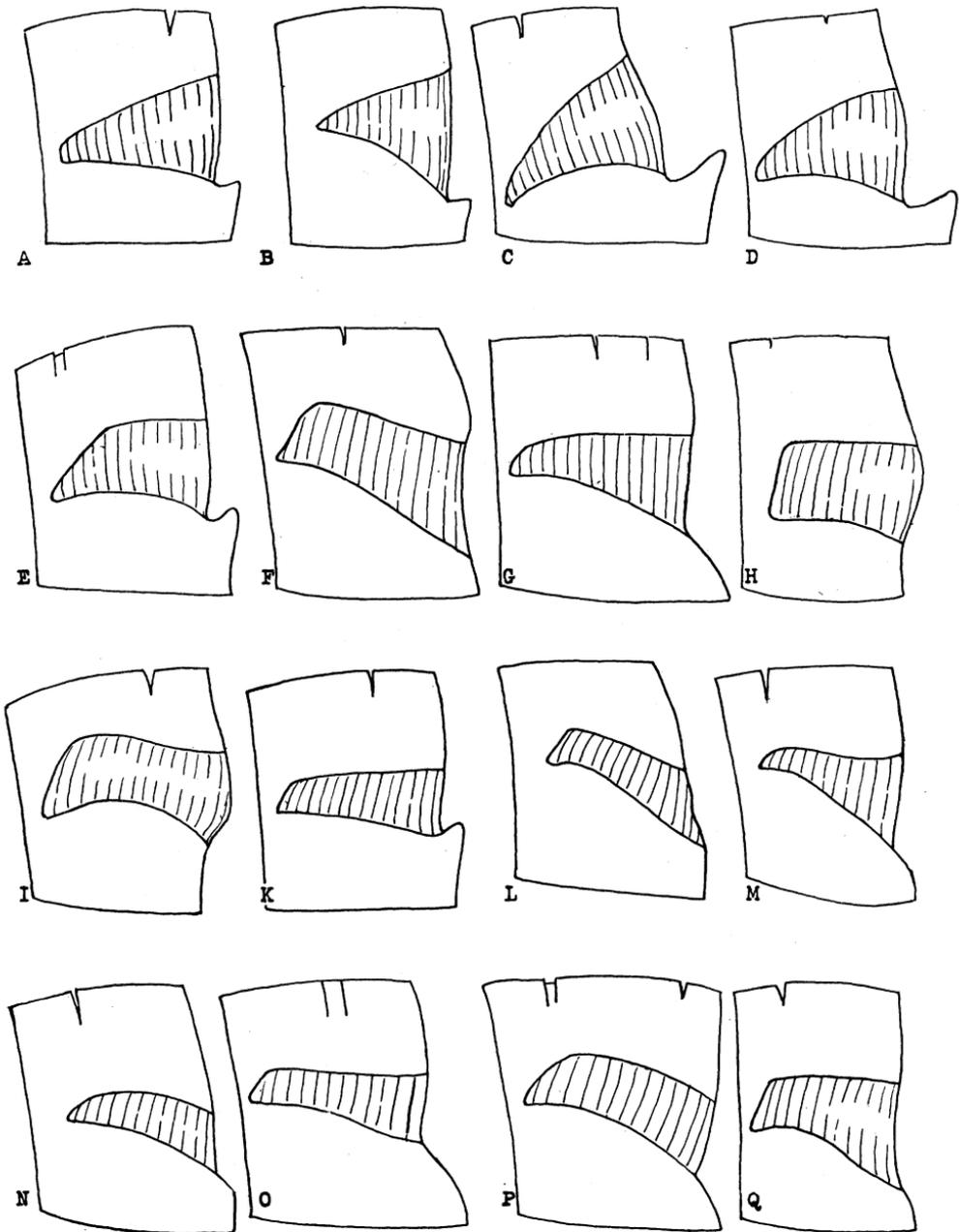


FIGURE 19.—Types of dewlaps: *A*, Deltoid; *B*, flaring deltoid; *C*, descending deltoid; *D*, double-crescent deltoid; *E*, squarish deltoid; *F*, ascending squarish; *G*, squarish subrescent; *H*, tall squarish; *I*, squarish crescent; *K*, narrow squarish; *L*, ascending ligulate; *M*, flaring ligulate; *N*, narrow double crescent; *O*, narrow ligulate; *P*, broad double crescent; *Q*, flaring squarish.

or a tint of red. As the leaf matures the dewlap color deepens, changing to olive, olive brown, or darker tones. The outer surface of the mature dewlap is more or less heavily waxed. The wax deposit is white but becomes discolored on aging, thus contributing to the changes in dewlap color already in progress.

Pubescence.—The outer, or dorsal, surface of the dewlap may be nearly glabrous or covered with a feltlike pubescence, overlaid regionally by longer hairs. The ventral or inner surface has a short or medium-long, sparse or dense, pubescence that is covered with long silky lashes toward the outer edge. The midrib region separating the two dewlaps may be smooth or hairy.

Groups 58 and 58a.—The hairs of group 58 (fig. 16, A) are short and feltlike, sparse or dense; occasionally very dense and slightly longer than is normal for the group. Group 58a is composed of long marginal hairs. In a few clones these hairs are implanted on a wide base and may cover most of the dewlap surface. Occasionally, in clones with hairy sheaths, the hairs of group 60 may project over the base line of the dewlaps, forming a pseudo 58a.

Group 52.—This group constitutes the basic pubescence of the inner dewlap surface. The hairs may be sparse or dense, uniformly scattered or occurring in bands between the veins. They are usually short, but occasionally semilong and matted—a characteristic diagnostic for a large number of clones.

Groups 51 and 51a.—The short hairs of the inner dewlap surface are covered marginally, occasionally entirely, by long hairs. The hairs are silky and soft, protruding as long lashes above the outer edge of the leaf. The length of the hair decreases from the outer edge toward the center. A weakly developed group 51 composed of medium-long hairs, if implanted on a broad base, constitutes group 51a. The latter is transitional between a typical 51 and the semilong matted variant of group 52.

Group 65.—This group, which is usually in juxtaposition with 65a of the ligule, forms a narrow file of long or medium-long hairs implanted at the base of the ligule and extending between leaf edge and midrib but rarely across it. It may be considered an extension of group 51. The hairs are evenly spaced or discontinuous and occasionally bunched along the veins. In some clones group 65 terminates near the midrib, forming on either side a prominent tuft (Jeswiet's group 68).

MIDRIB PUBESCENCE

In many sugarcane varieties the ventral midrib region between the two dewlaps is smooth; in others it is hairy. The hairs form discrete groups or represent an extension of the dewlap pubescence into the midrib.

Group 52a.—The extension of group 52 into the midrib may be limited to a few scattered hairs, or may be as prominent as the dewlap pubescence itself. The hairs are inserted directly behind the ligule and may range upward for a shorter or longer distance.

Group 55.—This group forms a sparse or prominent tuft of long or semilong hairs, the width of the midrib or narrower. It is in juxtaposition with group 55a if the latter is also present. Group 55 some-

times occurs in conjunction with 52a, covering the shorter hairs of the latter partially or entirely.

Group 63.—The hairs of this group form a deltoid or linear patch of varying length and prominence. The group may occur independently or in association with 55 or 52a. The hairs are almost always short and inserted somewhat obliquely, and show up to the naked eye by their silvery sheen. In a number of clones group 63 is made up of long or semilong hairs and stands out prominently.

EVALUATION OF CHARACTERS USED

To be of value in classification, a character must be diagnostic and practical (table 2). It should be constant, appearing on all pertinent organs of the plant; clear cut and not forming transition series or transition traps to impair its usefulness; easily seen, and, if used for primary grouping, manifest a high-percentage distribution among the clones (table 3).

The relative importance of a character varies with the group of clones under investigation (table 4). Thus, the lanceolate auricle has diagnostic value for the New Guinea canes but none for the New Caledonian or Hawaiian clones, in which it rarely occurs.

A character to be useful in primary separation must be qualitative, but its quantitative spectrum may be broad or confined. For example, the leaf sheath may be smooth or hairy (qualitative in primary separation), with the pubescence sparse or dense, general or topographically delimited (quantitative in secondary separation), etc.

Few characters are taxonomically perfect, but many are relatively constant and suffer little change during ontogeny or deterioration after maturity.

The modifying effects of environment manifest themselves chiefly in color changes, wax deposits, and formation of corky cracks. Differential growth rates, often the effect of a changed environment, may influence the shape, size, and length of the internodes while post-developmental changes independent of or accentuated by environment may affect the ligules, auricles, and buds.

Certain characters are clear cut and sharply delimited; others offer observational pitfalls. Among the latter, the following deserve special consideration:

Hair group 65.—This group represents a narrow-file extension of group 51 in the direction of the midrib. The group as such is often not clear cut; it may be prominent or inconspicuous, the hairs dense or sparse, distinct or camouflaged by a co-existing semilong-haired group 52 or 51a. The group is often developed asymmetrically, being more prominent on one dewlap than on the opposite one.

Hair group 63.—When we speak of the midrib being hairy, we commonly make reference to group 63. The hairs of this group are usually inconspicuous, but in some clones they are semilong and visible to the naked eye; occasionally the group attains a distinctness approaching that found in certain wild canes. The hairs are usually inserted low, occasionally some distance above the ligule. A vertical short group 63 inserted low may be considered identical with group 52a.

TABLE 2.—Relative prominence of various morphological features

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Bud hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
											<i>Mm.</i>		
1	+ --	+ --	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ -
2	+ --	+ --	+ -	-	+ -	-	+ --	-	-	+ -	3	c	+ -
3	+ --	+ -	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ .
4	+ -- -	+ -	+ -	-	+ -	+ --	+ --	-	-	+ -	4 5	l	+ -
5	+ --	+ --	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ -
6	+ --	+ .	+ -	-	+ -	-	+ --	-	-	+ -	2 5	l	+ +
7	+ -- -	+ .	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ +
8	+ --	+ .	+ -	+	+ -	-	+ --	-	-	+ -	2 5	l	+ +
9	+ --	+ .	+ -	-	+ -	-	+ --	-	-	+ -	3 5	l	+ -
10	+ --	+ -	+ -	-	+ -	-	+ --	-	-	+ -	7	t	+ -
11	+ -- -	+ -	+ -	-	+ -	-	+ --	-	-	+ -	2 5	l, c	+ -
12	+ --	+ -	+ .	-	+ -	-	+ --	-	-	+ -	3	f	+ .
14	-	-	+ -	-	+ -	-	+ --	-	-	+ -	4 5	c	+ .
14a	-	-	+ -	-	+ -	-	+ --	-	-	+ -	4 5	t, c	+ .
15	-	-	+ -	-	+ -	-	+ --	-	-	+ -	4 5	d, t	+ +
16	+ --	+ -	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ -
17	+ --	+ .	+ -	+	+ -	+	+ --	+	+	+ -	3 5	l	+ .
18	+ --	+ -	+ -	+	+ -	-	+ --	-	-	+ -	2 5	l	+ +
19	+ -- -	+ .	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ .
20	+ --	+ .	+ -	-	+ -	-	+ --	-	-	+ -	2	l	+ +
21	+ -- -	+ -	+ -	-	+ -	-	+ --	-	-	+ -	2 5	l	+ +
22	+ --	+ -	+ -	-	+ -	+ -	+ --	-	-	+ -	4	l, l	+ -
23	+ .	+ .	+ -	-	+ -	-	+ --	-	-	+ -	4	l	+ -
24	-	+ -	+ -	-	+ -	-	+ .	-	-	+ .	4	l	+ .
25	+ --	+ -	+ -	-	+ -	-	+ --	-	-	+ -	4	l, c	+ -
26	+ --	+ -	+ -	-	+ -	-	+ --	-	-	+ -	3 5	l	+ -
27	-	+ -	+ -	-	+ -	+ -	+ .	-	-	+ -	3	l	+ -
28	-	+ --	+ -	-	+ -	-	+ --	-	-	+ -	4	l	+ -
29	-	+ --	+ -	-	+ -	+	+ --	+	-	+ -	3	l	+ .

31	-	+	-	+	-	-	+	-	-	+	-	3. 5	L.	+	-
32	+	+	-	+	+	-	+	+	-	+	+	3	d	+	-
34	-	-	-	+	+	-	+	-	-	+	-	5. 5	C, L	+	-
35	-	+	-	+	+	-	+	-	-	+	-	2. 5	t, d	+	-
36	-	+	-	+	+	-	+	-	+	+	-	4. 5	L	+	-
37	-	+	-	+	+	-	+	-	+	+	-	3	L., C	+	-
38	-	-	-	+	+	-	+	-	-	+	-	4	d	+	-
40	+	+	-	+	+	-	+	+	-	+	-	2. 5	c, t	+	-
41	-	+	-	+	+	-	+	-	+	+	-	2. 5	l	+	-
43	+	+	-	+	+	-	+	-	-	+	-	5	L	+	-
44	+	+	-	+	+	-	+	+	-	+	-	2. 5	t, d	+	-
45	-	+	-	+	+	-	+	+	-	+	-	3. 5	l	+	-
46	-	+	-	+	+	-	+	+	-	+	-	3	l	+	-
47	-	+	-	+	+	-	+	+	-	+	-	4. 5	L.	+	-
48	-	+	-	+	+	-	+	+	-	+	-	3	d, l	+	-
49	-	-	-	+	+	-	+	-	-	+	-	5. 5	l, c	+	-
50	-	-	-	+	+	-	+	-	-	+	-	4	c	+	-
51	-	-	-	+	+	-	+	+	-	+	-	4	d	+	-
51a	+	+	-	+	+	-	+	+	-	+	-	3. 5	d	+	-
53	-	+	-	+	+	-	+	-	-	+	-	7	c	+	-
54	-	+	-	+	+	-	+	+	-	+	-	4	c, l	+	-
56	+	+	-	+	+	-	+	+	-	+	-	3	t	+	-
57	+	+	-	+	+	-	+	+	-	+	-	4	c	+	-
58	-	+	-	+	+	-	+	-	-	+	-	4	L.	+	-
60	-	+	-	+	+	-	+	+	-	+	-	4	L	+	-
61	+	+	-	+	+	-	+	+	-	+	-	4	L	+	-
62	-	+	-	+	+	-	+	-	-	+	-	4	L	+	-
63	-	+	-	+	+	-	+	-	-	+	-	4	L	+	-
64	+	+	-	+	+	-	+	-	-	+	-	3. 5	c	+	-
66	+	+	-	+	+	-	+	+	-	+	-	3. 5	l	+	-
67	+	+	-	+	+	-	+	+	-	+	-	4	l, C	+	-
69	-	+	-	+	+	-	+	-	-	+	-	2. 5	L.	+	-
70	-	+	-	+	+	-	+	+	-	+	-	2. 5	d	+	-
71	-	+	-	+	+	-	+	+	-	+	-	4	L	+	-
72	-	+	-	+	+	-	+	+	-	+	-	5	l, f	+	-
73	-	+	-	+	+	-	+	+	-	+	-	4	d	+	-
74	-	+	-	+	+	-	+	+	-	+	-	3. 5	d	+	-
75	+	+	-	+	+	-	+	+	-	+	-	5. 5	C	+	-

See footnotes at end of table.

TABLE 2.—Relative prominence of various morphological features—Continued

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Bud hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
76	+ - -	+ -	+ -	-	+ .	-	+ - -	-	-	+ -	<i>Mm.</i>	c	+ .
77	+ - -	+ -	+ -	-	+ -	+ -	-	-	-	+ -	3. 5	d	+ -
78	+ - -	+ .	+ -	-	+ -	-	-	-	-	+ -	4	c	+ -
79	-	+ .	+ -	-	+ -	-	-	-	-	+ -	4	l	+ -
80	+ - - -	+ -	+ -	-	+ -	-	-	-	-	+ -	4. 5	l	+ -
81	-	-	+ -	-	+ -	-	-	-	-	+ -	3	t, d-	+ -
82	+ -	+ .	+ -	-	+ -	-	+ - -	-	-	+ -	5. 5	t	+ -
83	-	+ -	+ -	-	+ -	+ -	-	-	-	+ -	3. 5	l, c	+ - -
84	-	+ -	+ -	-	+ .	+ -	-	-	-	+ -	3. 5	l	+ -
85	+ -	+ .	+ -	-	+ -	+ -	+ - -	-	-	+ -	3. 5	l	+ -
86	+ - -	+ -	+ -	+ -	+ -	+ - -	+ - -	-	-	+ -	3. 5	c	+ -
87	-	+ .	+ -	-	+ -	+ -	-	-	-	+ -	4	C	+ -
88	+ - - -	+ . - -	+ -	-	+ -	+ -	-	-	-	+ -	4	l, c	+ -
89	+ - - -	+ - - -	+ -	-	+ -	+ -	-	-	-	+ -	3. 5	l, d	+ .
90	+ - - -	+ - - -	+ -	-	+ -	+ -	-	-	-	+ -	3	d, t	+ -
91	-	+ .	+ -	-	+ -	-	-	-	-	+ -	3	t, d	+ .
92	+ - -	+ - - -	+ -	-	+ -	-	-	-	-	+ -	4. 5	L	+ .
93	-	+ .	+ -	-	+ -	-	-	-	-	+ -	3	t, d	+ -
94	-	+ -	+ -	-	+ -	-	+ - -	+ - -	-	+ -	5	d, l	+ -
95	-	+ -	+ -	-	+ -	-	+ - -	-	-	+ -	4. 5	d, c	+ -
96	-	+ -	+ -	-	+ -	-	-	-	-	+ -	3. 5	C	+ -
97	+ -	+ -	+ -	-	+ -	-	-	-	-	+ -	4. 5	t	+ -
98	-	-	+ -	-	+ -	-	-	-	-	+ -	3. 5	l	+ .
98a	-	+ -	+ -	-	+ -	-	-	-	-	+ -	6	d	+ .
99	-	+ -	+ -	-	+ -	-	-	-	-	+ -	6	d, c	+ -
100	-	-	+ -	-	+ -	+ - -	-	-	-	+ -	4. 5	l	+ .
101	-	-	+ -	-	+ -	+ - -	-	-	-	+ -	5	c	+ .
102	-	-	+ -	-	+ -	+ - -	+ - -	-	-	+ -	4. 5	c	+ .
103	-	+ .	+ -	-	+ .	-	-	-	-	+ -	3	c	+ -
											4	c	+ -

104	+ --	+ -	+	-	+	-	+	-	+	-	+	-	3	l	+	-
105	-	+ -	+	+	+	+	+	+	+	+	+	+	3	l	+	-
106	-	+	+	+	+	+	+	+	+	+	+	+	2	d	+	-
107	-	-	+	+	+	+	+	+	+	+	+	+	5	c	+	-
108	-	+	+	+	+	+	+	+	+	+	+	+	3.5	l	+	-
109	-	.	+	+	+	+	+	+	+	+	+	+	3.5	L	+	-
110	+ --	+ -	+	+	+	+	+	+	+	+	+	+	2	c	+	-
111	-	-	+	+	+	+	+	+	+	+	+	+	4.5	c	+	-
111a	+ -	+	+	+	+	+	+	+	+	+	+	+	3	c	+	-
112	+ --	+ -	+	+	+	+	+	+	+	+	+	+	3	c	+	-
113	-	-	+	+	+	+	+	+	+	+	+	+	4.5	l	+	-
114	-	+ --	+	+	+	+	+	+	+	+	+	+	4	c	+	-
115	-	-	+	+	+	+	+	+	+	+	+	+	4	l	+	-
116	-	-	+	+	+	+	+	+	+	+	+	+	4	L	+	-
117	-	-	+	+	+	+	+	+	+	+	+	+	3	l	+	-
118	-	-	+	+	+	+	+	+	+	+	+	+	2	l	+	-
119	-	-	+	+	+	+	+	+	+	+	+	+	3	l	+	-
120	+ --	-	+	+	+	+	+	+	+	+	+	+	2	l	+	-
121	-	-	+	+	+	+	+	+	+	+	+	+	3.5	l	+	-
122	-	-	+	+	+	+	+	+	+	+	+	+	2.5	l	+	-
122a	-	+ --	+	+	+	+	+	+	+	+	+	+	4	L	+	-
123	-	+ --	+	+	+	+	+	+	+	+	+	+	3	l	+	-
124	+ --	+ --	+	+	+	+	+	+	+	+	+	+	2.5	t	+	-
124a	-	+	+	+	+	+	+	+	+	+	+	+	4	C, L	+	-
124b	+ -	+ -	+	+	+	+	+	+	+	+	+	+	3	c	+	-
125	+	.	+	+	+	+	+	+	+	+	+	+	2.5	l, c	+	-
126	-	-	+	+	+	+	+	+	+	+	+	+	3.5	L	+	-
127	+	-	+	+	+	+	+	+	+	+	+	+	4.5	d	+	-
128	+	+ --	+	+	+	+	+	+	+	+	+	+	4	c, l	+	-
129	-	-	+	+	+	+	+	+	+	+	+	+	3.5	l, d	+	-
130	-	+ -	+	+	+	+	+	+	+	+	+	+	3	t	+	-
131	-	-	+	+	+	+	+	+	+	+	+	+	3	c	+	-
132	+ --	+ -	+	+	+	+	+	+	+	+	+	+	4	l	+	-
133	-	+ -	+	+	+	+	+	+	+	+	+	+	4.5	c	+	-
134	-	-	+	+	+	+	+	+	+	+	+	+	2.5	t	+	-
135	+ --	-	+	+	+	+	+	+	+	+	+	+	2.5	c	+	-
136	-	-	+	+	+	+	+	+	+	+	+	+	3.5	L	+	-
137	-	-	+	+	+	+	+	+	+	+	+	+	3.5	L, C	+	-

See footnotes at end of table.

TABLE 2.—Relative prominence of various morphological features—Continued

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Bud hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
137a	+ --	+ --	+	-	+ -	-	-	-	-	+ -	<i>Mm.</i>	d	+ . -
138	- - -	- - -	+	-	+	-	-	-	-	+	3	c, l	+
139	+ - - -	+ -	+	-	+	-	-	-	-	+	4.5	L, C	+
140	+ - - -	+ -	+	-	+	-	-	-	-	+	4.5	L, C	+
141	+ - - -	+ -	+	-	+	-	-	-	-	+	4	L	+
142	+ - - -	+ - -	+	-	+	-	-	-	-	+	4	L, C	+
143	+ - -	+ .	+	+	+	-	-	-	-	+	4	L	+
144	- - -	+ -	+	-	+	-	+	+	+	+	3.5	c	+
145	- - -	+ -	+	-	+	-	+	+	+	+	3	c	+
146	- - -	+ -	+	-	+	-	+	+	+	+	4	c	+
147	- - -	+ -	+	-	+	-	+	+	+	+	5	l	+
148	- - -	+ -	+	-	+	-	+	+	+	+	5	l, c	+
149	+ - -	+ -	+	-	+	-	+	+	+	+	3	L	+
150	- - -	- - -	+	-	+	-	+	+	+	+	4	c	+
151	+ - -	+ .	+	-	+	-	+	+	+	+	4.5	L	+
152	- - -	- - -	+	-	+	-	+	+	+	+	4.5	L	+
153	- - -	+ .	+	-	+	-	+	+	+	+	4	L	+
154	+ - -	+ .	+	-	+	+	+	+	+	+	3	l, d	+
156	- - -	+ -	+	-	+	-	+	+	+	+	4.5	d	+
157	- - -	+ -	+	+	+	-	+	+	+	+	3.5	c	+
158	- - -	+ .	+	+	+	+	+	+	+	+	3.5	t	+
159	+ - -	+ - - -	+	-	+	-	+	+	+	+	3	t	+
160	+ - - -	+ - - -	+	-	+	-	+	+	+	+	4	t	+
161	- - -	+ - -	+	-	+	-	+	+	+	+	4.5	c	+
162	- - -	+ - -	+	-	+	-	+	+	+	+	3.5	c	+
163	- - -	+ - -	+	-	+	-	+	+	+	+	4.5	l	+
164	- - -	+ .	+	-	+	-	+	+	+	+	3.5	c	+
165	+ - -	+ - -	+	-	+	-	+	+	+	+	3	t, l	+
166	- - -	+ -	+	+	+	-	+	+	+	+	4	t	+

TABLE 2.—Relative prominence of various morphological features—Continued

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Bud hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
206	+ --	-	+ -	-	+ -	-	+ ---	-	-	+ -	<i>Mm.</i>		+ . . .
207	-	-	+ -	-	+ -	+ --	+ ---	-	-	+ -	3	c	+ . . .
208	+ --	+ -	+ -	-	+ -	+ --	+ ---	-	-	+ -	2	t	+ . . .
209	-	+ --	+ -	-	+ -	-	-	-	-	+ -	3	t	+ . . .
210	-	+ -	+ -	-	+ -	+ --	-	-	+ -	+ -	4 5	t	+ . . .
212	-	-	+ -	-	+ -	-	+ .	+ -	+ -	+ -	4 5	c	+ . . .
213	+ --	+ -	+ -	-	+ -	-	+ -	-	+ -	+ -	3 5	c	+ . . .
213a	-	+ -	+ -	+ --	+ -	-	+ .	-	-	+ -	3	l	+ . . .
214	-	+ --	+ -	+ -	+ -	-	+ -	-	-	+ -	4	l	+ . . .
215	-	+ .	+ -	-	+ -	-	+ -	-	-	+ -	2 5	c	+ . . .
216	-	+ -	+ -	+ -	+ -	-	+ -	+ -	+ -	+ -	3 5	c	+ . . .
217	-	+ .	+ -	+ -	+ -	+ --	-	+ -	+ -	+ -	2 5	t	+ . . .
218	-	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	2 5	t	+ . . .
219	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	+ -	2 5	c, t	+ . . .
220	-	+ .	+ -	-	+ -	-	+ -	-	-	+ -	3 5	c	+ . . .
221	-	+ -	+ -	-	+ -	-	+ -	-	-	+ -	2 5	c, t	+ . . .
222	+ -	-	+ -	+ -	+ -	-	+ -	-	-	+ -	5	d	+ . . .
223	-	+ -	+ -	+ -	+ -	-	+ -	-	-	+ -	3 5	c	+ . . .
224	+ -	+ -	+ -	+ -	+ -	+ -	+ -	-	-	+ -	3	c	+ . . .
225	+ -	+ -	+ -	+ -	+ -	+ -	+ -	-	-	+ -	2 5	c	+ . . .
226	+ .	+ -	+ -	+ -	+ -	-	+ -	-	-	+ -	3 5	t	+ . . .
227	-	+ .	+ -	+ -	+ -	-	+ -	-	-	+ -	3	t	+ . . .
228	+ -	+ -	+ -	+ -	+ -	+ -	+ -	-	-	+ -	3	t	+ . . .
229	+ .	-	+ -	-	+ -	-	+ -	-	-	+ -	3 5	t	+ . . .
230	+ -	-	+ -	-	+ -	-	-	-	-	+ -	3	t	+ . . .
231	+ -	+ .	+ -	-	+ -	-	-	-	-	+ -	2 5	d, l	+ . . .
232	-	+ -	+ -	+ -	+ -	+ -	-	+ -	-	+ -	3 5	t	+ . . .
235	-	+ --	+ -	-	+ -	+ -	-	+ -	+ -	+ -	5	c, l	+ . . .

236	-	+ -	+ -	-	+ -	+	-	-	-	+ -
237	+ -	+	+ -	+ -	+ -	+	-	-	-	+ -
237a	-	+	+	+	+	-	-	-	-	+ -
238	-	+	+ -	+ -	+ -	-	-	-	-	+ -
239	-	-	+	+	+	-	-	-	-	+ -
240	+ - -	+ -	+ -	+ -	+ -	+	- - -	-	-	+ -
241	-	+	+	+	+	+	- - -	-	-	+ -
242	-	+	+	+	+	+	-	-	-	+ -
243	+ - -	+ - -	+ -	+ -	+ -	+	-	-	-	+ -
244	+ - -	+ - -	+	+	+	+	-	-	-	+ -
245	+ - -	+	+	+	+	-	+	-	+	-
245a	-	+ - - -	+	+	+	-	+	-	+	-
246	+	+ - -	+	+	+	-	+	-	+	-
247	+ - - -	+	+	+	+	-	-	-	-	+ -
248	+	+ -	+ -	+ -	+ -	-	-	-	-	+ -
249	-	+	+	+	+	+	-	-	-	+ -
250	-	+ - -	+ -	+ -	+ -	+	-	-	-	+ -
251	-	+	+ -	+ -	+ -	-	-	+	-	+ -
252	-	+	+	+	+	+	-	+	-	+ -
253	+	+ -	+ -	+ -	+ -	-	+	-	+	+ -
254	-	+	+ -	+ -	+ -	-	+	-	+	+ -
255	-	+	+	+	+	+	- - - -	-	-	+ -
256	-	+	+	+	+	+	+	- - -	+	-
257	+ -	+ - - -	+	+	+	-	+	-	+	-
258	+ -	+	+ -	+ -	+ -	-	+	-	-	+ -
259	+ -	+	+	+	+	-	+	-	-	+ -
260	-	+ - -	+	+	+	-	+	-	+	-
262	-	+	+	+	+	-	-	-	-	+ -
263a	-	+ -	+	+	+	-	+	-	-	+ -
264	-	+	+	+	+	-	+	-	-	+ -
266	+ - -	+ - -	+	+	+	+	+	- -	-	+ -
267	-	-	+	+	+	-	+	- -	-	+ -
268	-	+	+	+	+	-	-	-	-	+ -
269	-	+ - - -	+	+	+	+	+	- -	-	+ -
270	-	+	+	+	+	-	+	- - -	-	+ -
271	-	+	+	+	+	+	+	- -	-	+ -
272	+ - -	-	+	+	+	+	+	- -	-	+ -

See footnotes at end of table.

2	t	+	.
3	l	+	-
2	t	+	-
2	t	+	-
5	l	+	-
5	c	+	-
5	c, t	+	.
2	c, t	+	-
4	c	+	.
5	l, c	+	.
5	d, l	+	-
2	d, l	+	-
4	t	+	-
3	c	+	-
5	t	+	.
5	d	+	-
2	t, c	+	-
4	t	+	.
2	l	+	-
5	d, l	+	-
3	L., d	+	-
3	t, c	+	-
2	t	+	-
3	l	+	-
4	l	+	-
5	l	+	-
2	t	+	-
3	t	+	-
6	c	+	.
6	L	+	.
4	t	+	.
2	t	+	.
5	t, d	+	.
4	t, d	+	.
5	c	+	.
4	c	+	.
5	l	+	.
4	L	+	.
5	c	+	-

TABLE 2.—Relative prominence of various morphological features—Continued

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Brid hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
273	+ - -	+	+	-	+	-	+	-	-	+	<i>Mm.</i>	t	+ -
274	+	+ -	+ -	-	+ -	-	-	-	-	+ -	4	c	+ -
275	+ -	+	+ -	-	+	-	+ - -	-	-	+	3. 5	l	+ - -
276	-	+ -	+ -	+ - -	+ -	-	-	-	-	+	4	c, l	+ - -
277	+ - -	+ - -	+	-	+	-	+ - -	+ - -	-	+	3. 5	c	+ - -
278	+	+	+ -	+ -	+ -	-	-	-	-	+	5	t	+ - -
280	+ - -	+ - -	+	-	+	+ -	+ - -	+ -	-	+	3	c	+ -
281	+	+	+ -	-	+	-	+ - -	+ -	+	+	5	c	+ -
285	+	+ -	+ -	-	+	+ - -	+ - -	+ -	+	+	4	c	+ -
286	-	+ - - -	+	+ -	+	+ - -	-	+ -	-	+	3. 5	t	+ -
287	+ - -	+ - -	+ -	-	+	+ -	+ - -	+ - -	-	+	4. 5	l, c	+
288	-	+	+ -	-	+	+	-	+	-	+	5	c	+ -
289	-	+	+ -	-	+	-	-	-	-	+	4. 5	t	+ -
290	-	+	+ -	+ -	+	-	-	-	-	+	2. 5	d	+ -
291	-	+	+	-	+	+	-	-	-	+	3. 5	t	+ -
293	-	+	+ -	-	+	+	-	+	+	+	3. 5	t	+ - -
294	-	+	+	-	+	-	-	+	-	+	3. 5	t	+ - -
296	-	+	+	-	+	+	-	+	-	+	3. 5	t	+ - -
297	-	+ - -	+ -	+ - -	+	-	-	-	-	+	4	t	+ - -
298	+	+	+ -	-	+	-	+ - -	-	-	+	3. 5	l, C	+ -
299	-	+	+ -	-	+	-	-	-	-	+	4	t	+ -
300	-	+	+ -	-	+	-	-	-	-	+	3. 5	C, L	+ -
301	-	+	+ -	+ -	+	-	-	-	-	+	5	t, d	+ -
302	-	+ - -	+ -	+	+	-	-	-	-	+	2. 5	t	+ - -
304	-	+	+	-	+	+	-	+	-	+	6	t	+ -
305	-	+ - - -	+ -	-	+	+	-	+	+	+	4	l	+ -
306	-	+	+ -	-	+	-	-	-	-	+	3. 5	t	+ -
307	-	+	+	+	+	+	+	+	+	+	3. 5	t	+ -
											4	t	+ -

308	-	+ - - -	+	-	+	-	+ -	+ - -	-	+ -
309	-	+ - - -	+ +	-	+ +	-	-	-	-	+ +
311	-	+ - - -	+ -	-	+ -	-	-	-	-	+ -
312	+ - -	+ - - -	+ .	-	+ .	-	-	-	-	+ -
313	-	+ - - -	+ -	-	+ -	-	+ -	+ -	-	+ -
314	-	-	+ .	-	+ .	-	-	-	-	+ -
315	+ - -	+ .	+ .	-	+ .	-	+ - -	+ - -	-	+ -
316	-	+ .	+ -	+	+ -	+	+ -	+ -	+	+ -
317	+ - - -	+ - -	+ -	-	+ -	+	+ -	+ -	+	+ -
318	+	+ - -	+ -	-	+ -	-	-	-	-	+ -
319	-	+ - -	+ -	-	+ -	-	+ -	+ -	-	+ -
320	-	+ - -	+ -	-	+ -	-	+ - -	+ - -	-	+ -
321	-	+ .	+ -	-	+ -	-	-	-	-	+ -
322	-	-	+ -	-	+ -	-	+ - -	+ - -	-	+ -
323	+ - -	+ .	+ -	-	+ -	-	+ -	+ -	-	+ -
324	-	+ .	+ -	-	+ .	+ - -	-	-	-	+ -
325	-	+ .	+ -	-	+ -	+	+ -	+ -	+	+ -
326	+ - -	+ .	+ .	-	+ -	-	-	-	+	+ -
327	-	+ - -	+ -	-	+ -	+	-	-	-	+ -
328	+	+ - -	+ -	-	+ .	-	-	-	-	+ -
329	+ -	+ - -	+ -	-	+ -	+	-	-	-	+ -
330	-	+ - -	+ -	-	+ -	-	+	+	+	+ -
332	-	+ .	+ -	-	+ -	-	+ - -	+ - -	-	+ -
334	+ - -	+ - -	+ -	-	+ -	+	+ - -	+ - -	+	+ -
335	-	+ - -	+ -	-	+ -	+	-	-	-	+ -
336	-	+ - - -	+ -	+	+ -	-	-	-	-	+ -
337	+ - -	+ - - -	+ -	-	+ -	-	-	-	-	+ -
338	+ - -	+ - - -	+ -	-	+ -	-	-	-	-	+ -
339	-	+ - -	+ -	+	+ -	-	-	-	-	+ -
340	+ -	+ - -	+ -	-	+ -	-	-	-	-	+ .
341	+	+ - -	+ -	-	+ -	+	+ - -	+ - -	-	+ -
342	-	+ - -	+ -	-	+ -	+	-	-	+	+ -
343	-	+ - -	+ -	-	+ -	-	+ - -	+ - -	+	+ -
344	-	+ - -	+ -	-	+ -	-	-	-	+	+ -
345	-	+ - -	+ -	-	+ -	-	-	-	-	+ .
346	-	+ .	+ -	-	+ -	-	-	-	-	+ -
5. 5	c, l	+ -								+ -
4. 4	t	+ -								+ -
4. 5	L	+ - - -								+ - - -
2	t, d	+ - - -								+ - - -
3. 5	c	+ - - -								+ - - -
2. 5	t	+ - - -								+ - - -
3	d	-								-
4	t	+ -								+ -
4. 5	l, t	+ .								+ .
2. 5	t	+ -								+ -
4	d	+ -								+ -
4. 5	l, c	+ -								+ -
4	l, c	+ -								+ -
5	c, t	+ -								+ -
2. 5	t	+ - - -								+ - - -
4. 5	L	+ - - -								+ - - -
3. 5	L.	+ -								+ -
3. 5	t	+ - - -								+ - - -
4. 5	d, l	+ - - -								+ - - -
5	L, l	+ .								+ .
3. 5	t	+ - - -								+ - - -
3. 5	t, c	+ - - -								+ - - -
7	d, c	+ .								+ .
5	C	+ .								+ .
3. 5	c	+ -								+ -
2	c	+ -								+ -
3	d	+ -								+ -
3. 5	t	+ -								+ -
2	t	+ -								+ -
2. 5	t, c	+ - - -								+ - - -
3	c, d	+ .								+ .
4	l	+ -								+ -
4	c	+ .								+ .
4	C, F	+ -								+ -
6	L	+ -								+ -
4. 5	c, l	+ - - -								+ - - -

See footnotes at end of table.

TABLE 2.—Relative prominence of various morphological features—Continued

Accession No.	Hair groups ¹										Ligule ²	Inner auricle ³	Bud hairs ⁴
	56	57	58	59	52	65	63	55a	55	61			
347	+ -	+ - - -	+ -	-	+	-	-	-	-	+	<i>Mm.</i> 3.5 3.5 4 5.5	c, l t c l, c	+ + - + - + - + -
348	+	+ - - -	+	-	+	-	-	-	-	+			
349	+ -	+ - -	+ -	-	+	+ -	+ - -	+ -	+ - -	+			
350	-	+ .	+ -	-	+ -	-	-	-	-	+			

+ = Prominent, long, tall.
 +. = Medium prominent, medium long.
 +. - = Medium prominent to medium sparse.
 + - = Medium sparse, short, narrow, small, shallow, light.
 + - - = Very sparse, very small.
 + - - - = Inconspicuous to lacking.
 - = Lacking.
¹Maximum height of ligule, in millimeters, in midrib region.
²Inner auricle patterns:
 c = small calcarate;
 C = large calcarate;
 d = deltoid;

³ Inner auricle patterns—Continued
 f = small falcate;
 F = large falcate;
 l = short lanceolate;
 L = long lanceolate;
 L. = medium-long lanceolate;
 t = transitional;
 u = unciiform.
⁴ Pubescence of bud:
 + = hairy;
 +. = medium hairy;
 + - = sparse;
 + - - = slightly hairy to smooth.

Hair group 61.—A prominently ciliated ligular margin is characteristic of many New Caledonian clones. In some few clones the ligular fringe is prominent only in the flange zone or in the midrib region, making classification on the basis of this character uncertain. By far the largest number of clones have a short or inconspicuous ligular fringe (group 61).

Hair group 56.—Only relatively few noble canes have a prominent fringe along the upper sheath margin. When vertically short or poorly developed, group 56 is unreliable as a diagnostic character. It may be absent from some sheaths and manifest varying degrees of development in others—a typical “transition trap.” In clones with steeply sloping transitional auricles a prominent pseudo fringe (formed by group 54) that may be subtended by a short group 56 or a small deltoid hook is present, a characteristic of many Hawaiian clones.

Hair group 55a.—This group is usually associated with midrib group 55. It is prominent and constant in some clones, variable in others.

TABLE 3.—Percentage distribution of some morphological characters

Character	Clones			
	New Guinea	New Caledonian	Hawaiian	Miscellaneous nobles
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Prominent bud furrow.....	53	50	85	44
Heavy bloom.....	18	10	6	50
Lanceolate inner auricle.....	28	0	0	11
Transitional inner auricle.....	6.5	51	55	46
Narrow ligule.....	36	16	63	25.5
Hair group 52 prominent.....	47	28	3	50
Hair group 55a present.....	15	10	43	44
Hair group 56 present.....	40	18	60	35
Hair group 56 prominent.....	5.8	5	26	8.2
Leaf sheath hairy.....	71	97	46	94
Hair group 57 prominent.....	23	54	32	45
Hair group 61 long or tall.....	9	44	3	12
Midrib hairy.....	40	48	45.7	40
Hair group 63 prominent.....	11	21	14	4.5
Hair group 65 present.....	20	10	17	30
Epidermal pattern No. 2.....	15.3	17.5	31.4	12.7
Epidermal pattern No. 2—.....	16.6	22.5	25.7	15.5
Stem epidermis containing pointed cork cells.....	42	25	34	31

TABLE 4.—*Diagnostic characters used for grouping of the (1) New Guinea, (2) New Caledonian, (3) Hawaiian, and (4) miscellaneous noble canes, and accession number of clones associated with each taxonomic group. Group characters are distinct for each of the four major groups of canes*

Taxonomic group No.	Diagnostic characters	Accession No.
New Guinea cane Nos.: ¹		
1	Groups 63 and 61 prominent	24, 44, 45, 126
2	Groups 63 and 52 prominent; buds hairy.	51a, 115, 127, 128
3	Groups 63 and 52 prominent; buds slightly hairy.	60, 120, 121, 149
4	Group 63 prominent, 52 sparse, 65 present.	130
5	Group 63 prominent, 52 sparse, 65 absent.	20, 117, 119
6	Group 63 sparse, 57 prominent, 56 present.	6, 7, 19, 20, 56, 61, 66, 82, 85
7	Group 63 sparse, 57 prominent, 56 absent.	17, 37, 41, 74, 86, 94, 95, 106, 147
8	Groups 63, 57, 56 sparse, ligule narrow, prophyll with secondary wings.	5, 154
9	Groups 63, 57, 56 sparse, ligule narrow, secondary wings absent.	1
10	Groups 63 and 57 sparse, 56 absent, ligule narrow, inner auricle, long lanceolate.	27
11	Groups 63 and 57 sparse, 56 absent, ligule narrow, inner auricle short, 4-5 rows of root primordia.	46, 70
12	Groups 63 and 57 sparse, 56 absent, ligule narrow, inner auricle short, 2-3 rows of root primordia.	48, 145
13	Groups 63 and 57 sparse, ligule medium, 55a present.	51, 71, 132, 144
14	Groups 63 and 57 sparse, ligule medium, 55a absent, inner auricle long lanceolate.	31, 36, 47, 75
15	Groups 63 and 57 sparse, ligule medium, 55a absent, inner auricle small.	76
17	Group 63 sparse, 57 absent, ligule narrow, buds slightly hairy.	63, 102, 116, 118
18	Group 63 sparse, 57 absent, ligule medium, 52 prominent.	50, 72, 131, 137, 152
19	Group 63 sparse, 57 absent, ligule medium, 52 sparse.	57, 109, 122
20	Ligule narrow, buds hairy, 56 present.	18, 21, 89, 90, 92, 135
21	Ligule narrow, buds hairy, 56 absent, inner auricle long lanceolate.	3, 8, 122a
22	Ligule narrow, buds hairy, 56 absent, inner auricle small.	35, 123, 129, 133
23	Ligule narrow, buds slightly hairy, 56 present.	2, 11, 12, 16, 32, 40, 80, 104, 110, 111a, 112, 124b, 137a

See footnotes at end of table.

TABLE 4.—*Diagnostic characters used for grouping of the (1) New Guinea, (2) New Caledonian, (3) Hawaiian, and (4) miscellaneous noble canes, and accession number of clones associated with each taxonomic group. Group characters are distinct for each of the four major groups of canes—Continued*

Taxonomic group No.	Diagnostic characters	Accession No.
New Guinea cane Nos. 1—Con.		
24-----	Ligule narrow, buds slightly hairy, 56 absent.	29, 69, 105, 124a
25-----	Ligule medium, buds hairy, secondary wings present, 56 present.	4, 78, 124, 139, 140, 141, 142, 143
26-----	Ligule medium, buds hairy, secondary wings present, 56 absent.	38, 84, 87, 136, 148
27-----	Ligule medium, buds hairy, secondary wings absent, 65 present.	54, 111, 114
28-----	Ligule medium, buds hairy, secondary wings absent, 65 absent.	15, 34, ² 62, 74, 79, 99, 108, 113, 138
29-----	Ligule medium, buds slightly hairy, 57 prominent, inner auricle long lanceolate.	91, 151, 153
30-----	Ligule medium, buds slightly hairy, 57 prominent, inner auricle small, 56 present.	23, 25, 97
31-----	Ligule medium, buds slightly hairy, 57 prominent, inner auricle small, 56 absent.	26, 83, 103
32-----	Ligule medium, buds slightly hairy, 57 sparse, 56 present.	9, 43, 64, 67, 77, 88
33-----	Ligule medium, buds slightly hairy, 57 sparse, 56 absent.	22, 28, 53, 58, 73, 93, 98a, 146
34-----	Ligule medium, buds slightly hairy, 57 absent, 56 present.	10, 125
35-----	Ligule medium, buds slightly hairy, 57 absent, 56 absent.	14, 81, 107, 134, 150
36-----	Ligule medium, buds medium hairy, 57 absent, inner auricle long lanceolate.	34, ² 49
37-----	Ligule medium, buds medium hairy, inner auricle transitional or small.	14a, 96, 98, 100, 101
New Caledonian cane Nos.:		
1-----	Culms hairy-----	169
2-----	Group 61 prominent, 63 absent-----	162, 164, 173, 175, 178, 179, 184, 193
3-----	Groups 61, 63, and 58 prominent-----	166, 167, 171, 172, 182
4-----	Groups 61 and 63 prominent, 58 sparse--	187, 188, 189
5-----	Group 61 prominent, 63 sparse-----	186
6-----	Group 61 short, 63 absent, bud furrow prominent.	160, 161, 165, 170, 174, 177, 193
7-----	Group 61 short, 63 absent, bud furrow small.	156, 158, 159, 163, 194, 195
8-----	Group 61 short, 63 sparse-----	157, 168, 176, 180, 181, 183, 185, 190, 192

See footnotes at end of table.

TABLE 4.—*Diagnostic characters used for grouping of the (1) New Guinea, (2) New Caledonian, (3) Hawaiian, and (4) miscellaneous noble canes, and accession number of clones associated with each taxonomic group. Group characters are distinct for each of the four major groups of canes—Continued*

Taxonomic group No.	Diagnostic characters	Accession No.
Hawaiian cane		
Nos.:		
1-----	Culms hairy-----	216
2-----	Sheath smooth, midrib smooth, 56 present.	200, 201, 203, 204, 205, 230
3-----	Sheath smooth, midrib slightly hairy, 56 present.	196, 197, 198, 199, 200, 205, 206, 219, 222, 226, 229
4-----	Sheath smooth, midrib smooth, 56 absent.	None
5-----	Sheath smooth, midrib slightly hairy, 56 absent.	207, 212
6-----	Groups 56 and 57 present-----	196, 202, 203, 208, 213, 225, 224, 228
7-----	Group 57 present, midrib smooth, 56 absent.	209, 217, 218, 221, 227
8-----	Group 57 present, midrib slightly hairy, 56 absent.	210, 213a, 214, 215, 220, 223
Miscellaneous noble cane Nos.:		
1-----	Culms hairy-----	307, 316
2-----	Ligule tall (6 mm.), group 61 prominent.	260, 262, 345
3-----	Ligule tall, group 61 short-----	302, 308, 332
4-----	Ligule narrow, group 61 prominent-----	249, 340
5-----	Ligule narrow, groups 57 and 56 prominent.	318, 341
6-----	Ligule narrow, group 57 prominent, 56 sparse or absent.	231, 237, 237a, 238, 241, 251, 255, 258, 259, 264, 278, 290, 301, 315, 323
7-----	Ligule narrow, group 57 sparse-----	236, 244, 245, 312, 336, 339
8-----	Ligule narrow, group 57 absent-----	232, 314, 337, 339
9-----	Ligule medium, groups 61 and 56 prominent.	246, 298, 328
10-----	Ligule medium, group 61 prominent, 56 sparse.	273
11-----	Group 61 prominent, 56 absent-----	254, 296, 330
12-----	Group 61 short, 56 prominent-----	248, 253, 348
13-----	Buds rhomboid, midrib smooth-----	235, 239, 250, 270, 306, 322, 327, 334, 349
14-----	Buds rhomboid, midrib slightly hairy, culms striped.	263a, 269, 272, 285, 287, 317
15-----	Buds rhomboid, midrib slightly hairy, culms not striped.	240, 243, 245a, 266, 277, 286, 305, 319, 320, 338

See footnotes at end of table.

TABLE 4.—*Diagnostic characters used for grouping of the (1) New Guinea, (2) New Caledonian, (3) Hawaiian, and (4) miscellaneous noble canes, and accession number of clones associated with each taxonomic group. Group characters are distinct for each of the four major groups of canes—Continued*

Taxonomic group No.	Diagnostic characters	Accession No.
Miscellaneous noble cane Nos.—Con.		
16-----	Buds ovate, hairy, group 65 present...	252, 256, 268, 271, 291, 304, 325, 342
17-----	Buds ovate and hairy, group 65 absent...	242, 247, 257, 297, 300, 313, 347
18-----	Buds slightly hairy, group 65 present...	280, 281, 329
19-----	Buds slightly hairy, group 65 absent, sheath hairy, midrib hairy.	275, 293, 294
20-----	Buds slightly hairy, group 65 absent, midrib smooth, sheath hairy.	247, 289, 300, 321, 324, 346
21-----	Sheath slightly hairy or smooth, midrib slightly hairy.	343
22-----	Sheath slightly hairy or smooth, midrib smooth, bloom heavy.	274, 288, 299, 311, 326, 344, 350
23-----	Sheath slightly hairy or smooth, midrib smooth, bloom light.	267, 276, 309, 335

¹ In N. G. group Nos. 1 to 19, the midrib is hairy or slightly hairy, i. e., group 63 present; in N. G. group Nos. 20 to 37, the midrib is smooth, i. e., group 63 absent.

² Occasionally a clone is placed in two taxonomic groups when diagnostic character is weakly developed or sporadic in appearance.

DESCRIPTIONS AND TAXONOMIC KEYS OF THE CLONES^{15 16}

A summary characterization of each group of clones may be useful in showing homogeneity or diversity. Of the groups of noble canes, the Hawaiians are most homogeneous and the "miscellaneous nobles" the most diversified in regard to the characters employed in the description and classification of the clones (see table 3). All groups have representatives of canes with hairy culms.

HAWAIIAN GROUP.—Most outstanding character for the group is the long sloping transitional auricle. The auricles are heavily fringed, with the fringe sometimes descending beyond the insertion point of the auricle; the inner auricle has, in addition, a small calcarate hook. The ligules are narrow or medium tall and inconspicuously fringed

¹⁵ This section prepared by Ernst Artschwager; clonal descriptions checked by E. W. Brandes.

¹⁶ Footnotes to table 2 (p. 76) explain symbols used in describing hair groups and bud pubescence characters.

(group 61). Culms only slightly waxy; bud furrows as a rule prominent; flesh soft and of an orange hue. The buds are usually large and hairy with group 24 diagnostic of the Hawaiian originals. Leaf sheath and upper sheath margin may be smooth or hairy. The midrib is smooth, sparsely pubescent, or hairy. Dewlaps ascending ligulate and sparsely pubescent. Stem-epidermal pattern No. 2 prevalent.

NEW CALEDONIAN GROUP.—This group is sharply subdivided into clones with a prominent ligular fringe (group 61) and clones with an inconspicuous group 61; the ligule itself is tall or medium tall—rarely narrow. The culms are slightly waxy and half of them have a prominent bud furrow. Root bands are more or less narrow and rows of root primordia few. The leaf sheaths are usually hairy, but the fringe on the upper sheath margin (group 56) is seldom present. Bud pubescence is often prominent and dewlap hairs (52 and 58) often dense and semilong. The midrib, behind the ligule, is slightly or prominently hairy on one-half of the clones.

NEW GUINEA GROUP.—In contrast to the Hawaiian and New Caledonian canes, the New Guinea group contains a large number of clones with prominent lanceolate auricles. One-half of the clones have prominent bud furrows and hairy buds. Among the latter is a subgroup with secondary wing development of the prophyll. Although only one-third of the clones have smooth sheaths, prominent sheath pubescence is found in 23 percent of the clones. In about 60 percent of the clones the midrib is smooth. Prominent midrib pubescence is rare, and a prominent ligular fringe (group 61) is limited to 9.0 percent of the clones. The upper sheath margin is fringed in one-third of the clones but the fringe is prominent in only 5.8 percent of the canes in this group.

MISCELLANEOUS NOBLES.—This group is as diversified as the one above. The two groups resemble each other in regard to prominence of bud furrow, hairiness of buds, prominence of group 56, and smoothness of midrib. Only 6 percent of the clones have smooth sheaths and less than 5 percent have a prominent midrib pubescence. The auricles are often of the transitional type, with the prominent lanceolate type restricted to 11 percent of the clones. The culms of at least one-half of the clones are covered with a heavy bloom. One large section of the group to which the Preanger canes belong is characterized by a squat rhomboid or pentagonal bud. The miscellaneous nobles are forms belonging to all the above groups and were picked up from any available source, mostly from other collections gathered indiscriminately in the past 50 to 100 years by sugar experiment stations. In general they represent selections in a continuation of the screening process in various countries, and therefore many of them are superior to the forms of other groups.

DESCRIPTIONS OF THE CLONES

NEW GUINEA GROUP

CLONE 28 N. G. X

IMP. 707,¹⁷ ACC. 1¹⁸

CULMS.—Red becoming light brown, with narrow wax bands, sparse bloom, and prominent corky cracks; internodes slightly tumescent, 8 cm. long and 25 mm. across, bud furrow poorly defined or wanting, flesh white and hard; stem-epidermal pattern 2+3, average width of long cells 9.6μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindric-obconoidal, 8 and 6 mm. high with 3 rows of crowded primordia; buds red, 10×8 mm., inserted at scar and extending up to growth ring; prophyll ovate with prominent basal appendage and truncate-notched tip, wing inserted near middle of prophyll, medium broad, pubescence sparse, with groups 11, 16, 19, and a divided 10 indicated.

LEAVES.—Sheaths 30 cm. long with narrow group 57; blades 138 cm. long and 4.9 cm. broad, module 28; dewlaps squarish deltoid, outer surface with sparse group 58, inner surface with medium groups 51 and 52, small midrib group 63; outer auricle transitional and occasionally subtended by a very short group 56, inner auricle short lanceolate; ligule shallow crescent, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red cane with slightly hairy ovate buds; 3 rows of crowded root primordia; diagnostic hair groups 56+-- , 57+-- , 63+-- ; squarish-deltoid dewlaps (fig. 38 (1)); shallow crescent ligule; short lanceolate inner auricle.

CLONE 28 N. G. 1

IMP. 626, ACC. 2

CULMS.—Dark purplish red, with heavy bloom and merging wax bands; internodes cylindric, constricted below scar, 9 cm. long and 35×37 mm. across, bud furrow absent, flesh white, soft; stem-epidermal pattern 1+3+4, average width of long cells 9.2μ , stomates not observed; growth rings greenish red, narrow, flush or slightly tumescent; root bands ivory but later red, cylindric obconoidal, 12 and 9 mm. high with 4 rows of crowded primordia; buds red, 9×9 mm., inserted at scar and not exceeding growth ring; prophyll round and swollen at base, broad basal appendage and crescent tip, wing very small, inserted near apex of prophyll, pubescence sparse, principal hair groups 1, 16, 19.

LEAVES.—Leaf sheaths 37 cm. long, purplish with heavy bloom, smooth; sheath base prominently decurrent and appendaged; blades

¹⁷ Importation No. (Imp.) assigned by Sugar Crops Section. This number, as well as the clone designation, is used to identify parts in figures 20 to 36, pp. 263 to 279.

¹⁸ The Accession No. (Acc.) was assigned to the clones for practical reasons only; it has no taxonomic significance. This number is used in identifying parts in figures 37 to 61, pp. 280 to 304.

137 cm. long and 4.7 cm. broad, module 29; dewlaps squarish crescent, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle transitional and subtended by a short group 56, inner auricle small calcarate; ligule narrow-flanged flat crescent, 3 mm. high, group 61 very short, dorsal pubescence wanting.

DISTINGUISHING CHARACTERS.—Dark purplish-red cane with tall root bands and 4 or more rows of primordia; round swollen buds with sparse pubescence; sheath base with prominent appendage; diagnostic hair group 56+--; calcarate inner auricle; medium-narrow flat-crescent ligule; squarish-crescent dewlap.

CLONE 28 N. G. 2

IMP. 627, ACC. 3

CULMS.—Yellowish green, with rosy blush, constricted wax bands, sparse bloom, and corky cracks; internodes cylindric and shouldered, 10 cm. long and 26 mm. across, without bud furrow, flesh white, soft; stem-epidermal pattern 2+3, average width of long cells 10μ , stomates present; growth rings greenish red, narrow, tumescent; root bands greenish red, 8 and 7 mm. high with 4 rows of crowded primordia; buds green with narrow reddish wings, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, narrow and not fringed, anterior pubescence sparse, posterior general, outstanding hair groups 10, 11, 16, 19.

LEAVES.—Leaf sheath 32 cm. long with heavy bloom and narrow group 57; blades 138 cm. long and 3.5 cm. broad, module 39; dewlaps flaring deltoid, outer surface with sparse group 58, inner surface with medium-prominent group 51 and sparse group 52; outer auricle broad transitional, inner auricle short lanceolate and fringed nearly to tip; ligule shallow crescentiform, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Thin yellowish-green cane with sparse bloom and corky cracks; buds with narrow wings and general posterior pubescence; root bands with 4 rows of crowded primordia; diagnostic hair group 57+--; tall flaring-deltoid dewlaps; very narrow ligule; lanceolate inner auricle.

CLONE 28 N. G. 3

IMP. 520, ACC. 4

CULMS.—Red, becoming brownish or yellowish red, with medium bloom, corky cracks, and narrow constricted wax bands; internodes cylindric, 11 cm. long and 36 mm. across, shallow, prominent bud furrow, flesh white, medium soft; stem-epidermal pattern 2+3, average width of long cells 10.6μ , stomates not observed; growth ring red, narrow, tumescent; root band red, cylindric, 7 and 5 mm. high with 3 to 5 irregular rows of primordia; buds reddish, 13×10 mm., inserted at scar and extending above growth ring; prophyll broad deltoid with round-pointed tip, wing with unilateral secondary wing inserted below middle of prophyll, buds very hairy.

LEAVES.—Sheath 31 cm. long with heavy bloom and narrow to medium group 57 and group 60; blades 158 cm. long and 5.6 cm. broad, module 28; dewlaps flaring deltoid crescent, outer surface with sparse group 58, inner surface with broad group 51 with a few hairs extending single file toward midrib, dense group 52 and sparse 63; outer auricle deltoid, subtended by a very short 56, inner auricle long lanceolate and fringed in lower part; ligule broad-centered crescent, 4.5 mm. high, group 61 short, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Soft red cane with narrow root bands; small hairy buds with unilateral secondary wing; diagnostic hair groups 52+, 56+- -, 57+-, 63+- -, 65+- -; flaring deltoid-crescent dewlaps (fig. 38(4)); broad-centered crescent ligule; long lanceolate inner auricle.

CLONE 28 N. G. 4

IMP. 628, ACC. 5

CULMS.—Yellowish green, faint reddish blush, with sparse bloom, corky cracks, and merging wax bands; internodes cylindrical and shouldered, 12 cm. long and 26 mm. across, without or with small bud furrow, flesh white, soft; stem-epidermal pattern 2+3, average width of long cells 9.7μ , stomates not observed; growth rings red olive, narrow, flush or tumescent; root bands reddish, obconoidal on side opposite bud, 8 and 6 mm. high with 4 to 6 rows of small crowded primordia; buds greenish rose, 13×11 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, small secondary wings, pubescence general and prominent especially on posterior side.

LEAVES.—Leaf sheaths 30 cm. long with heavy bloom, smooth or with narrow group 57; blades 146 cm. long and 4.4 cm. broad, module 33; dewlaps squarish deltoid or squarish, outer surface with sparse group 58, inner surface with medium groups 51 and 52, occasionally small group 63; outer auricle broad transitional or small deltoid, subtended by a short group 56, inner auricle medium-long lanceolate and fringed to tip; ligule shallow crescent, 2 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Soft, thin cane, with medium-tall root bands and 4 to 6 rows of primordia; hairy buds with small secondary wings; diagnostic hair groups 56+- -, 57+- -, 63+- -; squarish-deltoid or squarish dewlaps (fig. 38 (5)); lanceolate inner auricle; shallow ligule.

CLONE 28 N. G. 5

IMP. 629, ACC. 6

CULMS.—Greenish-yellow cane becoming olive purple on maturing, sparse bloom, corky cracks, constricted merging wax bands; internodes cylindrical and shouldered, 11 cm. long and 29 mm. across, without or with small bud furrow, flesh white, soft; stem-epidermal pattern 2, average width of long cells 9μ , stomates present; growth rings green, medium broad, flush or tumescent; root bands greenish red, cylindrical but obconoidal on side opposite bud, 10 and 8 mm. high with 3 or 4

rows of primordia; buds reddish green, plump, 12×9 mm., inserted at scar and reaching growth ring; prophyll ovate deltoid with round-pointed tip, wing inserted at or below middle of prophyll, narrow, pubescence of anterior side general but sparse, on posterior side prominent.

LEAVES.—Leaf sheaths 31 cm. long with heavy bloom and more or less prominent group 57; blades 148 cm. long and 4.4 cm. broad, module 34; dewlaps flaring deltoid, outer surface with medium group 58, inner surface with medium groups 51 and 52, small 63; outer auricle broad transitional and subtended by a very short group 56, inner auricle long lanceolate and fringed nearly to tip; ligule shallow crescentiform, 2.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Soft cane, with plump ovate-deltoid buds prominently hairy on posterior side; diagnostic hair groups $56 + - -$, $57 + .$, $63 + - -$; flaring deltoid dewlaps; long lanceolate inner auricles; shallow crescent ligules.

CLONE 28 N. G. 6

IMP. 630, ACC. 7

CULMS.—Red with sparse bloom, corky cracks, and constricted merging wax bands; internodes cylindric and shouldered, 12 cm. long and 27 mm. across, small or medium bud furrow, soft, white flesh; stem-epidermal pattern $2 + 3$, average width of long cells 9.5μ , stomates not observed; growth rings red, narrow, tumescent; root bands red, cylindric, obconoidal on side opposite bud, 8 and 7 mm. high with 4 rows of small crowded primordia; buds greenish rose, 12×8 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, narrow, small secondary wing may be present, pubescence on anterior side sparse, posterior side prominent.

LEAVES.—Leaf sheaths 30 cm. long with heavy bloom and medium-narrow group 57; blades 128 cm. long and 4.4 cm. broad, module 32; dewlaps deltoid crescent, outer surface with medium group 58 and small marginal group 58a, inner surface with small group 51, medium group 52 and inconspicuous group 63; outer auricle small deltoid and subtended by a very short 56, inner auricle long lanceolate and fringed to tip; ligule shallow crescentiform, 2 mm. high, group 61 very short, dorsal pubescence wanting.

DISTINGUISHING CHARACTERS.—Soft cane, with ovate-deltoid buds prominently hairy on posterior side; 4 rows of small crowded primordia; diagnostic hair groups $56 + - - -$, $57 + .$, $63 + - - -$; deltoid-crescent dewlaps (fig. 38 (7)); narrow ligule; lanceolate inner auricle. This variety is very similar to 28 N. G. 5.

CLONE 28 N. G. 11

IMP. 863, ACC. 8

CULMS.—Reddish brown with sparse bloom, corky cracks, broad merging wax bands; internodes cylindric, 10 cm. long and 32 mm. across, without or with small bud furrow, soft white flesh; stem-

epidermal pattern 3, average width of long cells 9.7μ , stomates not observed; growth rings red, medium high, flush or depressed; root bands red, tumescent, 10 and 8 mm. high with 4 or 5 rows of primordia; buds red, 11×9 mm., inserted at scar and extending above growth ring; prophyll oval with round-pointed tip, wing inserted at or above middle of prophyll, medium broad and very hairy, pubescence of sides very sparse or absent.

LEAVES.—Sheath 26 cm. long with medium bloom, medium group 57 and small group 60; sheath base with prominent groups 59 and 69; blades 143 cm. long and 5 cm. broad, module 29; dewlaps squarish deltoid, outer surface with medium-sparse group 58 and prominent group 58a, inner surface with prominent group 51 and sparse group 52; outer auricle transitional or small deltoid, inner auricle short lanceolate and smooth; ligule shallow subarcuate 2.5 mm. high, group 61 medium long in flange zone, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Tall root bands with 4 or 5 rows of primordia; buds with hairy wings and smooth sides; diagnostic hair groups $57+$, $58a+$, $59+$, $60+$ -, $69+$; squarish-deltoid dewlaps (fig. 38 (8)); narrow subarcuate ligule; lanceolate inner auricle.

CLONE 28 N. G. 12

IMP. 523, ACC. 9

CULMS.—Reddish purple, with sparse bloom, inconspicuous corky cracks, and heavy wax bands; internodes cylindrical and shouldered, 12 cm. long and 32 mm. across, without bud furrow, hard grayish flesh; stem-epidermal pattern $1+3$, average width of long cells 9.5μ , stomates not observed; growth ring greenish red, narrow, tumescent; root bands cylindric, constricted on side opposite bud, 9 and 7 mm. high with 3 to 5 rows of crowded primordia; buds reddish, 13×10 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, emarginate with small secondary wings inserted high, general pubescence sparse, most prominent hair groups 1, 2, and 11.

LEAVES.—Sheaths 30 cm. long with heavy bloom and narrow group 57; blades 150 cm. long and 7 cm. broad, module 21; dewlaps ascending ligulate, outer surface with medium group 58 and prominent group 58a, inner surface with medium groups 51 and 52; outer auricle transitional and subtended by a short 56, inner auricle short lanceolate and not fringed; ligule crescentiform 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Reddish-purple cane with broad leaves; 3 to 5 rows of primordia; buds with basal but otherwise sparse pubescence; diagnostic hair groups $56+--$, $57+-$, $58a+$; ascending ligulate dewlaps; short lanceolate inner auricle; medium-tall crescent ligule.

CLONE 28 N. G. 13

IMP. 632, ACC. 10

CULMS.—Red with sparse bloom, corky cracks, and prominent wax bands; internodes slightly bobbin-shaped, 12 cm. long and 23×25 mm. across, medium or small bud furrow, soft brownish flesh; stem-

epidermal pattern 1+3, average width of long cells 10.6μ , stomates not observed; growth rings red, narrow, flush or slightly tumescent; root bands 9 and 8 mm. high, red, tumescent with 3 or 4 rows of primordia; buds red, 12×9 mm., inserted below scar and reaching growth ring; prophyll ovate with sharp-pointed tip, wing inserted below middle of prophyll, narrow, emarginate or lobed, pubescence sparse, hair group 11 most prominent.

LEAVES.—Sheath 31 cm. long, purplish red with heavy bloom, smooth; sheath base decurrent; blades with purple cast, 150 cm. long and 4.6 cm. broad, module 33; dewlaps ascending flaring ligulate, outer surface with sparse group 58, inner surface with sparse group 51 and medium group 52; both auricles transitional, outer one subtended by a short group 56; ligule crescent deltoid, 7 mm. high, group 61 short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Leaves purplish; diagnostic hair group 56+ - -; ascending flaring-ligulate dewlaps (fig. 38 (10)); transitional auricles; very tall deltoid-crescent ligule; buds with sparse pubescence.

CLONE 28 N. G. 14

IMP. 524, ACC. 11

CULMS.—Olive green, with yellow stripes, sparse bloom, and medium wax bands; internodes cylindrical or slightly obconoidal and shouldered, 12 cm. long and 33 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 1+4, average width of long cells 10.3μ , stomates absent; growth rings ivory, narrow, flush or tumescent; root bands slightly conoidal, 9 and 6 mm. high with 3 rows of primordia; buds reddish, 17×10 mm., inserted below scar and extending above growth ring; prophyll long deltoid with narrow truncate slightly notched tip, wing inserted below middle of prophyll, medium wide, pubescence general and sparse, most prominent hair groups 10 and 9.

LEAVES.—Sheath 30 cm. long with sparse bloom and narrow group 57; blades 127 cm. long and 5.7 cm. broad, module 22; dewlaps ascending flaring ligulate, outer surface with medium group 58 and small group 58a, inner surface with medium group 51 and dense group 52, occasionally inconspicuous group 52a; outer auricle broad transitional and subtended by a very short 56, inner auricle short lanceolate or calcarate and fringed to tip; ligule narrow orbicular crescent, 2.5 mm. high, group 61 very short, dorsal pubescence very sparse.

DISTINGUISHING CHARACTERS.—Large deltoid buds with prominent group 9; diagnostic hair groups 52+, 56+ - - -; 57+ -; ascending flaring-ligulate dewlaps (fig. 38 (11)); short lanceolate or calcarate inner auricle; narrow ligule.

CLONE 28 N. G. 15

IMP. 525, ACC. 12

CULMS.—Yellowish green, without bloom but prominent wax bands; internodes slightly obconoidal and shouldered, 13 cm. long and 29 mm. across, medium or prominent bud furrow, white soft flesh; stem-epidermal pattern 1+3+5, average width of long cells 11μ ,

stomates absent; growth rings ivory green, narrow, flush; root bands ivory green, conoidal, 10 and 9 mm. high with 3 rows of primordia; buds reddish, 16×10 mm., inserted at scar and extending above growth ring; prophyll long deltoid with truncate tip, wing inserted below middle of prophyll, slightly emarginate and confluent with sides, pubescence sparse, most prominent hair groups 9 and 10.

LEAVES.—Sheath 30 cm. long with heavy bloom and narrow group 57; blades 121 cm. long and 5.7 cm. broad, module 21; dewlaps ascending ligulate, outer surface with medium-dense group 58 and prominent group 58a, inner surface with medium group 51 and sparse group 52; outer auricle transitional and subtended by a short group 56, inner auricle small falcate and fringed to tip; ligule subarcuate, 3 mm. high, group 61 short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Large deltoid buds with prominent group 9; diagnostic hair groups $56 + -$, $57 + -$, $58 +$, $58a +$; ascending ligulate dewlaps (fig. 38 (12)); falcate inner auricle; narrow ligule. This variety is very similar to 28 N. G. 14.

CLONE 28 N. G. 17

IMP. 526, ACC. 14

CULMS.—Red, with sparse bloom, corky cracks, and broad merging wax bands; internodes cylindric, 10 cm. long and 27 mm. across, small bud furrow, soft greenish flesh; stem-epidermal pattern $1 + 3$, average width of long cells 9.2μ , stomates few; growth rings red, medium broad, tumescent; root bands red, cylindric, 7 and 6 mm. high with 2 rows of large, sparse primordia; buds red, 12×9 mm., inserted at scar and extending above growth ring; prophyll long ovate with somewhat pointed tip, wing inserted below middle of prophyll, narrow, most prominent hair groups 10 and 11.

LEAVES.—Sheaths 35 cm. long and smooth; blades 130 cm. long and 5 cm. broad, module 26; dewlaps shallow deltoid crescent, outer surface with medium sparse group 58, inner surface with prominent group 51 and sparse group 52; outer auricle transitional, inner auricle small calcarate and fringed; ligule strap-shaped or shallow broad-centered crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Thin red cane with 2 rows of sparse primordia; buds with prominent groups 10 and 11; shallow deltoid-crescent dewlaps (fig. 38 (14)); small calcarate and fringed inner auricle; tall ligule.

CLONE 28 N. G. 18

IMP. 483, ACC. 14A

CULMS.—Red and green striped, with sparse bloom and broad wax bands; internodes obconoidal and shouldered, 12 cm. long and 28×30 mm. across, prominent bud furrow, flesh greenish, hard; stem-epidermal pattern $1 + 3 + 4$, average width of long cells 8.3μ , stomates absent; growth rings striped, medium broad, flush; root bands striped, slightly conoidal, constricted on side opposite bud, 7 and 6 mm. high with 2 or 3 rows of primordia; buds reddish, 12×10 mm., inserted

at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, medium broad, smooth, pubescence medium sparse but with prominent hair groups 1, 2, 10, 11.

LEAVES.—Sheaths 33 cm. long and smooth; sheath base slightly decurrent; blades 160 cm. long and 7.7 cm. broad, module 21; dewlaps narrow squarish or shallow deltoid, outer surface with medium group 58, inner surface with small group 51 and medium-dense group 52; outer auricle transitional, inner auricle small calcarate or transitional; ligule broad-centered crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with medium-large buds having prominent groups 10 and 11; narrow root bands with 2 or 2 or 3 rows of primordia; inner auricle transitional or small calcarate; narrow squarish or shallow deltoid dewlaps (fig. 38 (14a)); broad-centered crescent ligule.

CLONE 28 N. G. 20

IMP. 475, ACC. 15

CULMS.—Light brown becoming olive, with sparse bloom and heavy wax bands; internodes cylindrical and shouldered, 10 cm. long and 27×29 mm. across, prominent bud furrow, soft gray flesh; stem-epidermal pattern 1+3, average width of long cells 10.4μ , stomates absent; growth rings olive, narrow, tumescent; root bands reddish, conoidal obconoidal, 8 and 7 mm. high with 2 rows of sparse primordia; buds reddish, 16×9 mm., inserted at scar and extending above growth ring; prophyll long ovate deltoid with somewhat pointed tip, wing inserted below middle of prophyll, medium wide, pubescence general and prominent, especially on posterior side, hair groups 10 and 11 conspicuous.

LEAVES.—Sheaths 34 cm. long and smooth; blades 132 cm. long and 4.8 cm. broad, module 27; dewlaps shallow deltoid ligulate, outer surface with medium group 58, inner surface with medium group 51 and sparse group 52; both auricles broad transitional, or sometimes small deltoid and fringed; ligule broad-centered crescent, 4.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Light-brown cane with very large deltoid, hairy buds; 2 rows of sparse primordia; shallow deltoid-ligulate dewlaps (fig. 38 (15)); small deltoid or transitional auricles; tall crescent ligule.

CLONE 28 N. G. 21

IMP. 527, ACC. 16

CULMS.—Yellowish green with sparse bloom, merging wax bands, and corky cracks; internodes cylindrical, 14 cm. long and 26 mm. across, medium bud furrow, soft gray flesh; stem-epidermal pattern 2+3, average width of long cells 9.6μ , stomates absent; growth rings olive, narrow, flush; root bands ivory green, slightly conoidal, 7 mm. high with 4 rows of small, crowded primordia; buds green with olive wing, 11×8 mm., inserted at scar and reaching growth ring; prophyll oval

with broad basal appendage and pointed tip, wing inserted at or above middle of prophyll, wing medium, narrow at tip, pubescence in general sparse, somewhat prominent at base and tip.

LEAVES.—Sheaths 30 cm. long with heavy bloom and narrow group 57; blades 140 cm. long and 5 cm. broad, module 29; dewlaps ascending squarish, outer surface with medium group 58, inner surface with small group 51 and dense group 52; outer auricle broad transitional, with short group 56, inner auricle medium-long lanceolate; ligule shallow crescent, 2 mm. high; group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Soft yellowish-green cane with medium-large slightly hairy buds, 4 rows of primordia; diagnostic hair groups 52+, 56+ --, 57+ -; ascending squarish dewlaps (fig. 38 (16)); lanceolate inner auricle; narrow ligule.

CLONE 28 N. G. 22

IMP. 633, ACC. 17

CULMS.—Yellow to olive without bloom, medium wax bands; internodes cylindrical, 11 cm. long and 21×24 mm. across, prominent bud furrow, hard grayish flesh; stem-epidermal pattern 1+3+4, average width of long cells 8.7 μ , stomates absent; growth rings green, narrow, tumescent; root bands reddish green, slightly tumescent, 9 and 8 mm. high with 4 or 5 rows of primordia; buds green with olive wings, 12×8 mm., inserted at scar and reaching growth ring; prophyll ovate-deltoid with pointed tip, wing inserted below middle of prophyll, emarginate at base, pubescence general especially on posterior side but not prominent, somewhat prominent at base and juncture.

LEAVES.—Sheaths 30 cm. long with medium group 57; sheath bases slightly decurrent, those of crown leaves with prominent 59 and 69; blades 137 cm. long and 4 cm. broad, module 34; dewlaps shallow deltoid or ligulate, outer surface with sparse group 58, inner surface with medium group 51 which extends as group 65 toward midrib, medium-prominent group 52 and sparse groups 55 and 63; outer auricle ascending transitional, inner auricle long lanceolate; ligule medium broad-centered and narrow-flanged crescent, 3.5 mm. high, group 61 short, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Thin yellow cane with deltoid somewhat hairy buds, emarginate wings; 4 or 5 rows of root primordia; diagnostic hair groups 55+ --, 55a+ --, 57+ ., 59+, 63+ ---, 65+, 69+; shallow deltoid or ligulate dewlaps (fig. 39 (17)); long lanceolate inner auricle; narrow crescent ligule with lozenge.

CLONE 28 N. G. 23

IMP. 528, ACC. 18

CULMS.—Bronze green with medium bloom, corky cracks, and narrow constricted wax bands; internodes cylindrical, 13 cm. long and 27×28 mm. across, broad, shallow bud furrow, soft greenish flesh; stem-epidermal pattern 2+3, average width of long cells 9.7 μ , stomates present; growth rings olive, narrow, flush or slightly tumescent; root bands ivory, cylindrical obconoidal, 8 and 7 mm. high with

4 or 5 rows of very small reddish, crowded primordia; buds greenish with red-olive wings, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium wide, pubescence general and more or less prominent, entire posterior side hairy.

LEAVES.—Sheaths 33 cm. long with narrow group 57; blades 160 cm. long and 4.6 cm. broad, module 35; dewlaps slightly flaring squarish deltoid, outer surface with medium-sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle transitional and subtended by a short group 56, inner auricle long lanceolate and fringed to tip; ligule shallow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Medium-thick bronze-colored cane, with somewhat hairy buds and 4 or 5 rows of root primordia; diagnostic hair groups $56+ - -$, $57+ -$; slightly flaring squarish-deltoid dewlaps (fig. 39 (18)); lanceolate inner auricle; narrow ligule.

CLONE 28 N. G. 24

IMP. 634, ACC. 19

CULMS.—Olive green with sparse bloom, prominent wax bands, and corky cracks; internodes cylindric, 14 cm. long and 29 mm. across, without bud furrow, soft greenish flesh; stem-epidermal pattern 2, average width of long cells 8.3μ , stomates absent; growth rings olive, narrow, flush; root bands ivory green, cylindric, 9 and 8 mm. high with 4 or 5 rows of small primordia; buds green with reddish wing, 12×10 mm., inserted at scar and extending to growth ring; prophyll round ovate or deltoid with round-pointed tip, wing inserted at or below middle of prophyll, medium wide to narrow, pubescence of posterior side general but somewhat sparse, anterior side with medium prominent groups 10, 16.

LEAVES.—Sheaths 34 cm. long with heavy bloom and medium groups 57 and 60; blades 142 cm. long and 4.5 cm. broad, module 31; dewlaps ascending squarish deltoid, outer surface with medium group 58, inner surface with small group 51, sparse semilong group 52 near midrib, and small group 63; outer auricle ascending transitional and subtended by a very short 56, inner auricle long lanceolate and partly fringed; ligule shallow crescent, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Slender olive-green cane with round-ovate buds with general pubescence on posterior side; 4 or 5 rows of small root primordia; diagnostic hair groups $56+ - - -$, $57+ .$, $60+ -$, $63+ - -$; ascending squarish-deltoid dewlaps (fig. 39 (19)); lanceolate inner auricle; narrow ligule.

CLONE 28 N. G. 25

IMP. 529, ACC. 20

CULMS.—Olive with red blush, sparse bloom, corky cracks, and prominent wax bands; internodes cylindric, slightly concave-convex, 12 cm. long and 27 mm. across, small bud furrow, soft greenish flesh

slightly pithy in center; stem-epidermal pattern 2+3, average width of long cells 9.6μ , stomates absent; growth rings olive, medium broad, flush; root bands greenish red, cylindric, 9 and 7 mm. high with 4 or 5 rows of crowded primordia; buds green with reddish wing, 12×9 mm., inserted at scar and reaching growth ring; prophyll broad ovate with round-pointed slightly notched tip, wing inserted below middle of prophyll, slightly emarginate, posterior side hairy, anterior with medium prominent groups 1, 2, 16, 11, 17.

LEAVES.—Sheaths 33 cm. long with medium groups 57 and 60; blades 133 cm. long and 4.5 cm. broad, module 29; dewlaps slightly ascending squarish deltoid, outer surface with dense group 58, inner surface with medium group 51, sparse semilong group 52 near midrib, and long-haired group 63 inserted high; outer auricle transitional and subtended by a short 56, inner auricle short lanceolate; ligule shallow crescent, 2 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Olive cane with red blush, long slightly concave-convex internodes, broad ovate buds with prominent pubescence on posterior side; tall root bands with 4 or 5 rows of small primordia; diagnostic hair groups 56+---, 57+., 58+, 60+-, 63+.; slightly ascending squarish-deltoid dewlaps (fig. 39 (20)); short lanceolate inner auricle; narrow ligule.

CLONE 28 N. G. 26

IMP. 530, ACC. 21

CULMS.—Red with sparse bloom, corky cracks, and narrow constricted wax bands; internodes cylindric, 12 cm. long and 21×22 mm. across, without or with medium prominent bud furrow, hard greenish flesh; stem-epidermal pattern 2+3, average width of long cells 9.2μ , stomates absent; growth rings greenish, narrow, tumescent; root bands reddish, cylindric, 8 and 7 mm. high with 4 rows of crowded primordia; buds green, later reddish, 12×8 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium wide, small secondary wings may be present, posterior side of bud hairy, anterior side with prominent group 6.

LEAVES.—Sheaths 28 cm. long with narrow group 57; blades 121 cm. long and 4.7 cm. broad, module 28; dewlaps squarish deltoid, more or less subrescent, outer surface with sparse group 58 and marginal group 58a, inner surface with medium group 51, sparse group 52; outer auricle broad-transitional, subtended by a very short group 56, inner auricle short lanceolate and fringed to tip; ligule shallow crescent, 2.5 mm. high; group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Thin red cane, with ovate buds hairy on posterior side, 4 rows of crowded root primordia; diagnostic hair groups 56+---, 57+-; squarish-deltoid, more or less subrescent dewlaps (fig. 39 (21)); short lanceolate inner auricle; narrow ligule.

CLONE 28 N. G. 27**IMP. 635, ACC. 22**

CULMS.—Dark red with sparse bloom, corky cracks, and prominent wax bands; internodes somewhat obconoidal and shouldered, 10 cm. long and 31×34 mm. across, without bud furrow, soft grayish-green flesh; stem-epidermal pattern 2+3, average width of long cells 11 μ , stomates absent; growth rings reddish green, medium broad or narrow, tumescent; root bands red, conoidal, 10 and 8 mm. high with 4 rows of crowded primordia; buds reddish, 12×10 mm., inserted at scar and reaching growth ring; prophyll broad ovate with round-pointed tip, wing inserted below middle of prophyll, emarginate, pubescence very sparse.

LEAVES.—Sheaths 31 cm. long with narrow group 57; blades 150 cm. long and 6 cm. broad, module 25; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with broad group 51 that extends as group 65 single file toward midrib, sparse group 52; outer auricle broad transitional, inner auricle short or long lanceolate and basally fringed; ligule orbicular crescent, 4 mm. high, group 61 short, dorsal pubescence as 65a and terminal flange zone.

DISTINGUISHING CHARACTERS.—Red soft cane with smooth buds; 4 rows of crowded root primordia; diagnostic hair groups 57+—, 65+—, 65a+—; ascending-ligulate dewlaps; lanceolate inner auricles; tall orbicular-crescent ligule.

CLONE 28 N. G. 30**IMP. 636, ACC. 23**

CULMS.—Dark red, faintly striped with lighter red when young, with sparse bloom and prominent wax bands; internodes thick and short cylindrical, 6.5 cm. long and 34 mm. across, small bud furrow, soft gray flesh; stem-epidermal pattern 1+3+5, average width of long cells 7.7 μ , stomates absent; growth rings red, narrow, tumescent; root bands red, cylindrical-conoidal, 7 and 5 mm. high with 2 or 3 rows of sparse primordia; buds red, 11×11 mm., inserted at scar and reaching growth ring; prophyll broad ovate with prominent basal appendage and pointed tip, wing inserted at middle of prophyll, emarginate, pubescence sparse, most prominent hair groups 1, 2, 11, 10, 22.

LEAVES.—Sheaths 35 cm. long with heavy bloom and broad short-haired group 57; blades 160 cm. long and 4.6 cm. broad, module 35; outer dewlap large ascending squarish, inner dewlap squarish sub-crescent, outer surface with medium group 58 and small group 58a, inner surface with medium group 51 and prominent semilong group 52; outer auricle transitional and subtended by a medium long 56, inner auricle short lanceolate and fringed to tip; ligule narrow-flanged subarcuate with lozenge, 4 mm. high; group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red cane with thick, short cylindrical internodes, broad ovate buds with sparse pubescence; narrow root bands with 2 or 3 rows of sparse primordia; diagnostic

hair groups 52+, 56+., 57+.; large ascending-squarish outer dewlap, squarish-subcrescent inner dewlap; lanceolate inner auricle; medium-tall subarcuate ligule with lozenge.

CLONE 28 N. G. 31

IMP. 637, ACC. 24

CULMS.—Bronze green with medium bloom and prominent wax bands; internodes somewhat bobbin-shaped, 9 cm. long and 33×34 mm. across, prominent bud furrow, soft grayish-green flesh; stem-epidermal pattern 1, average width of long cells 11 μ , stomates absent; growth rings reddish green, narrow, flush; root bands red, tumescent or conoidal, 7 and 5 mm. high with 3 rows of crowded primordia; buds reddish, 13×8 mm., inserted at scar and extending above growth ring; prophyll long ovate with medium basal appendage and somewhat pointed tip, wing inserted below middle of prophyll, medium broad, pubescence medium sparse, most prominent hair groups 1, 2, 10, 16, 19, and 3.

LEAVES.—Sheaths 37 cm. long with narrow group 57, blades 145 cm. long and 4.2 cm. broad, module 34; dewlaps ascending flaring ligulate, outer surface with medium group 58, inner surface with medium groups 51, 52, and 63; outer auricle sloping transitional, inner auricle short or medium-long lanceolate and fringed; ligule orbicular crescent, 4 mm. high; group 61 medium long, dorsal pubescence more or less prominent.

DISTINGUISHING CHARACTERS.—Thick short-jointed cane with large, slightly hairy buds, narrow root bands; diagnostic hair groups 57+ -, 61+., 63+.; ascending flaring-ligulate dewlaps (fig. 39 (24)); inner auricle medium-long lanceolate; tall orbicular-crescent ligule.

CLONE 28 N. G. 32

IMP. 463, ACC. 25

CULMS.—Dark red with heavy bloom and merging wax bands; internodes cylindrical, 9 cm. long and 41 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 4+3+5, average width of long cells 10 μ , stomates absent; growth ring red, medium broad, tumescent; root bands red, cylindrical, 9 and 6 mm. high with 1 to 3 rows of primordia; buds green with red wings 13×11, inserted at scar and extending above growth ring; prophyll short ovate or rhomboid, prominent basal appendage and notched tip, broad transparent wing inserted below middle of prophyll, pubescence sparse, most prominent hair groups 1, 16, 19, 11, and divided group 10.

LEAVES.—Sheaths 34 cm. long with heavy bloom and prominent short-haired group 57; blades 138 cm. long and 7.5 cm. broad, module 18.4; dewlaps ascending squarish deltoid, or squarish subcrescent, outer surface with medium group 58, inner surface with medium group 51 and dense group 52; outer auricle transitional and subtended by a short 56 in some of the leaves, inner auricle calcarate or short lanceolate and not fringed; ligule narrow-flanged crescent with lozenge, 4 mm. high, group 61 very short or absent, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red, thick cane with short ovate slightly hairy buds; 1 to 3 rows of large root primordia; diagnostic hair groups 52+, 56+ --, 57+; ascending squarish-deltoid or squarish-subcrescent dewlaps (fig. 39 (25)); short lanceolate or calcarate inner auricle; medium-tall crescent ligule with lozenge.

CLONE 28 N. G. 33

IMP. 535, ACC. 26

CULMS.—Red, with green or tan stripes, medium bloom, and prominent wax bands; internodes cylindrical, 9 cm. long and 46 mm. across, without bud furrow, medium-hard greenish flesh; stem-epidermal pattern 5+3, average width of long cells 9.6μ stomates present; growth rings striped, medium broad, tumescent; root bands striped, cylindrical obconoidal, 8 and 6 mm. high with 1 to 3 rows of sparse primordia; buds greenish red, 11×9 mm., inserted at scar and extending slightly above growth ring; prophyll broad ovate with prominent basal appendage and pointed slightly notched tip, wing inserted near middle of prophyll, broad and emarginate at base, buds with sparse pubescence, most prominent hair groups 1, 2, 11, 16, 10, and 22.

LEAVES.—Sheaths 33 cm. long with heavy bloom and prominent group 57; blades 134 cm. long and 5.6 cm. broad, module 24; dewlaps large ascending squarish, outer surface with sparse group 58, inner surface with medium group 51 and dense group 52; outer auricle sloping transitional, inner auricle short lanceolate and partly fringed; ligule narrow-flanged crescent with shallow lozenge, 3.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Red cane with green or tan stripes, with short ovate slightly hairy buds; 1 to 3 rows of sparse primordia; diagnostic hair groups 52+, 57+; large ascending-squarish dewlaps (fig. 39 (26)); short lanceolate inner auricle; medium-narrow ligule with shallow lozenge.

CLONE 28 N. G. 34

IMP. 536, ACC. 27

CULMS.—Red, with green or yellow stripes, sparse bloom, corky cracks, and prominent wax bands; internodes cylindrical, 9 cm. long and 34 mm. across, prominent bud furrow, orange flesh; stem-epidermal pattern 1, average width of long cells 11.6μ , stomates absent; growth rings striped, medium broad, flush or tumescent; root bands cylindrical, 8 and 7 mm. high with 3 rows of primordia; buds red, 14×12 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage inserted low and somewhat pointed tip, wing inserted near middle of prophyll, broad, pubescence very sparse.

LEAVES.—Sheaths 27 cm. long, striped with sparse bloom and narrow group 57; blades white-striped, 129 cm. long and 5.9 cm. broad, module 22; dewlaps ascending ligulate, outer surface with dense group 58, inner surface with medium group 51 that extends as group 65 sparingly single file toward midrib, medium group 52, small groups

52a and medium 63; outer auricle transitional, inner auricle long lanceolate and partly fringed; ligule subarcuate with shallow lozenge, 3 mm. high, group 61 medium short, dorsal pubescence as 65a.

DISTINGUISHING CHARACTERS.—Red cane with green or yellow stripes, with smooth buds; 3 rows of root primordia; diagnostic hair groups 57+ -, 58+, 63+., 65 + -, 65a + -; ascending-ligulate dewlaps (fig. 39 (27)); lanceolate inner auricle; subarcuate narrow ligule.

CLONE 28 N. G. 35

IMP. 482, ACC. 28

CULMS.—Brownish-red cane with medium bloom, prominent wax bands; internodes cylindric, 12 cm. long and 30×33 mm. across, prominent bud furrow, soft olive-brown flesh; stem-epidermal pattern 3, average width of long cells 12 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands reddish, cylindric or slightly conoidal, 8 mm. high with 3 or 4 rows of primordia; buds reddish olive, 11×7 mm., inserted at scar and reaching growth ring; prophyll ovate with apical appendage and pointed tip, wing inserted at or below middle of prophyll, narrow, fringed, pubescence medium to sparse, prominent hair groups 1, 2, 11, 16, 19, 10, 4.

LEAVES.—Sheaths 29 cm. long with narrow group 57; blades 133 cm. long and 4.5 cm. broad, module 29; dewlaps ascending squarish, outer surface with medium-dense group 58 and small group 58a, inner surface with medium group 51, marginal dense group 52; outer auricle broad transitional or small deltoid, inner auricle long lanceolate and basally fringed; ligule medium broad-flanged orbicular crescent, 4 mm. high; group 61 medium short, dorsal pubescence general and somewhat prominent.

DISTINGUISHING CHARACTERS.—Red cane with narrow-winged, slightly hairy buds with apical appendage, 3 or 4 rows of root primordia; diagnostic hair groups 51a+, 52+., 57+---; ascending-squarish dewlaps (fig. 39 (28)); long lanceolate inner auricle; medium broad-flanged orbicular-crescent ligule.

CLONE 28 N. G. 36

IMP. 476, ACC. 29

CULMS.—Yellowish green with sparse bloom and narrow wax bands; internodes cylindric, 8.5 cm. long and 40 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 2+3, average width of long cells 10 μ , stomates absent; growth rings greenish, narrow, flush; root bands ivory, cylindric, 7 mm. high with 2 or 3 rows of primordia; buds green with reddish wings, 18×13 mm., inserted at scar and extending above growth ring; prophyll long deltoid with small truncate tip, wing inserted very low, narrow, lobed at base, pubescence sparse, prominent groups 1, 16, 10.

LEAVES.—Sheaths 33 cm. long with heavy bloom and narrow group 57; blades 150 cm. long and 6 cm. broad, module 25; dewlaps squarish crescent, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51 that extends as group 65 single file toward midrib, medium group 52; outer auricle sloping transitional,

inner auricle very large and long lanceolate, fringed at base; ligule subarcuate, 3 mm. high, group 61 very short, dorsal pubescence as 55a, 65a, and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with large deltoid buds; 2 or 3 rows of root primordia; diagnostic hair groups 55a+—, 57+—, 65+., 65a+—; squarish-crescent dewlaps (fig. 39 (29)); large lanceolate inner auricle; narrow subarcuate ligule.

CLONE 28 N. G. 37

IMP. 638, ACC. 31

CULMS.—Olive green or greenish yellow, with sparse bloom and medium wax bands; internodes cylindric, 10 cm. long and 35 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+3+4, average width of long cells 9μ , stomates absent; growth rings greenish, narrow, flush or tumescent; root bands greenish, cylindric or slightly tumescent, 7 and 5 mm. high with 3 or 4 rows of primordia; buds green with olive wings, 17×10 mm., inserted at scar and extending above growth ring; prophyll long deltoid ovate with prominent basal and small fringed apical appendage, pubescence at base and tip, prominent hair groups 1, 2, 10, 19, 24.

LEAVES.—Sheaths 33 cm. long with heavy bloom and narrow group 57; blades 128 cm. long and 4.4 cm. broad, module 29; dewlaps ascending deltoid squarish, outer surface with medium group 58, inner surface with prominent group 51, dense group 52, and medium-sparse groups 52a and 63; outer auricle transitional, inner auricle medium long lanceolate and basally fringed; ligule broad-flanged and broad-centered crescent, 3.5 mm. high, group 61 short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Green or greenish-yellow cane with large medium-hairy buds; 3 or 4 rows of root primordia; diagnostic hair groups 52+, 57+—, 63+—; ascending deltoid-squarish dewlaps (fig. 39 (31)); lanceolate inner auricles; medium-tall ligule.

CLONE 28 N. G. 39

IMP. 368, ACC. 32

CULMS.—Dark red with sparse bloom and prominent constricted wax bands; internodes cylindric, 12 cm. long and 28×29 mm. across, shallow bud furrow, orange-brown flesh, medium hard; stem-epidermal pattern 2+3, average width of long cells 11μ , stomates absent; growth rings greenish, narrow, flush; root bands reddish, conoidal-obconoidal, 7 and 6 mm. high with 3 or 4 rows of primordia; buds deep red, 15×13 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence very sparse, hair groups 1 and 2 prominent.

LEAVES.—Sheaths 35 cm. long with heavy bloom and narrow group 57; blades 138 cm. long and 5.6 cm. broad, module 25; dewlaps squarish deltoid or flaring ligulate, outer surface with semilong group 58 and marginal group 58a, inner surface with small group 51 and prominent group 52; outer auricle transitional subtended by a short 56, inner auricle deltoid; ligule flat crescent with shallow lozenge, 3 mm.

high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane with orange-brown flesh, large smooth buds; 3 or 4 rows of root primordia; diagnostic hair groups 52+, 56+--, 57+-, 58+; squarish-deltoid or flaring ligulate dewlaps (fig. 40 (32)); deltoid inner auricle; narrow ligule.

CLONE 28 N. G. 40

IMP. 481, ACC. 34

CULMS.—Dark red obscurely striped with paler red when young, sparse bloom, and broad slightly merging wax bands; internodes cylindrical, 15 cm. long and 33 mm. across, medium or prominent bud furrow, soft gray flesh; stem-epidermal pattern 1+3, average width of long cells 9.2μ , stomates absent; growth rings red, medium broad, flush; root bands 8 and 7 mm. high, red, cylindrical, 2 or 3 rows of primordia; buds green with red wing, 14×8 mm., inserted above scar and extending above growth ring; prophyll long ovate with prominent basal appendage and somewhat pointed tip, posterior side hairy with most prominent group 10, anterior side with prominent 11 and less prominent hair groups 1, 2, 16, and 4.

LEAVES.—Sheaths 35 cm. long and smooth; sheath base slightly decurrent; blades 140 cm. long and 5.7 cm. broad, module 24; dewlaps slightly flaring shallow deltoid-crescent, outer surface with sparse to medium group 58, inner surface with medium groups 51 and 52; outer auricle transitional, inner auricle calcarate or long lanceolate and basally fringed; ligule broad-centered crescent, 5.5 mm. high, group 61 very short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Red striped cane, with large buds, prominent hair groups 11 and 10; 2 or 3 rows of root primordia; slightly decurrent sheath base; slightly flaring shallow deltoid-crescent dewlaps (fig. 40 (34)); calcarate or long-lanceolate inner auricle; tall crescent ligule.

CLONE 28 N. G. 42

IMP. 484, ACC. 35

CULMS.—Dark red faintly striped with light red when young, sparse bloom, corky cracks, and medium wax bands; internodes slightly tumescent and shouldered, 8 cm. long and 41 mm. across, prominent bud furrow, hard white flesh; stem-epidermal pattern 2, average width of long cells 12μ , stomates present; growth rings greenish red, medium broad, tumescent; root bands greenish red, cylindrical obconoidal, 10 and 7 mm. high with 3 to 5 rows of red primordia; buds greenish red with red wings, 15×10 mm., inserted at scar and extending above growth ring; prophyll long ovate with notched slightly hooked tip, wing inserted near middle of prophyll, medium-broad, small secondary wings may be present, posterior side hairy, most prominent hair group 10, anterior side with prominent hair groups 1, 2, and 11.

LEAVES.—Sheaths 30 cm. long, grayish purple, narrow group 57; sheath base slightly decurrent with group 69 present in crown leaves; blades 150 cm. long and 6.5 cm. broad, module 23; dewlaps shallow double crescent or squarish crescent, outer surface with medium group 58, inner surface with medium-prominent groups 51 and 52; both

auricles transitional or small deltoid; ligule orbicular crescent, 2.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Thick dark-red cane with prominent hairy buds; 3 to 5 rows of root primordia; diagnostic hair groups 57+ -, 69+ -; shallow double-crescent or squarish-crescent dewlaps (fig. 40 (35)); transitional auricles; narrow crescent ligule.

CLONE 28 N. G. 43

IMP. 537, ACC. 36

CULMS.—Dark red, with sparse bloom and medium-prominent wax bands; internodes cylindric, 10 cm. long and 36 mm. across, prominent bud furrow, greenish-white flesh; stem-epidermal pattern 1, average width of long cells 10μ , stomates present; growth rings ivory green, narrow, flush; root bands reddish, slightly constricted, 8 and 7 mm. high with 2 or 3 rows of primordia; buds 17×12 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed or narrow truncate tip, wing inserted low, medium broad or broad, pubescence sparse, hair groups 1, 16, 19, 10, 11 evident.

LEAVES.—Sheaths 35 cm. long, greenish purple with narrow to medium 57; blades 180 cm. long and 5.5 cm. broad, module 32; dewlaps squarish crescent, outer surface with medium or dense group 58 and small marginal group 58a, inner surface with more or less prominent groups 51 and 52; group 55 and semilong 63; outer auricle transitional, inner auricle broad lanceolate and fringed; ligule narrow-flanged crescent with shallow lozenge, 4.5 mm. high, group 61 short, dorsal pubescence as sparse 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Thick dark-red cane with prominent somewhat hairy buds; 3 rows of root primordia; diagnostic hair groups 52+, 52a+., 55+ -, 55a+ --, 57+ -, 63+ .; squarish-crescent dewlaps (fig. 41 (36)); lanceolate inner auricle; medium-tall crescent ligule.

CLONE 28 N. G. 44

IMP. 478, ACC. 37

CULMS.—Yellowish green often splotched with red, reddish when young, sparse bloom, and broad wax bands; internodes slightly obconoidal, 10 cm. long and 34×37 mm. across, prominent bud furrow, soft flesh; stem-epidermal pattern 4+1, average width of long cells 9.6μ , stomates absent; growth rings reddish green, medium broad, tumescent; root bands red, conoidal, 11 and 9 mm. high with 3 to 5 rows of primordia; buds green with olive wings, 14×12 mm., inserted at scar and extending above growth ring; prophyll ovate with broad crescent tip, wing inserted below middle of prophyll, medium broad or broad, pubescence sparse, most prominent hair group 10, less evident hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 35 cm. long with broad group 57; sheath base with sectorial 59; blades 150 cm. long and 7 cm. broad, module 21; dewlaps ascending ligulate, outer surface with medium group 58 and small marginal group 58a, inner surface with small group 51, dense group 52, and small group 63; outer auricle transitional or deltoid, inner auricle large calcarate or medium lanceolate and fringed; ligule

narrow-flanged crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green medium-thick cane with oval or slightly squarish buds with prominent group 10; 3 to 5 rows of root primordia; diagnostic hair groups 52+, 57+, 59+ -, 63+ - -; ascending ligulate dewlaps (fig. 40 (37)); calcarate or lanceolate inner auricle; narrow crescent ligule.

CLONE 28 N. G. 45

IMP. 485, ACC. 38

CULMS.—Olive green to yellowish green, with sparse bloom and medium wax bands; internodes concave-convex and shouldered, 10 cm. long and 36 mm. across, prominent bud furrow, hard white-green flesh; stem-epidermal pattern 2+6, average width of long cells 8.6 μ , stomates present; growth rings reddish green, narrow, tumescent; root bands reddish green, conoidal-obconoidal with 4 rows of crowded primordia; buds green with reddish wing, 15 \times 12 mm., inserted at scar and extending above growth ring; prophyll large deltoid with large basal appendage and serrate-truncate tip, wing inserted low, medium wide, emarginate at base and with small secondary wing, pubescence general and prominent.

LEAVES.—Sheath 34 cm. long and smooth; sheath base of crown leaves with groups 59 and 69; blades 135 cm. long and 6 cm. broad, module 22; dewlaps slightly flaring shallow deltoid, outer surface with medium group 58, inner surface with medium group 51 that extends as group 65 in single file toward midrib, dense group 52; both auricles deltoid; ligule medium broad-centered crescent, 4 mm. high, group 61 very short, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Olive-green cane with large hairy buds and 4 rows of root primordia; diagnostic hair groups 52+, 55a+ -, 59+ -, 65+ -, 65a+ -, 69+; slightly flaring shallow-deltoid dewlaps (fig. 40 (38)); small deltoid auricles; medium-tall crescent ligule.

CLONE 28 N. G. 46

IMP. 486, ACC. 40

CULMS.—Greenish yellow, with sparse bloom, corky cracks, and constricted wax bands; long cylindrical slightly shouldered internodes, 15 cm. long and 28 \times 30 mm. across, prominent bud furrow, soft green flesh; stem-epidermal pattern 2+3, average width of long cells 10.8 μ , stomates present; growth rings green, medium broad, depressed or flush; root bands ivory green, cylindrical obconoidal, 8 and 7 mm. high with 2 to 4 rows of primordia; buds green, 18 \times 10 mm., inserted at scar and extending above growth ring; prophyll long deltoid with narrow round-pointed tip, wing narrow, inserted low, confluent with sides, pubescence very sparse, prominent groups 9 and 24 near germ pore.

LEAVES.—Sheaths 32 cm. long with narrow group 57; blades 131 cm. long and 5 cm. broad, module 26; dewlaps ascending tall squarish crescent, outer surface with sparse group 58 and small marginal group 58a, inner surface with medium group 51 and sparse group 52;

outer auricle transitional subtended by a small group 56, inner auricle transitional or small calcarate; ligule narrow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Soft greenish-yellow cane with large deltoid glabrate buds; 2 to 4 rows of root primordia; diagnostic hair groups 56+—, 57+—; ascending tall squarish-crescent dewlaps (fig. 40 (40)); transitional auricles; narrow crescent ligule.

CLONE 28 N. G. 47

IMP. 538, ACC. 41

CULMS.—Bronze becoming yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical and shouldered, 10 cm. long and 29 mm. across, inconspicuous bud furrow, hard grayish flesh; stem-epidermal pattern 3+4+5, average width of long cells 10μ , stomates absent; growth rings ivory, narrow, flush; root bands ivory yellow, tumescent-conoidal, 12 mm. high with 4 or 5 rows of primordia; buds olive red, 12×10 mm., inserted at scar and extending above growth ring; prophyll broad deltoid with truncate-notched tip, wing broad, inserted below middle of prophyll, pubescence sparse, noticeable are hair groups 1, 2, basal 4.

LEAVES.—Sheaths 30 cm. long with medium group 57, sheath base slightly decurrent; blades 148 cm. long and 5.2 cm. broad, module 28; dewlaps crescent-deltoid, outer surface with dense groups 58 and 58a, inner surface with small group 51, prominent semilong group 52, and small group 63; outer auricle deltoid, inner auricle short lanceolate and prominently fringed; ligule narrow-flanged subarcuate, 2.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Thin bronze cane becoming yellowish green, with broad deltoid glabrate buds; very tall root bands with 4 or 5 rows of primordia; diagnostic hair groups 52+, 57+—, 58+, 63+—; crescent-deltoid dewlaps (fig. 40 (41)); short lanceolate inner auricle; narrow subarcuate ligule.

CLONE 28 N. G. 51

IMP. 540, ACC. 43

CULMS.—Green, sometimes faintly striped with yellow, sparse bloom, and broad wax bands; internodes cylindrical and slightly concave-convex, 9 cm. long and 31×33 mm. across, prominent bud furrow, hard white flesh; stem-epidermal pattern 2, average width of long cells 12.8μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, conoidal on bud side, 10 and 7 mm. high with 3 rows of primordia; buds green with reddish wing, 15×10 mm., inserted at scar and extending above growth ring; prophyll long ovate with round-pointed notched tip, wing inserted below middle of prophyll, medium broad to narrow, pubescence sparse, somewhat prominent are hair groups 1, 4, 10, 16, 19.

LEAVES.—Sheaths 34 cm. long, striped with heavy bloom and narrow group 57; blades 130 cm. long and 4.3 cm. broad, module 30; dewlaps shallow, squarish deltoid, outer surface with medium group 58, inner surface with broad group 51 and medium group 52; outer

auricle small deltoid subtended by a short 56, inner auricle long lanceolate and fringed; ligule broad-centered strap-shaped or crescent, 5 mm. high, group 61 very short, dorsal pubescence prominent in flange zone.

DISTINGUISHING CHARACTERS.—Green-and-yellow striped cane with more or less glabrate buds; 3 rows of root primordia; diagnostic hair groups 56+—, 57+—; shallow squarish-deltoid dewlaps (fig. 40 (43)); long lanceolate inner auricle; broad strap-shaped or crescent ligule.

CLONE 28 N. G. 52

IMP. 379, ACC. 44

CULMS.—Light reddish brown, with pale-red and green stripes, medium bloom, and merging wax bands; internodes cylindrical, 12 cm. long and 30 mm. across, small bud furrow, hard white flesh; stem-epidermal pattern 3, average width of long cells 8.7μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindrical, 8 and 7 mm. high with 3 or 4 rows of primordia; buds green with red wings, 10×8 mm., inserted at scar and extending slightly above growth ring; prophyll ovate with broad more or less crescent tip, wing broad, inserted at middle of prophyll, general pubescence sparse with outstanding hair group 10, and less prominent groups 1, 2, 16, 19.

LEAVES.—Sheaths 31 cm. long striped with narrow group 57; blades 137 cm. long and 5.6 cm. broad, module 24; dewlaps ascending broad ligulate, outer surface with prominent group 58 and marginal group 58a, inner surface with prominent group 51 that passes as group 65 in narrow file to midrib, semilong groups 51a, 52, 52a, and 63; outer auricle transitional, subtended by a medium-short 56, inner auricle transitional or small deltoid, ligule narrow crescent with shallow lozenge, 2.5 mm. high, group 61 tall, dorsal pubescence general.

DISTINGUISHING CHARACTERS.—Striped cane with small broad-winged more or less glabrate buds; 3 or 4 rows of root primordia; diagnostic hair groups 51a+, 52+, 52a+, 56+—, 57+—, 58+, 58a+, 61+, 63+, 65+; ascending broad ligulate dewlaps (fig. 40 (44)): transitional auricles; narrow crescent ligule.

CLONE 28 N. G. 54

IMP. 642, ACC. 45

CULMS.—Green becoming greenish yellow, with sparse bloom and broad constricted wax bands; internodes cylindrical, 12 cm. long and 32 mm. across, broad bud furrow, medium-hard light-green flesh; stem-epidermal pattern 1+5+4+3, average width of long cells 8.1μ , stomates present; growth rings light olive, narrow, slightly tumescent; root bands ivory green, cylindrical conoidal, 9 and 7 mm. high with 3 to 5 rows of crowded primordia; buds green or slightly reddish, 17×11 mm., inserted at scar and extending above growth ring; prophyll long deltoid with pointed tip, wing inserted low, narrow, sparsely fringed, pubescence sparse, somewhat prominent hair groups 16, 18, and 19.

LEAVES.—Sheaths 36 cm. long, smooth; blades 150 cm. long and 6 cm. broad, module 25; dewlaps crescent-squarish, outer surface with

semilong dense group 58 and marginal group 58a, inner surface with prominent group 51 that extends as group 65 single file toward midrib, dense group 52 and sparse semilong group 63 inserted high; outer auricle deltoid, inner auricle short lanceolate; ligule broad-centered subarcuate, 3.5 mm. high, group 61 medium tall, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Slender greenish-yellow cane with large glabrate deltoid buds; 3 to 5 rows of crowded root primordia; diagnostic hair groups 52+, 55a+-, 58+, 61+., 63+., 65+-, 65a+-; crescent-squarish dewlaps (fig. 41 (45)); short lanceolate inner auricle; broad-centered crescent or subarcuate ligule.

CLONE 28 N. G. 55

IMP. 643, ACC. 46

CULMS.—Yellowish green with red blush or sunscald, sparse bloom, and medium wax bands; internodes cylindric and slightly shouldered, 9.5 cm. long and 34 mm. across, without bud furrow, soft flesh; stem-epidermal pattern 2+4, average width of long cells 10.4μ , stomates present; growth rings greenish, medium broad, tumescent; root bands green, cylindric, 8 and 7 mm. high with 4 or 5 rows of primordia; buds green, edged in red, 10×7 mm., inserted at scar and extending above growth ring; prophyll ovate with narrow truncate tip, wing inserted near middle of prophyll, broad and membranaceous, smooth, pubescence very sparse, hair groups 1, 16, 19 outstanding.

LEAVES.—Sheaths 29 cm. long with inconspicuous group 57; blades 168 cm. long and 5.3 cm. broad, module 32; dewlaps squarish crescent, outer surface with medium sparse group 58, inner surface with prominent group 51, dense group 52, sparse medium-long groups 55 and 63; outer auricle transitional, inner auricle short lanceolate and fringed; ligule shallow crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with red blush, medium-large smooth buds; 3 or 4 rows of root primordia; diagnostic hair groups 52+, 55+-, 57+--, 63+--; squarish-crescent dewlaps (fig. 40 (46)); lanceolate inner auricle; shallow-crescent ligule.

CLONE 28 N. G. 56

IMP. 488, ACC. 47

CULMS.—Rosy to bronze, becoming yellowish green, with sparse bloom and medium wax bands; internodes cylindric, 9 cm. long and 31 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+3+4, average width of long cells 9.8μ , stomates present; growth rings olive red, medium broad, slightly tumescent; root bands reddish green, cylindric to slightly conoidal, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green, edged in red, 15×8 mm., inserted below scar and extending above growth ring; prophyll large ovate with small apical appendage and pointed tip, wing inserted below middle of prophyll, narrow, pubescence medium sparse, outstanding hair groups 10, 11, less so 1, 16, 19, 18, 9.

LEAVES.—Sheaths 34 cm. long with narrow group 57; sheath base

of crown leaves with 59 and 69; blades 144 cm. long and 4.1 cm. broad, module 35; dewlaps slightly ascending squarish, outer surface with dense group 58 and prominent group 58a, inner with prominent group 51 and dense group 52, inconspicuous groups 63 and 55; outer auricle transitional, inner auricle medium-long lanceolate and fringed nearly to tip; ligule orbicular crescent with lozenge, 4.5 mm. high, group 61 medium tall, dorsal pubescence short and general.

DISTINGUISHING CHARACTERS.—Bronze to yellowish-green soft cane with large deltoid buds; 2 or 3 rows or root primordia; diagnostic hair groups 52+, 55+---, 57+--, 58+, 58a+, 59+, 61+., 63+—, 69+; slightly ascending squarish dewlaps (fig. 40 (47)); lanceolate inner auricle; tall crescent ligule; small group 9 in germ pore.

CLONE 28 N. G. 59

IMP. 487, ACC. 48

CULMS.—Red, becoming yellowish green, with sparse bloom and broad wax bands; internodes cylindric and shouldered, 9.5 cm. long and 35×37 mm. across, without bud furrow; stem-epidermal pattern 3, average width of long cells 12.5 μ , stomates absent; growth rings olive, medium broad, flush; root bands reddish, slightly tumescent or conoidal, 11 and 10 mm. high with 3 rows of primordia; buds green flushed with red, 12×10 mm., inserted at scar and extending to growth ring; prophyll ovate with round-pointed slightly notched tip, wing inserted near middle of prophyll, membranaceous, broad, emarginate at base, pubescence limited to short sparse hairs.

LEAVES.—Sheaths 30 cm. long with narrow group 57; blades 144 cm. long and 6 cm. broad, module 24; dewlaps ascending squarish, outer surface with medium group 58, inner with small group 51 and medium group 52, small group 63; outer auricle sloping transitional, inner auricle short lanceolate or deltoid and fringed to tip; ligule narrow arcuate, 3 mm. high, group 61 short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with smooth buds; 3 rows of root primordia; diagnostic hair groups 57+ -, 63+ --; ascending squarish dewlaps (fig. 40 (48)); short lanceolate or deltoid inner auricle; narrow arcuate ligule.

CLONE 28 N. G. 62

IMP. 644, ACC. 49

CULMS.—Dark vinaceous red, with medium bloom and broad wax bands; internodes cylindric, 15 cm. long and 29 mm. across, prominent bud furrow, hard reddish flesh; stem-epidermal pattern 1+4, average width of long cells 9.2 μ , stomates present; growth rings red, medium broad, slightly tumescent; root bands red, tumescent conoidal, 7 mm. high with 2 or 3 rows of primordia; buds red, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed or small truncate tip, wing inserted near middle of prophyll, narrow to medium and fringed, pubescence medium prominent, outstanding are hair groups 10 and 11, less so 1, 16, and 19.

LEAVES.—Sheaths 31 cm. long and smooth; sheath base slightly decurrent; blades 139 cm. long and 5.1 cm. broad, module 27; dewlaps

shallow deltoid crescent or squarish, outer surface with sparse group 58, inner surface with prominent group 51 and dense group 52; outer auricle deltoid, inner auricle calcarate or short lanceolate; ligule strap-shaped or broad-flanged crescent, 5.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark vinaceous-red long-jointed cane with prominent medium-hairy buds; 2 or 3 rows of primordia; diagnostic hair group 52+; shallow deltoid crescent or squarish dewlaps (fig. 41 (49)); short lanceolate or calcarate inner auricle; broad strap-shaped or crescent ligule.

CLONE 28 N. G. 63

IMP. 645, ACC. 50

CULMS.—Bronze becoming yellowish green, with medium wax bands but without bloom; internodes cylindrical and slightly shouldered, 10 cm. long and 35×38 mm. across, without bud furrow, soft gray flesh; stem-epidermal pattern 4+1, average width of long cells 10.4 μ , stomates present; growth rings olive, narrow, flush; root bands greenish, slightly conoidal, 11 and 9 mm. high with 3 to 5 rows of crowded primordia; buds green with red wings, 12×11 mm., inserted at scar and extending slightly above growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, broad and notched at base, thinning out toward tip, pubescence more or less sparse, most prominent hair groups 19, 1, 16, 4, 2.

LEAVES.—Sheaths 32 cm. long and smooth; blades 120 cm. long and 6.5 cm. broad, module 18.4; dewlaps ascending narrow squarish, outer surface with sparse group 58, inner surface with small group 51, prominent group 52, and small group 63; outer auricle transitional, inner auricle calcarate, and fringed nearly to tip; ligule narrow-flanged crescent deltoid, 4 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Bronze to yellowish-green cane with broad ovate more or less smooth buds; 3 to 5 rows of primordia; diagnostic hair groups 52+, 63+--; ascending narrow squarish dewlaps (fig. 41 (50)); calcarate inner auricle; medium-tall crescent-deltoid ligule.

CLONE 28 N. G. 65

IMP. 512, ACC. 51

CULMS.—Rose-tinted when young, becoming yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical or slightly conoidal, 9.5 cm. long and 27×29 mm. across, prominent bud furrow, soft greenish flesh; stem-epidermal pattern 1+4, average width of long cells 9 μ , stomates absent; growth rings green, medium broad, flush; root bands ivory green, cylindrical to slightly conoidal, 10 and 9 mm. high with 4 or 5 rows of primordia; buds green with olive wings, 15×10 mm., inserted at scar and extending above growth ring; prophyll with truncate or hooked tip, wing inserted near middle of prophyll, medium broad, pubescence sparse, with hair groups 1, 16, 19, and 18 most prominent.

LEAVES.—Sheaths 34 cm. long and smooth, blades 142 cm. long and

3.5 cm. broad, module 40; dewlaps flaring ligulate or squarish sub-crescent, outer surface with matted, semilong group 58 and marginal group 58a, inner surface with prominent group 51 that extends as group 65 single file toward midrib, medium group 52, and small group 63; outer auricle sloping transitional, inner auricle deltoid; ligule broad-centered subarcuate, 4 mm. high, group 61 long, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with prominent, more or less smooth buds; 4 or 5 rows of root primordia; diagnostic hair groups 55a+-, 58+, 61+, 63+-, 65+-, 65a+-; flaring ligulate or squarish-subcrescent dewlaps (fig. 41 (51)); deltoid inner auricle; broad-centered subarcuate ligule.

CLONE 28 N. G. 68

IMP. 517, ACC. 51A

CULMS.—Yellow, with sparse bloom and prominent wax bands; internodes cylindric or slightly obconoidal, 15 cm. long and 40 mm. across, prominent bud furrow, flesh greenish, soft; stem-epidermal pattern 1+4+3, average width of long cells 10μ , stomates present; growth rings yellow green, medium broad, tumescent or flush; root bands ivory, cylindric conoidal, 10 and 9 mm. high with 5 or 6 rows of primordia; buds greenish, 15×12 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with narrow truncate tip, wing inserted far below middle of prophyll, medium broad, pubescence medium, prominent hair groups 1, 16, 19, 18, 2, 10, 11.

LEAVES.—Sheath 35 cm. long and smooth; sheath base slightly decurrent; blades 140 cm. long and 7.3 cm. broad, module 19.2; dewlaps ascending squarish, outer surface with dense semilong group 58, inner surface with prominent group 51 that extends as group 65 single file toward midrib, dense group 52 and prominent semilong group 63 inserted high; outer auricle transitional with a long narrow ledge of group 56, inner auricle small deltoid; ligule broad-centered subarcuate or crescent, 3.5 mm. high, group 61 short, dorsal pubescence prominent as 65a and 55a.

DISTINGUISHING CHARACTERS.—Pale-yellow cane with long internodes, prominent long-deltoid medium-hairy buds; 5 or 6 rows of primordia; diagnostic hair groups 52+, 55+-, 55a+, 56+, 58+, 63+, 65+, 65a+; ascending squarish dewlaps (fig. 41 (51a)) small deltoid inner auricle; subarcuate ligule.

CLONE 28 N. G. 78

IMP. 646, ACC. 53

CULMS.—Yellow and green striped, with sparse bloom and medium wax bands; internodes zigzag, cylindric and slightly shouldered, 11 cm. long and 37 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 3+4, average width of long cells 11μ , stomates present; growth rings greenish olive, narrow, tumescent; root bands striped, cylindric to slightly conoidal, 7 and 6 mm. high with 3 or 4 rows of primordia; buds green edged in red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with very

prominent basal appendage and pointed tip, wing inserted below middle of prophyll, broad and somewhat lobed at base, thinning more or less abruptly in direction of apex, pubescence very sparse, groups 1 and 2 outstanding.

LEAVES.—Sheaths 31 cm. long striped with narrow group 57; blades 135 cm. long and 6.5 cm. broad, module 21; dewlaps red when young, ascending narrow flaring squarish or ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle deltoid, inner auricle calcarate and not fringed; ligule very tall deltoid-crescent, 7 mm. high, group 61 short, dorsal pubescence short and semiadnate.

DISTINGUISHING CHARACTERS.—Striped cane with smooth buds, broad basal appendage, and broad basal wing region; 3 or 4 rows of root primordia; diagnostic hair group 57+-; ascending narrow flaring squarish or ligulate dewlaps (fig. 41 (53)), red when young; calcarate inner auricle; very tall ligule.

CLONE 28 N. G. 80

IMP. 402, ACC. 54

CULMS.—Pale red becoming yellowish green, with sparse bloom and prominent wax bands; internodes slightly bobbin-shaped, 12 cm. long and 30×33 mm. across, prominent bud furrow, flesh light olive and hard; stem-epidermal pattern 2+3, average width of long cells 9.6 μ , stomates present; growth ring ivory, medium broad, flush; root bands ivory, conoidal, 10 and 8 mm. high, with 3 or 4 rows of primordia; buds green with olive wings, 17×12 mm., inserted at scar and extending above growth ring; prophyll long ovate with beaked apical appendage, wing inserted below middle of prophyll, narrow and notched at base, anterior side with prominent hair groups 1, 2, 16, and 11, posterior side covered with short hair.

LEAVES.—Sheaths 35 cm. long with narrow group 57; blades 131 cm. long and 5.4 cm. broad, module 24; dewlaps large ascending squarish, outer surface with dense group 58 and marginal group 58a, inner surface with prominent group 51 that extends as group 65 single file toward midrib, dense semilong group 52, and small group 55; outer auricle broad transitional or deltoid, inner auricle calcarate or short lanceolate and fringed to tip; ligule subarcuate, 4 mm. high, group 61 long, dorsal pubescence as prominent 65a and 55a.

DISTINGUISHING CHARACTERS.—Hard yellowish-green cane, with large buds hairy at base and juncture; 3 or 4 rows of root primordia; large ascending-squarish dewlaps (fig. 41 (54)); diagnostic hair groups 52+, 55+---, 55a+-, 57+-, 58+, 61+, 65+, 65a+-; calcarate or short lanceolate inner auricle; subarcuate ligule.

CLONE 28 N. G. 83

IMP. 648, ACC. 56

CULMS.—Light reddish becoming yellowish green, with sparse bloom and prominent wax bands; internodes cylindric to slightly bobbin-shaped, 11 cm. long and 29 mm. across, small bud furrow, flesh soft, gray; stem-epidermal pattern 2+4, average width of long cells 7.8 μ ,

stomates absent; growth rings grayish, medium broad, flush; root bands ivory, conoidal, 9 mm. high, with 4 or 5 rows of primordia; buds reddish, 14×10 mm., inserted at scar and reaching above growth ring; prophyll ovate with long, narrow, truncate-notched tip, wing inserted below middle of prophyll, broad at base and slightly emarginate, basally fringed, principal hair groups 1, 2, 16, 11, 19.

LEAVES.—Sheaths 34 cm. long with medium group 57 inserted low; blades 151 cm. long and 4.5 cm. broad, module 33; dewlaps red, ascending flaring ligulate, outer surface with medium group 58, inner surface with medium group 51, dense semilong group 52, broad group 52a, and inconspicuous 63; outer auricle sloping transitional and subtended by a long 56, inner auricle transitional; ligule flat-centered subarcuate, 3 to 3.5 mm. high, group 61 short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with buds prominently hairy at base and juncture; tall root bands with 4 or 5 rows of primordia; diagnostic hair groups 52+, 52a+, 56+, 57+, 63+---; red, ascending flaring-ligulate dewlaps (fig. 41 (56)); transitional auricles; crescent or subarcuate ligule.

CLONE 28 N. G. 84

IMP. 649, ACC. 57

CULMS.—Dark red, when young faintly striped with lighter red, sparse bloom, corky cracks, and medium wax bands; internodes cylindric to tumescent, 7 cm. long and 41 mm. across, without bud furrow, flesh soft and white; stem-epidermal pattern 3+4, average width of long cells 11μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindric, 9 and 8 mm. high, with 3 to 5 rows of primordia; buds greenish red, 10×10 mm., inserted at scar reaching growth ring; prophyll broad ovate with narrow truncate-notched tip, wing inserted at middle of prophyll, narrow, base dentate, not fringed, important hair groups 16, 19, 1, 2.

LEAVES.—Sheaths striped, 35 cm. long, smooth; blades 145 cm. long and 6.5 cm. broad, module 22; dewlaps ascending ligulate, outer surface with medium sparse group 58, inner surface with small group 51, medium or sparse group 52, small group 63; outer auricle deltoid and subtended by a very short 56, inner auricle calcarate and fringed to tip; ligule narrow-flanged subarcuate, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red soft cane, with broad-ovate buds with prominent 16 and 19; tall root bands with 3 to 5 rows of primordia; diagnostic hair groups 56+---, 63+--; ascending ligulate dewlaps (fig. 41 (57)); calcarate inner auricle; medium-tall subarcuate ligule.

CLONE 28 N. G. 87

IMP. 409, ACC. 58

CULMS.—Brownish becoming yellow, with sparse bloom and prominent wax bands; internodes slightly bent, bobbin-shaped to obconoidal, 14 cm. long and 36×40 mm. across, prominent bud furrow,

more or less hard orange-brown flesh; stem-epidermal pattern 3, average width of long cells 10.5μ , stomates present; growth rings olive, medium broad, slightly tumescent; root bands ivory, tumescent conoidal, 9 mm. high with 3 or 4 rows of primordia; buds ivory with reddish tip, 13×10 mm., inserted at scar and reaching growth ring; prophyll ovate, with slightly beaked apical appendage and round-pointed tip, wing inserted below middle of prophyll, narrow, fringed, principal hair groups 1, 4, 10.

LEAVES.—Sheaths 32 cm. long, with heavy bloom and narrow group 57; blades 135 cm. long and 4.5 cm. broad, module 30; dewlaps ascending squarish, outer surface with dense group 58 and marginal group 58a, inner surface with medium group 51 and dense semilong group 52; outer auricle transitional, inner auricle medium lanceolate and fringed nearly to tip; ligule broad-centered subarcuate or crescent, 4 mm. high, group 61 more or less long, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brownish becoming yellow, with prominent bud furrow, ovate buds with fringed wing; tall root band with 3 or 4 rows of primordia; diagnostic hair groups 52+, 57+ -, 58+, 61+.; ascending squarish dewlaps (fig. 41 (58)); lanceolate inner auricle; broad-centered subarcuate or crescent ligule.

CLONE 28 N. G. 89

IMP. 516, ACC. 60

CULMS.—Olive green becoming yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical and slightly shouldered, 11 cm. long and 34 mm. across, small bud furrow, orange-brown soft flesh; stem-epidermal pattern 2+4, average width of long cells 9.2μ , stomates absent; growth rings orange, narrow, slightly tumescent; root bands cylindrical, 8 and 7 mm. high with 4 or 5 rows of reddish crowded primordia; buds green with reddish wing, 13×10 mm., inserted at scar and reaching growth ring; prophyll ovate with small apical appendage and pointed or narrow truncate tip, wing inserted below middle of prophyll, narrow, general pubescence sparse and short-haired, but prominent at base.

LEAVES.—Sheaths 39 cm. long, smooth or with small group 57; blades 150 cm. long and 5.3 cm. broad, module 28; dewlaps squarish subcrescent, outer surface with medium dense group 58, inner surface with broad group 51 and 65, medium group 52, and 63; outer auricle broad transitional, inner auricle long lanceolate and fringed to tip; ligule broad-centered crescent, 4 mm. high, group 61 very short, dorsal pubescence as 65a.

DISTINGUISHING CHARACTERS.—Olive-green cane with soft orange-brown flesh, more or less smooth ovate buds, long sheath; 4 or 5 rows of primordia; diagnostic hair groups 52+., 57+ - -, 58+., 63+., 65+, 65a+ -; squarish-subcrescent dewlaps (fig. 41 (60)); long lanceolate inner auricle; broad-centered tall ligule.

CLONE 28 N. G. 90**IMP. 518, ACC. 61**

CULMS.—Yellowish green to livid brown, with heavy bloom and merging wax bands; internodes cylindrical, 9 cm. long and 32×34 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 3+4+5, average width of long cells 8.7 μ , stomates absent; growth rings olive, narrow, flush; root bands conoidal, ivory, 13 and 11 mm. high with 4 rows of large primordia; buds light olive, 13×11 mm., inserted at scar and reaching growth ring; prophyll ovate with prominent basal appendage and slightly truncate tip, wing inserted below middle of prophyll, broad, pubescence sparse and short-haired, prominent hair group 1.

LEAVES.—Sheaths 31 cm. long with medium group 57; blades 130 cm. long and 5.5 cm. broad, module 24; dewlaps tall deltoid crescent, outer surface with medium group 58, inner surface with small to medium group 51, dense group 52, and small 63; outer auricle transitional, subtended by a medium 56, inner auricle long lanceolate and fringed to tip; ligule broad-centered arcuate, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Livid-brown cane, with heavy bloom and soft orange flesh, more or less smooth ovate buds; very tall root bands; diagnostic hair groups 52+, 56+., 57+., 63+ - -; tall deltoid-crescent dewlaps (fig. 42 (61)); lanceolate inner auricle; tall arcuate ligule.

CLONE 28 N. G. 93**IMP. 650, ACC. 62**

CULMS.—Greenish yellow with red sunscald patches, sparse bloom, and prominent wax bands; internodes cylindrical, slightly concave convex, 11 cm. long and 33 mm. across, prominent bud furrow, soft greenish flesh; stem-epidermal pattern 1+3, average width of long cells 9.8 μ , stomates absent; growth rings greenish, medium broad, tumescent; root bands green, cylindrical, 9 and 7 mm. high with 2 rows of primordia; buds green with olive wing, 11×8 mm., inserted at scar and reaching growth ring; prophyll long ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad, principal pubescence at base, with hair groups 1, 2, 16, 19, and 11, most outstanding 10.

LEAVES.—Sheaths 28 cm. long with prominent group 57; sheath base of crown leaves with 59 and 69; blades 130 cm. long and 5.5 cm. broad, module 24; dewlaps flaring deltoid, outer surface with medium-dense group 58, inner surface with small group 51 and medium group 52; both auricles lanceolate; ligule narrow-flanged crescent with lozenge, 4 mm. high, group 61 short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Slender greenish-yellow cane, with prominent bud furrow, narrow-ovate medium-hairy buds; tall root bands with 2 rows of large primordia; diagnostic hair groups 57+, 59+., 69+.; flaring deltoid dewlaps (fig. 42 (62)); lanceolate inner auricle; medium-tall crescent ligule.

CLONE 28 N. G. 96**IMP. 505, Acc. 63**

CULMS.—Greenish yellow, faint green and yellow stripes when young, with medium bloom and wax bands; internodes cylindric, 15 cm. long and 33 mm. across, small bud furrows, soft grayish-green flesh; stem-epidermal pattern 2+4, average width of long cells 11μ , stomates absent; growth rings broad and flush; root bands green, cylindric or slightly tumescent, 9 mm. high with 3 or 4 rows of primordia; buds green with olive wings, 19×12 mm., inserted at scar and extending above growth ring; prophyll long deltoid with prominent basal appendage and blunt tip, wing inserted low, medium broad, pubescence prominent at base with groups 1, 2, 16, 19, and 18 represented.

LEAVES.—Sheaths 36 cm. long and smooth; sheath base decurrent; blades 151 cm. long and 7.2 cm. broad, module 21; dewlaps steeply ascending ligulate, outer surface with dense group 58 and marginal group 58a, inner surface with medium group 51, dense group 52, and small group 63; outer auricle sloping transitional, inner auricle small calcarate; ligule narrow-flanged arcuate or subarcuate, 3 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane with very large slightly tumescent buds; broad root bands; diagnostic hair groups 52+, 58+, 63+---; steeply ascending ligulate dewlaps (fig. 42 (63)); calcarate inner auricle; narrow-arcuate or subarcuate ligule.

CLONE 28 N. G. 97**IMP. 418, Acc. 64**

CULMS.—Greenish yellow, with sparse bloom and prominent wax bands; internodes slightly bobbin-shaped, 10.5 cm. long and 28×31 mm. across, prominent bud furrow, flesh grayish green; stem-epidermal pattern 2+4, average width of long cells 8.6μ , stomates absent; growth rings olive, broad, flush; root bands ivory green, tumescent-conoidal, 9 mm. high with 3 or 4 rows of primordia; buds green with reddish wing, 11×10 mm., inserted at scar and reaching growth ring; prophyll broad ovate with broad truncate tip, wing inserted near middle of prophyll, broad and auriculate, pubescence very sparse, groups 1, 2, and 11 evident.

LEAVES.—Sheaths 34 cm. long with medium small group 57; blades 137 cm. long and 6.9 cm. broad, module 20; dewlaps ascending squarish crescent, outer surface with medium-dense group 58, inner surface with prominent group 51 and dense group 52; outer auricle sloping transitional, subtended by a short 56, inner auricle short lanceolate and fringed to tip; ligule subarcuate to arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with prominent bud furrow, smooth short ovate buds; tall conoidal root bands; diagnostic hair groups 52+, 56+--, 57+-; ascending squarish-crescent dewlaps (fig. 42 (64)); lanceolate inner auricle; subarcuate ligule.

CLONE 28 N. G. 98**IMP. 504, ACC. 66**

CULMS.—Greenish yellow without bloom, prominent wax bands; internodes obconoidal, 9 cm. long and 27×31 mm. across, prominent bud furrow, hard grayish-green flesh; stem-epidermal pattern $3+5+4$, average width of long cells 8.1μ , stomates absent; growth rings buff, medium high, flush; root bands tumescent conoidal, 10 and 9 mm. high with 4 to 6 rows of crowded primordia; buds ivory with reddish wing, 17×13 mm., inserted at scar and extending above growth ring; prophyll broad ovate deltoid with prominent basal appendage and round-pointed or truncate tip, wing inserted below middle of prophyll, broad, pubescence sparse, groups 1 and 2 present.

LEAVES.—Sheaths 34 cm. long with medium group 57; blades 155 cm. long and 5.5 cm. broad, module 28; dewlaps descending deltoid crescent or flaring squarish, outer surface with dense group 58, inner surface with prominent groups 51, 52, and small 65 and 63; outer auricle steeply sloping transitional and subtended by a long 56, inner auricle short lanceolate or calcarate and fringed; ligule narrow-flanged subarcuate, 3.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with prominent bud furrow, large smooth buds; broad conoidal root bands with 4 to 6 rows of primordia; diagnostic hair groups $52+$, $56+$, $57+-$, $58+$, $63+-$, $65+-$; descending deltoid-crescent or flaring-squarish dewlaps (fig. 42 (66)); lanceolate or calcarate inner auricle; narrow subarcuate ligule.

CLONE 28 N. G. 99**IMP. 651, ACC. 67**

CULMS.—Greenish yellow, with sparse bloom and prominent wax bands; internodes cylindric or slightly obconoidal, 12 cm. long and 31 mm. across, prominent bud furrow, flesh grayish green, soft; stem-epidermal pattern $3+5+4$, average width of long cells 8.3μ , stomates not observed; growth ring olive, narrow, flush; root bands ivory, tumescent conoidal, 10 mm. high with 4 rows of primordia; buds reddish, 13×10 mm., inserted at scar and reaching growth ring; prophyll broad ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad, auriculate, pubescence sparse, prominent groups 1, 2, 16, sparse groups 10 and 11.

LEAVES.—Sheaths 35 cm. long with narrow group 57; blades 154 cm. long and 4.5 cm. broad, module 34; dewlaps flaring deltoid crescent or squarish subcrescent, outer surface with dense or medium group 58, inner surface with broad group 51 and dense group 52; outer auricle sloping transitional and subtended by a medium short 56, inner auricle short lanceolate; ligule narrow-flanged subarcuate or arcuate, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with prominent bud furrow, broad ovate slightly hairy buds; tall root bands; diagnostic hair groups $52+$, $56+-$, $57+-$; flaring deltoid-crescent or squarish-subcrescent dewlaps (fig. 42 (67)); lanceolate inner auricle; subarcuate or arcuate medium-tall ligule.

CLONE 28 N. G. 106**IMP. 508, ACC. 69**

CULMS.—Red, with russet streaks, sparse bloom, and narrow wax bands; internodes cylindrical and slightly concave on bud side, 12 cm. long and 27×29 mm. across, small bud furrow, flesh grayish green; stem-epidermal pattern 3+4, average width of long cells 10.6 μ , stomates present; growth rings greenish red, narrow, tumescent; root bands red, cylindrical to obconoidal, 7 and 6 mm. high with 3 rows of small primordia; buds green with reddish wing, 9×9 mm., inserted at scar and reaching growth ring; prophyll short and broad ovate with broad-truncate tip, wing inserted near middle of prophyll, medium broad, pubescence medium sparse, prominent hair groups 10, 19, 1, 2.

LEAVES.—Sheaths 32 cm. long with medium group 57; blades 125 cm. long and 4.5 cm. broad, module 28; dewlaps steeply ascending ligulate, outer surface with sparse group 58, inner surface with broad group 51 and sparse group 52; outer auricle sloping transitional, inner auricle medium long lanceolate and fringed; ligule narrow subarcuate, 2.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Red cane, with ovate to rhomboid buds; medium to narrow root bands with 3 rows of primordia; diagnostic hair group 57+.; steeply ascending-ligulate dewlaps (fig. 42 (69)); lanceolate inner auricle; narrow subarcuate ligule.

CLONE 28 N. G. 107**IMP. 427, ACC. 70**

CULMS.—Yellowish green, with russet streaks, sparse bloom, and indistinct wax bands; internodes curved, bobbin-shaped, 12 cm. long and 30 mm. across, without or with inconspicuous bud furrow, hard yellow-white flesh; stem-epidermal pattern 3, average width of long cells 10 μ , stomates absent; growth rings olive, medium broad, flush; root bands ivory, cylindrical obconoidal, 7 mm. high with 4 rows of small primordia; buds reddish, plump, 10×11 mm., inserted below scar and reaching growth ring; prophyll roundish pentagonal with crescent tip, wing inserted at middle of prophyll, medium broad and not fringed, general pubescence medium prominent, entire posterior side hairy with group 10 most conspicuous, anterior side with hair groups 1, 2, 16, 6, 11.

LEAVES.—Sheaths 34 cm. long with narrow group 57; blades 135 cm. long and 4.3 cm. broad, module 31; dewlaps ascending ligulate, outer surface with sparse group 58 and small marginal group 58a, inner surface with prominent group 51, and sparse groups 52, 65, and 63; outer auricle transitional, inner auricle deltoid; ligule narrow subarcuate or arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with roundish pentagonal hairy buds; narrow root bands; diagnostic hair groups 57+., 63+., 65+.; ascending-ligulate dewlaps (fig. 42 (70)); deltoid inner auricle; narrow subrescent ligule.

CLONE 28 N. G. 109**IMP. 507, ACC. 71**

CULMS.—Olive to yellowish green, with sparse bloom and medium wax bands; internodes cylindrical, 10 cm. long and 43 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+4, average width of long cells 12.5μ , stomates present; growth rings yellow green, narrow to medium broad, flush; root bands yellow green, cylindrical conoidal, 8 and 7 mm. high with 4 rows of crowded primordia; buds green, edged in olive, 15×10 mm., inserted at scar and extending above growth ring; prophyll deltoid ovate, more or less beaked tip, wing inserted low, medium broad, fringed, pubescence general, most prominent hair groups 1, 2, 16, 4, 13, 14, 11, 10, 22, 19.

LEAVES.—Sheaths 34 cm. long with heavy bloom and narrow group 57; blades 140 cm. long and 5.5 cm. broad, module 25; dewlaps narrow squarish crescent, outer surface with dense group 58 and prominent group 58a, inner surface with prominent group 51, dense group 52 and small group 63; both auricles lanceolate; ligule more or less strap-shaped, 4 mm. high, group 61 very short, dorsal pubescence as short 55a.

DISTINGUISHING CHARACTERS.—Olive-green cane, with prominent bud furrow, tall deltoid buds with hairy wings and prominent group 4, 4 rows of root primordia; diagnostic hair groups 52+, 55a+---, 57+-, 58+, 58a+, 63+--; narrow squarish-crescent dewlaps (fig. 42 (71)), lanceolate auricles; strap-shaped ligule.

CLONE 28 N. G. 110**IMP. 510, ACC. 72**

CULMS.—Dark red, with sparse bloom and prominent wax bands; internodes slightly obconoidal, concave on bud side, 11 cm. long and 28 mm. across, small bud furrow, gray-green flesh; stem-epidermal pattern 1+3+4, average width of long cells 9.6μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindrical to slightly tumescent, 10 and 9 mm. high with 3 rows of medium-sparse primordia; buds red, 12×10 mm., inserted at scar and extending to growth ring; prophyll oval or rhomboid, with round-pointed tip, wing inserted above middle of prophyll, medium broad, pubescence very sparse, hair groups 1, 2, 10, and 11 evident.

LEAVES.—Sheaths 35 cm. long and smooth; blades 130 cm. long and 5.3 cm. broad, module 24; dewlaps narrow squarish or deltoid crescent, outer surface with medium-dense group 58, inner surface with prominent group 51, dense groups 52 and inconspicuous group 63; outer auricle transitional or deltoid, inner auricle short lanceolate or falcate, fringed; ligule broad-centered subarcuate, 5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane with oval or rhomboid more or less smooth buds; tall root bands with sparse primordia; diagnostic hair groups 52+, 63+--; narrow squarish or deltoid-crescent dewlaps (fig. 42 (72)); short lanceolate inner auricle; tall subarcuate ligule.

CLONE 28 N. G. 202**IMP. 506, ACC. 73**

CULMS.—Light red becoming reddish green, with sparse bloom, corky cracks, and prominent wax bands; internodes cylindrical, 10 cm. long and 30 mm. across, without bud furrow, soft white flesh; stem-epidermal pattern 3+2, average width of long cells 11.6μ , stomates absent; growth rings ivory, medium broad, flush; root bands light olive, cylindrical, 7 mm. high with 3 rows of primordia; buds red, 14×11 mm., inserted at scar and extending above growth ring; prophyll broad deltoid with pointed tip, wing inserted low, narrow, small apical appendage, pubescence more or less sparse, prominent hair groups 10 and 11.

LEAVES.—Sheath 34 cm. long with narrow group 57; sheath base saccate; blades 133 cm. long and 5.6 cm. broad, module 24; dewlaps large squarish crescent, outer surface with medium group 58, inner surface with prominent group 51 and sparse group 52; outer auricle transitional, inner auricle deltoid; ligule narrow-flanged crescent with tall lozenge, 4 mm. high, group 61 very short, dorsal pubescence as sparse 65a.

DISTINGUISHING CHARACTERS.—Red to reddish-green cane with large deltoid buds more or less smooth, prominent groups 10 and 11; narrow root bands with 3 rows of primordia; diagnostic hair groups 57+ -, 65a+ -; large squarish-crescent dewlaps (fig. 42 (73)); deltoid inner auricle; flat-crescent medium-tall ligule.

CLONE 28 N. G. 203**IMP. 655, ACC. 74**

CULMS.—Yellowish green and red striped, with sparse bloom and medium wax bands; internodes concave convex and shouldered, 10 cm. long and 28×29 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 2+4, average width of long cells 10.2μ , stomates present; growth rings striped, medium broad, flush; root bands striped, cylindrical, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with reddish wings, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with broad basal appendage and slightly notched, truncate tip, wing inserted below middle of prophyll, medium broad and not fringed, pubescence medium prominent, outstanding hair groups 10+25, 11+17, 1, 2.

LEAVES.—Sheath 31 cm. long, striped, with heavy bloom and prominent group 57; blades 136 cm. long and 5 cm. broad, module 27; dewlaps ascending ligulate, outer surface with medium group 58, inner surface with small group 51, medium group 52, and inconspicuous 63; outer auricle transitional, inner auricle deltoid; ligule broad-centered subarcuate or arcuate, 3.5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green and red striped cane, with large medium-hairy buds with prominent groups 10+25 and 11+17; narrow root bands; diagnostic hair groups 57+, 63+ - - -; ascending ligulate dewlaps (fig. 43 (74)); deltoid inner auricle; subarcuate or arcuate ligule.

CLONE 28 N. G. 204

IMP. 656, ACC. 75

CULMS.—Dark red, without bloom or wax bands; internodes cylindrical, constricted at side opposite bud, 11 cm. long and 35 mm. across, medium bud furrow, hard white flesh; stem-epidermal pattern 3, average width of long cells 11.4μ , stomates absent, extensive, irregular corky patches; growth rings red, narrow to medium broad, tumescent; root bands red, cylindrical to slightly conoidal, 8 mm. high with 4 rows of primordia; buds red, 12×11 mm., inserted at scar and reaching growth ring; prophyll broad ovate with pointed tip, wing inserted near middle of prophyll, medium broad, pubescence prominent with entire posterior side hairy and anterior side with prominent hair groups 11, 1, 2, and 16.

LEAVES.—Sheaths 32 cm. long smooth or with narrow group 57; blades 137 cm. long and 4.2 cm. broad, module 33; dewlaps large and tall ascending squarish, outer surface with medium group 58 and marginal group 58a, inner surface with prominent group 51 that extends sparingly as group 65 single file toward midrib, prominent dense group 52 and small 63; outer auricle transitional and subtended by a very short 56, inner auricle large calcarate and partly fringed; ligule tall orbicular crescent, 5.5 mm. high, group 61 medium long, dorsal pubescence prominent along flanges.

DISTINGUISHING CHARACTERS.—Dark-red cane with extensive, irregular corky patches, without bloom and with prominent more or less hairy buds in which groups 11 and 10 are conspicuous; 4 rows of root primordia; diagnostic hair groups 52+, 56+ --, 57+ --, 61+ ., 63+ --, 65+ --; large and tall ascending-squarish dewlaps (fig. 43 (75)); large calcarate inner auricle; tall orbicular-crescent ligule.

CLONE 28 N. G. 206

IMP. 499, ACC. 76

CULMS.—Light red, with dark-red stripes when young, becoming greenish yellow, sparse bloom, and medium wax bands; internodes cylindrical and shouldered, 8 cm. long and 29×31 mm. across, medium prominent bud furrow, flesh soft grayish green; stem-epidermal pattern 2+4, average width of long cells 10.6μ , stomates present; growth rings reddish green, medium broad, tumescent; root bands green, cylindrical obconoidal, 7 mm. high with 2 or 3 rows of primordia; buds green with olive wing, 15×9 mm., inserted at scar and extending above growth ring; prophyll long ovate deltoid with apical appendage and pointed tip, wing inserted low, medium to narrow, medium-sparse pubescence, most prominent hair group 10, less prominent 18, 11, 1.

LEAVES.—Sheaths 31 cm. long with narrow group 57; blades 145 cm. long and 5 cm. broad, module 29; dewlaps squarish, outer surface with sparse group 58, inner surface with prominent group 51 and medium or dense group 52, sparse group 63; outer auricle transitional subtended by short 56, inner auricle small calcarate and fringed; ligule narrow-flanged crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red-striped cane becoming green-

ish yellow, with large deltoid slightly hairy buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+., 56+ --, 57+ -, 63+ --; squarish dewlaps (fig. 43 (76)); small calcarate inner auricle; medium-narrow orbicular crescent ligule.

CLONE 28 N. G. 207

IMP. 501, ACC. 77

CULMS.—Olive green becoming greenish yellow, with sparse bloom and medium wax bands; internodes more or less tumescent, 7.5 cm. long and 31×33 mm. across, prominent bud furrow, flesh hard, white; stem-epidermal pattern 2+4, average width of long cells 11.3 μ , stomates present; growth rings olive, narrow, tumescent; root bands green, cylindric and constricted on side opposite bud, 8 and 7 mm. high with 3 or 4 rows of primordia; buds green with olive wing, 10×8 mm., inserted at scar and reaching growth ring; prophyll ovate with slightly pointed tip, wing inserted below middle of prophyll, narrow, pubescence sparse, most outstanding hair groups 10, 11, 1, 16.

LEAVES.—Sheaths 32 cm. long with narrow group 57; blades 158 cm. long and 5.5 cm. broad, module 29; dewlaps ascending large squarish crescent, outer surface with medium group 58, inner surface with prominent group 51 that extends as group 65 single file toward midrib, medium group 52; outer auricle transitional and subtended by a short 56, inner auricle deltoid; ligule narrow-flanged subarcuate with lozenge, 4 mm. high, group 61 very short, dorsal pubescence as sparse 65a.

DISTINGUISHING CHARACTERS.—Olive-green to yellow cane, with prominent bud furrow, small slightly hairy buds, 3 or 4 rows of primordia; diagnostic hair groups 56+ --, 57+ -, 65+ -, 65a+ --; ascending large squarish-crescent dewlaps (fig. 43 (77)); deltoid inner auricle; subarcuate ligule with lozenge.

CLONE 28 N. G. 208

IMP. 498, ACC. 78

CULMS.—Red with narrow green stripes, sparse bloom, medium wax bands, and corky cracks; internodes slightly concave-convex and shouldered, 12 cm. long and 29×31 mm. across, medium bud furrow, flesh olive, soft; stem-epidermal pattern 3+4, average width of long cells 10.8 μ , stomates absent; growth rings striped, broad, tumescent; root bands striped, cylindric, 5 mm. high with 2 or 3 rows of primordia; buds greenish with rose wings, 14×13 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium-prominent secondary wings, pubescence prominent on both sides with all groups represented, hair group 10 prominent but short.

LEAVES.—Sheaths 32 cm. long with medium group 57; blades 149 cm. long and 5 cm. broad, module 30; dewlaps flaring deltoid crescent, outer surface with sparse group 58, inner surface with medium-small group 51, prominent group 52; outer auricle broad transitional subtended by a short 56, inner auricle calcarate and fringed to tip; ligule broad-centered crescent or subarcuate, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with hairy buds having prominent secondary wings; narrow root bands; diagnostic hair groups 52+, 56+ - -, 57+.; flaring deltoid-crescent dewlaps (fig. 43 (78)); calcarate inner auricle; broad-centered subarcuate or crescent ligule.

CLONE 28 N. G. 209

IMP. 657, ACC. 79

CULMS.—Green, sometimes with reddish sunscald when older, with sparse bloom and corky cracks; internodes cylindric to obconoidal, 9 cm. long and 39×43 mm. across, without bud furrow, soft olive flesh; stem-epidermal pattern 2+4, average width of long cells 9.8 μ , stomates present; growth rings olive, narrow, flush; root bands light green, cylindric to obconoidal, 10 mm. high with 4 or 5 rows of primordia; buds greenish olive, 10×9 mm., inserted at scar and reaching growth ring; prophyll ovate with oblique truncate-notched tip, wing inserted below middle of prophyll, broad and basally fringed, hairy, most prominent hair groups 1, 2, 16, 11, 19, basal 4.

LEAVES.—Sheaths 30 cm. long with medium group 57; sheath base of crown leaves with group 69; blades 146 cm. long and 7.6 cm. broad, module 19; dewlaps ascending broad ligulate, outer surface with sparse group 58, inner surface with small group 51 and medium group 52; outer auricle transitional, inner auricle short lanceolate and fringed to tip; ligule broad-centered arcuate or subarcuate, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Thick-stemmed green to reddish cane, with small hairy buds having oblique broad truncate-notched tip; tall root bands; diagnostic hair group 57+.; ascending broad ligulate dewlaps (fig. 43 (79)); short lanceolate inner auricle; broad subarcuate or arcuate ligule.

CLONE 28 N. G. 210

IMP. 658, ACC. 80

CULMS.—Brilliant green and red striped, becoming yellow and red striped without bloom, medium wax bands; internodes 14 cm. long and 28 mm. across, cylindrical or slightly bobbin-shaped, without bud furrow, soft orange flesh; stem-epidermal pattern 3+4, average width of long cells 10.6 μ , stomates absent; growth rings striped, broad, tumescent; root bands striped, cylindric, 7 and 6 mm. high with 4 or 5 rows of primordia; buds green with olive wing, 10×8 mm., inserted at scar and reaching growth ring; prophyll narrow ovate with broad basal appendage and round-pointed tip, wing inserted below middle of prophyll, narrow, pubescence sparse except for base, prominent hair groups 1, 2, basal 4, 16, 19.

LEAVES.—Sheaths striped, 35 cm. long with medium-narrow group 57; blades 120 cm. long and 6 cm. broad, module 20; dewlaps deltoid subcrescent, outer surface with sparse group 58, inner surface with small group 51 and medium-sparse group 52; both auricles transitional or small deltoid, outer one subtended by a very short 56; ligule arcuate or subarcuate, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brilliant green- and red-striped cane, with small basally hairy buds and basally fringed wing; 4 or 5 rows of primordia; diagnostic hair groups 56+ - - -, 57+ -; deltoid-subcrescent dewlaps (fig. 43 (80)); small deltoid or transitional auricles; arcuate or subarcuate narrow ligule.

CLONE 28 N. G. 211

IMP. 502, ACC. 81

CULMS.—Black to deep purple, without bloom; medium wax bands; internodes cylindrical, 14 cm. long and 22 mm. across, small bud furrow, hard orange-brown flesh; stem-epidermal pattern 1+4, average width of long cells 9.8 μ , stomates present; growth rings red, narrow, tumescent; root bands red, cylindrical to conoidal, 7 and 6 mm. high with 4 rows of primordia; buds red, 11 \times 8 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, medium narrow, pubescence sparse, noticeable hair groups 1+16, 10, 11.

LEAVES.—Sheaths 33 cm. long and smooth; blades 147 cm. long and 4.3 cm. broad, module 34; dewlaps ascending ligulate, outer surface with medium-sparse group 58, inner surface with small group 51 and medium-sparse group 52; both auricles sloping transitional; ligule broad-centered orbicular crescent, 5.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Black cane with small slightly hairy buds; narrow root bands; ascending ligulate dewlaps (fig. 43 (81)); transitional auricles; tall orbicular-crescent ligule.

CLONE 28 N. G. 212

IMP. 541, ACC. 82

CULMS.—Yellowish green, reddish when young, sparse bloom, and medium wax bands; internodes cylindrical, 10 cm. long and 28 \times 34 mm. across, small bud furrow; stem-epidermal pattern 3+4+6, average width of long cells 10.6 μ , stomates present; growth rings olive, narrow, tumescent; root bands ivory, cylindrical, 11 and 10 mm. high with 5 or 6 rows of small primordia; buds greenish, 14 \times 11 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, narrow with very small secondary wings, pubescence sparse.

LEAVES.—Sheaths 34 cm. long with medium group 57; blades 147 cm. long and 5.2 cm. broad, module 28; dewlaps large ascending squarish, outer surface with prominent group 58 and marginal group 58a, inner surface with prominent group 51, dense semilong group 52, and small group 63; outer auricle sloping transitional and subtended by a long 56, inner auricle calcarate or short lanceolate and fringed; ligule subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad ovate-deltoid buds; tall root bands, 5 or 6 rows of primordia; diag-

nostic hair groups 52+, 56+, 57+, 58+, 63+ --; large ascending squarish dewlaps (fig. 43 (82)); calcarate or short lanceolate inner auricle; medium-narrow subarcuate ligule.

CLONE 28 N. G. 213

IMP. 659, ACC. 83

CULMS.—Red and yellow striped becoming yellowish green, with sparse bloom and prominent wax bands; internodes cylindric, concave on bud side, 11 cm. long and 29 mm. across, medium bud furrow, soft olive flesh; stem-epidermal pattern 2, average width of long cells 10.4μ , stomates present; growth rings striped, narrow, tumescent; root bands striped, cylindric, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with reddish wings, later red, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, medium broad, pubescence sparse, slightly prominent are hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 35 cm. long with prominent group 57; blades 158 cm. long and 5.5 cm. broad, module 29; dewlaps slightly descending deltoid crescent, outer surface with sparse group 58, inner surface with broad group 51 that extends inconspicuously as group 65 toward midrib, medium group 52; outer auricle transitional, inner auricle short lanceolate; ligule inverted deltoid, 3.5 mm. high, group 61 very short, dorsal pubescence as 65a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brilliant red-and-yellow striped cane, with slightly hairy buds; narrow root bands; diagnostic hair groups 57+, 65+ --, 65a+ --; slightly descending deltoid-crescent dewlaps (fig. 43 (83)); short lanceolate inner auricle; inverted-deltoid ligule.

CLONE 28 N. G. 214

IMP. 660, ACC. 84

CULMS.—Brilliant red, becoming faded reddish brown, with sparse bloom, prominent wax bands, corky cracks; internodes slightly concave on bud side and shouldered, 14 cm. long and 29×35 mm. across, small bud furrow, hard olive flesh; stem-epidermal pattern 1+3, average width of long cells 11μ , stomates present; growth rings ivory olive, medium broad, tumescent; root bands red, cylindric obconoidal, 8 and 6 mm. high with 3 or 4 rows of primordia; buds green with olive wings, later red, 12×11 mm., inserted at scar and extending above growth ring; prophyll broad ovate with small secondary wings, round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence general and prominent.

LEAVES.—Sheaths 33 cm. long with medium-small group 57; blades 144 cm. long and 6 cm. broad, module 24; dewlaps flaring deltoid crescent, outer surface with sparse group 58, inner surface with prominent group 51, and more or less dense group 52; outer auricle deltoid, inner auricle short lanceolate; ligule broad-centered flat crescent or sub-strap-shaped 3.5 mm. high, group 61 very short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Brilliant-red cane with hairy buds having secondary wings; 3 or 4 rows of primordia; diagnostic hair

groups 52+., 57+ -; flaring deltoid-crescent dewlaps (fig. 43 (84)); lanceolate inner auricle; broad-centered flat-crescent ligule.

CLONE 28 N. G. 215

IMP. 542, ACC. 85

CULMS.—Yellowish green with rose flush, becoming darker green, sparse bloom and medium wax bands; internodes slightly concave and shouldered, 10 cm. long and 34 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 2+4, average width of long cells 10.4 μ , stomates absent; growth rings olive, narrow, slightly tumescent; root bands ivory, cylindric, 7 mm. high with 4 to 6 rows of crowded primordia; buds green, 14 \times 12 mm., inserted at scar and extending above growth ring; prophyll broad ovate with blunt serrate tip, wing inserted below middle of prophyll, narrow, emarginate, fading out over tip, pubescence sparse, more or less prominent hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 34 cm. long with medium group 57; sheath base of crown leaves with groups 69 and 64e; blades 140 cm. long and 6.8 cm. broad, module 20; dewlaps tall ascending squarish, outer surface with prominent group 58 and marginal group 58a, inner surface with prominent group 51 that extends as group 65 single file toward midrib, small 63, dense semilong group 52; outer auricle sloping transitional, subtended by a long group 56, inner auricle small calcarate; ligules usually subarcuate or arcuate, 3.5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with broad ovate more or less smooth buds; 4 to 6 rows of root primordia; diagnostic hair groups 52+, 56+, 57+., 58+, 63+ - -, 65+ -; tall ascending-squarish dewlaps (fig. 43 (85)); small calcarate inner auricle; subarcuate ligule.

CLONE 28 N. G. 216

IMP. 661, ACC. 86

CULMS.—Red and bronze striped, with sparse bloom, medium wax bands; internodes cylindric, slightly concave on bud side and shouldered, 11 cm. long and 31 \times 34 mm. across, small bud furrow, grayish-green hard flesh; stem-epidermal pattern 3, average width of long cells 9.6 μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, cylindrical obconoidal, 7 and 6 mm. high with 3 or 4 rows of primordia; buds green with red wings, 12 \times 11 mm., inserted at scar and extending above growth ring, prophyll broad ovate, with pointed tip, wing inserted below middle of prophyll, medium broad, small secondary wings; pubescence prominent.

LEAVES.—Sheaths 34 cm. long with broad short-haired group 57; sheath base of crown leaves with group 59; blades 135 cm. long and 7 cm. broad, module 19; dewlaps flaring deltoid squarish, outer surface with sparse group 58, inner surface with a broad group 51, dense group 52, and small 63; outer auricle deltoid subtended by a short group 56; inner auricle large calcarate; ligule broad-centered subarcuate, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red-and-bronze striped cane with hairy buds having secondary wings; narrow root bands; diagnostic hair groups 52+, 56+ --, 57+, 59+ -, 63+ --; flaring deltoid-squarish dewlaps (fig. 44 (86)); large calcarate inner auricle; broad-centered subarcuate ligule.

CLONE 28 N. G. 217

IMP. 662, ACC. 87

CULMS.—Red becoming red bronze, with sparse bloom, corky cracks, and prominent wax bands; internodes concave on bud side and shouldered, 13 cm. long and 34×35 mm. across, medium prominent bud furrow, grayish-green flesh; stem-epidermal pattern 1+3+4, average width of long cells 10.8 μ , stomates absent; growth rings reddish, medium broad, tumescent; root bands red, cylindric-constricted, 7 and 5 mm. high with 3 rows of crowded primordia; buds green with olive wings, later red, 10×8 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, small secondary wings, prominent pubescence at base and on wings.

LEAVES.—Sheaths 32 cm. long with medium groups 57 and 60; blades 142 cm. long and 3.5 cm. broad, module 28; dewlaps deltoid or squarish deltoid, outer surface with sparse group 58, inner surface with broad group 51, dense semilong group 52, and small 65; outer auricle deltoid, inner auricle calcarate or short lanceolate and fringed; ligule broad-centered crescent, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane becoming red bronze, with hairy buds and narrow root bands; diagnostic hair groups 52+, 57+ ., 60+ -, 65+ -; deltoid or squarish-deltoid dewlaps (fig. 44 (87)); short lanceolate inner auricle; broad-centered crescent ligule.

CLONE 28 N. G. 220

IMP. 495, ACC. 88

CULMS.—Buff with red stripes, sparse bloom and narrow wax bands; internodes slightly bobbin-shaped, 13 cm. long and 33 mm. across, small bud furrow, orange flesh; stem-epidermal pattern 3+4, average width of long cells 10.2 μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped, conoidal on bud side, 8 and 7 mm. high with 3 rows of primordia; buds green edged in red, later red, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate with broad basal appendage and pointed tip, wing inserted below middle of prophyll, narrow at base and fringed, principal pubescence at base, with prominent hair groups 1, 2, 4, 16, 19.

LEAVES.—Sheaths striped, 37 cm. long, with narrow group 57 or smooth; blades 147 cm. long and 6 cm. broad, module 24; dewlaps flaring ligulate, outer surface with semilong marginal group 58, inner surface with medium group 51 and sparse group 52; outer auricle deltoid and subtended by a very short 56, inner auricle small deltoid or short lanceolate; ligule subarcuate to arcuate, medium broad-

centered, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red-striped cane, with medium-large basally hairy buds; 3 irregular rows of root primordia; diagnostic hair groups 56+ ---, 57+ ---; flaring ligulate dewlaps (fig. 44 (88)); deltoid to short lanceolate inner auricle; medium-tall subarcuate to arcuate ligule.

CLONE 28 N. G. 221

IMP. 706, ACC. 89

CULMS.—Greenish yellow with red stripes becoming yellowish, with sparse bloom and medium wax bands; internodes slightly bobbin-shaped, 13 cm. long and 27 mm. across, inconspicuous bud furrow, soft orange flesh; stem-epidermal pattern 3, average width of long cells 9μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped, cylindrical, 7 and 6 mm. high with 3 or 4 rows of crowded primordia; buds green with olive wings, later red, 12×9 mm., inserted at scar and extending to growth ring; prophyll broad ovate with broad basal appendage and narrow truncate-notched tip, wing inserted low, broad, with long prominent fringe; principal pubescence at base, wing covered on both sides with dense short hairs, hair groups 1, 2, 4, 16, 19, prominent.

LEAVES.—Sheaths 36 cm. long with narrow group 57; blades 132 cm. long and 6 cm. broad, module 22; dewlaps narrow squarish subcrescent or double crescent, outer surface with medium group 58, inner surface with medium to sparse groups 51 and 52; both auricles transitional or small deltoid, outer one subtended by a short 56; ligule subarcuate or arcuate, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green-and-red striped cane, with broad ovate buds prominently hairy at base, with broad fringe; narrow root bands; narrow squarish-subcrescent or double-crescent dewlaps (fig. 44 (89)); diagnostic hair groups 56+ ---, 57+ ---; transitional or small deltoid auricles; subarcuate or arcuate ligule.

CLONE 28 N. G. 222

IMP. 664, ACC. 90

CULMS.—Pink with reddish-brown stripes, without bloom, corky cracks, and prominent wax bands; internodes tumescent, 9 cm. long and 39 mm. across, prominent bud furrow, soft olive-gray flesh; stem-epidermal pattern 1+3, average width of long cells 10.4μ , stomates absent; growth rings striped, narrow, flush; root bands striped, tumescent conoidal, 7 and 6 mm. high with 3 or 4 rows of primordia; buds green with red wings, 14×10 mm., inserted above scar and extending above growth ring; prophyll ovate with truncate tip, wing inserted below middle of prophyll, medium broad, prominently fringed, pubescence most prominent at base, outstanding hair groups 1, 2, 4, 16, 11, 10, 19, and especially 18.

LEAVES.—Sheaths striped, 34 cm. long with narrow group 57; blades 135 cm. long and 6.2 cm. broad, module 22; dewlaps large as-

ending squarish, outer surface with medium-sparse group 58, inner surface with prominent group 51 and medium-semilong group 52; outer auricle sloping transitional and subtended by a very short 56, inner auricle transitional or small deltoid; ligule thin-flanged crescent with lozenge 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with short tumescent internodes, prominently fringed buds hairy at base and juncture with outstanding group 18; narrow root bands; diagnostic hair groups 52+, 56+ ---, 57+-; large ascending squarish dewlaps (fig. 44 (90)); transitional auricles; thin-flanged crescent ligule.

CLONE 28 N. G. 223

IMP. 864, ACC. 91

CULMS.—Olive, with red flush, prominent bloom, and merging wax bands; internodes slightly obconoidal, 9.5 cm. long and 26×33 mm. across, without or with small bud furrow, hard olive-green flesh; stem-epidermal pattern 1+6, average width of long cells 10.6 μ , stomates absent; growth rings olive, narrow, flush; root bands ivory green, conoidal, 7 and 5 mm. high with 3 or 4 rows of sparse primordia; buds reddish, 10×9 mm., inserted at scar and extending above growth ring; prophyll squarish with round-pointed tip, wing inserted above middle of prophyll, medium broad and basally fringed, pubescence more or less sparse, prominent 22.

LEAVES.—Sheaths 32 cm. long with medium-prominent group 57; blades 130 cm. long and 5.5 cm. broad, module 23; dewlaps deltoid crescent or squarish, outer surface with medium group 58, inner surface with broad group 51 and dense group 52; outer auricle transitional to deltoid, inner auricle long lanceolate and fringed to tip; ligule narrow-flanged crescent with lozenge, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-red cane, with squarish buds prominently fringed in lower half of wing and with prominent group 22; narrow root bands with 3 or 4 rows of sparse primordia; diagnostic hair groups 52+, 57+.; deltoid-crescent or squarish dewlaps (fig. 44 (91)); long lanceolate inner auricle; tall narrow-flanged crescent ligule with tall lozenge.

CLONE 28 N. G. 224

IMP. 980, ACC. 92

CULMS.—Red and green striped, with sparse bloom and prominent wax bands; internodes somewhat bobbin-shaped, 15 cm. long and 22×27 mm. across, without bud furrow, orange flesh; stem-epidermal pattern 2, average width of long cells 9 μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, cylindrical, 8 and 7 mm. high with 3 rows of primordia; buds when young green, edged in olive, later red, 10×9 mm., inserted at scar and reaching growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad,

prominently fringed, principal pubescence at base, outstanding hair groups 1, 2, 4, 16, 19, and 24, as in 28 N. G. 221.

LEAVES.—Sheath 38 cm. long with narrow group 57; blades 120 cm. long and 6 cm. broad, module 20; dewlap narrow double crescent or squarish subcrescent, outer surface with medium-sparse group 58, inner surface with small or medium group 51 and sparse group 52; both auricles transitional or small deltoid, outer one subtended by a short 56; ligule arcuate, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with small buds hairy at base, prominently fringed and with prominent 24; medium root bands; diagnostic hair groups 56+ --, 57+ --, 59+ -; narrow double-crescent or squarish-subcrescent dewlaps (fig. 44 (92)); transitional or small deltoid auricles; arcuate ligule.

CLONE 28 N. G. 256

IMP. 665, ACC. 93

CULMS.—Brownish red, sparse bloom and heavy wax bands; internodes cylindrical, 11 cm. long and 29×31 mm. across, prominent bud furrow, soft grayish-green flesh; stem-epidermal pattern 1+3, average width of long cells 9.2 μ , stomates absent; growth rings reddish green, narrow, tumescent; root bands rose, cylindrical, 9 and 7 mm. high with 3 or 4 rows of crowded primordia; buds green with olive wing, later red, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and truncate tip, wing inserted below middle of prophyll, medium broad, secondary wings may be present, pubescence sparse, hair groups 10, 11, 16, 19 evident.

LEAVES.—Sheaths 36 cm. long with heavy bloom and narrow group 57; blades 138 cm. long and 5.8 cm. broad, module 24; dewlaps deltoid, outer surface with sparse group 58, inner surface with medium group 51 and dense group 52; both auricles deltoid to short lanceolate; ligule broad orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Brownish-red cane with prominent bud furrow, medium-large buds with sparse pubescence; medium-tall root bands; diagnostic hair groups 52+, 57+ --; deltoid dewlaps (fig. 44 (93)); deltoid or short lanceolate auricles; tall orbicular-crescent ligule.

CLONE 28 N. G. 257

IMP. 666, ACC. 94

CULMS.—Yellowish green sometimes with red sunscald, sparse bloom, corky cracks, and medium wax bands; internodes cylindrical and shouldered, 10 cm. long and 34 mm. across, without bud furrow, hard gray-green flesh; stem-epidermal pattern 1, average width of long cells 12 μ , stomates absent; growth rings greenish olive, narrow, tumescent; root bands cylindrical conoidal, 10 and 8 mm. high with 3 rows of primordia; buds greenish red, 10×10 mm., inserted at scar and reaching growth ring; prophyll roundish with prominent basal appendage and crescent-serrate tip, wing inserted near middle of

prophyll, broad at base and fading toward tip, pubescence somewhat sparse, hair groups 1, 16, 19, 22 evident.

LEAVES.—Sheaths 37 cm. long with medium group 57; blades 143 cm. long and 5.4 cm. broad, module 26; dewlaps deltoid or squarish crescent, outer surface with medium group 58, inner surface with prominent group 51, medium-dense group 52, and small 63; outer auricle transitional, inner auricle small deltoid or calcarate; ligule broad crescent to strap-shaped, 4.5 mm. high, group 61 medium short, dorsal pubescence as inconspicuous 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with plump roundish buds; tall root bands; diagnostic hair groups 55a+ - -, 57+., 63+ - -; deltoid or squarish-crescent dewlaps (fig. 44 (94)); deltoid or calcarate inner auricle; broad crescent or tapering strap-shaped ligule.

CLONE 28 N. G. 259

IMP. 545, ACC. 95

CULMS.—Dark red and yellow striped, with sparse bloom and prominent wax bands; internodes concave on bud side and shouldered, 9.5 cm. long and 27×30 mm. across, without bud furrow, hard orange flesh; stem-epidermal pattern 1+3, average width of long cells 10.4 μ , stomates present; growth rings striped, medium broad, flush; root bands striped, cylindrical conoidal, 12 mm. high with 5–6 rows of primordia; buds greenish red, 17×12 mm., inserted at scar and extending above growth ring; prophyll deltoid ovate with round-pointed tip, wing inserted below middle of prophyll with secondary wings occasionally present, pubescence general and prominent.

LEAVES.—Sheath striped, 30 cm. long, with broad group 57; blades 110 cm. long and 5 cm. broad, module 22; dewlaps deltoid double crescent, outer surface with dense group 58, inner surface with medium group 51, dense group 52, and sparse to medium 63; outer auricle deltoid, inner auricle large calcarate; ligule broad-centered shallow crescent, 3.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Red-and-yellow striped cane, with large hairy buds; very tall root bands; diagnostic hair groups 52+, 57+, 58+, 63+.-; deltoid double-crescent dewlaps (fig. 44 (95)); large calcarate inner auricle; medium-broad crescent ligule.

CLONE 28 N. G. 260

IMP. 494, ACC. 96

CULMS.—Olive yellow, with sparse bloom and medium wax bands; internodes cylindric, slightly concave on bud side and shouldered, 12 cm. long and 25×32 mm. across, prominent bud furrow, hard flesh; stem-epidermal pattern 3+4, average width of long cells 9 μ , stomates absent; growth rings olive red, medium broad, tumescent; root bands greenish, conoidal, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with red wings, 17×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of

prophyll, medium wide, pubescence more or less general but not heavy, important hair groups 10, 11, 1.

LEAVES.—Sheath 33 cm. long with heavy bloom, smooth; sheath base slightly decurrent; blades 134 cm. long and 4.4 cm. broad, module 30; dewlaps double crescent or crescent subcrescent, outer surface with medium group 58, inner surface with medium groups 51 and 52; both auricles sloping transitional; ligule broad-centered crescent or subarcuate, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Olive-yellow cane with large somewhat hairy buds; medium to narrow root bands; double-crescent or crescent-subcrescent dewlaps (fig. 44 (96)); transitional auricles; broad subarcuate ligule.

CLONE 28 N. G. 261

IMP. 500, ACC. 97

CULMS.—Yellowish green, with heavy bloom and merging wax bands, internodes cylindrical, 13 cm. long and 35 mm. across, small bud furrow, soft gray flesh; stem-epidermal pattern 2+3+4, average width of long cells 8.9μ , stomates absent; growth rings green, narrow, flush; root bands green, cylindrical conoidal, 11 mm. high with 4 or 5 rows of primordia; buds green edged in red, 10×7 mm., inserted at scar and reaching growth ring; prophyll narrow ovate with broad basal appendage and truncate-serrate tip, wing inserted below middle of prophyll, very broad and smooth, pubescence sparse, prominent hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 32 cm. long with broad group 57; blades 145 cm. long and 5.9 cm. broad, module 24; dewlaps red, steeply ascending ligulate, outer surface with medium-dense group 58, inner surface with small group 51, dense semilong group 52; outer auricle transitional, subtended by a long group 56, inner auricle short lanceolate; ligule thin-flanged orbicular-crescent with lozenge, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with heavy bloom; small broad-winged buds with more or less sparse pubescence; diagnostic hair groups 52+, 56+, 57+; red, steeply ascending ligulate dewlaps (fig. 44 (97)); transitional auricles; thin-flanged orbicular-crescent ligule with shallow lozenge.

CLONE 28 N. G. 262

IMP. 493, ACC. 98

CULMS.—Red with green stripes becoming yellowish green, with sparse bloom and broad wax bands; internodes cylindrical, slightly concave on bud side, 12 cm. long and 28 mm. across, medium-prominent bud furrow, soft greenish flesh; stem-epidermal pattern 3+4, average width of long cells 8.6μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, slightly conoidal, 7 mm. high with 2 or 3 rows of primordia; buds green with red wings, later red, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-

pointed tip, wing inserted near middle of prophyll, medium wide, pubescence medium, principal hair groups 1+16, 10, 11.

LEAVES.—Sheaths striped, 38 cm. long, smooth; blades 145 cm. long and 5.3 cm. broad, module 27; dewlaps narrow squarish crescent, outer surface with sparse group 58, inner surface with medium group 51 and somewhat prominent group 52; outer auricle transitional, inner auricle blunt deltoid; ligule broad-centered crescent, 6 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane with green or yellow stripes, large medium-hairy buds with prominent groups 10, 11, and 1+16; narrow conoidal root bands; narrow squarish-crescent dewlaps (fig. 44 (98)); blunt deltoid inner auricle; broad crescent ligule.

CLONE 28 N. G. 263

IMP. 492, ACC. 98A

CULMS.—Red and tan striped, with prominent bloom, corky cracks, and narrow wax bands; internodes cylindrical, sharply constricted in region of root band, 12 cm. long and 30×44 mm. across, shallow bud furrow; stem-epidermal pattern 1+3+4, average width of long cells 10.5 μ , stomates absent; growth rings striped, more or less narrow, flush; root bands striped, constricted, 8 and 7 mm. high with 3 rows of primordia; buds reddish, 12×11 mm., inserted at scar and reaching growth ring; prophyll ovate with large basal appendage and pointed tip, wing inserted near middle of prophyll, broad at base and emarginate, pubescence sparse, prominent hair groups 1, 19.

LEAVES.—Sheaths striped, 34 cm. long with narrow group 57; blades 140 cm. long and 7.5 cm. broad, module 19; dewlaps flaring ascending ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle deltoid, inner auricle small deltoid or calcarate; narrow-flanged orbicular crescent ligule with tall lozenge, 6 mm. high, group 61 very short, dorsal pubescence inconspicuous in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red-and-tan striped cane, with large ovate, basally broad-winged more-or-less smooth buds; medium-broad conoidal root bands; diagnostic hair group 57+-; flaring ascending-ligulate dewlaps (fig. 44 (98a)); small deltoid or calcarate inner auricle; very tall orbicular-crescent ligule.

CLONE 28 N. G. 264

IMP. 667, ACC. 99

CULMS.—Yellowish green, with sparse bloom and medium wax bands; internodes cylindrical, 13 cm. long and 30×29 mm. broad, prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+3, average width of long cells 10.2 μ , stomates absent; growth rings green, narrow, flush; root bands green, cylindrical, 8 mm. high with 3 rows of primordia; buds greenish red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, medium wide; pubescence medium prominent, hair groups 10, 11, 1, 2, 19 evident.

LEAVES.—Sheaths 34 cm. long with prominent group 57; blades 154 cm. long and 5.3 cm. broad, module 29; dewlaps ascending squarish, outer surface with medium group 58 and inner surface with small group 51 and sparse group 52; outer auricle transitional or small deltoid, inner auricle long lanceolate and partly fringed; ligule tall narrow-flanged crescent or broad-centered crescent, 4.5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with prominent bud furrow; medium-hairy ovate buds with prominent groups 10, 11, 1, 2; medium-tall root bands; diagnostic hair group 57+; ascending-squarish dewlaps (fig. 45 (99)); long lanceolate inner auricle; tall narrow-flanged crescent ligule.

CLONE 28 N. G. 265

IMP. 546, ACC. 100

CULMS.—Light brown becoming greenish yellow, with sparse bloom and slightly merging wax bands; internodes cylindrical or slightly obconoidal and shouldered, 11 cm. long and 24×28 mm. across, without or with small bud furrow, somewhat hard light-olive flesh; stem-epidermal pattern 7+3+4, average width of long cells 8.3 μ , stomates absent; growth rings olive, narrow, flush; root bands ivory reddish, conoidal, 8 and 7 mm. tall with 2 or 3 rows of primordia; buds green with reddish wings, 15×12 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, medium broad, pubescence medium prominent, hair groups 10, 11, 1, 2, 16, basal 4 evident.

LEAVES.—Sheaths 34 cm. long, smooth; blades 145 cm. long and 6 mm. broad, module 24; dewlaps shallow deltoid, outer surface with medium group 58, inner surface with prominent group 51, small 65, and dense group 52; outer auricle transitional, inner auricle small calcarate; ligule broad-centered crescent or tapering strap-shaped, 5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with prominent medium-hairy buds with outstanding hair groups 10 and 11; medium-tall root bands; diagnostic hair group 52+, 65+--; shallow deltoid dewlaps (fig. 45 (100)); calcarate inner auricle; tapering strap-shaped ligule.

CLONE 28 N. G. 266

IMP. 547, ACC. 101

CULMS.—Dark red, with sparse bloom and prominent wax bands; internodes cylindrical, concave on bud side, 10 cm. long and 24×27 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 1+3+4, average width of long cells 8.3 μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindrical, 8 and 7 mm. high with 2 or 3 rows of primordia; buds green with red wings, later all red, 15×11 mm., inserted at scar and extending above growth ring; prophyll long ovate with pointed tip, wing inserted near middle

of prophyll, narrow, fringed, medium-prominent pubescence, outstanding hair groups 10, 11, 22, 8, 1, 2, 4, 16.

LEAVES.—Sheaths 32 cm. long, smooth; blades 121 cm. long and 4.3 cm. broad, module 28; dewlaps shallow deltoid, outer surface with medium group 58, inner surface with small group 51, sparse 65, and dense group 52; outer auricle transitional, inner auricle calcarate; ligule tapering strap-shaped or flat crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with large medium-hairy buds with outstanding groups 10, 11, and 4; more or less narrow root bands; diagnostic hair groups 52+, 65+-; shallow deltoid dewlaps (fig. 45 (101)); calcarate inner auricle; tapering strap-shaped ligule.

CLONE 28 N. G. 267

IMP. 548, ACC. 102

CULMS.—Yellow and green striped, with sparse bloom and medium wax bands; internodes cylindric, 10 cm. long and 27 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 2+4, average width of long cells 9.2μ , stomates absent; growth rings striped, medium broad, flush; root bands striped, cylindric, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with olive wings, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium narrow, slightly emarginate, pubescence very sparse, hair groups 1, 16, and 19 evident.

LEAVES.—Striped sheaths 33 cm. long, smooth; sheath base of crown leaves with group 69; blades 116 cm. long and 4.8 cm. broad, module 24; dewlaps more or less flaring deltoid, outer surface with medium group 58, inner surface with small group 51, sparse group 52, and small group 63; outer auricle transitional, inner auricle calcarate; ligule flat crescent with shallow lozenge, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with smooth ovate buds; narrow root bands; diagnostic hair groups 63+-- , 69+; slightly flaring deltoid dewlaps (fig. 45 (102)); calcarate inner auricle; narrow crescent ligule.

CLONE 28 N. G. 268

IMP. 668, ACC. 103

CULMS.—Dark purplish red, with sparse bloom, prominent wax bands, corky cracks; internodes tumescent, 9 cm. long and 33×35 mm. across, small bud furrow, hard green-olive flesh; stem-epidermal pattern 1+6, average width of long cells 13μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindric obconoidal, 10 and 9 mm. high with 4 or 5 rows of primordia; buds green with red wings, later all red, 10×9 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, more or less narrow, pubescence sparse, hair groups 11, 22, 16, and 19 outstanding.

LEAVES.—Sheath 31 cm. long with medium group 57; blades 135 cm. long and 7.5 cm. broad, module 18; dewlaps slightly ascending squarish, outer surface with dense group 58, inner surface with small group 51 and short dense group 52; outer auricle ascending transitional, inner auricle small calcarate and partly fringed; ligule thin-flanged crescent with lozenge, 4 mm. high, group 61 very short, dorsal pubescence sparse in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark purplish-red cane, with medium-ovate slightly hairy buds; tall root bands with many rows of primordia; diagnostic hair groups 52+, 57+, 58+; slightly ascending squarish dewlaps (fig. 45 (103)); small calcarate inner auricle; crescent ligule with more or less prominent lozenge.

CLONE 28 N. G. 269

IMP. 977, ACC. 104

CULMS.—Yellowish green with faint red flush, sparse bloom and prominent wax bands; internodes cylindrical or slightly obconoidal, 11 cm. long and 27×29 mm. across, medium-prominent bud furrow, flesh olive green, soft; stem-epidermal pattern 2, average width of long cells 8.7 μ , stomates absent; growth rings olive, broad, flush or slightly tumescent; root bands green, cylindrical conoidal, 7 mm. high with 4 rows of primordia; buds green, edged in red, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and truncate-notched tip, wing inserted below middle of prophyll, medium broad, pubescence very sparse, group 1 evident.

LEAVES.—Sheaths 31 cm. long with narrow group 57; sheath base with group 69; blades 140 cm. long and 5.5 cm. broad, module 25; dewlaps tall flaring deltoid, outer surface with prominent group 58, inner surface with small group 51, dense group 52; outer auricle sloping transitional, subtended by a short 56, inner auricle short lanceolate and fringed to tip; ligule subarcuate, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with faint red flush, prominent smooth buds; 4 rows of root primordia; diagnostic hair groups 52+, 56+ --, 57+ -, 58+, 69+ -; tall flaring deltoid dewlaps (fig. 45 (104)); short lanceolate inner auricle; medium-narrow subarcuate ligule.

CLONE 28 N. G. 273

IMP. 671, ACC. 105

CULMS.—Greenish yellow, with sparse bloom and prominent wax bands; internodes cylindrical and shouldered, 10 cm. long and 24×28 mm. across, medium bud furrow, soft olive-gray flesh; stem-epidermal pattern 1+3, average width of long cells 9.4 μ , stomates absent; growth rings greenish, medium broad, flush; root bands green, obconoidal, 8 and 7 mm. high with 3 or 4 rows of primordia; buds green, 9×7 mm., inserted at scar and reaching growth ring; prophyll roundish or short ovate with round-pointed tip, wing inserted slightly above middle of prophyll, medium broad and covered on both sides with prominent medium-short hair, pubescence in general sparse.

LEAVES.—Sheath 29 cm. long with heavy bloom and narrow group 57; sheath base of crown leaves with groups 59 and 69; blades 142 cm. long and 5.5 cm. broad, module 26; dewlaps squarish and slightly crescent, outer surface with medium-sparse groups 58 and 58a, inner surface with prominent group 51 that extends as a sparse group 65 toward midrib, medium-sparse group 52; outer auricle transitional, inner auricle short lanceolate and partly fringed; ligule flat shallow crescent, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with short ovate or roundish buds, wings covered with dense semishort hair; 3 or 4 rows of root primordia; diagnostic hair groups 57+ -, 59+ -, 65+ -, 65a+ -, 69+; squarish and slightly crescent dewlaps (fig. 45 (105)); short lanceolate inner auricle; flat shallow crescent ligule.

CLONE 28 N. G. 274

IMP. 672, Acc. 106

CULMS.—Dark red, with medium heavy bloom and merging wax bands; internodes slightly tumescent conoidal, 13 cm. long and 28 mm. across, small bud furrow, soft greenish flesh; stem-epidermal pattern 1+4+3, average width of long cells 9.1μ , stomates absent; growth rings ivory, medium broad, flush; root bands ivory, cylindric, 8 and 7 mm. high with 3 rows of primordia; buds green, later red, 10×9 mm., inserted at scar and extending above growth ring; prophyll ovate with broad basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, emarginate, medium hairy with prominent hair groups 10, 11, 1, 16, 19, 18.

LEAVES.—Sheaths 28 cm. long with broad group 57; blades 134 cm. long and 5.3 cm. broad, module 25; dewlaps ascending squarish or ligulate, outer surface with dense group 58, inner surface with prominent group 51, dense group 52, and small group 63; outer auricle transitional, inner auricle small deltoid; ligule very narrow subarcuate, 2 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with small medium-hairy buds having prominent groups 10 and 11; 3 rows of root primordia; diagnostic hair groups 52+, 57+, 58+, 63+ - -; ascending squarish or ligulate dewlaps (fig. 45 (106)); small deltoid inner auricle; very narrow subarcuate ligule.

CLONE 28 N. G. 279

IMP. 673, Acc. 107

CULMS.—Pale brown and red striped, with sparse bloom and prominent wax bands; internodes obconoidal, 11 cm. long and 28 mm. across, prominent bud furrow, olive flesh; stem-epidermal pattern 1+3, average width of long cells 8.9μ , stomates absent; growth rings striped, broad, flush; root bands striped, cylindric-constricted, 6 and 5 mm. high with 2 rows of sparse primordia, corky cracks across primordia; buds green with olive-red wings, later all red, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate

with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, narrow, pubescence more or less sparse, outstanding groups 10, 17, 1, 2, 11.

LEAVES.—Sheaths 34 cm. long and smooth; blades 140 cm. long and 7 cm. broad, module 20; dewlaps shallow deltoid crescent, outer surface with sparse group 58, inner surface with prominent group 51 and sparse 65, and dense semilong group 52; both auricles sloping transitional; ligule broad-centered subarcuate, 5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brown-and-red striped cane with slightly hairy buds; narrow root bands with corky cracks across root primordia; diagnostic hair groups 52+, 65+ - -; shallow deltoid-crescent dewlaps (fig. 45 (107)); transitional auricles; tall subarcuate ligule.

CLONE 28 N. G. 280

IMP. 674, ACC. 108

CULMS.—Reddish brown, with medium bloom and merging wax bands; internodes cylindrical to slightly obconoidal, 9 cm. long and 27×31 mm. across, without bud furrow, soft olive flesh; stem-epidermal pattern 1+3, average width of long cells 11 μ , stomates absent, extensive corky patches; growth rings greenish red, narrow, flush; root bands red, somewhat conoidal, 10 and 8 mm. high with 4 or 5 rows of primordia; buds green with red-olive wing, later all red, 11×10 mm., inserted at scar and extending above growth ring; prophyll roundish oval with round-pointed tip, wing inserted above middle of prophyll, fading out over tip, pubescence prominent, hair groups 1, 16, 11, 10, 13, 14, 19, 22, and 8 outstanding.

LEAVES.—Sheaths 30 cm. long with medium groups 57 and 60; sheath base with group 59; blades 145 cm. long and 4.5 cm. broad, module 26; dewlaps squarish crescent, outer surface with medium group 58 and small marginal group 58a, inner surface with prominent group 51 and medium group 52; outer auricle small deltoid, inner auricle short lanceolate; ligule medium broad-centered subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Reddish-brown cane, with oval more or less hairy buds having prominent wing pubescence and outstanding group 19; tall root bands with 4 or 5 rows of primordia; diagnostic hair groups 57+., 59+ -, 60+; squarish-crescent dewlaps (fig. 45 (108)); short lanceolate inner auricle; medium-broad subarcuate ligule.

CLONE 28 N. G. 282

IMP. 675, ACC. 109

CULMS.—Green and yellow striped, with sparse bloom and medium wax bands; internodes cylindrical and shouldered, 7 cm. long and 28 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 3+4, average width of long cells 10.4 μ , stomates absent; growth rings striped, narrow, flush; root bands green, cylindrical conoidal, 11 mm. high with 3 or 4 rows of primordia; buds green with olive wings,

11×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed or truncate tip, wing inserted near middle of prophyll, broad, pubescence very sparse, hair groups 1, 16, and 19 outstanding.

LEAVES.—Sheaths striped, 32 cm. long and smooth; blades 140 cm. long and 4 cm. broad, module 35; dewlaps squarish deltoid, outer surface with medium sparse group 58, inner surface with medium groups 51 and 52 and small group 63; outer auricle deltoid, inner auricle medium-long lanceolate and fringed to tip; ligule flat or narrow orbicular crescent, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green-and-yellow striped cane, with short internodes, medium large, smooth buds and tall root bands; diagnostic hair group 63+ - -; squarish-deltoid dewlaps (fig. 45 (109)); medium-long lanceolate inner auricle; narrow crescent ligule.

CLONE 28 N. G. 284

IMP. 551, ACC. 110

CULMS.—Inconspicuously red striped on olive green, becoming dark red, sparse bloom and broad wax bands; internodes cylindrical to slightly bobbin-shaped, 8 cm. long and 24×26 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 2+3, average width of long cells 9.4 μ , stomates absent; growth rings rose, medium broad, tumescent; root bands reddish, tumescent conoidal, 9 and 8 mm. high with 4 rows of primordia; buds green with reddish wings, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed or narrow truncate-notched tip, wing inserted below middle of prophyll, notched and fringed at base, pubescence very sparse, more or less prominent hair groups 1, 16, 19, 18, basal 4.

LEAVES.—Sheaths 32 cm. long, narrow group 57; blades 147 cm. long and 4.3 cm. broad, module 34; dewlaps crescent squarish deltoid, outer surface with dense group 58 and small group 58a, inner surface with small group 51 and dense group 52; outer auricle transitional, subtended by a short 56, inner auricle calcarate; ligule narrow arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Olive-green cane, becoming red, with smooth basally fringed buds; 4 rows of root primordia; diagnostic hair groups 52+, 56+ - -, 57+ -, 58+; crescent squarish-deltoid dewlaps (fig. 45 (110)); calcarate inner auricle; narrow arcuate ligule.

CLONE 28 N. G. 285

IMP. 552, ACC. 111

CULMS.—Red, with heavy bloom and broad merging wax bands; internodes slightly concave obconoidal, 8 cm. long and 28×29 mm. across, medium bud furrow, more or less hard green-olive flesh; stem-epidermal pattern 1+4+3, average width of long cells 10.6 μ , stomates absent; growth rings greenish red, narrow, flush, root bands reddish, conoidal, 8 mm. high with 2 or 3 rows of primordia; buds green with reddish wings, later all red, 17×10 mm., inserted at scar and extending

above growth ring; prophyll long ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, very narrow at base, prominently fringed, pubescence more or less prominent, outstanding hair groups 10, 11, 1, 2, 17, 19, 18, 4.

LEAVES.—Sheaths 36 cm. long and smooth; blades 157 cm. long and 4.6 cm. broad, module 34; dewlaps shallow deltoid, outer surface with sparse group 58, inner surface with medium groups 51, 65, and 52; outer auricle deltoid or transitional, inner auricle small calcarate and fringed to tip; ligule broad-centered subarcuate, 4.5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with large more or less hairy buds; 2 rows of sparse root primordia; diagnostic hair group 65+-; shallow deltoid dewlaps (fig. 45 (111)); small calcarate inner auricle; broad-centered subarcuate ligule.

CLONE 28 N. G. 287

IMP. 676, ACC. 111A

CULMS.—Dark purplish red, with heavy bloom and merging wax bands; internodes cylindric, 7 cm. long and 36×38 mm. across, medium bud furrow, soft light-orange flesh; stem-epidermal pattern 3, average width of long cells 11 μ , stomates absent; growth rings red, narrow, tumescent; root bands red, constricted, 8 and 6 mm. broad with 2 rows of primordia; buds red, 14×12 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing medium broad, lobed, and emarginate at base, pubescence more or less sparse, with groups 11, 10, 16, 19, and 1 evident.

LEAVES.—Sheaths 27 cm. long, with medium short-haired group 57; blades 140 cm. long and 5.5 cm. broad, module 25; sheath base with sectorial 59; dewlaps ascending squarish crescent or tall deltoid crescent, outer surface with sparse group 58, inner surface with narrow group 51 and medium group 52; outer auricle sloping transitional and subtended by a short group 56, inner auricle small calcarate inserted low; ligule crescent, 3 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark purplish-red cane, with short thick internodes; ovate, slightly hairy buds; narrow root bands with 2 rows of primordia; diagnostic hair groups 56+-, 57+., 59+-; ascending squarish-crescent or tall deltoid-crescent dewlaps (fig. 45 (111a)); small calcarate inner auricle; narrow crescent ligule.

CLONE 28 N. G. 288

IMP. 554, ACC. 112

CULMS.—Green and yellow striped, with sparse bloom, corky cracks, and narrow wax bands; internodes cylindric, 14 cm. long and 35×40 mm. across, prominent bud furrow, light-olive flesh; stem-epidermal pattern 1+4, average width of long cells 10 μ , stomates present; growth rings ivory green, medium broad, flush; root bands green, conoidal, 9 and 7 mm. high with 4 rows of crowded primordia; buds green, 17×15 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed

or truncate-notched tip; wing inserted below middle of prophyll, medium wide, emarginate, pubescence sparse.

LEAVES.—Sheaths 28 cm. long with narrow group 57; blades 122 cm. long and 6.2 broad, module 20; dewlaps large ascending squarish, outer surface with prominent groups 58 and 58a, inner surface with small group 51 and medium group 52; outer auricle transitional and subtended by a short 56, inner auricle short lanceolate; ligule narrow crescent or shallow subarcuate, 3 mm. high, group 61 very short, dorsal pubescence sparse semiadnate.

DISTINGUISHING CHARACTERS.—Green-and-yellow striped cane, with large more or less smooth buds; 4 rows of crowded root primordia; diagnostic hair groups 56+—, 57+—, 58+; large ascending squarish dewlaps (fig. 45 (112)); lanceolate inner auricle; narrow crescent ligule.

CLONE 21 N. G. 1

IMP. 308, ACC. 113

CULMS.—Purple, with heavy bloom and merging wax bands; internodes cylindrical, 11 cm. long and 28×29 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 1+4+3, average width of long cells 10 μ , stomates absent; growth rings greenish red, narrow, flush; root bands greenish red, cylindrical conoidal, 8 and 6 mm. high with 2 or 3 rows of primordia; buds reddish, 12×9 mm., inserted below scar and extending above growth ring; prophyll ovate with long medium-narrow truncate tip, pubescence more or less prominent, important hair groups are 10, 11, 1, 16, 4, 19, 2, 8.

LEAVES.—Sheath 33 cm. long and smooth; sheath base slightly decurrent; blades 126 cm. long and 4.7 cm. broad, module 27; dewlaps flaring deltoid, outer surface with medium-sparse group 58, inner surface with prominent groups 51 and 52; outer auricle broad transitional, inner auricle small calcarate and fringed; ligule broad-centered crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane, with heavy bloom and prominent bud furrow; large more or less hairy buds with outstanding groups 10 and 11; 2 or 3 rows of root primordia; diagnostic hair group 52+; flaring deltoid dewlaps (fig. 46 (113)); calcarate inner auricle; broad-centered crescent ligule.

CLONE 21 N. G. 2

IMP. 309, ACC. 114

CULMS.—Greenish yellow to lemon yellow, with sparse bloom and broad wax bands; internodes bobbin-shaped with prominent nodal region, 14 cm. long and 32 mm. across, medium bud furrow, soft greenish flesh; stem-epidermal pattern 2, average width of long cells 10 μ , stomates present; growth rings olive, narrow, tumescent; root bands greenish, conoidal, 11 and 10 mm. high with 4 rows of primordia; buds green, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with medium-prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll,

narrow at base, pubescence of anterior side more or less prominent, outstanding hair groups 1, 2, 16, 11.

LEAVES.—Sheaths 37 cm. long with narrow group 57; blades 133 cm. long and 7 cm. broad, module 19; dewlaps tall squarish or squarish deltoid, outer surface with prominent dense group 58 and marginal group 58a, inner surface with prominent group 51, which extends to midrib, and dense semilong group 52; outer auricle transitional, inner auricle short lanceolate and fringed to tip; ligule thin-flanged and broad-centered subarcuate or crescent, 4 mm. high, group 61 medium tall, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Greenish-yellow to lemon-yellow cane, with prominent nodal regions; large buds with prominent anterior pubescence in which groups 1, 2, 16, and 11 are outstanding (fig. 33); broad root bands; diagnostic hair groups 52+, 55a+ -, 57+ --, 58+, 61+ ., 65+ -; tall squarish or squarish deltoid dewlaps (fig. 46 (114)); short lanceolate inner auricle; broad crescent or subarcuate ligule.

CLONE 21 N. G. 3

IMP. 310, ACC. 115

CULMS.—Light brownish green to yellowish green, with sparse bloom and prominent wax bands; internodes cylindric concave and shouldered, 10 cm. long and 31×33 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 2+4, average width of long cells 10 μ , stomates present; growth rings olive, narrow, flush; root bands ivory green, cylindric, 7 and 6 mm. high with 3 or 4 rows of crowded primordia; buds green with red tip and olive wings, 16×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, medium hairy, most outstanding are groups 10, 1, 16, 11, 4, 19, 18.

LEAVES.—Sheaths 35 cm. long with heavy bloom, smooth; blades 157 cm. long and 4.6 cm. broad, module 34; dewlaps narrow squarish subrescent, outer surface with medium group 58 and marginal group 58a, inner surface with prominent group 51, dense group 52, and medium groups 55 and 63; outer auricle transitional, inner auricle medium-long lanceolate and fringed; ligule orbicular crescent, 4 mm. high, group 61 short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brownish-green cane, with prominent more or less hairy buds (fig. 33); narrow root bands; diagnostic hair groups 52+, 55+ -, 55a+ -, 63+ .; narrow squarish-subrescent dewlaps (fig. 46 (115)); medium-long lanceolate inner auricle; orbicular-crescent broad ligule.

CLONE 21 N. G. 4

IMP. 311, ACC. 116

CULMS.—Tan, becoming olive green to yellowish green, with sparse bloom and prominent wax bands; internodes concave cylindric, 12 cm. long and 30 mm. across, medium bud furrow, hard olive flesh;

stem-epidermal pattern 2+3+4, average width of long cells 10.6μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindrical, 8 and 7 mm. high with 3 or 4 rows of primordia; buds greenish rose, 18×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, more or less broad, sparingly fringed, pubescence sparse, prominent hair groups 16 and 9.

LEAVES.—Sheaths 36 cm. long and smooth; sheath base slightly decurrent; blades 160 cm. long and 7 cm. broad, module 27; dewlaps ascending squarish ligulate, outer surface with dense group 58, inner surface with medium group 51, dense semilong group 52, and small 63; outer auricle transitional, inner auricle short lanceolate and fringed; ligule narrow orbicular crescent, 3 mm. high, group 61 short; dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-green cane, with large more or less smooth buds; 3 or 4 rows of root primordia; diagnostic hair groups 52+, 58+, 63+; ascending squarish-ligulate dewlaps (fig. 46 (116)); short lanceolate inner auricle; narrow orbicular-crescent ligule.

CLONE 21 N. G. 5

IMP. 312, Acc. 117

CULMS.—Olive with red blush, sparse bloom and prominent wax bands; internodes cylindrical, 12 cm. long and 27×28 mm. across, medium prominent bud furrow, soft white flesh; stem-epidermal pattern 3+4+6, average width of long cells 10μ , stomates absent; growth rings olive, narrow, slightly tumescent; root bands yellow green, cylindrical, 8 and 7 mm. high, with 5 rows of crowded primordia; buds green with rose-colored base, later all red, plump, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad, prominently fringed, medium hairy, outstanding hair groups 1+16, 10, 4, 11, 24.

LEAVES.—Sheaths 35 cm. long and smooth; blades 132 cm. long and 4.7 cm. broad, module 28; dewlaps crescent deltoid, outer surface with sparse group 58, inner surface with prominent group 51, medium group 52, and long-haired group 63; outer auricle deltoid, inner auricle short lanceolate; ligule narrow crescent, 2 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Olive-reddish cane, with large medium hairy buds with outstanding groups 10, 1, and 4 (fig. 27); 5 rows of root primordia; diagnostic hair group 63+; crescent-deltoid dewlaps (fig. 46 (117)); short lanceolate inner auricle; very narrow crescent ligule.

CLONE 21 N. G. 6

IMP. 313, Acc. 118

CULMS.—Red to brown, with green stripes, sparse bloom, and medium wax bands; internodes slightly bobbin-shaped, 9 cm. long and 26×30 mm. across, prominent bud furrow; stem-epidermal pattern 3+4, average width of long cells 10μ , stomates absent; growth rings striped, narrow, flush; root bands striped, conoidal, 10

and 7 mm. high with 5 irregular rows of primordia; buds green with red wings, later all red, 18×12 mm., inserted below scar and extending above growth ring; prophyll ovate with prominent basal appendage and narrow truncate tip, wing inserted below middle of prophyll, broad and smooth, pubescence more or less sparse, prominent hair groups include 1, 2, 16, 18, 19, 9.

LEAVES.—Sheaths 33 cm. long and smooth; blades 142 cm. long and 4.6 cm. broad, module 31; dewlaps ligulate, outer surface with medium group 58, inner surface with small group 51, semilong group 52 and small group 63; outer auricle transitional, inner auricle medium long to short lanceolate and fringed to tip; ligule shallow or slightly orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red-and-green striped cane, with large more or less smooth buds; 5 rows of root primordia; diagnostic hair groups 52+, 63+ --; ligulate dewlaps (fig. 46 (118)); short lanceolate inner auricle; shallow crescent ligule.

CLONE 21 N. G. 7

IMP. 314, ACC. 119

CULMS.—Yellow bronze, with sparse bloom and medium wax bands; internodes cylindrical, 11 cm. long and 31 mm. across, prominent bud furrow, white flesh; stem-epidermal pattern 1+3+5, average width of long cells 9.5μ , stomates absent; growth rings olive, medium broad, flush; root bands red, tumescent obconoidal, 9 and 7 mm. high with 4 or 5 rows of primordia; buds greenish red with olive wings, 14×9 mm., inserted at scar and extending above growth ring; prophyll plump ovate with pointed tip, wing inserted below middle of prophyll, narrow, pubescence medium sparse, prominent hair groups include 10, 1, 16, 8, 11.

LEAVES.—Sheaths 34 cm. long and smooth; blades 142 cm. long and 4.6 cm. broad, module 31; deltoid double crescent dewlaps, outer surface with medium sparse group 58, inner surface with broad group 51, medium group 52 and long-haired group 63 inserted high; outer auricle transitional or small deltoid, inner auricle short lanceolate and fringed to tip; ligule flat narrow crescent, 2 mm. high, group 61 short, more or less tall in flanges, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Yellow-bronze cane, with prominent bud furrow, large buds with juncture pubescence and group 10; 4 or 5 rows of root primordia; diagnostic hair groups 61+., 63+; deltoid double-crescent dewlaps (fig. 46 (119)); short lanceolate inner auricle; shallow crescent ligule.

CLONE 21 N. G. 9

IMP. 315, ACC. 120

CULMS.—Yellowish green, with red blush, sparse bloom, and prominent wax bands; internodes cylindrical to slightly tumescent, 10 cm. long and 31 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 3+5+6, average width of long cells 9.2μ , stomates absent; growth rings olive, medium broad, flush; root bands

green, cylindric, tumescent on bud side, 10 and 8 mm. high with 4 or 5 rows of crowded primordia; buds yellow green, with red wings, 16×10 mm., inserted at scar and extending above growth ring; prophyll long ovate with pointed tip, wing inserted below middle of prophyll, medium broad to narrow, long sparse fringe, pubescence more or less sparse, prominent hair groups 10, 11, 8, $16+1$, 19, 18.

LEAVES.—Sheaths 30 cm. long and smooth; blades 135 cm. long and 5.3 cm. broad, module 24; dewlaps squarish crescent, outer surface with sparse group 58, inner surface with prominent group 51 that extends for a short distance as group 65 in narrow file toward midrib, prominent group 52 and long-haired group 63; outer auricle small deltoid and subtended by a short group 56, inner auricle short lanceolate and fringed to tip; ligule narrow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with large, slightly hairy buds; tall root bands with 4 or 5 rows of primordia; diagnostic hair groups $52+$, $56+--$, $63+$, $65+--$; squarish-crescent dewlaps (fig. 46 (120)); short lanceolate inner auricle; narrow crescent ligule.

CLONE 21 N. G. 10

IMP. 316, ACC. 121

CULMS.—Dark red, with heavy bloom and merging wax bands; internodes slightly obconoidal, 9 cm. long and 27×31 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern $1+3$, average width of long cells 10μ , stomates absent; growth rings greenish red, medium broad, tumescent; root bands red, cylindric tumescent on bud side, 7 and 5 mm. high with 2 rows of primordia; buds red, 13×9 mm., inserted below scar and extending above growth ring; prophyll ovate with large basal appendage and pointed tip, wing inserted below middle of prophyll, narrowest at base, pubescence sparse, more or less prominent hair groups 10, 1, 16, 19, 18.

LEAVES.—Sheaths 35 cm. long and smooth; blades 159 cm. long and 4.8 cm. broad, module 33; dewlaps ascending squarish ligulate, outer surface with dense group 58 and marginal group 58a, inner surface with prominent group 51, dense semilong groups 52, 63, and 52a; outer auricle transitional, inner auricle short lanceolate and fringed; ligule orbicular crescent, 3.5 mm. high, group 61 short or medium short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with prominent bloom and bud furrow, large smooth buds; narrow root bands; diagnostic hair groups $52+$, $55a+-$, $58+$, $63+$; ascending squarish-ligulate dewlaps (fig. 46 (121)); lanceolate inner auricle; orbicular-crescent ligule.

CLONE 21 N. G. 11

IMP. 317, ACC. 122

CULMS.—Bronze to yellowish green, with sparse bloom, corky cracks, and medium wax bands; internodes cylindric and shouldered, 11 cm. long and 32×39 mm. across, small bud furrow, hard white flesh; stem-epidermal pattern $1+4+6$, average width of long cells

10.3 μ , stomates present; growth rings green, medium broad, flush; root bands greenish, tumescent conoidal, 11 and 9 mm. high with 4 or 5 rows of primordia; buds reddish, 10 \times 10 mm., inserted at scar and reaching growth ring; prophyll broad ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad and fringed, margin scalloped, medium hairy, hair groups 1, 2, 16, 4, and 19 more or less prominent.

LEAVES.—Sheaths 36 cm. long and smooth; blades 137 cm. long and 5 cm. broad, module 27; dewlaps ascending narrow squarish, outer surface with sparse group 58, inner surface with small group 51, medium group 52, and very small group 63; outer auricle broad transitional, inner auricle long lanceolate and fringed to tip; ligule orbicular crescent, 4 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Bronze to yellowish-green cane, with sparse bloom and usually without bud furrow; broad ovate buds with prominent groups 1, 2, and 19; broad root bands with 4 or 5 rows of primordia; diagnostic hair group 63+— —; ascending narrow-squarish dewlaps (fig. 46 (122)); long lanceolate inner auricle; medium-tall orbicular crescent ligule.

CLONE 21 N. G. 12

IMP. 318, ACC. 122A

CULMS.—Bronze to bronze green, with sparse bloom, corky cracks, and prominent wax bands; internodes cylindrical to tumescent, sharply constricted near growth ring and shouldered, 13 cm. long and 30 \times 32 mm. across, prominent bud furrow, soft light-orange flesh; stem-epidermal pattern 4+3, average width of long cells 10 μ , stomates absent; growth rings greenish, narrow, depressed; root bands greenish, conoidal, 8 and 7 mm. high with 3 rows of primordia; buds greenish, 10 \times 8 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, more or less narrow, pubescence general and prominent.

LEAVES.—Sheaths 39 cm. long with narrow group 57; blades 170 cm. long and 6 cm. broad, module 28; dewlaps squarish crescent, outer surface with medium sparse group 58, inner surface with broad group 51, medium dense group 52, and small group 55; outer auricle transitional, inner auricle short lanceolate; ligule thin-flanged subarcuate, 3 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Bronze-colored cane, with corky cracks, small hairy buds; 3 rows of root primordia; diagnostic hair groups 55+., 55a+—, 57+— —; squarish-crescent dewlaps (fig. 51 (122a)); short lanceolate inner auricle; narrow subarcuate ligule.

CLONE 21 N. G. 13

IMP. 319, ACC. 123

CULMS.—Yellow and green striped, with brick-red flush, without bloom, small corky cracks, and constricted wax bands; internodes cylindrical or slightly tumescent and shouldered, 12 cm. long and 30 mm. across, medium-prominent bud furrow, soft light-orange flesh; stem-epidermal pattern 2+3+4, average width of long cells 8.3 μ ,

stomates present; growth rings yellow ivory, medium broad, depressed; root bands ivory, cylindric, 5 and 4 mm. high with 2 rows of sparse primordia; buds green, 13×9 mm., inserted below scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, pubescence general and prominent.

LEAVES.—Sheaths 32 cm. long with narrow group 57; blades 146 cm. long and 5.1 cm. broad, module 29; dewlaps ascending ligulate, outer surface with medium sparse group 58, inner surface with broad groups 51 and 52, sparse group 55; both auricles transitional; ligule narrow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with small corky cracks and without bloom, medium-large hairy buds; narrow root bands; diagnostic hair groups 55+—, 55a+—, 57+—; ascending ligulate dewlaps (fig. 46 (123)); transitional auricles; narrow crescent ligule.

CLONE 21 N. G. 14

IMP. 320, ACC. 124

CULMS.—Red becoming brown, with sparse bloom and narrow wax bands; internodes cylindric and shouldered, 11 cm. long and 35 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 1+3+6, average width of long cells 12.5 μ , stomates present; growth rings light olive, medium broad, tumescent; root bands red, cylindric obconoidal, 7 and 5 mm. high with 3 rows of primordia; buds reddish, 11×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad with unilateral secondary wing, pubescence general and prominent.

LEAVES.—Sheaths 35 cm. long with narrow group 57; blades 162 cm. long and 6 cm. broad module 27; dewlaps tall deltoid crescent, outer surface with sparse group 58, inner surface with prominent group 51 and semilong group 52; outer auricle small deltoid with short group 56, inner auricle large calcarate or lanceolate and fringed to tip, ligule tapering broad-centered crescent, 4 mm. high, group 61 short, more or less tall in flanges, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with small hairy buds having unilateral secondary wings; narrow root bands; diagnostic hair groups 52+, 56+—, 57+—, 61+.; tall deltoid-crescent dewlaps (fig. 46 (124)); calcarate or lanceolate inner auricle; tall broad-centered ligule.

CLONE 21 N. G. 16

IMP. 322, ACC. 124A

CULMS.—Greenish yellow, irregularly streaked with red, extensive corky patches; internodes obconoidal and shouldered, 12 cm. long and 28×30 mm. across, small bud furrow; stem-epidermal pattern 2+3, average width of long cells 12 μ , stomates absent; growth rings reddish, broad, flush or tumescent; root bands reddish, cylindric, 7 mm. high with 2 or 3 irregular rows of primordia; buds red, plump, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with

narrow truncate tip, wing inserted below middle of prophyll, medium broad, smooth, pubescence sparse with medium-prominent hair groups 1, 16, 18, 10.

LEAVES.—Sheath 30 cm. long with narrow group 57; blades 120 cm. long and 5.1 cm. broad, module 24; dewlaps ascending ligulate, outer surface with medium-sparse group 58, inner surface with broad group 51 and medium-sparse group 52; outer auricle transitional, inner auricle small calcarate and basally fringed; ligule narrow-flanged orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Reddish cane, with extensive corky patches, large more or less smooth buds; narrow root bands; diagnostic hair group 57+ -; ascending ligulate dewlaps (fig. 42 (124a)); small calcarate inner auricle; narrow orbicular-crescent ligule.

CLONE 21 N. G. 15

IMP. 321, ACC. 124B

CULMS.—Yellow and red striped, with sparse bloom and prominent corky cracks; internodes cylindric, 11 cm. long and 26×32 mm. across, without or with small bud furrow; stem-epidermal pattern 4+2, average width of long cells 10 μ , stomates absent; growth rings striped, narrow, slightly tumescent; root bands striped, cylindric, 6 mm. high with 2 rows of primordia, buds greenish red, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate tip, wing inserted near middle of prophyll, narrow at base and smooth, pubescence sparse, more or less prominent hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 29 cm. long with narrow group 57; sheath base with sectorial group 59; blades 130 cm. long and 6.6 cm. broad, module 20; dewlaps ascending ligulate, outer surface with medium-dense group 58, inner with medium to small group 51 that extends as group 65 in single file clear through midrib, sparse group 52; outer auricle transitional and subtended by a short 56, inner auricle calcarate or short lanceolate and basally fringed; ligule narrow arcuate or subarcuate, 2.5 mm. high, group 61 short but appears long because of the projecting hairs of group 65a, which are prominent along entire length of ligule.

DISTINGUISHING CHARACTERS.—Striped cane, with prominent corky cracks, medium-large more or less smooth buds; narrow root bands; diagnostic hair groups 56+ -, 57+ -, 59+ -, 65+, 65a+ -; ascending ligulate dewlaps; short lanceolate inner auricle; narrow arcuate ligule.

CLONE 21 N. G. 17

IMP. 323, ACC. 125

CULMS.—Green to greenish yellow, with extensive red blush, sparse bloom and prominent wax bands; internodes cylindric, 11 cm. long and 28×32 mm. across, prominent bud furrow, yellow-brown flesh; stem-epidermal pattern 3+4, average width of long cells 10.6 μ , stomates absent; growth rings greenish olive, medium broad, tumescent; root bands green, cylindric conoidal, 10 and 9 mm. high with

3 rows of primordia; buds green, 17×14 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with truncate-notched tip, wing inserted below middle of prophyll, broad, auriculate at base and prominently fringed, pubescence more or less sparse except for basal region, prominent hair groups 4, 1, 16, 19.

LEAVES.—Sheaths 37 cm. long and smooth; blades 129 cm. long and 5 cm. broad, module 26; dewlaps ascending flaring ligulate, outer surface with dense group 58 and small marginal group 58a, inner surface with prominent group 51 and dense group 52; outer auricle small deltoid and subtended by a ledge of group 56, inner auricle long lanceolate and fringed to tip; ligule orbicular crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Green cane, with large deltoid, prominently fringed buds; broad root bands; diagnostic hair groups 52+, 56+, 58+; ascending flaring-ligulate dewlaps (fig. 46 (125)); long lanceolate inner auricle; broad orbicular-crescent ligule.

CLONE 21 N. G. 20

IMP. 326, ACC. 126

CULMS.—Dark red, becoming brownish red, with medium heavy bloom and merging wax bands; internodes bobbin-shaped, 13 cm. long and 37 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 2+3, average width of long cells 9.7μ , stomates present; growth rings greenish, narrow, flush; root bands red, slightly conoidal, 6 and 5 mm. high with 2 rows of small primordia; buds reddish, 11×10 mm., inserted at scar and extending above growth ring; prophyll broad ovate with truncate or round-pointed and notched tip, wing inserted below middle of prophyll, narrow at base, pubescence more or less sparse, prominent hair groups 1, 10, 19, 9.

LEAVES.—Sheaths 34 cm. long and smooth; blades 158 cm. long and 5.2 cm. broad, module 30; dewlaps squarish deltoid subcrescent, outer surface with medium group 58, inner surface with prominent groups 51, 52, and 63; outer auricle sloping transitional, inner auricle small deltoid and basally fringed; ligule orbicular crescent, 4.5 mm. high, group 61 short, more or less long in flanges, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with heavy bloom and prominent bud furrow, broad ovate buds with groups 1, 10, and 9; narrow root bands; diagnostic hair groups 52+, 61+, 63+; squarish deltoid-subcrescent dewlaps (fig. 46 (126)); deltoid inner auricle; broad orbicular-crescent ligule.

CLONE 21 N. G. 21

IMP. 327, ACC. 127

CULMS.—Green with sparse bloom, corky cracks, and broad wax bands; internodes concave convex, 16 cm. long and 31 mm. across, broad shallow bud furrow, hard olive flesh; stem-epidermal pattern 6+3+4, average width of long cells 11.7μ , stomates absent; growth rings olive green, narrow, flush; root bands green, conoidal, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds reddish, 15×11 mm.,

inserted below scar and extending above growth ring; prophyll ovate deltoid with truncate tip, wing inserted below middle of prophyll, narrow, pubescence general and very prominent at base and on wing.

LEAVES.—Sheaths 33 cm. long and smooth; blades 139 cm. long and 5.1 cm. broad, module 27; dewlaps crescent squarish, outer surface with prominent semilong group 58 and marginal group 58a, inner surface with broad group 51 and dense semilong group 52, long-haired groups 63 and 55; outer auricle broad transitional or deltoid and subtended by a long 56, inner auricle calcarate or short lanceolate and fringed to tip; ligule narrow-flanged crescent with lozenge, 4 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Green cane, with long concave-convex internodes, large hairy buds; 3 or 4 rows of crowded primordia; diagnostic hair groups 52+, 55+, 56+, 58+, 63+; crescent-squarish dewlaps (fig. 46 (127)); calcarate inner auricle; medium-broad crescent ligule.

CLONE 21 N. G. 22

IMP. 328, ACC. 128

CULMS.—Olive green, with sparse bloom and narrow wax bands, internodes cylindrical and shouldered, 9 cm. long and 29 mm. across; prominent bud furrow, soft greenish flesh; stem-epidermal pattern 1+3, average width of long cells 9.7μ , stomates absent; growth rings olive green, narrow, flush; root bands ivory green, slightly conoidal, 8 and 7 mm. high with 3 or 4, occasionally up to 7 rows, of crowded primordia; buds green with reddish wing, 18×10 mm., inserted below scar and extending above growth ring; prophyll ovate deltoid with round-pointed tip, wing inserted low, narrow, pubescence general and prominent at base, wing and juncture, with hair group 10 short or wanting.

LEAVES.—Sheaths 33 cm. long with very sparse 57 or smooth; sheath base with 59 and 69; blades 140 cm. long and 4.5 cm. broad, module 30; dewlaps tall squarish crescent, outer surface with prominent group 58, inner surface with broad group 51 and dense group 52, long-haired groups 63 and 55; outer auricle transitional or small deltoid and subtended by a long 56, inner auricle deltoid or short lanceolate and fringed; ligule thin-flanged deltoid crescent, 3.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Green cane, with sparse bloom and narrow wax bands, prominent bud furrow; large hairy buds; root bands with 3 or 4, or more, rows of crowded primordia; diagnostic hair groups 52+, 55+, 56+, 57+---, 58+, 59+-, 63+, 69+-; tall squarish-crescent dewlaps (fig. 47 (128)); deltoid or short lanceolate inner auricle; thin-flanged deltoid-crescent ligule.

This variety is very similar to Clone 21 N. G. 21.

CLONE 21 N. G. 23

IMP. 329, ACC. 129

CULMS.—Yellowish green, with sparse bloom and medium wax band; internodes concave cylindrical and shouldered, 13 cm. long and 26×28 mm. across, broad and shallow bud furrow, soft greenish flesh; stem-epidermal pattern 5+6, average width of long cells 10.3μ , stomates

absent; growth rings olive, medium broad, tumescent; root bands greenish red, conoidal obconoidal, 9 and 8 mm. high with 2 or 3 rows of sparse primordia; buds green with reddish wing, 17×9 mm., inserted at scar and extending above growth ring; prophyll ovate with roundish or pointed tip, wing inserted low, narrow, pubescence medium prominent, hair groups 10, 22, 1, 2, 16, 11 outstanding.

LEAVES.—Sheaths 34 cm. long and smooth; sheath base slightly decurrent; blades 145 cm. long and 6.3 cm. broad, module 23; dewlaps ascending ligulate, outer surface with prominent group 58, inner surface with prominent groups 51 and 52; both auricles transitional; ligule narrow crescent, 3 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with long, narrow ovate buds, medium hairy but not fringed; 2 or 3 rows of sparse primordia; diagnostic hair groups 52+, 55a+ - -, 58+; ascending ligulate dewlaps (fig. 47 (129)); transitional auricles; narrow crescent ligule.

CLONE 21 N. G. 29

IMP. 332, ACC. 130

CULMS.—Yellowish green with red blush, heavy bloom and merging wax bands; internodes cylindric and shouldered, 11 cm. long and 28×33 mm. across, prominent bud furrow, soft greenish flesh; stem-epidermal pattern 3, average width of long cells 9.7μ , stomates absent; growth rings greenish red, broad, tumescent; root bands reddish, cylindric, 7 and 6 mm. high with 3 rows of crowded primordia; buds green with red wing, 28×11 mm., inserted at scar and extending above growth ring; prophyll very long ovate with round-pointed tip, wing inserted low, narrow at base, principal pubescence at base and as 10+25; group 24 near germ pore.

LEAVES.—Sheaths 32 cm. long with narrow group 57; sheath base decurrent; blades 150 cm. long and 5.2 cm. broad, module 29; dewlaps ascending ligulate, outer surface with medium sparse group 58, inner surface with prominent group 51 which extends as group 65 in narrow file toward midrib, medium group 52, prominent group 55, sparse medium long-haired group 63 inserted high; outer auricle sloping transitional, inner auricle calcarate and fringed; ligule deltoid crescent, 3 mm. high, group 61 very short, dorsal pubescence as small 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with heavy bloom and prominent bud furrow; very large narrow buds, medium hairy but not fringed and with diagnostic group 24; narrow root bands; diagnostic hair groups 55+, 55a+---, 57+-, 63+., 65+.; ascending ligulate dewlaps (fig. 47 (130)); calcarate inner auricle; deltoid-crescent ligule.

CLONE 21 N. G. 30

IMP. 333, ACC. 131

CULMS.—Dark red, with medium bloom and broad wax bands; internodes concave convex and shouldered, 13 cm. long and 33 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pat-

tern 1+3, average width of long cells 9.5μ , stomates present; growth rings greenish red, narrow, flush; root bands red, cylindrical, 6 mm. high with 3 rows of small primordia; buds red, 12×10 mm., inserted at scar and extending above growth ring; prophyll roundish ovate with truncate tip, wing inserted below middle of prophyll, narrow, pubescence medium prominent with more or less outstanding groups 1, 16, 11, 10, 19, and 9.

LEAVES.—Sheaths 32 cm. long and smooth; blades 156 cm. long and 5.7 cm. broad, module 27; dewlaps ascending ligulate, outer surface with prominent group 58 and marginal group 58a, inner surface with medium group 51, medium-dense group 52, and small group 63; outer auricle sloping transitional, inner auricle short lanceolate and not fringed; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence as prominent 55a and generally semiadnate throughout.

DISTINGUISHING CHARACTERS.—Dark-red cane, with semihairy buds having narrow wings and diagnostic group 9; narrow root bands; diagnostic hair groups 52+., 55a+., 58+, 63+--; ascending ligulate dewlaps (fig. 47 (131)); short lanceolate inner auricle; broad orbicular-crescent ligule.

CLONE 21 N. G. 31

IMP. 334, ACC. 132

CULMS.—Olive green, with sparse bloom and prominent wax bands; internodes cylindrical and shouldered, 9 cm. long and 41 mm. across, without bud furrow, soft white flesh; stem-epidermal pattern 2, average width of long cells 8.7μ , stomates absent; growth rings olive, narrow, flush; root bands green, cylindrical conoidal, 10 and 9 mm. high with 4 rows of primordia; buds olive green, with red wings, 11×11 mm., inserted below scar and reaching growth ring; prophyll short ovate with prominent basal appendage and small truncate tip, wing inserted below middle of prophyll, medium broad, pubescence very sparse except for group 1.

LEAVES.—Sheaths 37 cm. long with narrow group 57; blades 144 cm. long and 5.5 cm. broad, module 26; dewlaps ascending squarish, outer surface with sparse group 58, inner with prominent group 51, sparse group 52, and small groups 55 and 63; outer auricle transitional subtended by a short 56, inner auricle transitional and fringed; ligule broad-centered subarcuate, 4.5 mm. high, group 61 short, dorsal pubescence as 55a and in terminal flanged zone.

DISTINGUISHING CHARACTERS.—Green cane, with medium-large broad-ovate, more or less smooth buds; tall root bands with 4 rows of primordia; diagnostic hair groups 55+-- , 55a+-- , 56+-- , 57+-- , 63+-- ; ascending-squarish dewlaps (fig. 47 (132)); transitional auricles; broad subarcuate ligule.

CLONE 21 N. G. 32

IMP. 335, ACC. 133

CULMS.—Yellowish green, with sparse bloom and merging wax bands; internodes tumescent, 7 cm. long and 48 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 1+2,

average width of long cells 10.6μ , stomates absent; growth rings striped, narrow, flush; root bands striped, cylindrical obconoidal, 9 and 7 mm. high with 2 or 3 rows of primordia; buds reddish, 11×9 mm., inserted at scar and reaching growth ring; prophyll ovate with apical appendage and round-pointed tip; wing inserted at middle of prophyll, broad, notched, and prominently fringed, pubescence general and prominent, most conspicuous are hair groups 1, 2, 4, 10, 11.

LEAVES.—Sheaths 31 cm. long with narrow group 57; blades 137 cm. long and 5.5 cm. broad, module 25; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle sloping transitional, inner auricle calcarate and fringed; ligule narrow crescent, 2.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with medium-small hairy buds; 2 or 3 rows of root primordia; diagnostic hair group $57+ -$; ascending ligulate dewlaps (fig. 47 (133)); calcarate inner auricle; narrow-crescent ligule.

CLONE 21 N. G. 33

IMP. 336, ACC. 134

CULMS.—Olive green to brown, with sparse bloom and narrow wax bands; internodes tumescent, 11 cm. long and 26×32 mm. across, prominent bud furrow, hard white flesh; stem-epidermal pattern $2+3$, average width of long cells 11.3μ , stomates absent; growth rings reddish, narrow, tumescent; root bands reddish, cylindrical obconoidal, 8 and 7 mm. high with 3 or 4 rows of primordia; buds reddish green, 13×11 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, narrow, slightly dentate, pubescence at base and juncture; groups 1, 2, 4, 16, 11, 22, 19 evident.

LEAVES.—Sheaths 32 cm. long and smooth; blades 140 cm. long and 5 cm. broad, module 28; dewlaps ascending squarish, outer surface with dense group 58 and small group 58a, inner surface with broad group 51 and dense group 52; outer auricle transitional, inner auricle long lanceolate and fringed; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-green to brown cane, with sparse bloom and prominent bud furrow, medium-large ovate buds, with more or less prominent marginal fringe and basal and juncture pubescence; 3 or 4 rows of root primordia; diagnostic hair groups $52+$, $58+$; ascending squarish dewlaps (fig. 47 (134)); lanceolate inner auricle; broad orbicular-crescent ligule with broad lozenge.

CLONE 21 N. G. 34

IMP. 337, ACC. 135

CULMS.—Bronze, with sparse bloom and prominent wax bands; internodes cylindrical, 15 cm. long and 28×31 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern $2+3+4$, average width of long cells 9.2μ , stomates present; growth rings olive green, narrow, tumescent; root bands cylindrical to slightly tumescent, red,

10 and 8 mm. high with 4 or 5 rows of crowded primordia; buds green, with red wings, 13×10 mm., inserted at scar and reaching growth ring; prophyll ovate squarish with round-pointed or truncate tip, wing inserted above middle of prophyll, broad, notched, pubescence prominent at base and posterior juncture, groups 1, 2, 16, 17, 10+22, 19 evident.

LEAVES.—Sheaths 34 cm. long and smooth; blades 130 cm. long and 5 cm. broad, module 26; dewlaps ascending squarish or ligulate, outer surface with medium group 58, inner surface with prominent group 51 that extends as group 65 in narrow file toward midrib, medium group 52; outer auricle transitional, subtended by a short 56, inner auricle short lanceolate; ligule very narrow subarcuate, 2.5 mm. high, group 61 very short, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Bronze-colored cane, with medium-hairy buds; 4 or 5 rows of crowded root primordia; diagnostic hair groups 55a+ --, 56+ --, 65+ -, 65a+; ascending squarish or ligulate dewlaps (fig. 47 (135)); short lanceolate inner auricle; narrow crescent ligule.

CLONE 21 N. G. 35

IMP. 338, ACC. 136

CULMS.—Red to brownish red, with medium bloom, corky cracks, and prominent wax bands; internodes cylindric and slightly shouldered, 10 cm. long and 29×31 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern 3, average width of long cells 13.5 μ , stomates absent; growth rings olive red, narrow, slightly tumescent; root bands red, cylindric, 8 and 7 mm. high with 3 rows of primordia; buds olive rose, 16×12 mm., inserted below scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted at middle of prophyll, medium broad, 2 secondary wings, pubescence general and prominent.

LEAVES.—Sheaths 32 cm. long and smooth; blades 140 cm. long and 6 cm. broad, module 23; dewlaps flaring deltoid squarish, outer surface with dense group 58, inner surface with prominent group 51 and dense group 52; outer auricle deltoid, inner auricle calcarate or short lanceolate and fringed; ligule broad, centered, subarcuate or arcuate, 3.5 mm. high, group 61 medium, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with prominent bud furrow, large very hairy buds; 3 rows of root primordia; diagnostic hair groups 52+, 58+, 61+; flaring deltoid-squarish dewlaps (fig. 47 (136)); calcarate inner auricle; medium-broad subarcuate or arcuate ligule.

CLONE 21 N. G. 36

IMP. 339, ACC. 137

CULMS.—Green to yellowish green, reddish blush when young, sparse bloom, and narrow wax bands; internodes cylindric and prominently shouldered, 11 cm. long and 29+35 mm. across, without bud furrow, hard greenish flesh; stem-epidermal pattern 1+4, average width of long cells 10.6 μ , stomates present; growth rings olive green, medium broad, flush; root bands green, cylindric, 10 mm. high with

4 to 6 rows of primordia; buds greenish rose, 10×10 mm., inserted below scar and not reaching growth ring; prophyll ovate with slightly pointed tip, wing inserted below middle of prophyll, medium broad, emarginate, slightly hairy, prominent hair groups 1+16, 19, and 4 edging upper one-third of wing.

LEAVES.—Sheaths 32 cm. long smooth or with very small group 57; sheath base slightly decurrent; blades 140 cm. long and 5.7 cm. broad, module 24; dewlaps ascending narrow squarish, outer surface with sparse group 58, inner surface with small group 51, dense short-haired group 52 and small groups 52a and 63; outer auricle sloping transitional, inner auricle calcarate or long lanceolate and fringed; ligule orbicular crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Green cane, with medium small slightly hairy buds; tall root bands with 4 to 6 rows of primordia; diagnostic hair groups 52+, 63+ --; ascending narrow squarish dewlaps (fig. 47 (137)); calcarate or long-lanceolate inner auricle; medium-narrow orbicular-crescent ligule.

CLONE 21 N. G. 37

IMP. 340, ACC. 137A

CULMS.—Yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical and shouldered, 14 cm. long and 39 mm. across, medium-prominent bud furrow; stem-epidermal pattern 1+4, average width of long cells 10.3μ , stomates present; growth rings yellow green, medium or narrow and flush; root bands dark green, cylindrical or slightly conoidal, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds greenish, $14+10$ mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with truncate notched tip, wing inserted below middle of prophyll, broad and prominently emarginate throughout, pubescence medium sparse, with hair groups 11, 16, 1, 22, 19, and 18 somewhat prominent.

LEAVES.—Sheaths 30 cm. long with medium or narrow group 57 inserted high; blades 120 cm. long and 6.6 cm. broad, module 18, dewlaps deltoid squarish or squarish subcrescent, outer surface with dense and marginally semilong group 58, inner surface with medium small group 51 and medium group 52; outer auricle transitional and subtended by a short 56, inner auricle deltoid; ligule subarcuate, 3 mm. high, group 61 very short; dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with deltoid slightly hairy buds; 3 or 4 rows of root primordia; diagnostic hair groups 56+ --, 57+ --, 58+; deltoid-squarish or squarish-subcrescent dewlaps (fig. 47 (137a)); deltoid inner auricle; narrow subarcuate ligule.

CLONE 21 N. G. 44

IMP. 341, ACC. 138

CULMS.—Brownish red, with narrow green stripes, sparse bloom, and medium wax bands; internodes concave cylindrical, shouldered, 12 cm. long and 28 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 1, average width of long cells 11μ , stomates

absent; growth rings striped, medium broad, tumescent; root bands striped, somewhat conoidal, 9 mm. high with 2 rows of primordia; buds green with reddish wings, later all red, 10×8 mm., inserted at scar and extending above growth ring; prophyll long ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, broader at base, fringed, pubescence general and very prominent.

LEAVES.—Sheaths 37 cm. long and smooth; sheath base slightly decurrent; blades 155 cm. long and 5.3 cm. broad, module 29; dewlaps narrow squarish, slightly flaring, outer surface with sparse group 58, inner surface with prominent groups 51 and 52; outer auricle transitional, inner auricle medium-large calcarate or lanceolate and fringed; ligule tapering broad-centered subarcuate or strap-shaped, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-small hairy buds; 2 rows of root primordia; diagnostic hair group $52+$.; slightly flaring narrow squarish dewlaps (fig. 47 (138)); calcarate inner auricle; broad-centered flat crescent or strap-shaped ligule.

CLONE 21 N. G. 49

IMP. 342, ACC. 139

CULMS.—Dark red, with sparse bloom, corky cracks, and narrow wax bands; internodes cylindric, 14 cm. long and 28×32 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 3, average width of long cells 12μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindric, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds reddish, 10×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted at middle of prophyll, medium broad with small secondary wing, pubescence prominent on wing and in juncture, less prominent at base.

LEAVES.—Sheaths 35 cm. long with narrow group 57; blades 150 cm. long and 5.7 cm. broad, module 26; dewlaps flaring deltoid, outer surface with sparse group 58, inner surface with prominent groups 51 and 52; outer auricle short lanceolate and subtended by a very short 56, inner auricle long lanceolate or calcarate and fringed to tip; ligule tapering broad-centered crescent, 4.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red cane, with medium-sized buds having very hairy wing and juncture regions; 3 or 4 rows of crowded primordia; diagnostic hair groups $52+$, $56+---$, $57+-$; flaring-deltoid dewlaps (fig. 47 (139)); calcarate or long lanceolate inner auricle; broad crescent ligule.

CLONE 21 N. G. 51

IMP. 344, ACC. 140

CULMS.—Red, with sparse bloom, corky cracks, and narrow wax bands; internodes cylindric and shouldered, 13 cm. long and 39 mm. across, prominent bud furrow, soft white flesh; stem-epidermal pattern

3, average width of long cells 13μ , stomates absent; growth rings olive red, broad, tumescent; root bands red, cylindrical, 9 and 8 mm. high with 4 or 5 rows of primordia; buds greenish with olive wing, later all red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed, notched tip, wing inserted near middle of prophyll, medium broad, 2 small secondary wings, pubescence general and prominent.

LEAVES.—Sheaths 33 cm. long with narrow group 57; blades 167 cm. long and 6 cm. broad, module 28; dewlaps flaring crescent deltoid, outer surface with sparse group 58, inner surface with prominent group 51 and dense group 52; outer auricle deltoid or short lanceolate and subtended by a short 56, inner auricle long lanceolate or calcarate and fringed to tip; ligule tapering broad-centered crescent, 4.5 mm. high, group 61 more or less short, dorsal pubescence dense and short in flanges.

DISTINGUISHING CHARACTERS.—Red cane, with prominent bud furrow; hairy buds; 4 or 5 rows of root primordia; diagnostic hair groups $52+$, $56+--$, $57+-$, $61+$. —; flaring crescent-deltoid dewlaps (fig. 47 (140)); lanceolate or calcarate inner auricle; broad crescent ligule.

CLONE 21 N. G. 54

IMP. 347, ACC. 141

CULMS.—Brownish red, with sparse bloom, corky cracks, and narrow wax bands; internodes cylindrical and shouldered, 13 cm. long and 37 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 1, average width of long cells 11.3μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindrical, 7 and 6 mm. high with 3 or 4 rows of primordia; buds greenish red, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad with 2 small secondary wings, pubescence general and prominent.

LEAVES.—Sheaths 35 cm. long with a narrow and sparse group 57; sheath base with group 69; blades 147 cm. long and 5 cm. broad, module 29; dewlaps flaring deltoid crescent, outer surface with sparse group 58, inner surface with medium groups 51 and 52; outer auricle deltoid and subtended by a very short group 56, inner auricle long lanceolate and fringed; ligule tapering broad-centered crescent, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brownish-red cane, with hairy buds; narrow root bands having 3 or 4 rows of primordia; diagnostic hair groups $56+--$, $57+-$, $69+-$ (in old leaves); flaring deltoid-crescent dewlaps (fig. 47 (141)); lanceolate inner auricle; tapering broad-centered ligule.

CLONE 21 N. G. 55

IMP. 348, ACC. 142

CULMS.—Red, with sparse bloom, corky cracks, and constricted wax bands; internodes cylindrical, 12 cm. long and 34 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 3, average width

of long cells 11.7μ , stomates present; growth rings reddish, narrow, flush or slightly tumescent; root bands red, cylindric obconoidal, 8 and 7 mm. high with 3 rows of primordia; buds red, 11×9 mm., inserted below scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, 2 small secondary wings pubescence general and prominent.

LEAVES.—Sheaths 33 cm. long with very small group 57; blades 160 cm. long and 6.3 cm. broad, module 25; dewlaps crescent squarish deltoid, outer surface with medium sparse group 58, inner surface with medium group 51 and dense 52; outer auricle small deltoid, subtended by a short 56, inner auricle large calcarate or long lanceolate and fringed to tip; ligule tapering broad-centered crescent, 4 mm., group 61 medium short, dorsal pubescence short and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane with hairy buds; medium root bands having 3 rows of primordia; diagnostic hair groups $52+$, $56+--$, $57+--$, $61+.-$; crescent squarish-deltoid dewlaps (fig. 48 (142)); large calcarate or lanceolate inner auricle; broad-centered ligule.

CLONE 21 N. G. 57

IMP. 350, ACC. 143

CULMS.—Green, becoming yellowish green, with sparse bloom, prominent corky cracks, and narrow wax bands; internodes cylindric, 12 cm. long and 35 mm. across, broad bud furrow, white flesh; stem-epidermal pattern 3, average width of long cells 12.5μ , stomates not observed; growth rings green, narrow, tumescent; root bands green, cylindric obconoidal, 7 and 6 mm. high, with 3 or 4 rows of crowded primordia; buds green with reddish wing, 14×10 mm., inserted below scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll with 2 secondary wings, pubescence general and very prominent.

LEAVES.—Sheath 34 cm. long with medium group 57 and small 60; sheath base with small 59; blades 147 cm. long and 5.7 cm. broad, module 26; dewlaps squarish crescent, outer surface with sparse group 58, inner surface with prominent group 51 and dense group 52; both auricles lanceolate and fringed, outer subtended by a short 56; ligule broad-centered crescent, 4 mm. high, hair group 61 medium short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green cane, with very hairy buds and narrow root bands having 3 or 4 rows of primordia; diagnostic hair groups $52+$, $56+--$, $57+.$, $59+ -$, $60+ -$, $61+.-$; squarish-crescent dewlaps (fig. 48 (143)); lanceolate auricle; broad-centered ligules.

CLONE 21 N. G. 58

IMP. 351, ACC. 144

CULMS.—Bright red and green striped, with sparse bloom and medium wax bands; internodes cylindric and shouldered, 12 cm. long and 35 mm. across, without bud furrow, white flesh; stem-epidermal

pattern 2+4, average width of long cells 9.5μ , stomates present; growth rings striped, narrow, flush or tumescent; root bands striped, cylindrical obconoidal, 8 and 7 mm. high, with 4 rows of crowded primordia; buds olive red, 12×11 mm., inserted at scar and reaching growth ring; prophyll broad ovate with prominent basal appendage and round-pointed notched tip, wing inserted at middle of prophyll, broad and prominently emarginate, pubescence very sparse.

LEAVES.—Sheaths striped, 30 cm. long with narrow group 57; sheath base prominently decurrent; blades 146 cm. long and 6.5 cm. broad, module 22; dewlaps squarish subrescent, outer surface with dense group 58 and prominent marginal group 58a, inner surface with sparse group 51, medium group 52, and small groups 55 and 63; outer auricle sloping transitional, inner auricle small calcarate; ligule thin-flanged crescent, 3.5 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Bright red-and-green striped cane, with broad-ovate more or less smooth buds having broad emarginate wings; 4 rows of crowded root primordia; diagnostic hair groups $55+--$, $55a+-$, $57+-$, $58+$, $63+--$; squarish-subrescent dewlaps (fig. 48 (144)); transitional or small calcarate inner auricle; medium-narrow crescent ligule.

CLONE 96 N. G. 14

IMP. 246, ACC. 145

CULMS.—Green to greenish yellow, with sparse bloom and corky patches; internodes cylindrical and shouldered, 8 cm. long and 25×35 mm. across, small bud furrow, soft greenish flesh; stem-epidermal pattern 3+5, average width of long cells 10μ , stomates absent; growth rings green, medium broad, tumescent; root bands greenish, cylindrical, 7 and 6 mm. high with 2 or 3 rows of sparse primordia; buds reddish, 9×8 mm., inserted below scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, 2 prominent secondary wings, principal pubescence on wing and on entire posterior surface, outstanding hair groups 4, 14, 13, 10, 22.

LEAVES.—Sheaths 30 cm. long with narrow group 57; blades 150 cm. long and 5.5 cm. broad, module 27; dewlaps red, narrow squarish, outer surface with prominent groups 58 and 58a, inner surface with small group 51 and sparse groups 52 and 63; outer auricle transitional, inner auricle small calcarate and basally fringed; ligule narrow-flanged subarcuate, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with small medium-hairy buds having prominent secondary wings; narrow root bands with sparse primordia; diagnostic hair groups $57+-$, $58+$, $58a+$, $63+--$; red, narrow squarish dewlaps (fig. 48 (145)); small calcarate inner auricle; narrow subarcuate ligule.

BADILA, 96 N. G. 15**IMP 228, ACC. 146**

CULMS.—Deep purple, with heavy bloom and broad wax bands; internodes cylindric, 6 cm. long and 38×41 mm. across, prominent bud furrow, soft cream-olive flesh; stem-epidermal pattern 1+3+5, average width of long cells 10μ , stomates present; growth rings red, narrow, tumescent; root bands red, cylindric, 8 and 6 mm. high with 2 rows of primordia; buds red, 11×11 mm., inserted at scar and extending above growth ring; prophyll broad ovate or rhomboid with pointed tip, wing inserted below middle of prophyll, broad and emarginate, pubescence sparse, noticeable hair groups are 1, 2, 16, 6, 10, 19.

LEAVES.—Sheath 34 cm. long with heavy bloom and small group 57; blades 132 cm. long and 7 cm. broad, module 19; dewlaps large, ascending squarish, outer surface with medium-dense group 58, inner surface with small group 51 and dense group 52; outer auricle sloping transitional, inner auricle short lanceolate and fringed to tip; ligule thin-flanged crescent with lozenge, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purple cane, with short thick internodes, broad-ovate more or less smooth buds; 2 rows of root primordia; diagnostic hair groups 52+, 57+-; large, ascending squarish dewlaps (fig. 48 (146)); short lanceolate inner auricle; thin-flanged crescent ligule with broad lozenge.

CLONE 96 N. G. 16**IMP. 247, ACC. 147**

CULMS.—Dark purple to dark red, with heavy bloom, corky cracks, and merging wax bands; internodes tumescent, 8 cm. long and 38×34 mm. across, medium bud furrow, white soft flesh; stem-epidermal pattern 6, average width of long cells 13.5μ , stomates absent; growth rings red, broad, tumescent or flush; root bands red, cylindric obconoidal, 10 and 8 mm. high with 4 rows of primordia; buds red, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, more or less narrow, pubescence in juncture zone and on entire posterior surface.

LEAVES.—Sheaths 28 cm. long with medium group 57; blades 150 cm. long and 8 cm. broad, module 19; dewlaps medium-tall squarish, outer surface with dense group 58, inner surface with small group 51, dense group 52, and very small group 63; outer auricle small deltoid, inner auricle short lanceolate and fringed to tip; ligule narrow-flanged deltoid crescent with tall lozenge, 5 mm. high, group 61 very short, dorsal pubescence short and semiadnate in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple to dark-red cane, with thick short internodes, buds with prominent posterior pubescence; 4 rows of root primordia; diagnostic hair groups 52+, 57+, 63+ ---; medium-tall squarish dewlaps (fig. 48 (147)); short lanceolate inner auricle; deltoid-crescent ligule with tall lozenge.

CLONE 96 N. G. 22**IMP. 249, ACC. 148**

CULMS.—Purple, becoming purplish brown, with constricted wax bands and prominent bloom; internodes slightly tumescent, constricted in nodal region, 12 cm. long and 33×35 mm. across, shallow bud furrow, soft light-olive flesh; stem-epidermal pattern $1+6+4$, average width of long cells 10μ , stomates absent; growth rings light olive but later red, medium broad, flush; root bands ivory but later red, cylindrical obconoidal, 12 and 10 mm. high, with 4 or 5 rows of primordia; buds reddish, 12×11 mm., inserted at scar and reaching growth ring; prophyll ovate with prominent basal appendage and pointed tip, wing inserted below middle of prophyll, medium broad, lobed at base or with small secondary wings, pubescence general and prominent on posterior side, anterior side with more or less prominent hair groups 1, 16, 11.

LEAVES.—Sheaths 30 cm. long with narrow group 57; blades 158 cm. long and 6 cm. broad, module 26; dewlaps large ascending squarish, outer surface with medium or dense group 58, inner surface with small group 51 and dense group 52; outer auricle broad transitional or small deltoid, inner auricle calcarate or short lanceolate and fringed to tip; ligule narrow-flanged orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane, with thick internodes constricted in nodal region, more or less hairy buds lobed or with small secondary wings; broad root bands; diagnostic hair groups $52+$, $57+$ -; large ascending squarish dewlaps (fig. 48 (148)); short lanceolate inner auricle; orbicular-crescent ligule.

CLONE 96 N. G. 24**IMP. 227, ACC. 149**

CULMS.—Greenish yellow, with reddish-brown overcast, discolored bloom, and broad wax bands; internodes cylindric and shouldered, 11 cm. long and 35×40 mm. across, medium-prominent bud furrow, orange flesh; stem-epidermal pattern 1, average width of long cells 9.8μ , stomates present; growth rings greenish, medium broad, tumescent; root bands greenish, cylindric, 10 and 9 mm. high with 3 or 4 rows of primordia; buds green with reddish wing, later all red, 13×12 mm., inserted at scar and extending above growth ring; prophyll broad rhomboid with pointed slightly notched tip, wing inserted above middle of prophyll, very broad at base, pubescence more or less sparse, somewhat prominent are hair groups 1, 2, 16.

LEAVES.—Sheaths 32 cm. long with prominent group 57; blades 134 cm. long and 6 cm. broad, module 22; dewlaps large ascending squarish outer surface with dense group 58, inner surface with prominent group 51, dense group 52, and prominent long-haired group 63; outer auricle transitional with long group 56, inner auricle very long lanceolate and not fringed; ligule narrow crescent or subarcuate, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Thick reddish-brown cane, with broad-rhomboid more or less smooth buds; tall root bands; diagnostic

hair groups 52+, 56+, 57+, 58+, 63+; large ascending squarish dewlaps (fig. 48 (149)); lanceolate inner auricle; narrow crescent ligule.

CLONE 96 N. G. 24a

IMP. 226, ACC. 150

CULMS.—Greenish yellow, with sparse bloom and medium wax bands; internodes slightly bobbin-shaped, 10 cm. long and 25×29 mm. across, without bud furrow, light-green flesh; stem-epidermal pattern 1+3, average width of long cells 10.2 μ , stomates present; growth rings yellow green, narrow, tumescent; root bands green, cylindric or constricted, 8 and 6 mm. high with 3 rows of primordia; buds green, with red wing, 12×12 mm., inserted below scar and reaching growth ring; prophyll broad ovate with round-pointed tip, wing inserted below middle of prophyll, broad with short-haired fringe, pubescence sparse, hair groups 1, 16, 4, 10 evident.

LEAVES.—Sheaths 31 cm. long and smooth; blades 150 cm. long and 6.5 cm. broad, module 24; dewlaps squarish crescent, outer surface with medium group 58 and marginal group 58a, inner surface with prominent group 51 that continues as group 65 in narrow file toward midrib, medium group 52; outer auricle sloping transitional, inner auricle small calcarate and fringed; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence as 65a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with broad-ovate more or less smooth buds; narrow root bands with 3 rows of primordia; diagnostic hair groups 65+, 65a+ -; squarish-crescent dewlaps (fig. 48 (150)); small calcarate inner auricle; broad orbicular-crescent ligule.

CLONE 14 N. G. 124

IMP. 624, ACC. 151

CULMS.—Light brown, becoming brownish green, heavy bloom, and merging wax bands; internodes cylindric, 8 cm. long and 38 mm. across, without bud furrow, light green flesh; stem-epidermal pattern 1+3, average width of long cells 10 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands olive green, cylindric, 10 and 8 mm. high with 3 or 4 rows of primordia; buds green with rose tip, later red, 11×11 mm., inserted below scar and reaching growth ring; prophyll broad ovate or roundish with truncate tip, wing inserted near middle of prophyll, more or less broad, emarginate at base, pubescence sparse, hair groups 1 and 16 evident.

LEAVES.—Sheaths 34 cm. long with medium group 57; blades 180 cm. long and 8.5 cm. broad, module 21; dewlaps ascending squarish, outer surface with dense group 58 and prominent group 58a, inner surface with prominent group 51, dense semilong group 52 and sparse 55; outer auricle transitional and subtended by a short 56, inner auricle medium-long lanceolate and not fringed; ligule thin-flanged orbicular crescent with tall lozenge, 4.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brown-colored cane, with short thick internodes, broad-ovate or roundish more or less smooth buds,

and 3 or 4 rows of root primordia; diagnostic hair groups 52+, 55+ -, 55a+ -, 56+ - -, 57+., 58+, 58a+; ascending squarish dewlaps (fig. 48 (151)); medium-long lanceolate inner auricle; thin-flanged orbicular-crescent ligule with tall lozenge.

CLONE 14 N. G. 190

IMP. 625, ACC. 152

CULMS.—Bronze, becoming greenish yellow to green, with sparse bloom and prominent wax bands; internodes cylindrical, 8 cm. long and 32×36 mm. across, without bud furrow, light-orange flesh; stem-epidermal pattern 1+4, average width of long cells 9.6 μ , stomates absent; growth rings green, narrow, flush or slightly tumescent; root bands greenish, cylindric tumescent, 10 and 9 mm. high with 4 rows of primordia; buds reddish, 11×10 mm., inserted below scar and reaching growth ring; prophyll broad ovate to rhomboid, round-pointed tip, wing inserted below middle of prophyll, broad, pubescence sparse, most prominent hair groups include 19, 1, 16, 4.

LEAVES.—Sheaths 33 cm. long and smooth; blades 150 cm. long and 6.5 cm. broad, module 23; dewlaps ascending ligulate, outer surface with medium group 58, inner surface with small group 51, dense group 52, and small group 63; outer auricle transitional or small deltoid, inner auricle medium-long lanceolate and fringed; ligule medium broad-flanged deltoid crescent, 4.5 mm. high, 61 medium short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Bronze-colored cane, with more or less short thick internodes, broad-ovate slightly hairy buds with prominent group 19; tall root bands with 4 rows of primordia; diagnostic hair groups 52+, 63+ - -; ascending ligulate dewlaps (fig. 48 (152)); medium-long lanceolate inner auricle; medium broad-flanged deltoid-crescent ligule.

CLONE 14 N. G. 241

IMP. 623, ACC. 153

CULMS.—Rose, with olive-green stripes becoming yellow and green striped, brick-red flush, sparse bloom, and medium wax bands; internodes cylindrical, 14 cm. long and 33 mm. across, small bud furrow, hard light-orange flesh; stem-epidermal pattern 1+3+7, average width of long cells 8.3 μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped, cylindric, 8 and 7 mm. high with 3 irregular rows of primordia; buds green with reddish cast, 13×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, more or less narrow, pubescence sparse, hair groups 1, 10 evident.

LEAVES.—Sheaths striped, 35 cm. long with medium group 57; blades striped 120 cm. long and 5 cm. broad, module 24; dewlaps ascending squarish, outer surface with sparse group 58, inner surface with somewhat prominent group 51 and medium group 52; outer auricle transitional or small deltoid, inner auricle long lanceolate and

fringed; ligule thin-flanged crescent with broad lozenge, 4 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Cane with striped internodes, sheath, and blade, medium-large more or less smooth buds; 3 irregular rows of root primordia; diagnostic hair group 57+.; ascending squarish dewlaps (fig. 48 (153)); long lanceolate and fringed inner auricle; thin-flanged crescent ligule with broad lozenge.

CLONE 37 N. G. 6

IMP. 1035, ACC. 154

CULMS.—Yellowish green, with sparse bloom, corky cracks, and broad wax bands; internodes cylindric, 12 cm. long and 28×29 mm. across, prominent bud furrow, green-olive flesh; stem-epidermal pattern 2+5, average width of long cells 8 μ , stomates present; growth rings olive, narrow, tumescent; root bands green, cylindric conoidal, 9 and 8 mm. high with 4 rows of crowded primordia; buds green, with light-olive wings, 13 × 11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted at or slightly above middle of prophyll, medium broad with 2 secondary wings, pubescence medium dense especially on posterior side, prominent hair groups 1, 2, 16, 6, 11, 10, 18, 19.

LEAVES.—Sheaths 32 cm. long with medium group 57; sheath base with small group 64e; blades 140 cm. long and 6 cm. broad, module 23; dewlaps deltoid squarish or squarish, outer surface with medium group 58, inner surface with prominent group 51 that continues as group 65 toward midrib, dense group 52, small groups 63 and 55; outer auricle transitional and subtended by a short 56, inner auricle deltoid or short lanceolate and fringed to tip; ligule narrow crescent, 3 mm. high, group 61 very short; dorsal pubescence as sparse 55a and 65a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with prominent bud furrow, medium-hairy ovate buds having secondary wings; 4 rows of crowded root primordia; diagnostic hair groups 52+, 55+-- , 55a+-, 56+-- , 57+., 63+-- , 64e+-, 65+-, 65a+-; deltoid squarish or squarish dewlaps (fig. 48 (154)); deltoid or short lanceolate inner auricle; narrow crescent ligule.

NEW CALEDONIAN GROUP

CLONE N. C. 5

IMP. 879, ACC. 156

CULMS.—Reddish brown and green striped, with sparse bloom and prominent wax bands; internodes cylindric, concave on bud side and shouldered, 8.5 cm. long and 37×40 mm. across, without or with small bud furrow, light-orange flesh; stem-epidermal pattern 2+3, average width of long cells 13.1 μ , stomates absent; growth rings striped, narrow, flush or slightly tumescent; root bands striped, tumescent-conoidal, 11 mm. high with 3 or 4 rows of primordia; buds green with red tip, later all red, somewhat protruding, 11×10 mm., inserted at scar and extending to or above growth ring; prophyll ovate with prominent

basal appendage and pointed tip, wing inserted below middle of prophyll, very narrow, pubescence medium, more or less prominent on back side, important hair groups 1, 2, 10, 19, 11.

LEAVES.—Sheaths striped, 32 cm. long with narrow group 57; sheath base decurrent; blades 164 cm. long and 7 cm. broad, module 23; dewlaps ascending flaring ligulate, outer surface with sparse group 58, inner surface with a small group 51 and sparse group 52; outer auricle transitional, inner auricle small deltoid; ligule crescent deltoid, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped, thick, short-jointed cane, with medium hairy buds having narrow wings (fig. 28 (879)); tall root bands; diagnostic hair group 57+ -; ascending flaring-ligulate dewlaps (fig. 48 (156)); small deltoid inner auricle; tall crescent-deltoid ligule.

CLONE N. C. 11

IMP. 880, ACC. 157

CULMS.—Purple and green striped, with sparse bloom, and prominent wax bands; internodes cylindric tumescent and shouldered, 8.5 cm. long and 37 mm. across, without or with small bud furrow, soft light-green flesh; stem-epidermal pattern 2+4, average width of long cells 11.3 μ , stomates absent; growth rings striped, narrow, flush or tumescent; root bands striped, cylindric-constricted, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds green with reddish wings, later all red, 15 \times 14 mm., inserted at scar and extending above growth ring; prophyll broad ovate with prominent basal appendage and round-pointed or truncate tip, wing inserted below middle of prophyll, broad, emarginate and fringed at base, pubescence more or less sparse, hair groups 1, 2, 19, 10 evident.

LEAVES.—Sheaths 33 cm. long with small group 57; sheath base with groups 59 and 69; blades 161 cm. long and 5.9 cm. broad, module 27; dewlaps red, ascending squarish, outer surface with sparse group 58 and long marginal group 58a, inner surface with a narrow group 51, sparse groups 52, 55, and 63; outer auricle transitional, inner auricle small calcarate; ligule broad-centered subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Striped cane, with large more or less smooth buds having broad basally emarginate and fringed wings (fig. 29 (880)); 3 or 4 rows of crowded primordia; diagnostic hair groups 55+ - -, 57+ -, 59+ -, 63+ - -, 69+ -; red, ascending squarish dewlaps (fig. 49 (157)); small calcarate inner auricle; medium-tall somewhat broad-centered ligule.

CLONE N. C. 15

IMP. 881, ACC. 158

CULMS.—Dark reddish-brown and green striped, when young light reddish-brown and green striped, with sparse bloom and prominent wax bands; internodes cylindric or slightly bobbin-shaped, 9.5 cm. long and 35 mm. across, without or with small bud furrow, soft olive flesh; stem-epidermal pattern 4+5, average width of long cells 10.8 μ , stomates present; growth rings greenish, narrow, tumescent; root

bands greenish red, cylindric, 6 and 5 mm. high with 2 rows of primordia; buds red, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence medium prominent with hair groups 1, 2, 16, 11, 10, 18, and especially 19 outstanding.

LEAVES.—Sheaths 30 cm. long with medium group 57; sheath base with prominent groups 69, 59; blades 148 cm. long and 5.3 cm. broad, module 28; dewlaps squarish double crescent or ascending flaring ligulate, outer surface with dense group 58, inner surface with broad group 51 that extends as group 65 in narrow file toward midrib, sparse groups 52 and 55; both auricles sloping transitional; ligule subarcuate, 3.5 mm. high, group 61 medium long, dorsal pubescence as prominent 55a, 65a+-, and in flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy buds having outstanding groups 16 and 19 (fig. 27 (881)); narrow root bands with 2 rows of primordia; diagnostic hair groups 55+, 55a+, 57+., 58+, 59+-, 61+., 65+, 65a+-, 69+; squarish double-crescent or ascending flaring-ligulate dewlaps (fig. 49 (158)); transitional auricles; medium-narrow subarcuate ligule.

CLONE N. C. 17

IMP. 882, ACC. 159

CULMS.—Green becoming bronze, with sparse bloom and prominent wax bands; internodes cylindric, 6 cm. long and 38 mm. across, small bud furrow, green flesh except center; stem-epidermal pattern 3+2, average width of long cells 8.9 μ , stomates absent; growth rings green, narrow, flush; root bands cylindric to conoidal, 6 mm. high with 2 rows of primordia; buds green with olive wing, 15×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and covered with short or semilong white hair, pubescence medium prominent, outstanding hair groups 1, 2, 16, 19, 10, 11.

LEAVES.—Sheaths 30 cm. long with small and narrow group 57; blades 125 cm. long and 7.6 cm. broad, module 16; dewlaps ascending squarish, outer surface with medium-sparse group 58, inner surface with medium group 51, and sparse group 52; both auricles sloping transitional, outer one subtended by a short group 56; ligule orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERISTICS.—Green-colored cane, with medium-hairy ovate buds (fig. 29 (882)); narrow root bands with 2 rows of primordia; diagnostic hair groups 56+-, 57+--; ascending squarish dewlaps (fig. 49 (159)); inner auricle transitional; narrow crescent ligule.

CLONE N. C. 18

IMP. 883, ACC. 160

CULMS.—Bronze green, when young yellowish green faintly striped with pink, with sparse bloom and prominent wax bands; internodes cylindric, 8 cm. long and 37 mm. across, prominent bud furrow, faint

violet flesh; stem-epidermal pattern 2+3, average width of long cells 9.4μ , stomates present; growth rings reddish, narrow, tumescent; root bands reddish-green, cylindrical, 6 and 4 mm. high with 2 or 3 rows of primordia; buds reddish, 12×11 mm., inserted at scar and extending above growth ring; prophyll broad ovate with round-pointed tip, wing inserted near middle of prophyll, medium wide and broadening toward tip, pubescence medium with hair groups 1, 2, 11, 10, 16, 19 evident, posterior side with prominent group 10.

LEAVES.—Sheaths 34 cm. long with small group 57; sheath base with group 69 blades 157 cm. long and 5.4 cm. broad, module 29; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with very small group 51 and sparse group 52; outer auricle transitional occasionally with small 56, inner auricle small calcarate; ligule subarcuate, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Bronze-green cane, with small medium-hairy buds and narrow root bands (fig. 25 (883)); diagnostic hair groups 56+ - - -, 57+ - -, 69+ -; ascending ligulate dewlaps (fig. 49 (160)); small calcarate inner auricle; broad subarcuate ligule.

CLONE N. C. 19

IMP. 884, ACC. 161

CULMS.—Greenish yellow becoming green, with sparse bloom and prominent wax bands; internodes cylindrical or slightly obconoidal and shouldered, 9 cm. long and 36 mm. across, prominent bud furrow, green flesh; stem-epidermal pattern 1+4, average width of long cells 9.8μ , stomates absent; growth rings green, narrow, flush; root bands green, conoidal, 13 and 11 mm. high with 3 or 4 rows of primordia; buds green with reddish wing, 15×10 mm., inserted at scar and extending above growth ring; prophyll long ovate with prominent basal appendage and round-pointed tip, wing inserted near middle of prophyll, medium broad and basally fringed, pubescence sparse, hair groups 1, 2, 10, 11 evident.

LEAVES.—Sheaths 36 cm. long with small group 57; sheath base decurrent; blades 144 cm. long and 5.9 cm. broad, module 24; dewlaps deltoid, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle transitional, inner auricle small calcarate; ligule crescent deltoid, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green cane, with long ovate slightly hairy buds (fig. 29 (884)); very tall root bands with 3 or 4 rows of primordia; diagnostic hair group 57+ - -; deltoid dewlaps (fig. 49 (161)); small calcarate inner auricle; tall deltoid-crescent ligule.

CLONE N. C. 20

IMP. 885, ACC. 162

CULMS.—Dark red, with sparse bloom and narrow wax bands; internodes cylindrical to bobbin-shaped, 11 cm. long and 30 mm. across, prominent bud furrow, medium-hard greenish-brown flesh; stem-epidermal pattern 2, average width of long cells 13μ , stomates present; growth rings red, narrow, flush; root bands conoidal, 5 and 4 mm. high

with 2 or 3 rows of primordia; buds red, 15×10 mm., inserted at scar and extending above growth ring; prophyll narrow deltoid with round-pointed tip, wing inserted very low, narrow, deltoid and fringed; anterior pubescence more or less sparse, posterior general and prominent.

LEAVES.—Sheaths 32 cm. long with medium group 57; blades 135 cm. long and 4 cm. broad, module 24; dewlaps shallow deltoid crescent, outer surface with medium group 58, inner surface with small to medium group 51 and sparse group 52; outer auricle transitional, inner auricle lanceolate and fringed; ligule subarcuate, 3.5 mm. high, hair group 61 long, dorsal pubescence prominent as dense semiadnate 66.

DISTINGUISHING CHARACTERS.—Dark-red cane, with deltoid buds prominently hairy on posterior side (fig. 24 (885)); narrow root bands; diagnostic hair groups $57+$, $61+$; shallow deltoid-crescent dewlaps (fig. 49 (162)); lanceolate inner auricle; narrow subarcuate ligules.

CLONE N. C. 21

IMP. 886, ACC. 163

CULMS.—Olive, with light-purple stripes, sparse bloom, and prominent wax bands; internodes cylindrical, concave on bud side and shouldered, 9 cm. long and 36 mm. across, small bud furrow, medium-hard faint-green flesh; stem-epidermal pattern 3, average width of long cells 9.6μ , stomates present; growth rings striped, medium broad, flush; root bands striped, conoidal, 11 and 10 mm. tall with 4 rows of primordia; buds red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence sparse, hair groups 1 and 10 somewhat prominent.

LEAVES.—Sheaths 35 cm. long with narrow group 57; blades 142 cm. long and 4.2 cm. broad, module 22; dewlaps flaring deltoid, outer surface with sparse group 58, inner surface with very small group 51 and sparse group 52; outer auricle transitional, inner auricle calcarate and partly fringed; ligule crescent deltoid, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with more or less smooth buds (fig. 23 (886)); tall root bands with 4 rows of primordia; diagnostic hair group $57+ - -$; flaring deltoid dewlaps (fig. 49 (163)); calcarate inner auricle; deltoid-crescent ligule.

CLONE N. C. 24

IMP. 887, ACC. 164

CULMS.—Olive, when young faintly red and green striped, with sparse bloom and prominent wax bands; internodes cylindrical to slightly bobbin-shaped, concave on bud side and shouldered, 12 cm. long and 30 mm. across, medium-prominent bud furrow, greenish flesh; stem-epidermal pattern 2, average width of long cells 11.6μ , stomates absent; growth rings reddish olive, narrow, flush; root bands reddish, cylindrical obconoidal, 6 and 5 mm. high with 2 or 3 rows of sparse primordia; buds reddish, 11×8 mm., inserted below scar and reaching growth ring; prophyll oval with prominent basal append-

age and long-pointed tip, wing inserted below middle of prophyll, broad, especially in apical region, pubescence medium sparse and mostly basal, hair groups 1, 2, 19 evident.

LEAVES.—Sheaths 34 cm. long with medium group 57 and prominent group 60; blades 142 cm. long and 4.4 cm. broad, module 32; dewlaps tall squarish deltoid, outer surface with medium group 58, inner surface with small group 51, medium group 52; both auricles ascending transitional or inner short lanceolate; ligule crescent, 3.5 mm. high, group 61 tall, dorsal pubescence short.

DISTINGUISHING CHARACTERS.—Olive cane, with small, slightly hairy buds having prominent broad wings (fig. 25 (887)); narrow root bands; diagnostic hair groups 57+, 60+, 61+; tall squarish-deltoid dewlaps (fig. 49 (164)); transitional or short lanceolate inner auricle; crescent ligule.

CLONE N. C. 25

IMP. 888, ACC. 165

CULMS.—Yellow and olive-green striped, with sparse bloom and narrow wax bands; internodes cylindrical, 8.5 cm. long and 36 mm. across, prominent bud furrow, light-orange flesh; stem-epidermal pattern 3, average width of long cells 9.2μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindrical, 6 and 5 mm. high with 2 or 3 rows of primordia; buds greenish with rose tip, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with broad basal appendage and slightly truncate tip, wing inserted below middle of prophyll, medium broad to broad, pubescence very sparse, only hair group 1 somewhat outstanding.

LEAVES.—Sheaths striped, 34 cm. long with narrow group 57; blades 149 cm. long and 6.9 cm. broad, module 21; dewlaps steeply ascending ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles sloping transitional, outer one subtended by a short group 56; ligule orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane with smooth broad-winged buds (fig. 28 (888)); narrow root bands; diagnostic hair groups $56+ - -$, $57+ - -$; steeply ascending ligulate dewlaps (fig. 49 (165)); transitional auricles; orbicular-crescent ligule.

CLONE N. C. 29

IMP. 889, ACC. 166

CULMS.—Green, with red blush, heavy bloom, and prominent wax bands; corky cracks and patches; internodes slightly conoidal, concave on bud side and shouldered, 10 cm. long and 35 mm. across, long bud furrow, olive-green flesh; stem-epidermal pattern $1 + 6 + 4$, average width of long cells 11μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindrical tumescent, 8 and 7 mm. high with 2 rows of sparse primordia; buds green, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate tip, wing inserted near middle of prophyll, narrow at base and broadening toward tip, wing pubescence short-haired and

dense, principal pubescence at base and tip, hair groups 1, 2, 4, 10, 11, outstanding.

LEAVES.—Sheaths 32 cm. long with prominent group 57; sheath base with prominent groups 59, 69; blades 148 cm. long and 7.5 cm. broad, module 20; dewlaps tall crescent squarish, outer surface with prominent group 58, inner surface with small group 51, prominent semilong groups 52 and 63, prominent group 55; outer auricles transitional, inner auricle small calcarate; ligule broad-flanged subarcuate, 4 mm. high, group 61 tall, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Green cane, with medium-hairy buds (fig. 24 (889)); 2 rows of sparse root primordia; diagnostic hair groups 52+, 55+, 57+, 58+, 59+, 61+, 63+, 69+; tall crescent-squarish dewlaps (fig. 49 (166)); small calcarate inner auricle; broad-flanged medium-tall subarcuate ligule.

CLONE N. C. 30

IMP. 890, ACC. 167

CULMS.—Olive to bronze green, with sparse bloom, corky cracks, and medium wax bands; internodes cylindrical or slightly bobbin-shaped, 11 cm. long and 27×30 mm. across, small bud furrow, hard light-olive flesh; stem-epidermal pattern 2, average width of long cells 12.5 μ , stomates absent; growth rings green, narrow, tumescent; root bands green, cylindrical obconoidal, 7 and 6 mm. high with 2 or 3 rows of semispars primordia; buds green with red tip, 10×9 mm., inserted at scar and extending above growth ring, protruding at wide angle when mature; prophyll pentagonal with truncate-notched tip, wing inserted near middle of prophyll, very broad, fringed at base, pubescence sparse, hair groups 1 and 11 somewhat prominent.

LEAVES.—Sheaths 31 cm. long with prominent groups 57 and 60; sheath base with group 64e; blades 148 cm. long and 7 cm. broad, module 21; dewlaps deltoid crescent, outer surface with prominent group 58, inner surface with medium group 51, dense semilong-haired groups 52, 55, and 63; outer auricle transitional, inner auricle small unciform; ligule broad-flanged crescent or subarcuate, 4 mm. high, group 61 long, dorsal pubescence medium long and prominent.

DISTINGUISHING CHARACTERS.—Olive to bronze-green cane, with small more or less smooth buds having broad wings; narrow root bands; diagnostic hair groups 52+, 55+, 57+, 58+, 60+, 61+, 63+, 64e+ -; deltoid-crescent dewlaps (fig. 49 (167)); unciform inner auricle; broad-flanged, crescent or subarcuate, medium-tall ligule.

CLONE N. C. 31

IMP. 891, ACC. 168

CULMS.—Green and purple striped, with sparse bloom and medium wax bands; internodes cylindrical, slightly obconoidal or concave convex, up to 12 cm. long and 34 mm. across, without bud furrow, light-green flesh; stem-epidermal pattern 1+6-, average width of long cells 13 μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindrical or conoidal, 9 and 8 mm. high with 3 or 4 rows of primordia; buds green with red tip, later red, 15×10 mm., inserted at

scar and extending above growth ring; prophyll deltoid ovate, when young roundish ovate, wing inserted below middle of prophyll, narrow, tip rounded or pointed, pubescence sparse, groups 1, 2, 11, 16, 19 evident.

LEAVES.—Sheaths 30 cm. long with medium-prominent group 57 and small group 60; blades 143 cm. long and 5.5 cm. broad, module 26; dewlaps medium tall, squarish deltoid, outer surface with sparse group 58, inner surface with sparse groups 51, 52, and 63; outer auricle transitional, inner auricle short lanceolate or falcate and basally fringed; ligule crescent-deltoid with tall center and narrow flanges, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with prominent more or less conoidal root bands; large smooth buds (fig. 26 (891)); diagnostic hair groups 57+, 60+, 63+; medium-tall squarish-deltoid dewlaps (fig. 49 (168)); short lanceolate or falcate inner auricle; crescent-deltoid ligule.

CLONE N. C. 32

IMP. 892, ACC. 169

CULMS.—Bronze green, becoming brownish purple and densely covered with hair; internodes short, tumescent, 35 mm. across, without bud furrow, medium-hard flesh, green to center; stem-epidermal pattern 3, average width of long cells 11.5μ , stomates present; growth rings green, narrow, flush; root bands green, constricted, 8 mm. high with 3 or 4 rows of primordia; buds greenish red, 8×9 mm., inserted below scar and reaching growth ring; prophyll broad ovate with round-pointed tip, wing inserted below middle of prophyll, broad at base, pubescence sparse, hair group 24 present.

LEAVES.—Sheaths 28 cm. long with medium group 57; sheath base decurrent with groups 59, 69; blades 140 cm. long and 7 cm. broad, module 20; dewlaps ascending squarish or ligulate, outer surface with more or less dense group 58, inner surface with small group 51 that continues as group 65 single file for a short distance, medium group 52 and sparse group 63; both auricles broad transitional; ligule crescent, 3.5 mm. tall, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Bronze-green cane with hairy stems, broad ovate buds with broad wings and very sparse pubescence (fig. 23 (892)); medium root band with 3 or 4 rows of primordia; diagnostic hair groups 57+, 59+, 63+--, 65+--, 69+, ascending squarish or ligulate dewlaps (fig. 49 (169)); transitional auricles; crescent ligule.

CLONE N. C. 33

IMP. 893, ACC. 170

CULMS.—Pallid green, faintly striped with olive green, inconspicuous red blush, sparse bloom, and narrow wax bands; internodes cylindrical, 8 cm. long and 28 mm. across, long bud furrow, very light brown flesh; stem-epidermal pattern 2+3, average width of long cells 11.9μ , stomates present; growth rings olive, narrow, flush; root bands olive, cylindrical or constricted, 6 and 5 mm. high with 2 or 3 rows of primordia; buds green with rose tip, 12×10 mm., inserted below scar and extend-

ing above growth ring; prophyll ovate with pointed or truncate-notched tip, wing inserted below middle of prophyll, narrow at base, pubescence medium sparse, prominent hair groups 1, 16, 11, 19, 18.

LEAVES.—Sheath 34 cm. long with small group 57; blades 150 cm. long and 6.3 cm. broad, module 24; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles transitional; ligule broad-centered crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Faintly striped cane with medium-hairy buds with prominent groups 16 and 19 (fig. 20 (893)); narrow root bands; diagnostic hair group 57+ --; ascending ligulate dewlaps (fig. 49 (170)); transitional auricles; broad-centered crescent ligule.

CLONE N. C. 39

IMP. 896, ACC. 171

CULMS.—Yellowish green, sometimes with reddish blush, sparse bloom, and prominent wax bands; internodes cylindrical to bobbin-shaped, 10 cm. long and 38 mm. across, medium bud furrow, somewhat spongy light-green flesh; stem-epidermal pattern 1+3+7, average width of long cells 11μ , stomates absent; growth rings olive green, narrow, tumescent; root bands green, cylindrical tumescent, 10 and 7 mm. high with 2 or 3 rows of primordia; buds green with rose wings, 11×8 mm. inserted above or at scar and extending above growth ring; prophyll ovate with truncate-serrate tip, wing inserted above middle of prophyll, broad, pubescence medium prominent, outstanding groups 11, 10, 1, 2.

LEAVES.—Sheaths 35 cm. long with prominent groups 57 and 60; sheath base with groups 59 and 69; blades 138 cm. long and 6.9 cm. broad, module 20; dewlaps squarish deltoid, outer surface with dense group 58, inner surface with prominent group 51, dense semilong groups 52 and 63, and very prominent group 52a; both auricles sloping transitional; ligule broad-centered subarcuate, 4 mm. high, group 61 long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with medium-large buds having very prominent groups 10 and 11; medium-tall root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 52a+, 57+, 58+, 59+, 61+, 63+, 69+; squarish-deltoid dewlaps (fig. 49 (171)); transitional auricles; broad-centered subarcuate ligule.

CLONE N. C. 40

IMP. 897, ACC. 172

CULMS.—Olive, with purple blush, sparse bloom, and prominent wax bands; internodes cylindrical, 10 cm. long and 29 mm. across, medium bud furrow, very light brown flesh; stem-epidermal pattern 1+4, average width of long cells 11.3μ , stomates absent; growth rings green, narrow, tumescent; root bands green, cylindrical, 7 and 6 mm. high with 2 or 3 rows of sparse primordia; buds green with rose wing, later red, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with truncate and notched tip, wing in-

served below middle of prophyll, broad and fringed, medium hairy, groups 1, 2, 4, 13, 11, 10 prominent.

LEAVES.—Sheaths 34 cm. long with prominent groups 57 and 60; blades 145 cm. long and 7 cm. broad, module 21; dewlaps tall squarish or tall crescent deltoid, outer surface with prominent group 58, inner surface with prominent group 51, and dense group 52, very prominent semilong-haired groups 63 and 52a; both auricles transitional, or inner auricle small calcarate; ligule broad-centered subarcuate, 3.5 mm. high, group 61 very long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Olive cane, with purple blush, broad-winged medium-hairy buds (fig. 28 (897)); narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 52a+, 57+, 58+, 60+, 61+, 63+; tall squarish or tall crescent-deltoid dewlaps (fig. 50 (172)); small calcarate or transitional inner auricle; broad-centered subarcuate ligule.

CLONE N. C. 42

IMP. 898, ACC. 173

CULMS.—Bright green to greenish yellow, with faint purple stripes when young, general bloom, and merging wax bands; internodes cylindric, 12.5 cm. long and 33 mm. across, small bud furrow, soft white flesh; stem-epidermal pattern 3+1, average width of long cells 9.8μ , stomates absent; growth rings indistinct, narrow, flush; root bands green, cylindric-constricted, 9 and 8 mm. high with 3 rows of primordia; buds green edged in red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate notched or more or less serrate tip, wing inserted below middle of prophyll, very broad, and heavily fringed, pubescence more or less sparse, wing densely covered on both sides with red semishort hair, most prominent hair groups 16, 19, 1, 4.

LEAVES.—Sheaths 38 cm. long and smooth; sheath base with short sectorial group 59; blades 147 cm. long and 5.5 cm. broad, module 27; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with very small group 51, and dense group 52; both auricles transitional; ligule narrow deltoid crescent, 3 mm. high, group 61 long, dorsal pubescence short.

DISTINGUISHING CHARACTERS.—Faintly striped cane with broad-winged heavily fringed buds having outstanding groups 16 and 19 (fig. 20 (898)); medium root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 59+ -, 61+; ascending ligulate dewlaps (fig. 50 (173)); transitional auricles; narrow deltoid-crescent ligule.

CLONE N. C. 49

IMP. 900, ACC. 174

CULMS.—Greenish yellow, with sparse bloom and medium wax bands; internodes cylindric, 10 cm. long and 32 mm. across, prominent bud furrow, spongy greenish-ivory flesh; stem-epidermal pattern 3+7, average width of long cells 10μ , stomates present; growth rings olive, narrow, flush; root bands ivory green, cylindric, 8 and 7 mm. tall with 3 or 4 rows of primordia; buds green, 12×11 mm., inserted

at scar and extending above growth ring; prophyll ovate with prominent basal appendage and broad truncate, notched tip, wing inserted below middle of prophyll, broad, emarginate at base, pubescence very sparse.

LEAVES.—Sheaths 32 cm. long with medium group 57; blades 156 cm. long and 6.9 cm. broad, module 23; dewlaps crescent squarish, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles sloping transitional; ligule narrow arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence wanting.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with broad-winged smooth buds; 3 or 4 rows of primordia; diagnostic hair group 57+.; crescent-squarish dewlaps (fig. 50 (174)); sloping transitional auricles; narrow arcuate ligule.

CLONE N. C. 50

IMP. 902, ACC. 175

CULMS.—Dark red, faintly striped with light red when young, sparse bloom, and constricted wax bands; internodes cylindrical and shouldered, 9 cm. long and 29 mm. across, long and narrow bud furrow, light brownish hard flesh; stem-epidermal pattern 1, average width of long cells 10.6μ , stomates present; growth rings indistinct, medium broad, flush; root bands red, cylindrical, 9 and 7 mm. high with 3 or 4 irregular rows of primordia; buds red, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate rhomboid with blunt tip, wing inserted below middle of prophyll, broad at base and more or less emarginate throughout, medium hairy, principal hair groups 16, 19, 1, 2, 10, 11.

LEAVES.—Sheaths 34 cm. long with medium group 57; sheath base decurrent with sectorial group 59 and group 64e; blades 171 cm. long and 6 cm. broad, module 28; dewlaps squarish double crescent, outer surface with dense group 58, inner surface with small group 51, prominent 65, and sparse group 52; both auricles ascending transitional; ligule tall crescent, 8 mm. high, group 61 long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Faintly striped cane with medium-hairy buds (fig. 20 (902)); 3 or 4 rows of root primordia; diagnostic hair groups 57+., 58+, 59+., 61+, 64e+., 65+; squarish double-crescent dewlaps (fig. 50 (175)); ascending transitional auricles; very tall crescent ligule.

CLONE N. C. 51

IMP. 894, ACC. 176

CULMS.—Purple and green striped, with sparse bloom and prominent wax bands; internodes cylindrical, 10 cm. long and 34 mm. across, prominent bud furrow, hard light-purple flesh; stem-epidermal pattern 1 + 4, average width of long cells 12.1μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, cylindrical obconoidal, 7 and 6 mm. high with 2 rows of sparse primordia; buds red, 13×9 mm., inserted at scar and extending above growth ring;

prophyll ovate with broad basal appendage and pointed tip, wing inserted below middle of prophyll, medium narrow, pubescence sparse, hair groups 1, 2, 16, 19, 11, 10 evident.

LEAVES.—Sheaths 35 cm. long with narrow group 57; sheath base decurrent with group 69; blades 140 cm. long and 7.4 cm. broad, module 19; dewlaps ascending flaring double crescent, outer surface with sparse group 58, inner surface with small group 51, dense group 52, and very small group 63; both auricles transitional, outer one subtended by a short group 56; ligule medium broad-centered subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane with slightly hairy buds; 2 rows of sparse root primordia; diagnostic hair groups 52+, 56+--, 57+--, 63+--, 64e+--; ascending flaring double-crescent dewlaps (fig. 50 (176)); transitional auricles; medium-tall subarcuate ligule.

CLONE N. C. 53

IMP. 895, ACC. 177

CULMS.—Dark red, with sparse bloom and narrow wax bands; internodes cylindrical and shouldered, 11 cm. long and 31 mm. across, prominent bud furrow, soft light-purple flesh; stem-epidermal pattern 1 + 3, average width of long cells 11μ , stomates absent; growth rings red, narrow, flush; root bands red, conoidal-tumescient, 10 and 9 mm. high with 3 or 4 rows of crowded primordia; buds red, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad and slightly emarginate at base, pubescence medium sparse, prominent hair groups 16, 1, 2, 10, 19, 18.

LEAVES.—Sheaths reddish, 30 cm. long with narrow group 57; blades 105 cm. long and 5 cm. broad, module 21; dewlaps ascending ligulate, outer surface with dense group 58 and marginal group 58a, inner surface with small group 51 and dense group 52; outer auricle broad transitional, inner auricle medium-large calcarate and inserted low; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red cane with broad-winged buds having prominent groups 16, 19, 1, and 10 (fig. 21 (895)); tall root bands with 3 rows of primordia; diagnostic hair groups 52+., 57+., 58+; ascending ligulate dewlaps (fig. 50 (177)); calcarate inner auricle; broad orbicular-crescent ligule.

CLONE N. C. 64

IMP. 901, ACC. 178

CULMS.—Dark red, with prominent wax bands and sparse bloom; internodes cylindrical or slightly tumescient, 10 cm. long and 29 mm. across, prominent bud furrow, light-red flesh; stem-epidermal pattern 1+3, average width of long cells 11.6μ , stomates absent; growth rings red, narrow, tumescient; root bands red, tumescient, 8 mm. high with 3 or 4 rows of primordia; buds red, 11×8 mm., inserted below scar and extending above growth ring; prophyll narrow ovate, often

with hooked tip, wing inserted below middle of prophyll, narrow, pubescence sparse, hair groups include 13, 14, 29 evident.

LEAVES.—Sheaths reddish with small group 57, 34 cm. long; sheath base slightly decurrent; blades 115 cm. long and 5.1 cm. broad, module 22; dewlaps deltoid, outer surface with medium-dense group 58, inner surface with small to medium group 51, dense group 52; outer auricle transitional, inner auricle small calcarate; ligule broad-centered orbicular crescent, 4.5 mm. high, group 61 long, dorsal pubescence medium prominent.

DISTINGUISHING CHARACTERS.—Dark-red cane, with sparsely hairy buds (fig. 30 (901)); narrow root bands; diagnostic hair groups 52+, 57+ -, 61+; deltoid dewlaps (fig. 50 (178)); small calcarate inner auricle; broad-centered orbicular-crescent ligule.

CLONE N. C. 74

IMP. 903, ACC. 179

CULMS.—Mottled purple, with olive undercast, sparse bloom, and narrow heavy wax bands; internodes cylindrical to bobbin-shaped, concave on bud side, 11 cm. long and 27×28 mm. across, shallow bud furrow, soft light-purple flesh; stem-epidermal pattern 2+3, average width of long cells 12.8 μ , stomates absent; growth rings olive, narrow, tumescent; root bands greenish red, tumescent conoidal, 6 and 5 mm. high with 2 or 3 rows of sparse primordia; buds red, 12×9 mm., inserted below scar and extending above growth ring; prophyll ovate or rhomboid with pointed tip, wing inserted near middle of prophyll, broad, pubescence medium sparse with groups 1, 2, 4, 19, 6 evident.

LEAVES.—Sheaths 32 cm. long with medium narrow group 57 and small group 60; blades 139 cm. long and 4.6 cm. broad, module 30; dewlaps deltoid crescent, outer surface with medium-sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle transitional, inner auricle small deltoid; ligule crescent, 3.5 mm. high, group 61 long, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Mottled purple cane with medium smooth buds (fig. 22 (903)); narrow root bands; diagnostic hair groups 57+ -, 60+ -, 61+; deltoid-crescent dewlaps (fig. 50 (179)); small deltoid inner auricle; medium-narrow crescent ligule.

CLONE N. C. 76

IMP. 904, ACC. 180

CULMS.—Yellowish green, with light-purple stripes when young, sparse bloom and narrow prominent wax bands; internodes bobbin-shaped, 9 cm. long and 29 mm. across, small bud furrow, light-purple flesh; stem-epidermal pattern 1+3, average width of long cells 12.1 μ , stomates absent; growth rings indistinct, narrow, depressed; root bands striped, cylindrical obconoidal, 5 and 4 mm. high with 2 rows of primordia; buds red, 13×10 mm., inserted below scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, more or less broad, pubescence sparse with groups 1, 2, 11, 10, and 26 evident.

LEAVES.—Sheaths 31 cm. long with medium group 57; blades 150 cm. long and 5.5 cm. broad, module 27; dewlaps ascending squarish crescent or broad ligulate, outer surface with dense group 58, inner surface with small group 51, medium group 52 and semisparsely short-haired group 63 inserted high; outer auricle transitional, inner auricle small deltoid and fringed; ligule broad-centered subarcuate, 4 mm. high, group 61 short, dorsal pubescence short-haired.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with smooth buds (fig. 30 (904)); narrow root bands; diagnostic hair groups 57+, 58+, 63+-; ascending squarish-crescent or broad-ligulate dewlaps (fig. 50 (180)); small deltoid inner auricle; broad-centered subarcuate ligule.

CLONE N. C. 78

IMP. 905, ACC. 181

CULMS.—Purple and green striped, with sparse bloom and prominent constricted wax bands; internodes tumescent and shouldered, constricted above growth ring, 12 cm. long and 34 mm. across, small bud furrow, hard faint-green flesh; stem-epidermal pattern 2, average width of long cells 11μ , stomates present; growth rings striped, narrow, depressed; root bands striped, cylindric-constricted, 10 and 8 mm. high with 4 or 5 rows of small crowded primordia; buds red, 10×9 mm., inserted at scar and extending to growth ring; prophyll broad ovate with prominent basal appendage and notched tip, wing inserted below middle of prophyll, broad and emarginate, pubescence sparse with hair groups 1 and 19 evident.

LEAVES.—Sheaths 31 cm. long with narrow group 57; blades 153 cm. long and 6.5 cm. broad, module 23; dewlaps broad ascending squarish, outer surface with dense group 58 and broad prominent group 58a, inner surface with small or prominent group 51 that extends as group 65 sparingly toward midrib, small group 55, and short-haired sparse group 63, medium group 52; outer auricle transitional, inner auricle small calcarate; ligule tapering broad-centered crescent or subarcuate, 4 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with broad-winged more or less smooth buds; 4 or 5 rows of root primordia; diagnostic hair groups 55+--, 55a+-, 57+--, 58+, 58a+, 63+-, 65+--; broad ascending squarish dewlaps (fig. 50 (181)); small calcarate inner auricle; broad-centered subarcuate ligule.

CLONE N. C. 80

IMP. 906, ACC. 182

CULMS.—Dark red, with sparse bloom and prominent wax bands; internodes cylindric or slightly bobbin-shaped, 8 cm. long and 26 mm. across, prominent bud furrow, olive-orange or light-purple flesh; stem-epidermal pattern 1+7, average width of long cells 10.6μ , stomates absent; growth rings red, narrow, flush; root bands red, tumescent, 6 and 5 mm. high with 2 rows of sparse primordia; buds green with reddish tip, later red, 18×12 mm., inserted at scar and extending above growth ring; prophyll long ovate with crescent-

serrate tip, wing inserted below middle of prophyll, medium broad and prominently fringed, pubescence sparse.

LEAVES.—Sheaths 34 cm. long with medium group 57; blades 143 cm. long and 6 cm. broad, module 24; dewlaps narrow squarish crescent, outer surface with short, dense group 58, inner surface with marginal group 51 and dense semilong group 52; prominent midrib groups 52a and 63; outer auricle transitional, inner auricle small calcarate; ligule orbicular crescent, 3 mm. high, group 61 long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Dark-red cane, with prominently fringed, more or less smooth buds (fig. 26 (906)); 2 rows of root primordia; diagnostic hair groups 52+, 52a+, 57+., 58+, 61+, 63+; narrow squarish-crescent dewlaps (fig. 50 (182)); small calcarate inner auricle; somewhat narrow orbicular-crescent ligule.

CLONE N. C. 81

IMP. 908, Acc. 183

CULMS.—Red and green striped, without bloom but prominent wax bands; internodes cylindric, 12 cm. long and 28 mm. across, long bud furrow, soft olive flesh; stem-epidermal pattern 4+1, average width of long cells 8.3μ , stomates absent; growth rings light olive, narrow, flush; root bands ivory, cylindric tumescent, 8 and 6 mm. high with 2 rows of sparse primordia; buds greenish rose, later red, 9×7 mm., inserted below scar and reaching growth ring; prophyll squarish, often with prominent basal appendage and irregular crescent-serrate tip, wing inserted at middle of prophyll, broad, often unilaterally fringed, pubescence medium prominent.

LEAVES.—Sheaths 30 cm. long with narrow group 57; sheath base appendaged with small group 64e; blades 163 cm. long and 6.9 cm. broad, module 23; dewlaps large squarish crescent, outer surface with sparse group 58, inner surface with sparse groups 51 and 52 and small midrib groups 55 and 63; outer auricle sloping transitional, inner auricle small calcarate; ligule arcuate, 4 mm. high, group 61 short, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Green-and-red striped cane with small medium-hairy buds (fig. 25 (908)); 2 rows of root primordia; diagnostic hair groups 55+-, 57+-, 63+-, 64e+-; large squarish-crescent dewlaps (fig. 50 (183)); small calcarate inner auricle; arcuate or subarcuate ligule.

CLONE N. C. 83

IMP. 910, Acc. 184

CULMS.—Olive with red blush, light green when young, merging bloom, and medium-broad wax bands; internodes slightly bobbin-shaped, 14 cm. long and 25×27 mm. across, bud furrow medium prominent, flesh greenish, hard; stem-epidermal pattern 2+3, average width of long cells 10.2μ , stomates absent; growth rings olive green, medium broad, slightly tumescent; root bands olive, tumescent, 6 and 5 mm. high with 2 rows of sparse primordia; young buds green with reddish tip 11×9 mm., prophyll pentagonal, wing inserted above

middle of prophyll, broad, basally fringed and hairy, pubescence medium with prominent groups 1, 4, 13, 14.

LEAVES.—Sheaths 35 cm. long with prominent group 57; blades 139 cm. long and 4.5 cm. broad, module 31; dewlaps squarish or squarish crescent, outer surface with medium to dense group 58, inner surface with small marginal group 51 and sparse groups 52 and 63; outer auricle transitional, inner auricle falcate; ligule deltoid crescent, 4 mm. high, group 61 long, dorsal pubescence adnate.

DISTINGUISHING CHARACTERS.—Olive-colored cane, with small pentagonal medium-hairy buds (fig. 22(910)); narrow root bands with 2 rows of primordia; diagnostic hair groups 57+, 61+, 63+—; squarish or squarish-crescent dewlaps (fig. 50 (184)); inner auricle falcate; medium-tall deltoid-crescent ligule.

CLONE N. C. 90

IMP. 911, ACC. 185

CULMS.—Yellowish green, with sparse bloom and prominent wax bands; internodes cylindric, concave on bud side and shouldered, 9 cm. long and 40 mm. across, bud furrow medium, flesh faintly green; stem-epidermal pattern 1, average width of long cells 10μ , stomates present; growth rings olive, medium broad, tumescent; root bands olive, cylindric conoidal, 7 and 5 mm. high with 2 rows of primordia; buds green with reddish wing, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, pubescence sparse.

LEAVES.—Sheaths 39 cm. long with narrow group 57; sheath base decurrent and appendaged with small group 64e; blades 151 cm. long and 6.6 cm. broad, module 22; dewlaps deltoid double crescent, outer surface with medium group 58, inner surface with small group 51 and dense group 52, sparse midrib group 63 inserted low; both auricles transitional, outer auricle one subtended by a short group 56; ligule shallow crescent, 3.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with nearly smooth buds (fig. 24 (911)); narrow root bands; diagnostic hair groups 52+, 56+—, 57+—, 63+—, 64e+—; deltoid double-crescent dewlaps (fig. 50 (185)); transitional auricles; shallow-crescent ligule; decurrent and appendaged sheath base.

CLONE N. C. 91

IMP. 912, ACC. 186

CULMS.—Greenish yellow, with rose flush, discolored bloom, and broad wax bands; nodes very prominent; internodes conoidal, 10 cm. long and 29×32 mm. across, without bud furrow, soft light-purple flesh; stem-epidermal pattern 2, average width of long cells 11.9μ , stomates absent; growth ring green, narrow, depressed; root bands green, tumescent, 6 and 5 mm. high with 2 or 3 rows of primordia; buds green with reddish tip, 11×11 mm., inserted at scar and reaching growth ring; prophyll roundish with crescent or roundish tip, wing inserted above middle of prophyll, broad with prominent basal

fringe, pubescence sparse, with groups 1, 2, 16, and 19 somewhat prominent.

LEAVES.—Sheaths 34 cm. long with prominent groups 57 and 60; blades 150 cm. long and 5.5 cm. broad, module 27; dewlaps double crescent or squarish crescent, outer surface with medium to sparse group 58, inner surface with small group 51 and medium dense group 52, small midrib group 63; outer auricle sloping transitional, inner auricle small calcarate; ligule broad-flanged subarcuate, 5 mm. high, group 61 long, dorsal pubescence prominent but partly adnate.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with roundish slightly hairy buds (fig. 23 (912)); narrow root bands; diagnostic hair groups 52+, 57+, 60+, 61+, 63+ -; double-crescent or squarish-crescent dewlaps (fig. 50 (186)); small calcarate inner auricle; broad subarcuate ligule.

CLONE N. C. 92

IMP. 913, ACC. 187

CULMS.—Purple mottled with olive, heavy bloom and broad merging wax bands; internodes bobbin-shaped conoidal, 11 cm. long and 32×34 mm. across, inconspicuous bud furrow, hard light brownish-purple flesh; stem-epidermal pattern 3+4+2, average width of long cells 9.4 μ , stomates present; growth rings olive red, medium broad, tumescent; root bands olive red, cylindric or tumescent-obconoidal, 10 and 7 mm. high with 3 or 4 rows of primordia; buds red, 15×11 mm., inserted at scar and extending to or above growth ring; prophyll ovate with truncate-notched tip, wing inserted above middle of prophyll, medium broad and fringed, pubescence sparse with hair groups 1, 4, 11, and 10 showing.

LEAVES.—Sheaths 31 cm. long with medium groups 56 and 60; sheath base decurrent with small group 64e; blades 138 cm. long and 5.6 cm. broad, module 27; dewlaps large double-crescent deltoid, outer surface with medium-sparse group 58, inner surface with small group 51, medium-dense group 52, and prominent semilong-haired or sometimes short-haired group 63; both auricles transitional; ligule thin-flanged arcuate with small lozenge, 4 mm. high, hair group 61 long, dorsal pubescence prominent but mostly adnate.

DISTINGUISHING CHARACTERS.—Purple mottled with olive cane with slightly hairy buds prominently fringed and with outstanding groups 10 and 11; medium-tall root bands with 3 or 4 rows of primordia; decurrent sheath base; diagnostic hair groups 57+, 60+ -, 61+, 63+., 64e+ -; large double-crescent-deltoid dewlaps (fig. 51 (187)); transitional auricles; thin-flanged arcuate ligule.

CLONE N. C. 93

IMP. 914, ACC. 188

CULMS.—Greenish yellow and green striped, with medium bloom and broad merging wax bands; internodes somewhat bobbin-shaped, 15 cm. long and 32 mm. across, medium bud furrow, hard light-green flesh; stem-epidermal pattern 1+4+3, average width of long cells 10.3 μ , stomates present; growth rings olive, narrow, flush; root bands ivory, cylindric, 7 and 5 mm. high with 2 rows of sparse primordia;

buds reddish, 13×10 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and prominently fringed, pubescence more or less prominent, hair groups 1, 2, 16, 11, 10, 18, and 4 outstanding.

LEAVES.—Sheaths striped, 34 cm. long with broad group 57; sheath base slightly decurrent with sectorial group 59 and group 69; blades 138 cm. long and 6.4 cm. broad, module 22; dewlaps all flaring deltoid squarish, outer surface with medium group 58, inner surface with broad group 51, dense semilong group 52 and prominent semilong groups 63 and 52a; both auricles sloping transitional; ligule broad-centered subarcuate, 4 mm. high, hair group 61 very long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Striped cane, with somewhat hairy prominently fringed buds having very prominent groups 10 and 11 (fig. 22 (914)); narrow root bands with 2 rows of primordia; diagnostic hair groups 52+, 52a+, 57+, 59+−, 61+, 63+, 69+; tall flaring deltoid-squarish dewlaps (fig. 51 (188)); transitional auricles; broad subarcuate ligule.

CLONE N. C. 94

IMP. 915, ACC. 189

CULMS.—Red, with heavy merging bloom and heavy wax bands; internodes cylindrical to bobbin-shaped, 9.5 cm. long and 30×31 mm. across, prominent bud furrow, light reddish-green flesh; stem-epidermal pattern 2+7, average width of long cells 10.8μ , stomates absent; growth rings red, narrow, tumescent; root bands red, cylindrical, 7 and 6 mm. high with 2 rows of primordia; buds red, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed or truncate-notched tip, wing inserted below middle of prophyll, medium broad and prominently fringed, prominent hair groups 1, 2, 16, 4, 19.

LEAVES.—Sheath 30 cm. long with medium group 57; blades 135 cm. long and 5.5 cm. broad, module 24; dewlaps squarish subcreescent, outer surface with medium-dense group 58, inner surface with medium group 51, dense semilong group 52; semilong-haired group 52a and medium group 63; outer auricle transitional, inner auricle calcarate; ligule broad-centered subarcuate 3.5 mm. high, group 61 long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Red cane, with prominently fringed buds having more or less prominent basal pubescence; narrow root bands with 2 rows of primordia; diagnostic hair groups 52+, 52a+, 57+., 61+, 63+.; squarish-subcreescent dewlaps (fig. 51 (189)); inner auricle calcarate; medium-broad subarcuate ligule.

CLONE N. C. 99

IMP. 917, ACC. 190

CULMS.—Yellowish green, with sparse bloom and medium wax bands; internodes cylindrical or slightly bobbin-shaped, 11 cm. long and 38 mm. across, bud furrow medium, flesh soft, light green; stem-epidermal pattern 2+4+3, average width of long cells 10.6μ , stomates absent; growth rings green, narrow, tumescent; root bands green,

tumescent, 9 and 7 mm. high with 3 or 4 rows of primordia; buds green, 12×8 mm., inserted at scar and extending above growth ring; prophyll deltoid with narrow truncate tip, wing inserted below middle of prophyll, medium broad and fringed, wing surface hairy, important hair groups 1, 2, 4, 10, 11, 16, 19.

LEAVES.—Sheath 37 cm. long with prominent group 57; blades 150 cm. long and 5.5 cm. broad, module 27; dewlaps ascending squarish or flaring ligulate, outer surface with prominent group 58 and small marginal group 58a, inner surface with broad group 51 that extends as group 65 single file to midrib, prominent group 52 and small group 63; outer auricle transitional and subtended by a long narrow ledge of group 56, inner auricle transitional or small deltoid; ligule narrow arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence as an inconspicuous group 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, having deltoid buds with fringed and hairy wings and prominent basal and tip pubescence (fig. 26 (917)); diagnostic hair groups 52+, 55a+ --, 56+, 57+, 58+, 63+ -, 65+; ascending-squarish or flaring-ligulate dewlaps (fig. 51 (190)); small deltoid inner auricle; narrow arcuate ligule.

CLONE N. C. 104

IMP. 919, ACC. 192

CULMS.—Greenish yellow, with irregular light-purple stripes, general bloom, and broad wax bands; internodes cylindrical, concave on bud side and shouldered, 9 cm. long and 34 mm. across, small bud furrow, soft, reddish-brown flesh; stem-epidermal pattern 2+3, average width of long cells 12.5 μ , stomates present; growth rings striped, narrow, depressed; root bands striped, cylindrical, 7 and 5 mm. high with 2 rows of primordia; buds green with red wing, 12×9 mm. inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium, broadening toward tip, pubescence sparse.

LEAVES.—Sheaths 30 cm. long with prominent group 57 and small group 60; sheath base with sectorial group 59; blades 133 cm. long and 5.1 cm. broad, module 27; dewlaps double-crescent deltoid, outer surface with medium group 58 and small group 58a, inner surface with small group 51, medium-dense group 52, and sparse group 63; both auricles transitional; ligule crescent deltoid, 3.5 mm. high, group 61 somewhat short, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Striped cane with medium-small, more or less smooth buds (fig. 21 (919)); narrow root bands with 2 rows of primordia; diagnostic hair groups 57+, 59+-, 60+-, 63+--; double-crescent-deltoid dewlaps (fig. 51 (192)); transitional auricles; crescent-deltoid ligule.

CLONE N. C. 116

IMP. 907, ACC. 193

CULMS.—Brownish red, with heavy bloom and merging wax bands; internodes cylindrical, concave on bud side and shouldered, 12 cm. long and 31 mm. across, bud furrow medium, flesh light green; stem-epidermal pattern 3+7+4, average width of long cells 11.6 μ , stomates

present; growth rings red, narrow, tumescent; root bands red, cylindrical tumescent, 8 and 7 mm. high with 2 or 3 rows of primordia; buds red, 11×10 mm., inserted at scar and extending above growth ring; prophyll ovate with crescent tip, wing inserted near middle of prophyll, broad and prominently fringed, pubescence sparse with groups 1, 2, 4, 10 evident.

LEAVES.—Sheaths 34 cm. long and 5.6 cm. broad with narrow group 57; sheath base with sectorial 59 and 69; blades 130 cm. long and 5.6 cm. broad, module 22; dewlaps very tall ascending squarish or rhomboid, outer surface with medium group 58, inner surface with marginal group 51 and medium-prominent group 52; both auricles sloping transitional, or inner auricle small calcarate; ligule crescent, 2 mm. high, group 61 short, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Brownish-red cane, with prominently fringed buds (fig. 27 (907)); narrow root bands; diagnostic hair groups 52+, 57+-, 59+, 69+-; very tall ascending-squarish or rhomboid dewlaps (fig. 51 (193)); transitional auricles; narrow ligule.

CLONE N. C. 117

IMP. 909, ACC. 194

CULMS.—Bright green, with dusty-rose stripes, sparse bloom, corky cracks, and medium wax bands; internodes obconoidal, 15 cm. long and 37 mm. across, small bud furrow, light-brown flesh to center; stem-epidermal pattern 1+3+4, average width of long cells 9 μ , stomates present, growth rings striped, narrow, depressed; root bands striped, tumescent conoidal, 9 and 8 mm. tall with 4 rows of crowded primordia; buds red, 15×12 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, broad and sparingly fringed; general pubescence sparse, most prominent hair group 10.

LEAVES.—Sheaths striped, 34 cm. long with small group 57; sheath base decurrent with group 69; blades 141 cm. long and 6.5 cm. broad, module 22; dewlaps squarish subcrescent, outer surface with sparse group 58, inner surface with marginal group 51 and sparse group 52; both auricles transitional, subtended by a very short 56; inner auricle small calcarate, ligule thin-flanged deltoid crescent, 5.5 mm. high, group 61 short, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Striped cane, with slightly hairy buds having prominent group 10 (fig. 21 (909)); 4 rows of root primordia; diagnostic hair groups 56+---, 57+-; squarish-subcrescent dewlaps (fig. 51 (194)); inner auricle small calcarate; tall deltoid-crescent ligule.

CLONE N. C. 130

IMP. 916, ACC. 195

CULMS.—Red or mottled olive, with red flush, sparse bloom, and prominent wax bands; internodes cylindrical, 10 cm. long and 34×35 mm. across, inconspicuous bud furrow, orange or light reddish-brown flesh; stem-epidermal pattern 2, average width of long cells 12.5 μ , stomates not observed; growth rings red, narrow, tumescent; root bands red, cylindrical tumescent, 7 and 6 mm. high with 2 or 3 rows of

primordia; buds red, 11×10 mm., inserted at scar and extending above growth ring; prophyll ovate squarish with medium basal appendage and broad tip, wing inserted below middle of prophyll, very broad at base, pubescence sparse, groups 1, 2, 19, 10, 24, 9 evident.

LEAVES.—Sheaths 34 cm. long with prominent group 57; sheath base slightly decurrent with a small sectorial group 59; blades 123 cm. long and 4.5 cm. broad, module 27; dewlaps flaring deltoid crescent, outer surface with dense group 58, inner surface with medium-prominent group 51 and sparse group 52; both auricles transitional, outer one subtended by a medium group 56; ligule thin-flanged crescent, 4 mm. high, group 61 short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with broad-winged slightly hairy buds having hair groups 24 and 9; narrow root bands; diagnostic hair groups 55a+, 56+., 57+, 58+, 59+--; flaring deltoid-crescent dewlaps (fig. 51 (195)); transitional auricles; thin-flanged crescent ligule.

HAWAIIAN GROUP

HAWAIIAN ORIGINAL 6

IMP. 825, ACC. 196

CULMS.—Brick red, with sparse bloom and medium-narrow wax bands; internodes cylindric, 10 cm. long and 38 mm. across, bud furrow prominent, flesh orange, soft; stem-epidermal pattern $2+4+3$, average width of long cells 8.7μ , stomates absent; growth rings ivory green, flush or tumescent, narrow; root bands red, constricted obconoidal, 7 and 6 mm. high with 2 or 3 rows of primordia; buds reddish, 16×12 mm., inserted at scar and extending above growth ring; prophyll deltoid with round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence somewhat prominent, outstanding hair groups 1, 2, 10, 11, 16, 19, 24.

LEAVES.—Sheath 33 cm. long and smooth, with narrow group 57; sheath base decurrent with sectorial 59; blades 121 cm. long and 5 cm. broad, module 24; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with small group 51, sparse groups 52 and 63; outer auricle transitional and subtended by a short group 56, inner auricle small calcarate and inserted very low; ligule crescentiform, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Brick-red cane with large deltoid medium-hairy buds (fig. 31 (825)); medium root bands; diagnostic hair groups 56+--., 57+--., 59+, 63+--., 64e+--; ascending-ligulate dewlaps (fig. 51 (196)); small calcarate inner auricle; narrow crescent ligule.

HAWAIIAN ORIGINAL 24

IMP. 827, ACC. 197

CULMS.—Green, with sparse bloom and medium-constricted wax band; internodes cylindric, 11 cm. long and 37 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern $4+6+3$, average

width of long cells 9.4μ , stomates present; growth rings green, broad, tumescent; root bands green, slightly obconoidal, 10 and 8 mm. high with 3 or 4 rows of primordia; buds green with red wings, 15×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, emarginate, pubescence most prominent at base, outstanding hair groups 1, 2, 16, 19, 10, 24.

LEAVES.—Sheaths 36 cm. long and smooth; sheath base with small 64; blades 128 cm. long and 5.3 cm. broad, module 24; dewlaps ascending ligulate, outer surface with sparse 58 and marginal 58a, inner surface with a very narrow 51 and sparse 52 and 63; outer auricle transitional, subtended by a medium-long 56, inner auricle small calcarate; ligule narrow crescent, 3 mm. high, group 61 very short, dorsal pubescence as small 55a.

DISTINGUISHING CHARACTERS.—Green cane, with large ovate medium-hairy buds with prominent groups 1, 2, 16, 19, 10; more or less tall root bands with 3 or 4 rows of primordia; diagnostic groups $55a + -$, $56 + .$, $58a + -$, $63 + - -$; ascending ligulate dewlaps (fig. 51 (197)); calcarate inner auricle; narrow crescent ligule.

HAWAIIAN ORIGINAL 26

IMP. 828, ACC. 198

CULMS.—Striped pale red and green becoming uniformly bronze; with sparse bloom and medium wax bands; internodes cylindrical, 10 cm. long and 35 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern $2+3+5$, average width of long cells 10μ , stomates absent; growth rings striped, narrow, tumescent; root bands red, constricted, 7 mm. high with 2 or 3 rows of primordia; buds greenish red, 13×11 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with prominent basal appendage and round-pointed or truncate tip, wing inserted below middle of prophyll, medium wide, fringed at base; pubescence medium prominent with entire posterior side more or less hairy, prominent anterior hair groups 1, 2, 16, 11, 24.

LEAVES.—Sheaths 28 cm. long and smooth; sheath base decurrent with group 64e and short-haired narrow 59; blades 115 cm. long and 7.4 cm. broad, module 15; dewlaps slightly ascending ligulate, outer surface with sparse 58, inner surface with small 51, sparse 52, and small 63; both auricles transitional, outer one subtended by a long 56; ligule thin-flanged crescent, 3.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Bronze-green cane with medium-hairy ovate-deltoid buds (fig. 33 (828)); narrow root bands; diagnostic groups $56 +$, $59 + -$, $63 + - -$, $64 + -$; slightly ascending ligulate dewlaps (fig. 51 (198)); transitional auricles; thin-flanged and tall-centered ligule.

HAWAIIAN ORIGINAL 36

IMP. 831, ACC. 199

CULMS.—Reddish rose becoming red, with sparse bloom and prominent wax bands; internodes cylindrical, 11 cm. long and 36 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern $2+4$,

average width of long cells 8.6μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, constricted, 7 mm. high with 3 rows of primordia; buds reddish, 13×12 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with round-pointed tip, wing, inserted below middle of prophyll, medium broad and fringed, medium hairy, prominent groups 1, 2, 10, 11, 16, 19, 24.

LEAVES.—Sheaths 35 cm. long and smooth; sheath base decurrent with small 64e and sectorial 59; blades 106 cm. long and 6.5 cm. broad, module 16; dewlaps steeply ascending ligulate, outer surface with sparse 58, inner surface with small 51, and sparse 52 and 63; both auricles sloping transitional, or inner auricle small calcarate, outer auricle subtended by a medium-long 56; ligule thin-flanged and tall-centered crescent, 4 mm. high, group 61 very short or absent, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Red cane, with medium-hairy buds (fig. 31 (831)); narrow root bands; diagnostic groups $55a + -$, $56 +$, $59 +$, $63 + -$, $64e + -$; steeply ascending ligulate dewlaps (fig. 51 (199)); inner auricle transitional or small calcarate, thin-flanged medium-tall ligule.

HAWAIIAN ORIGINAL 38

IMP. 832, ACC. 200

CULMS.—Purple to red, with sparse bloom and prominent wax bands; internodes cylindric or slightly tumescent, 12 cm. long and 36 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern $4+2+3$, average width of long cells 9μ , stomates present; growth rings red, narrow, tumescent; root bands red, cylindric-constricted, 8 and 7 mm. high with 2 or 3 rows of primordia; buds green with red wing, 15×9 mm., inserted at scar and extending above growth ring; prophyll ovate with low basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, auriculate, medium hairy, prominent groups include 1, 2, 16, 19, 10, 11, 24.

LEAVES.—Sheaths 34 cm. long and smooth; sheath base decurrent with sectorial 59; blades 145 cm. long and 7.3 cm. broad, module 20; dewlaps ascending ligulate, outer surface with sparse 58, inner surface with sparse 51 and 52; outer auricle transitional with a short 56, inner auricle small calcarate inserted very low; ligule narrow crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purplish-red cane, with medium-hairy buds and medium-broad root bands; diagnostic groups $56 + -$; $59 + -$; ascending ligulate dewlaps (fig. 51 (200)); small calcarate inner auricle; narrow crescent ligule.

HAWAIIAN ORIGINAL 39

IMP. 833, ACC. 201

CULMS.—Reddish brown, with sparse bloom and prominent wax bands; internodes cylindric, 10 cm. long and 39 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern $2+5$, average width of long cells 10.2μ , stomates not observed; growth rings red, medium broad, tumescent; root bands red, cylindric-constricted, 8

mm. high with 3 or 4 rows of primordia; buds green with reddish wings, 10×8 (15×11) mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence medium prominent with groups 1, 10, 11, 16, 19, and 24 more or less outstanding.

LEAVES.—Sheaths slightly purplish, 34 cm. long and smooth or with very sparse 57; blades 135 cm. long and 5.3 cm. broad, module 25; dewlaps ascending ligulate, outer surface with sparse 58, inner surface with small 51, and sparse 52; both auricles sloping transitional, outer one subtended by a long 56, inner auricle with deltoid hook inserted very low; ligule thin-flanged orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Reddish-brown cane, with medium-hairy buds and 3 or 4 rows of root primordia (fig. 32 (833)); diagnostic groups 55a+ --, 56+, 57+ ---, 63+ --; ascending ligulate dewlaps (fig. 51 (201)); transitional auricles; narrow crescent ligule.

HAWAIIAN ORIGINAL 41

IMP. 835, ACC. 202

CULMS.—Red, with sparse bloom and prominent wax bands; internodes cylindric, 10 cm. long and 34 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+3+5, average width of long cells 10.8μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, constricted, 7 mm. high with 3 rows of semicrowded primordia; buds red, 17×12 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with medium basal appendage and pointed tip, wing inserted below middle of prophyll, medium broad and fringed at base, medium hairy with principal pubescence at base and tip region; prominent hair groups include 1, 2, 16, 10, 19, 24.

LEAVES.—Sheaths reddish, 32 cm. long with sparse 57; sheath base decurrent with 64e; blades 110 cm. long and 7.5 cm. broad, module 15; dewlaps squarish deltoid, outer surface with sparse 58, inner surface with small 51 and sparse 52; outer auricle sloping transitional subtended by a short 56, inner one transitional with deltoid hook inserted low; ligule thin-flanged crescent with shallow lozenge, 3 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red thick-jointed cane, with ovate-deltoid somewhat hairy buds and narrow root bands with 3 rows of primordia (fig. 31 (835)); diagnostic groups 56+ -, 57+ ---, 64e+; squarish-deltoid dewlaps (fig. 52 (202)); transitional auricles; thin-flanged narrow ligule.

HAWAIIAN ORIGINAL 43

IMP. 836, ACC. 203

CULMS.—Purplish red fading to brown, with sparse bloom and prominent wax bands; internodes cylindric or slightly tumescent, 9 cm. long and 37×39 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 3+5, average width of long cells 11μ ,

stomates absent; growth rings red, medium broad, tumescent; root bands red, constricted, 6 mm. high with 2 rows of semicrowded primordia; buds green with red wings, 17×13 mm., inserted at scar and extending above growth ring; prophyll long ovate deltoid with round-pointed tip, wing inserted below middle of prophyll, medium broad, auriculate, medium hairy with outstanding groups 1, 2, 10, 11, 16, 19, 24.

LEAVES.—Sheaths purplish, 29 cm. long and smooth or with sparse 57; sheath base somewhat decurrent with 64e and sectorial 59; blades 115 cm. long and 7.3 cm. broad, module 16; dewlaps ascending ligulate, outer surface with sparse 58, inner surface with small 51 and sparse 52; both auricles sloping transitional, outer one subtended by a medium-long 56; ligule thin-flanged crescent with shallow lozenge, 3 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Red-to-brown colored, thick-jointed cane with large medium-hairy buds (fig. 32 (836)); narrow root bands with 2 rows of primordia; diagnostic groups 55a+ --, 56+., 57+ ---, 59+ --, 64e+ -; ascending ligulate dewlaps (fig. 52 (203)); transitional auricles; thin-flanged narrow crescent ligule with shallow lozenge.

HAWAIIAN ORIGINAL 52

IMP. 838, ACC. 204

CULMS.—Olive green, with sparse bloom and narrow wax bands; internodes cylindric, 10 cm. long and 35 mm. across, prominent bud furrow, soft orange flesh, stem-epidermal pattern 2+4, average width of long cells 12.5μ , stomates absent; growth rings olive, medium broad, slightly tumescent; root bands greenish, cylindric-constricted, 7 and 6 mm. high with 3 rows of primordia; buds greenish with red wings, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with round-pointed tip, wing inserted below middle of prophyll, broad and fringed, pubescence more or less prominent with groups 1, 2, 10, 16, 19, 24 outstanding.

LEAVES.—Sheaths 34 cm. long with sparse 57; sheath base with 64e; blades 135 cm. long and 5.9 cm. broad, module 23; dewlaps ascending ligulate or double crescent, outer surface with sparse 58, inner surface with small 51 and sparse 52; outer auricle transitional, subtended by a short 56, inner auricle calcarate; ligule thin-flanged shallow crescent with oval lozenge, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Olive-green cane, with more or less hairy buds and narrow root bands (fig. 32 (838)); diagnostic groups 56+ --, 57+ --, 64e+ -; ascending ligulate or double-crescent dewlaps (fig. 52 (204)); calcarate inner auricle; narrow crescent ligule with shallow lozenge.

HAWAIIAN ORIGINAL 71

IMP. 842, ACC. 205

CULMS.—Green and yellow striped, becoming red and green striped, with inconspicuous bloom and prominent wax bands; internodes cylindric, 13 cm. long and 38 mm. across, prominent bud furrow, soft

orange flesh; stem-epidermal pattern 3+4, average width of long cells 10.8μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, constricted obconoidal, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with reddish wings, 20×14 mm., inserted at scar and extending above growth ring; prophyll deltoid ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, principal pubescence at base tip and juncture, prominent hair groups 1, 2, 10, 11, 16, 19, 24.

LEAVES.—Sheaths striped, 32 cm. long and smooth; sheath base decurrent with short-haired 59; blades 135 cm. long and 4.6 cm. broad, module 29; dewlaps ascending ligulate, outer surface with sparse 58, inner surface with small 51, sparse 52, and small 63; outer auricle transitional, subtended by a short 56, inner auricle calcarate; ligule narrow crescent with shallow lozenge, 3 mm. high, group 61 very short, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Striped thick-jointed cane, with large medium-hairy buds and narrow root bands (fig. 30 (842)); diagnostic groups $55a + - -$, $56 + - -$, $59 + -$, $63 + - -$, $64e + -$; ascending ligulate dewlaps (fig. 52 (205)); calcarate inner auricles, narrow crescent ligule.

CLONE AKILOLO 20

IMP. 727, ACC. 206

CULMS.—Green and red striped becoming yellow and red striped, with sparse bloom and medium wax bands; internodes cylindric, 9 cm. long and 34 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+3+4, average width of long cells 11μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindric, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green, 13×8 mm., inserted at scar and extending above growth ring; prophyll narrow ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad, medium hairy with prominent groups 1, 2, 4, 16, 11, 10.

LEAVES.—Sheaths 33 cm. long and smooth; blades 125 cm. long and 5.7 cm. broad, module 22; dewlaps more or less flaring ascending ligulate, outer surface with sparse 58 and marginal 58a, inner surface with small 51 and sparse 52 and inconspicuous 63; outer auricle transitional and subtended by a short 56, inner auricle small calcarate and fringed; ligule thin-flanged crescent with small deltoid lozenge, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy buds; narrow root bands; diagnostic groups $56 + - -$, $63 + - - -$; slightly flaring ascending ligulate dewlaps (fig. 52 (206)); small calcarate inner auricle; narrow crescent ligule with small lozenge.

CLONE AKOKI 22

IMP. 826, ACC. 207

CULMS.—Greenish yellow, with dark-red stripes, very sparse bloom, and prominent wax bands; internodes cylindric or slightly obconoidal, 13 cm. long and 41×42 mm. across, bud furrow prominent, light-

brown flesh; stem-epidermal pattern 4+3, many cork cells long and pointed, average width of long cells 9.7μ , stomates absent; growth rings green, medium broad, tumescent; root bands reddish, cylindrical-constricted, 8 and 7 mm. high with 2 or 2 or 3 rows of primordia; buds green with olive wing region, later reddish, 15×10 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate and notched tip, wing inserted below middle of prophyll, medium broad and somewhat hairy, with groups 1, 16, 10, 11, and 19 more or less prominent.

LEAVES.—Sheaths 28 cm. long and smooth, sheath base with 64e; blades 125 cm. long and 6 cm. broad, module 21; dewlaps shallow crescent or ascending ligulate, outer surface with sparse group 58, inner surface with narrow 51 that may extend as group 65 single file toward midrib, sparse groups 63 and 52; both auricles transitional; ligule very narrow, 2 mm. high, shallow crescent, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Prominently striped cane with deep bud furrow, large slightly hairy buds, and smooth sheaths; diagnostic hair groups 63+---, 64e+-, 65+--; shallow crescent or ascending ligulate dewlaps (fig. 52 (207)); transitional auricles; very narrow crescentiform ligule.

CLONE AWELA 68

IMP. 728, ACC. 208

CULMS.—Green and yellow striped becoming green and pink striped, with sparse bloom and prominent wax bands; internodes cylindrical, 9 cm. long and 33 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+6, average width of long cells 12.5μ , stomates absent; growth rings striped, medium broad, tumescent; root bands greenish, constricted, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds green with olive wing, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed or truncate tip, wing inserted below middle of prophyll, medium broad and fringed, pubescence prominent at base, tip, and juncture, principal hair groups 1, 2, 4, 10, 11, 16, 19, 24.

LEAVES.—Sheaths striped, 33 cm. long with medium-sparse 57; blades 137 cm. long and 5.2 cm. broad, module 26; dewlaps ascending narrow ligulate, outer surface with somewhat dense 58 and marginal 58a, inner surface with medium 51 and very sparse 52; both auricles transitional, outer one with group 56; ligule thin-flanged crescent, 3 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane with medium-hairy buds; 3 or 4 rows of crowded root primordia; diagnostic groups 56+--, 57+-; ascending narrow ligulate dewlaps (fig. 52 (208)); transitional auricles; thin-flanged crescent ligule.

CLONE HALALII 32

IMP. 729, ACC. 209

CULMS.—Reddish yellow and green striped, with very sparse bloom and narrow prominent wax bands; internodes cylindrical, somewhat concave and shouldered, 10 cm. long and 39 mm. across, prominent

bud furrow, soft light-olive flesh; stem-epidermal pattern 1+6, average width of long cells 8.6μ , stomates absent; growth rings striped, narrow, flush; root bands striped, cylindrical conoidal, 10 mm. high with 4 or 5 rows of crowded primordia; buds green, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad at base, principal pubescence at base, juncture, and tip, outstanding groups 1, 2, 16, 11, 10.

LEAVES.—Sheaths 32 cm. long with narrow group 57; blades 133 cm. long and 5.5 cm. broad, module 24; dewlaps ascending squarish or ligulate, outer surface with sparse 58 and 58a, inner surface with small 51 and sparse 52; both auricles transitional; ligule thin-flanged deltoid crescent with tall lozenge, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy buds and 4 or 5 rows of crowded primordia; diagnostic group 57+ - -; ascending squarish or ligulate dewlaps (fig. 52 (209)); transitional auricles; tall deltoid-crescent ligule.

CLONE HINAHINA 18

IMP. 730, ACC. 210

CULMS.—Bronze green overcast with gray, moderate bloom, and medium wax bands; internodes cylindrical and slightly shouldered, 9 cm. long and 36 mm. across, bud furrow lacking, soft orange flesh; stem-epidermal pattern 3+6, average width of long cells 12.5μ , stomates absent; growth rings olive, narrow, tumescent; root bands ivory, cylindrical obconoidal, 8 and 7 mm. high with 3 or 3 or 4 rows of small crowded primordia; buds green with olive wing, 16×11 mm., inserted at scar and extending above growth ring; prophyll broad ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad, fringed and hairy, general pubescence more or less prominent.

LEAVES.—Sheaths 28 cm. long with prominent groups 57 and 60; blades 142 cm. long and 5.2 cm. broad, module 27; dewlaps squarish crescent, outer surface with sparse group 58, inner surface with narrow group 51 that may extend as group 65 single file toward midrib, sparse 52 and 55, and somewhat prominent group 63; outer auricle transitional, inner auricle small calcarate and basally fringed; ligule tall crescent, 4.5 mm. high, group 61 very short, dorsal pubescence as small 55a.

DISTINGUISHING CHARACTERS.—Green cane, with broad-ovate medium-hairy buds; diagnostic groups 55+ -, 55a+ -, 57+, 60+, 63+., 65+ - -; squarish-crescent dewlaps (fig. 52 (210)); tall crescent ligule; small calcarate inner auricle.

CLONE ILIOPUA 29

IMP. 829, ACC. 212

CULMS.—Yellowish green overcast with gray, sparse bloom, and prominent wax bands; internodes cylindrical and shouldered, 9 cm. long and 27 mm. across, medium bud furrow, olive-green flesh; stem-epidermal pattern 2, average width of long cells 12.5μ , stomates absent;

growth rings olive green, narrow, tumescent; root bands green, cylindrical-constricted, 9 and 8 mm. high with 3 or 4 rows of primordia; buds green with reddish wing, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed or truncate tip, wing inserted below middle of prophyll, medium broad, hairy and fringed, pubescence medium but posterior side very hairy.

LEAVES.—Sheaths 33 cm. long and smooth; sheath base slightly decurrent; blades 140 cm. long and 6.2 cm. broad, module 23; dewlaps ascending ligulate or narrow squarish, outer surface with prominent group 58 and marginal group 58a, inner surface with small group 51 and medium group 52, small groups 63 and 55; outer auricle transitional, inner auricle small calcarate; ligule orbicular crescent, 3.5 mm. high, hair group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with more or less hairy buds; medium root bands with 3 or 4 rows of primordia; diagnostic hair groups 55+ --, 58+, 63+ --; ascending ligulate or narrow squarish dewlaps (fig. 52 (212)); calcarate inner auricle; orbicular-crescent ligule.

CLONE KEA 31

IMP. 731, ACC. 213

CULMS.—Brownish yellow, with sparse bloom and medium wax bands; internodes cylindrical, 9 cm. long and 36×37 mm. across, bud furrow prominent, flesh light orange; stem-epidermal pattern 4+3, average width of long cells 10 μ , stomates present; growth rings light olive, narrow, tumescent; root bands reddish ivory, constricted, 7 and 6 mm. high with 3 rows of primordia; buds greenish, 15×11 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate tip, wing inserted below middle of prophyll, medium broad and fringed, general pubescence somewhat sparse except for prominent group 10.

LEAVES.—Sheaths 31 cm. long with prominent short-haired group 57; sheath base slightly decurrent; blades 130 cm. long and 7 cm. broad, module 19; dewlaps ascending ligulate, outer surface with sparse 58, inner surface with narrow group 51, sparse 52, and medium-prominent group 63; outer auricle sloping transitional, occasionally subtended by a short 56, inner auricle short lanceolate; ligule subarcuate, 3 mm. high, group 61 very short, dorsal pubescence as inconspicuous group 55a.

DISTINGUISHING CHARACTERS.—Thick brownish-yellow cane, with prominent bud furrow, constricted root bands, and large slightly hairy buds with prominent hair group 10; diagnostic hair groups 55a+ --, 56+ --, 57+, 63+; ascending ligulate dewlaps (fig. 52 (213)); short lanceolate inner auricle; narrow subarcuate ligule.

CLONE KEA 31

IMP. 830, ACC. 213A

CULMS.—Greenish yellow, with sparse bloom and heavy wax bands; internodes cylindrical and somewhat shouldered, 10 cm. long and 36 mm. across, bud furrow inconspicuous, flesh white or old ivory; stem-

epidermal pattern 2, average width of long cells 9.7μ , stomates present; growth rings olive green, narrow, flush; root bands green, cylindrical-constricted, 9 and 7 mm. high with 4 rows of small, dense primordia; buds green, 15×10 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted at or below middle of prophyll, medium broad and fringed, general pubescence prominent.

LEAVES.—Sheaths 26 cm. long with prominent group 57 and small 60 on underlying side; sheath base slightly decurrent with small sectorial 59; blades 140 cm. long and 6.2 cm. broad, module 22; dewlaps slightly ascending broad squarish, outer surface with medium sparse 58; inner surface with narrow 51 and somewhat prominent 52, short-haired midrib group 63; outer auricle ascending-transitional, inner auricle lanceolate or calcarate and basally fringed; ligule broad crescent, 4 mm. high, group 61 very short, dorsal pubescence as small 55a.

DISTINGUISHING CHARACTERS.—Thick greenish-yellow cane, with inconspicuous bud furrow; large hairy buds; 4 rows of small crowded primordia; diagnostic groups $55a + - -$, $57 +$, $59 + - -$, $60 + -$, $63 +$.; slightly ascending broad-squarish dewlaps; lanceolate inner auricle; broad crescent ligule.

CLONE LAHI 7

IMP. 733, ACC. 214

CULMS.—Greenish yellow, with sparse bloom and medium wax bands; internodes cylindrical, 11 cm. long and 36 mm. across, small bud furrow, soft orange flesh; stem-epidermal pattern 2, average width of long cells 9.6μ , stomates absent; growth rings olive, medium high, tumescent; root bands ivory, cylindrical-constricted, 9 and 8 mm. high with 4 rows of crowded primordia; buds green with olive wings, 16×11 mm. inserted at scar and extending above growth ring; prophyll ovate with truncate tip, wing inserted below middle of prophyll, medium broad, pubescence prominent.

LEAVES.—Sheaths 30 cm. long with narrow group 57; sheath base with small 59; blades 140 cm. long and 6.8 cm. broad, module 20; dewlaps ascending ligulate, outer surface with medium 58 with hairs becoming semilong in marginal zone, inner surface with medium 51, 52, small 52a, and 63; outer auricle transitional, inner auricle large calcarate and not fringed; ligule narrow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence as small 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with hairy buds; 4 or 5 rows of root primordia; diagnostic groups $55a + - -$, $57 + - -$, $59 + -$, $63 + - -$; ascending ligulate dewlaps (fig. 53 (214)); calcarate inner auricle; narrow crescent ligule.

CLONE LAUKONA 15

IMP. 735, ACC. 215

CULMS.—Pink and green striped, becoming green and yellow striped, with rosy blush, sparse bloom, and prominent wax bands; internodes cylindrical, 10 cm. long and 34×37 mm. across, small bud furrow, soft orange flesh; stem-epidermal pattern 2, average width of long cells

10.4 μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindric-constricted, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds green with olive wings, 13 \times 10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and truncate tip, wing inserted below middle of prophyll, broad, fringed and hairy, pubescence general and more or less prominent, outstanding hair groups 1, 2, 4, 13, 16, 10, 19.

LEAVES.—Sheaths striped, 31 cm. long with medium group 57; blades striped, 128 cm. long and 7.2 cm. broad, module 18; dewlaps ascending ligulate, outer surface with prominent semilong group 58 and marginal group 58a, inner surface with a small group 51 and medium group 52, small groups 55 and 63; outer auricle transitional, inner auricle calcarate and partly fringed; ligule narrow orbicular crescent, 3.5 mm. high, hair group 61 very short, dorsal pubescence as small 55a.

DISTINGUISHING CHARACTERS.—Pink-and-green striped cane, with medium hairy to hairy buds having a distinct prominent basal appendage and truncate tip; 3 or 4 rows of crowded root primordia; diagnostic hair groups 55+ -, 55a+ -, 57+., 58+, 63+ -; ascending ligulate dewlaps (fig. 53 (215)); calcarate inner auricles; narrow orbicular-crescent ligule.

CLONE LEHU 75

IMP. 736, ACC. 216

CULMS.—Olive, with irregular dark-gray blotches, sparse bloom, and medium wax bands; internodes cylindric and shouldered, hairy, 12 cm. long and 35 mm. across, small bud furrow, soft grayish-green flesh; stem-epidermal pattern 2, average width of long cells 10.6 μ , stomates absent; growth rings green, narrow, tumescent; root bands olive, cylindric obconoidal, 8 mm. high with 4 rows of primordia; buds olive with red wings, 15 \times 14 mm., inserted below scar and extending above growth ring; prophyll broad deltoid with round-pointed tip, wing inserted below middle of prophyll, medium broad, more or less prominent basal pubescence, outstanding hair groups 9 and 24.

LEAVES.—Sheaths 37 cm. long with small group 57 and prominent group 60; sheath base with very prominent groups 59 and 69; blades 157 cm. long and 4.4 cm. broad, module 36; dewlaps squarish deltoid, outer surface with sparse group 58, inner surface with prominent group 51 and sparse group 52; both auricles transitional; ligule narrow subarcuate, 2.5 mm. high, hair group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Hairy stems; diagnostic hair groups 57+ -, 59+; squarish-deltoid dewlaps (fig. 53 (216)); transitional auricles; narrow arcuate or subarcuate ligule.

CLONE MAIKOIKO 73

IMP. 822, ACC. 217

CULMS.—Purple becoming black, with sparse bloom and prominent wax bands; internodes bobbin-shaped to obconoidal, 10 cm. long and 33 mm. across, small bud furrow, soft orange flesh; stem-epidermal

pattern 1, average width of long cells 11.3μ , stomates absent; growth rings red, narrow, slightly tumescent; root bands red, tumescent-constricted, 6 mm. high with 1 or 2 rows of sparse primordia; buds red 12×10 mm., inserted below scar and extending above growth ring; prophyll short ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, pubescence general and more or less prominent, outstanding hair groups 1, 2, 16, 4, 11, 10, 19, 18.

LEAVES.—Sheaths pink, 37 cm. long with medium group 57; sheath base with 59 and 69; blades 139 cm. long and 4 cm. broad, module 35; dewlaps ascending flaring ligulate, outer surface with medium group 58, inner surface with prominent group 51 which extends sparingly as group 65 in narrow file toward midrib, sparse group 52; both auricles transitional; ligule narrow arcuate or subarcuate, 2.5 mm. high, hair group 61 short, dorsal pubescence as groups 65a and 55a.

DISTINGUISHING CHARACTERS.—Black cane, with more or less hairy buds; narrow root bands with 1 or 2 rows of sparse primordia; diagnostic hair groups 55a+, 57+, 59+, 65+ --, 65a+ --, 69+; ascending flaring ligulate dewlaps (fig. 53 (217)); transitional auricles; narrow arcuate or subarcuate ligule.

CLONE MAIKOIKO 74

IMP. 738, ACC. 218

CULMS.—Pink with red stripes, becoming brownish yellow with purple stripes, sparse bloom and narrow wax bands; internodes cylindrical, 10 cm. long and 33 mm. across, medium to prominent bud furrow, soft orange flesh; stem-epidermal pattern 1, average width of long cells 12.5μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindrical obconoidal, 5 mm. high with 1 or 2 rows of sparse primordia; buds red, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with medium prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, notched at base, pubescence more or less prominent especially at base and tip, outstanding hair groups 1, 2, 4, 16, 11, 10, 18, 19.

LEAVES.—Sheaths pink, 34 cm. long with broad group 57; sheath base with 69 and sectorial 59; blades 133 cm. long and 3.5 cm. broad, module 38; dewlaps slightly flaring ligulate, outer surface with medium group 58, inner surface with prominent group 51 that extends as 65 single file toward midrib, sparse groups 52 and 55; both auricles transitional, or inner one calcarate; ligule narrow arcuate, 2.5 mm. high, hair group 61 short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy buds; narrow root bands with 1 or 2 rows of primordia; diagnostic hair groups 55+ -, 55a+ -, 57+, 59+, 65+ -, 65a+ -; slightly flaring ligulate dewlaps (fig. 53 (218)); transitional or calcarate inner auricle; narrow crescent ligule.

CLONE MANULELE 27**IMP. 744, Acc. 219**

CULMS.—Reddish brown, with purple stripes, sparse bloom, and heavy narrow wax bands; internodes cylindric concave, 7.5 cm. long and 31 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+3, average width of long cells 11.6μ , stomates absent; growth rings striped, narrow, tumescent; root bands striped, cylindric obconoidal, 8 mm. high with 3 or 4 rows of primordia; buds green with olive wings, 14×12 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and fringed, pubescence general and more or less prominent, hair groups 1, 2, 4, 10, 11, 19 outstanding.

LEAVES.—Sheaths reddish with light stripes, 33 cm. long and smooth; sheath base decurrent with 59; blades 124 cm. long and 5.6 cm. broad, module 22; dewlaps steeply ascending flaring ligulate, outer surface with sparse group 58 and marginal group 58a, inner surface with small group 51 and sparse groups 52 and 63; both auricles transitional, outer one subtended by a long 56; ligule shallow crescent, 3.5 mm. high, hair group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy or hairy buds; 3 or 4 rows of root primordia; diagnostic hair groups 55a+ - -, 56+, 59+ -, 63+ -; steeply ascending flaring ligulate dewflaps (fig. 53 (219)); transitional auricles; narrow crescent ligule.

CLONE MIKIOI 44**IMP. 745, Acc. 220**

CULMS.—Olive becoming brownish red, with very sparse bloom and narrow prominent wax bands; internodes cylindric and slightly concave, 12 cm. long and 39 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+4, average width of long cells 11.3μ , stomates absent; growth rings red, narrow, tumescent; root bands red, constricted, 7 mm. high with 3 or 3 or 4 rows of primordia; buds reddish, 17×12 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, more or less narrow, pubescence medium prominent, outstanding hair groups 1, 2, 16, 10, 11, 19.

LEAVES.—Sheaths 32 cm. long with medium 57; blades 127 cm. long and 5.7 cm. broad, module 22; dewlaps ligulate, outer surface with sparse group 58 and small marginal group 58a, inner surface with small group 51 and sparse groups 52 and 63; outer auricle transitional, inner auricle transitional or small calcarate; ligule narrow crescent, 2.5 mm. high, hair group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Browish-red cane, with large medium-hairy buds; narrow root bands with 3 or 4 rows of primordia; diagnostic hair groups 57+., 63+ - - -; transitional or small calcarate inner auricle; ligulate dewlaps (fig. 53 (220)); narrow orbicular crescent ligule.

CLONE MOANO 48**IMP. 837, Acc. 221**

CULMS.—Purple, with sparse bloom and prominent wax bands; internodes cylindric, 9 cm. long and 33 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+3, average width of long cells 15.6μ , stomates absent; growth rings red, narrow, flush; root bands cylindric obconoidal, red, 8 mm. high with 2 or 3 rows of sparse primordia; buds reddish, 20×13 mm., inserted at scar and extending above growth ring; prophyll arrowhead-shaped, with prominent basal appendage and small truncate or pointed tip, wing inserted low, broad, prominently auriculate, pubescence very sparse, hair groups 1, 10 evident.

LEAVES.—Sheaths purplish, 34 cm. long with narrow group 57; sheath base slightly decurrent; blades 130 cm. long and 7.2 cm. broad, module 18; dewlaps squarish or squarish deltoid, outer surface with sparse groups 58 and 58a, inner surface with small group 51 and sparse group 52; both auricles small deltoid and fringed; ligule broad-crescent or subarcuate, 5 mm. high, hair group 61 long, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple-colored cane with large smooth buds; medium-broad root bands with 2 or 3 rows of sparse primordia; diagnostic hair groups 57+ -, 61+; squarish or squarish-deltoid dewlaps (fig. 53 (221)); small deltoid auricles; broad-centered crescent or subarcuate ligule.

CLONE NANAHU 40**IMP. 834, Acc. 222**

CULMS.—Dark vinaceous red, with sparse bloom and prominent wax bands; internodes cylindric, 9 cm. long and 35 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+5+4, average width of long cells 10.8μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, constricted, 7 mm. high with 3 or 4 rows of primordia; buds green with red wings, 15×11 mm., inserted at scar and extending above growth ring; prophyll elongate deltoid with prominent basal appendage and truncate tip, wing inserted below middle of prophyll, broad to medium broad and fringed, pubescence medium prominent, hair groups 4 and 10 outstanding.

LEAVES.—Sheaths with red stripes, 32 cm. long and smooth; sheath base with groups 59 and 64e; blades 129 cm. long and 5.3 cm. broad, module 24; dewlaps ascending ligulate or double crescent, outer surface with sparse group 58, inner surface with small group 51 and sparse groups 52 and 63; outer auricle transitional, subtended by a short 56; inner auricle small calcarate; ligule thin-flanged crescent, 3.5 mm. high, hair group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Red cane, with medium-hairy buds; narrow root bands and 3 or 4 rows of primordia; diagnostic hair groups 55a+ --, 56+ -, 59+ -, 63+ --, 64e+ -; ascending ligulate or double-crescent dewlaps (fig. 53 (222)); inner auricle small calcarate; thin-flanged crescent ligule.

CLONE OHIA 1**IMP. 823, Acc. 223**

CULMS.—Olive green, with maroon stripes, sparse bloom, and medium-broad wax bands; internodes cylindric and slightly concave, 12 cm. long and 40×43 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+3, average width of long cells 10.2 μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, constricted-obconoidal, 8 and 7 mm. high with 3 or 4 rows of crowded primordia; buds green with olive wings, later red, 16×14 mm., inserted at scar and extending above growth ring; prophyll long ovate with pointed tip, wing inserted below middle of prophyll, broad and fringed, pubescence general and medium prominent, hair groups 2, 16, 10, 11, 19 outstanding.

LEAVES.—Sheaths striped, 31 cm. long with prominent 57; sheath base with small 59; blades 134 cm. long and 5.7 cm. broad, module 23; dewlaps ascending ligulate, outer surface with sparse groups 58 and 58a, inner surface with small group 51, sparse group 52, and inconspicuous group 63; both auricles transitional; ligule narrow deltoid crescent, 3 mm. high, hair group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Striped cane, with medium-hairy buds; medium-broad root bands with 3 or 4 rows of crowded primordia; diagnostic hair groups 57+, 59+ -, 63+ - - -; ascending ligulate dewlaps (fig. 53 (223)); transitional auricles; narrow crescent-deltoid ligule.

CLONE OPUKEA 34**IMP. 747, Acc. 224**

CULMS.—Greenish yellow, with sparse bloom and broad wax bands; internodes cylindric, concave and shouldered, 10 cm. long and 41×44 mm. across, prominent bud furrow, soft ivory flesh; stem-epidermal pattern 1, average width of long cells 10.8 μ , stomates absent; growth rings green, medium broad, flush; root bands green, cylindric-constricted, 8 and 7 mm. high with 3 or 4 rows of primordia; buds green with olive wings, 17×12 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and truncate tip, wing inserted below middle of prophyll, broad, general pubescence prominent.

LEAVES.—Sheaths purplish, 32 cm. long with medium or small group 57; blades 150 cm. long and 5.4 cm. broad, module 28; dewlaps ascending flaring ligulate, outer surface with dense group 58, inner surface with prominent group 51 that extends as group 65 single file toward midrib, dense group 52, and small group 63; outer auricle transitional, subtended by a short 56, inner auricle small calcarate; ligule narrow subarcuate, 2.5 mm. high, hair group 61 very short, dorsal pubescence as sparse 65a.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with hairy buds; medium-broad root bands with 3 or 4 rows of primordia; diagnostic hair groups 52+, 56+ -, 57+., 58+, 63+ - -, 65+ -, 65a+ -; ascending flaring-ligulate dewlaps (fig. 53 (224)); calcarate inner auricle; narrow subarcuate ligule.

CLONE PAKAWELI 2**IMP. 824, Acc. 225**

CULMS.—Brilliant green and red striped, with sparse bloom and prominent wax bands; internodes cylindric, 9.5 cm. long and 38 mm. across, bud furrow small, soft orange flesh; stem-epidermal pattern 4+3, many cork cells long and pointed, average width of long cells 8.3μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, deeply constricted or obconoidal, 8 and 7 mm. high with 3 or 3 or 4 rows of primordia; buds green with olive wings, later reddish, 14×9 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad and heavily fringed, general pubescence somewhat sparse on both surfaces, with groups 1, 2, 4, 10, 11, 16, and 19 evident.

LEAVES.—Sheaths green with purple stripes, 31 cm. long, narrow group 57; sheath base slightly decurrent with very small sectorial 59; blades 121 cm. long and 6.3 cm. broad, module 19; dewlaps ascending flaring ligulate, outer surface with sparse group 58, inner surface with narrow group 51, sparse 52, and medium 63 and 55; both auricles transitional, outer one may be subtended by a short 56; ligule orbicular crescent, 3.5 mm. high, group 61 short, dorsal pubescence as short 55a.

DISTINGUISHING CHARACTERS.—Brilliantly striped cane, with large somewhat hairy, prominently fringed buds; diagnostic hair groups 55+., 55a+ -, 56+ --, 57+ -, 59+ --, 63+.; ascending flaring-ligulate dewlaps (fig. 53 (225)); medium-broad crescent ligule; transitional auricles.

CLONE PILIMAI 60**IMP. 839, Acc. 226**

CULMS.—Olive yellow, with red sunscald patches, sparse bloom, and prominent wax bands; internodes cylindric, 9 cm. long and 34 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+3+4, average width of long cells 10μ , stomates absent; growth rings green, medium broad, tumescent; root bands green, constricted, 7 and 6 mm. high with 3 or 4 rows of crowded primordia; buds green with reddish wing, 15×11 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and fringed, pubescence medium prominent, with hair groups 1, 2, 4, 10, 11, 19 outstanding.

LEAVES.—Sheaths 32 cm. long and smooth; sheath base with small 59; blades 127 cm. long and 5.6 cm. broad, module 23; dewlaps ascending ligulate, outer surface with sparse group 58, inner surface with small group 51 and sparse group 63; both auricles transitional, outer one subtended by a medium 56; ligule thin-flanged subarcuate, 3 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-yellow cane, with medium-hairy buds; narrow root bands with 3 or 4 rows of crowded primordia;

diagnostic hair groups 56+., 59+ -, 63+ - -; ascending ligulate dewlaps (fig. 53 (226)); transitional auricles; thin-flanged subarcuate or arcuate ligule.

CLONE POHINA 51

IMP. 749, ACC. 227

CULMS.—Purple, with moderate bloom and merging wax bands; internodes cylindric or slightly tumescent and shouldered, 9 cm. long and 39 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+7+6, average width of long cells 13.1 μ , stomates absent; growth rings red, narrow, flush; root bands green, cylindric-constricted, 8 and 7 mm. high with 3 rows of crowded primordia; buds green with red wings, 17 \times 14 mm. inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, broad auriculate, pubescence medium prominent, hair groups 10 and 19 most outstanding.

LEAVES.—Sheaths purplish, 37 cm. long with a medium group 57; sheath base with 64e and sectorial 59; blades 135 cm. long and 5.5 cm. broad, module 24; dewlaps shallow deltoid, outer surface with sparse group 58 and marginal group 58a, inner surface with a small group 51 and sparse group 52; both auricles transitional; ligule narrow crescent, 3 mm. high, hair group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane, with medium-hairy buds having prominent hair groups 10 and 19; medium root bands with 3 rows of crowded primordia; diagnostic hair groups 57+., 59+ -, 64e+ -; shallow deltoid dewlaps (fig. 53 (227)); transitional auricles; narrow crescent ligule.

CLONE UAHI-A-PELE 50

IMP. 795, ACC. 228

CULMS.—Purple, with heavy bloom and constricted wax bands; internodes cylindric or slightly tumescent, prominently shouldered, 12 cm. long and 38 \times 42 mm. across, small bud furrow, semihard orange flesh; stem-epidermal pattern 1+3+7, average width of long cells 14 μ , stomates present; growth rings olive, narrow, flush; root bands red, cylindric-obconoidal, 10 and 9 mm. high with 4 rows of primordia; buds reddish, 14 \times 10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed notched tip, wing inserted below middle of prophyll, medium broad, pubescence sparse, hair groups 1, 2, 10 evident.

LEAVES.—Sheaths 37 cm. long with broad group 57; sheath base with 59 and 69; blades 170 cm. long and 7 cm. broad, module 25; dewlaps flaring ligulate, outer surface with sparse group 58, inner surface with broad group 51 that extends as group 65 single file toward midrib, sparse group 52, and small group 63; both auricles transitional, outer one subtended by a ledge of 56 adjacent to 60; ligule narrow deltoid crescent, 3 to 3.5 mm. high, hair group 61 short, dorsal pubescence as 65a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane with heavy bloom; more or less smooth buds; tall root bands with 4 rows of primordia;

diagnostic hair groups 56+, 57+, 59+-, 60+-, 63+- -, 65+-, 65a+-, 69+-; flaring ligulate dewlaps (fig. 53 (228)); transitional auricles; narrow deltoid-crescent ligule.

CLONE UALA 61

IMP. 840, ACC. 229

CULMS.—Olive, with pink flush becoming yellowish olive, sparse bloom, and prominent wax bands; internodes cylindrical or slightly bobbin-shaped, 9 cm. long and 42 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 1+3+4, average width of long cells 10.8μ , stomates absent; growth rings green, medium broad, tumescent; root bands green, constricted, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with olive wing, 14×11 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and fringed, pubescence prominent at base and tip region, outstanding hair groups 1, 2, 16, 11, 10, 19.

LEAVES.—Sheaths 37 cm. long and smooth; blades 130 cm. long and 5.4 cm. broad, module 24; dewlaps ascending ligulate, outer surface with sparse group 58 and marginal group 58a, inner surface with small group 51, sparse groups 52 and 63; both auricles sloping transitional, outer one subtended by a medium-long 56; ligule narrow orbicular crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Thick-stemmed cane with pinkish flush, medium-hairy buds; narrow constricted root bands; diagnostic hair groups 56+, 63+-; ascending ligulate dewlaps; sloping transitional auricles; orbicular-crescent ligule.

CLONE ULUHUI 67

IMP. 841, ACC. 230

CULMS.—Yellowish green with red blush, sparse bloom and prominent wax bands; internodes cylindrical, 9 cm. long and 37×38 mm. across, prominent bud furrow, soft orange flesh; stem-epidermal pattern 2+4, average width of long cells 9.4μ , stomates absent; growth rings green, narrow, tumescent; root bands green, constricted, 7 mm. high with 3 rows of semi-crowded primordia; buds green, 14×10 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed or slightly truncate tip, wing inserted below middle of prophyll, broad, pubescence medium prominent, outstanding hair groups 1, 2, 16, 11, 10, 19.

LEAVES.—Sheaths 33 cm. long and smooth; sheath base with group 64e; blades 129 cm. long and 5.5 cm. broad, module 23; dewlaps ascending ligulate, outer surface with sparse group 58 and marginal group 58a, inner surface with small group 51, sparse group 52; both auricles transitional, outer one subtended by a short 56; ligule narrow orbicular crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green, thick-jointed cane with medium-hairy buds; narrow constricted root bands; diagnostic hair groups 56+-, 64e+-; ascending ligulate dewlaps; transitional auricles; narrow orbicular-crescent ligule.

MISCELLANEOUS NOBLE GROUP**CLONE ABOE****IMP. 1047, ACC. 231**

CULMS.—Dark red, with heavy bloom and merging wax bands; internodes cylindric and slightly shouldered, 9 cm. long and 23×29 mm. across, prominent bud furrow, white flesh; stem-epidermal pattern 3, average width of long cells 8.7 μ , stomates present; growth rings red, narrow, tumescent; root bands cylindric or slightly tumescent, 8 and 7 mm. high with 4 or 5 irregular rows of primordia; buds red, 12×10 mm., inserted at scar and extending above growth ring; prophyll broad ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, somewhat narrow, pubescence sparse except at base, hair groups 1, 2, 16, and 11 evident.

LEAVES.—Sheaths 33 cm. long with medium 57; sheath base with small 64; blades 150 cm. long and 5 cm. broad, module 30; dewlaps large ascending squarish, outer surface with medium-dense group 58, inner surface with small group 51 and medium group 52; outer auricle broad transitional and subtended by a short 56, inner auricle deltoid or short lanceolate; ligule narrow subarcuate, 2.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-red cane, with large broad-ovate more or less smooth buds; medium root bands with 4 or 5 rows of primordia; diagnostic hair groups 56+-, 57+., 64+-; large ascending-squarish dewlaps (fig. 54 (231)); deltoid inner auricle; narrow ligule.

CLONE ANOMAN**IMP. 1580, ACC. 232**

CULMS.—Yellowish green, with red flush, sparse bloom, and medium-constricted wax bands; internodes cylindric or slightly obconoidal, 9 cm. long and 22×24 mm. across, small shallow bud furrow, flesh light green, soft; stem-epidermal pattern 3, average width of long cells 10 μ , stomates absent; growth rings greenish red, narrow, flush; root bands conoidal, 6 and 5 mm. high with 3 irregular rows of primordia; buds green, 13×8 mm., inserted at scar and extending above growth; prophyll elongate ovate with narrow round-pointed tip, wing inserted below middle of prophyll, narrow, notched at base, hairy, with groups 11, 17, 16, 1, 2, 10 prominent.

LEAVES.—Sheaths 31 cm. long and smooth; sheath base with prominent 69 and short-haired 59; blades 150 cm. long and 4.5 cm. broad, module 33; dewlaps usually flaring deltoid crescent, outer surface with heavy bloom and dense group 58, inner surface with a broad group 51 that extends as group 65 single file toward midrib, dense semilong group 52; both auricles narrow transitional; ligule thin-flanged crescent, 3.5 mm. high, group 61 short, dorsal pubescence in flange zone and as small 55a.

DISTINGUISHING CHARACTERS.—Thin yellowish-green cane flushed with red, elongated ovate hairy buds; narrow root bands; diagnostic

hair groups 52+, 55a+ --, 58+, 59+ -, 65+ --, 69+; usually flaring deltoid-crescent dewlaps (fig. 54 (232)); transitional auricles; narrow crescent ligule.

CLONE ASHY MAURITIUS

IMP. 952, ACC. 235

CULMS.—Dark red becoming bronze, with heavy bloom and merging wax bands; internodes cylindric or slightly tumescent, 9 cm. long and 27×33 mm. across, medium bud furrow, soft olive flesh; stem-epidermal pattern 6+4, average width of long cells 10 μ , stomates absent; growth rings red, medium broad, flush to slightly tumescent; root bands red, slightly conoidal, 7 and 6 mm. high with 3 irregular rows of crowded primordia; buds reddish, 11×12 mm., inserted at scar and extending a little above growth ring; prophyll broad rhomboid with round-pointed slightly notched or serrate tip, wing inserted near middle of prophyll, very broad at base and basally fringed, pubescence sparse with outstanding hair groups 1, 2, 16, 19.

LEAVES.—Sheaths 33 cm. long with narrow 57; sheath base slightly decurrent with small 64e; blades 136 cm. long and 6 cm. broad, module 23; dewlaps large flaring double crescent, outer surface with medium group 58, inner surface with prominent group 51, sparse 65 and 55, and dense semilong group 52; outer auricle sloping transitional, inner auricle short lanceolate or calcarate; ligule broad-centered crescent, 5 mm. high, group 61 short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Red cane, with broad ovate buds having broad basal wing region and more or less sparse pubescence; narrow root band with 3 rows of primordia; diagnostic hair groups 52+, 55+ --, 55a+ --, 57+ --, 64e+ -, 65+ -; large flaring double-crescent dewlaps (fig. 54 (235)); calcarate or short lanceolate inner auricle; tall crescent ligule.

CLONE BACOYA

IMP. 765, ACC. 236

CULMS.—Light purplish gray, with heavy bloom and merging wax bands; internodes cylindric, 11 cm. long and 35 mm. across, small bud furrow; stem-epidermal pattern 1+6+3+4, average width of long cells 9.2 μ , stomates absent; growth rings light olive, medium broad, flush; root bands ivory, cylindric, 8 and 7 mm. high with 3 or 4 irregular rows of primordia; buds greenish red, 9×7 mm., inserted below scar and reaching growth ring; prophyll roundish with beaked tip, wing inserted near middle of prophyll, narrow, posterior side hairy, anterior side sparsely pubescent, with hair groups 1, 2, 16, 6, and 18 more or less evident.

LEAVES.—Sheaths 30 cm. long with heavy bloom and sparse 57; sheath base slightly decurrent with narrow ledge 64 and inconspicuous 64e; blades 110 cm. long and 6 cm. broad, module 20; dewlaps ligulate or double crescent, outer surface with sparse group 58, inner surface with small group 51 that extends as group 65 single file toward midrib, medium-dense group 52; both auricles transitional; ligule narrow

arcuate, 2 mm. high, group 61 very short, dorsal pubescence semiadnate group 65a.

DISTINGUISHING CHARACTERS.—Light purplish-gray cane, with round beaked medium-hairy buds and 3 or 4 rows of root primordia; diagnostic hair groups 57+ -, 64+ -, 64e+ --, 65+, 65a+ -; ligulate or double-crescent dewlaps (fig. 54 (236)); transitional auricles; narrow arcuate ligule.

CLONE BADILA FIJI

IMP. 1187, ACC. 237

CULMS.—Dark purple, with sparse bloom and broad wax bands; internodes cylindric, 6 cm. long and 32×37 mm. across, broad and shallow bud furrow, soft cream flesh; stem-epidermal pattern 3+5, average width of long cells 9 μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, constricted, 8 and 7 mm. high with 3 rows of primordia; buds red, 14×14 mm., inserted at scar and extending above growth ring; prophyll broad ovate with round-pointed tip, wing inserted below middle of prophyll, broad at base and emarginate, pubescence very sparse.

LEAVES.—Sheaths 32 cm. long with prominent 57; blades 146 cm. long and 6.5 cm. broad, module 22; dewlaps tall ascending squarish, outer surface with medium group 58, inner surface with small group 51 and more or less prominent group 52; outer auricle transitional and subtended by a short group 56, inner auricle short lanceolate; ligule thin-flanged crescent, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Dark-purple cane, with broad ovate more or less smooth buds; 3 rows of root primordia; diagnostic hair groups 52+, 56+ -, 57+; tall ascending-squarish dewlaps (fig. 54 (237)); short lanceolate inner auricle; shallow crescent ligule.

CLONE BALGHAT THIN

IMP. 1633, ACC. 237A

CULMS.—Green, becoming greenish yellow with sparse bloom, corky cracks, and predominant wax bands; internodes cylindric and shouldered, 10 cm. long and 26 mm. across, broad prominent bud furrow; stem-epidermal pattern 1+3+4, average width of long cells 12.1 μ , stomates numerous; growth ring greenish yellow, medium to narrow, tumescent; root bands greenish, cylindric-constricted, 8 mm. high with 3 or 4 rows of primordia; buds greenish, more or less plump, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad to narrow, more or less smooth, hair groups 1, 2, 10, and 19 somewhat evident.

LEAVES.—Sheaths 35 cm. long with broad 57 and 60; sheath base slightly decurrent with small 59; blades 140 cm. long and 5.5 cm. broad, module 25; dewlaps narrow squarish subrescent, outer surface with medium sparse group 58, inner surface with very small group 51 and medium sparse group 52; both auricles sloping transitional; ligule narrow arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with more or less smooth buds; medium root bands with 3 or 4 rows of primordia; diagnostic hair groups 57+, 59+ --, 60+; narrow squarish sub-crescent dewlaps (fig. 54 (237a)); transitional auricles; narrow arcuate ligule.

CLONE BAMBOO BLANCA

IMP. 757, ACC. 238

CULMS.—Pallid green becoming greenish yellow, with red flush, sparse bloom, and constricted heavy wax bands; internodes slightly concave and shouldered, 10 cm. long and 30×32 mm. across, medium bud furrow, greenish-olive flesh; stem-epidermal pattern 3+4, average width of long cells 12.1 μ , stomates present; growth rings olive green, narrow, tumescent; root bands green, cylindric obconoidal, 8 and 7 mm. high with 3 or 4 rows of reddish primordia; buds ivory green, 14×12 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and truncate notched tip, wing inserted below middle of prophyll, broad to medium wide, pubescence very sparse.

LEAVES.—Sheaths 33 cm. long with heavy bloom and medium 57; blades 157 cm. long and 7 cm. broad, module 22; dewlaps ascending squarish, outer surface with sparse group 58, inner surface with a small group 51 and medium group 52; both auricles sloping transitional, ligule very narrow arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Greenish-yellow, red-flushed cane, with large glabrate buds and 3 or 4 rows of reddish root primordia; diagnostic hair group 57+.; ascending-squarish dewlaps (fig. 54 (238)); transitional auricles; very narrow arcuate ligule.

CLONE BAMBOO MORADA

IMP. 768, ACC. 239

CULMS.—Red, with heavy bloom and merging wax bands; internodes concave cylindric and shouldered, 14 cm. long and 29×38 mm. across; medium prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+6+4, average width of long cells 9.8 μ , stomates present; growth rings greenish red, narrow, flush or somewhat tumescent; root bands red, cylindric obconoidal, 7 and 6 mm. high with 2 or 3 rows of primordia; buds reddish, 10×12 mm., inserted at scar and extending slightly above growth ring; prophyll broad rhomboid with prominent basal appendage and flat- to round-pointed tip, wing inserted slightly above middle of prophyll, broad and fringed at base, pubescence sparse, with more or less prominent hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 33 cm. long and smooth; blades 140 cm. long and 6 cm. broad, module 23; dewlaps shallow crescent deltoid, outer surface with medium group 58 and marginal group 58a, inner surface with prominent group 51 and dense group 52; outer auricle transitional, inner auricle short lanceolate; ligule orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with broad-ovate or rhomboid more or less smooth buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55a+ - -; shallow crescent-deltoid dewlaps; short lanceolate inner auricle; tall orbicular-crescent ligule.

CLONE BANDJARMASIN HITAM

IMP. 1049, ACC. 240

CULMS.—Dark vinaceous red, with heavy bloom, merging wax bands, and corky patches; internodes tumescent, 9 cm. long and 44×47 mm. across, medium bud furrow, greenish-ivory flesh; stem-epidermal pattern 1+6, average width of long cells 10 μ , stomates present; growth rings red, narrow, tumescent; root bands red, cylindrical or slightly constricted, 7 mm. high with 3 or 3 or 4 rows of primordia; buds red, 14×15 mm., inserted at scar and extending above growth ring; prophyll squarish-ovate or pentagonal, with prominent basal appendage and round-pointed often notched tip, wing inserted below middle of prophyll, broad at base, notched and basally fringed, pubescence prominent at base, with outstanding hair groups 1, 2, 19.

LEAVES.—Sheaths 33 cm. long with medium or narrow 57; blades 150 cm. long and 8 cm. broad, module 19; dewlaps tall squarish deltoid, outer surface with medium dense group 58 and marginal group 58a, inner surface with prominent groups 51, 65, 68, sparse group 63, and dense group 52; outer auricle transitional, subtended by a very short 56, inner auricle calcarate and not fringed; ligule broad crescent, 5 mm. high, group 61 short, dorsal pubescence as 65a and 55a.

DISTINGUISHING CHARACTERS.—Dark vinaceous-red cane, with thick tumescent internodes and pentagonal slightly hairy buds with prominent groups 1, 2, and 19; medium-narrow root bands; diagnostic hair groups 52+, 55a+ - - , 56+ - - , 57+ - , 58+ - , 63+ - - , 65+, 65a+; tall squarish-deltoid dewlaps (fig. 54 (240)); calcarate inner auricle; broad crescent ligule (fig. 37 (240)).

CLONE BANTENG

IMP. 1050, ACC. 241

CULMS.—Yellowish green, with sparse bloom, broad wax bands, and corky patches; internodes constricted below wax bands and slightly conoidal, 12 cm. long and 33 mm. across, without bud furrow, olive flesh; stem-epidermal pattern 2 with 50 percent solitary silica cells, average width of long cells 10.2 μ , stomates numerous; growth rings olive, medium broad, tumescent; root bands cylindrical obconoidal, 8 and 7 mm. high, with 3 irregular rows of primordia; buds green, 11×7 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and prominently fringed, pubescence prominent; hair groups 1, 2, 16, 19, 22, 4 evident.

LEAVES.—Sheaths 30 cm. long with prominent 57 and 60; blades 140 cm. long and 4.7 cm. broad, module 30; dewlaps crescent squarish deltoid, outer surface with medium-dense group 58, inner surface with a small group 51 and medium-dense group 52; both auricles

transitional or inner auricle small calcarate; ligule narrow subarcuate, 2 mm. high, hair group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with medium-hairy buds and narrow root bands; diagnostic hair groups 57+, 60+; crescent squarish-deltoid dewlaps (fig. 54 (241)); transitional auricles or inner auricle small calcarate; narrow subarcuate ligule.

CLONE BARBADOS WHITE

IMP. 698, ACC. 242

CULMS.—Grass green to pallid green, with heavy bloom and merging wax bands; internodes cylindrical to tumescent and shouldered, 10 cm. long and 34 mm. across, small bud furrow, soft creamy flesh; stem-epidermal pattern 1 -, average width of long cells 12.5μ , stomates absent; growth rings olive, narrow, flush; root bands greenish, cylindrical-constricted or slightly obconoidal, 10 and 8 mm. high, with 3 or 4 rows of primordia; buds green, 15×9 mm., inserted at scar and extending above growth ring; prophyll long ovate with round-pointed and notched tip, wing inserted near middle of prophyll, medium broad, pubescence prominent at base, with hair groups 19, 1, 2 most outstanding, 10 less evident.

LEAVES.—Sheaths 37 cm. long with medium 57; sheath base with 64 and sectorial 59; blades 150 cm. long and 5.3 cm. broad, module 28; dewlaps ascending ligulate, outer surface with medium group 58, inner surface with small group 51, sparse group 52, and medium group 63 inserted high; outer auricle transitional, inner auricle calcarate and basally fringed; ligule broad-centered subarcuate, 4 mm. high, group 61 very short, dorsal pubescence composed of semi-adnate hairs.

DISTINGUISHING CHARACTERS.—Green to pale-green cane, with medium-hairy buds and root bands; diagnostic hair groups 57+., 59+ --, 63+., 64+ -; ascending ligulate dewlaps (fig. 54 (242)); calcarate inner auricles; broad-centered subarcuate ligule (fig. 37 (242)).

CLONE BATEC LUPOG

IMP. 1237, ACC. 243

CULMS.—Pallid green to ivory yellow, with sparse bloom; internodes cylindrical, 9 cm. long and 35 mm. across, without bud furrow, soft light-olive flesh; stem-epidermal pattern 1+7+4, average width of long cells 10μ , stomates present; growth rings ivory, medium broad, flush; root bands ivory, cylindrical, 7 and 5 mm. high, with 2 or 3 rows of crowded primordia; buds greenish, 8×8 mm., inserted at scar and reaching growth ring; prophyll squarish with prominent basal appendage and crescent-serrate tip, wing inserted high, emarginate at base, broad and basically fringed, pubescence prominent on front side, less so on back side, hair groups 1, 2, 16, and 11 more or less outstanding.

LEAVES.—Sheaths 33 cm. long with small and sparse 57; sheath base with small 64e; blades 170 cm. long and 6 cm. broad, module 28; dewlaps ascending squarish crescent, outer surface with medium group 58, inner with broad group 51 and dense group 52; group 51 may

extend as sparse group 65 toward midrib, medium-small midrib groups 63 and 55; outer auricle sloping transitional, subtended by a short 56, inner auricle short lanceolate or calcarate and not fringed; ligule broad-centered crescent or subarcuate, 5 mm. high, group 61 medium short, dorsal pubescence as sparse 55a and 65a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Ivory-yellow cane, with squarish medium-hairy buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55+ -, 55a+ --, 56+ --, 57+ --, 63+ --, 64e+ --, 65+ --, 65a+ --; ascending squarish-crescent dewlaps (fig. 54 (243)), (fig. 57 (243)); short lanceolate or calcarate inner auricles; broad crescent ligule.

CLONE BATJAN

IMP. 771, ACC. 244

CULMS.—Yellow and green striped, or green, with sparse bloom and narrow wax bands, corky patches; internodes cylindrical and shouldered, 9.5 cm. long and 23 mm. across, medium-small bud furrow, greenish-olive flesh; stem-epidermal pattern 1+3, average width of long cells 10.2 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindrical-obconoidal, 8 and 7 mm. high with 3 irregular rows of more or less sparse primordia; buds green with olive wing, 11 \times 7 mm., inserted at scar and extending above growth ring; prophyll long and narrow ovate with round-pointed slightly notched tip, wing inserted below middle of prophyll; medium and broadening toward apex, pubescence very sparse.

LEAVES.—Sheaths 31 cm. long with medium narrow 57; sheath base saccate; blades 125 cm. long and 4.6 cm. broad, module 27; dewlaps small, narrow ascending squarish, outer surface with sparse group 58, inner surface with medium groups 51 and 52; outer auricle transitional and subtended by a short group 56, inner auricle deltoid to short lanceolate and fringed, ligule crescentiform, 2.5 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellow- and green-striped or green cane, with slender smooth buds and medium root bands; diagnostic hair groups 56+ --, 57+ -; small, narrow ascending-squarish dewlaps (fig. 56 (244)); deltoid or short lanceolate inner auricle; narrow ligule.

CLONE BATJAN GREEN SPORT

IMP. 770, ACC. 245

CULMS.—Yellowish green, with sparse bloom, narrow wax bands, and corky cracks and patches; internodes cylindrical and shouldered, 9 cm. long and 26 mm. across, medium-small bud furrow, hard greenish-olive flesh; stem-epidermal pattern 1+3+4, average width of long cells 9.2 μ , stomates absent; growth rings green, broad, tumescent; root bands green, cylindrical-conoidal, 8 and 7 mm. high with 3 irregular rows of primordia; buds green with olive wings, 13 \times 8 mm. inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, narrow, pubescence sparse, with hair groups 1, 2, 16, 19, 10 evident.

LEAVES.—Sheaths 30 cm. long with medium narrow 57; blades 125 cm. long and 5.4 cm. broad, module 23; dewlaps ascending narrow squarish, outer surface with sparse group 58, inner surface with medium small group 51, sparse group 52; outer auricle transitional and subtended by a short 56, inner one deltoid or short lanceolate; ligule crescent, 2.5 mm. high, group 61 medium long in flange zone, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with narrow ovate slightly hairy buds, medium root bands; diagnostic hair groups 55a+--, 56+--, 57+-; ascending narrow squarish dewlaps (fig. 55 (245)); small deltoid or short lanceolate inner auricle; medium-broad crescent ligule.

CLONE BLACK CHERIBON

IMP. 1627, ACC. 245A

CULMS.—Purple, with heavy bloom and merging wax bands; internodes cylindrical, 9 cm. long and 34×36 mm. across, prominent bud furrow; stem-epidermal pattern 1+6+4, average width of long cells 9.5 μ , stomates present; growth rings light olive, broad, flush or slightly tumescent; root bands red, cylindrical, 7 and 6 mm. high with 3 or 3 or 4 rows of primordia; buds reddish, 10×10 mm., inserted at scar and reaching growth ring; prophyll pentagonal with small crescent tip, wing inserted near middle of prophyll, broad especially at base and somewhat emarginate, prominently fringed in lower half, pubescence medium sparse with prominent hair groups 1, 2, 16, 19, 10, and 4.

LEAVES.—Sheath 31 cm. long, smooth or with narrow 57; sheath base with 64e; blades 145 cm. long and 6.5 cm. broad, module 22; dewlaps flaring deltoid crescent, outer surface with medium group 58, inner with more or less prominent group 51 and dense group 52, sparse groups 63 and 55; both auricles transitional; ligule crescent, 4 mm. high, group 61 very short, dorsal pubescence as prominent 55a.

DISTINGUISHING CHARACTERS.—Purplish cane, with pentagonal slightly hairy buds having broad wings prominently fringed in lower part; narrow root bands with 3 or 4 rows of primordia; diagnostic hair groups 52+, 55+-, 55a+-, 57+---, 63+-, 64e+-; flaring deltoid-crescent dewlaps (fig. 55 (245a)); transitional auricles; more or less broad crescent ligule.

CLONE BLACK FIJI

IMP. 697, ACC. 246

CULMS.—Red, with sparse bloom and prominent wax bands; internodes cylindrical, 9 cm. long and 33 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 2, average width of long cells 11.6 μ , stomates present; growth rings red, narrow, flush; root bands red, cylindrical conoidal, 10 and 8 mm. high with 4 or 5 irregular rows of crowded primordia; buds red, 16×14 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad, pubescence general and somewhat prominent, with outstanding hair groups 1, 2, 16, 11, 10, 19.

LEAVES.—Sheaths 31 cm. long with inconspicuous 57; sheath base with narrow sectorial 59 and 64; blades 110 cm. long and 6.2 cm. broad, module 18; dewlaps squarish, outer surface with medium group 58, inner surface with small group 51, medium group 52, small group 63, and prominent 68; outer auricle transitional and subtended by a long 56, inner auricle small calcarate and fringed; ligule thin-flanged deltoid crescent, 3.5 mm. high, group 61 long, dorsal pubescence inconspicuous.

DISTINGUISHING CHARACTERS.—Red cane, with large more or less hairy buds having outstanding groups 10 and 19; 4 or 5 rows of irregular, crowded primordia; diagnostic hair groups 56+, 57+--, 59+-, 61+, 63+--, 64+-; squarish dewlaps (fig. 55 (246)); small calcarate inner auricle; medium-tall deltoid-crescent ligule.

CLONE BLACK TANNA

IMP. 1568, ACC. 247

CULMS.—Yellowish red, with sparse bloom and prominent wax bands; internodes cylindric shouldered, 14 cm. long and 39×41 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 3+4+5, average width of long cells 9.2 μ , stomates present; growth rings greenish red, medium broad, flush; root bands red, cylindric, 12 and 9 mm. high with 3 or 4 rows of reddish primordia; buds greenish, 15×12 mm., inserted at scar and extending to growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence medium prominent, with outstanding hair groups 10, 1, 2, and 11.

LEAVES.—Sheaths 35 cm. long with broad 57; sheath base decurrent with small 64e; blades 160 cm. long and 7.2 cm. broad, module 22; dewlaps ascending squarish, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles transitional, outer one may be subtended by a very short 56; ligule thin-flanged crescent deltoid, 5 mm. high, hair group 61 very short, dorsal pubescence short and sparse.

DISTINGUISHING CHARACTERS.—Yellowish-red cane, with large, medium-hairy buds; tall root bands with 3 or 4 rows of primordia; diagnostic hair groups 56+---, 57+, 64e+-; ascending-squarish dewlaps (fig. 55 (247)); transitional auricles; tall crescent-deltoid ligule (fig. 37 (247)).

CLONE BRANCHE BLANCHE

IMP. 1055, ACC. 248

CULMS.—Yellowish green, with red sunscald, sparse bloom, and prominent wax bands; internodes slightly bobbin-shaped, 12 cm. long and 24×26 mm. across, medium-prominent bud furrow, orange flesh with pithy center; stem-epidermal pattern 2, average width of long cells 10.8 μ , stomates present; growth rings orange green, medium broad, flush; root bands green, cylindric obconoidal, 9 and 8 mm. high with 3 or 4 rows of primordia; buds green with reddish wing, 15×11 mm., inserted at scar and extending above growth ring;

prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and basally fringed, pubescence sparse, with small hair groups 10, 16, 19.

LEAVES.—Sheaths 30 cm. long with narrow 57; blades 130 cm. long and 5 cm. broad, module 26; dewlaps tall squarish deltoid, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle transitional and subtended by a long 56, inner auricle deltoid and fringed; ligule orbicular crescent, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with somewhat bobbin-shaped internodes and pithy center; more or less smooth buds; medium-tall root bands with 3 or 4 rows of primordia; diagnostic hair groups 56+, 57+-; tall squarish-deltoid dewlaps (fig. 55 (248)); deltoid inner auricle; medium-broad crescent ligule with lozenge.

CLONE BOENGAJA

IMP. 1051, ACC. 249

CULMS.—Yellowish green, with sparse bloom and prominent wax bands, growth cracks, and corky patches; nodes more or less thick; internodes concave cylindrical, 7.5 cm. long and 34 mm. across, medium bud furrow, light-orange flesh; stem-epidermal pattern 1+6, average width of long cells 8.6μ , stomates absent; growth rings green, medium broad, tumescent; root bands green, cylindrical, 9 and 8 mm. high with 3 rows of primordia; buds green edged in olive, 10×7 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, medium broad, pubescence general, with prominent hair groups 10 and 11.

LEAVES.—Sheaths 31 cm. long with prominent 57 and 60; sheath base with short-haired 59; blades 135 cm. long and 5.3 cm. broad, module 25; dewlaps squarish crescent, outer surface with dense, semilong group 58, inner surface with broad group 51, 65, and dense semilong group 52; outer auricle transitional, inner auricle transitional or small calcarate; ligule narrow arcuate, 2 mm. high, group 61 long, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with hairy buds; medium-tall root bands; diagnostic hair groups 52+., 57+, 58+, 59+-, 61+., 65+-; squarish-crescent dewlaps (fig. 55 (249)); inner auricle transitional or small calcarate; narrow arcuate ligule.

CLONE BOETON LICHTGROEN

IMP. 1550, ACC. 250

CULMS.—Faint red becoming yellowish green, with heavy bloom and merging wax bands; internodes cylindrical, 15 cm. long and 34 mm. across, prominent bud furrow, greenish medium-soft flesh; stem-epidermal pattern 6+4, average width of long cells 10.3μ , stomates absent; growth rings olive green, medium broad, flush; root bands ivory green, cylindrical conoidal, 6 and 5 mm. high with 3 rows of semicrowded primordia; buds green, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate squarish with crescent or round-pointed tip, wing inserted above middle of prophyll,

medium broad, wide at base, pubescence medium, with hair groups 1, 2, 16, 19, and 10 prominent.

LEAVES.—Sheaths 34 cm. long with narrow 57; sheath base with small sectorial 59; blades 145 cm. long and 6 cm. broad, module 24; dewlaps squarish subrescent, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51, sparse group 65, and dense group 52; outer auricle sloping transitional, inner auricle short lanceolate and not fringed; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with medium hairy buds; narrow root bands; diagnostic hair groups 52+, 55a+ -, 57+ --, 59+ --, 65+ -; squarish-subrescent dewlaps (fig. 55 (250)); short lanceolate inner auricle; orbicular-crescent ligule (fig. 37 (250)).

CLONE BOETOTA BILATOE

IMP. 1052, ACC. 251

CULMS.—Dark red, with sparse bloom and broad wax bands, growth cracks, and corky patches; internodes cylindric and shouldered, 11 cm. long and 30×31 mm. across, small bud furrow, orange flesh; stem-epidermal pattern 1-, average width of long cells 12.5 μ , stomates present; growth rings red, medium broad, flush; root bands red, cylindric conoidal, 8 and 6 mm. high with 2 or 3 irregular rows of primordia; buds dark red, 14×9 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, medium broad, pubescence sparse, hair groups 1, 16, and 19 somewhat prominent.

LEAVES.—Sheaths 30 cm. long, reddish, with short-haired 57 and 60; sheath base decurrent; blades reddish, 120 cm. long and 5.6 cm. broad, module 21; dewlaps red, narrow squarish subrescent, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles transitional; ligule narrow arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red cane with reddish sheath and blade; slightly hairy buds; medium root bands; diagnostic hair groups 57+, 60+ -; red narrow squarish-subrescent dewlaps (fig. 55 (251)); transitional auricles; narrow arcuate ligule.

CLONE BOURBONRIET

IMP. 1054, ACC. 252

CULMS.—Yellowish green, with light reddish flush, sparse bloom. and broad wax bands; internodes cylindric and slightly shouldered, 9 cm. long and 42 mm. across, prominent bud furrow, ivory flesh; stem-epidermal pattern 1-, average width of long cells 9 μ , stomates present; growth rings green, narrow, slightly tumescent; root bands green, cylindric, 7 and 5 mm. high with 2 rows of primordia; buds green with olive wing, 15×10 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, more or less narrow hairy, pubescence prominent at base and in wing region, outstanding hair groups 1 and 2.

LEAVES.—Sheaths 37 cm. long with prominent 57; sheath base with small 64e; blades 135 cm. long and 6.3 cm. broad, module 21; dewlaps shallow squarish crescent, outer surface with dense group 58, inner surface with broad group 51, sparse group 65, dense semilong group 52, and small groups 55 and 63; outer auricle broad transitional, inner auricle deltoid or short lanceolate and fringed; ligule broad-centered arcuate, 5 mm. high, group 61 very short, dorsal pubescence as 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with buds prominently hairy at base and wing regions; narrow root bands; diagnostic hair groups 52+, 55+ -, 55a+ -, 57+, 58+, 63+ -, 64e+ -, 65+ -; shallow squarish-crescent dewlaps (fig. 55 (252)); deltoid or short lanceolate inner auricle; broad arcuate ligule (fig. 37 (252)).

CLONE BRANCHUE

IMP. 988, ACC. 253

CULMS.—Apple green, with sparse bloom and prominent wax bands; internodes cylindrical conoidal, 11 cm. long and 26 mm. across, small bud furrow, orange flesh with pithy center; stem-epidermal pattern 2, average width of long cells 10.8μ , stomates present; growth rings olive, broad, tumescent; root bands ivory rose, cylindrical tumescent, 9 and 8 mm. high with 3 rows of sparse primordia; buds green with rose tip, 15×10 mm., inserted at scar and extending above growth ring; prophyll ovate, medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, fringed, pubescence very sparse, small hair groups 16 and 10.

LEAVES.—Sheaths 33 cm. long with narrow or medium-broad 57; blades 140 cm. long and 5.2 cm. broad, module 27; dewlaps small crescent deltoid, outer surface with sparse group 58, inner surface with very small group 51 and sparse group 52; outer auricle transitional and subtended by a long 56, inner auricle deltoid to medium-long lanceolate; ligule broad-centered subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence faint.

DISTINGUISHING CHARACTERS.—Green cane with long ovate, smooth buds, pithy-centered stems; tall root bands; diagnostic hair groups 56+, 57+ -; small crescent-deltoid dewlaps (fig. 55 (253)); deltoid to medium-long lanceolate inner auricle; medium-broad subarcuate ligule (fig. 37 (253)).

CLONE BRAVA DE PERICO

IMP. 766, ACC. 254

CULMS.—Olive green, with red flush, sparse bloom and prominent wax bands; internodes slightly bobbin-shaped, 13 cm. long and 29 mm. across, medium bud furrow, soft olive-orange flesh; stem-epidermal pattern 1+6, average width of long cells 11.6μ , stomates absent; growth rings green, medium broad, tumescent; root bands green, cylindrical, 7 mm. high with 2 or 3 rows of reddish primordia; buds green with rose wings, 15×12 mm., inserted at scar and extending above growth ring; prophyll long ovate with round-pointed notched tip, wing inserted below middle of prophyll, medium wide and promi-

nently fringed, pubescence general and prominent at base and wing surface, outstanding hair groups 1, 2, 4, 10, 11, 13, 16.

LEAVES.—Sheaths 27 cm. long with prominent 57; sheath base with 69 and sectorial 59; blades 137 cm. long and 6.6 cm. broad, module 21; dewlaps tall squarish, outer surface with medium group 58, inner surface with prominent group 51, semilong groups 52 and 55, and prominent long-haired group 63; both auricles transitional, or inner one small calcarate; ligule broad-flanged subarcuate, 3.5 mm. high, group 61 very tall, dorsal pubescence general, prominent 55a.

DISTINGUISHING CHARACTERS.—Olive-green cane, with large prominently fringed buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55+, 55a+, 57+, 59+-, 61+, 63+, 69+; tall squarish dewlaps (fig. 55 (254)); transitional or small calcarate inner auricle; broad-flanged subarcuate ligule (fig. 37 (254)).

CLONE CAIARA

IMP. 1582, ACC. 255

CULMS.—Brown and yellow striped, sparse bloom, and prominent narrow wax bands; internodes concave cylindrical and shouldered, 14 cm. long and 39×40 mm. across, without bud furrow, flesh green and medium hard; stem-epidermal pattern 2+3+4, average width of long cells 9 μ , stomates present; growth rings green, medium broad, flush; root bands red, constricted, 7 mm. high with 3 rows of small red primordia; buds green with red wings, 13×12 mm., inserted at scar and extending to growth ring; prophyll broad ovate or rhomboid with prominent basal appendage and flat tip, wing inserted near middle of prophyll, medium broad, pubescence very sparse.

LEAVES.—Sheaths 38 cm. long with medium 57; blades 125 cm. long and 7.5 cm. broad, module 17; dewlaps double-crescent squarish, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51, dense group 52, and sparse group 63; both auricles sloping transitional; ligule arcuate, 3 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Brown-and-yellow striped cane, with broad rhomboid, smooth buds; narrow root bands with 3 rows of small red primordia; diagnostic hair groups 52+, 55a+ -, 57+., 63+ - - -; double-crescent squarish dewlaps (fig. 55 (255)); transitional auricles; narrow arcuate ligule (fig. 37 (255)).

CLONE CAÑA BLANCA

IMP. 194, ACC. 256

CULMS.—Yellowish green, with sparse bloom, prominent wax bands, and corky patches; internodes cylindrical and slightly shouldered, 11 cm. long and 40 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 1-, average width of long cells 9.6 μ , stomates absent; growth rings yellow green, narrow, flush; root bands ivory green, cylindrical, conoidal, 7 and 6 mm. high with 3 rows of primordia; buds green with olive wing, 10×8 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing

inserted below middle of prophyll, medium broad, pubescence general and prominent, outstanding hair groups 1, 2, 16, 11, 19.

LEAVES.—Sheaths 30 cm. long with prominent 57 and 60; sheath base decurrent with small 64e; blades 140 cm. long and 5.6 cm. broad, module 25; dewlaps slightly descending deltoid-crescent or double crescent, outer surface with medium group 58, inner surface with prominent groups 51 and 65, dense semilong 52, small 55 and 63; outer auricle deltoid, inner auricle short lanceolate and fringed; ligule medium-broad arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with hairy buds; narrow root bands; diagnostic hair groups 52+, 55+-, 55a+-, 57+, 60+, 63+---, 64e+---, 65+, 65a+-; slightly descending deltoid-crescent or double-crescent dewlaps (fig. 55 (256)); short lanceolate inner auricle; arcuate ligule.

CLONE CALEDONIA RIBBON

IMP. 1239, ACC. 257

CULMS.—Brown and purple striped, with sparse bloom and prominent wax bands; internodes cylindric and shouldered, 11 cm. long and 36 mm. across, without bud furrow, olive-gray flesh; stem-epidermal pattern 3, average width of long cells 9.4μ , stomates absent; growth rings striped, narrow, tumescent; root bands red, cylindric-constricted, 8 and 7 mm. high with 3 or 4 rows of reddish primordia; buds red, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate squarish, with broad basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and basally fringed, pubescence more or less prominent especially in wing region, outstanding hair groups 16 and 19.

LEAVES.—Sheaths 40 cm. long and smooth or with inconspicuous 57; blades 165 cm. long and 6.7 cm. broad, module 25; dewlaps narrow squarish double-crescent or ascending ligulate, outer surface with dense group 58, inner surface with broad group 51 and dense semilong group 52; both auricles sloping transitional, outer one subtended by a short 56; ligule broad-centered arcuate, 4.5 mm. high, group 61 very short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with more or less hairy buds having prominent groups 16 and 19; narrow wings; medium root bands with 3 or 4 rows of primordia; diagnostic hair groups 52+, 56+-, 57+---, 58+; narrow squarish double-crescent or ascending ligulate dewlaps (fig. 55 (257)); transitional auricles; broad arcuate ligule (fig. 37 (257)).

CLONE CAVENGERIE

IMP. 696, ACC. 258

CULMS.—Red, with sparse olive stripes, sparse bloom, and broad wax bands; internodes cylindric and slightly shouldered, 15 cm. long and 32 mm. across, prominent bud furrow, hard ivory flesh; stem-epidermal pattern 2+4, average width of long cells 11μ , stomates numerous; growth rings red-striped, medium high, tumescent; root

bands red, cylindric-constricted, 7 and 6 mm. high with 3 rows of crowded primordia; buds greenish with bright-red wings, 13×10 mm., inserted at scar and extending above growth ring; prophyll long deltoid with prominent basal appendage and truncate tip, wing inserted low, medium broad, pubescence very sparse.

LEAVES.—Sheaths 38 cm. long, striped, with medium-prominent 57; blades striped, 125 cm. long and 5.6 cm. broad, module 22; dewlaps ascending double-crescent squarish, outer surface with sparse 58, inner surface with broad 51 and sparse 52; both auricles steeply sloping transitional, outer one subtended by a short long-haired 56; ligule narrow arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with elongated-deltoid more or less smooth buds; narrow root bands; diagnostic hair groups 55a+-, 56+-, 57+.; ascending double-crescent squarish dewlaps (fig. 55 (258)); transitional auricles; narrow arcuate ligule.

CLONE CAVENGERIE SANGRE DE TORO

IMP. 972, ACC. 259

CULMS.—Brilliant red, with few green pencil stripes, sparse bloom, prominent wax bands, and corky patches; internodes cylindric, 11 cm. long and 35×38 mm. across, broad bud furrow; stem-epidermal pattern 2, average width of long cells 10.8μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindric-constricted, 8 and 7 mm. high with 3 irregular rows of primordia; buds greenish with red wings, 13×12 mm., inserted at scar and extending above growth ring; prophyll broad deltoid with round-pointed tip, wing inserted low, medium broad, pubescence sparse with hair groups 1 and 2 somewhat prominent.

LEAVES.—Sheaths striped, 37 cm. long with prominent 57; blades 150 cm. long and 5.1 cm. broad, module 29; dewlaps flaring double-crescent squarish, outer surface with sparse group 58, inner surface with broad group 51 and sparse group 52; both auricles steeply sloping transitional, outer one subtended by a short long-haired 56; ligule arcuate, 3 mm. high, hair group 61 very short, dorsal pubescence as a sparse 55a and in flange zone.

DISTINGUISHING CHARACTERS.—Brilliant-red cane with broad-deltoid more or less smooth buds; medium root bands; diagnostic hair groups 55a+ -, 56+ -, 57+; flaring double-crescent-squarish dewlaps (fig. 56 (259)); transitional auricles; narrow arcuate ligule.

CLONE CEBU LIGHT PURPLE

IMP. 1241, ACC. 260

CULMS.—Light purplish red, with heavy bloom and merging wax bands; internodes cylindric, 15 cm. long and 28 mm. across, without bud furrow, soft green-olive flesh; stem-epidermal pattern 4+6+1, average width of long cells 11.7μ , stomates present; growth rings green, medium broad, flush; root bands greenish ivory, cylindric, 8 and 7 mm. high with 2 or 3 rows of primordia; buds reddish, 10×8 mm., inserted at scar and reaching growth ring; prophyll more or less

roundish or pentagonal with broad crescent-serrate tip, wing inserted above middle of prophyll, medium or narrow, pubescence at base and juncture, with hair groups 1, 2, 16, 8, 10, 22, 19, 4, prominent.

LEAVES.—Sheaths 24 cm. long with narrow 57; sheath base with prominent sectorial 59; blades 130 cm. long and 4.2 cm. broad, module 30; dewlaps ascending ligulate, outer surface with dense group 58 and marginal group 58a, inner surface with medium group 51, dense group 52, and small group 55; outer auricle transitional, inner auricle small calcarate; ligule broad-centered crescent, 6 mm. high, group 61 medium long, dorsal pubescence as 55a, semiadnate in flange zone.

DISTINGUISHING CHARACTERS.—Purplish-red cane with roundish medium-hairy prominently fringed buds; medium root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55+ -, 55a+ -, 57+ --, 58+, 59+ -, 61+.; ascending ligulate dewlaps (fig. 56 (260)); small calcarate inner auricles; tall crescent ligule.

CLONE CERAM RED

IMP. 1076, ACC. 262

CULMS.—Red, with heavy bloom, merging wax bands, and corky patches; internodes tumescent, 6 cm. long and 30 mm. across, without or with small bud furrow, white flesh; stem-epidermal pattern 1+6+4, average width of long cells 9.2μ , stomates absent; growth rings green, narrow, flush; root bands red, conoidal, 10 and 8 mm. high with 3 or 4 irregular rows of sparse primordia; buds green with red wings, 13×10 mm., inserted below scar and reaching slightly above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and prominently fringed; pubescence general and prominent especially on posterior side.

LEAVES.—Sheaths 32 cm. long with prominent group 57; sheath base with group 69; blades 140 cm. long and 6.7 cm. broad, module 21; dewlaps large ascending squarish or ligulate, outer surface with medium group 58, inner surface with small 51 and sparse 52; outer auricle greatly sloping transitional, inner auricle long lanceolate and fringed to tip; ligule narrow-flanged subarcuate or crescent with lozenge, 6 mm. high, group 61 long, dorsal pubescence prominent.

DISTINGUISHING CHARACTERS.—Red cane, with short thick tumescent internodes, hairy buds; tall root bands; diagnostic hair groups 57+, 61+., 66+, 69+ -; large ascending-squarish or ligulate dewlaps (fig. 56 (262)); long lanceolate inner auricles; very tall subarcuate or crescent ligule.

CLONE CHITTAN

IMP. 1632, ACC. 263A

CULMS.—Purple and green striped, with heavy bloom and prominent wax bands; internodes cylindric and slightly shouldered, 11 cm. long and 36 mm. across, shallow prominent bud furrow; stem-epidermal pattern 6+4, average width of long cells 10μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped, cylindric-constricted, 8 and 5 mm. high with 2 rows of primordia; buds green with red wing tip, plump, 15×13 mm., inserted at scar and extending above growth ring; prophyll short ovate or pentagonal

with small basal appendage and round-pointed tip, wing inserted below middle or prophyll, auriculate and confluent with sides, medium broad or broad and prominently fringed, surface covered with medium-short white hair, general pubescence more or less sparse except for hair groups 1, 2, 16, 19, and 10.

LEAVES.—Sheaths 35 cm. long with narrow 57; blades 165 cm. long and 6.5 cm. broad, module 25; dewlaps shallow crescent-deltoid, outer surface with medium group 58, inner surface with prominent 51 and sparse 65, dense semilong 52 and medium short 63 inserted high; both auricles greatly sloping transitional; ligule crescent with lozenge, 4 mm. high, group 61 very short, dorsal pubescence as sparse 55a and in flange zone.

DISTINGUISHING CHARACTERS.—Striped cane; plump broad ovate or pentagonal buds with medium-sparse pubescence; root bands with 2 rows of primordia; diagnostic hair groups 52+, 55a+ —, 57+ —, 63+ —, 65+ —; shallow crescent-deltoid dewlaps (fig. 56 (263a)); transitional auricles; broad crescent ligule.

CLONE CREOLA

IMP. 1583, ACC. 264

CULMS.—Yellowish green, with sparse bloom, corky patches, and merging wax bands; internodes cylindric, constricted near growth ring and shouldered, 11 cm. long and 28×29 mm. across, medium bud furrow, soft greenish flesh; stem-epidermal pattern 1+4+3, average width of long cells 10.6 μ , stomates present; growth rings olive, medium broad, depressed; root bands green, cylindric, 8 and 7 mm. high with 4 irregular rows of primordia; buds green with reddish wings, 11×9 mm., inserted below scar and reaching growth ring; prophyll narrow ovate with small basal appendage and narrow truncate and notched tip, wing inserted below middle of prophyll, medium broad to narrow and not fringed, pubescence medium prominent with hair groups 1, 2, 16, and 19 somewhat outstanding.

LEAVES.—Sheaths 33 cm. long and covered with medium short-haired 57 and 60; blades 135 cm. long and 5.3 cm. broad, module 25; dewlaps double-crescent deltoid, outer surface with medium 58, inner surface with small 51 and sparse 52; both auricles sloping transitional, ligule thin-flanged arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with narrow ovate slightly hairy buds; medium root bands with 4 rows of primordia; diagnostic hair groups short-haired 57+., 60+ —; double-crescent-deltoid dewlaps (fig. 56 (264)); transitional auricles; very narrow arcuate ligule.

CLONE CRYSTALINA

IMP. 10, ACC. 266

CULMS.—Yellowish green, with heavy bloom and merging wax bands; internodes cylindric, 10 cm. long and 37 mm. across, prominent bud furrow, soft olive flesh; stem-epidermal pattern 1+6, average width of long cells 8.4 μ , stomates present; growth rings olive, narrow, flush; root bands ivory, cylindric, 8 and 6 mm. high with 3 rows of

sparse purple primordia; buds green with reddish wing, 12×12 mm., inserted at scar and reaching growth ring; prophyll pentagonal with round-pointed tip, wing inserted near middle of prophyll, broad, emarginate at base and covered with short, brown hair, prominent hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 32 cm. long with a narrow 57; blades 145 cm. long and 7 cm. broad, module 20; dewlaps squarish subrescent, outer surface with medium dense 58 and small 58a, inner surface with broad 51, sparse 65, dense 52, and small 63; outer auricle sloping transitional, sometimes subtended by a short 56, inner auricle transitional or deltoid; ligule broad-flanged crescent, 5 mm. high, group 61 very short, dorsal pubescence as 55a and in flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with pentagonal medium-hairy buds; 3 rows of sparse purplish primordia; diagnostic hair groups 52+, 55a+---, 56+---, 57+---, 63+---, 65+--; squarish-subrescent dewlaps (fig. 56 (266)); inner auricle transitional or deltoid; tall crescent ligule (fig. 37 (266)).

CLONE FIJI

IMP. 70, Acc. 267

CULMS.—Red, with medium bloom and broad wax bands; internodes concave cylindric and shouldered, 15 cm. long and 24×26 mm. across, small bud furrow, olive-green flesh; stem-epidermal pattern 1+3+4, average width of long cells 8.6μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindric, 8 and 7 mm. high with 2 or 3 rows of large primordia; buds red, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate with medium prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and basally fringed, pubescence prominent at base and juncture, outstanding hair groups 11 and 10.

LEAVES.—Sheaths 34 cm. long and smooth; sheath base slightly decurrent; blades 160 cm. long and 5.1 cm. broad, module 31; dewlaps shallow deltoid squarish, outer surface with medium 58, inner surface with broad 51 and dense 52; both auricles transitional or small deltoid; ligule broad-flanged crescent, 4.5 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane with medium or slightly hairy buds; 2 or 3 rows of large primordia; diagnostic hair group dense 52+; shallow deltoid-squarish dewlaps (fig. 56 (267)); transitional auricles; broad crescent ligule (fig. 37 (267)).

CLONE GEEL MUNTOK

IMP. 1058, Acc. 268

CULMS.—Light red becoming yellowish green, with sparse bloom and prominent wax bands; internodes with corky cracks, cylindric, 8 cm. long and 33 mm. across, more or less prominent bud furrow, light-olive flesh; stem-epidermal pattern 2, average width of long cells 13.8μ , stomates absent; growth rings olive, narrow tumescent; root bands greenish, cylindric, 6 and 5 mm. high with 3 rows of purplish primordia; buds green with olive wings, 12×12 mm.,

inserted at scar and extending above growth ring; prophyll ovate and prominently auriculate, small basal appendage and slightly truncate tip, wing inserted below middle of prophyll, broad at base and prominently fringed, pubescence medium prominent with hair groups 1, 2, 4, 16, 11, 19-, and localized 13 and 14.

LEAVES.—Sheaths 30 cm. long with a very broad 57; sheath base slightly decurrent with small 64e; blades 135 cm. long and 7 cm. broad, module 19; dewlaps flaring ascending squarish, outer surface with medium 58 and small 58a, inner surface with broad 51 and sparse 65 and 52; outer auricle transitional, inner auricle small calcarate and fringed; ligule broad-centered crescent, 5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with prominently auriculate and basally fringed, medium-hairy buds; narrow root bands with 3 rows of purplish primordia; diagnostic hair groups 57+, 65+ -; flaring ascending-squarish dewlaps (fig. 56 (268)); small calcarate inner auricle; broad crescent ligule.

CLONE GESTREEPT PREANGER

IMP. 71, ACC. 269

CULMS.—Purple and green striped, with heavy bloom and merging wax bands; internodes cylindrical and slightly shouldered, 13 cm. long and 31×33 mm. across, prominent bud furrow, white flesh; stem-epidermal pattern 1, average width of long cells 12.8 μ , stomates present; growth rings striped, narrow, tumescent; root bands striped, cylindrical, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with red wing, 8×11 mm., inserted at scar and reaching growth ring; prophyll broad rhomboid with small basal appendage and round-pointed tip, wing inserted above middle of prophyll, broad at base, auriculate and somewhat emarginate, pubescence medium with outstanding groups 1, 2, 3, 16, 19, 29.

LEAVES.—Sheaths 38 cm. long, smooth or with inconspicuous 57; blades 170 cm. long and 6.4 cm. broad, module 26; dewlaps squarish or double-crescent deltoid, outer surface with medium 58, inner surface with prominent 51, dense 52, and small 63 and 65; outer auricle transitional, inner auricle small calcarate; ligule broad orbicular crescent, 4.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with broad rhomboid, medium-hairy buds; narrow root bands; diagnostic hair groups 52+, 55a+ - -, 57+ - - -, 63+ - -, 65+ -; squarish or double-crescent-deltoid dewlaps (fig. 56 (269)); inner auricle small calcarate; tall orbicular-crescent ligule (fig. 37 (269)).

CLONE GREEN GERMAN NEW GUINEA

IMP. 210, ACC. 270

CULMS.—Yellowish green, with rose flush, medium bloom, and prominent wax bands; internodes cylindrical or slightly obconoidal, 10 cm. long and 37×38 mm. across, without bud furrow, hard olive flesh; stem-epidermal pattern 2-, average width of long cells 9.2 μ , stomates absent; growth rings olive, narrow, flush; root bands green,

cylindric conoidal, 7 and 6 mm. high with 3 rows of crowded primordia; buds green with red tip, 12×13 mm., inserted at scar and extending above growth ring; prophyll broad deltoid or pentagonal with irregular serrate tip, wing inserted near middle of prophyll, broad at base, covered with short brown hair, outstanding hair groups 1, 2, 4, 16, 11, 13, 19, 22, 14.

LEAVES.—Sheaths 37 cm. long with prominent 57 and 60; blades 150 cm. long and 7 cm. broad, module 21; dewlaps tall squarish, outer surface with medium 58, inner surface with prominent 51 and dense 52; outer auricle sloping transitional, inner auricle short lanceolate and fringed to tip; ligule broad-centered subarcuate, 5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone and occasionally as 55a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad pentagonal more or less hairy buds; narrow root bands with 3 rows of crowded primordia; diagnostic hair groups $52+$, $55a+---$, $57+$, $60+$; tall squarish dewlaps (fig. 56 (270)); short lanceolate inner auricle; broad subarcuate ligule.

CLONE GREEN RIBBON

IMP. 31, ACC. 271

CULMS.—Green and yellow striped, with sparse bloom and prominent wax bands; internodes cylindric, 13 cm. long and 36 mm. across, small to prominent bud furrow, ivory-rose flesh; stem-epidermal pattern 1-, average width of long cells 10.2μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, cylindric, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with olive wing, 9×7 mm., inserted at scar and extending to growth ring; prophyll narrow ovate deltoid with prominent basal appendage and round-pointed tip, wing inserted low, medium broad, pubescence somewhat prominent, outstanding hair groups 1, 2, 11, 16, 19, 22, 10.

LEAVES.—Sheaths striped, 32 cm. long with broad 57; sheath base decurrent; blades 145 cm. long and 5.7 cm. broad, module 25; dewlaps slightly descending double crescent, outer surface with medium group 58, inner surface with broad group 51 that continues sparingly as group 65 single file toward midrib, dense semilong group 52, sparse groups 63 and 55; outer auricle ascending transitional, inner auricle long lanceolate and fringed; ligule broad arcuate, 4 mm. high, group 61 very short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Striped cane, with narrow ovate-deltoid more or less hairy buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups $52+$, $55+-$, $55a+-$, $57+$, $63+---$, $65+--$, $65a+-$; slightly descending double-crescent dewlaps (fig. 56 (271)); long lanceolate inner auricle; broad arcuate ligule.

CLONE GREEN STRIPED PREANGER

IMP. 767, ACC. 272

CULMS.—Purple and green striped, with prominent bloom and merging wax bands; internodes cylindric, 15 cm. long and 39 mm. across, small or medium bud furrow; stem-epidermal pattern $1+6$, average width of long cells 9μ , stomates absent; growth rings striped,

medium broad, tumescent; root bands striped, cylindric to obconoidal, 7 and 5 mm. high with 3 rows of primordia; buds green with red-olive wing, 8×11 mm., inserted at scar and reaching growth ring; prophyll broad pentagonal with round-pointed, often notched tip, wing inserted near middle of prophyll, broad at base and basally fringed, pubescence more or less sparse except for hair groups 1, 2, 3, 16, 19.

LEAVES.—Sheaths 30 cm. long and smooth; sheath base decurrent; blades 165 cm. long and 5.8 cm. broad, module 28; dewlaps medium-narrow squarish subcrescent, outer surface with medium group 58 and small group 58a, inner surface with broad group 51, dense group 52, and small group 63; outer auricle sloping transitional, subtended by a short 56, inner auricle calcarate and fringed; ligule orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with broad pentagonal slightly hairy buds (fig. 36 (767)); narrow root bands with 3 rows of primordia; diagnostic hair groups $52+$, $55a+--$, $56+--$, $63+--$, $65a+-$; medium-narrow squarish-subcrescent dewlaps (fig. 56 (272)); calcarate inner auricle; broad orbicular-crescent ligule (fig. 37 (272)).

CLONE GROS GENOUX

IMP. 989, ACC. 273

CULMS.—Green, with red flush, heavy bloom, and merging wax bands; internodes somewhat bobbin-shaped, 14 cm. long and 30×32 mm. across, without bud furrow, green-olive flesh; stem-epidermal pattern 2, average width of long cells 10.8μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindric, 8 and 7 mm. high with 2 or 3 rows of crowded primordia; buds green with reddish wings, 12×10 mm., inserted at scar and reaching growth ring; prophyll broad ovate or roundish with broad truncate-notched or crescent-serrate tip, wing inserted near middle of prophyll, broad and smooth, pubescence sparse except for hair groups 1, 2, 16, 19, 11.

LEAVES.—Sheaths 32 cm. long with confluent groups 57 and 60; blades 135 cm. long and 7 cm. broad, module 19; dewlaps tall flaring squarish or deltoid crescent, outer surface with dense group 58, inner surface with small group 51, dense semilong group 52, small group 52a, and semilong-haired group 63; both auricles transitional, outer one subtended by a short 56; ligule broad-centered subarcuate, 4 mm. high, group 61 tall, dorsal pubescence dense and semiadnate.

DISTINGUISHING CHARACTERS.—Reddish-green cane, with more or less smooth slightly roundish buds; medium root bands with 2 or 3 rows of primordia; diagnostic hair groups $52+$, $56+--$, $57+$, $58+$, $61+$, $63+$; tall flaring squarish or deltoid-crescent dewlaps (fig. 56 (273)); transitional auricles; broad subarcuate ligule.

CLONE HAAK KWAT CHE

IMP. 180, ACC. 274

CULMS.—Dark purple, with heavy bloom and merging wax bands; internodes cylindric and constricted below wax band, 13 cm. long and 33 mm. across, without bud furrow, olive flesh with pithy center; stem-epidermal pattern 1-, average width of long cells 8.3μ , stomates

present; growth ring red, medium broad, flush; root bands red, cylindrical, 8 and 7 mm. high with 4 to 6 rows of crowded primordia; buds red, 11×10 mm., inserted at scar and reaching growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, smooth, pubescence very sparse with hair groups 16 and 19 evident.

LEAVES.—Sheaths 28 cm. long with small 57 and 60; sheath base decurrent with 64e; blades 160 cm. long and 5 cm. broad, module 32; dewlaps ascending squarish, outer surface with sparse group 58, inner surface with small group 51 and more or less sparse group 52; outer auricle sloping transitional, inner auricle calcarate and basally fringed; ligule thin-flanged subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-purple cane, with more or less smooth ovate buds; 4 to 6 rows of root primordia; diagnostic hair groups $57+ -$, $60+ -$, $64+ -$; ascending-squarish dewlaps (fig. 57 (274)); calcarate inner auricle; thin-flanged subarcuate ligule (fig. 37 (274)).

CLONE HVA 124

IMP. 1290, ACC. 275

CULMS.—Yellowish green, with heavy bloom and merging wax bands; internodes cylindrical and shouldered, 13 cm. long and 37 mm. across, without bud furrow, white flesh; stem-epidermal pattern $1+6$, average width of long cells 11.3μ , stomates present; growth rings olive, narrow, flush; root bands ivory turning green, tumescent, 11 and 9 mm. high with 2 rows of sparse primordia; buds greenish rose, 11×13 mm., inserted at scar and reaching growth ring; prophyll pentagonal with crescent-serrate tip, wing inserted above middle of prophyll very broad, of more or less crawfish pattern and basally fringed, pubescence very sparse, with hair groups 1, 16, and 19 somewhat outstanding.

LEAVES.—Sheaths 38 cm. long with short-haired 57; blades 150 cm. long and 7 cm. broad, module 21; dewlaps red, ascending squarish, outer surface with medium group 58 and marginal group 58a, inner surface with medium groups 51 and 52, and sparse groups 52a and 63; outer auricle transitional and subtended by a short 56, inner auricle long lanceolate and not fringed; ligule orbicular crescent, 4 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad pentagonal or roundish, smooth buds having crawfish-type wing pattern; broad root bands with 2 rows of sparse primordia; diagnostic hair groups $56+ -$, $57+ -$, $63+ - -$; red ascending-squarish dewlaps (fig. 57 (275)); long lanceolate inner auricle; broad orbicular crescent ligule (fig. 37 (275)).

CLONE HITAM BROEWANG

IMP. 1060, ACC. 276

CULMS.—Dark red, with sparse bloom and broad wax bands; internodes cylindrical and shouldered, 15 cm. long and 27 mm. across, prominent bud furrow, greenish flesh; stem-epidermal pattern $3+2$, average width of long cells 9.2μ , stomates present; growth ring red,

narrow, flush or tumescent; root bands red, cylindric, 10 and 9 mm. high with 4 rows of crowded primordia; buds green with red wing, 12×10 mm., inserted at scar and reaching growth ring; prophyll ovate with pointed tip, wing inserted near middle of prophyll, medium broad and smooth, pubescence more or less sparse, with outstanding hair groups 1, 2, 11, 16, 19, 22, 10.

LEAVES.—Sheaths 30 cm. long with somewhat sparse 57 and 60; sheath base with small sectorial 59; blades 140 cm. long and 5.6 cm. broad, module 25; dewlaps squarish, outer surface with medium group 58, inner surface with small group 51 and sparse group 52; outer auricle ascending transitional, inner auricle calcarate or short lanceolate; ligule subarcuate or arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence sparse in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with slightly hairy ovate buds; broad root bands with 4 rows of primordia; diagnostic hair groups $57+ -$, $59+ - -$, $60+ -$; squarish dewlaps (fig. 57 (276)); small calcarate inner auricle; medium-tall arcuate ligule.

CLONE HORNE

IMP. 1570, ACC. 277

CULMS.—Light red becoming yellowish green, with heavy bloom and merging wax bands; internodes cylindric, 13 cm. long and 34×36 mm. across, medium-prominent bud furrow, light-olive medium-hard flesh; stem-epidermal pattern $6+1+4$, average width of long cells 9.2μ , stomates present; growth rings olive, medium broad; flush or tumescent; root bands ivory when young, cylindric, 8 and 6 mm. high with 3 rows of small primordia; buds green with reddish wing, 12×12 mm., inserted at scar and reaching growth ring; prophyll rhomboid or broad ovate, with broad basal appendage and round-pointed tip, wing inserted near middle of prophyll, broad and notched at base, pubescence sparse except for groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 34 cm. long with sparse 57; sheath base with small 64e; blades 165 cm. long and 7 cm. broad, module 23; dewlaps large flaring deltoid or double crescent, outer surface with somewhat dense group 58, inner surface with broad group 51, dense semilong group 52, and small group 63; outer auricle transitional, subtended by a short 56, inner auricle small calcarate; ligule orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence as 55a and along flanges.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad pentagonal slightly hairy buds; medium-size root bands with 3 rows of small primordia; diagnostic hair groups $52+$, $55a+ - -$, $56+ - -$, $57+ - -$, $63+ - -$, $64e+ -$; large flaring-deltoid or double-crescent dewlaps (fig. 57 (277)); small calcarate inner auricle; broad orbicular-crescent ligule (fig. 37 (277)).

CLONE IRENG MALANG

IMP. 1062, ACC. 278

CULMS.—Deep red to purple, with sparse bloom, medium wax bands, and corky patches; internodes cylindric and shouldered, 12 cm. long and 32 mm. across, small bud furrow, light-olive flesh; stem-

epidermal pattern 3, average width of long cells 10.8μ , stomates present; growth rings red, medium broad, flush; root bands red, cylindric-obconoidal, 7 and 6 mm. high with 3 irregular rows of primordia; buds red, 9×8 mm., inserted at scar and reaching growth ring; prophyll ovate with small basal appendage and elongated truncate tip, wing inserted at middle of prophyll, medium broad and smooth, pubescence very sparse.

LEAVES.—Sheaths red, 31 cm. long and hairy (57 and 60); sheath base decurrent with prominent sectorial 59; blades 160 cm. long and 5.8 cm. broad, module 27; dewlaps deltoid, outer surface with medium group 58, inner surface with small group 51 and sparse group 52; both auricles broad transitional; ligule shallow crescent or subarcuate, 3 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Red-leaved cane, with smooth ovate buds; narrow root bands with 3 rows of primordia; diagnostic hair groups $57+$, $59+$, $60+$; deltoid dewlaps (fig. 57 (278)); transitional auricles; narrow subarcuate ligule.

CLONE KAM SHAAN CHE

IMP. 182, ACC. 280

CULMS.—Olive, with light-purple blush, heavy bloom, and merging wax bands; internodes cylindric, 14 cm. long and 35 mm. across, medium-prominent bud furrow, soft light-olive flesh; stem-epidermal pattern $1+6$, average width of long cells 9.6μ , stomates absent; growth rings olive, medium broad, flush to tumescent; root bands green, cylindric, 8 and 6 mm. high with 3 rows of purplish primordia; buds yellow green with olive wing, 10×9 mm., inserted at scar and extending above growth ring; prophyll ovate pentagonal with medium basal appendage and crescent tip, wing inserted near middle of prophyll, broad at base, pubescence somewhat sparse except for hair groups 1, 2, 16, 26, 19, 11, 10.

LEAVES.—Sheaths 34 cm. long, with narrow 57; blades 170 cm. long and 5.3 cm. broad, module 32; dewlaps tall flaring-deltoid crescent, outer dewlap often deltoid subrescent, outer surface with medium-dense group 58, inner surface with medium group 51, dense group 52, and small groups 63 and 65; outer auricle sloping transitional and occasionally subtended by a very short 56, inner auricle small calcarate; ligule broad-centered crescent or subarcuate, 5 mm. tall, group 61 very short, dorsal pubescence as sparse 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive cane often with purplish flush, pentagonal basally hairy buds; medium root bands with 3 rows of purplish primordia; diagnostic hair groups $52+$, $55a+$, $56+-$, $57+-$, $58+$, $63+-$, $65+-$; tall flaring-deltoid-crescent dewlaps (fig. 57 (280)); small calcarate inner auricle; tall broad-centered crescent or subarcuate ligule (fig. 37 (280)).

KARA-KARA-WA (CLONE 32-C-73)

IMP. 565, ACC. 281

CULMS.—Olive, with red flush, heavy bloom, and merging wax bands; internodes slightly concave, cylindric, and shouldered, 12 cm. long and 34×36 mm. across, small bud furrow, hard light-olive

flesh; stem-epidermal pattern 2+4, average width of long cells 9.5μ , stomates numerous; growth rings greenish, narrow, flush; root bands reddish, cylindric or slightly conoidal-obconoidal, 11 and 10 mm. high with 3 or 3 or 4 irregular rows of primordia; buds reddish green, 11×10 mm., inserted at scar and reaching growth ring; prophyll ovate-deltoid with pointed tip, wing inserted low, narrow and smooth, pubescence more or less sparse except for hair groups 1, 2, 16, and 19.

LEAVES.—Sheaths 32 cm. long with narrow 57; sheath base with 64e; blades 150 cm. long and 7.5 cm. broad, module 20; dewlaps ascending ligulate, outer surface with medium group 58, inner surface with prominent group 51 that extends as group 65 single file across midrib, semilong group 52, small group 63, and prominent group 55; outer auricle transitional subtended by a medium 56, inner auricle calcarate; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Olive cane with red flush, deltoid ovate buds having prominent groups 16 and 19; tall root bands with 3 or 4 rows of primordia; diagnostic hair groups 52+, 55+, 55a+, 56+, 57+-, 63+ --, 64e+, 65+, 65a+; ascending-ligulate dewlaps (fig. 57 (281)); small calcarate inner auricle; orbicular-crescent ligule.

CLONE LISTADA

IMP. 1584, ACC. 285

CULMS.—Yellow and green striped, with rose flush, without bloom and with narrow constricted wax bands; internodes concave cylindric and shouldered, 14 cm. long and 33 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 2+4+5, average width of long cells 9.5μ stomates present; growth rings striped, medium broad, tumescent; root bands striped, obconoidal, 6 and 5 mm. high with 3 rows of primordia; buds green with red wing, 10×9 mm., inserted at scar and extending to growth ring; prophyll broad deltoid with round-pointed tip, wing inserted low, medium narrow and fringed, pubescence sparse except for hair groups 1, 4, 11, 22.

LEAVES.—Sheaths 35 cm. long with medium narrow 57; blades 140 cm. long and 7 cm. broad, module 20; dewlaps large, flaring squarish crescent, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51 and sparse group 65, dense semilong group 52, and inconspicuous group 63; both auricles broad transitional; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane with broad deltoid slightly hairy buds; narrow root bands; diagnostic hair groups 52+, 55a+ -, 57+ -, 63+ ---, 65+ --; large flaring squarish-crescent dewlaps (fig. 57 (285)); transitional auricles; arcuate ligule.

CLONE LOUISIANA PURPLE

IMP. 5, ACC. 286

CULMS.—Purple to red, with heavy bloom and merging wax bands; internodes cylindric, 12 cm. long and 32 mm. across, prominent bud furrow, ivory flesh; stem-epidermal pattern 1+6+4, average width of long cells 9μ , stomate present; growth rings red, narrow, tumes-

cent; root bands red, cylindric, 8 and 6 mm. high with 3 rows of primordia; buds red, 10×12 mm., inserted at scar and reaching growth ring; prophyll broad pentagonal with prominent basal appendage and round-pointed tip, wing inserted near middle of prophyll, broad at base, pubescence medium with prominent hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 30 cm. long, smooth or with inconspicuous 57; sheath base with sectorial 59 and 64e; blades 165 cm. long and 6.3 cm. broad, module 26; dewlaps squarish subrescent, outer surface with dense group 58 and marginal group 58a, inner surface with broad group 51, sparse 65, and dense group 52; outer auricle transitional, inner auricle short lanceolate or small calcarate and not fringed; ligule orbicular crescent, 4.5 mm. high, group 61 very short, dorsal pubescence as small 55a and 65a.

DISTINGUISHING CHARACTERS.—Purple cane, with broad pentagonal somewhat hairy buds; medium root bands with 3 rows of primordia; diagnostic hair groups 52+, 55a+ -, 57+ ---, 58+, 59+ -, 64e+ -, 65a+ -, 65+ -; squarish-subrescent dewlaps (fig. 57 (286)); short lanceolate or calcarate inner auricle; broad orbicular-crescent ligule.

CLONE LOUISIANA STRIPED

IMP. 1422, Acc. 287

CULMS.—Purple and green striped, with heavy bloom and merging wax bands; internodes concave cylindric and shouldered, 12 cm. long and 32×34 mm. across, prominent bud furrow, ivory flesh; stem-epidermal pattern 3, average width of long cells 10.2 μ , stomates absent; growth rings striped, medium broad, tumescent; root bands red, cylindric, 7 and 6 mm. high with 2 or 3 rows of primordia; buds reddish, 12×14 mm., inserted at scar and extending above growth ring; prophyll broad pentagonal with prominent basal appendage and rounded-pointed tip, wing inserted near middle of prophyll, broad at base and fringed, pubescence somewhat sparse except for groups 1, 2, 16, and 19.

LEAVES.—Sheaths 32 cm. long with narrow 57; sheath base slightly decurrent with small 64e; blades 160 cm. long and 7 cm. broad, module 23; dewlaps large squarish subrescent, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51, sparse 65, semilong group 52, and small group 63; outer auricle sloping transitional often subtended by a short 56, inner auricle small calcarate; ligule orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence as sparse 55a and 65a.

DISTINGUISHING CHARACTERS.—Striped cane, with broad pentagonal slightly hairy buds; narrow root bands; diagnostic hair groups 52+, 55a+ ---, 56+ ---, 57+ ---, 63+ ---, 64e+ ---, 65+ -, 65a+ -; large squarish-subrescent dewlaps (fig. 57 (287)); small calcarate inner auricle; broad orbicular-crescent ligule (fig. 37 (287)).

CLONE LUZON WHITE

IMP. 1293, Acc. 288

CULMS.—Yellowish green, with purple flush, light bloom, merging wax bands, and corky patches; internodes cylindric and shouldered, 11 cm. long and 37×39 mm. across, medium-prominent bud furrow,

light-olive flesh; stem-epidermal pattern 7+1, average width of long cells 11.6μ , stomates absent; growth rings green, medium broad, tumescent; root bands greenish or ivory, cylindrical-constricted, 8 and 6 mm. high, with 2 rows of very small scarcely visible primordia; buds green with light-olive wing, 12×10 mm., inserted at scar and extending above growth; prophyll broad ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and smooth, basally fringed, buds slightly to medium hairy with groups 1, 2, 16, 17, 11, 19, and 10 prominent.

LEAVES.—Sheaths 34 cm. long with medium narrow 57; sheath base with small 64e; blades 165 cm. long and 6.5 cm. broad, module 25; dewlaps red, narrow ascending squarish, outer surface with marginal group 58, inner surface with somewhat small group 51 and sparse group 52; both auricles transitional; ligule thin-flanged crescent with lozenge, 4 mm. high, group 61 medium, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad ovate medium-hairy buds; 2 rows of small indistinct primordia; diagnostic hair groups 57+ -, 61+ ., 64e+ - -; red, narrow ascending squarish dewlaps (fig. 57 (288)); transitional auricles; thin-flanged crescent ligule with lozenge.

CLONE MIA DO

IMP. 1553, ACC. 289

CULMS.—Purple, with heavy bloom and constricted merging wax bands; internodes cylindrical, 12 cm. long and 34 mm. across, inconspicuous bud furrow, light-olive flesh; stem-epidermal pattern 1+6, average width of long cells 8.7μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindrical, 8 and 7 mm. high with 3 or 4 rows of small crowded primordia; buds green, 11×10 mm., inserted at scar and reaching growth ring; prophyll short ovate with round-pointed tip, wing inserted below middle of prophyll, somewhat broad at base and narrowing toward apex, pubescence sparse with medium-prominent hair groups 1, 16, 19, 22.

LEAVES.—Sheaths 30 cm. long with medium 57 and 60; sheath base slightly decurrent with small 64e; blades 180 cm. long and 6.5 cm. broad, module 27; dewlaps ascending flaring ligulate, outer surface with medium group 58, inner surface with small group 51 and medium-dense group 52; outer auricle sloping transitional, inner auricle small deltoid; ligule thin-flanged subarcuate, 4.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purple cane, with short ovate more or less smooth buds; 3 or 4 rows of small crowded root primordia; diagnostic hair groups 57+ ., 60+ ., 64e+ -; ascending flaring ligulate dewlaps (fig. 57 (289)); inner auricle small deltoid; broad subarcuate to arcuate ligule (fig. 37 (289)).

CLONE MALAGACHE

IMP. 1068, ACC. 290

CULMS.—Purple to red, with heavy bloom and distinct or merging wax bands; internodes concave cylindrical, 14 cm. long and 28×31 mm. across, medium bud furrow, greenish flesh; stem-epidermal pattern

1+4, average width of long cells 10.4μ , stomates present; growth rings red, narrow, flush; root bands red, cylindric, 7 and 5 mm. high with 2 rows of primordia; buds red, 13×12 mm., inserted at scar and extending above growth ring; prophyll broad ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad and emarginate at base, pubescence sparse, with hair groups 19, 16, 1, and 2 outstanding.

LEAVES.—Sheaths 32 cm. long with prominent 57; sheath base with sectorial 59; blades 120 cm. long and 6.4 cm. broad, module 19; dewlaps slightly ascending squarish or squarish crescent, outer surface with sparse group 58, inner surface with very small group 51 and sparse group 52; both auricles sloping transitional; ligule narrow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purple-colored cane, with broad ovate more or less smooth buds but with outstanding group 19; narrow root band with 2 rows of primordia; diagnostic hair groups 57+, 59+ -; slightly ascending-squarish or squarish-crescent dewlaps (fig. 57 (290)); transitional auricles; narrow-crescent ligule.

CLONE MANI

IMP. 1294, ACC. 291

CULMS.—Olive green, with rose flush, sparse bloom, prominent wax bands, and corky patches; internodes cylindric, 19 cm. long and 39 mm. across, small to prominent bud furrow, light-olive flesh; stem-epidermal pattern 2-, average width of long cells 11μ , stomates absent; growth rings olive, broad, flush; root bands light rose, cylindric, 8 and 6 mm. high with 3 irregular rows of primordia; buds green with reddish wings, 17×12 mm., inserted at scar and extending above growth ring; prophyll long ovate with small basal appendage and pointed tip, wing inserted below middle of prophyll, narrow, fringed at base, medium hairy, with basal and wing pubescence prominent.

LEAVES.—Sheaths 32 cm. long with prominent 57; sheath base with small 64e; blades 160 cm. long and 8 cm. broad, module 19; dewlaps large shallow deltoid or flaring ligulate, outer surface with dense group 58 and prominent 58a, inner surface with broad 51, 65, dense 52, medium-prominent 52a, and small 63; both auricles transitional; ligule narrow-flanged crescent, 3.5 mm. high, group 61 absent, dorsal pubescence as sparse 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-green cane, with large medium-hairy buds; medium root bands; diagnostic hair groups 52+, 55a+ -, 57+, 58+, 58a+, 63+ -, 64e+ -, 65+; large shallow deltoid or flaring ligulate dewlaps (fig. 58 (291)); transitional auricles; narrow-flanged crescent ligule.

CLONE MANTEIGA

IMP. 1585, ACC. 293

CULMS.—Apple green, without bloom and narrow prominent wax bands; internodes cylindric, 15 cm. long and 40×41 mm. across, narrow bud furrow, light-green medium-hard flesh; stem-epidermal pattern 2+4+5, average width of long cells 9μ , stomates present;

growth rings green, medium broad, slightly tumescent; root bands green, slightly constricted, 7 and 6 mm. high with 3 rows of primordia; buds green, 9×10 mm., inserted below scar and reaching growth ring; prophyll short deltoid with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence sparse, consisting of short brown hair.

LEAVES.—Sheaths 36 cm. long with medium 57; blades 150 cm. long and 8 cm. broad, module 19; dewlaps large double crescent or squarish crescent, outer surface with medium-sparse group 58 and marginal 58a, inner surface with broad 51 and medium-dense 52, occasionally small 63 and 55; both auricles transitional; ligule thin-flanged subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Green cane, with short broad-deltoid more or less smooth buds and narrow root bands with 3 rows of primordia; diagnostic hair groups 55+ - -, 55a+ - -, 57+., 63+ - - -; large double-crescent or squarish-crescent dewlaps (fig. 58 (293)); transitional auricles; subarcuate ligule.

CLONE MANTEIGA

IMP. 1295, ACC. 294

CULMS.—Apple green to greenish yellow, with sparse bloom, narrow prominent wax bands, and isolated corky patches; internodes cylindric, 14 cm. long and 36×38 mm. across, small bud furrow, yellow-green flesh; stem-epidermal pattern 2, average width of long cells 9.8 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindric, 6 and 5 mm. high with 3 rows of primordia; buds reddish, 11×11 mm., inserted at scar and reaching growth ring; prophyll broad deltoid with medium basal appendage and round-pointed tip, wing inserted very low, emarginate at base, pubescence very sparse.

LEAVES.—Sheaths 32 cm. long with medium prominent 57; blades 155 cm. long and 9.5 cm. broad, module 16; dewlaps ascending squarish crescent, outer surface with medium group 58, inner surface with medium broad 51, semidense 52, and occasionally small 63; both auricles sloping transitional; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as sparse 55a.

DISTINGUISHING CHARACTERS.—Green cane, with broad deltoid more or less smooth buds; narrow root bands with 3 rows of primordia; diagnostic hair groups 55a+ - -, 57+., 63+ - - -; ascending squarish-crescent dewlaps (fig. 58 (294)); transitional auricles; medium-broad arcuate ligule.

CLONE MELIGELI

IMP. 1069, ACC. 296

CULMS.—Green, with sparse bloom, corky cracks, and prominent wax bands; internodes concave cylindric and shouldered, 11 cm. long and 32×34 mm. across, prominent bud furrow, ivory-olive flesh; stem-epidermal pattern 3, average width of long cells 11 μ , stomates absent; growth rings olive, broad, somewhat tumescent; root bands ivory green, cylindric obconoidal, 9 and 8 mm. high with 3 rows of

primordia; buds green with rose wings, 14×9 mm., inserted at scar and extending above growth ring; prophyll long ovate with pointed tip, wing inserted below middle of prophyll, medium narrow but broadening toward tip, pubescence more or less sparse with base and wing covered with short brown hair.

LEAVES.—Sheaths 36 cm. long with medium-broad 57 and 60; blades 145 cm. long and 6.6 cm. broad, module 22; dewlaps tall squarish, outer surface with medium-dense 58, inner surface with broad 51 that extends as 65 single file toward midrib, sparse semilong 52, and medium-small 63; both auricles transitional; ligule strap-shaped or flat crescent, 4 mm. high, group 61 long, dorsal pubescence as prominent 55a and along flanges.

DISTINGUISHING CHARACTERS.—Green cane, with more or less smooth long ovate buds; medium-tall root bands; diagnostic hair groups 55a+, 57+., 58+., 61+, 63+-, 65+, 65a+; tall squarish dewlaps (fig. 58 (296)); transitional auricles; strap-shaped or flat crescent ligule.

CLONE MENADO ROOD

IMP. 1070, Acc. 297

CULMS.—Purple, with sparse bloom, narrow wax bands, and corky patches; internodes cylindric obconoidal, concave and shouldered, 12 cm. long and 23×30 mm. across, with shallow bud furrow, light-olive flesh; stem-epidermal pattern 2-, average width of long cells 10.8μ , stomates present; growth rings red, medium broad, flush; root bands red, cylindric, 8 and 7 mm. high with 5 rows of crowded primordia; buds green with red wings, 12×9 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted near middle of prophyll, medium broad, pubescence general, with hair groups 1, 2, 16, 8, 11, 19, 22, and 10 outstanding.

LEAVES.—Sheaths 31 cm. long with narrow 57; sheath base with short-haired sectorial 59; blades 159 cm. long and 6 cm. broad, module 26; dewlaps ascending squarish crescent, outer surface with medium-sparse group 58, inner surface with small 51 and more or less sparse 52; outer auricle broad transitional, inner auricle lanceolate or calcarate; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purple cane, with medium-hairy buds having prominent basal and juncture pubescence; 5 rows of crowded root primordia; diagnostic hair groups 57+--, 59+--; ascending squarish-crescent dewlaps (fig. 58 (297)); inner auricle lanceolate or calcarate; arcuate ligule.

CLONE MONJET GAYAM

IMP. 1071, Acc. 298

CULMS.—Yellowish green becoming light purple, with sparse bloom and narrow wax bands; internodes slightly conoidal, sharply constricted below wax band, 17 cm. long and 22×23 mm. across, without bud furrow, greenish flesh with pithy center; stem-epidermal pattern 2-,

average width of long cells 12.5μ , stomates present; growth rings red, medium broad, tumescent; root bands greenish red, cylindrical-obconoidal, 8 mm. high with 2 or 3 rows of sparse primordia; buds green with reddish membranaceous wings, 13×11 mm., inserted at scar and reaching growth ring; prophyll obovate, wing inserted above middle of prophyll very broad with crescent serrate tip, prominently fringed, pubescence of sides very sparse.

LEAVES.—Sheaths 35 cm. long with broad 57 and 60; blades 140 cm. long and 5.3 cm. broad, module 26; dewlaps squarish crescent, outer surface with sparse 58, inner surface with medium-broad 51, dense semilong 52, and small 63; both auricles transitional, outer one subtended by a ledge of long dense hair; ligule broad-flanged crescent, 4 mm. high, group 61 long, dorsal pubescence general and medium long.

DISTINGUISHING CHARACTERS.—Yellowish-green to purplish cane, with obovate more or less smooth broad-winged, prominently fringed buds; medium root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 56+, 57+, 61+, 63+—; squarish-crescent dewlaps (fig. 58 (298)); transitional auricles; broad-flanged subarcuate ligule.

CLONE MUK CHE

IMP. 184, ACC. 299

CULMS.—Yellowish green, with heavy bloom, merging wax bands, and corky cracks; internodes cylindrical and slightly shouldered, 11 cm. long and 31×32 mm. across, without bud furrow, soft orange flesh; stem-epidermal pattern 1-, average width of long cells 10.2μ , stomates present; growth rings light olive, narrow, flush; root bands ivory, conoidal, 7 mm. high, with 4 rows of primordia; buds greenish rose with red wings, 15×11 mm., inserted at scar and extending above growth ring; prophyll ovate with truncate, notched tip, wing inserted below middle of prophyll, medium broad, pubescence sparse except for prominent hair groups 1, 16, and 19.

LEAVES.—Sheaths 35 cm. long with medium-narrow 57; blades 160 cm. long and 6.3 cm. broad, module 25; dewlaps double-crescent deltoid, outer surface with medium group 58, inner surface with small to medium 51 and sparse 52; outer auricle transitional, inner auricle large calcarate or lanceolate and fringed to tip; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with large more or less smooth buds having very prominent groups 16 and 19 (fig. 34 (184)); medium-narrow root bands with 4 rows of primordia; diagnostic hair group 57+—; double-crescent-deltoid dewlaps (fig. 58 (299)); large calcarate or long lanceolate inner auricle; arcuate ligule.

CLONE MUNTOK, JAVA

IMP. 1072, ACC. 300

CULMS.—Purple, with medium bloom and merging wax bands; internodes slightly concave cylindrical, 9 cm. long and 32 mm. across, prominent bud furrow, green-ivory flesh; stem-epidermal pattern 2, average width of long cells 9μ , stomates absent; growth rings red,

medium broad, tumescent; root bands red, cylindric-constricted, 6 and 5 mm. high with 3 or 4 irregular rows of crowded primordia; buds red, 15×12 mm., inserted at scar and extending above growth ring; prophyll ovate with small basal appendage and pointed tip, wing inserted below middle of prophyll, broad at base and prominently fringed throughout, pubescence medium, with hair groups 1, 2, 4, 11, 10, and 17 evident.

LEAVES.—Sheaths 27 cm. long with broad 57; sheath base with small 64e; blades 140 cm. long and 6 cm. broad, module 23; dewlaps slightly ascending ligulate, outer surface with medium group 58, inner surface with small 51 and sparse 52; both auricles transitional or small deltoid; ligule broad-centered subarcuate, 5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane, with large prominently fringed buds; narrow root bands with 3 or 4 rows of crowded primordia; diagnostic hair groups 57+, 64e+ -; slightly ascending-ligulate dewlaps (fig. 58 (300)); transitional auricles; broad subarcuate ligule.

CLONE NEGRITA

IMP. 1179, ACC. 301

CULMS.—Deep purple, with sparse bloom, medium wax bands, and corky cracks; internodes cylindric and slightly shouldered, 11 cm. long and 29×30 mm. across, without bud furrow, light-olive flesh; stem-epidermal pattern 1 -, average width of long cells 12.1 μ , stomates present; growth rings red, broad, flush; root bands red, cylindric, 8 and 6 mm. high with 3 rows of primordia; buds deep purple, 15×9 mm., inserted at scar and extending above growth ring; prophyll ovate with pointed tip, wing inserted below middle of prophyll, narrow, pubescence very sparse, small hair groups 1, 16, 19.

LEAVES.—Sheaths purplish, 32 cm. long with medium 57 and 60; sheath base saccate, decurrent with 64e and small 59; blades purplish, 141 cm. long and 5.5 cm. broad, module 26; dewlaps flaring shallow deltoid-crescent, outer surface with sparse 58, inner surface with very small 51 and sparse 52; both auricles broad transitional; ligule shallow crescent, 2.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Purplish-leaved cane, with medium-large more or less smooth buds; medium root bands with 3 rows of primordia; diagnostic hair groups 57+, 59+ -, 60+ -, 64e+ -; flaring shallow deltoid-crescent dewlaps (fig. 58 (301)); transitional auricles; narrow crescent ligule.

CLONE OEDANG AMBOINA

IMP. 1073, ACC. 302

CULMS.—Yellowish green, with sparse bloom and broad wax bands; internodes somewhat tumescent and constricted in region of growth ring, 11 cm. long and 39 mm. across, prominent bud furrow, light-gray flesh; stem-epidermal pattern 1, average width of long cells 11.9 μ , stomates present; growth rings olive green, narrow, flush; root bands green, conoidal, 9 and 7 mm. high with 3 rows of crowded pri-

mordia; buds green with olive wing, 18×13 mm., inserted at scar and extending above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, broad at base and basally fringed, pubescence somewhat sparse, prominent hair groups 1, 16, 11, 17.

LEAVES.—Sheaths 31 cm. long with narrow 57; blades 150 cm. long and 6.8 cm. broad, module 22; dewlaps tall squarish-crescent, outer surface with medium-sparse group 58 and marginal 58a, inner surface with small 51 and medium-sparse 52; both auricles broad transitional; ligule broad-centered crescent or arcuate, 6 mm. high, group 61 short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with large slightly hairy buds; medium root bands with 3 rows of primordia; diagnostic hair group $57+ - -$; tall squarish-crescent dewlaps (fig. 58 (302)); transitional auricles; tall crescent or arcuate ligule (fig. 37 (302)).

CLONE OTAHEITE

IMP. 466, ACC. 304

CULMS.—Yellowish green, with faint reddish flush, sparse bloom, and broad wax bands; internodes cylindrical or slightly conoidal and shouldered, 12 cm. long and 32×35 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 1, average width of long cells 8.7μ , stomates present; growth rings olive, broad, tumescent; root bands green, cylindrical or slightly conoidal, 6 and 5 mm. high with 2 rows of primordia; buds green with red wings, 15×9 mm., inserted at scar and extending above growth ring; prophyll elongate ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence general, wings hairy.

LEAVES.—Sheaths 33 cm. long with medium-prominent 57; sheath base decurrent, with small 64e; blades 170 cm. long and 6.8 cm. broad, module 25; dewlaps shallow deltoid crescent, outer surface with medium group 58, inner surface with prominent 51 that extends as 65 single file toward midrib, dense semilong 52, small 55 and 63; outer auricle ascending transitional, inner auricle short or medium-long lanceolate and fringed; ligule arcuate, 4 mm. high, group 61 very short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with hairy buds (fig. 34 (466)); narrow root bands with 2 rows of primordia; diagnostic hair groups $52+$, $55+ -$, $55a+ -$, $57+.$, $63+ -$, $64e+ -$, $65+ -$, $65a+ -$; shallow deltoid-crescent dewlaps (fig. 58 (304)); short lanceolate inner auricle; broad arcuate ligule.

CLONE PADANGSCHE, DARK RED

IMP. 1085, ACC. 305

CULMS.—Dark red, with heavy bloom and merging wax bands; internodes cylindrical, 15 cm. long and 38 mm. across, small bud furrow, gray-ivory flesh; stem-epidermal pattern 1, average width of long cells 10.6μ , stomates present; growth rings red, medium broad, flush; root bands red, cylindrical, 7 and 6 mm. high with 2 or 3 irregular rows of

crowded primordia; buds red, 13×13 mm. or larger, inserted at scar and extending above growth ring; prophyll broad pentagonal with prominent basal appendage and round-pointed or truncate-notched tip, wing inserted near middle of prophyll, broad, pubescence sparse except for hair groups 1, 2, 19, 9, 16.

LEAVES.—Sheaths 31 cm. long, smooth or with narrow 57 and 60; sheath base slightly decurrent with small 64e; blades 145 cm. long and 5.5 cm. broad, module 26; dewlaps medium-tall crescent squarish, outer surface with medium group 58, inner surface with small 51 and dense 52; both auricles broad transitional, outer one subtended by a narrow ledge of groups 70 and 60; ligule flat crescent, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with ovate or broad pentagonal more or less smooth buds having diagnostic group 9; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 57+ ---, 60+-, 64e+-, 70+-; medium-tall crescent-squarish dewlaps (fig. 58 (305)); transitional auricles; flat crescent ligule.

CLONE PADANGSCHE, LIGHT RED

IMP. 1067, ACC. 306

CULMS.—Red, with sparse bloom and prominent constricted wax bands; internodes cylindrical, 8 cm. long and 28×30 mm. across, without bud furrow, medium-hard gray flesh; stem-epidermal pattern 1+6, average width of long cells 10.6 μ , stomates present; growth rings red, medium broad, flush; root bands red, slightly tumescent, 8 and 6 mm. high with 3 or 4 irregular rows of crowded primordia; buds red, 13×11 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage inserted low and irregular truncate tip, wing inserted near middle of prophyll, broad at base and somewhat emarginate, pubescence very sparse.

LEAVES.—Sheaths 29 cm. long, when young covered with short dense 57 and 60; sheath base decurrent with prominent narrow appendage and group 64e; blades 120 cm. long and 6.2 cm. broad, module 19; dewlaps steeply ascending ligulate, outer surface with sparse group 58, inner surface with narrow 51 and medium-dense 52; both auricles sloping transitional; ligule thin-flanged crescent with lozenge, 3.5 mm. high, group 61 very short, dorsal pubescence as sparse 65a.

DISTINGUISHING CHARACTERS.—Pale-red cane, with constricted wax bands, more or less smooth buds; 3 or 4 rows of crowded primordia; decurrent sheath margin with prominent appendage; diagnostic hair groups 52+, 57+-, 60+-, 64e+, 65a+-; steeply ascending-ligulate dewlaps (fig. 58 (306)); sloping transitional auricles; crescent ligule with shallow lozenge.

CLONE PELO DE MOCA

IMP. 1586, ACC. 307

CULMS.—Light greenish purple, hairy, medium bloom, and merging wax bands; internodes cylindrical, 15 cm. long and 34×36 mm. across, somewhat prominent bud furrow, soft greenish flesh; stem-epidermal

pattern indefinite, average width of long cells 10μ , stomates absent; growth rings green, broad, tumescent; root bands green, cylindric obconoidal, 8 and 7 mm. high with 3 irregular rows of crowded primordia; buds green with reddish wings, 11×12 mm., inserted at scar and extending above growth ring; prophyll broad deltoid with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, more or less broad at base, very hairy.

LEAVES.—Sheaths 34 cm. long with very broad 57; sheath base decurrent and prominently appendaged, prominent 59; blades 150 cm. long and 6.9 cm. broad, module 22; blade surface with group 67; dewlaps shallow double-crescent deltoid, outer surface with dense group 58 and marginal 58a, inner surface with prominent 51 which continues as 65 single file toward midrib, dense 52, medium 52a and 63; both auricles transitional, outer one with a prominent ledge of 70; ligule arcuate, 4 mm. high, group 61 short, dorsal pubescence as 55a and in flange zone.

DISTINGUISHING CHARACTERS.—Light greenish-purple cane, with hairy culms and leaf blades; broad deltoid very hairy buds; hairy root bands with 3 rows of primordia; diagnostic hair groups 52+, 55a+, 57+, 58+, 59+, 63+ -, 65+ -, 65a+ -, 67+, 70+ (hairy stem); shallow double-crescent-deltoid dewlaps (fig. 58 (307)); transitional auricles; arcuate ligule (fig. 37 (307)).

CLONE PITU

IMP. 1587, ACC. 308

CULMS.—Red and green striped, with heavy bloom and merging wax bands; internodes cylindric, 12 cm. long and 32×34 mm. across, shallow bud furrow, olive-green flesh; stem-epidermal pattern 1+6, average width of long cells 9.5μ , stomates present; growth rings striped, medium broad, tumescent; root bands red, cylindric, 8 and 7 mm. high with 2 or 3 rows of crowded primordia; buds light green, 15×13 mm., inserted at scar and reaching upper limit of growth ring; prophyll pentagonal with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, broad and basally fringed, pubescence sparse with somewhat prominent hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 33 cm. long and smooth or with narrow 57; blades 170 cm. long and 7 cm. broad, module 24; dewlaps squarish slightly subcrescent, outer surface with somewhat dense group 58 and small 58a, inner surface with prominent 51, dense 52, and medium-prominent 63; outer auricle sloping transitional, inner calcarate or short lanceolate and not fringed; ligule orbicular crescent, 5.5 mm. high, group 61 short, dorsal pubescence as sparse 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with pentagonal slightly hairy buds; medium root bands with 2 or 3 rows of crowded primordia; diagnostic hair groups 52+, 55a+ --, 57+ ---, 58+, 63+ -; squarish slightly subcrescent dewlaps (fig. 59 (308)); small calcarate inner auricle; broad orbicular crescent ligule (fig. 37 (308)).

CLONE POETIH BORNEO**IMP. 1074, Acc. 309**

CULMS.—Green, with rose flush, becoming greenish yellow, sparse bloom, and prominent wax bands; internodes tumescent and shouldered, 11 cm. long and 31×34 mm. across, prominent or medium bud furrow, green-ivory flesh; stem-epidermal pattern 2-, average width of long cells 12.8 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindrical, 8 and 7 mm. high with 2 or 3 rows of primordia; buds reddish, 16×12 mm., inserted at scar and extending above growth ring; prophyll long deltoid with round-pointed tip, wing inserted low, narrow, smooth, pubescence sparse with prominent hair groups 10 and 11.

LEAVES.—Sheaths 31 cm. long with short and medium-narrow 57; blades 160 cm. long and 6.5 cm. broad, module 25; dewlaps squarish, outer surface with dense group 58, inner surface with prominent broad 51 and medium sparse 52; both auricles sloping transitional; ligule thin-flanged and broad-centered crescent, 4 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Green stems with rose flush; large more or less smooth buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 51+, 57+ -, 58+; squarish dewlaps (fig. 59 (309)); transitional auricles; broad-centered crescent ligule.

CLONE PUNDIA**IMP. 759, Acc. 311**

CULMS.—Yellowish green, with rose flush, heavy bloom, and somewhat merging wax bands; internodes tumescent, 11 cm. long and 38 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 1+6+3, average width of long cells 12 μ , stomates present; growth rings light olive, narrow, depressed; root bands yellow green, conoidal, 12 and 9 mm. high with 4 rows of small purplish primordia; buds green with olive wing, 17×9 mm., inserted at scar and extending above growth ring; prophyll long deltoid with medium-small basal appendage and pointed tip, wing inserted very low, pubescence very sparse, with medium-prominent hair groups 1+16, 19.

LEAVES.—Sheaths 35 cm. long, smooth or with very narrow 57; blades 157 cm. long and 6 cm. broad, module 26; dewlaps slightly descending shallow crescent-deltoid, outer surface with very sparse group 58, inner surface with small 51 and sparse 52; outer auricle ascending transitional or deltoid, inner auricle long lanceolate and fringed to tip; ligule broad-centered subarcuate, 4.5 mm. high, group 61 very short, dorsal pubescence sparse and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green stems with rose flush; large and smooth deltoid buds; tall root bands with 4 rows of small purplish primordia; diagnostic hair group 57+ - - -; slightly descending shallow crescent-deltoid dewlaps (fig. 59 (311)); long lanceolate inner auricle; broad subarcuate ligule.

CLONE RA CHA**IMP. 1075, ACC. 312**

CULMS.—Yellowish green, with rose flush, medium prominent bloom, and broad merging wax bands; internodes slightly tumescent, 9 cm. long and 27 mm. across, prominent bud furrow, greenish flesh; stem-epidermal pattern 3, average width of long cells 8.1μ , stomates present; growth rings olive green, medium broad, flush; root bands green, cylindrical, 7 and 6 mm. high with 2 or 3 rows of primordia; buds green with reddish wing, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with broad truncate notched tip, wing inserted below middle of prophyll, narrow at base and broadening toward apex, smooth, pubescence very sparse, with prominent hair groups 1 and 2.

LEAVES.—Sheaths 29 cm. long with small 57 and 60; blades 118 cm. long and 4.5 cm. broad, module 26; dewlaps squarish crescent or double crescent, outer surface with somewhat dense group 58, inner surface with small 51 and medium-dense 52; outer auricle sloping transitional and subtended by a very short 56, inner auricle transitional or small deltoid; ligule narrow subarcuate or arcuate, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green stems with rose flush; smooth buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups $52+$, $56+--$, $57+---$, $58+$, $60+-$; squarish-crescent or double-crescent dewlaps (fig. 59 (312)); transitional or small deltoid inner auricle; narrow more or less arcuate ligule.

CLONE RARATONGA 1**IMP. 854, ACC. 313**

CULMS.—Green, with red flush becoming yellowish green, sparse bloom, and prominent narrow wax bands; internodes cylindrical, 9 cm. long and 37 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 2-, average width of long cells 10μ , stomates absent; growth rings olive, medium broad, tumescent; root bands green, cylindrical, 11 and 9 mm. high with 4 or 5 rows of primordia; buds green with olive wing, 10×8 mm., inserted at scar and reaching growth ring; prophyll squarish ovate with large basal appendage and round pointed tip, wing inserted below middle of prophyll, medium broad and prominently fringed, pubescence general and more or less prominent.

LEAVES.—Sheaths 31 cm. long with prominent 57 and 60; blades 140 cm. long and 6.3 cm. broad, module 22; dewlaps ascending squarish or ligulate, outer surface with medium group 58 and marginal 58a, inner surface with small 51, dense 52, small 52a, 55, and 63; outer auricle broad transitional with group 70, inner auricle small calcarate; ligule narrow-flanged subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as 55a and in flange zone.

DISTINGUISHING CHARACTERS.—Green stems with red flush, hairy buds (fig. 35 (854)); root bands with 4 or 5 rows of primordia; diagnostic hair groups $52+$, $55+-$, $55a+-$, $57+$, $60+$, $63+-$, $70+$; ascending squarish or ligulate dewlaps (fig. 59 (313)); small calcarate inner auricle; medium-broad subarcuate ligule (fig. 37 (313)).

CLONE RARATONGA 2**IMP. 855, ACC. 314**

CULMS.—Olive brown, with medium heavy bloom and broad merging wax bands; internodes slightly concave cylindrical and shouldered, 12 cm. long and 29×31 mm. across, inconspicuous bud furrow, soft olive flesh; stem-epidermal pattern 2-, average width of long cells 13.8 μ , stomates absent; growth rings greenish red, medium broad, flush; root bands green, cylindrical, 8 and 7 mm. high with 3 rows of primordia; buds green with olive wings, 16×12 mm., inserted at scar and extending above growth ring; prophyll long ovate with round-pointed tip, wing inserted near middle of prophyll, broad and notched at base, pubescence very sparse.

LEAVES.—Sheaths 36 cm. long and smooth; blades 128 cm. long and 7.3 cm. broad, module 17; dewlaps ascending squarish, outer surface with medium dense 58, inner surface with broad 51, dense 52, and small 63; both auricles broad transitional; ligule narrow orbicular crescent, 2.5 mm. high, group 61 very short, dorsal pubescence in flange zone.

DISTINGUISHING CHARACTERS.—Olive-brown cane, with more or less smooth buds (fig. 35 (855)); medium root bands with 3 rows of primordia; diagnostic hair groups 52+, 58+., 63+-; ascending squarish dewlaps (fig. 59 (314)); transitional auricles; narrow crescent ligule.

CLONE RARATONGA 3**IMP. 856, ACC. 315**

CULMS.—Red and green striped, with sparse bloom and medium wax bands; internodes cylindrical, 5 cm. long and 37 mm. across, prominent bud furrow, soft light-green flesh; stem-epidermal pattern 1+7, average width of long cells 12.1 μ , stomates absent; growth rings striped, medium broad, flush; root bands striped, cylindrical, 6 mm. high with 2 or 3 rows of primordia; buds green with red wing, 13×10 mm., inserted below scar and extending slightly above growth ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll, medium broad and hairy, pubescence general and more or less prominent.

LEAVES.—Sheaths 31 cm. long with medium 57; blades 125 cm. long and 5.4 cm. broad, module 23; dewlaps slightly ascending narrow squarish or squarish deltoid, outer surface with dense 58 and prominent basal 58a, inner surface with broad 51, dense 52, and occasionally small 63; outer auricle transitional and subtended by a short 56, inner auricle deltoid; ligule shallow crescent, 3 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with hairy buds (fig. 35 (856)); narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55a+--, 56+--, 57+., 58+, 58a+, 63+--; slightly ascending narrow squarish or squarish-deltoid dewlaps (fig. 59 (315)); deltoid inner auricle; narrow flat crescent ligule.

CLONE RAT GROS VENTRE**IMP. 990, ACC. 316**

CULMS.—Olive, with red flush, medium bloom, and prominent wax bands, hairy, without bud furrow, hard olive-green flesh; internodes cylindric and prominently shouldered, 14 cm. long and 33 mm. across; stem-epidermal pattern 2+3+4, cork cells often in multiples, average width of long cells 10.6μ , stomates present; growth rings green, medium broad, depressed; root bands green, conoidal obconoidal, 8 and 6 mm. high with 4 rows of small purplish primordia; buds greenish, 11×12 mm., inserted below scar and reaching growth ring; prophyll broad ovate with broad basal appendage and round-pointed tip, wing inserted near middle of prophyll, broad at base, emarginate, pubescence sparse except for groups 1 and 2.

LEAVES.—Sheaths 31 cm. long with medium 57 and sparse 60; sheath base with prominent 59; blades 160 cm. long and 5.2 cm. broad, module 31; dewlaps slightly ascending squarish crescent, outer surface with medium-sparse 58 and small 58a, inner surface with small 51, 65, dense 52, and small 55 and 63; both auricles transitional; ligule thin-flanged crescent with lozenge, 4 mm. high, group 61 very short, dorsal pubescence as small 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Hairy culms, olive with red flush; short broad slightly hairy buds with prominent groups 1 and 2; hairy root bands with 4 rows of purplish primordia; diagnostic hair groups 52+, 55+ --, 55a+ --, 57+., 59+, 60+ --, 63+ -, 65+ - (hairy stem); slightly ascending squarish-crescent dewlaps (fig. 59 (316)); transitional auricles; orbicular-crescent ligule (fig. 37 (316)).

CLONE RAYADA**IMP. 9, ACC. 317**

CULMS.—Purple and green striped, with heavy bloom and merging wax bands; internodes cylindric, 12 cm. long and 30×33 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 1+7+4, average width of long cells 10.4μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped, cylindric, 7 and 5 mm. high with 2 or 2 or 3 rows of primordia; buds green with red wings, 10×12 mm., inserted at scar and reaching growth ring; prophyll broad pentagonal with prominent basal appendage and crescent or round-pointed tip, wing inserted near middle of prophyll, broad at base and basally fringed, pubescence at base and tip with prominent hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 34 cm. long with narrow 57; blades 165 cm. long and 6.1 cm. broad, module 27; dewlaps ascending squarish crescent, outer surface with medium 58 and marginal 58a, inner surface with prominent 51, 52, and small 63 and 65; outer auricle sloping transitional subtended by a very short 56, inner auricle small lanceolate or transitional; ligule orbicular crescent, 4.5 mm. high, group 61 short, dorsal pubescence short and semiadnate all along back side, small 55a.

DISTINGUISHING CHARACTERS.—Striped cane, with broad pentagonal somewhat hairy buds (fig. 36 (9)); narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55a+ --, 56+ --, --,

57+ --, 63+ --, 65+ -; ascending squarish-crescent dewlaps (fig. 59 (317)); sloping transitional or short lanceolate inner auricle; broad orbicular-crescent ligule (fig. 37 (317)).

CLONE RED CAVENGERIE

IMP. 737, ACC. 318

CULMS.—Red becoming brownish yellow, with sparse bloom and narrow wax bands; internodes concave cylindrical, 18 cm. long and 29×31 mm. across, small bud furrow, hard green flesh; stem-epidermal pattern 2+4, average width of long cells 11.6 μ , stomates present; growth rings green, later red, medium broad, tumescent; root bands red, cylindrical, 6 mm. high with 3 rows of primordia; buds green with reddish wings, 12×10 mm., inserted at scar and extending to growth ring; prophyll ovate with small basal appendage and round-pointed or truncate tip, wing inserted below middle of prophyll, more or less broad, pubescence sparse with medium-small hair groups 1, 2, and 19.

LEAVES.—Sheath 34 cm. long, with medium long-haired 57 and sparse 60; blades 128 cm. long and 5.7 cm. broad, module 23; dewlaps double crescent deltoid, outer surface with sparse 58, inner surface with medium 51 and sparse 52; both auricles greatly sloping transitional, outer one subtended by a short long-haired 56; ligule shallow arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with ovate more or less smooth buds and narrow root bands with 3 rows of primordia; diagnostic hair groups 55a+ -, 56+, 57+, 60+ -; double crescent-deltoid dewlaps (fig. 59 (318)); transitional auricles; narrow arcuate ligule.

CLONE RED PREANGER

IMP. 762, ACC. 319

CULMS.—Red, with heavy bloom and merging wax bands; internodes cylindrical, 11 cm. long and 30×33 mm. across, prominent bud furrow, light-olive flesh; stem-epidermal pattern 1+6, average width of long cells 10.8 μ , stomates absent; growth rings red, medium broad, tumescent; root bands red, cylindrical, 7 and 5 mm. high with 2 or 3 rows of primordia; buds red, 14×14 mm., inserted below scar and reaching growth ring; prophyll broad pentagonal or roundish with broad basal appendage and notched tip, wing inserted below middle of prophyll, broad and notched at base, pubescence sparse, hair groups 1, 2, 10 16, 19.

LEAVES.—Sheaths 28 cm. long, smooth; blades 150 cm. long and 5.3 cm. broad, module 28; dewlaps narrow squarish crescent or flaring ligulate, outer surface with medium sparse 58 and small 58a, inner surface with broad 51, dense 52, and small 63; outer auricle transitional, inner auricle small deltoid, ligule orbicular-crescent, 4 mm. high, group 61 short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with broad pentagonal or roundish more or less smooth buds; narrow root bands with 2 or 3

rows of primordia; diagnostic hair groups 52+, 55a+ -, 63+ -; narrow squarish-crescent or flaring ligulate dewlaps (fig. 59 (319)); small deltoid inner auricle; crescent ligule.

CLONE RED TIP

IMP. 773, ACC. 320

CULMS.—Purple to red, with heavy bloom and merging wax bands; internodes cylindrical, 12 cm. long and 34 mm. across, medium or prominent bud furrow, light-olive flesh; stem-epidermal pattern 1+7+6, average width of long cells 9.6μ , stomates absent; growth rings red, broad, tumescent; root bands red, cylindrical, 7 and 6 mm. high with 2 or 3 rows of primordia; buds red, 11×13 mm., inserted at scar and reaching growth ring; prophyll ovate or broad pentagonal with round-pointed tip, wing inserted at middle of prophyll, broad, fringed and notched at base, general pubescence sparse with more or less prominent hair groups 1, 2, 16, 19, and 10.

LEAVES.—Sheaths 31 cm. long and smooth or with narrow 57; sheath base with small 64e, blades 150 cm. long and 6.3 cm. broad, module 24; dewlaps squarish subcrescent or double crescent, outer surface with dense group 58 and small 58a, inner surface with broad 51, dense 52, and occasionally small 63; outer auricle sloping transitional, inner auricle calcarate or short lanceolate and not fringed; ligule broad orbicular crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Purple cane, with broad pentagonal slightly hairy buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 57+ - -, 58+, 63+ - -, 64e+ - -; squarish-subcrescent or double crescent dewlaps (fig. 59 (320)); calcarate or short lanceolate inner auricle; broad orbicular-crescent ligule.

CLONE ROOD DJAPARA

IMP. 1077, ACC. 321

CULMS.—Red becoming reddish bronze, with heavy bloom and merging wax bands; internodes tumescent, 9 cm. long and 43 mm. across, without bud furrow, light-orange flesh; stem-epidermal pattern 1+3, average width of long cells 12.1μ , stomates absent; growth rings ivory, confluent with internode above and with root band; root band ivory, cylindrical-constricted, 10 and 9 mm. high with 4 or 5 rows of crowded primordia; buds red, 14×11 mm., inserted at scar and reaching upper margin of growth ring; prophyll ovate with prominent basal appendage and truncate-notched tip, wing inserted below middle of prophyll, broad at base, pubescence sparse but with prominent hair groups 16, 18, and 19.

LEAVES.—Sheaths 36 cm. long with medium 57; blades 165 cm. long and 7 cm. broad, module 23; dewlaps slightly descending shallow deltoid, outer surface with sparse group 58, inner surface with small 51 and prominent 52; outer auricle transitional, inner auricle short lanceolate or calcarate; ligule arcuate, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with medium-large more

or less smooth buds having very prominent groups 16 and 19; tall root bands with 4 or 5 rows of primordia; diagnostic hair groups 52+, 57+.; slightly descending shallow-deltoid dewlaps (fig. 59 (321)); short lanceolate or calcarate inner auricle; arcuate ligule.

CLONE ROOD EGYPTISCH

IMP. 104, ACC. 322

CULMS.—Red becoming green, with prominent red sunscald, heavy bloom, and merging wax bands; internodes cylindric, 11 cm. long and 34 mm. across, shallow bud furrow, soft light-green flesh; stem-epidermal pattern 1+6+4, average width of long cells 10.3 μ , stomates few; growth rings green, later red, narrow, flush; root bands red, slightly obconoidal, 7 and 5 mm. high with 2 rows of primordia; buds green with reddish wings, 10 \times 12 mm., inserted below scar and reaching growth ring; prophyll broad pentagonal with small basal appendage and notched tip, wing inserted near middle of prophyll, broad at base and notched, pubescence prominent at base and corners, outstanding hair groups 1, 2, 4, 16, 19, 10, 26.

LEAVES.—Sheaths 30 cm. long and smooth; sheath base with small 64e; blades 150 cm. long and 6.3 cm. broad, module 24; dewlaps squarish subrescent, outer surface with medium group 58 and marginal 58a, inner surface with broad 51, medium dense 52, and small 63; both auricles sloping transitional or inner auricle small calcarate; ligule broad orbicular crescent, 5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Red cane, with broad pentagonal buds sparsely pubescent but with prominent groups at base and corner of junctures (fig. 36 (104)); narrow root bands with 2 rows of primordia; diagnostic hair groups 55a+-, 63+-- , 64e+-; squarish-subrescent dewlaps (fig. 59 (322)); inner auricle transitional or small calcarate; broad-crescent ligule (fig. 37 (322)).

CLONE SELEMI, BALI

IMP. 1318, ACC. 323

CULMS.—Dark red, with sparse bloom and medium wax bands; internodes slightly bobbin-shaped conoidal, 10 cm. long and 33 mm. across, medium-prominent bud furrow, gray-white flesh; stem-epidermal pattern 2+4, average width of long cells 12.2 μ , stomates present; growth rings red, narrow, tumescent; root bands red, cylindric obconoidal, 8 and 6 mm. high with 3 or 4 rows of sparse primordia; buds red, 13 \times 12 mm., inserted at scar and extending above growth ring; prophyll short deltoid with more or less prominent basal appendage and round-pointed tip, wing inserted low, medium broad, notched at base, pubescence very sparse with slightly prominent hair groups 1, 2, 19.

LEAVES.—Sheaths 34 cm. long with medium 57; blades 135 cm. long and 5.7 cm. broad, module 24; dewlaps ascending squarish-double-crescent, outer surface with sparse 58, inner surface with broad 51 and sparse 52; both auricles sloping transitional, outer one subtended

by a short long-haired 56; ligule narrow arcuate, 2.5 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with short-deltoid more or less smooth buds; medium root bands with 3 or 4 rows of primordia; diagnostic hair groups 55a+ -, 56+ --, 57+.; ascending squarish-double-crescent dewlaps (fig. 59 (323)); transitional auricles; narrow arcuate ligule.

CLONE SAWOE KROEPOEK

IMP. 1560, ACC. 324

CULMS.—Olive, with orange blush, sparse bloom, and prominent wax bands; internodes flat cylindrical, 13 cm. long and 33×36 mm. across, without bud furrow, hard olive-green flesh; stem-epidermal pattern 3+4+6, average width of long cells 10.3 μ , stomates absent; growth rings greenish olive, narrow, tumescent; root bands greenish, cylindrical or conoidal, 8 and 7 mm. high with 4 or 5 rows of small crowded primordia; buds greenish red, 10×12 mm., inserted below scar and reaching growth ring; prophyll roundish pentagonal with more or less prominent basal appendage and narrow crescent tip, wing inserted near middle of prophyll, broad at base and fading out over tip, pubescence sparse with semiprominent hair groups 1, 2, 19, 26, 10.

LEAVES.—Sheaths 38 cm. long with very broad 57 and sparse 60; blades 180 cm. long and 6.1 cm. broad, module 30; dewlaps squarish crescent, outer surface with medium 58, inner surface with prominent 51, sparse 65, more or less dense 52; outer auricle ascending transitional, inner auricle long lanceolate and fringed; ligule broad-centered crescent, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive stems with orange blush, roundish pentagonal more or less smooth buds; medium root bands with 4 or 5 rows of primordia; diagnostic hair groups 52+., 57+, 60+ -, 65+ --; squarish-crescent dewlaps (fig. 60 (324)); long lanceolate inner auricle; broad-centered crescent ligule (fig. 37 (324)).

CLONE SIMPSON

IMP. 1424, ACC. 325

CULMS.—Yellow- and green-striped, with sparse bloom and prominent wax bands; internodes concave cylindrical and shouldered, 9 cm. long and 35×36 mm. across, prominent bud furrow, soft light-olive flesh; stem-epidermal pattern 1-, average width of long cells 8.1 μ , stomates absent; growth rings striped, medium broad, tumescent; root bands striped, cylindrical, 6 and 5 mm. high with 2 rows of primordia; buds green with red wings, 10×7 mm., inserted at scar and extending to growth ring; prophyll long ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, very hairy, pubescence general and prominent, hair group 24 present.

LEAVES.—Sheaths 29 cm. long with medium 57; sheath base decurrent with small 64e; blades 130 cm. long and 5.7 cm. broad, module

23; dewlaps squarish crescent, outer surface with medium group 58, inner surface with broad 51, sparse 65, dense 52, small 55 and 63; outer auricle deltoid, inner auricle lanceolate; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence as 55a, 65a, and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Striped cane, with narrow ovate hairy buds; narrow root bands with 2 rows of primordia; diagnostic hair groups 52+, 55+-, 55a+-, 57+., 63+-, 64e+-, 65+-, 65a+-.; squarish-crescent dewlaps (fig. 60 (325)); lanceolate inner auricle; arcuate ligule.

CLONE SOERAT SOEMBAWA WIT

IMP. 1556, ACC. 326

CULMS.—Yellowish green, with reddish sunscald, corky cracks, heavy bloom, and more or less merging wax bands; internodes cylindrical, 13 cm. long and 32 mm. across, without bud furrow, medium-hard light-orange flesh; stem-epidermal pattern 1+3, average width of long cells 9μ , stomates present; growth rings olive, narrow, tumescent; root bands ivory, cylindrical, 8 and 7 mm. high with 4 rows of small purplish primordia; buds greenish red, 10×10 mm., inserted below scar and reaching growth ring; prophyll squarish ovate with round-pointed tip, wing inserted at or above middle of prophyll, more or less narrow, pubescence very sparse, prominent hair groups 16 and 19.

LEAVES.—Sheaths 31 cm. long with medium 57 and sparse 60; sheath base slightly descending with 64e; blades 160 cm. long and 6.3 cm. broad, module 25; dewlaps ascending flaring ligulate, outer surface with medium-sparse group 58, inner surface with small 51 and more or less sparse 52; both auricles transitional, outer one subtended by a short 56, inner auricle has a small deltoid hook inserted low; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with squarish-ovate more or less smooth buds having prominent groups 16 and 19; medium root bands with 4 rows of small purplish primordia; diagnostic hair groups 56+--., 57+., 58+., 60+--., 64e+--.; ascending flaring ligulate dewlaps (fig. 60 (326)); transitional auricles; arcuate ligule (fig. 37 (326)).

CLONE SPAANSCH

IMP. 105, ACC. 327

CULMS.—Red, with heavy bloom and merging wax bands; internodes cylindrical, 8 cm. long and 33 mm. across, prominent bud furrow; stem-epidermal pattern 1+6+4, average width of long cells 10μ , stomates absent; growth rings olive, narrow, tumescent; root bands cylindrical or slightly tumescent, 7 and 5 mm. high with 2 rows of root primordia; buds red, 11×12 mm., inserted at scar and extending above growth ring; prophyll broad ovate with broad basal appendage and round-pointed tip, wing inserted near middle of prophyll, medium broad and smooth, pubescence somewhat sparse, prominent hair groups 1, 2, 4, 16, 19, and 10.

LEAVES.—Sheaths 31 cm. long with narrow 57; blades 140 cm. long and 6 cm. broad, module 23; dewlaps ascending crescent squarish, outer surface with medium group 58, inner surface with medium 51, dense 52, and sparse 65; outer auricle transitional, inner auricle deltoid or short lanceolate and not fringed; ligule broad orbicular crescent, 4.5 mm. high, group 61 short, dorsal pubescence as 65a.

DISTINGUISHING CHARACTERS.—Red cane, with ovate-pentagonal slightly hairy buds; narrow root bands with 2 rows of primordia; diagnostic hair groups 52+, 57+---, 65+-, 65a+-; ascending crescent-squarish dewlaps (fig. 60 (327)); deltoid or short lanceolate inner auricle; broad orbicular-crescent ligule.

CLONE STRIPED TIP

IMP. 611, ACC. 328

CULMS.—Red- and green-striped becoming red- and tan-striped, with sparse bloom and broad wax bands; thick nodes; internodes concave cylindrical and shouldered, 12 cm. long and 26×29 mm. across, small bud furrow, orange flesh with pithy center; stem-epidermal pattern 2, average width of long cells 10.6 μ , stomates present; growth rings striped, medium broad, tumescent; root bands striped cylindrical tumescent, 8 and 7 mm. high with 3 or 4 rows of primordia; buds green with reddish wings, 13×9 mm., inserted below scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and fringed, pubescence sparse, prominent hair groups 1, 2, 16, 4.

LEAVES.—Sheaths 32 cm. long with medium-small 57 and sparse 60; blades 145 cm. long and 6 cm. broad, module 24; dewlaps medium-tall squarish crescent, outer surface with more or less dense 58 and small 58a, inner surface with small 51 and medium-dense 52; outer auricle transitional to deltoid and subtended by a prominent 56, inner auricle medium-long or short lanceolate; ligule broad crescent, 5 mm. high, group 61 medium long, dorsal pubescence short and semiadnate throughout.

DISTINGUISHING CHARACTERS.—Red and brownish-tan striped cane, with fringed, more or less smooth buds; medium root bands with 3 or 4 rows of primordia; diagnostic hair groups 52+., 56+, 57+-, 60+-, 61+.; medium-tall squarish-crescent dewlaps (fig. 60 (328)); short or medium-long lanceolate inner auricle; broad crescent ligule.

CLONE TAHITI 3

IMP. 850, ACC. 329

CULMS.—Greenish tan, with dark red flush, sparse bloom, prominent corky cracks, and broad wax bands; internodes cylindrical, 12 cm. long and 40×41 mm. across, without bud furrow, green-olive flesh; stem-epidermal pattern 2+4, average width of long cells 8.7 μ , stomates absent; growth rings olive green, medium broad, tumescent; root bands green, cylindrical obconoidal, 8 and 7 mm. high with 3 rows of large reddish primordia; buds red, 12×12 mm., inserted at scar and reaching growth ring; prophyll roundish ovate with prominent

basal appendage and round-pointed tip, wing inserted near middle of prophyll, medium broad and fringed at base, prominent hair group 19.

LEAVES.—Sheaths 40 cm. long with narrow groups 57 and 60; blades 165 cm. long and 7.6 cm. broad, module 22; dewlaps red, very large, slightly ascending squarish-double-crescent, outer surface with medium group 58, inner surface with prominent 51, 51a, 65, and dense 52; both auricles sloping transitional, outer one subtended by a short 56; ligule thin-flanged subarcuate, 3.5 mm. high, group 61 very short, dorsal pubescence sparse.

DISTINGUISHING CHARACTERS.—Thick-jointed greenish-tan cane, roundish more or less smooth buds, with prominent group 19 (fig. 34 (850)); root bands with 3 rows of primordia; diagnostic hair groups 52+, 56+-, 57+-, 60+-, 65+; red, very large, slightly ascending squarish-double-crescent dewlaps (fig. 60 (329)); transitional auricles; medium-broad subarcuate ligule (fig. 37 (329)).

CLONE TAMARIN, REUNION

IMP. 1081, ACC. 330

CULMS.—Yellowish green, with sparse bloom and merging wax bands; internodes cylindric, 8 cm. long and 30×32 mm. across, small bud furrow, olive-orange flesh; stem-epidermal pattern 3, average width of long cells 12.5 μ , stomates absent; growth rings olive, medium broad, tumescent; root bands ivory, cylindric, 6 and 5 mm. high with 2 rows of primordia; buds reddish, 10×10 mm., inserted below scar and reaching growth ring; prophyll roundish with broad-notched tip, wing inserted at middle of prophyll, broad membranaceous, and covered with short hair, pubescence very sparse.

LEAVES.—Sheaths 33 cm. long with prominent 57 and sparse 60; blades 145 cm. long and 6.4 cm. broad, module 23; dewlaps flaring squarish subcrescent, outer surface with medium-sparse group 58, inner surface with small 51, medium 52, and medium-long 63 inserted high; both auricles small transitional or inner one small calcarate; ligule shallow crescent, 3.5 mm. high, group 61 medium long, dorsal pubescence along flanges.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with roundish more or less smooth broad-winged buds; narrow root bands with 2 rows of primordia; diagnostic hair groups 57+, 60+ -, 61+., 63+.; flaring squarish-subcrescent dewlaps (fig. 60 (330)); transitional or small calcarate inner auricle; shallow crescent ligule.

CLONE TEBOE POHINA

IMP. 1082, ACC. 332

CULMS.—Yellowish green, with heavy bloom and merging wax bands; internodes slightly obconoidal, 10 cm. long and 34×36 mm. across, prominent bud furrow, white flesh; stem-epidermal pattern 4, average width of long cells 9 μ , stomates present; growth rings light green, narrow, tumescent; root bands green, cylindric-constricted, 9 and 8 mm. high with 2 or 3 rows of sparse primordia; buds reddish green with olive wing, 14×10, inserted below scar and extending

above growth ring; prophyll elongate ovate with small basal appendage and pointed tip, wing inserted near middle of prophyll, broad at base and notched, somewhat hairy, prominent hair groups at base and in wing area.

LEAVES.—Sheaths 30 cm. long with medium 57; sheath base slightly decurrent with a small 64e; blades 140 cm. long and 8 cm. broad, module 17; dewlaps large ascending squarish, outer surface with medium-sparse group 58, inner surface with prominent 51, medium 52, and sparse 63; outer auricle deltoid, inner auricle deltoid or calcarate; ligule orbicular crescent, 7 mm. high, group 61 very short, dorsal pubescence along flanges.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with medium-hairy buds with prominent hairs at base and wing region; medium root bands with 2 or 3 rows of primordia; diagnostic hair groups 57+., 63+ - -, 64e+ -; large ascending squarish dewlaps (fig. 60 (332)); deltoid or calcarate inner auricle; very tall crescent ligule.

CLONE TIBBO MIRD

IMP. 758, ACC. 334

CULMS.—Yellowish green, with red flush, heavy bloom, and merging wax bands; internodes cylindrical, 17 cm. long and 39 mm. across, prominent shallow bud furrow, ivory flesh; stem-epidermal pattern 1, average width of long cells 8.9μ , stomates absent; growth rings green, medium broad, tumescent; root bands green, cylindrical, 7 and 6 mm. high with 2 or 3 rows of primordia; buds greenish olive, 13×13 mm., inserted at scar and extending above growth ring; prophyll rhomboid with prominent basal appendage and round-pointed tip, wing inserted near middle of prophyll, broad and smooth, pubescence somewhat prominent, with outstanding hair groups 1, 2, 16, 19, 10.

LEAVES.—Sheaths 34 cm. long with narrow 57; sheath base decurrent; blades 175 cm. long and 7 cm. broad, module 25; dewlaps large flaring crescent deltoid, outer surface with dense groups 58 and 58a, inner surface with broad 51, dense semilong 52, small 63 and 65; outer auricle sloping transitional, subtended by a short 56, inner auricle calcarate and partly fringed; ligule orbicular crescent, 5 mm. high, group 61 medium, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with broad rhomboid medium-hairy buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55a+ -, 56+ - -, 57+ - -, 58+, 63+ -, 65+ - -; large flaring crescent-deltoid dewlaps (fig. 60 (334)); large calcarate inner auricle; broad crescent ligule (fig. 37 (334)).

CLONE TIJING, BALI

IMP. 1083, ACC. 335

CULMS.—Yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical and prominently shouldered, 12 cm. long and 29 mm. across, medium bud furrow, white flesh; stem-epidermal pattern 3, average width of long cells 9.2μ , stomates present; growth rings green, narrow, tumescent; root bands yellow green, cylindrical or

slightly conoidal or constricted, 8 and 7 mm. high with 3 rows of primordia; buds green with reddish wing, 13×9 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid with round-pointed tip, wing inserted low, medium broad and smooth, pubescence more or less sparse, with medium-prominent hair group 10.

LEAVES.—Sheaths 34 cm. long with narrow 57; blades 140 cm. long and 5.6 cm. broad, module 25; dewlaps tall squarish, outer surface with dense group 58, inner surface with broad 51, sparse 65, and 52; outer auricle sloping transitional, inner auricle small calcarate; ligule thin-flanged crescent deltoid, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with narrow ovate-deltoid more or less smooth buds; medium root bands with 3 rows of primordia; diagnostic hair groups $57 + - -$, $65 + -$; tall squarish dewlaps (fig. 60 (335)); small calcarate inner auricle; shallow crescent-deltoid ligule.

CLONE TIMOR RIET

IMP. 1551, Acc. 336

CULMS.—Olive red, with medium bloom, corky cracks, and constricted narrow wax bands; internodes cylindric or slightly conoidal, tumescent, 11 cm. long and 33 mm. across, without bud furrow, soft olive flesh; stem-epidermal pattern $1 + 4 + 3$, average width of long cells 10.8μ , stomates present; growth rings ivory green, medium broad, depressed; root bands ivory, cylindric, 8 and 7 mm. high with 3 or 4 rows of small purplish primordia; buds reddish, 10×8 mm., inserted below scar and reaching growth ring; prophyll broad ovate with prominent basal appendage and truncate tip, wing inserted near middle of prophyll, narrow at base, pubescence sparse, with hair groups 1, 2, 16, and 19 evident.

LEAVES.—Sheaths 28 cm. long and smooth or with narrow 57 and 60; sheath base decurrent with sectorial 59 and 64e; blades 130 cm. long and 5.1 cm. broad, module 25; dewlaps tall squarish crescent, outer surface with sparse group 58, inner surface with small 51 and medium-sparse 52; outer auricle transitional, inner auricle small calcarate and fringed; ligule narrow arcuate, 2 mm. high, group 61 very short in center but medium long in terminal flange zone, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Olive-red cane, with broad ovate, more or less smooth buds; medium-tall root bands with 3 or 4 rows of primordia; diagnostic hair groups $57 + - - -$, $59 + -$, $60 + - -$, $64e + -$; tall squarish-crescent dewlaps (fig. 60 (336)); small calcarate inner auricle; very narrow arcuate ligule.

CLONE TOMOHON WIT

IMP. 1089, Acc. 337

CULMS.—Light green, becoming greenish yellow, without bloom, and with narrow wax bands; internodes concave cylindric or bobbin-shaped and shouldered, 10 cm. long and 31 mm. across, medium-prominent bud furrow, green-olive flesh; stem-epidermal pattern 1, average width of long cells 10μ , stomates absent; growth rings green,

medium broad, tumescent; root bands green, cylindric-constricted, 7 and 6 mm. high with 4 rows of primordia; buds green with olive wing, 12×10 mm., inserted at scar and extending above growth ring; prophyll ovate with small basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and basally fringed, pubescence sparse, with hair groups 1, 2, 4, and 10 evident.

LEAVES.—Sheaths 28 cm. long, with narrow group 57; blades 115 cm. long and 5.5 cm. broad, module 21; dewlaps large, squarish, outer surface with sparse group 58, inner surface with small 51 and sparse 52; outer auricle transitional and subtended by a short long-haired 56, inner auricle small deltoid; ligule crescent, 3 mm. high, group 61 short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Green cane, with slightly hairy buds and medium-narrow root bands with 4 rows of primordia; diagnostic hair groups $56 + - -$ and $57 + - -$; large squarish dewlaps (fig. 58 (337)); small deltoid inner auricle; crescent ligule.

CLONE TJEMENG PAYAMAN

IMP. 1088, ACC. 338

CULMS.—Dark purple or black, with heavy bloom and prominent wax bands; internodes cylindric, constricted below wax band, 16 cm. long and 32×34 mm. across, without bud furrow, olive flesh; stem-epidermal pattern 1-, average width of long cells 11.9μ , stomates present; growth rings olive, broad, tumescent; root bands red, obco-noidal, 8 and 6 mm. high with 2 or 3 rows of primordia; buds green with broad membranaceous wings, 13×13 mm., inserted at scar and reaching growth ring; prophyll broad pentagonal with round-pointed or small crescent serrate tip, wing inserted above middle of prophyll, very broad, pubescence sparse, with hair groups 1, 6, 19, and 26 evident.

LEAVES.—Sheaths 33 cm. long with sparse 57 and 60 when young; blades 110 cm. long and 3.7 cm. broad, module 30; dewlaps red, shallow deltoid, outer surface with dense group 58, inner surface with small 51 and dense 52; both auricles transitional, outer one often subtended by a ledge of group 56; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Blackish-purple cane, with broad pentagonal more or less smooth buds; narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups $52 +$, $56 + -$, $57 + - -$, $58 +$, $60 + -$; red, shallow deltoid dewlaps (fig. 61 (338)); transitional auricles; arcuate ligule.

CLONE TOMOHON ZWART

IMP. 1090, ACC. 339

CULMS.—Purple, with sparse bloom and prominent wax bands; internodes cylindric, 10 cm. long and 22×28 mm. across, small bud furrow, orange flesh; stem-epidermal pattern 1-, average width of long cells 10.6μ , stomates present; growth rings red, narrow, slightly tumescent; root bands red, cylindric, 6 and 4 mm. high with 3 rows of primordia; buds purple, 10×9 mm., inserted at scar and reaching

above growth ring; prophyll ovate with round-pointed and notched tip, wing inserted below middle of prophyll, more or less narrow at base and widening toward tip, pubescence sparse, with hair groups 16, 19, and 26 slightly evident.

LEAVES.—Sheaths purplish, 29 cm. long, smooth or with narrow 57 and 60; sheath base decurrent with prominent 64e and adjacent sectorial 59; blades purplish, 150 cm. long and 4.5 cm. broad, module 33; dewlaps shallow crescent deltoid, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; both auricles transitional; ligule flat crescent, 2 mm. high, group 61 very short, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Cane, with purple stalks and leaves, smooth buds, and narrow root bands with 3 rows of primordia; diagnostic hair groups 57+ --, 59+ --, 60+ -, 64e+; shallow crescent-deltoid dewlaps (fig. 61 (339)); transitional auricles; narrow crescent ligule.

CLONE TONGATABU 5

IMP. 925, ACC. 340

CULMS.—Yellowish green, with sparse bloom and prominent wax bands; internodes cylindrical, 13 cm. long and 26×29 mm. across, without bud furrow, soft greenish flesh; stem-epidermal pattern 1+3+5, average width of long cells 9.8 μ , stomates absent; growth rings olive green, medium broad, tumescent; root bands green, cylindrical, 8 mm. high with 4 rows of primordia; buds green with olive wings, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with small basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad and smooth, pubescence very sparse.

LEAVES.—Sheaths 31 cm. long with narrow 57 or smooth; blades 140 cm. long and 6 cm. broad, module 23; dewlaps ascending squarish, outer surface with medium-sparse group 58, inner surface with small group 51 and more or less sparse medium-long group 52; both auricles transitional, or inner auricle small calcarate, outer one subtended by a short 56; ligule flat-topped crescent, 2.5 mm. high, group 61 medium high, dorsal pubescence absent.

DISTINGUISHING CHARACTERS.—Yellowish-green cane with smooth buds and medium root bands with 4 rows of primordia (fig. 36 (925)); diagnostic hair groups 56+ -, 57+ --, 61+.; ascending squarish dewlaps (fig. 61 (340)); transitional or small calcarate inner auricle; narrow crescent ligule.

CLONE TONGATABU 6

IMP. 926, ACC. 341

CULMS.—Olive green becoming olive yellow, with sparse bloom and prominent wax bands; internodes cylindrical, 9 cm. long and 34 mm. across, small bud furrow, soft olive flesh; stem-epidermal pattern 1+6, average width of long cells 10.4 μ , stomates absent; growth rings olive, medium broad, flush; root bands ivory-greenish, cylindrical, 7 and 5 mm. high with 2 or 3 rows of primordia; buds green with olive wings, 14×10 mm., inserted at scar and extending above growth

ring; prophyll ovate with round-pointed tip, wing inserted below middle of prophyll with medium-broad more or less hairy wings, pubescence somewhat prominent, with prominent hair groups 1, 2, 11, 16, 19, 10, 13.

LEAVES.—Sheaths 36 cm. long with medium 57; sheath base with 64e; blades 130 cm. long and 6.3 cm. broad, module 21; dewlaps deltoid double crescent or squarish crescent, outer surface with dense group 58 and prominent basal group 58a, inner surface with prominent group 51, dense 52, and sparse groups 63 and 65; outer auricle transitional and subtended by a long 56, inner auricle small calcarate or blunt deltoid; ligule thin-flanged crescent, 3 mm. high, group 61 very short, dorsal pubescence as a small sparse 55a.

DISTINGUISHING CHARACTERS.—Olive-green cane, with medium-hairy buds (fig. 36 (926)); narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 55a+ ---, 56+, 57+, 58+, 58a+, 63+ --, 64e+ -, 65+ -, 69+ -; deltoid double-crescent or squarish-crescent dewlaps (fig. 61 (341)); small calcarate or deltoid inner auricle; narrow ligule.

CLONE VELLAI

IMP. 1348, ACC. 342

CULMS.—Grass green to yellowish green, with sparse bloom; internodes slightly obconoidal, 15 cm. long and 42 mm. across, more or less prominent bud furrow, white flesh; stem-epidermal pattern 1-, average width of long cells 10.3 μ , stomates present; growth rings ivory green, narrow, tumescent; root bands conoidal obconoidal, 7 mm. high with 3 rows of primordia; buds green with olive wings, 12 \times 8 mm., inserted below scar and reaching growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, narrow and hairy, pubescence general and prominent.

LEAVES.—Sheaths 33 cm. long with broad 57; sheath base with small 64e; blades 160 cm. long and 5 cm. broad, module 32; dewlaps deltoid crescent or squarish crescent, outer surface with sparse group 58, inner surface with broad group 51, sparse groups 55 and 65, and dense semilong group 52; outer auricle ascending transitional, inner auricle short lanceolate and fringed; ligule arcuate, 4 mm. high, group 61 very short, dorsal pubescence general as 55a and 65a.

DISTINGUISHING CHARACTERS.—Green to yellowish-green cane, with hairy-winged buds; narrow root bands with 3 rows of primordia; diagnostic hair groups 52+, 55+ -, 55a+ -, 57+, 65+ -, 65a+ -; deltoid-crescent or squarish-crescent dewlaps (fig. 61 (342)); short lanceolate inner auricle; arcuate ligule.

CLONE VESPERTINA

IMP. 1588, ACC. 343

CULMS.—Grass green with rosy flush, becoming greenish yellow, with medium heavy bloom and merging wax bands; internodes cylindrical-constricted and shouldered, 17 cm. long and 34 \times 42 mm. across, prominent bud furrow, light olive-green flesh; stem-epidermal pattern 3+5, average width of long cells 9 μ , stomates absent; growth

rings olive, medium broad, tumescent; root bands green, cylindric, 5 mm. high with 2 rows of primordia; buds green, 10×9 mm., inserted at scar and extending above growth ring; prophyll ovate with medium basal appendage and round-pointed tip, wing inserted below middle of prophyll, somewhat narrow, pubescence at base and juncture, with outstanding hair groups 1, 2, 11, 16, 19, 10.

LEAVES.—Sheaths 32 cm. long, smooth or with inconspicuous 57; sheath base decurrent; blades 160 cm. long and 5.7 cm. broad, module 28; dewlaps double crescent, outer surface with somewhat sparse group 58, inner surface with small group 51, medium group 52, and small groups 63 and 55; outer auricle transitional, inner auricle calcarate and basally fringed; ligule arcuate, 4 mm. high, group 61 very short, dorsal pubescence as 55a and in terminal flange zone.

DISTINGUISHING CHARACTERS.—Green to yellow cane, with medium-hairy buds and narrow root bands; diagnostic hair groups $55+--$, $55a+-$, $57+--$, $63+--$; double-crescent dewlaps (fig. 61 (343)); calcarate inner auricle; broad arcuate ligule (fig. 37 (343)).

CLONE WIT MANILA

IMP. 1093, Acc. 344

CULMS.—Yellowish green, with rose blush, general bloom, and merging wax bands; internodes cylindric, 9 cm. long and 27×33 mm. across, medium bud furrow, light-olive flesh; stem-epidermal pattern 2 -, average width of long cells 10.2μ , stomates present; growth rings green, narrow, flush or more or less tumescent; root bands ivory, cylindric obconoidal, 7 and 6 mm. high with 3 or 4 rows of crowded purplish primordia; buds green with red wings, 15×13 mm., inserted at scar and extending above growth ring; prophyll ovate with small basal appendage and pointed tip, wing inserted below middle of prophyll, narrow at base, pubescence more or less sparse, with hair groups 1, 2, 16, 19, 11, and 10 somewhat prominent.

LEAVES.—Sheaths 29 cm. long with medium-narrow 57; blades 125 cm. long and 6.1 cm. broad, module 20; dewlaps ascending squarish, outer surface with sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle small deltoid, inner auricle large calcarate or falcate and not fringed; ligule tall-centered orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Yellowish-green cane, with more or less smooth buds; narrow root bands with 3 or 4 rows of purplish primordia; diagnostic hair group $57+-$; ascending-squarish dewlaps (fig. 61 (344)); large calcarate or falcate inner auricle; tall-centered orbicular-crescent ligule.

CLONE WIT CERAM

IMP. 211, Acc. 345

CULMS.—Yellow, with rose flush, medium bloom, and merging wax bands; internodes cylindric, 10 cm. long and 29×37 mm. across, without bud furrow, ivory flesh; stem-epidermal pattern 3, average width of long cells 9.2μ , stomates absent; growth rings light olive, medium broad, flush; root bands green, conoidal, 8 mm. high with

4 rows of primordia; buds green with olive wing, 11×9 mm., inserted at scar and reaching growth ring; prophyll ovate with round-pointed tip, wing inserted near middle of prophyll, medium broad, hairy, pubescence general and prominent.

LEAVES.—Sheaths 32 cm. long with broad 57; sheath base with group 69; blades 165 cm. long and 6.6 cm. broad, module 25; dewlaps large ascending squarish, outer surface with dense group 58 and marginal group 58a, inner surface with small group 51 and sparse group 52; outer auricle deltoid, inner auricle large and long lanceolate and basally fringed; ligule thin-flanged orbicular crescent, 6 mm. high, group 61 long, dorsal pubescence prominent over entire back side.

DISTINGUISHING CHARACTERS.—Yellow cane, with hairy buds and medium root bands with 4 rows of primordia; diagnostic hair groups 57+, 58+, 61+., 69+–; large ascending squarish dewlaps (fig. 61 (345)); long lanceolate inner auricle; very tall orbicular-crescent ligule (fig. 37 (345)).

CLONE WIT DJAPARA

IMP. 1558, ACC. 346

CULMS.—Greenish yellow, with heavy bloom, corky cracks, and merging wax bands; internodes cylindrical or slightly tumescent, sharply constricted in region of wax bands, 12 cm. long and 37 mm. across, small bud furrow, medium-hard olive-green flesh; stem-epidermal pattern 3, cork cells often in multiples of 2 and 3, average width of long cells 10.6μ , stomates present; growth rings olive green, narrow, depressed; root bands ivory, cylindrical, 9 and 8 mm. high with 4 or 5 rows of small purplish primordia; buds greenish red, 16×11 mm., inserted at scar and extending above growth ring; prophyll elongated deltoid ovate with prominent basal appendage and notched tip, wing inserted below middle of prophyll, more or less narrow, buds more or less smooth but with prominent hair groups 1+16 and 19.

LEAVES.—Sheaths 33 cm. long with medium-broad 57 and 60; blades 180 cm. long and 6.3 cm. broad, module 28; dewlaps narrow deltoid crescent, outer surface with medium-sparse group 58, inner surface with medium group 51 that attenuates to single file, sparse group 52; outer auricle sloping transitional with deltoid hook, inner auricle calcarate or short lanceolate and fringed; ligule subarcuate, 4.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with corky cracks; more or less smooth buds having prominent groups 1+16 and especially 19; medium root bands with 4 or 5 rows of purplish primordia; diagnostic hair groups 57+., and 60+; narrow deltoid-crescent dewlaps (fig. 61 (346)); calcarate or short lanceolate inner auricle; broad subarcuate ligule.

CLONE YELLOW BAMBOO

IMP. 769, ACC. 347

CULMS.—Greenish yellow, with sparse bloom, broad wax bands, and numerous corky cracks; internodes concave cylindrical and shouldered, 12 cm. long and 40×42 mm. across, without bud furrow, hard

light-olive flesh; stem-epidermal pattern 2+5, average width of long cells 8.4μ , stomates absent; growth rings olive, broad, slightly tumescent; root bands ivory, cylindrical obconoidal, 7 mm. high with 2 or 3 rows of primordia; buds green with reddish-olive wings, 12×11 mm., inserted below scar and reaching growth ring; prophyll roundish or ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, medium broad, pubescence general and prominent.

LEAVES.—Sheaths 35 cm. long and smooth or inconspicuous narrow 57; blades 180 cm. long and 6.5 cm. broad, module 28; dewlaps red, steeply sloping ascending ligulate, outer surface with medium-sparse group 58, inner surface with medium group 51 and dense semilong group 52; outer auricle transitional and subtended by a short 56, inner auricle calcarate or lanceolate; ligule crescent, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-yellow cane, with hairy buds and narrow root bands with 2 or 3 rows of primordia; diagnostic hair groups 52+, 56+ -, 57+ - - -; red, steeply sloping, ascending-ligulate dewlaps (fig. 61 (347)); calcarate or lanceolate inner auricle; crescent ligule (fig. 37 (347)).

CLONE YELLOW CALEDONIA

IMP. 1177, ACC. 348

CULMS.—Greenish tan, with rose flush, sparse bloom, corky cracks, and broad wax bands; internodes cylindrical, 13 cm. long and 33×42 mm. across, without bud furrow, greenish flesh with pithy center; stem-epidermal pattern 2+5, average width of long cells 8.7μ , stomates absent; growth rings green, narrow, flush; root bands ivory, cylindrical, 6 and 5 mm. high with 3 or 4 rows of purplish primordia; buds reddish with olive wings, 13×10 mm., inserted at scar and extending above growth ring; prophyll ovate with prominent basal appendage and round-pointed tip, wing inserted below middle of prophyll, narrow, covered with semilong white hair, pubescence somewhat sparse, prominent hair groups 1, 4, 16, 19, 10.

LEAVES.—Sheaths 37 cm. long and smooth or with narrow 57; blades 170 cm. long and 6.8 cm. broad, module 25; dewlaps ascending squarish or ligulate, outer surface with medium to dense group 58, inner surface with broad group 51 and semilong group 52; both auricles narrow sloping transitional, outer one subtended by a medium-long 56; ligule arcuate, 3.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Greenish-tan cane, with rose flush, medium-hairy buds, and narrow root bands with 3 or 4 rows of purplish primordia; diagnostic hair groups 52+, 56+, 57+ - - -, 58+; ascending-squarish or ligulate dewlaps (fig. 61 (348)); transitional auricles; medium-broad arcuate ligule.

CLONE ZWART BORNEO**IMP. 1095, ACC. 349**

CULMS.—Red, with sparse bloom and prominent wax bands; internodes cylindrical and slightly shouldered, 9 cm. long and 34×38 mm. across, prominent bud furrow, ivory flesh; stem-epidermal pattern 1+6; average width of long cells 8.9 μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindrical-constricted, 8 mm. high with 3 rows of primordia; buds red, 13×13 mm., inserted at scar and extending above growth ring; prophyll pentagonal with prominent basal appendage and round-pointed tip, wing inserted near middle of prophyll, broad and fringed, pubescence more or less sparse, with prominent hair groups 1, 2, 4, 16, 19, 10.

LEAVES.—Sheaths 33 cm. long with narrow 57; blades 155 cm. long and 6.8 cm. broad, module 23; dewlaps squarish subcrescent or ascending squarish, outer surface with medium group 58 and marginal group 58a, inner surface with broad group 51 that extends as group 65 single file toward midrib, dense semilong group 52, and small groups 55 and 63; outer auricle sloping transitional and subtended by a short 56, inner auricle small calcarate and fringed; ligule orbicular crescent, 4 mm. high, group 61 very short, dorsal pubescence as 55a and 65a.

DISTINGUISHING CHARACTERS.—Red cane, with broad pentagonal somewhat hairy buds and medium root bands with 3 rows of primordia; diagnostic hair groups 52+, 55+ --, 55a+ -, 56+ -, 57+ --, 63+ --, 65+ -, 65a+ -; squarish-subcrescent or ascending-squarish dewlaps (fig. 61 (349)); small calcarate inner auricle; broad orbicular-crescent ligule.

CLONE ZWART MANILA**IMP. 1096, ACC. 350**

CULMS.—Dark red to purple, with heavy bloom and prominent wax bands; internodes cylindrical-constricted, 9 cm. long and 31 mm. across, prominent bud furrow, ivory flesh; stem-epidermal pattern 1+6, average width of long cells 10.6 μ , stomates present; growth rings red, medium broad, tumescent; root bands red, cylindrical-constricted, 8 and 6 mm. high with 3 or 4 rows of primordia; buds red, 16×15 mm., inserted at scar and extending above growth ring; prophyll ovate deltoid, medium basal appendage and pointed tip, wing inserted below middle of prophyll, narrow and basally fringed, pubescence sparse, hair groups 1, 16, 19, and 11 evident.

LEAVES.—Sheaths 30 cm. long with medium 57; blades 140 cm. long and 6.5 cm. broad, module 21; dewlaps ascending rhomboid squarish, outer surface with medium-sparse group 58, inner surface with small group 51 and sparse group 52; outer auricle deltoid or short lanceolate, inner auricle lanceolate or calcarate; ligule narrow-flanged orbicular crescent, 5.5 mm. high, group 61 very short, dorsal pubescence in terminal flange zone.

DISTINGUISHING CHARACTERS.—Dark-red cane, with slightly hairy buds and medium root bands with 3 or 4 rows of primordia; diagnostic hair group 57+.; ascending rhomboid-squarish dewlaps (fig. 60 (350)); lanceolate or calcarate inner auricle; tall orbicular-crescent ligule.

TAXONOMIC KEYS

NEW GUINEA CLONES

(See table 4 and fig. 62)

- A. Midrib hairy (hairs often sparse and inconspicuous).
 B. Group 63 of midrib prominent to medium prominent.
 C. Group 61 of ligule tall.
 D. Sheath smooth.
 E. Ligule 4.5 mm. high 21 N. G. 20
 EE. Ligule 3.5 mm. tall 28 N. G. 54
 DD. Sheath slightly hairy
 E. Ligule 2.5 mm. high 28 N. G. 52
 EE. Ligule 4 mm. high 28 N. G. 31
 CC. Group 61 short.
 D. Group 52 dense, often semilong.
 E. Buds more or less prominently hairy.
 F. Inner auricle long lanceolate 21 N. G. 3
 FF. Inner auricle short lanceolate or deltoid.
 G. Group 56 prominent 28 N. G. 68; 21 N. G. 21
 GG. Group 56 short 21 N. G. 22
 EE. Buds slightly hairy.
 F. Inner auricle lanceolate 28 N. G. 89; 96 N. G. 24
 FF. Inner auricle small; sheath smooth 21 N. G. 9, 10
 DD. Group 52 sparse, short-haired; ligule narrow.
 E. Sheath hairy 28 N. G. 25
 EE. Sheath smooth 21 N. G. 5, 7
 BB. Group 63 short and sparse; often inconspicuous.
 C. Sheath hairy to medium hairy.
 D. Group 56 present.
 B. Group 56 prominent; ligule 3-5 mm. high 28 N. G. 83, 90, 98, 212, 215
 EE. Group 56 inconspicuous 28 N. G. 5, 6, 24
 DD. Group 56 absent.
 E. Group 52 dense.
 F. Inner auricle lanceolate 28 N. G. 44
 FF. Inner auricle small.
 G. Ligule narrow 28 N. G. 47, 274
 GG. Ligule tall 96 N. G. 16
 EE. Group 52 medium dense to sparse.
 F. Inner auricle lanceolate 28 N. G. 22, 216
 FF. Inner auricle small 28 N. G. 203, 257, 259
 CC. Sheath slightly hairy to smooth (medium in 37 N. G. 6).
 D. Sheath slightly hairy.
 E. Ligule narrow.
 F. Group 56 present.
 G. Buds with secondary wings 28 N. G. 4; 37 N. G. 6
 GG. Secondary wings absent 28 N. G. X
 FF. Group 56 absent.
 G. Inner auricle lanceolate 28 N. G. 34
 GG. Inner auricle small.
 H. 4-5 rows of root primordia 28 N. G. 55, 107
 HH. 2-3 rows of root primordia.
 I. Buds with secondary wings 96 N. G. 14
 II. Secondary wings absent 28 N. G. 59
 EE. Ligule medium broad to broad (3-5 mm.).
 F. Group 55a present.
 G. Inner auricle lanceolate 28 N. G. 109
 GG. Inner auricle transitional or small calcarate.
 H. Group 56 present 21 N. G. 31
 HH. Group 56 absent 28 N. G. 65; 21 N. G. 58
 FF. Group 55a absent.
 G. Inner auricle lanceolate, ligule medium tall.
 H. Group 61 medium long.
 I. Culms bronze 28 N. G. 56
 II. Culms dark red 28 N. G. 204
 HH. Group 61 short 28 N. G. 37, 43
 GG. Inner auricle small or transitional 28 N. G. 206

A. Midrib hairy—Continued

BB. Group 63 short and sparse; often inconspicuous—Continued

CC. Sheath slightly hairy to smooth—Continued

DD. Sheath smooth.

E. Ligule narrow (2-3 mm.), group 56 absent.

F. Culms striped..... 28 N. G. 267; 21 N. G. 6

FF. Culms not striped..... 28 N. G. 96; 21 N. G. 4

EE. Ligule medium broad.

F. Group 52 dense.

G. 3-5 rows of root primordia..... 28 N. G. 63; 14 N. G. 190

GG. 2-3 rows of root primordia.

H. Bud furrow prominent..... 21 N. G. 30; 36

HH. Bud furrow small..... 28 N. G. 110

FF. Group 52 sparse.

G. Inner auricle lanceolate.

H. Buds slightly hairy..... 28 N. G. 282

HH. Buds medium hairy..... 21 N. G. 11

GG. Inner auricle small calcarate..... 28 N. G. 84

AA. Midrib smooth.

B. Ligule narrow (2-3 mm.).

C. Buds hairy.

D. Group 56 present but sparse.

E. Inner auricle short to long lanceolate.

F. Sheath smooth..... 21 N. G. 34

FF. Sheath slightly hairy..... 28 N. G. 23, 26

EE. Inner auricle small or transitional.

F. Group 52 prominent..... 28 N. G. 222

FF. Group 52 sparse..... 28 N. G. 224, 221

DD. Group 56 absent.

E. Inner auricle short to medium lanceolate.

F. Group 52 prominent..... 28 N. G. 11

FF. Group 52 sparse..... 28 N. G. 2; 21 N. G. 12

EE. Inner auricle small or transitional.

F. Buds with secondary wings..... 28 N. G. 42

FF. Secondary wings absent.

G. Groups 52 and 58 prominent..... 21 N. G. 23

GG. Groups 52 and 58 sparse..... 21 N. G. 13, 32

CC. Buds slightly hairy.

D. Group 56 present.

E. Group 58 prominent.

F. Bud furrow prominent... 28 N. G. 15, 269, 284, 288; 21 N. G. 37

FF. Bud furrow absent or small..... 28 N. G. 39

EE. Group 58 sparse.

F. Bud furrow prominent..... 28 N. G. 14, 21, 46, 287

FF. Bud furrow small or absent..... 28 N. G. 1, 210; 21 N. G. 15

DD. Group 56 absent.

E. Inner auricle long lanceolate..... 28 N. G. 36, 106

EE. Inner auricle short lanceolate or calcarate..... 28 N. G. 273; 21 N. G. 16

BB. Ligule medium tall to tall (3-5 mm.).

C. Buds hairy.

D. Buds with secondary wings.

E. Group 56 present.

F. Group 61 medium tall in flange zone..... 28 N. G. 3; 21 N. G. 14, 51, 57

FF. Group 61 short..... 28 N. G. 208; 21 N. G. 49, 54, 55

EE. Group 56 absent.

F. Sheath smooth.

G. Culms olive green..... 28 N. G. 45

GG. Culms red..... 21 N. G. 35

FF. Sheath slightly hairy.

G. Bloom prominent..... 96 N. G. 22

GG. Bloom light..... 28 N. G. 214, 217

AA. Midrib smooth—Continued	
BB. Ligule medium tall to tall—Continued	
C. Buds hairy—Continued	
DD. Secondary wings absent.	
E. Group 65 present.	
F. Sheath smooth.....	28 N. G. 285
FF. Sheath slightly hairy.	
G. Group 61 medium long.....	21 N. G. 2
GG. Group 61 short.....	28 N. G. 80
EE. Group 65 absent.	
F. Sheath smooth.	
G. Culms striped.....	28 N. G. 20; 21 N. G. 44
GG. Culms not striped.....	28 N. G. 40; 21 N. G. 1
FF. Sheath hairy.	
G. Bud furrow prominent.	
H. Culms striped.....	28 N. G. 203
HH. Culms not striped.....	28 N. G. 93, 264
GG. Bud furrow absent.	
H. Culms greenish.....	28 N. G. 209
HH. Culms red.....	28 N. G. 280
CC. Buds slightly hairy.	
D. Sheath hairy (group 57).	
E. Sheath hairs medium to prominent.	
F. Inner auricle long lanceolate.	
G. Culms striped; bloom sparse.....	14 N. G. 2418
GG. Culms not striped; bloom heavy.	
H. Group 56 present.....	14 N. G. 124
HH. Group 56 absent.....	28 N. G. 223
FF. Inner auricle small.	
G. Group 56 present.	
H. Bloom light.....	28 N. G. 30
HH. Bloom heavy.	
I. Culms yellow.....	28 N. G. 261
II. Culms red.....	28 N. G. 32
GG. Group 56 absent.	
H. Group 52 prominent.	
I. Culms red striped.....	28 N. G. 33
II. Culms red.....	28 N. G. 268
HH. Group 52 sparse.....	28 N. G. 213
EE. Sheath hairs sparse (group 57).	
F. Group 56 present.	
G. Bud furrow small.....	28 N. G. 12, 220
GG. Bud furrow prominent.	
H. Inner auricle long lanceolate.....	28 N. G. 51
HH. Inner auricle short lanceolate or deltoid.	
I. Group 52 prominent.....	28 N. G. 97, 99
II. Group 52 sparse; 65 present.....	28 N. G. 207
FF. Group 56 absent.	
G. Bud furrow prominent.	
H. Inner auricle long lanceolate.....	28 N. G. 35, 87
HH. Inner auricle short lanceolate.....	28 N. G. 256; 96 N. G. 15
GG. Bud furrow small or absent.	
H. Ligule very tall (6-7 mm.).	
I. Bloom heavy.....	28 N. G. 263
II. Bloom light.....	28 N. G. 78
HH. Ligule medium tall.	
I. Inner auricle lanceolate.....	28 N. G. 27
II. Inner auricle deltoid.....	28 N. G. 202

AA. Midrib smooth—Continued

BB. Ligule medium tall to tall—Continued

CC. Buds slightly hairy—Continued

DD. Sheath smooth.

E. Group 56 present.

F. Auricles transitional; ligule very tall..... 28 N. G. 13

FF. Inner auricle lanceolate..... 21 N. G. 17

EE. Group 56 absent.

F. Buds slightly hairy.

G. 4-5 rows of root primordia.

H. Inner auricle lanceolate..... 21 N. G. 33

HH. Inner auricle transitional..... 28 N. G. 211

GG. 2-3 rows of root primordia.

H. Group 65 present.

I. Bud furrow prominent..... 28 N. G. 279

II. Bud furrow absent..... 96 N. G. 24a

HH. Group 65 absent..... 28 N. G. 17

FF. Buds medium hairy.

G. Inner auricle lanceolate; bud furrow prominent.

H. Group 52 prominent..... 28 N. G. 62

HH. Group 52 sparse..... 28 N. G. 40

GG. Inner auricle small or transitional.

H. Bud furrow prominent.

I. Ligule very tall (6 mm.)..... 28 N. G. 262

II. Ligule medium tall..... 28 N. G. 18, 260

HH. Bud furrow small..... 28 N. G. 265, 266

NEW CALEDONIAN CLONES

(See table 4 and fig. 63, A)

A. Culms hairy..... N. C. 32

AA. Culms smooth.

B. Group 60 prominent.

C. Midrib smooth.

D. Ligule 8 mm. tall..... N. C. 50

DD. Ligule 3-5 mm. tall.

E. Sheath smooth..... N. C. 42

EE. Sheath hairy.

F. Group 57 prominent..... N. C. 20, 24, 83

FF. Group 57 medium to sparse.

G. Group 52 dense..... N. C. 64, 116

GG. Group 52 sparse..... N. C. 74

CC. Midrib hairy.

D. Group 63 prominent.

E. Group 58 prominent.

F. Group 59 present..... N. C. 29, 39

FF. Group 59 absent..... N. C. 30, 40, 80

EE. Group 58 short and sparse..... N. C. 92, 93, 94

DD. Group 63 sparse..... N. C. 91

BB. Group 61 short.

C. Midrib smooth.

D. Bud furrow prominent.

E. Ligule 2-3 mm. high..... N. C. 25, 49, 116

EE. Ligule 3-5 mm. high..... N. C. 18, 19, 33, 53

DD. Bud furrow small.

E. Ligule 2-3 mm. high..... N. C. 17

EE. Ligule 3-5 mm. high.

F. Group 55a present..... N. C. 15, 130

FF. Group 55a absent..... N. C. 5, 21, 117

CC. Midrib hairy.

D. Group 55a present..... N. C. 11, 78, 99

DD. Group 55a absent.

E. Group 56 present..... N. C. 51, 90

EE. Group 56 absent..... N. C. 31, 76, 81, 104

HAWAIIAN CLONES

(See table 4 and fig. 63, B)

A. Culms hairy.....	Lehu 75
AA. Culms smooth.	
B. Sheath smooth.	
C. Group 56 present.	
D. Midrib smooth.	
E. Group 56 prominent.....	Ha.O. 39, 43
EE. Group 56 short.	
F. Group 59 present.....	Ha.O. 38, 52
FF. Group 59 absent.....	Uluhui 67
DD. Midrib hairy.	
E. Group 55a present.....	Ha.O. 24, 36; Manulele 27; Nanahu 40
EE. Group 55a absent.	
F. Group 59 present.....	Ha.O. 6, 26, 38, 71
FF. Group 59 absent.....	Akilotolo 20; Pilimai 60; Uala 61
CC. Group 56 absent.....	Iliopua 29; Akoki 22
BB. Sheath hairy.	
C. Group 56 present.	
D. Group 55a present.....	Kea 31 (213); Pakaweli 2
DD. Group 55a absent	
	Ha.O. 6, 41, 43; Awela 68; Opukea 34; Uahi-a-pele 50
CC. Group 56 absent.	
D. Midrib smooth.	
E. Group 61 tall.....	Moano 48
EE. Group 61 short.	
F. Group 55a present.....	Maikoiko 73
FF. Group 55a absent.....	Halalii 32; Pohina 51
DD. Midrib hairy.	
E. Group 55a present	
	Hinahina 18; Kea 31 (213a); Lahi 7; Laukona 15
EE. Group 55a absent.....	Mikiioi 44; Ohia 1

MISCELLANEOUS NOBLE GROUP

(See table 4 and fig. 64)

A. Culms hairy.....	Pelo de Moca; Rat Gros Ventre
AA. Culms smooth.	
B. Ligule tall (6-7 mm.).	
C. Group 61 tall.	
D. Culms red.....	Cebu Light Purple; Ceram Red
DD. Culms yellow.	
CC. Group 61 short.	
D. Sheath medium to sparsely hairy.....	Teboe Pohina
DD. Sheath smooth or with inconspicuous group 57..	Pitu; Oedang Amboina
BB. Ligule narrow or medium tall.	
C. Ligule narrow (2-3 mm.).	
D. Group 61 tall.....	Boengaja; Tongatabu 5
DD. Group 61 short.	
E. Sheath hairy.	
F. Group 56 present.	
G. Group 56 prominent.	
H. Groups 58 and 52 dense.....	Tongatabu 6
HH. Groups 58 and 52 sparse.....	Red Cavengerie
GG. Group 56 short or inconspicuous.	
H. Group 52 sparse.	
I. Group 55a present... ..	Selemi, Bali; Cavengerie; Cavengerie Sangre de Toro
II. Group 55a absent.....	Aboe
HH. Group 52 prominent.	
I. Group 55a present.....	Raratonga 3
II. Group 55a absent.....	Badila Fiji

AA. Culms smooth—Continued

BB. Ligule narrow or medium tall—Continued

C. Ligule narrow—Continued

DD. Group 61 short—Continued

E. Sheath hairy—Continued

FF. Group 56 absent.

G. Culms red.

H. Leaves red.....**Boetota Bilatoc; Ireng Maleng; Negrita**HH. Leaves green.....**Malagache**

GG. Culms green (striped in Caiara).

H. Buds hairy.....**Banteng; Creoula**HH. Buds slightly hairy...**Caiara; Bamboo Blanca; Balghat Thin**

EE. Sheath slightly hairy or smooth.

F. Sheath slightly hairy.

G. Group 65 present.....**Bacoya**

GG. Group 65 absent.

H. Bud furrow prominent.....**Ra Cha**

HH. Bud furrow small.

I. Bloom heavy.....**Timor Riet**II. Bloom light.....**Batjan; Batjan Green Sport;
Tomohon Zwart**

FF. Sheath smooth.

G. Group 63 sparse.....**Raratonga 2**

GG. Group 63 absent.

H. Group 65 present.....**Anoman**HH. Group 65 absent.....**Tomohon Wit; Tomohon Zwart**

CC. Ligule medium tall (3–5 mm.).

D. Group 61 tall.

E. Group 56 present.

F. Group 56 prominent.

G. Bud furrow prominent.....**Black Fiji**GG. Bud furrow absent.....**Striped Tip; Monjet Gayam**FF. Group 56 inconspicuous.....**Gros Genoux**

EE. Group 56 absent.

F. Bud furrow prominent; group 65 present.....**Meligeli**

FF. Bud furrow small.

G. Buds hairy, midrib hairy.....**Brava de Perico**GG. Buds somewhat hairy; group 63 inserted high.....**Tamarin,
Reunion**

DD. Group 61 short.

E. Group 56 prominent; epidermal pattern No. 2.

F. Groups 52 and 58 sparse.....**Branche Blanche; Branchue**FF. Groups 52 and 58 prominent.....**Yellow Caledonia**

EE. Group 56 short or absent.

F. Buds squat rhomboid or pentagonal.

G. Midrib smooth.

H. Culms yellow to yellow green.

I. Sheath hairy.....**Green German New Guinea**II. Sheath slightly hairy.....**Boeton Lichtgroen**

HH. Culms red.

I. Bud furrow prominent.....**Ashy Mauritius; Spaansch, La.
Purple**

II. Bud furrow small.

K. Group 64e present...**Padangsche Dark Red; P. Light Red**

KK. Group 64e absent.

L. Group 58 dense.....**Tjemeng Payaman**LL. Group 58 sparse.....**Bamboo Morada**

- AA. Culms smooth—Continued
- BB. Ligule narrow or medium tall—Continued
- CC. Ligule medium tall—Continued
- DD. Group 61 short—Continued
- EE. Group 56 short or absent—Continued
- F. Buds squat rhomboid or pentagonal—Continued
- GG. Midrib hairy.
- H. Culms striped.
- I. Inner auricle transitional.
- K. Sheath hairy..... Caiara
- KK. Sheath smooth or slightly hairy.
- L. Group 65 present..... Chittan; Listada
- LL. Group 65 absent..... Gestreep Preanger
- II. Inner auricle small calcarate.
- K. Bud furrow prominent..... La. Striped; Rayada
- KK. Bud furrow small..... Green Striped Preanger; Pitu
- HH. Culms not striped.
- I. Culms red.
- K. Inner auricle lanceolate..... Red Preanger
- KK. Inner auricle small.
- L. Bud furrow prominent.
- M. Group 56 present..... Zwart Borneo
- MM. Group 56 absent.
- N. Inner auricle transitional..... Black Cheribon
- NN. Inner auricle deltoid..... Red Tip
- LL. Bud furrow medium.
- M. Sheath smooth..... Rood Egyptisch
- MM. Sheath + - hairy..... Bandjarmasin Hitam
- II. Culms yellow green, often reddish.
- K. Bud furrow prominent..... Tibbo Mird
- KK. Bud furrow small or absent.
- L. Inner auricle transitional..... Crystalina
- LL. Inner auricle calcarate..... Batec Lupog; Horne;
HVA 124
- FF. Buds ovate.
- G. Buds hairy.
- H. Group 65 present.
- I. Stem-epidermal pattern No. 2..... Geel Muntok; Mani
- II. Pattern No. 1..... Bourbonriet; Cana
Blanca; Green Ribbon; Otaheite; Simpson; Vellai
- HH. Group 65 absent.
- I. Bloom heavy.
- K. Midrib slightly hairy..... Barbados White
- KK. Midrib smooth..... Muntok, Java
- II. Bloom light.
- K. Culms striped..... Caledonia Ribbon
- KK. Culms not striped.
- L. Culms reddish..... Black Tanna; Menado Rood
- LL. Culms green..... Raratonga 1; Yellow Bamboo
- GG. Buds slightly hairy.
- H. Group 65 present.
- I. Bud furrow prominent..... Kara-kara-wa
- II. Bud furrow small.
- K. Bloom heavy..... Kam Shaan Che
- KK. Bloom light..... Tahiti 3
- HH. Group 65 absent.
- I. Sheath hairy.
- K. Midrib slightly hairy.
- L. Bloom heavy..... HVA 124
- LL. Bloom light..... Manteiga 293, 294

- AA. Culms smooth—Continued
 - BB. Ligule narrow or medium tall—Continued
 - CC. Ligule medium tall—Continued
 - DD. Group 61 short—Continued
 - EE. Group 56 short or absent—Continued
 - FF. Buds ovate—Continued
 - GG. Buds slightly hairy—Continued
 - HH. Group 65 absent—Continued
 - I. Sheath hairy—Continued
 - KK. Midrib smooth.
 - L. Bloom heavy.
 - M. Culms red----- Mia Do; Rood Djapara
 - MM. Culms yellow----- Wit Djapara
 - LL. Bloom light.
 - M. Bud furrow prominent----- Muntok, Java
 - MM. Bud furrow absent----- Sawoe Kroepoek
 - II. Sheath smooth or slightly hairy.
 - K. Midrib slightly hairy----- Vespertina
 - KK. Midrib smooth.
 - L. Bloom heavy.
 - M. Inner auricle lanceolate.
 - N. Bud furrow prominent----- Pundia
 - NN. Bud furrow small----- Muk Che; Wit Manila; Zwart Manila
 - MM. Inner auricle small.
 - N. Culm red----- Haak Kwat Che
 - NN. Culms yellow-green.
 - O. Group 56 present----- Soerat Soembawa Wit
 - OO. 56 absent----- Luzon White
 - LL. Bloom light.
 - M. Bud furrow prominent----- Hitam Broewang
 - MM. Bud furrow small or absent.
 - N. Culms red----- Fiji
 - NN. Culms greenish.
 - O. Group 52 dense----- Poetih Borneo
 - OO. Group 52 sparse----- Tijing, Bali

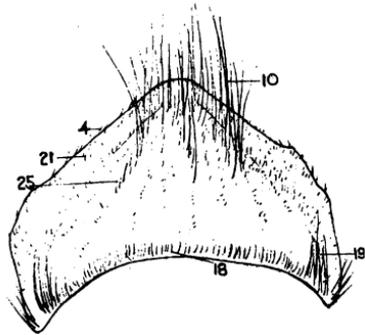
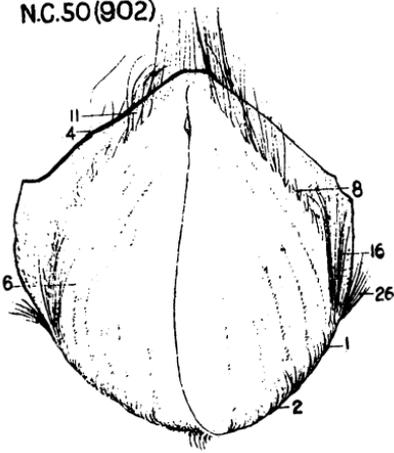
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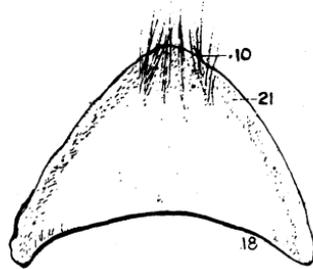
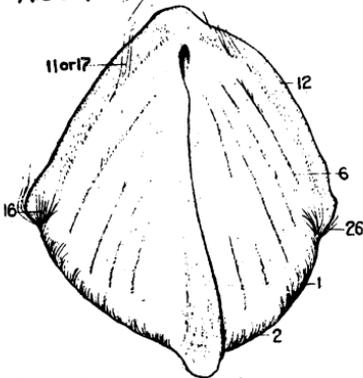
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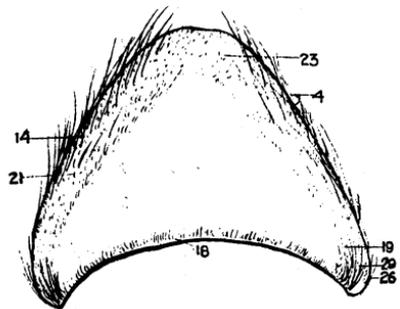
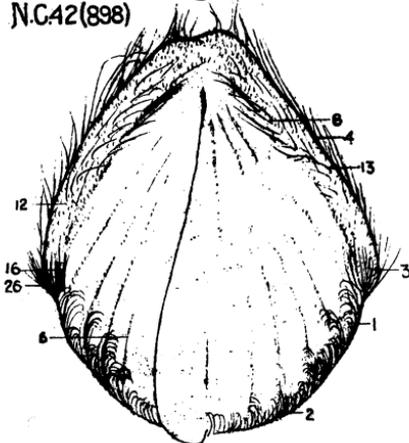
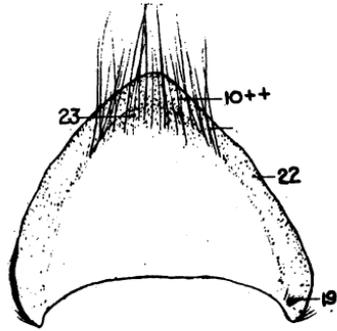
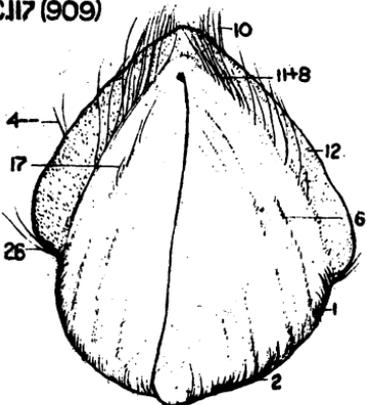
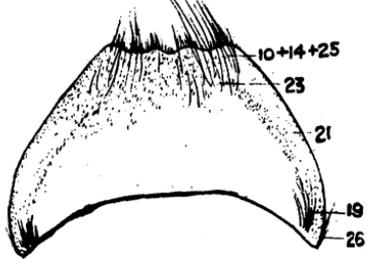
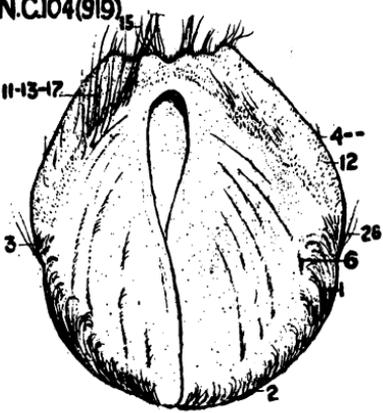


FIGURE 20.—Bud drawings: Importation Nos. 902, 893, 898.

NC.117 (909)



N.C.104 (919)



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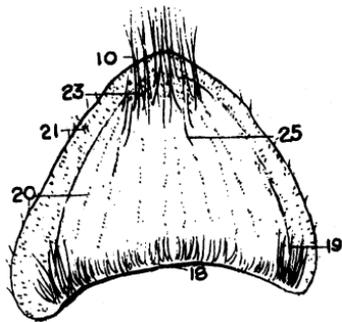
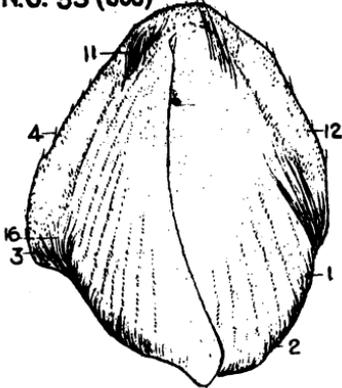
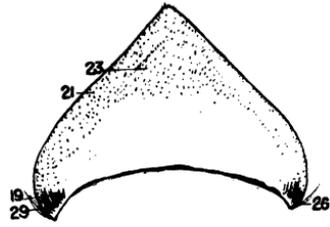
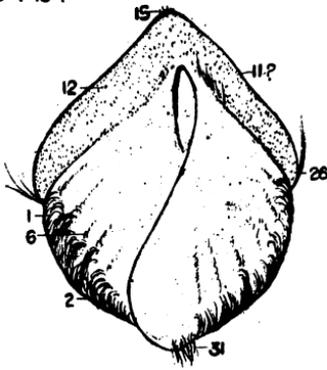
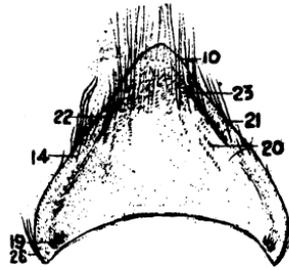
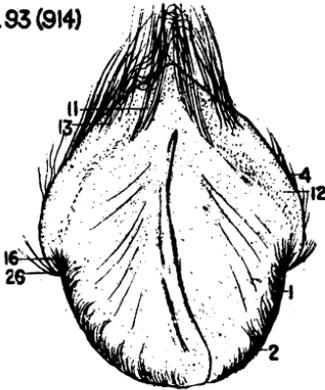


FIGURE 21.—Bud drawings: Importation Nos. 909, 919, 895.

N.C. 83 (910)
C-4-13-1



N.C. 93 (914)



N.C. 74 (903)

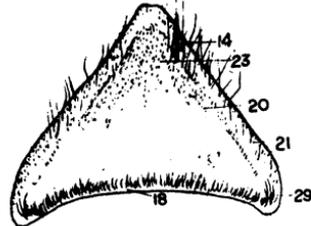
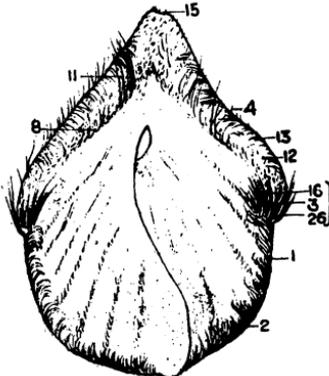
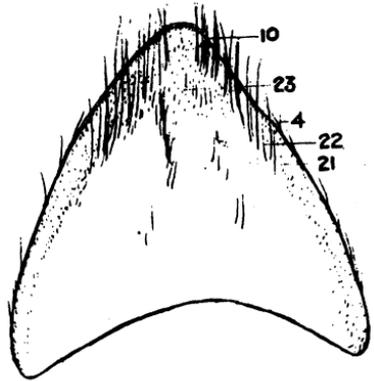
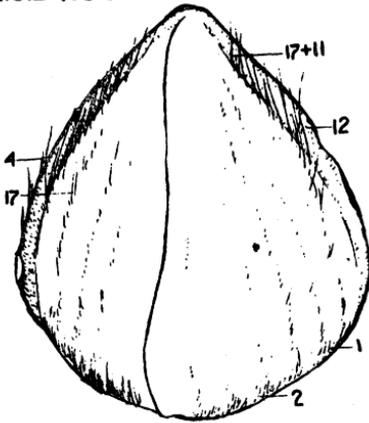
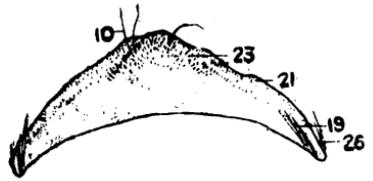
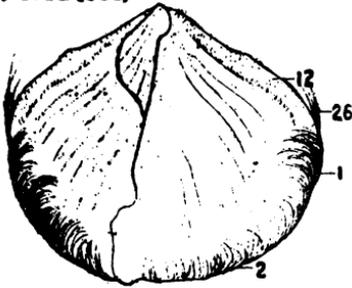


FIGURE 22.—Bud drawings: Importation Nos. 910, 914, 903.

N.C.21(886)



N.C.32(892)



N.C.91(912)

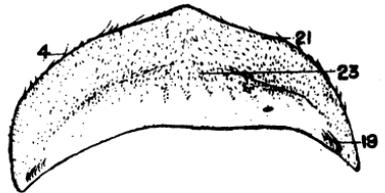
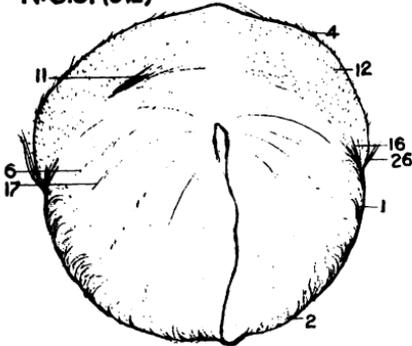
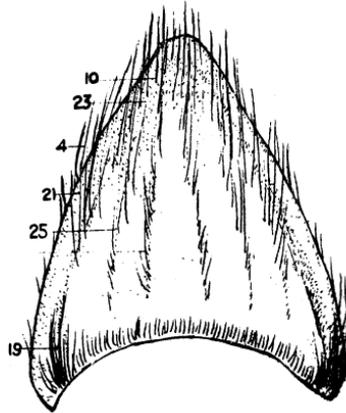
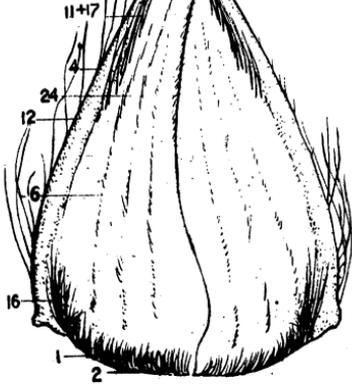
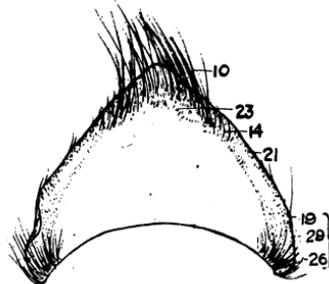
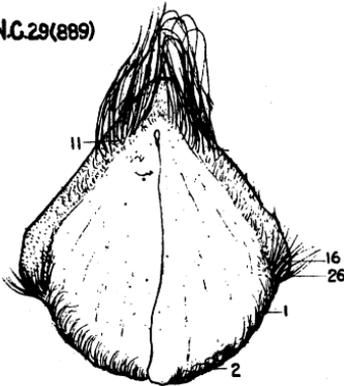


FIGURE 23.—Bud drawings: Importation Nos. 886, 892, 912.

N.C.20(885)



N.C.29(889)



N.C.90 (911)

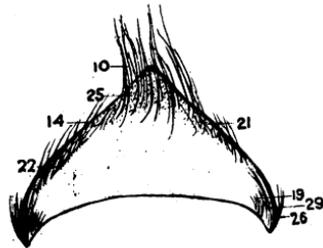
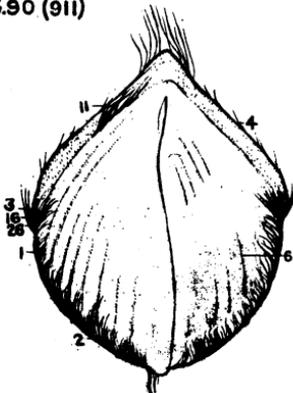


FIGURE 24.—Bud drawings: Importation Nos. 885, 889, 911.

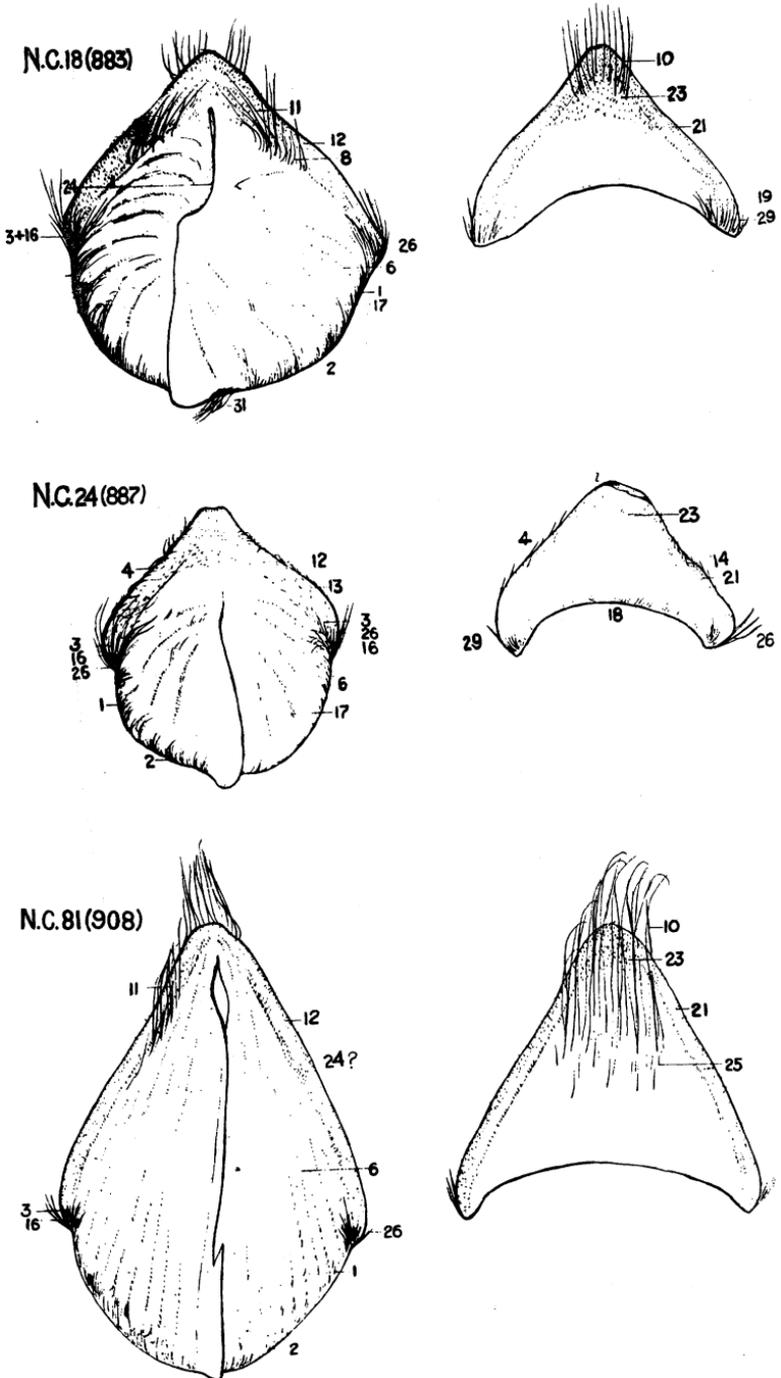
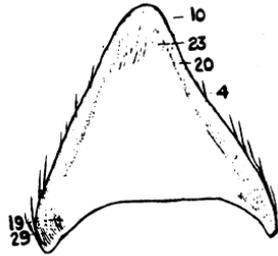
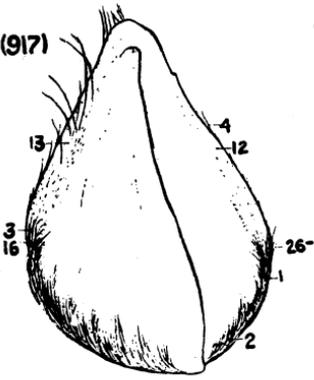
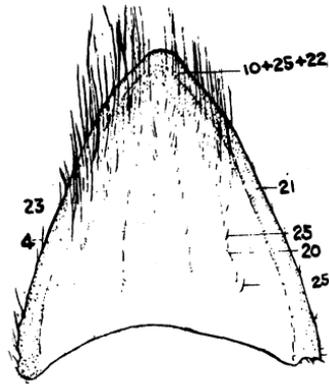
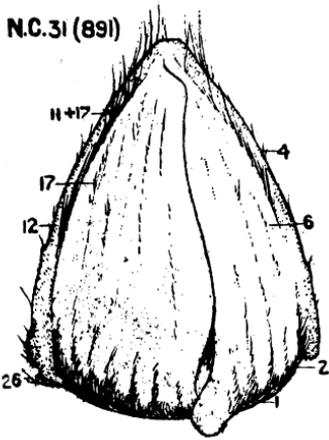


FIGURE 25.—Bud drawings: Importation Nos. 883, 887, 908.

N.C.99(917)



N.C.31 (891)



N.C. 80 (906)

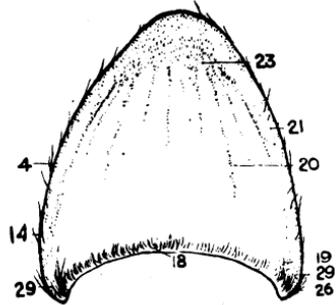
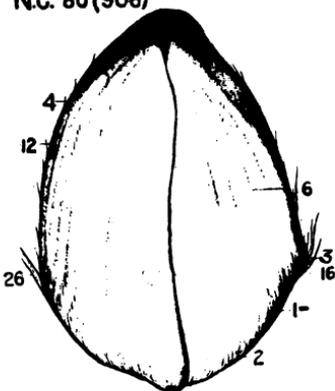


FIGURE 26.—Bud drawings: Importation Nos. 917, 891, 906.

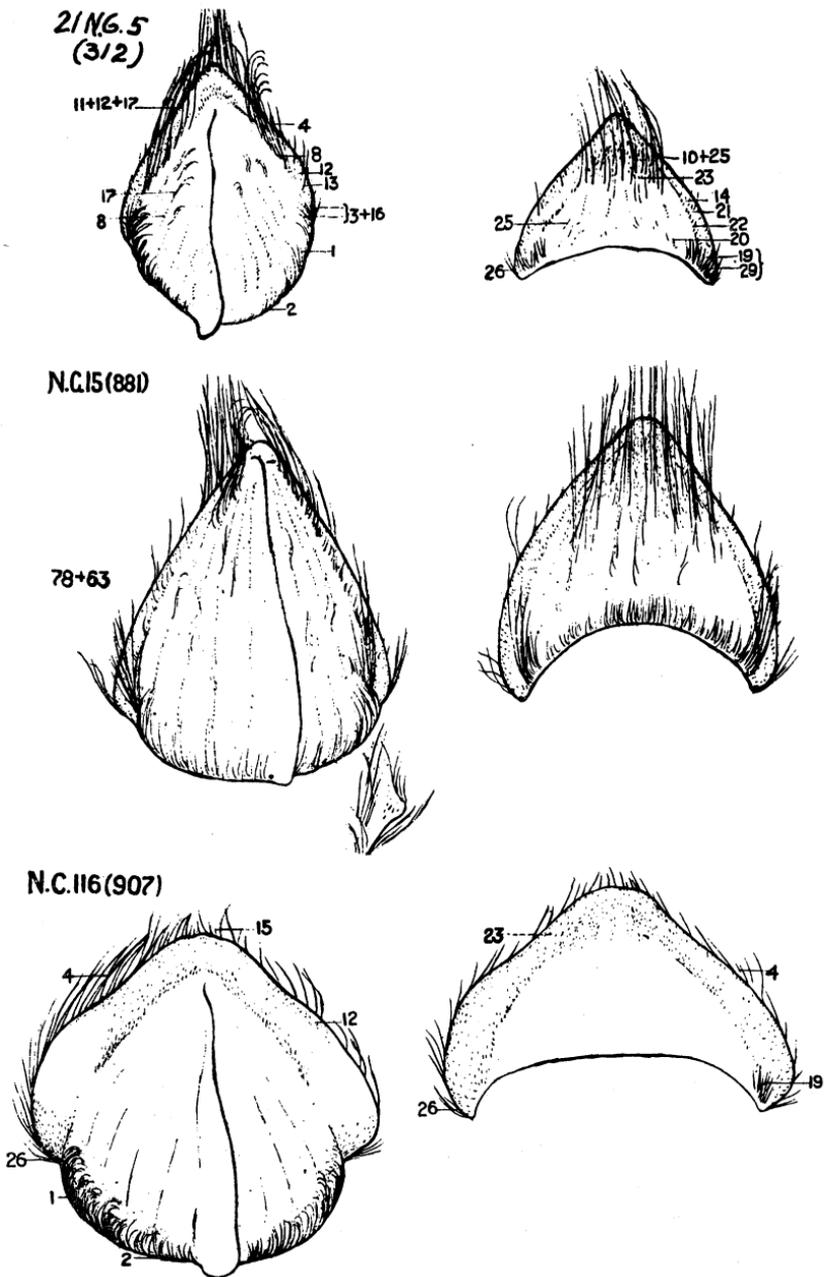
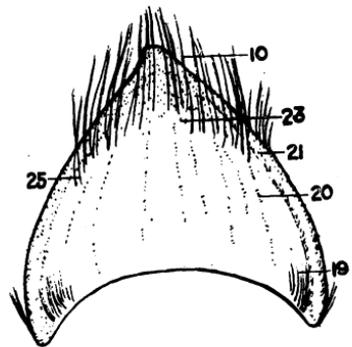
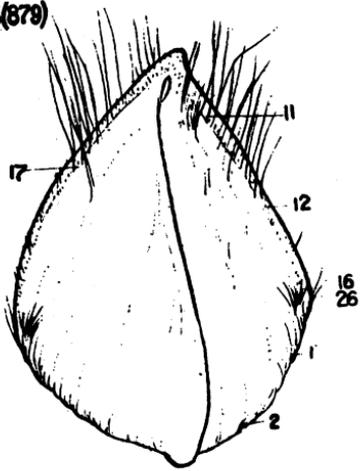
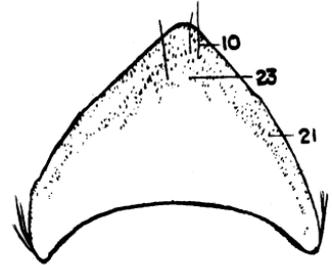
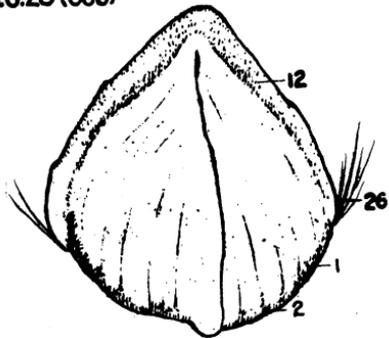


FIGURE 27.—Bud drawings: Importation Nos. 312, 881, 907.

N.C.5(879)



N.C.25(888)



N.C.40(897)

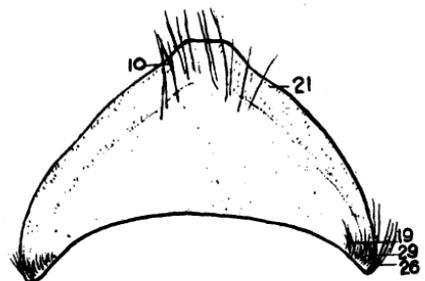
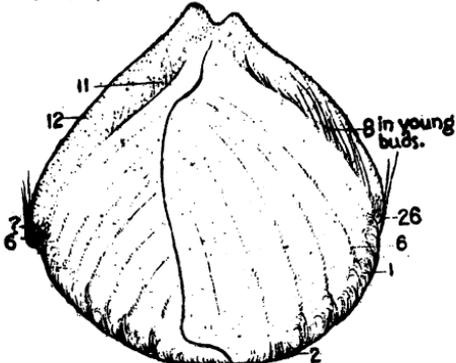
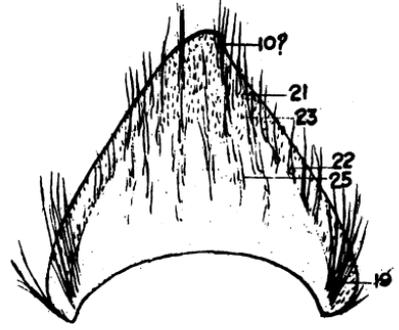
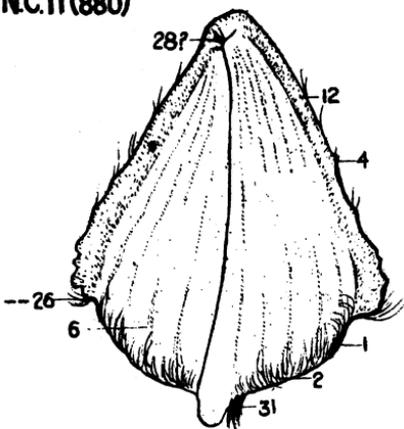
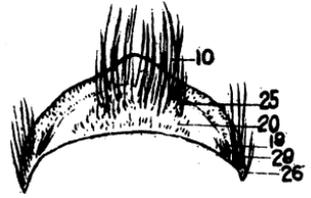
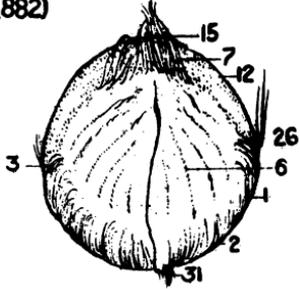


FIGURE 28.—Bud drawings: Importation Nos. 879, 888, 897.

NC.11(880)



NC.17(882)



NC.19(884)

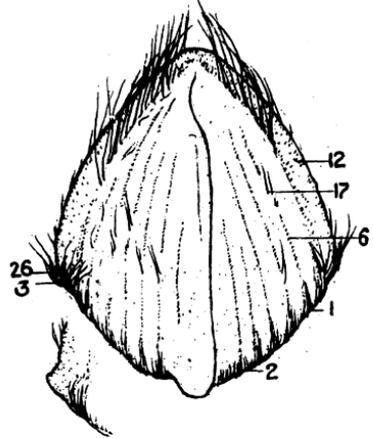
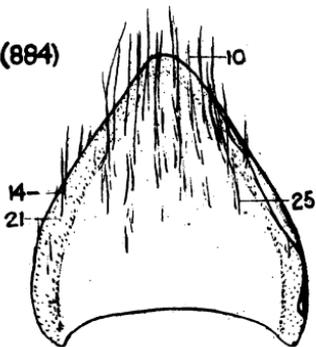
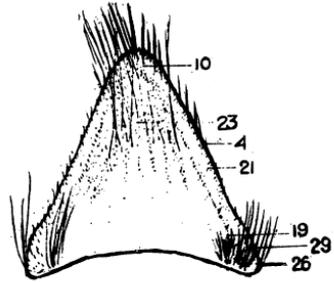
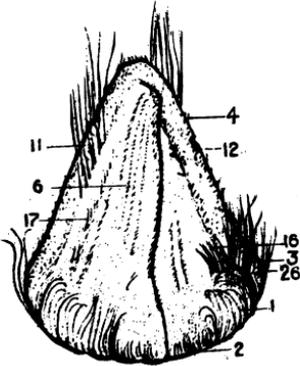
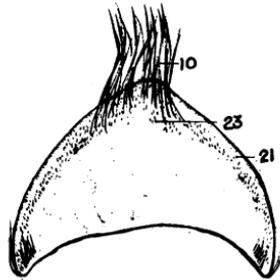
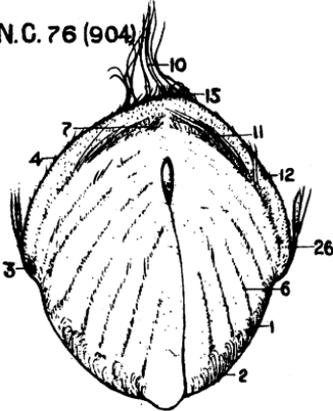


FIGURE 29.—Bud drawings: Importation Nos. 880, 882, 884.

71 Hawaiian Original (842)



N.C. 76 (904)



N.C. 64 (901)

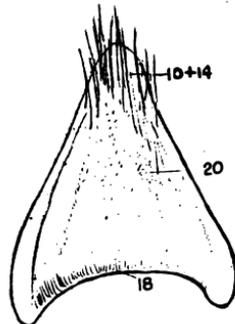
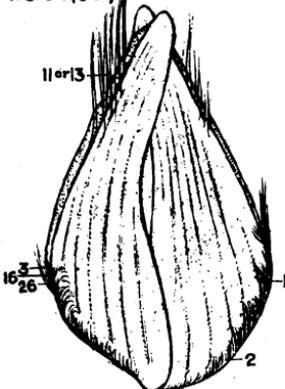
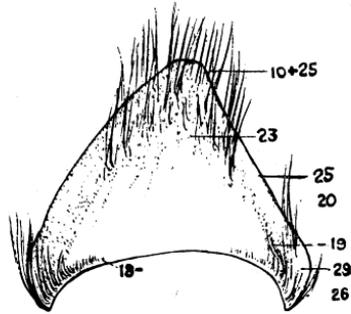
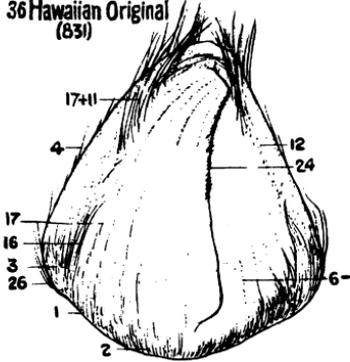
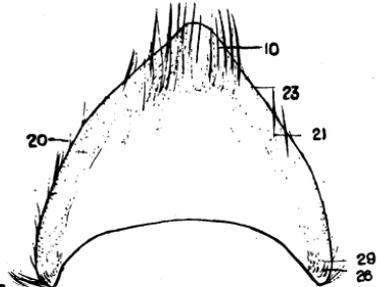
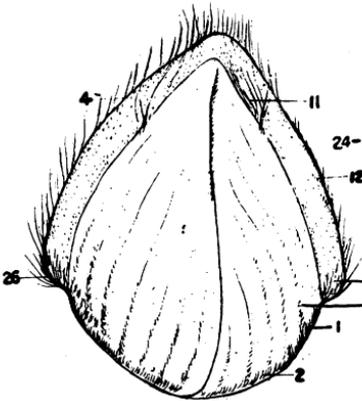


FIGURE 30.—Bud drawings: Importation Nos. 842, 904, 901.

36 Hawaiian Original (831)



41 Hawaiian Original (835)



6 Hawaiian Original (825)

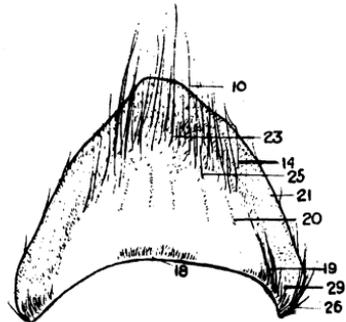
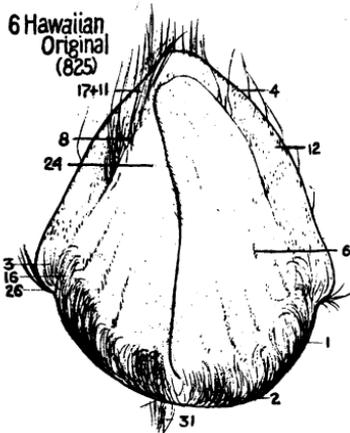


FIGURE 31.—Bud drawings: Importation Nos. 831, 835, 825.

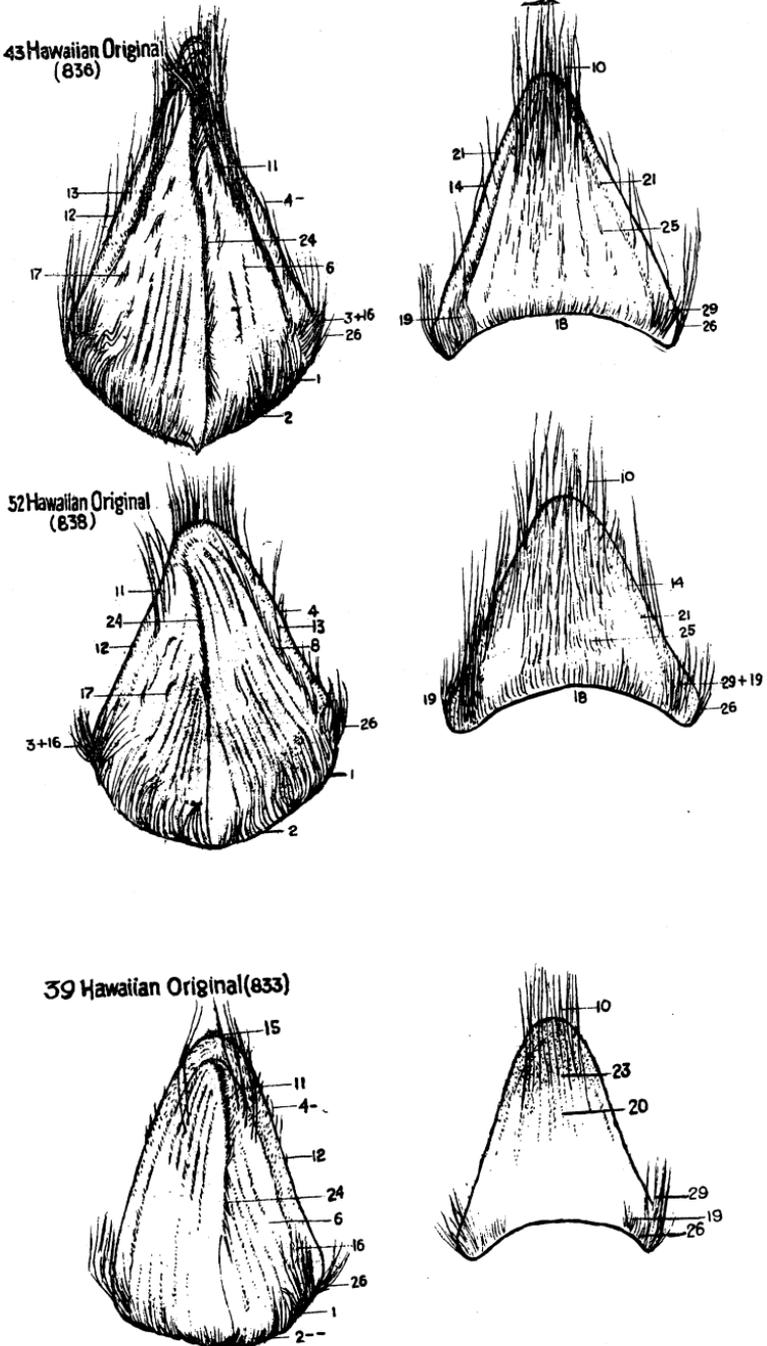
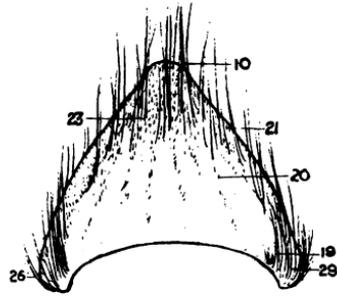
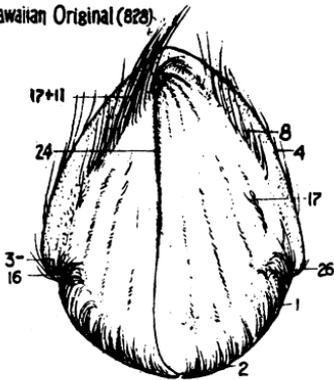
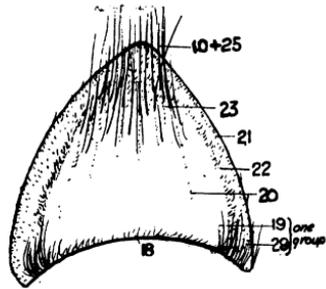
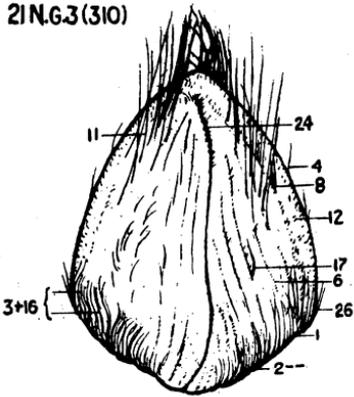


FIGURE 32.—Bud drawings: Importation Nos. 836, 838, 833.

26 Hawaiian Original (828)



2ING3(310)



2ING2 (309)

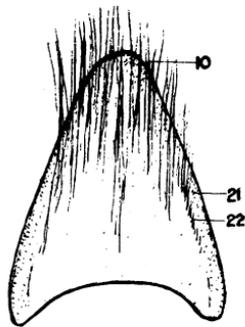
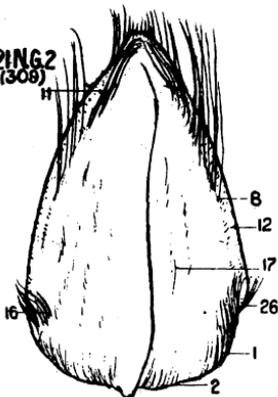
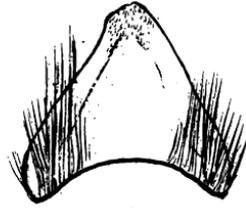
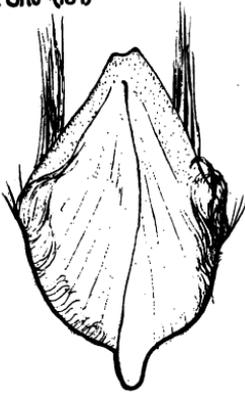
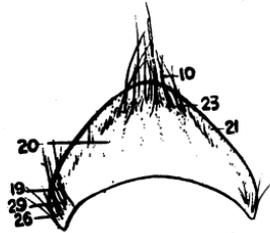
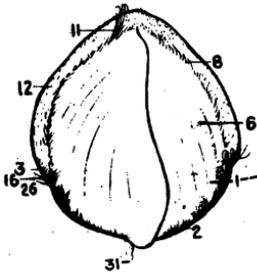


FIGURE 33.—Bud drawings: Importation Nos. 828, 310, 309.

Mukche (184)



Tahiti 3 (850)



Otaheite (466)

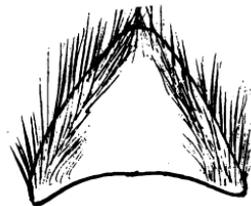
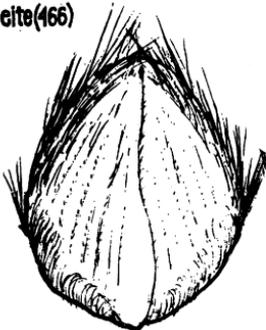
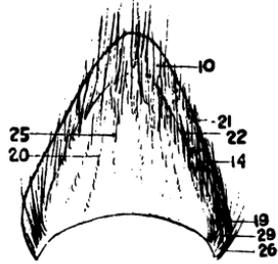
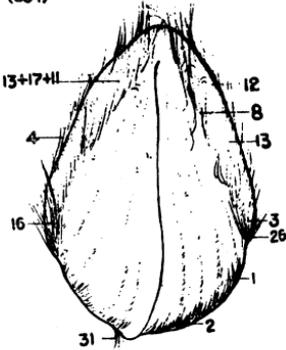
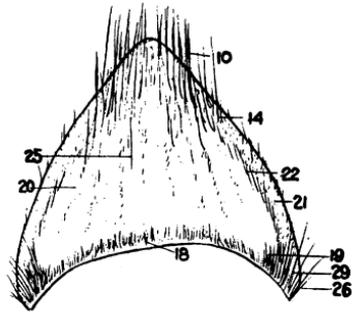
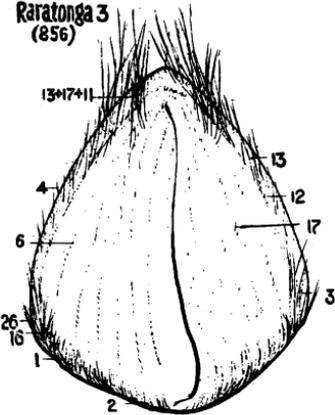


FIGURE 34.—Bud drawings: Importation Nos. 184, 850, 466.

Raratonga 1
(854)



Raratonga 3
(856)



Raratonga 2 (855)

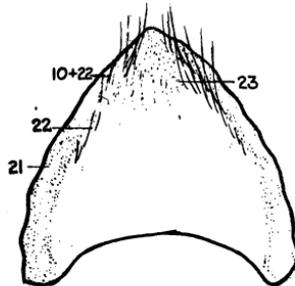
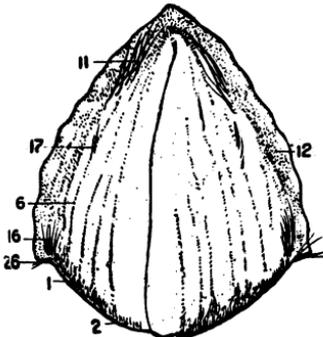
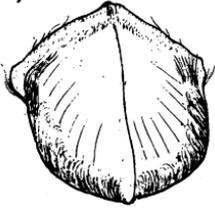
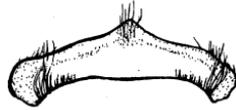
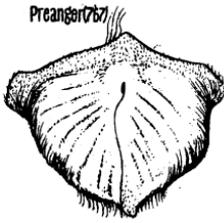


FIGURE 35.—Bud drawings: Importation Nos. 854, 856, 855.

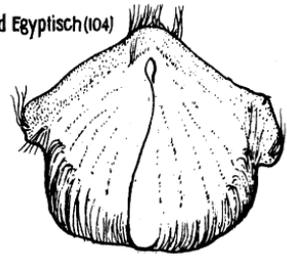
Rayada(9)



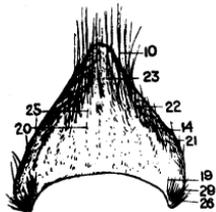
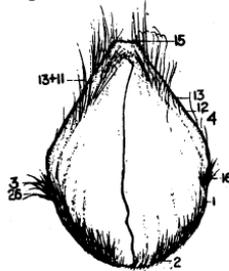
Preangar(767)



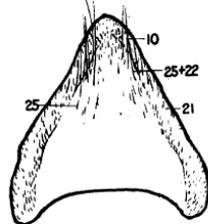
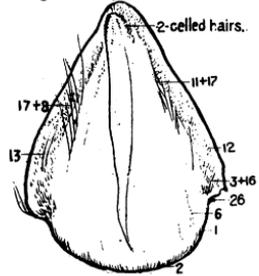
Rood Egyptisch(104)



Tongatabu 6 (926)



Tongatabu 5 (925)



2-celled hairs.

PN-262

FIGURE 36.—Bud drawings: Importation Nos. 9, 767, 104, 926, 925.

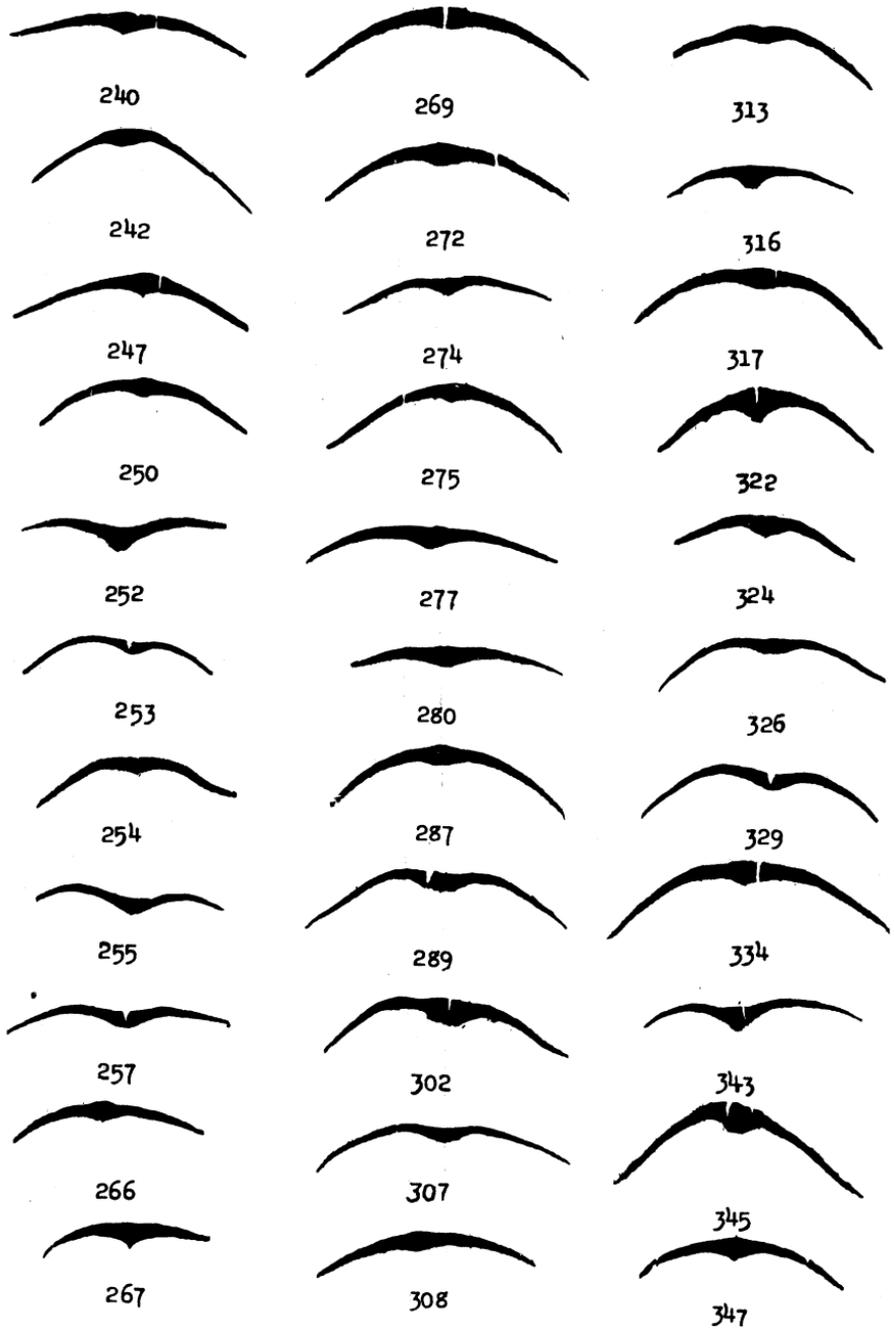
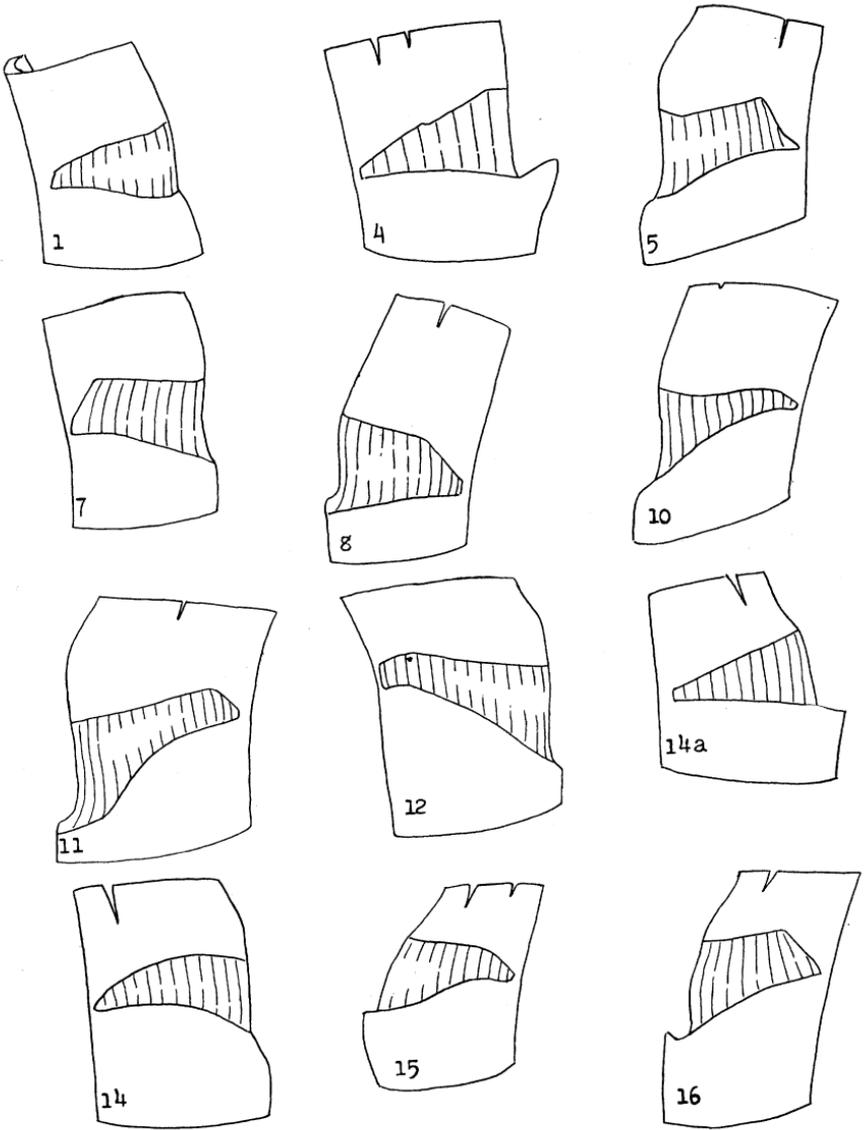


FIGURE 37.—Ligule photographs: Accession Nos. 240, 242, 247, 250, 252-255, 257, 266, 267, 269, 272, 274, 275, 277, 280, 287, 289, 302, 307, 308, 313, 316, 317, 322, 324, 326, 329, 334, 343, 345, 347.

FN-263



PN-264

FIGURE 38.—Dewlaps: Accession Nos. 1, 4, 5, 7, 8, 10-12, 14, 14a, 15, 16.

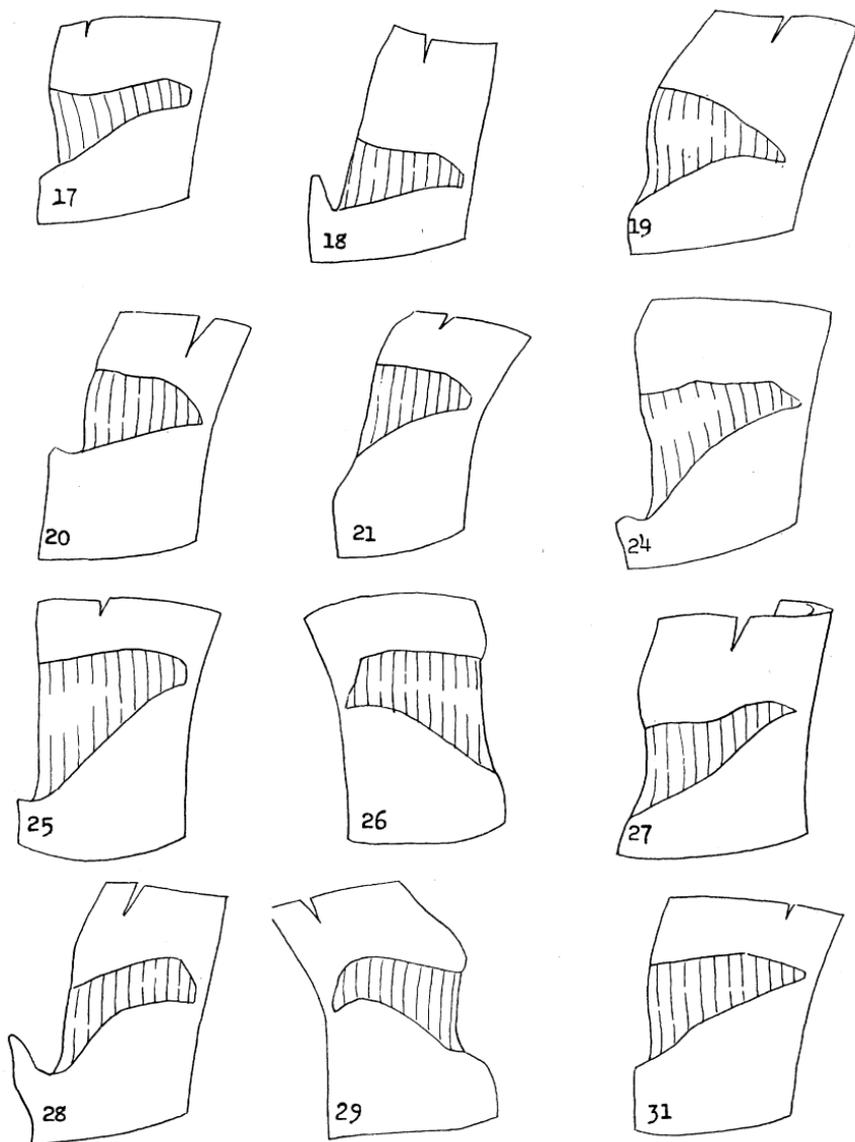
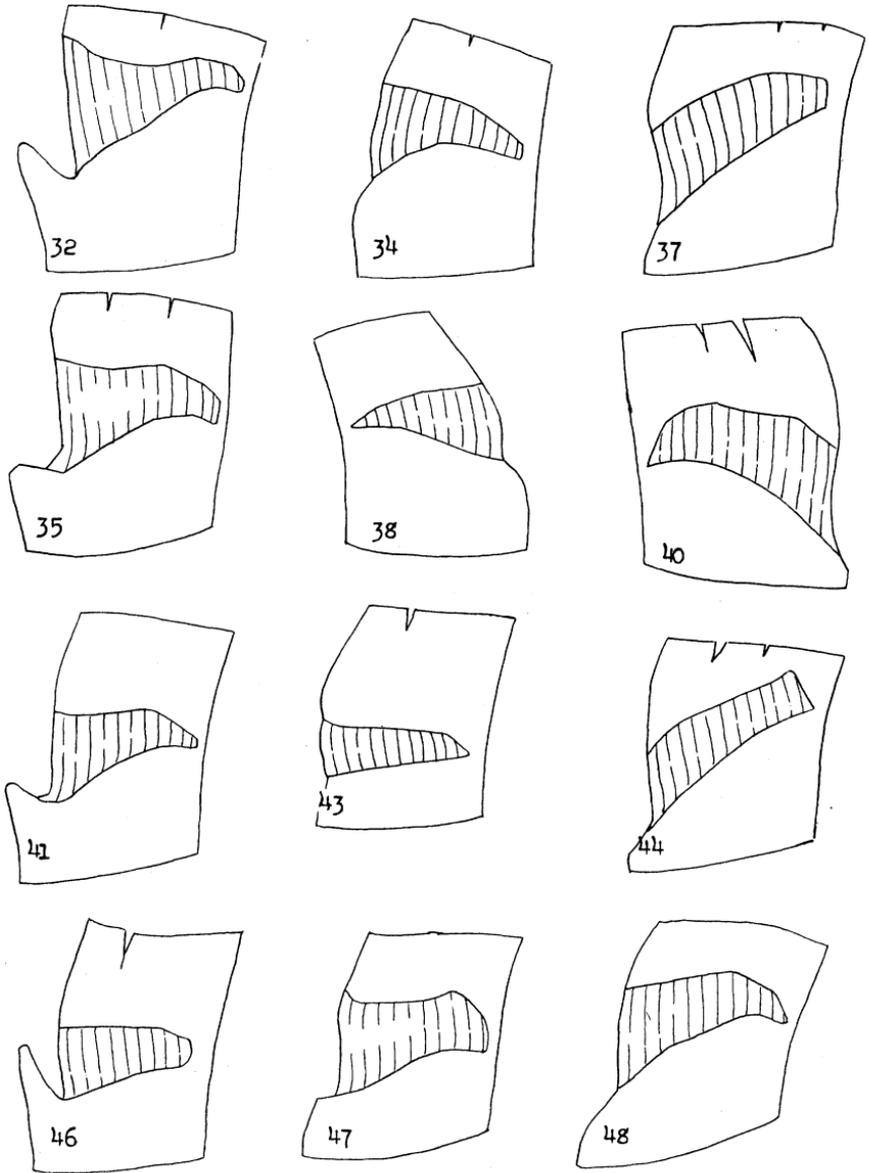


FIGURE 39.—Dewlaps: Accession Nos. 17-21, 24-29, 31.



PN-266

FIGURE 40.—Dewlaps: Accession Nos. 32, 34, 35, 37, 38, 40, 41, 43, 44, 46-48.

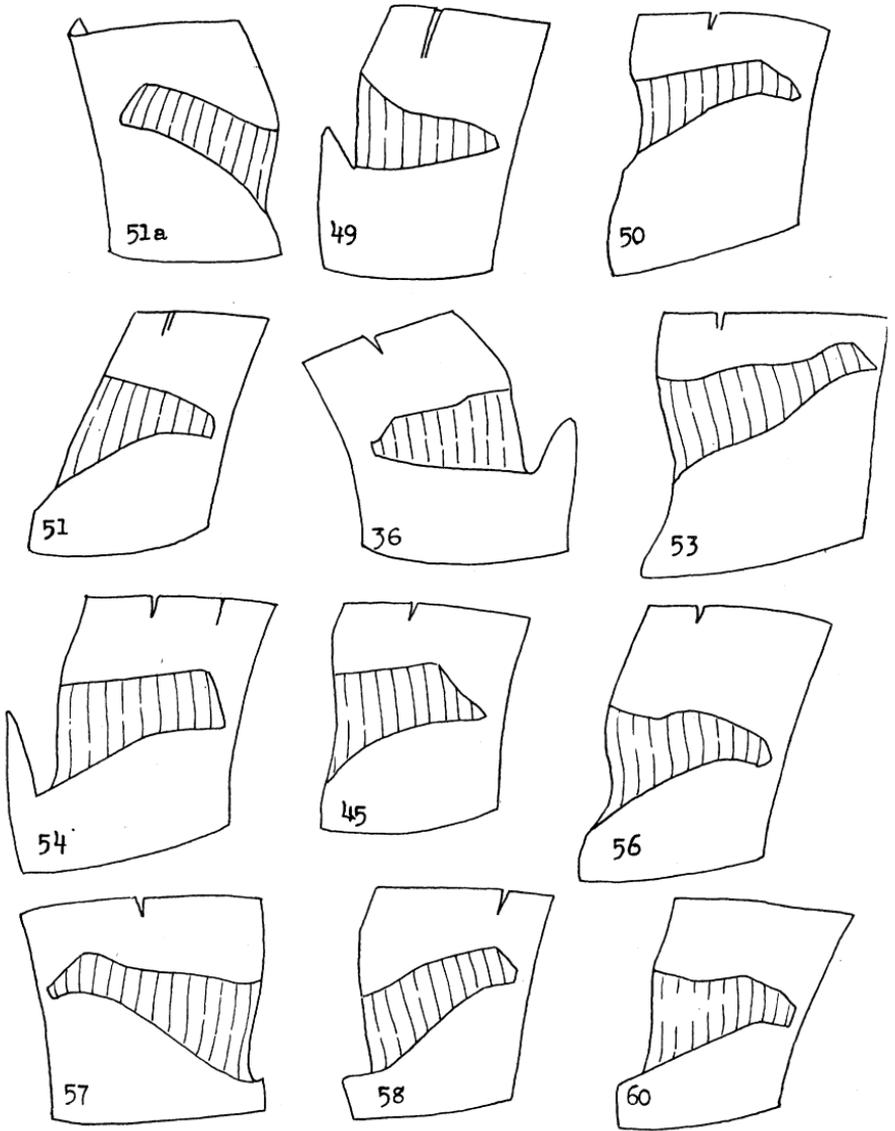
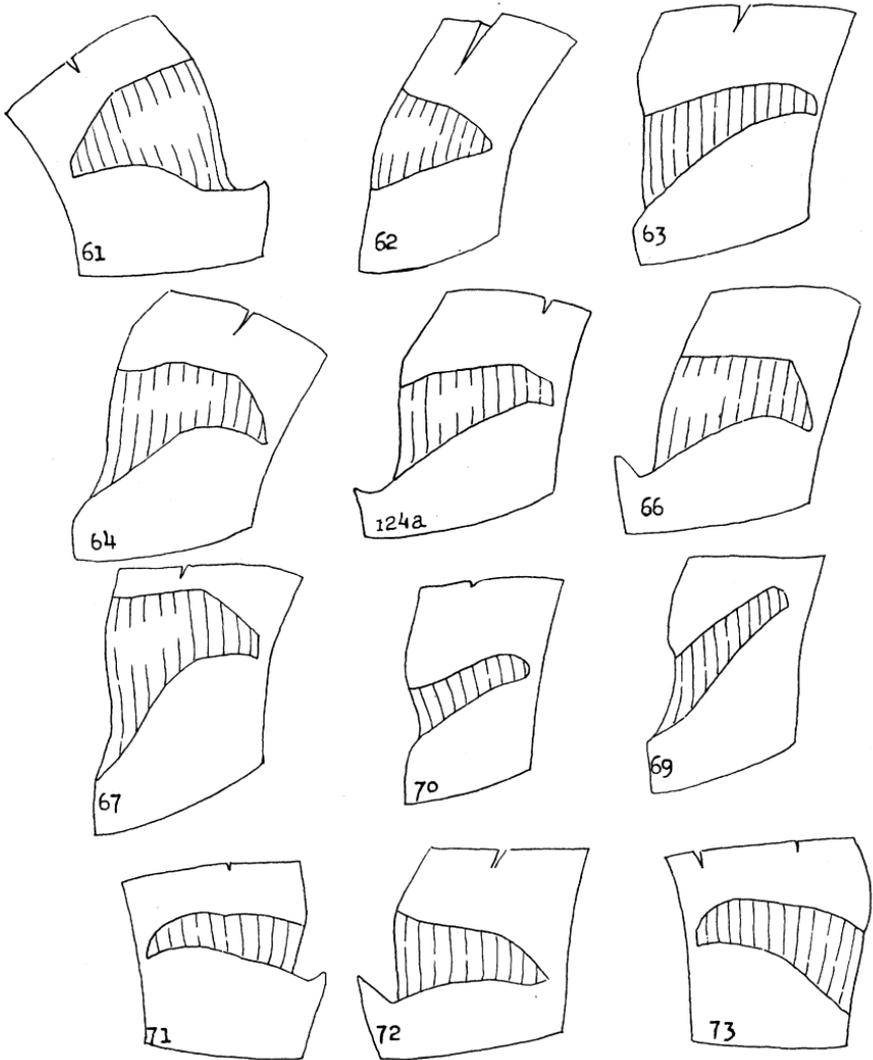


FIGURE 41.—Dewlaps: Accession Nos. 36, 45, 49-51a, 53, 54, 56-58, 60.

PN-267



PN-268

FIGURE 42.—Dewlaps: Accession Nos. 61-64, 66, 67, 69, 70-73, 124a.

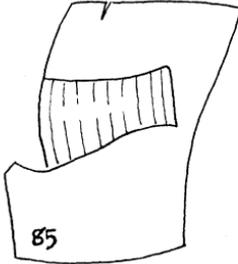
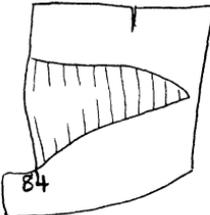
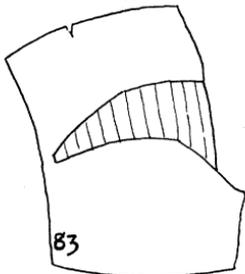
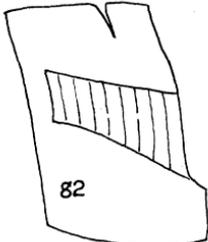
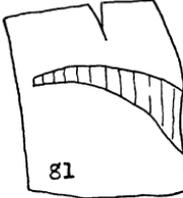
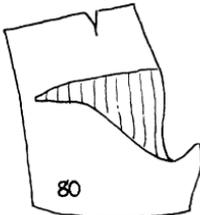
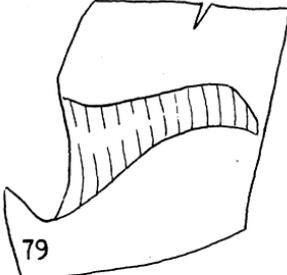
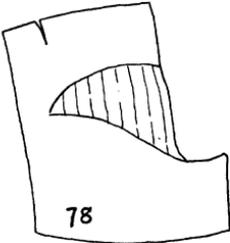
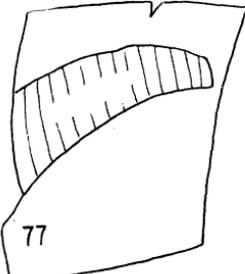
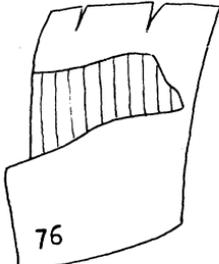
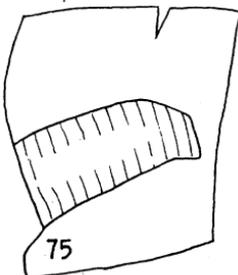
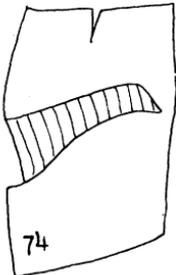


FIGURE 43.—Dewlaps: Accession Nos. 74-85.

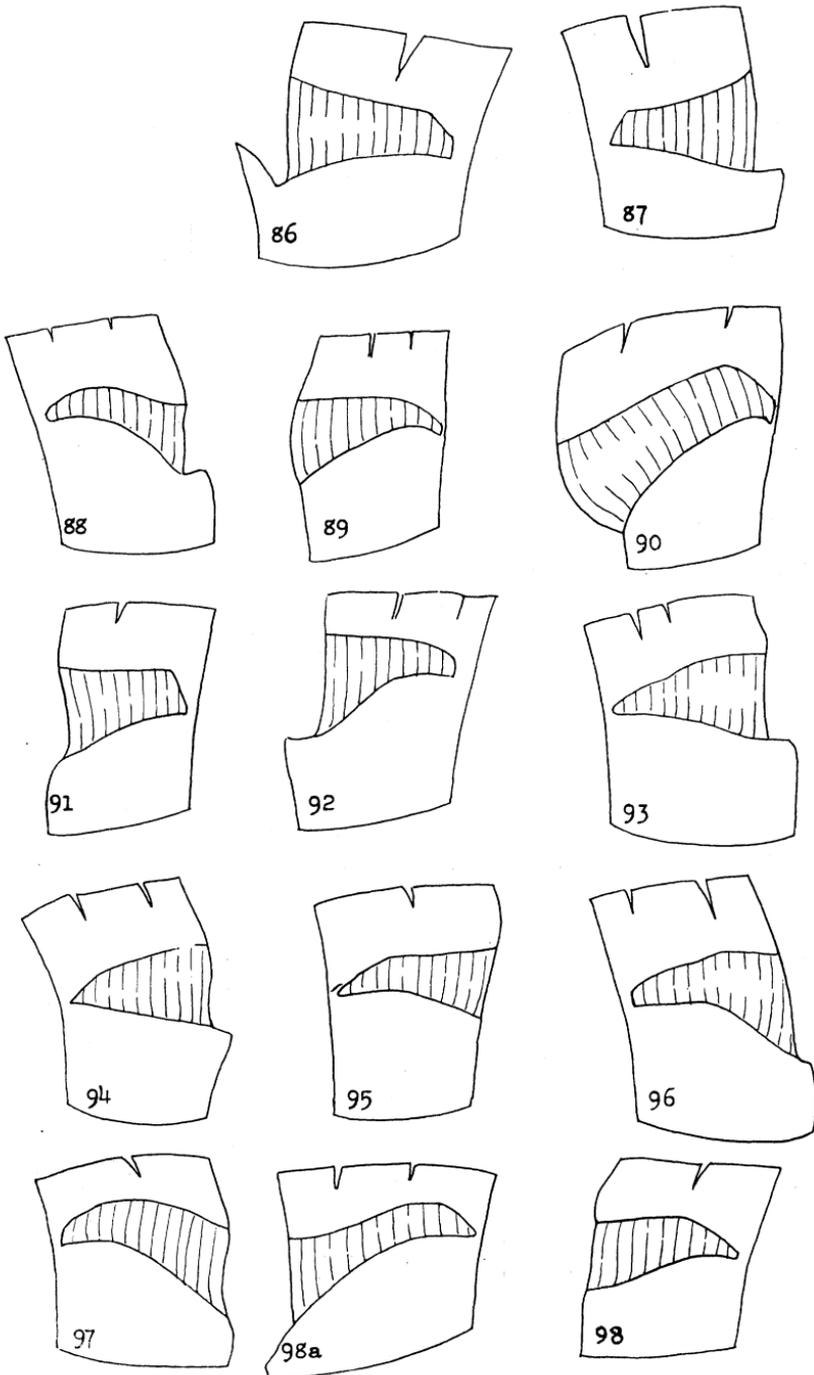


FIGURE 44.—Dewlaps: Accession Nos. 86-98, 98a.

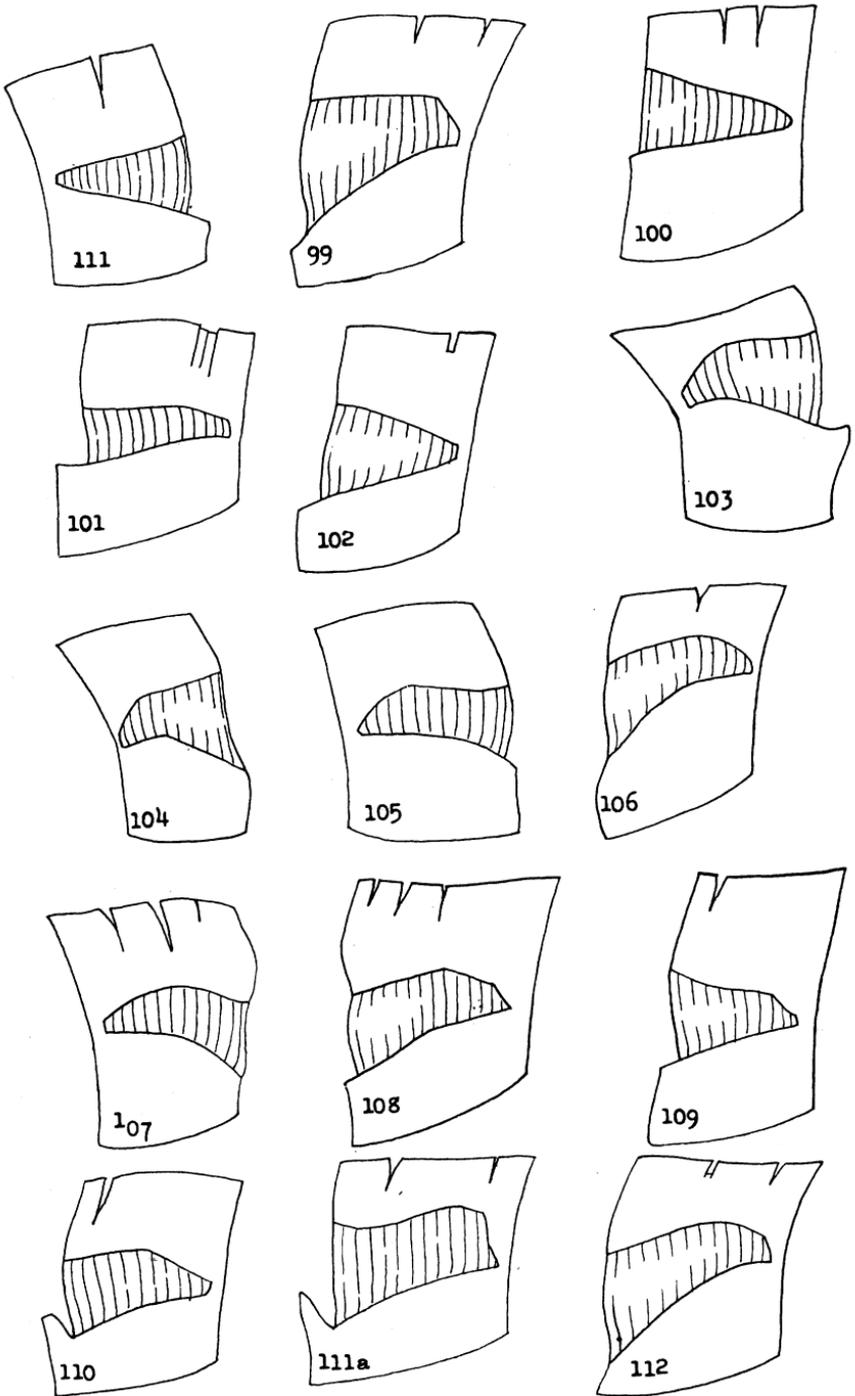


FIGURE 45.—Dewlaps: Accession Nos. 99–112, 111a.

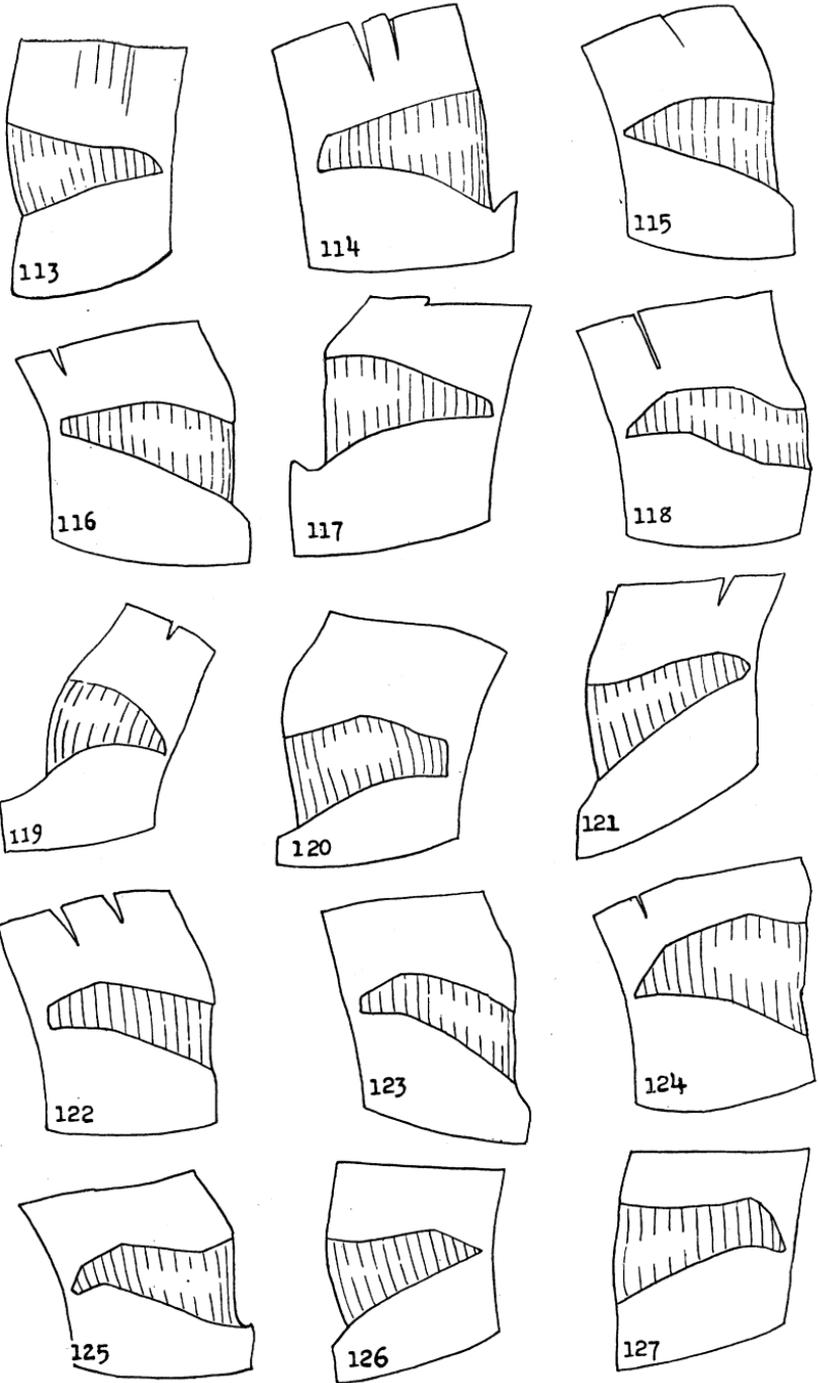


FIGURE 46.—Dewlaps: Accession Nos. 113-127.

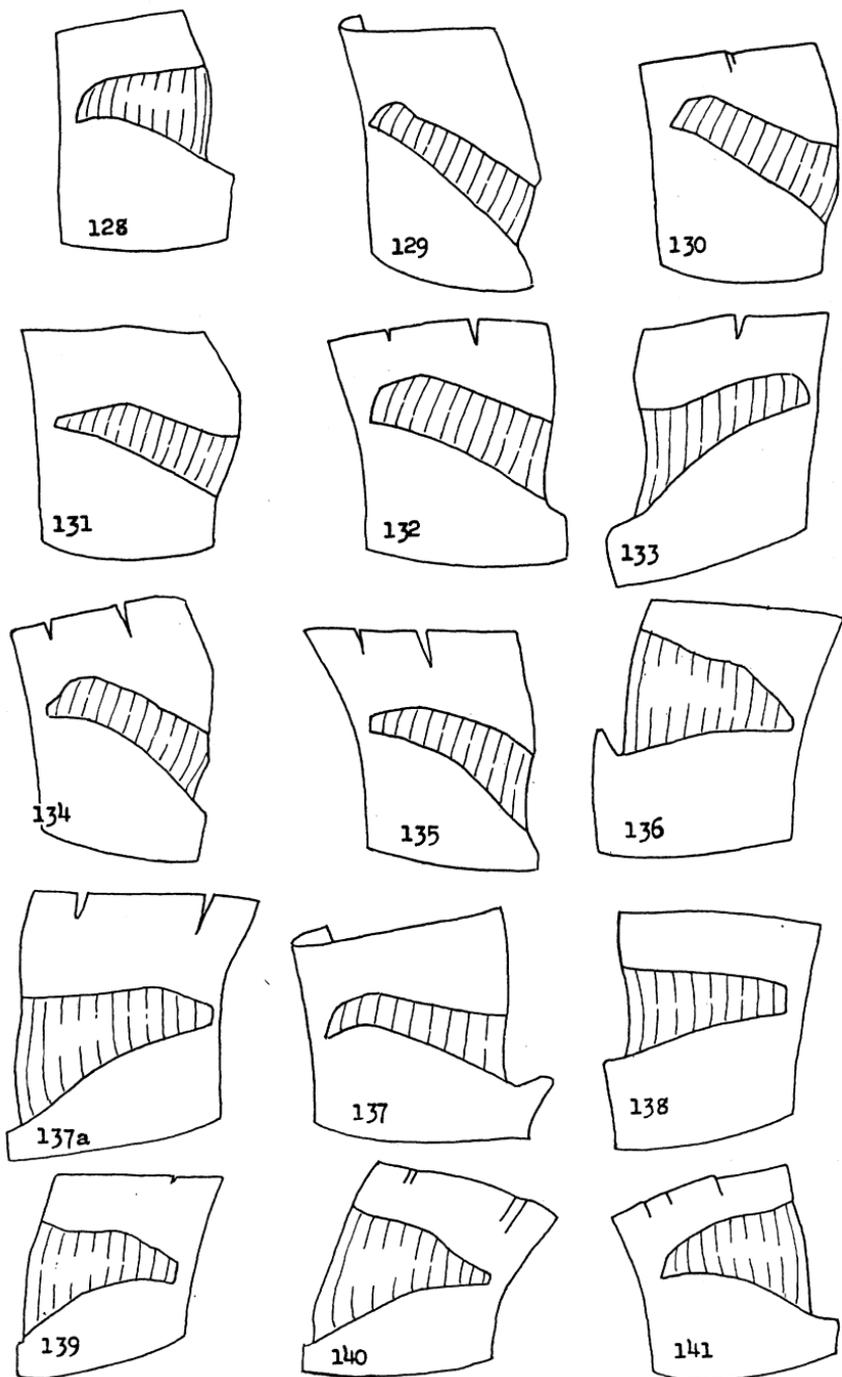


FIGURE 47.—Dewlaps: Accession Nos. 128–141, 137a.

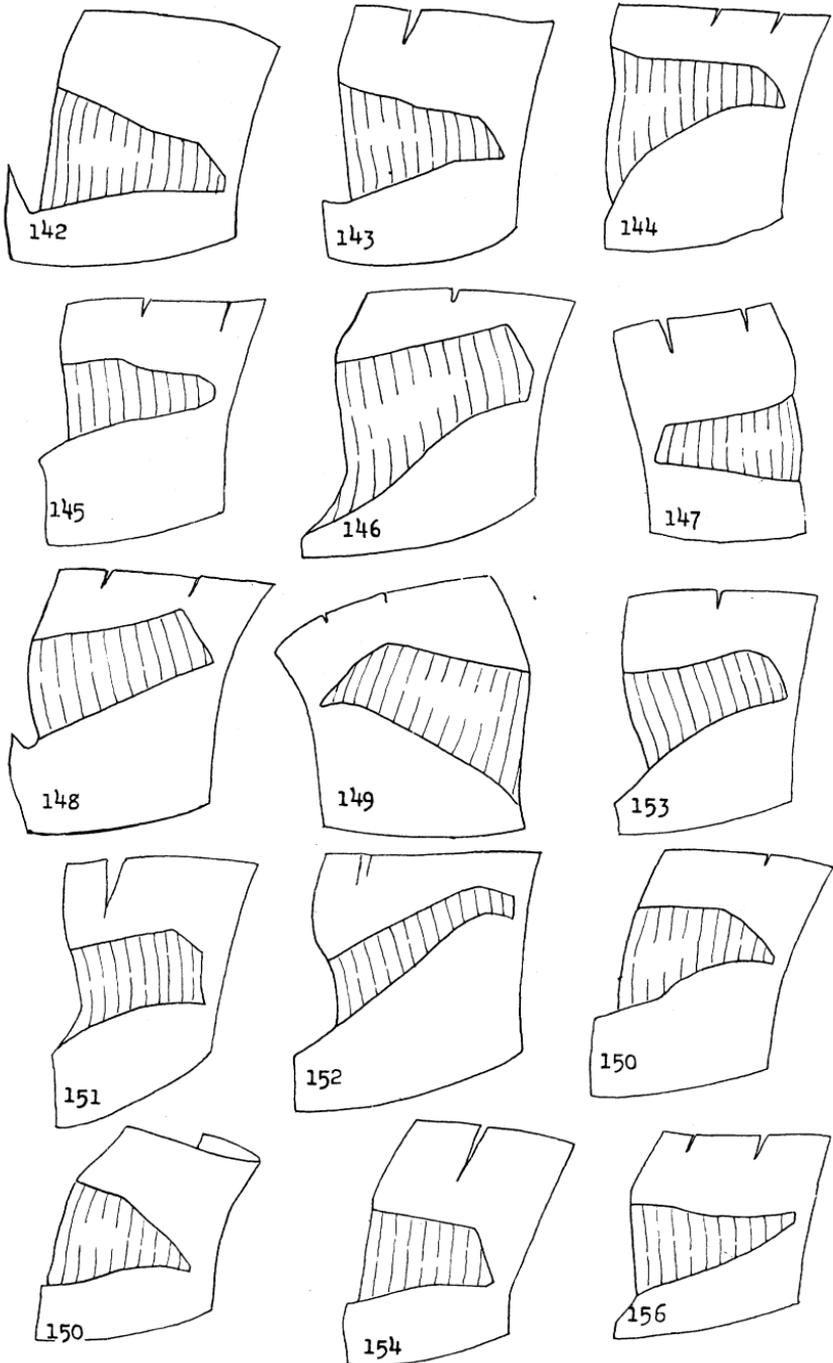


FIGURE 48.—Dewlaps: Accession Nos. 142–154, 156.

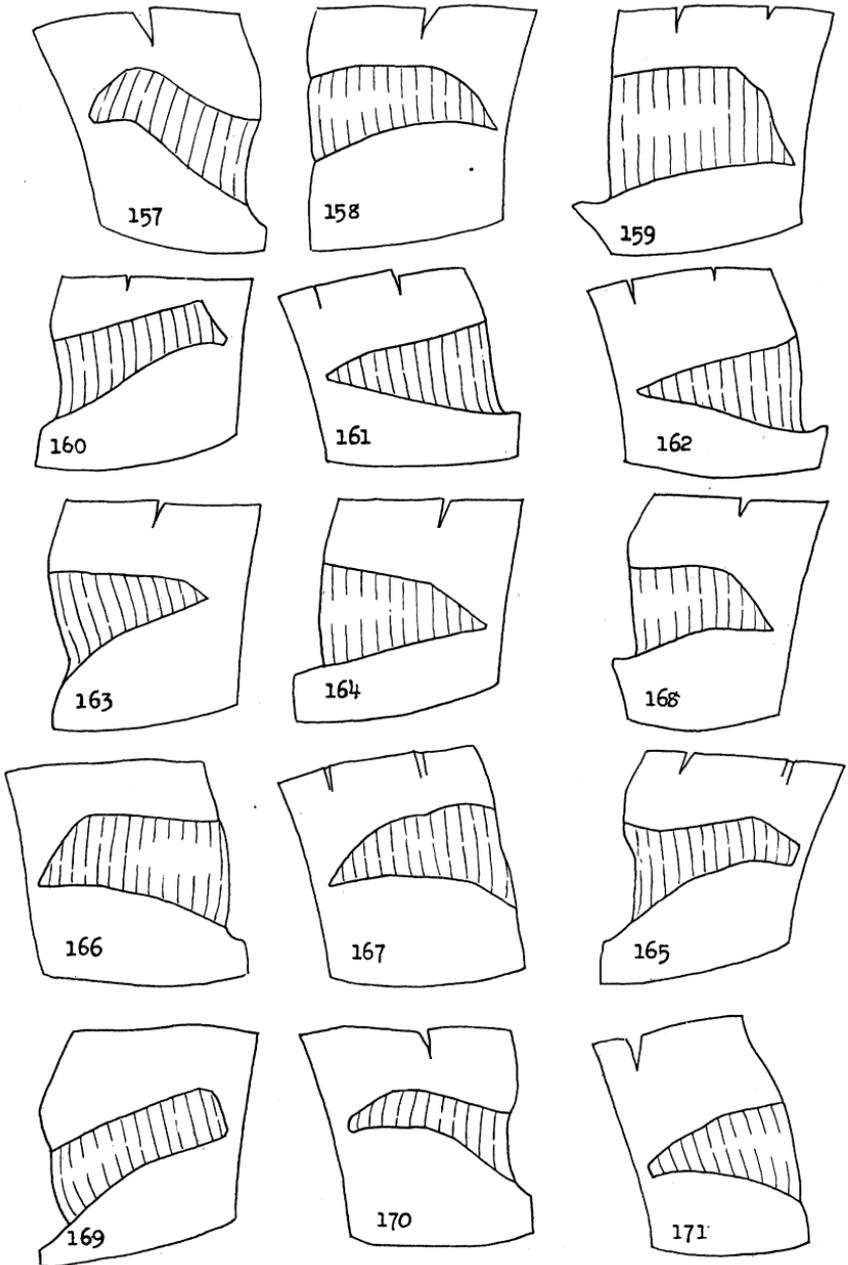


FIGURE 49.—Dewlaps: Accession Nos, 157-171,

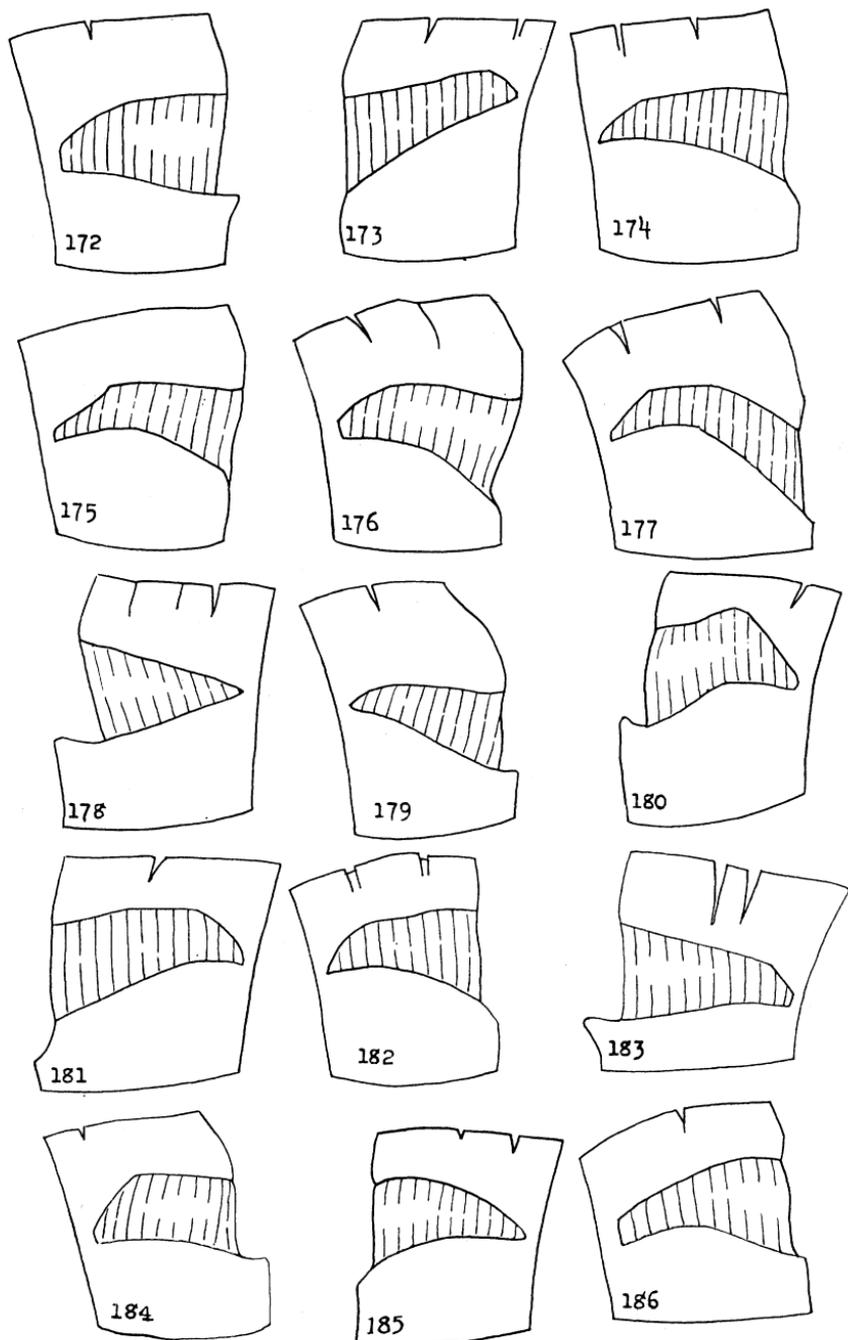


FIGURE 50.—Dewlaps: Accession Nos. 172-186.

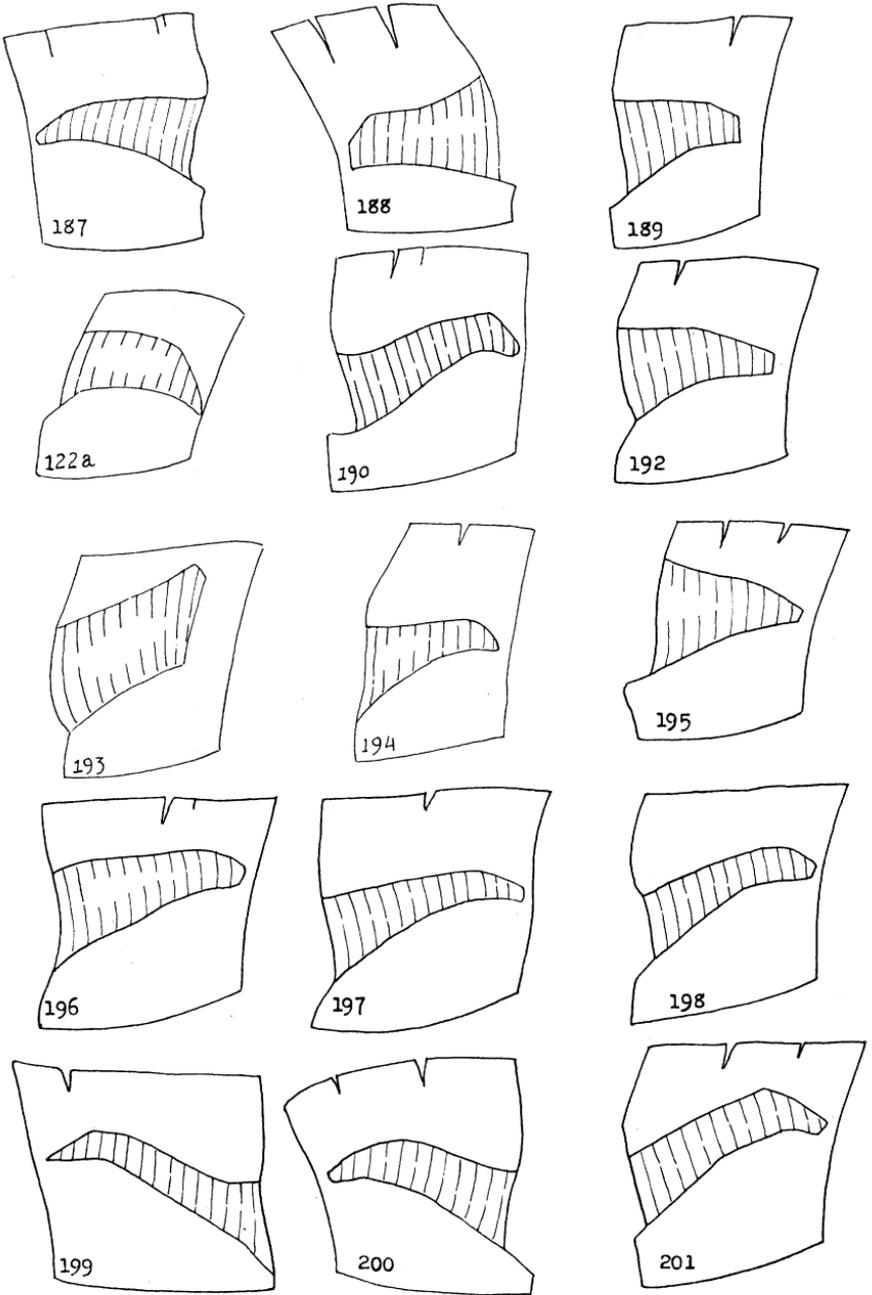


FIGURE 51.—Dewlaps: Accession Nos. 122a, 187-190, 192-201.

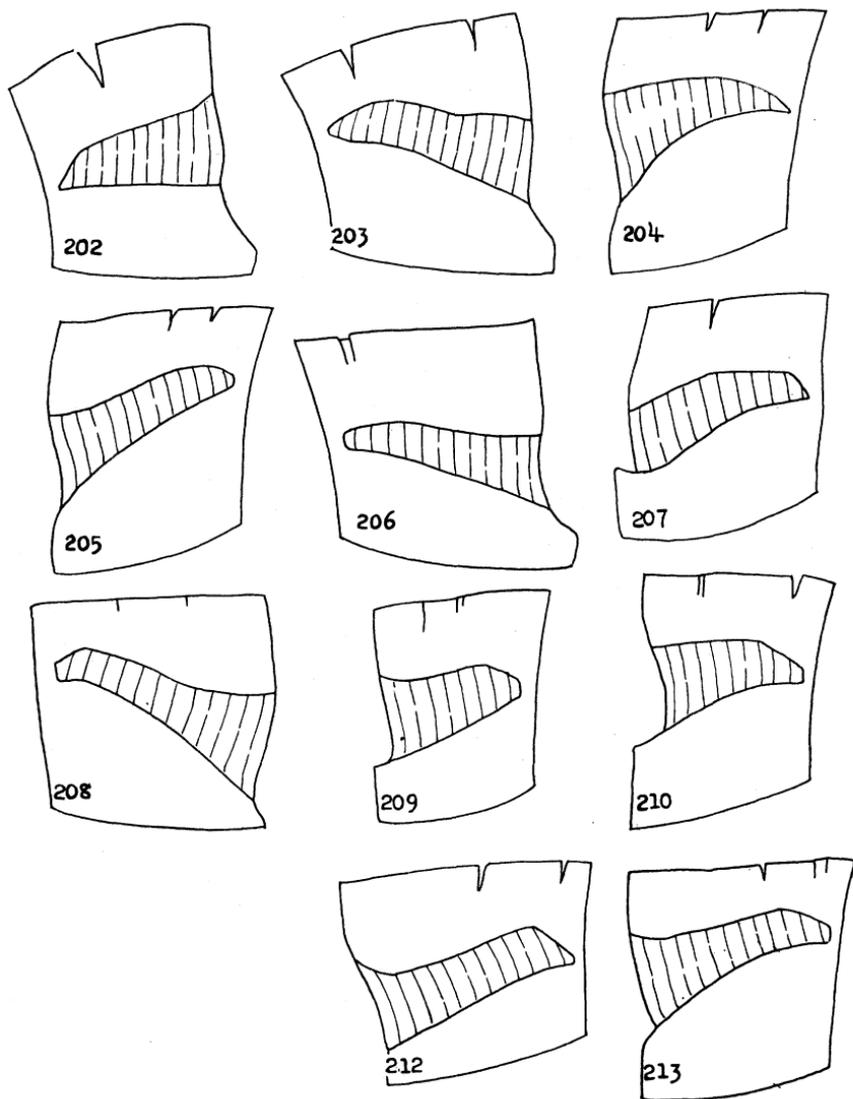


FIGURE 52.—Dewlaps: Accession Nos. 202-210, 212, 213.

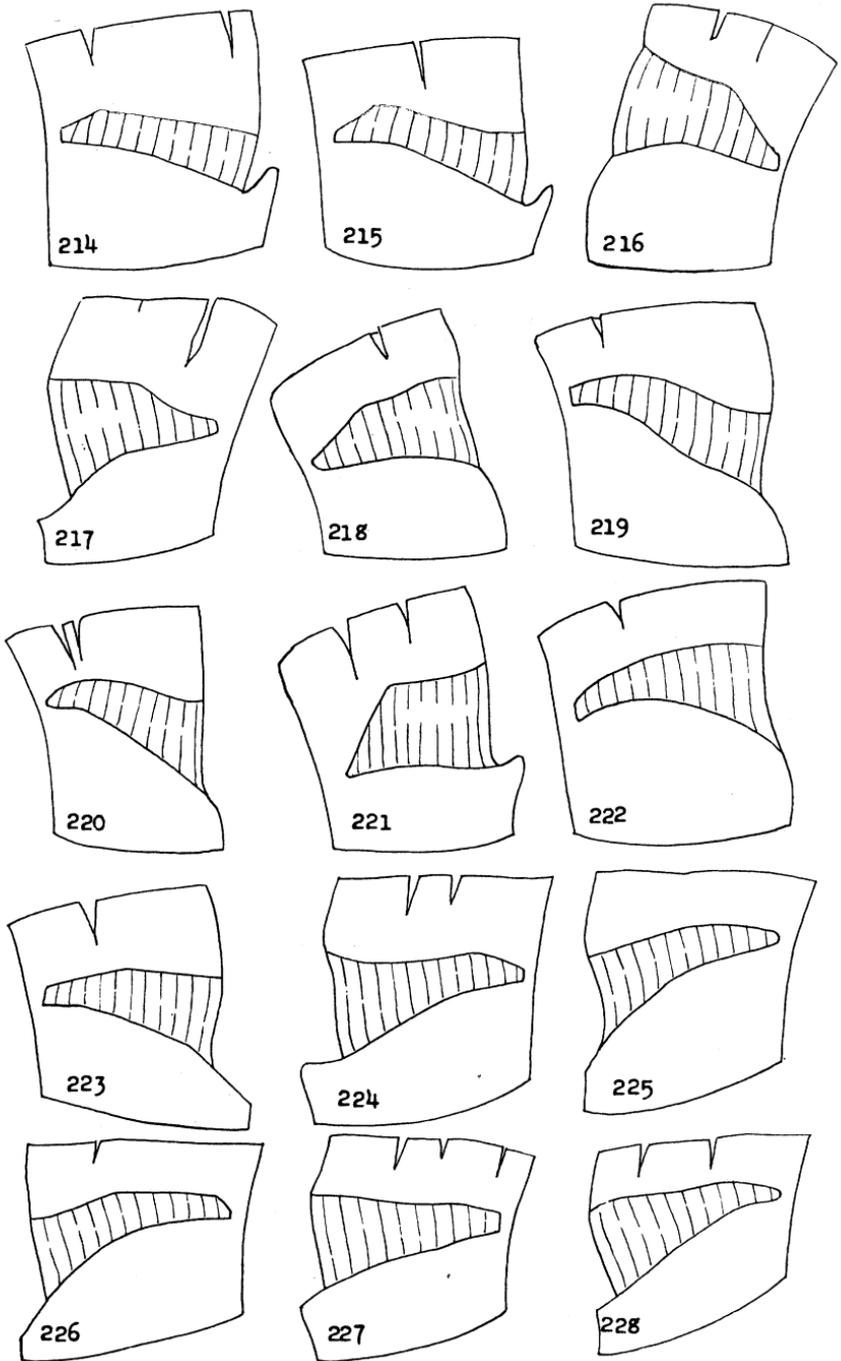


FIGURE 53.—Dewlaps: Accession Nos. 214–228.

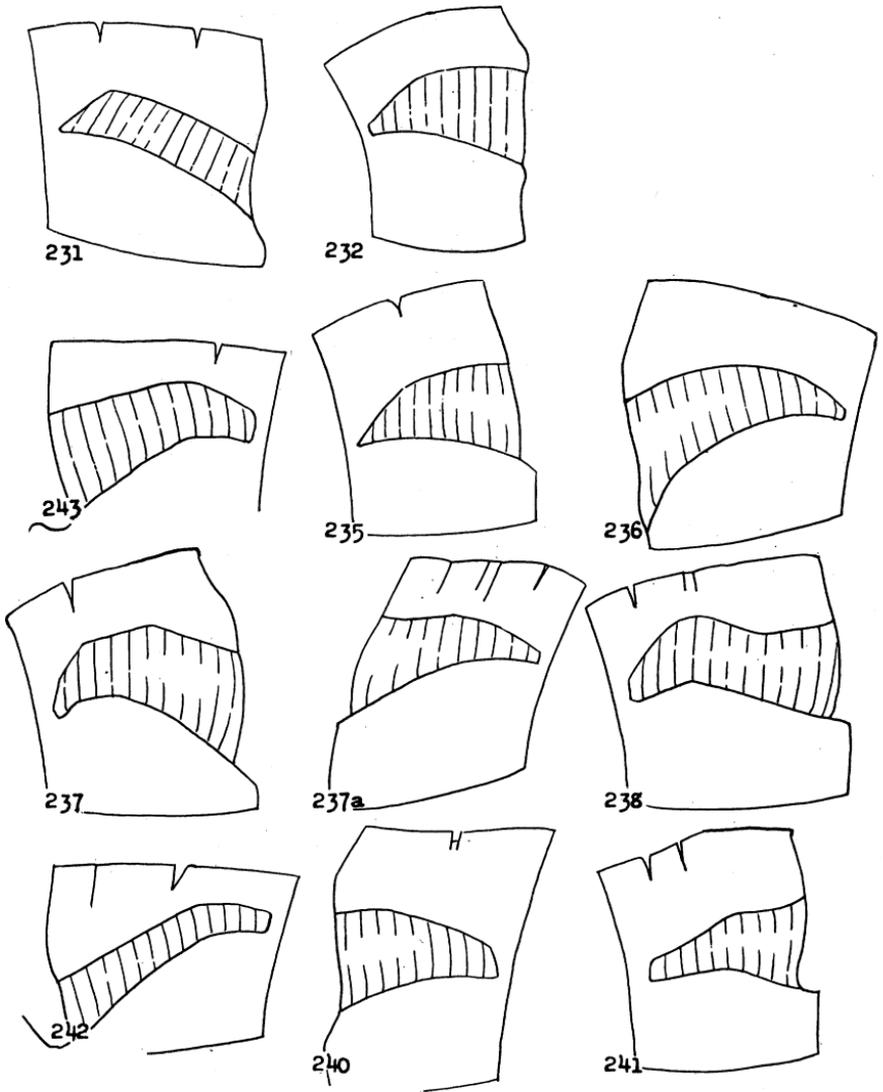


FIGURE 54.—Dewlaps: Accession Nos. 231, 232, 235–238, 237a, 240–243.

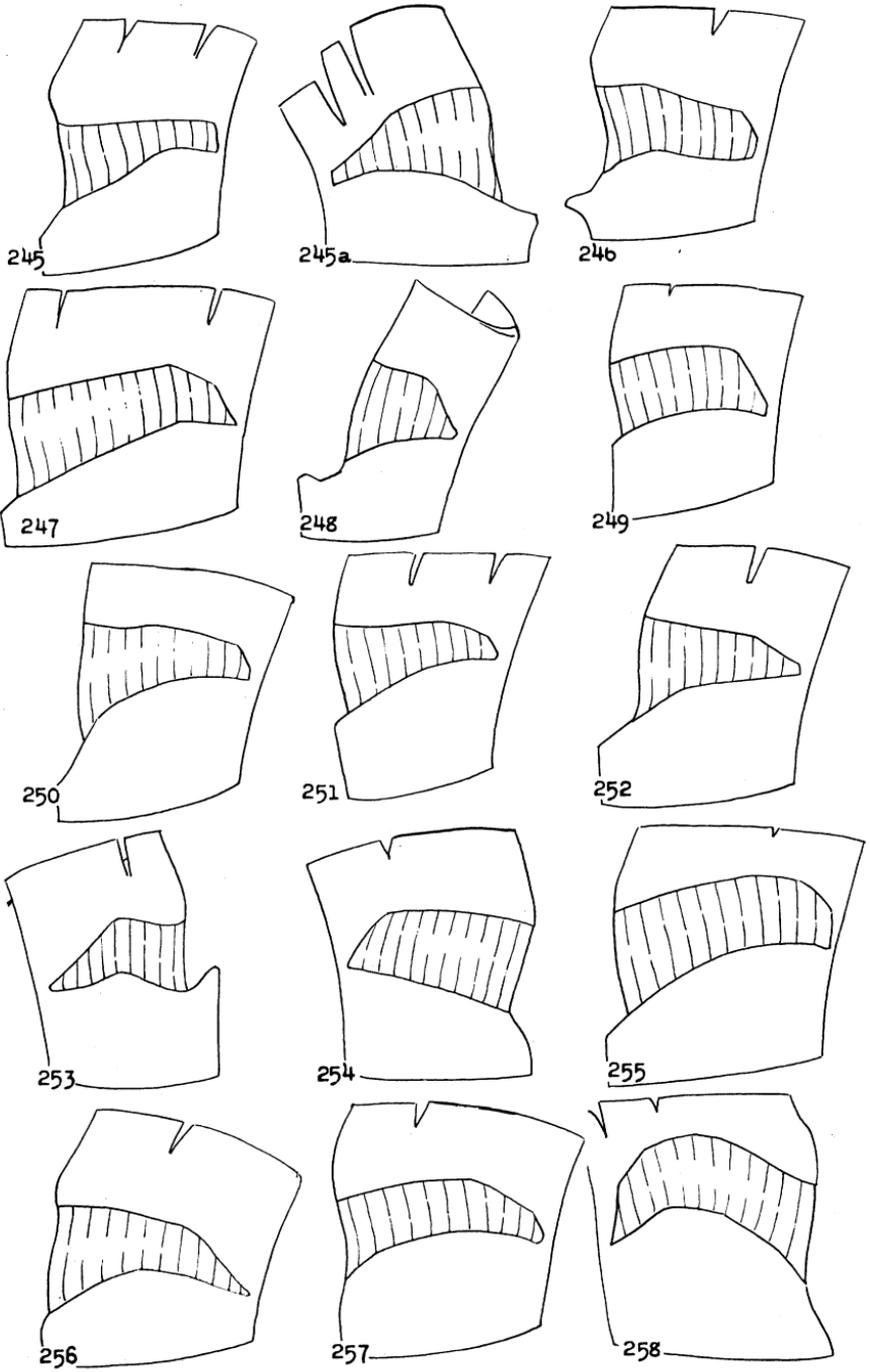
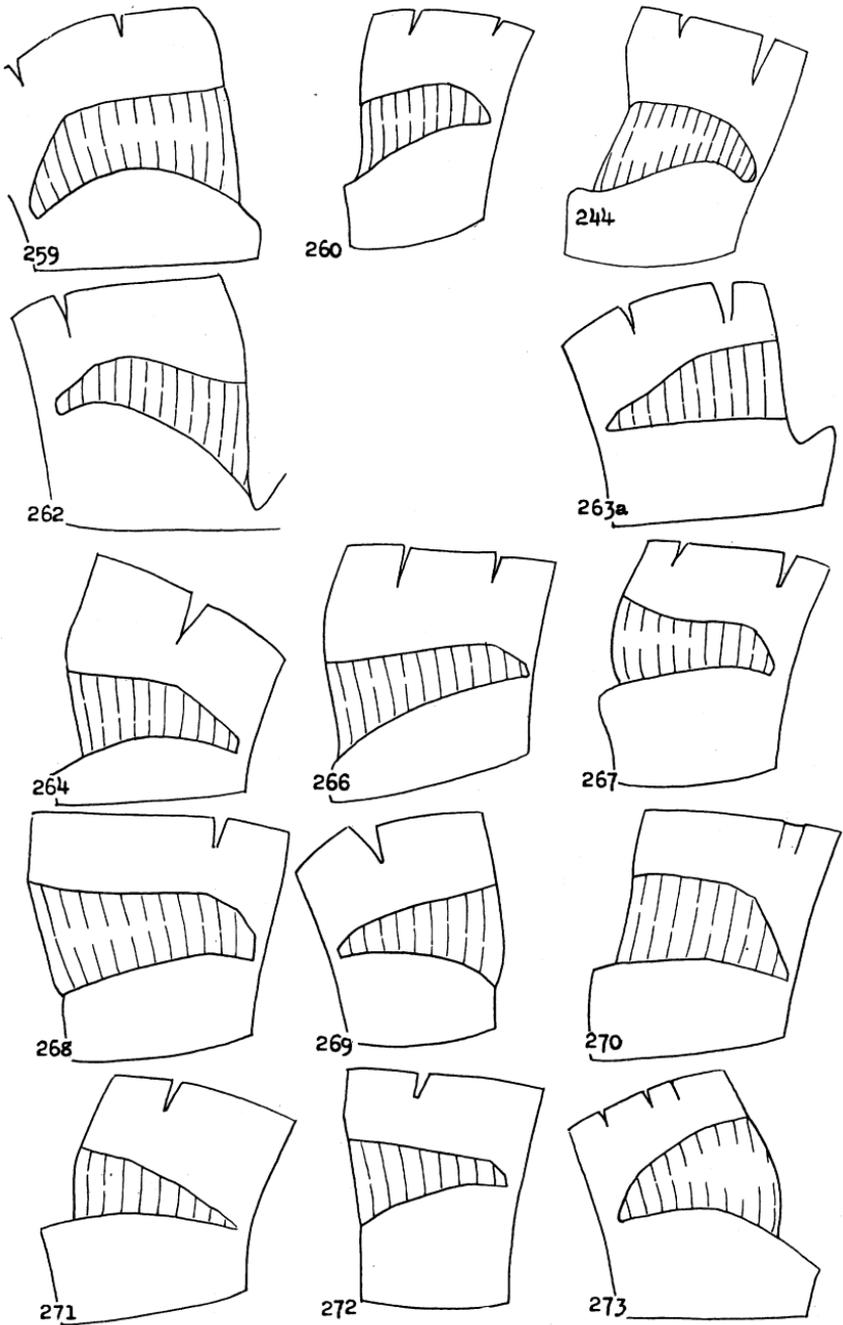


FIGURE 55.—Dewlaps: Accession Nos. 245–258, 245a.



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FIGURE 56.—Dewlaps: Accession Nos. 244, 259, 260, 262, 263a, 264, 266–273.

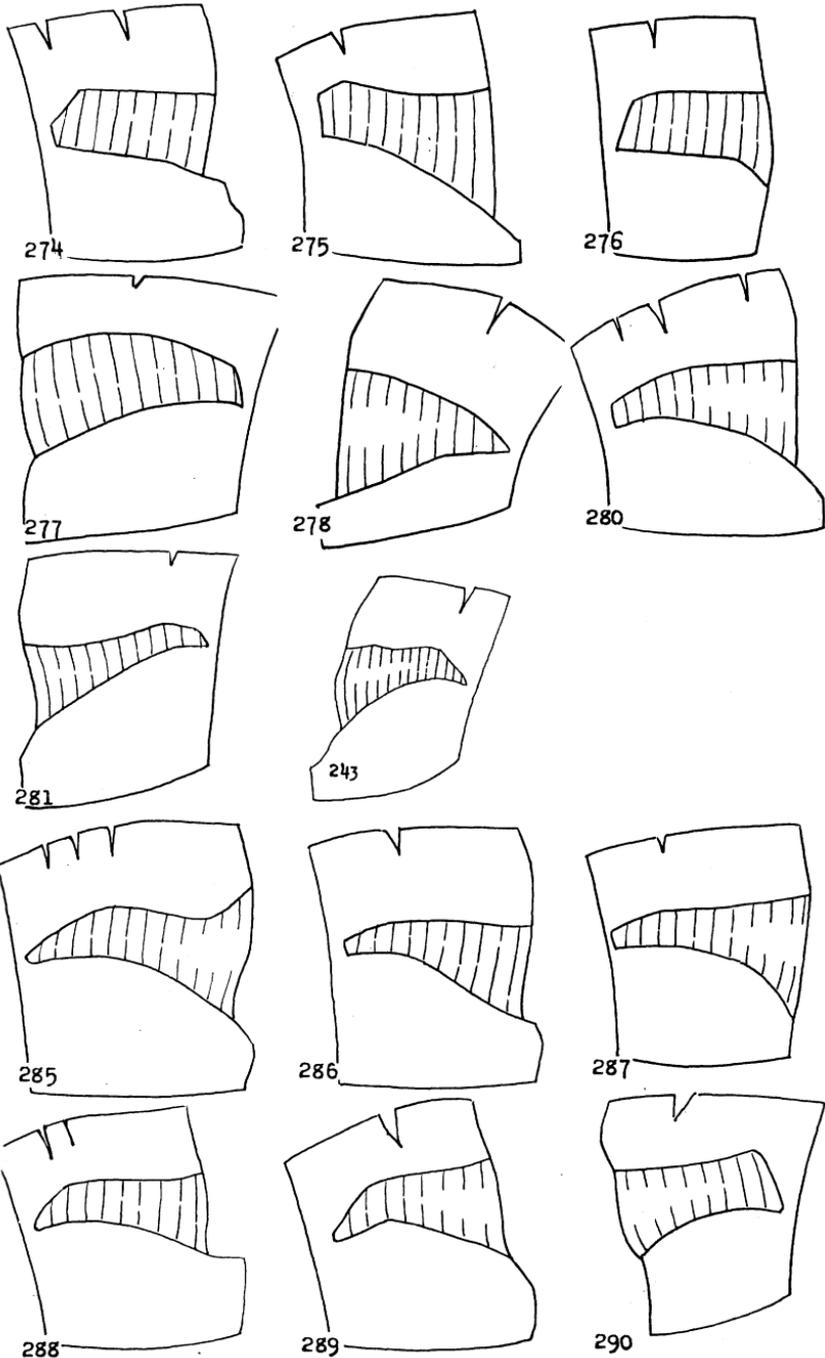


FIGURE 57.—Dewlaps: Accession Nos. 243, 274–278, 280, 281, 285–290.

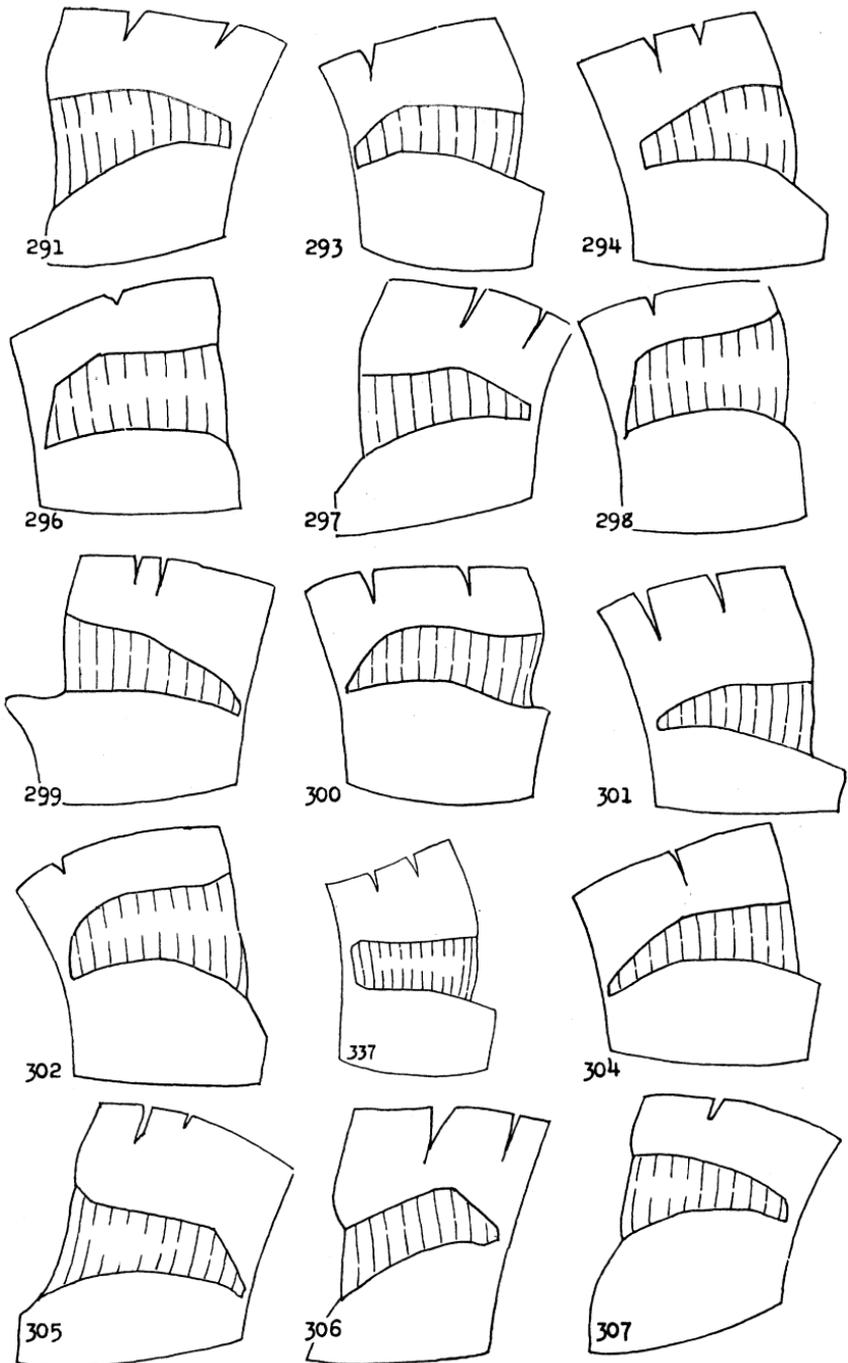


FIGURE 58.—Dewlaps: Accession Nos. 291, 293, 294, 296–302, 304–307, 337.

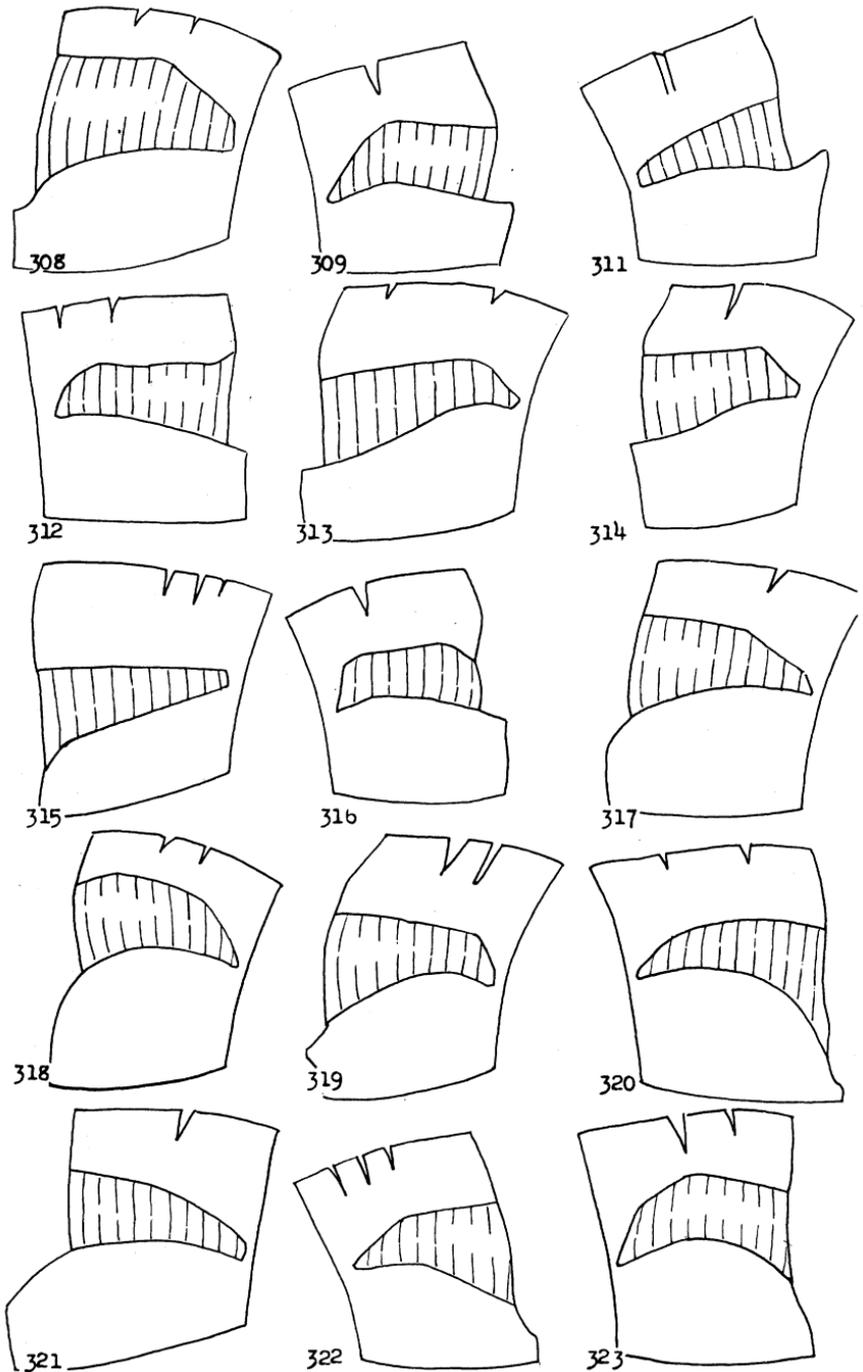


FIGURE 59.—Dewlaps: Accession Nos. 308, 309, 311–323.

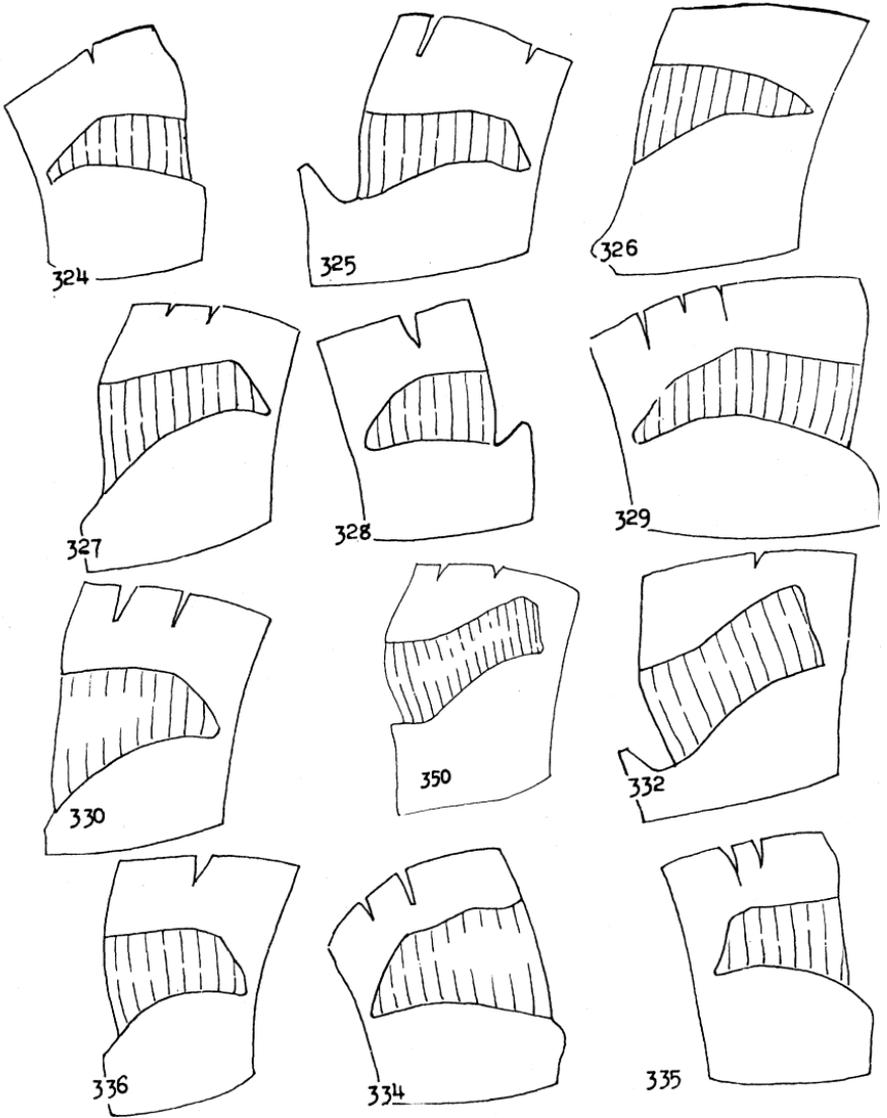


FIGURE 60.—Dewlaps: Accession Nos. 324–330, 332, 334–336, 350.

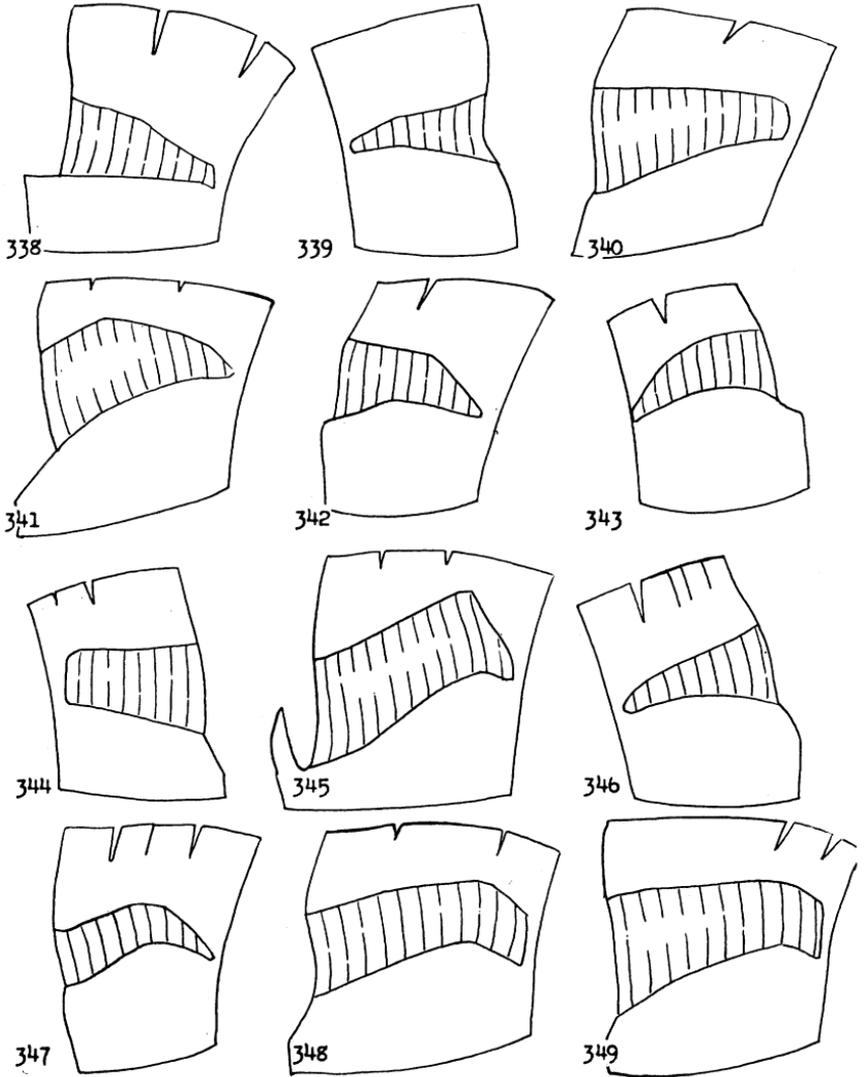
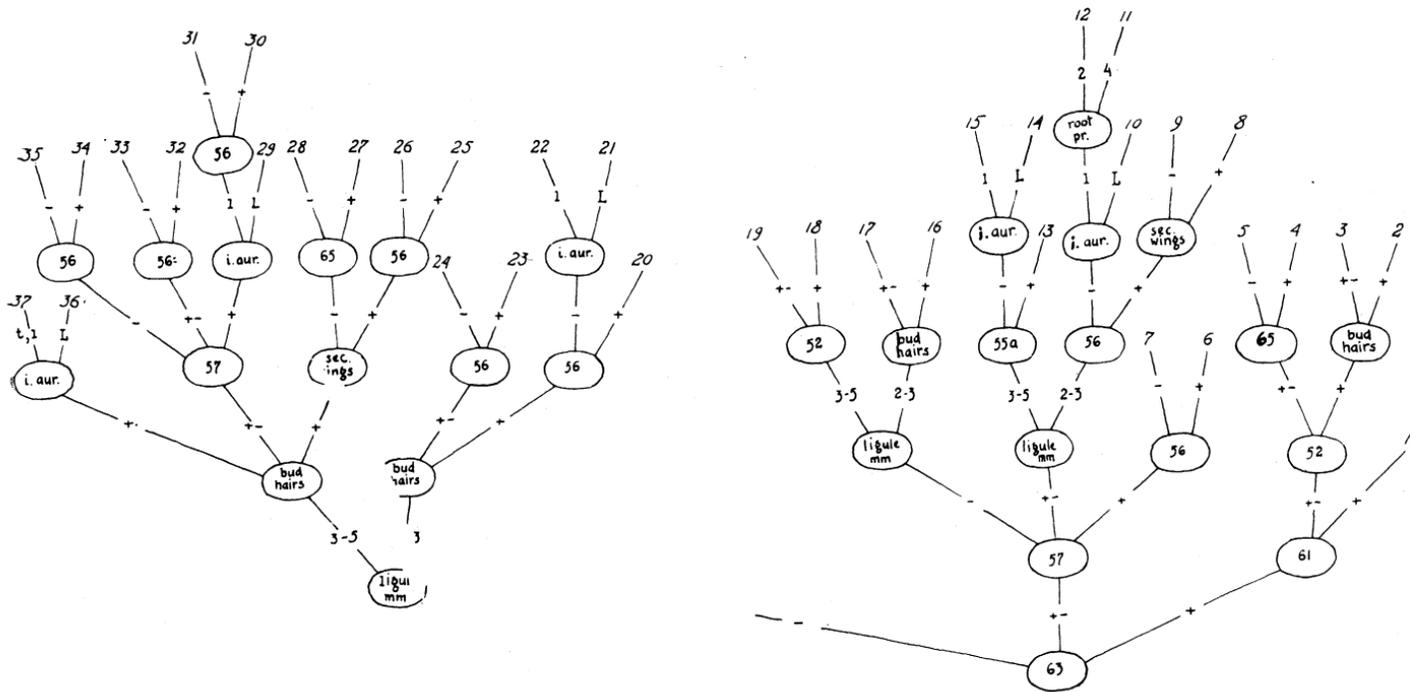


FIGURE 61.—Dewlaps: Accession Nos. 338-349.



SUGARCANE

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FIGURE 62.—Taxonomic grouping of New Guinea canes; i. aur.=inner auricle; sec. wings=secondary wings; root pr.=root primordia rows; t=transitional auricle; l=short lanceolate auricle; L=long lanceolate auricle.

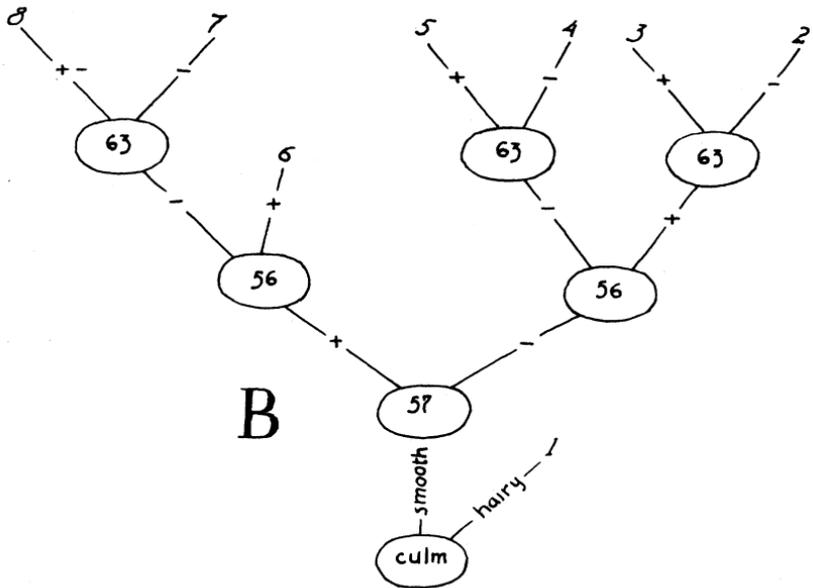
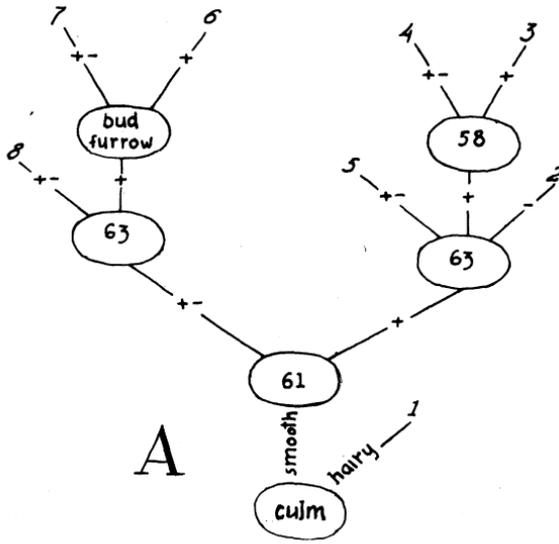


FIGURE 63.—Taxonomic grouping of (A) New Caledonia clones and (B) Hawaiian clones.

