

in developing drought tolerant beans. Tepary maintained a higher relative turgidity of the leaves during the course of the day in comparison with the drought susceptible variety Nebraska #1 dry bean when grown under a low level of available soil moisture.

A qualitative examination of some soluble carbohydrates in Tepary, and Harvester showed that Tepary contained more sucrose in the morning than Harvester.

The respiration rate of Harvester when grown at a low level of available soil moisture was lower than when grown at a high level of available soil moisture and was lower than Tepary grown at either low or high levels of available soil moisture. It is suggested that one of the factors involved in drought tolerance of Tepary is the ability to maintain photosynthesis under high soil water stress and to provide substrates for the maintenance of a near normal respiration rate.

It was observed that the root dry weight leaf area ratio was higher in the drought tolerant Tepary and in the drought susceptible P. vulgaris varieties: Harvester, Nebraska #1 and Top Crop.

SPECIES HYBRIDIZATION IN THE GENUS PHASEOLUS

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No report in the literature has been found by the author on the interspecific cross of Phaseolus acutifolius, the Tepary bean x P. coccineus, the Scarlet Runner bean and on the trihybrid P. acutifolius x (P. vulgaris x P. coccineus.) The creation of a gene pool of these species would enable plant breeders to combine tolerance to drought and a wide range of bacterial, fungal and virus diseases in beans of P. vulgaris type.

Numerous pollinations were made reciprocally between the self-pollinating species, P. acutifolius, and the cross pollinating species, P. coccineus. One interspecific hybrid was obtained when P. acutifolius was used as the female parent. Anthocyanin pigment in the stem of the hybrid served as a genetic marker in this cross. The P. coccineus parent develops anthocyanin on the stem. The cotyledons were intermediate in position on the stem in comparison with the parents. The wings of the petals of the hybrid are scarlet, and the standard is a light pink. The flowers of P. acutifolius and P. coccineus are white and scarlet respectively. The hybrid plant did not flower until two months after P. acutifolius flowered and six weeks after P. coccineus. The flowers of the hybrid were not self-fertile, and no success was obtained in backcrossing reciprocally the hybrid to either parent. Pollen production was considerably reduced in the hybrid but a high percentage of stainable pollen was observed.

Success in obtaining the interspecific cross, P. vulgaris x P. coccineus, has been known since the time of Mendel. Dr. Honma using embryo culture, obtained the interspecific hybrid P. vulgaris x P. acutifolius. The possibility of using P. coccineus as a bridging species in the formation of a gene pool consisting of P. acutifolius, P. coccineus and P. vulgaris was

then investigated. Two trihybrid plants were obtained when the cross P. acutifolius x (P. vulgaris var. Red Kidney x (F_1 P. vulgaris var. Seaway x P. coccineus)) was made. The reciprocal cross was not successful. Petiole length of the primary leaves served as a genetic marker in this cross. P. acutifolius which was used as the female parent in the above cross has extremely short petioles of the primary leaves while the trihybrid plant has long petioles. One of the trihybrid plants developed into a vigorous plant while the other developed into a stunted plant. Pollen production was reduced in this trihybrid plant, and the plant was not self-fertile. It is thought that this barrier to the creation of a gene pool may be overcome by crossing varieties of P. vulgaris, P. coccineus and P. acutifolius other than those used in this study.

Inheritance of Growth Habit and Other Morphological Characters in True and Blue Lake Derived Bushes

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The sturdy, upright habit which characterizes most true bush snap bean varieties contrasts sharply, under western Oregon conditions, with the rangy, floppy habit of determinate breeding lines derived by recurrent backcrossing of determinate bush x pole derivatives to the FM-1 Blue Lake pole bean. This differential appears to be even more marked in warmer climates. During 1961 and 1962 comparison of true bushes with these Blue Lake derived bushes at Corvallis demonstrated the greater general sensitivity of the derived bushes to environmental change imposed by different times of planting, in-row plant spacings, locations (greenhouse versus field), and by short periods of shade. Derived bushes exhibited markedly greater stem elongation under winter greenhouse conditions and, in the field, with closer spacing, later planting, and shade. In all varieties the number of central stem internodes was not greatly sensitive to environmental change.

The inheritance of several morphological characters as well as of gross habit of growth was studied by using 4 parental stocks and the F_1 and F_2 progeny resulting from the 12 possible crosses among them. The two true bush varieties, White Seeded Tendercrop (from Geneva, N.Y.), Puregold Wax, and two Blue Lake breeding lines, OSU 836-9 and OSU 2466 were used as parental material. In the field parents and F_1 and F_2 progeny were grown in a mid-May and a late June planting. In addition, parents and F_1 progeny were grown in the greenhouse during the 1961-62 winter season. Approximately 160 and 480 F_1 and F_2 plants, respectively, from each of the 12 crosses were examined in the field. Except for height of plant, measured shortly prior to anthesis, all characters were measured or rated at the time of pod maturity for processing. Since gross habit of growth and height of pod placement were rated on a 0-9 basis (with 9 denoting better habit or higher pod placement than 0) results concerning these characters may not be absolutely repeatable.

In the greenhouse true bush varieties appeared to contain more of the recessive alleles for habit, height, length of the outstretched plant at maturity, mean internode length, number of central stem internodes, and number of branches. Over the field environments the tendency toward recessiveness in true bushes, while evident in the inheritance of habit and number of internodes, was somewhat less certain for height, length, mean internode length and number of branches.