with considerable success in Florida. Destruction of weed hosts around celery seedbeds and plant houses in the north is being employed to reduce losses in the field. It is well known that when hay is cut, when pastures dry up, or when weeds mature, great migrations of aphids and leafhoppers take place when the weather is warm and the air calm.

R. C. Dickson in the Imperial Valley of California calculated some 40 million winged aphids on a mile front may pass in an hour and flights may keep up for many days or weeks. He found that an individual aphid may feed for less than a minute, before flying on to another host, so each plant may play host to many aphids a day.

Weekly spray or dust programs against the insects after the diseases appear have been disappointing in California, probably because the migrating females that bring in the viruses are not killed quickly enough to prevent their first feeding.

Celery is also subject to attack by several parasitic nematodes such as the root knot nematode (*Meloidogyne* species), the sting nematode (*Belonolaimus gracilis*), the stubby root nematode (*Trichodorus* species), and the awl nematode (*Dolichodorus heteroccephalus*), as well as to damping-off disease (*Pythium* species), pink rot (*Sclerotinia sclerotiorum*), black crown rot (*Centrospora acerina*), rhizoctonia crater spot, a fusarium seedling root rot, a bacterial soft rot (*Erwinia carotovora*), bud failure, and two or more physiogenic diseases, such as black heart, crack stem (boron deficiency), and a pale-yellow mottle leaf (magnesium deficiency).

A. G. Newhall is a graduate of the University of Minnesota and Cornell University. He has made research contributions in the fields of vegetable seed treatments; fungicide testing; and soil sterilization by heat, chemicals, and volatile fumigants. He is research professor of plant pathology at Cornell University.

The Important Diseases of Lettuce

Guy Weston Bohn

American gardeners grow several types of lettuce—the loose leaf varieties, cos or romaine, butterhead, and iceberg. All are in the botanical species *Lactuca sativa*.

Most of the commercial acreage of lettuce is in the Southwestern States, where lettuce, most of it the iceberg type, is grown the year around and shipped in refrigerated cars to all parts of the country.

The lettuce plant has a compact mass of edible, tender leaves on a short stem. Its structure makes it very perishable. Harvesting and handling must be prompt. Lettuce is subject to a variety of diseases during its growth and its distribution to consumers.

Seed decay and seedling blight, diseases that reduce plant stands, are caused by several soil-inhabiting fungi, such as *Rhizoctonia solani* and *Pythium ultimum*.

The fungi attack the tender plants before and shortly after they emerge from the soil and cause the stems and roots to rot. Young plants may be attacked only at the soil surface. If that happens, a short section of the stem rots and the seedling falls over. The injury is called damping-off. Older plants are seldom attacked.

Conditions that reduce the rates of germination and emergence increase losses from seed and seedling rots in heavy, wet, poorly aerated soils, which tend to puddle. Losses in such
soils are increased if seed is planted too deeply or if rain or irrigation water packs the soil about the seeds.

Lettuce seed germinates best at moderately cool temperatures in coarse, well-aerated soils. Losses from rots can be reduced, especially in heavy soils, by planting the seeds shallowly, and by irrigating before planting, or subirrigating. In districts where rain is likely to fall while the seedlings emerge, planting should be after, rather than before, a rain.

Seed decay can be reduced by dusting the seed with a fungicide, such as chloranil (Spergon), at the rate of 4 ounces to 100 pounds of seed; ferric dimethyl dithiocarbamate (Fermate), at 1 pound to 100 pounds of seed; or thiram (Arasan) at the rate of 1 pound to 100 pounds of seed. Yellow cuprous oxide (Cuprocide) is likely to injure the seed.

Sclerotinia drop often causes severe losses in localities where rains come during the growing season, as in the Eastern and Central States. It is especially severe if lettuce and other susceptible hosts are grown repeatedly in the same soil. The disease causes occasional losses in Arizona and California, but it is seldom severe there because most of the commercial crop is grown on raised beds and harvested during rain-free periods.

Sclerotinia drop is caused by the soil-inhabiting fungi Sclerotinia sclerotiorum and S. minor. The fungi attack the leaves of older plants where they touch moist soil. They attack the stem at the moist axils of large leaves near the base of the plant. They cause a soft, watery rot, which spreads rapidly over the stem and leaf bases. The entire plant suddenly collapses. It becomes a soft, watery mass and then turns brown and dry.

A cottony fungus growth can be observed on the stem and leaf bases of plants that show early symptoms. Small black sclerotia of various shapes can be found in the decayed tissues as they become brown and dry. The sclerotia are resting bodies that enable the fungi to pass through periods of unfavorable weather. When moist, cool conditions favor their development, the sclerotia produce mushroom-like apothecia. The apothecia produce innumerable spores which distribute the fungus to new host plants by wind, rain, irrigation water, and cultivating tools.

The fungi can persist for long periods in the soil. They can also attack other crop plants, such as bean, cabbage, celery, eggplant, potato, and tomato. In places where the disease occurs on those crops, large populations of the fungi are built up in the soil and increasingly severe losses occur when susceptible crops follow susceptible crops in soils that harbor the pathogens.

Sclerotinia drop can be controlled in seedbed soils with steam pasteurization or with chemicals: One part of commercial formalin in 50 parts of water applied at the dosage of 1 gallon to a square foot, or calcium cyanamide at the rate of 1,000 pounds an acre, 15 days before planting.

Losses in seedbeds and greenhouses can be reduced by providing good ventilation and by using cultural methods that maintain a dry atmosphere and dry plant and soil surfaces.

In commercial lettuce fields it is best to grow the plants during rain-free periods and maintain a dry mulch around the bases of the plants.

In the West the plants are grown on raised beds and irrigation water is applied in semipermanent ditches. Irrigation water should be applied with care to prevent waterlogging and to prevent wetting the soil surface in contact with the plants.

The building up of large populations of the fungi in the soil can be prevented by rotating lettuce and other susceptible crops with grains and other crops that are not attacked by Sclerotinia.

No variety of iceberg lettuce is known to be resistant to Sclerotinia.
The cos varieties are also susceptible but often are less severely injured than the iceberg varieties. The cos varieties have an upright habit of growth and present fewer moist infection courts to invading fungi.

Botrytis rot and gray mold of lettuce are caused by the soil-inhabiting fungus, *Botrytis cinerea*.

The plants usually develop brown, necrotic lesions on the stem near the soil line, on the bases of leaves near the soil line, or on leaves in contact with moist soil. Infection usually proceeds upward along the stem and inward through successive layers of leaves. Hence, the rot often occurs in one side of the plant. In moist weather a gray mold appears on the dead tissues and on spots elsewhere on the leaves.

*Botrytis cinerea* grows upon decaying vegetable matter in the soil and attacks numerous ornamental and vegetable crop plants during moist weather. It is often troublesome in greenhouses and occasionally causes losses in fields during wet, muggy weather.

Control measures for sclerotinia drop also apply to botrytis rot.

Slime or bacterial rot of lettuce occurs in the field during warm, muggy weather; in transit, in lettuce shipped without refrigeration; and in markets. It often is troublesome in Eastern and Central States. In the West it is seldom seen during cool weather but often occurs in spring.

Slime causes a wet, slimy decay of the large internal head leaves. The outer leaves and the small leaves at the center of the head are usually not affected at first, and the plants often appear normal in the field. They can be detected by twisting the top of the head. The outer and inner firm tissues separate readily at the rotted leaves.

Similarly, the first symptoms of infection in nonheading varieties are observed in the rapidly growing large leaves between the older mature leaves and the younger central leaves. The decaying tissues at first appear water-soaked and soon turn brown. The decay proceeds until the entire plant is reduced to a loose, wet mass. Brown spots and marginal necrosis may occur on all exposed leaves.

Slime is caused by *Erwinia carotovora*, *Pseudomonas virid Elliott*, *P. marginalis*, and other species of bacteria. The growth of these micro-organisms seems to start in dead tissues, such as those caused by tipburn. Once started, the rot spreads rapidly to healthy tissues, progressing most rapidly within affected leaves.

The disease occurs under conditions favorable for the development of tipburn. Losses from slime can be reduced by using the control measures recommended for tipburn. Losses in transit and in markets can be kept low by providing adequate refrigeration and ventilation.

Downy mildew of lettuce occurs throughout the year in the coastal lettuce districts in California, where it is most severe in winter. It is less severe in winter in the drier valleys of California and Arizona. The disease also occurs on lettuce grown under glass elsewhere in the United States and is especially severe during cool, wet weather in winter and spring.

The first symptoms of downy mildew in lettuce appear as scattered light-green to yellow areas on the upper surfaces of exposed leaves. Within a few days downy, white hyphae and conidia can be observed beneath the discolored spots. Old spots become brown. The fungus continues to grow under refrigeration and predisposes lettuce heads to decay by bacteria and other organisms in transit and storage. Symptoms of downy mildew are not spectacular. Secondary organisms may be identified as the sole causal agents of infections initiated by the downy mildew organism.

Downy mildew is caused by an obligate parasite, *Bremia lactucae*. If
moisture is abundant, the fungus penetrates the exposed leaves and grows between the cells. Some hyphae penetrate host cells without killing them and form absorbing organs (haustoria). The fungus produces conidia on profusely branched hyphae that project into the air through stomata. The conidia are carried to new locations by wind and rain and initiate new infections. They enable the fungus to spread rapidly during moist weather.

The fungus that causes downy mildew produces thick-walled resting spores (oospores) within the host tissues. They are released when the host tissue disintegrates. They enable the fungus to survive freezing temperatures and other unfavorable conditions.

The fungus grows only on lettuce and some of its wild relatives. It may overwinter on weeds or in lettuce debris and volunteers in cultivated fields.

Serious losses can be avoided by growing lettuce in a dry atmosphere during rain-free periods, by avoiding excessive irrigation, and by practicing clean cultivation to eliminate lettuce crop residue, volunteers, and weeds.

C. E. Yarwood, working at the University of California at Berkeley, reported that downy mildew on lettuce can be controlled in California fields with 0.2 percent zineb (Parzate or Dithane Z-78) spray with a spreader. However, F. A. Haasis and D. E. Ellis, at the North Carolina Agricultural Experiment Station, found that more potent 2.0 percent zineb drenches at seeding and at weekly intervals thereafter were required to control downy mildew on lettuce in propagation frames in North Carolina.

When conditions are very favorable for downy mildew, control is difficult and expensive. Besides, it is best to avoid the use of fungicides on plants such as lettuce, the edible part of which consists of a mass of leaves.

The varieties Imperial 44, Imperial 152, Imperial 410, Imperial 456, Imperial 615, Imperial 847, Imperial 850, and Great Lakes are resistant to some of the races of downy mildew. These varieties are protected from injury in localities where only those races of downy mildew occur.

Numerous races of B. lactucae exist. Some can attack all the varieties mentioned. Downy mildew has been observed on all of them at some places. Resistance to the different races is very specific; that is, resistance to one race of Bremia does not protect a variety from attack by other races. The value of a variety in controlling downy mildew at any specific location can best be determined by trying it out in that location.

Mosaic of lettuce causes losses in all parts of the United States. Its importance may not be recognized because the plants continue to grow and produce heads. Losses are often attributed to unknown causes.

A filterable virus, harbored in the seed and transferred from one plant to another by aphid vectors, causes the disease. It attacks plants of all ages.

Plants with seed-borne infection and those attacked while young are dwarfed and exhibit leaves that are mottled with irregular, pale-green or yellow areas. Occasional plants are uniformly pale, yellowish green. The leaves often have excessively ruffled margins and may be distorted. They are usually more prostrate than those of healthy plants. The plants may fail to form heads or they may produce small, loose heads of poor quality.

Plants attacked when the heads are developing show mild symptoms, often on one side of the plant. The heads may be irregular in shape because of the unequal growth of diseased and healthy tissues.

Mosaic plants produce seed stalks with mottled and distorted leaves. The plants lack vigor and produce little seed.

The lettuce mosaic virus overwinters in the seeds of lettuce and, perhaps, in the weed hosts, sowthistle and
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groundsel. Usually less than 1 percent of the seedlings are infected so that the disease causes little damage unless the virus is transmitted from the infected seedlings or from infected weeds to neighboring plants by aphids. The disease therefore causes little damage in winter lettuce. It often causes severe losses in summer lettuce in places where aphids are abundant while the plants are small.

Seed-borne infection can be reduced by producing seed in fields free from wild *Lactuca*, *Sonchus*, *Senecio*, and other weeds and isolated from other lettuce. The fields should be rogued while the plants are small to destroy plants that were infected from the seed.

R. G. Grogan and his associates, working at Davis and Salinas, Calif., demonstrated that mosaic can be controlled in market-production fields by the use of mosaic-free seed. Other control measures include isolation from other lettuce and from weeds that harbor mosaic or the insect vector, the reduction of insect populations with insecticides, and the prompt destruction of crop residue in harvested fields.

No variety of the iceberg type of head lettuce is known to be resistant to mosaic. The mosaic-resistant Parris Island variety of cos was made available to growers by the South Carolina Agricultural Experiment Station in 1951.

Aster yellows in lettuce is caused by a filterable virus, which leafhoppers transfer from one plant to another. The disease is widely distributed in the United States and causes severe losses in summer lettuce, especially in the East. Aster yellows has limited the expansion of lettuce production centers in the East and elsewhere. Most of the important production centers are in parts of California and Arizona where the disease seldom occurs.

Young lettuce plants affected by aster yellows have some curled and yellow or white leaves. Small brown spots of dried latex may occur along the margins of the leaves. The leaf veins may be more translucent than those of normal plants. The whole plant may be affected or the infection may be limited to one part. Plants attacked after heading have twisted and dwarfed heart leaves and do not become firm. The axillary shoots often grow before the head is mature. The flowering branches are chlorotic and slender and often bend down under their own weight. The flower heads on such branches are commonly dwarfed and may be distorted. The few seeds they produce are dwarfed and fail to grow.

Aster yellows in lettuce is caused by the aster yellows virus, *Chlorogenus callistephi*. It attacks many cultivated plants and weeds. The California strain of the virus differs from strains found elsewhere in the United States in its ability to attack certain host plants, such as celery and zinnia, which are immune to other strains.

The virus is transmitted from one host plant to another by *Macrosteles divisus* and certain other leafhoppers. It can be transmitted by grafting but not by mechanical means. It is not transmitted by aphids.

The virus commonly passes the winter in such perennial weed hosts as the common plantain. M. B. Linn, working at the Cornell University Agricultural Experiment Station, presented evidence that the vector does not pass the winter in the insect host or in cultivated fields and bordering weed areas in New York. His observations suggest that the insect overwinters in a milder climate some distance from the cultivated areas. The virus is apparently picked up from perennial hosts as the insects migrate into the fields.

A disease of this sort, with a wide host range and transmitted by migrating insects, is difficult to control. For the country as a whole, the disease is controlled by growing most of the commercial crop in districts free from the disease during the lettuce-production season.
The best potential method of control in areas where aster yellows is troublesome is the development of varieties of lettuce resistant to the disease. That is not easy. Ross C. Thompson, working at the Plant Industry Station at Beltsville, failed to find immunity or potent resistance in cultivated lettuce (*Lactuca sativa*) or in related species that can be crossed readily with it. Certain collections of *L. serriola* and *L. saligna* exhibited marked ability to escape infection. Those species may have value in breeding for resistance to aster yellows. *L. tatarica*, *L. bourgaei*, and *L. marschallii* appeared to be immune from aster yellows. Those species are cross-sterile with *L. sativa*. Some means must be found to cross them with cultivated lettuce before their immunity can be exploited.

Until resistant varieties of lettuce have been developed, it will be necessary to use other methods to control this disease in areas where it is troublesome. Dr. Linn recommended protection of seedlings from leafhoppers by cloth or metal screens; isolation of lettuce field plantings from weed areas and other yellows-susceptible crops by 200 feet or more; and weekly applications, from transplanting until 10 days before harvest, of either pyrethrum-sulfur dust (0.15 percent pyrethrum) or rotenone-sulfur dust (1.0 percent rotenone).

D. Ashdown and T. C. Watkins, working at the Cornell University Agricultural Experiment Station, reported success in the control of aster yellows in lettuce in New York with applications at 5-day intervals, from emergence until 2 to 3 weeks before harvest, of 5 percent DDT at 35 pounds an acre. They found no dangerous residue on harvested, marketable heads. The symptoms fade as the head matures, but the head is smaller and less firm than normal heads and the leaves have poor flavor and texture.

Although the above-ground parts of the plants exhibit marked symptoms, they do not contain the virus. The virus is limited to the roots, in which it multiplies. The amount of virus in infested soil is greatly increased when lettuce is grown. The big vein virus persists for long periods in the soil, but not in dried lettuce roots. The reason for this paradox is not clear.

The big vein virus can penetrate lettuce roots without the aid of nematodes or other known vectors. It is possible, however, that root aphids, nematodes, or other organisms act as vectors in natural infections.

No variety of lettuce is known to be resistant to big vein.

Big vein can be controlled in greenhouse and seedbed soils by treatment with heat, with D-D or chloropicrin at the dosage of 0.46 milliliters to a
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Gallon of soil, or with formaldehyde (1.6 percent aqueous) at the dosage of 1 quart to a square foot.

Big vein can be controlled in the field by growing lettuce in virus-free soil. Losses can be held in check in infested soils by rotation of lettuce with other crops that do not harbor the virus. Sporadic infected plants in otherwise clean fields should be removed carefully and destroyed by burning. The infested soil can be treated locally with D-D, chloropicrin, or formalin. Saul Rich, working in Connecticut, recommended a mixture of 1 part commercial chloropicrin with 3 parts of xylene applied at the rate of 500 pounds an acre for the treatment of entire fields.

Brown blight of lettuce is a soil-borne disease of undetermined cause. It is of little importance at present, but it has considerable historical importance. It was a serious disease in California and Arizona from 1917 or earlier until its conquest through the use of resistant varieties developed by the Department of Agriculture and the University of California. Nearly all of the commercial varieties now grown in California and Arizona are resistant to brown blight.

The conquest of brown blight of lettuce by Ivan C. Jagger and Thomas W. Whitaker and their associates had beneficial effects on the lettuce industry and on the quality of lettuce on American dinner tables. The varieties they developed were not only resistant to brown blight; they were also superior to older varieties in uniformity, firmness of head, adaptation to culture during different seasons, and high quality. They are widely grown in the United States and elsewhere, and they have served as high-quality parents in breeding programs.

Brown blight attacks lettuce plants after they have developed five to ten leaves. Seedlings do not show symptoms. Plants attacked while they are small develop small, light-yellow spots in the young, expanding leaves at the center of the plant. The spots enlarge slightly and the leaf areas between them become yellowish green. Those leaves and all subsequent leaves are reduced in size and tend to lie flat on the ground. The diseased plants are discolored, small, and rosettelike. Finally, the leaves turn brown and dry from the bases upward. Many plants die before harvest.

Plants attacked after heads form first show brown, irregular, disconnected, sunken blotches and streaks in the frame leaves or the larger head leaves. The streaks are usually associated with the midrib and larger veins, but they may occur between veins or along smaller veins. They are usually confined to the leaves, but they may extend into the stem. Many leaves or only an occasional leaf may show symptoms. The heart leaves are usually free from symptoms, but they may become brown and moist in nearly mature plants.

In early stages, the roots appear normal. In plants with advanced symptoms the roots may be discolored and have dead root tips.

The cause of brown blight is unknown. It may be a soil-borne virus. Observations by R. G. Grogan, of the University of California at Davis, and me in Imperial Valley suggest that the disease may be caused by the accumulation of toxic concentrations of substances in the soil about the lettuce roots.

Brown blight can be controlled by growing the resistant varieties Imperial 17, Imperial 44, Imperial 152, Imperial 410, Imperial 456, Imperial 615, Imperial 847, Imperial 850, and Great Lakes. Imperial 101 and most other varieties derived from those varieties are also resistant.

Brown blight can be controlled in susceptible varieties by growing them in disease-free soil.

Tipburn of lettuce is a physiological disease that occurs wherever lettuce matures during warm weather. It occurs as the plants approach
maturity and is seldom observed in young plants. Tipburn causes severe losses during the spring and summer. It is less severe during the fall. It seldom occurs during the winter.

Tipburn is characterized by the death and dark-brown discoloration of marginal bands of the larger head leaves. In nonheading varieties, the symptoms appear in the rapidly expanding large leaves as they approach maturity. The mature leaves and the very young leaves are less often injured.

The first symptom of tipburn is usually the breakdown and brown discoloration of small spots of tissue near the edge of the leaf. The spots usually occur first between the larger veins. The spots increase in numbers and coalesce as the disease progresses until the entire marginal band of tissue is killed. The symptoms may appear on only one or two leaves or on most of the leaves in the head. Under very favorable conditions most of the leaves may be involved. The dead tissues remain dry and are confined to the marginal portions of the leaves unless they are invaded by microorganisms. Various bacteria and other fungi may grow in the dead tissues, producing slime. Rotting then proceeds until the entire head is involved.

Tipburn in lettuce appears to be caused by the accumulation of excessive respiratory products in the sensitive tissues during warm nights. Injury seldom occurs at temperatures below 65° F. or during daylight.

Environmental conditions that favor rapid, succulent growth predispose the plants to tipburn injury—excessive soil fertility, excessive soil moisture, and warm temperatures.

Environmental conditions that favor rapid respiration and the accumulation of respiratory products in the large head leaves favor the development of tipburn—warm night temperatures and high relative humidity.

Tipburn can be controlled by growing lettuce during seasons when night temperatures do not exceed 65° F. as the heads mature; growing lettuce in soils that do not favor excessively rapid succulent growth; limiting the amount of fertilizers, especially nitrogenous fertilizers; using irrigation water sparingly when the heads approach maturity; and using resistant varieties.

The Department of Agriculture, in cooperation with several State agricultural experiment stations, has released several varieties of lettuce that are tolerant of conditions that cause tipburn. The most resistant varieties, Imperial 456, Progress, Great Lakes and some of its derivatives, and Alaska, are adapted to culture during the summer. The moderately resistant varieties, Imperial 410, Imperial 615, Imperial 847, Imperial 850, and Jade, are adapted to culture during the spring. Resistance to tipburn is not complete, and all varieties suffer tipburn when conditions are very favorable. The resistant varieties often show little or no tipburn, however, under conditions that render susceptible varieties worthless.

REDHEART OF LETTUCE, a physiological disease, is characterized by the chestnut brown discoloration and breakdown of the small, inner head leaves. The outer leaves may appear normal or they may develop numerous, elongate, brown pits on the midribs and veins and sometimes on the tissue between the veins. It often occurs in transcontinental shipments of lettuce, especially in spring.

The cause appears to be lack of sufficient oxygen, which results from poor aeration or prolonged exposure to low temperatures during shipment and storage. It also results from bacterial rot of the outer leaves, which occurs in shipments without adequate refrigeration.

Redheart can be controlled by providing adequate aeration and prompt and continuous cooling of lettuce to 39° to 41° F. in shipping containers, refrigerator cars, and terminal storage, and by prompt movement of the produce from the grower to the consumer.
PreMature yEllowing, rib blight, and several other obscure diseases occur in head lettuce in the field and during shipping and marketing. The diseases occur most commonly during the spring and appear to be caused by various physiological disturbances.

Premature yellowing is associated with poor development of the root system and the production of small, infirm heads. Losses result from reduction in yield and from poor quality. Yellowing in early spring lettuce in Arizona was found to be associated with poor aeration, excessive soil moisture, and salt accumulation in the root zone. This complex of adverse conditions results from soil compaction by farm machinery and untimely applications of irrigation water. Losses can be reduced by avoiding the use of heavy machinery, especially on wet soils, and by avoiding excessive applications of irrigation water.

Rib blight is characterized by the occurrence of a dark-brown, necrotic strip of tissue along the midvein near the center of the leaf. This symptom occurs in only one or two or in several of the large head leaves. The plants often appear otherwise normal and the disease can be detected only by removing the outer leaves.

Rib blight appears to be associated with rapid, succulent growth; the plants are often vigorous and dark green in color. The disease predisposes heads to attack by bacteria and losses are often attributed to slime. The cause of rib blight is unknown. Excessive applications of fertilizers and irrigation water should be avoided—they favor rapid, succulent growth and predispose lettuce to injury by rib blight, tipburn, and other physiological disorders.

Guy Weston Bohn is a pathologist in the Bureau of Plant Industry, Soils, and Agricultural Engineering at the United States Horticultural Field Station, La Jolla, Calif. Before joining the Department, he was an instructor in genetics in Texas Agricultural and Mechanical College.

Cauliflower, Cabbage, and Others

J. C. Walker

The cabbage tribe includes cabbage, cauliflower, broccoli, brussels sprouts, kohlrabi, kale, and collard. All have been derived from the leafy wild cabbage of Europe. They intercross readily with each other and with cabbage.

Somewhat removed from them botanically is radish, which does not ordinarily cross with members of the cabbage tribe. When it does, a rank-growing, sterile hybrid usually results.

Turnip and rutabaga are the other two important vegetables in this group. They are known to hybridize with each other. Their hybrids, too, generally are sterile.

All these vegetables belong to the family of plants known as crucifers, which includes also Chinese cabbage, water cress, rape, the wild and cultivated mustards, and many weeds, such as shepherds-purse and pennycress.

Some 60 diseases may affect one or more of the cruciferous vegetables. The most destructive are yellows, black rot, blackleg and dry rot, clubroot, and mosaic.

Yellows, a warm-weather malady, is most destructive throughout the Corn Belt and as far north as central Wisconsin and northwestern New York. It is not important on the midwinter crop in the South but may be destructive on autumn-sown cabbage and on the part of the crop that grows into late spring.