Legumes in the South

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The annual legumes grown in the Southeastern States are classified into two groups, winter and summer annuals, according to their adaptation. They are grown in rotations, for green manure, intermixed with a main crop but subsidiary to it, following a main crop, and for hay and pasture. Some are grown as seed crops. A few perennial legumes are also grown for soil improvement, erosion control, hay, and pasture.

The winter annuals are field pea (Pisum arvense), vetch (Vicia species), crimson clover (Trifolium incarnatum), lupine (Lupinus species), roughpea (Lathyrus hirsutus), and bur-clover (Medicago species).

The summer annuals are lespedeza (Lespedeza species), cowpea (Vigna sinensis), velvetbean (Stizolobium species), crotalaria (Crotalaria species), and alyceclover (Alysicarpus vaginalis).

The perennial legumes are kudzu (Pueraria thunbergiana), sericea lespedeza (Lespedeza cuneata), and big trefoil (Lotus uliginosus).

None of them is native to the Southeast. All are susceptible to diseases, some of which are widespread and serious. The diseases are caused by bacteria, fungi, viruses, nematodes, and parasitic seed plants.

Root knot nematodes (Meloidogyne species) occur throughout the Southeastern States. They are usually more abundant in sandy soils than in heavy soils and cause greater damage to the roots of susceptible plants during the summer than in the winter, although they are active and do multiply to some extent on the roots of winter crops. All the legumes we named, except species of Crotalaria, are susceptible to root knot nematodes; their culture in areas where nematodes are present tends to increase the nematode population in the soil and to increase the possible damage to susceptible crops that follow in rotations.

The field pea (represented by the Austrian winter) is grown largely as a soil-improvement crop. It has lost favor with some growers because of competition from the blue lupine, its failure to produce seed well in the Southeast, and its susceptibility to diseases.

The most destructive of the diseases in most years is caused by the fungi Ascochyta pinodella and Mycosphaerella pinodes, which involve so much of the stem tissue and turn it dark brown or black that the name black stem is applied to the disease they produce. All above-ground parts of the plant are susceptible to it. Sometimes the plants are killed before they can produce seed. The disease may live over summer in the seed or soil. The best way to control it therefore is to plant disease-free seed and practice a rotation of 3 or 4 years.

Another common disease of pea is leaf blotch, caused by the fungus Septoria pisi. It usually is the first to appear on the seedlings in the autumn. Often it is present a month or so after planting time. It attacks the first leaves, causing the tissues to turn yellow and later brown. Gradually it kills them. Brown or black pycnidia soon appear in the diseased areas. In them are formed the spores, which spread the disease still further. A single blotch may involve the petioles and tendrils and run down these into the stem and girdle it. It usually does not involve as much of the stem above or below the node as does the black stem. The blotch disease continues to
spread in winter, when it often is too cold for the black stem. Rotation is the only control method we know of.

Peas are commonly attacked in spring by powdery mildew, caused by the fungus *Erysiphe polygoni*. The mildew attacks the lower leaves first and gradually spreads toward the top. The mildew fungus gives the plant a whitish color as if it had been dusted with flour. Seriously affected plants eventually die. Because the disease does not appear until late spring, it usually is not very injurious if the crop is plowed under for green manure. This disease and the others we mentioned largely are responsible for the low yield of seed. No control method is known.

Root rot, caused by the fungus *Aphanomyces euteiches*, is a destructive disease of peas. In late winter or spring it gives a dwarfed appearance and pale yellow color to the affected plants. The affected roots and underground part of the stem are slightly darker in color than the healthy parts and have a moist rot, mostly on the outer layers. The discolored and dwarfed condition of the tops is brought about by the inefficient functioning of the diseased roots. Many of the plants die but others, although alive, make little growth and set little seed. The Romack variety of pea is resistant to the disease.

Winter peas are susceptible to root knot nematodes but usually are not seriously damaged by them, except in the southernmost part of the pea belt and in some of the soils of the Coastal Plain.

Vetches are planted largely for soil improvement and winter pasture, but they have lost favor in areas in which lupines can be grown. Diseases also have been a factor.

One of the most common fungus diseases is anthracnose, caused by *Colletotrichum villosum*. On the leaves it produces small, round spots, which first are light green and later become light brown or gray, with a brown or red border. The stem lesions are linear and usually dark brown. On the pods the lesions are dark red, with a darker margin and lighter center. Severe defoliation and death of the entire plant may occur during wet weather. The disease can be controlled by rotation or by planting such resistant species as the bigflower vetch (*Vicia grandiflora*), monantha vetch (*V. articulata*), and Hungarian vetch (*V. panonica*).

Some species are quite susceptible to a blight caused by the *Ascochyta* fungi that attack pea. The blight causes more or less circular spots on the leaves and long, reddish lesions, which later turn gray on the stems. The lesions usually have a reddish border surrounding the grayish center. Black pycnidia are scattered over the gray area. Pod lesions are like those on the stem. Leaves, stems, and pods may be killed. The disease can be controlled by rotation of crops.

Several species of vetch are rather severely attacked by a leaf spot caused by the fungus *Botrytis cinerea*. Small, dark-red spots are produced on the leaflets, stems, tendrils, and petioles of some species. The spots may be so numerous that they cause considerable defoliation and kill the stems. The disease is especially serious in wet weather. It can be controlled by rotation and by planting resistant species, such as hairy vetch (*Vicia villosa*) and purple vetch (*V. atropurpurea*).

Many vetches are quite susceptible to the aphanomyces root rot. Hairy vetch is resistant and should be used when that fungus is known to occur in the soil. Vetches are susceptible to root knot nematodes but usually are not seriously injured by them.

**Crimson clover** is grown for soil improvement and pasture throughout the Southeastern States and in some places as a seed crop. The development of hard-seeded varieties, such as Dixie and Auburn, which are maintained by volunteer reseeding for several years, has increased its use for pasture.

Crimson clover is prey to several
diseases. Crown and stem rot, caused by the fungus *Sclerotinia trifoliorum*, is the most destructive. It develops and spreads rapidly in cool, wet weather. It can be recognized by the scalded, circular patches of dead and dying plants in affected fields.

The fungus produces small, black, tough bodies about the size of wheat kernels after it has destroyed the plants. The sclerotial bodies carry the fungus through hot weather, which is unfavorable for its growth. They germinate in fall when the weather is again cool and wet. Small, inconspicuous structures like toadstools, which develop from them, produce the spores or seeds of the fungus. These reinfect plants and start the disease off anew each year.

Rotations that use crops not susceptible to the disease are one way of holding it in check. The fungus dies in the soil when susceptible plants are absent. Deep plowing of land is another way of controlling it. The sclerotial bodies are buried deeply and cannot get their sporebearing structures to the soil surface. The normal life cycle of the fungus is broken and it soon dies.

Sooty blotch, caused by the fungus *Cymadothea trifolii*, appears as black, crusty blotches on the under sides of leaves and on petioles. It prefers wet, cool weather and causes the greatest damage in late fall while plants are still in the seedling stage. No control method is known.

Crimson clover is susceptible to root knot nematodes. Nematode injury stunts and yellows the plants.

The blue lupine has largely replaced peas and vetches as a soil-improvement crop in places where it is adapted because it grows vigorously and yields abundant seed. The sweet strains of lupine also provide winter forage. Like the other winter legumes, however, the lupines are subject to a number of diseases.

Anthracnose, caused by the fungus *Glomerella cingulata*, is destructive in some areas. It attacks all above-ground parts of the plant. The first symptoms are dark-colored, circular spots on the cotyledons. From those lesions the disease usually spreads to the stem, where it causes black bands, which may eventually girdle the stem and kill the plant. Small, dark lesions, usually one-third to one-half as wide as the leaflet and having light centers and dark borders, may be found on the leaflets. Older stems and branches may have many long, brown lesions, often with concentric rings on the surface. Pod lesions are nearly black and circular or irregular; they may involve half or more of the pod, often killing it and destroying the seeds within. Anthracnose can be controlled by planting disease-free seed on land that has not grown lupines for at least 2 or 3 years. As the fungus in the seed dies in about 18 months, seed held over until the second planting time after harvest is free of disease.

Brown spot, caused by the fungus *Ceratophorum setosum*, appears as small, nearly black spots on leaves, petioles, stems, blossoms, and pods. When the spots are very abundant, severe defoliation results. The spots may be so abundant on the stems that they merge and form large, black cankers, which may girdle and kill the stem. The causal fungus may grow through the pod and enter the seed. The fungus in the seed remains alive for more than 2 years; hence, 2-year-old seed is not disease-free, as is that affected with the anthracnose fungus. Rotation is the only control method known.

All above-ground parts of the lupine plant are susceptible to powdery mildew. The disease appears too late in the spring, except possibly in the extreme southern part of the lupine belt, to do much harm to the part of the crop turned under for green manure, but it can cause defoliation and loss of the seed crop. No control method is known.

Southern blight, caused by the fungus *Sclerotium rolfsii*, may attack lupines. It rots the base of the stem
and kills many plants. It usually can be identified by the presence of white mold on the surface of the decayed area. Often, especially in wet weather, small white or brown sclerotia are present on the base of the diseased plant or on the nearby soil. Seedlings and grown plants may be attacked if conditions are suitable. Generally the disease is confined to a plant here and there, but occasionally it kills large numbers of plants. No control method is known.

Lupines are susceptible but are seldom conspicuously injured by root knot nematodes. Occasionally swelling of the roots and dwarfing of the tops of affected plants are seen, especially in areas where the nematodes are abundant.

The so-called rough pea, single-bolt pea, Caley-pea, or wild winter pea is grown in small areas in the Southeast for soil improvement and pasture. The plant is more resistant to diseases than are most legumes. It may be attacked by some of the diseases described for field peas, such as the Ascochyta, but it seldom is seriously injured by them. Roughpea is susceptible to root knot nematodes but is seldom seriously damaged by them.

Several species of bur-clover are grown to some extent in the Southeast for soil improvement, forage, and seed. All are susceptible to anthracnose, caused by the fungus Colletotrichum trifolii, which also attacks other clovers. The disease may girdle the petioles, thereby killing the leaves and eventually the entire plant.

Another clover disease that sometimes causes considerable injury to bur-clover is cercospora leaf spot, caused by the fungus Cercospora zebrina, which produces dark, circular spots on leaves and linear lesions on the petioles. Many leaves are killed during wet periods. Rotation is the only control method known for the diseases.

Bur-clovers are also susceptible to the root knot nematodes, but, like most other winter annuals, are not seriously retarded by them.

Lespedeza is grown extensively in many of the Southeastern States as a summer annual. It is commonly grown intermixed with a main crop but subsidiary to it. Lespedeza is utilized as a hay, pasture, seed, and soil-improvement crop. It is host to several diseases.

Dodder (Cuscuta arvensis) is a parasitic seed plant that attacks lespedeza and frequently overruns entire fields in late summer. It retards normal plant growth. Once dodder is introduced into the soil it persists for many years. Rotation with crops that it does not attack is the only known method of control.

Southern blight, discussed earlier as a disease of lupines, also attacks lespedeza and destroys many plants in late summer. Hot, wet weather favors its development and spread. We know of no way to control it.

Powdery mildew, caused by Microsphaera diffusa, is also common on les pedeza. Resistance to powdery mildew has been incorporated into Rowan, a new variety.

Root knot nematodes attack lespedeza throughout its entire range and frequently cause severe stunting and yellowing of infested plants. During drought periods such plants die as their root systems are so completely knotted by the multiplying nematode population that they can no longer function properly. Rowan is resistant to root knot nematode and will likely replace susceptible varieties wherever it is adapted.

Cowpeas have been grown in most of the Southeast for many years. The many varieties are utilized for hay, soil improvement, and food. Diseases were recognized as a limiting factor in the production of cowpea at an early date, and some of the first selection for disease resistance was done with this crop.

Wilt, caused by Fusarium oxysporum f. tracheiphilum, probably is the most seri-
ous disease. It affects the vascular systems and causes the plants to wilt and die. Brabham, Buff, Iron, Victor, and Groit are resistant varieties.

Powdery mildew, described earlier as a fungus disease of winter pea and lupine, also attacks cowpeas. White spot, caused by *Aristostoma oeconomicum*, is another fungus disease very common on cowpeas. It often does severe damage to leaves. No control for either disease is known.

Bacterial blight, caused by *Xanthomonas vignicola*, a destructive disease of cowpeas in some areas, produces stem cankers, which blight and often kill infected plants. Brabham, Buff, and Iron are resistant varieties and should be grown in the areas where blight is known to occur.

Cowpeas are host to several viruses, about which little is known.

Root knot nematodes commonly attack cowpeas and retard their growth. The cowpea is a host on which the nematodes multiply rapidly.

**VELVETBEANS** are grown extensively in limited areas in the Gulf Coast States and are utilized primarily for pasture and soil improvement. Diseases have not been reported destructive on any of the many species that are grown, although several are known to attack velvetbeans. They are susceptible to the southern blight fungus, which has been mentioned as attacking other annual legumes. Two leaf spots, one caused by a bacterium, *Pseudomonas syringae*, and the second caused by a fungus, *Cercospora stizolobi*, are common diseases on velvetbeans. Root knot nematodes attack velvetbeans but are considered less severe than on many other legumes.

**CROTALARIA** is a summer annual grown on very sandy soils in limited areas in the Southeast. It is commonly planted following an early crop and is used quite extensively to improve soil in peach orchards. It is the only annual legume grown in the region that resists root knot nematodes. This resistance accounts for its specialized use as a cover crop in orchards and with other perennial plantings that are susceptible to root knot.

Although resistant to root knot, crotalaria is susceptible to several fungus diseases. Stem canker, caused by *Rhizoctonia solani*, destroys many young plants in hot, dry weather. Leaf spot, caused by *Cercospora crotalariae*, is common on crotalaria wherever it is grown and frequently causes severe defoliation. No control methods are known.

**ALYCECLOVER** is a summer annual grown only in limited areas in the Gulf Coast States. It is utilized as a pasture, hay, and soil-improvement crop. It is very susceptible to root knot nematodes and is quickly killed by them. No other diseases are known to be destructive to alyceclover.

**KUDZU**, a perennial, is grown quite widely in the Southeast for the control of soil erosion and for pasture and hay. It is a vigorous grower and seldom is injured severely by disease. Small plants are sometimes killed by a root rot caused by the fungus *Rhizoctonia solani*. Leaflets are commonly affected with halo blight, caused by the bacterium *Pseudomonas phaseolicola*, a disease that also attacks the garden bean plant. On kudzu it produces a small, brown center, surrounded by a wide yellow band or halo. Sometimes the halo is several times as large as the brown center. Only when the spots are numerous does much defoliation occur. New leaves are produced so rapidly that the loss of a few of the older ones is of minor importance.

A disease more limited in its distribution but more destructive when it does occur is caused by the fungus *Mycosphaerella puerariae*. Lesions are confined to the leaves and are dark brown and often have a yellowish margin. Lesions may coalesce over large areas of the leaf, and defoliation results. Leaves having many lesions gradually die and fall off. Kudzu is
LEAF DISEASES OF RANGE GRASSES

Susceptible to root knot nematodes but seldom is damaged by them.

SERICEA LESPEDEZA is a perennial grown throughout the Southeast. It is widely utilized for hay, pasture, soil improvement, and erosion control. Many of the diseases that attack annual lespedeza also attack sericea. None is considered destructive, however, and on the whole sericea lespedeza is quite free from disease troubles. It is somewhat susceptible to root knot nematodes but is not seriously retarded by them.

BIG TREFOIL is a perennial legume. It is well adapted on the low, wet soils in the coastal areas of the entire region and it is planted with grasses for pasture purposes.

Trefoil is susceptible to a foliage blight caused by Rhizoctonia solani. Blight is most destructive during the hot, wet summer season on rank, dense growth. Proper management through grazing is the only means of checking extensive damage from the disease. That does not eliminate the fungus from the soil but does check its destructiveness as a foliage disease of trefoil.

Big trefoil is also susceptible to root knot nematodes. It does not suffer extensive damage from them, however, as it is grown on low, wet land; secondary drought effects frequently associated with root knot damage do not occur.

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