ALABAMA A&M AND AUBURN UNIVERSITIES

ALABAMA COOPERATIVE Extension SYSTEM

ANR-856

Nematode Suppressive Crops

Plant parasitic nematodes are destructive, hard-to-control soil pests of vegetables, annual flowers, woody ornamentals, and many row crops. Southern and peanut root-knot nematodes are the two most common nematode pests. Control practices for these and other damaging nematodes have largely focused on yearly nematicide treatments. However, nematicides for home and farm use may not be available in the future, so environmentally sound control practices may have to be used to effectively manage these damaging pests.

One of these practices is growing nematode suppressive crops. Nematode suppressive crops prevent the buildup of damaging levels of nematodes naturally without nematicides or lengthy rotations to non-host crops (see Table 1).

Several plants may minimize nematode damage in the following vegetable and field crops. Some marigolds, a few varieties of chrysanthemum, and castor bean, partridge pea, several *Crotalaria* spp., velvetbean, sesame, and rapeseed produce nematicidal (killing) and nematistatic (suppressive) organic compounds. These natural compounds, which are toxic to nematodes, are released from the roots of living plants or by plants incorporated into the soil as a green manure. Some plants, which also act as a trap crop, prevent nematodes from maturing or reproducing once they enter the roots. In addition, the roots of some of these plants simply may not be a good food source for nematodes, thereby reducing their numbers by starvation. Finally, the bacteria colonizing the roots of some plants may interfere with the life cycle of plant parasitic nematodes.

Marigolds

The ever-popular marigold is the most familiar of the plants known to actively suppress plant parasitic nematodes. In trials, marigolds grown throughout the summer suppressed common garden nematodes such as root-knot *(Meloidogyne),* lesion *(Pratylenchus),* and stunt *(Tylenchorhynchus)* nematodes. Available evidence indicates that all marigolds act generally as trap crops and also contain chemicals toxic to nematodes.

Not all marigold species are effective in suppressing populations of damaging nematodes. In fact, some marigolds are susceptible to the less common ring *(Criconemella),* stubby-rot *(Trichodorus),* and spiral *(Rotylenchus)* nematodes.

Of all types of marigolds, French dwarf marigolds *(Tagetes patula)* give the most consistent control of the greatest number of damaging nematodes species. (French dwarf marigolds known to suppress nematodes are listed in Table 2). Four other marigold

Table 1. Host Range Of Common Root-Knot Nematodes.

Root-Knot Nematode	Susceptible	Resistant
Southern	cotton, soybean, corn, tobacco, peach, edible beans, carrot, cucumber, cabbage, okra, potato sweet potato, tomato	peanut, johnsongrass, strawberry, coastal bermudagrass, sorghum, millet (some), bahiagrass
Peanut	peanut, tobacco, soybean, corn, watermelon, carrot, cucumber, eggplant, cabbage, pepper, onion, potato, squash	sudangrass, cotton, coastal bermudagrass, sweet potato, sorghum (some), millet (some), bahiagrass
Northern	peanut, tobacco, soybean, cantelope, carrots, cucumber, eggplants, lima beans, onion, pepper, lettuce, mustard, potato, snap bean, squash, sweet potato, tomato	coastal bermudagrass, corn, cotton, okra, watermelon, bahiagrass
Javanese	soybean, tobacco, corn, grain sorghum, bahiagrass, vetch, clover, cowpea, cantelope, carrot, okra, beans, cabbage eggplant, lettuce, onions, potato, squash, tomato	peanut, cotton, pepper, strawberry, sweet potato, coastal bermudagrass, marigold

Table 2. Reaction Of Nematode Suppressive Crops To Common Nematode Pests.

Suppressive Crop	Common Root-knot Species			
	Southern	Peanut	Northern	Javanese
French Marigold *(Tagetes patula)*				
'Tangerine'	**	**	**	—
'Happy Days'	—	—	—	**
'Lemondrop'	**	—	—	—
'French Dwarf Double'	—	—	—	—
Chrysanthemum *(C. morifolium)*				
'Escapade'	**	—	—	—
Castor Bean *(Ricinus communis)*				
'Bronze King'	**	—	—	—
'Hale'	—	**	—	—
Partridge Pea *(Cassia fasciculata)*	—	**	—	
Showy Crotalaria *(C. spectabilis)*	**	**	—	**
Florida Velvetbean *(Mucuna deeringiana)*	**	**	—	**
Common Vetch *(Vicia sativa)*				
'Cahaba White', 'Vantage', 'Nova II', 'Vanguard', and 'Warrior'	**	**	—	**
	—	**	—	—
Rapeseed *(Brassica napus)*				
'Juniter', 'Cascade', 'Elena', 'Indore', 'Humus', 'Bridger', and 'Dwarf Essex	**	—	—	**
Sesame *(Sesame indicum)*	—	**	—	—

**indicates a high level of suppression.
—indicates no suppression or no available data.

species, including some cultivars of the African *(T. erecta)* and South American *(T. minuta)* marigold, reduce numbers of root-knot nematode.

Control of root-knot nematode with French dwarf marigolds is complicated by the number of root-knot species found in Alabama soils. All French dwarf cultivars are not equally effective in controlling a mixed population of several root-knot nematode species. In one study, the French dwarf marigold cv. 'Tangerine' suppressed reproduction on southern *(M. incognita)*, northern *(M. hapla)*, and peanut *(M. arenaria)* root-knot nematodes while cvs. 'Petite Harmony', 'Petite Gold', and 'Goldie' supported some root-knot reproduction. The cv. 'Petite Harmony' was very susceptible to several root-knot species. In another study, the French dwarf cv. 'Lemondrop' controlled southern root-knot. When planted as a cover crop before carrot, the French dwarf cv. 'Happy Days' greatly reduced damage caused by javanese root-knot *(M. javanica)* and lesion nematode *(P. alleni)*. Reaction of cvs. 'Lemondrop' and 'Happy Days' to other root-knot nematode species is not known. In another study, the cv. 'French Dwarf Double' greatly reduced populations of reniform nematode.

A few marigolds scattered through a vegetable garden will not control plant parasitic nematodes. For effective nematode suppression with marigolds, solid seed the garden with a recommended cultivar from Table 2. Maintain the solid stand of marigolds for at least 2 months and then turn them under with a plow or rototiller as green manure. Keep the treated area weed free until the next vegetable crop is planted.

While marigolds can suppress nematodes, they can also cause other problems. Dense stands of marigolds are weeds in a vegetable garden because they compete with crops for essential nutrients and water. In many gardens and landscape beds, marigolds are also a common source of spider mites.

Tropical Legumes

Tropical legumes are often used as summer annual forages for grazing livestock and for improving soil fertility. Some have been shown to suppress damaging nematodes. Foliage of some tropical legumes incorporated into the soil as a green manure may also reduce populations of some root-knot nematodes.

Many tropical legumes are highly susceptible to attack by all common root-knot nematodes. Carpon desmodium *(Desmodium heterocarpon)*, hairy indigo *(Indigofera hirsuta)*, pigeonpea *(Cajanus cajan)*, and alyceclover *(Alysicarpus vaginalis)* should not be planted in areas infested with root-knot nematode.

Forage crops that may be used for nematode suppression in vegetable gardens and row crop fields are discussed below.

Castor Bean *(Ricinus communis)* greatly reduces survival of juveniles and reproduction of southern, peanut, and lesion nematodes. Castor bean cultivars evaluated for

nematode suppression are listed in Table 2. Castor beans should be plowed under as a green manure before a seed crop is set. A single seed contains enough poison to kill humans, pets, and livestock. Seed availability is limited.

American Jointvetch. When incorporated as green manure, American jointvetch *(Aeschynomeme americana)* suppresses the peanut root-knot nematode. However, other trials have shown that American jointvetch is susceptible to five root-knot species, including southern and javanese root-knot nematodes. Therefore, this forage legume should not be used to suppress nematodes in a garden or most row crop production systems.

Partridge Pea. Grown for 2 years, partridge pea *(Cassia fasciculata)* will reduce populations of peanut root-knot nematode. Since the effect of partridge pea on the more common southern root-knot species is not known, partridge pea is not recommended as a nematode suppressive crop in home gardens but may be rotated with peanuts. Also, partridge pea's small, hard seed makes this forage a potential weed problem.

Showy Crotalaria *(C. spectabilis)* is reported to be highly resistant to the southern, peanut, and javanese root-knot nematodes. Its resistance to a broad range of root-knot nematodes makes showy crotalaria a suitable rotation and green manure crop in home gardens. Showy crotalaria should be grown as a green manure because its tops and seed are toxic to livestock and humans.

Velvetbean. If velvetbean *(Mucuna deeringiana)* is grown the year before planting peanuts, root exudates of velvetbean and associated rhizobacteria reduce populations of the peanut root-knot nematode. Velvetbean also reduces juvenile populations of the southern and javanese root-knot nematode. Velvetbean may be incorporated into the soil as a green manure, allowed to mature before the tops are chopped down with a disk, or cut as hay for cattle or other livestock.

Temperate Legumes

Temperate legumes are often planted as a winter cover crop in gardens and row crop land. Common vetch *(Vicia saliva)* and hairy vetch *(V. villosa)* are widely cultivated as winter cover crops. Caley pea *(Lathyius hirsutus)* has also been used as a cover and forage crop on calcareous clay soils in Alabama and Mississippi.

Use of these cover crops for nematode suppression is discussed below.

Common Vetch. Cultivars of common vetch are resistant to the southern, peanut, and javanese root-knot nematodes. Those cultivars are 'Cahaba White', 'Vantage', 'Nova II', and 'Vangard'. The cultivar 'Warrior' is highly resistant to the peanut root-knot nematode. The broad resistance of the above common vetch cultivars makes them suitable for use as a winter cover crop in gardens and some row crops. Common vetch may be a weed problem if allowed to set seed.

Hairy Vetch. Because hairy vetch is highly susceptible to several root-knot species, this legume should not be grown on root-knot infested garden and croplands.

Caley Pea. In screening trials, caley pea has supported some reproduction of the peanut root-knot nematode. Reaction of this legume to the southern and javanese root-knot nematodes is unknown. Because little information is available concerning the reaction of caley pea to several damaging nematodes, it is not recommended as a cover crop on nematode infested sites.

Rapeseed

Rapeseed *(Brassica napus)* is an annual winter crop grown for industrial oil. Normally, this crop is planted in the fall and harvested for seed in the spring. Rapeseed contains sulfur-containing chemicals (glucosinolates) that break down in decomposing tissues into compounds toxic to nematodes. Rapeseed cultivars 'Dwarf Essex', 'Elena', 'Indore', 'Jupiter', 'Cascade', 'Bridger', and 'Humus' are effective in suppressing southern and javanese root-knot nematodes. However, some rapeseed cultivars support high populations of the southern root-knot nematode and reproduction of the less common northern root-knot nematode.

Rapeseed is most effective against nematodes when incorporated as a green manure 2 to 3 months after planting in the fall. Mature rapeseed (6 months old) plowed under as a green manure has little affect on root-knot nematode populations. Early (September) plantings of rapeseed should be avoided.

Bahiagrass

Bahiagrass, a widely used warm-season perennial pasturegrass in the southern two-thirds of Alabama, is an excellent nematode suppressive crop of all important root-knot species. This aggressive grass is especially well adapted to the well-drained soils of Alabama's coastal plain.

Bahiagrass rotations provide excellent suppression of peanut and southern root-knot nematodes. Long-term bahiagrass rotations provide the additional benefit of suppressing soil-borne diseases (white mold and vascular wilts) and improving soil tilth. All bahiagrass varieties are easily established from seed.

In most fields and gardens, bahiagrass works best when grown for a minimum of three summers. Often, two summer crops can be grown with little interference from nematodes or soil diseases before reseeding bahiagrass. When grown

for at least 4 years, bahiagrass pasture controls nematodes and soil-borne diseases in root-knot sensitive field and vegetable crops. Shorter bahiagrass rotations will greatly reduce juvenile numbers but some damage, particularly in fields or gardens with exceptionally high root-knot populations, will occur. In those fields or gardens with high larval populations, bahiagrass should be grown for a minimum of 5 years before the field is rotated back to a nematode susceptible crop.

When tall fescue or coastal bermudagrass is used in place of bahiagrass, the same cropping patterns should be followed. If broadleaf weeds in a bahiagrass pasture are not controlled, some nematode damage may be seen.

Sesame

Sesame *(Sesame indica)*, a crop valued for its oil and seed, has suppressive activity against the peanut root-knot nematode. When grown as a summer annual, this crop has proven equally if not more effective than bahiagrass and cotton in reducing the carryover of peanut root-knot nematode juveniles in the soil in a peanut or soybean production system. The status of sesame as a host of other species of root-knot nematode commonly found in Alabama has not been determined. Sesame may be rotated with peanut, soybean, and possibly cotton. A single crop of sesame in a field heavily infested with the peanut root-knot nematode will not suppress nematode populations sufficiently to eliminate the need for a nematicide treatment on the following year's peanut crop.

Conclusion

Growing a nematode suppressive crop will not eliminate plant parasitic nematodes from the soil. However, it may reduce nematode numbers enough to allow production of nematode susceptible plants in a nematode infested field, bed, or garden. If nematode populations are high, cropping several successive suppressive or non-host crops will be needed before a susceptible crop may be grown without the protection of a nematicide. Nematode populations often can rebound to pretreatment levels on a susceptible vegetable or field crop grown after the production of a nematode suppressive crop. Nevertheless, suppression of nematodes by growing nematode suppressive crops has been similar to or somewhat better than suppression of nematodes obtained with a weed-free summer fallow.

Some Additional Sources Of Information

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