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EFFECTS OF COTTON AND ROTATION CROPS ON NEMATODES AND PLANT DISEASES

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Abstract

Damage to cotton from nematodes and diseases results in significant economic loss each year throughout the cotton belt. The average crop loss caused by nematodes has been reported to be as high as 10% in some states, though losses in individual fields can be more than 50%. Such losses occur despite the widespread use of nematicides. Losses caused by seedling diseases are highly variable and hard to predict, but losses can be devastating when conditions are favorable for disease: for example, Tennessee reported a statewide average loss to seedling diseases of 20% in 2002. Crop rotation can help minimize damage from nematodes and diseases, but potential rotation crops are often less profitable than cotton. A rotation crop that is profitable in one area may be economically unsuitable in another, so rotation recommendations must be evaluated with due consideration of local experience. Crop rotations may have beneficial effects regardless of nematode and disease problems if they improve soil fertility, soil tilth, cation exchange capacity, soil organic matter, or other factors that are likely to increase the yield of a subsequent cotton crop. Various legumes, sod-forming grasses, and crops that leave a lot of organic matter in the field are the most likely rotations to improve soil quality. The greatest cotton losses often occur in varieties and fields with the highest yield potential. If the percent loss is the same for two varieties, the variety with the greatest yield potential will lose more actual pounds of lint: a 25% loss is greater if the yield potential is 1,000 pounds per acre than if the potential is only 600 pounds. There is some evidence that varieties with the highest yield potential may suffer greater percent losses, but that has not yet been documented conclusively. However, it is clear that nematode and disease management become more important as yield potential increases. Rotation crops will reduce the damage caused by nematodes in a subsequent cotton crop if nematode reproduction is sufficiently limited on the rotation crop, so the best rotation crops must be very poor hosts for the nematode you wish to suppress. To illustrate why a rotation crop must be matched to the specific problem in a field, consider an example: corn is a very poor host for the reniform nematode and a good host for the southern root-knot nematode, so corn could reduce reniform damage but increase root-knot damage in a subsequent cotton crop. A few examples of crops that have been shown to be useful rotations for reniform nematode suppression in cotton include corn, peanut, bahiagrass, and coastal bermudagrass; crops useful for southern root-knot nematode suppression include peanut, sorghum, and coastal bermudagrass. Some crops that are generally susceptible to a specific nematode may have certain cultivars that are highly resistant, and the resistant varieties may be suitable for rotation with cotton: for example, most soybean varieties are very susceptible to the reniform nematode, but a few varieties have a high level of resistance and are effective at suppressing reniform nematode population levels. In most instances, one year of a nematode-resistant rotation crop will have a significant effect, and two years will be sufficient to achieve the maximum benefit. Unfortunately, nematodes typically rebound to pre-rotation levels after only one year of cotton. Cotton seedling diseases may be suppressed slightly by a rotation crop that is a poor or non-host for the fungal pathogen, but the fungus *Rhizoctonia* can grow on dead plant residue in a field and on some weeds, so even several years of a poor host may have limited effect. *Rhizoctonia* may possibly be suppressed by growing several years of corn, bahiagrass, or bermudagrass, but problems will be increased by growing peanut or soybean, which are good hosts for *Rhizoctonia*. Direct effects of rotations on the fungus that causes Fusarium wilt are not known, but suppression of the southern root-knot nematode will reduce the amount of Fusarium wilt in a field because the nematode and the fungus have a synergistic interaction. Winter cover crops that are good nematode hosts can increase nematode population levels in a field if soil temperatures are sufficient, and this can reduce the beneficial effect that a summer rotation crop might otherwise have had. Nematode resistant cover crops will not reduce nematode levels compared to winter fallow, but they should be used when nematodes are present in a field because they will not increase nematode levels as a susceptible cover crop might. As with all plants, a cover crop may be resistant to one nematode species and susceptible to others, so the resistance must be matched to the nematodes present in a field. Weeds that are good hosts for nematodes also can reduce the nematode-suppressive effect of a rotation crop. For example, Florida beggarweed is a good host for the reniform nematode and it is one of the most common weeds in Southeastern peanut fields, so it has the potential to allow significant reniform nematode reproduction when peanut is grown, even though peanut is virtually a non-host.