

Use of Perennial Grasses in Peanut/Cotton Rotations: Effect on Pests¹

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While there is no such thing as a silver bullet that solves all the problems in cropping systems, the sod-based peanut/cotton cropping system does solve several farming related problems. In several articles on the importance of adopting sod-based peanut/cotton cropping systems, we showed beneficial effects on soil health and economics (Katsvairo et al. 2006a; Katsvairo et al., 2006b; Katsvairo et al., 2006c). In this publication we discuss the effect of perennial grasses on peanut and cotton nematode, disease and weed problems.

Nematodes

Nematodes cause plant damage estimated at about \$8 billion every year across the entire nation. Although not always visible to farmers and subsequently often overlooked, crop losses due to nematodes can exceed 80% on some fields. Nematode damage is more pronounced in Florida because of the sandy nature of the soils. Nematode damage also varies with crop, nematode species and environmental conditions. Most farmers use nematicides or fumigants to control nematodes. This

practice is expensive and environmentally unsustainable. Over the past years, many nematicides have been dropped from the market and this has reduced the number of available nematicides. Fumigants such as 1,2-dibromo-3-chloropropane (DBCP) and ethylene bromide are now banned and fenamiphos and methyl bromide will no longer be available to farmers in the future.

More than 40 % of fields in Florida were affected by nematodes of the *Meloidogyne* species (root knot) in 2005. With no commercial peanut and cotton varieties resistant to root-knot and the limited availability of nematicides, coupled with the high costs, perennial grasses including bahiagrass and Bermuda grass in rotations are an alternative control for nematodes. For over half a century, farmers in the southeastern U.S. have obtained good crop yields immediately following perennial grasses and less nematode damage. This is because the perennial grasses, including bahiagrass, are non-hosts to most nematodes. Bahiagrass and Bermuda grass reduces infestations from nematodes of the *Meloidogyne* species. In addition, both bahiagrass and coastal

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1. This document is SS-AGR-125, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date July 2006. Reviewed August 2009. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.
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Bermuda grass can reduce southern blight caused by the fungus *Sclerotium rolfsii* in both peanut and cotton. The most damaging pathogen, *Sclerotium rolfsii*, also augments infestation from *M. arenaria*.

The two major nematodes affecting cotton in Florida are *M. incognita* and *Rotylenchulus reniformis*. More than 50% of cotton fields in some regions of Florida are infested by nematodes. Nematodes of the *Meloidogyne* species that affect cotton also interact with other pathogens and augment yield losses. Bahiagrass is a non-host to both the *Meloidogyne* species and *Rotylenchulus* species.

When included in the peanut/cotton rotation, bahiagrass reduces nematode infestation by spacing out in time the susceptible crops. This allows nematode levels to decline to levels which will not cause economic damage when the host crop is planted. Use of crop rotations as a nematode control method is more practical in field crops than in high value horticultural crops because field crops are of lower value and less money can be spent on control measures.

Peanut Diseases

Huge increases in yield have been reported when peanut and cotton are grown in sod-based rotations compared to the conventional peanut/cotton rotation. Our studies have shown peanut yields to be consistently higher in the sod rotation (up to 982 lbs/acre) compared to the conventional rotations (Table 1). Previously in many southern states, including Florida, Georgia, Alabama, the Carolinas and Mississippi, peanut yield increases in sod rotations are the result of reduced nematodes and diseases following the non-host perennial crop. However, we now consider improvements in soil conditions a contributory factor for the high yields. Averaged over two years, our results showed lower tomato spotted wilt (TSW) (10.2%) incidence for the bahiagrass rotated peanuts compared to the conventional peanut/cotton (21.7%) rotation using conservation tillage (Figure 1). Similarly, bahiagrass reduced *Cercospora* leaf spot severity. We have also observed lower incidences of the fungus *Sclerotium rolfsii* for peanuts in the sod-based rotation compared to the peanut/cotton rotation.

Weeds reduce plant growth and yield by competing with crops for essential resources such as moisture, nutrients and light. Weeds also make harvesting more difficult and can stain the cotton lint during harvest, thus reducing both yield and quality. Complex multi-crop rotations are considered superior over simple rotations from a weed control perspective. Better weed control can be achieved with diverse rotations because a broader spectrum of herbicides can be used compared to simpler rotations. Including perennial grasses in rotations provides for longer periods between crops and this can effectively break the lifecycles of weeds that are adapted to certain crops or even weeds that are adapted to certain rotations. Also, by spacing out crops, diverse rotations enable growers to rotate herbicides with different modes of action. This can delay and may prevent the development of herbicide-resistance in weeds. Diverse rotations improve soil health and result in healthier plants which can out-compete weeds. Our studies from Quincy have shown fewer weeds and weed biomass for the sod-based peanut/cotton cropping system. We also observed rapid canopy development and early season weed suppression in cotton and peanuts after bahiagrass. Figure 2 contrasts weed densities for cotton in the traditional peanut/cotton rotation and cotton in the sod-based peanut/cotton rotation. Cotton in the sod rotation grew taller and had better weed suppression compared to cotton in the conventional rotation.

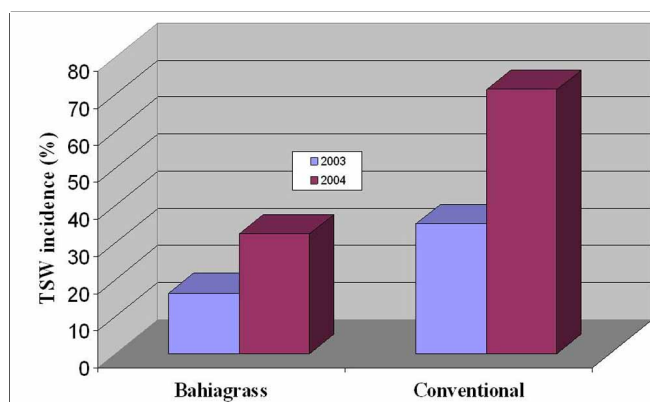


Figure 1. Incidence of TSWV on peanut under bahiagrass and conventional rotations in Quincy, FL during 2003 and 2004.



Figure 2. In the forefront are weed problems in the conventional cotton and in the background are less weeds in the sod-rotated cotton.

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Table 1. Peanut yield for two crop rotations in FL during 2003 and 2004.

Rotation	2003	2004
	lbs/acre	
Bahiagrass-Bahiagrass-Peanut-Cotton	2783	3281
Peanut-Cotton-Cotton	1958	2415

Conclusion

A reduction in the number of pesticides (herbicides, insecticides and nematicides) is good from an environmental stand point and can also help farmers realize more profit. The small profit margin from both cotton and peanuts necessitates that all management practices that cause yield losses including pest management be controlled within economic constraints. Growing cotton in rotation with bahiagrass would be a cost effective way to control pests. Complete details on the sod rotation including the effect on soil health and economics are available on our website http://nfrec.ifas.ufl.edu/programs/sod_rotation.shtml and also in our other publication on this site and elsewhere.

References

Katsvairo, T.W., D.L. Wright, J.J. Marois, D.L. Hartzog, P.J. Wiatrak and J. R. Rich. 2006a. Sod/Livestock based Peanut/Cotton Production Systems: Why We Recommend It! <http://edis.ifas.ufl.edu/AG258>