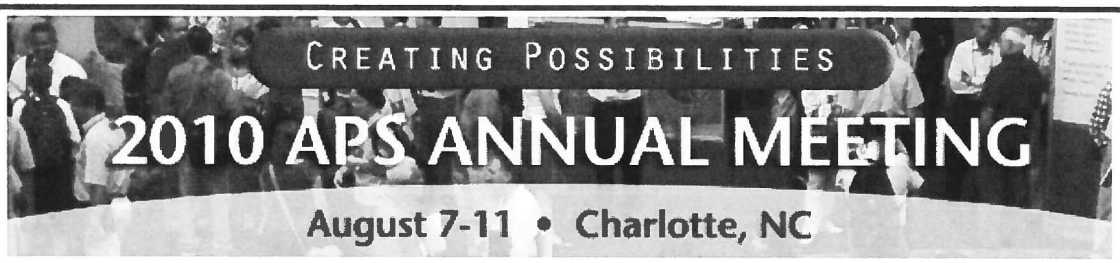

Impact of cropping sequence on diseases, nematodes, and yield of peanut, cotton, and corn in central Alabama

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A study was established at the Plant Breeding Unit, Tallassee, AL in 2003 to assess the impact of crop rotation on severity of diseases in peanut and corn as well as cotton root-knot nematode in corn, cotton, and peanut and to define the agronomic benefits or limitations of corn as a rotation partner with peanut and cotton. Peanuts were rated for leaf spot diseases, soil-borne diseases, and TSWV. Soil samples were taken for nematode assays shortly after each crop was harvested. In 2009, rotation and the Counter 15G soil insecticide treatment had a significant impact on corn yield and yield was significantly higher for the Counter 15G treated corn. Occurrence of CBR and peanut yield was significantly influenced by crop sequence but stem rot and leaf spot were not. TSWV levels were so low that only a few symptomatic plants were observed. CBR incidence was highest in plots maintained in continuous peanuts and yield was significantly lower than that of peanuts cropped behind one or two years of cotton or corn. Generally, yields for the one year out cropping sequence where cotton followed corn were higher compared with cotton followed by cotton and corn. Crop sequence had a significant impact on the yield of corn as well as on CBR and yield of peanut but not the severity of foliar diseases of corn or peanut.

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Report: Studies were conducted at the Gulf Coast Research and Extension Center (GCREC) and Plant Breeding Unit (PBU) at the E.V. Smith Research Center to evaluate the impact of peanut cropping frequency as well as the value of cotton and corn as rotation partners on the severity of diseases and yield of peanut. Studies were initiated in 2003 and run through 2010. At PBU, peanut cropping sequence had a significant impact on late leaf spot intensity and CBR incidence as well as peanut yield. Incidence of TSWV was very low and was not impacted by cropping sequence. Peanut yields were higher when corn and cotton followed peanut as compared with peanut after peanut. With both cotton and corn, yield gains obtained after one and two years of peanut were similar. As a result, maximum corn and cotton yields can be maintained in a one year out rotation with peanut. When compared with continuous peanuts, lower early leaf spot ratings were seen only with the peanuts followed two years of cotton. One or two years of cotton or corn between peanut crops reduced stem rot incidence as well as increasing peanut yield. Reductions in stem rot but not CBR were obtained with Moncut 70DF. Regardless of the crop sequence, no yield gains were obtained with a mid-summer application of Moncut 70DF (Convoy equivalent). At GCREC, cropping sequence had a significant impact on leaf spot intensity and the yield of peanut, while the soil fungicide (Moncut 70W) treatment only influenced stem incidence. Since the soil fungicide x crop sequence interaction for leaf spot intensity, stem rot incidence, and yield was not significant, data was pooled across soil fungicide treatments. In some years, cropping frequency had a significant impact on the intensity of leaf spot diseases, pod yield and to a lesser extent stem rot in peanut. Late leaf spot was the dominant leaf spot disease present. With the exception of 2006, TSWV (tomato spotted wilt virus) pressure was low during the study period (Figure 2). Previous crop significantly impacted TSWV incidence in peanut in several study years. In 2007, 2009, and 2010, incidence of TSWV was higher in peanut following peanut as compared with cotton. Peanut cropped behind corn also suffered less TSWV damage than peanut following peanut in 2007 and 2010. Over 7 year study period, leaf spot intensity was higher in 2004, 2008, 2009, and 2010 for continuous peanut when compared with peanut cropped after one year of either cotton or corn. Further reductions in leaf spot intensity were noted in 2009 and 2010, when two or three years of cotton and/or corn, respectively, proceeded peanut. When peanut were cropped for two consecutive years in 2007 and 2010, leaf spot intensity levels were similar to ratings for continuous peanut. With the exception of 2006 and 2007, leaf spot intensity as significantly influenced by previous crop. When compared with peanut as the previous crop, significant reductions in leaf spot intensity were noted in four and five study years in peanut cropped behind corn and cotton, respectively. With the exception of 2009 when leaf spot intensity was lower in peanut following cotton as compared with corn, similarly low disease ratings were recorded in peanut cropped behind cotton and corn. In contrast to leaf spot diseases, cropping frequency had very limited impact on stem rot incidence in peanut. In some years such as 2008 and 2009, stem rot incidence in peanut was so low that counts for the continuous, one year out, and two year out peanut rotations were similar. Surprisingly, peanut cropping frequency also had little impact on stem rot incidence under moderate to high pressure in 2004 through 2007. In 2010, higher stem rot incidence was noted for plots cropped for two or more consecutive years as compared with peanut cropped after one or two years of either cotton or corn. As was the case with cropping frequency, previous crop also had limited impact on stem rot intensity in peanut (Figure 3). Peanut cropped behind cotton and corn suffered less stem rot damage as compared with peanut following peanut only in 2008 and 2010. In all other study years, similar stem rot indices were recorded in peanut regardless of the previous crop. With a few exceptions in plots heavily colonized

by morningglory, root knot juvenile counts in plots cropped to peanut were near zero in all study years. In three of seven study years, pod yield was noticeably influenced by peanut cropping frequency. The value of crop rotation as a tool for enhancing peanut yields was noted as early as the 2nd study year, when higher pod yields were obtained for peanuts cropped behind one year of either cotton or corn as compared with two or more successive years of peanut. In 2006 and 2008, similar yields were noted regardless of peanut cropping frequency. In contrast, sizable yield gains were not always noted where peanut followed two or three as compared with one year of cotton or corn. Previous crop impacted peanut yield in five of seven study years (Figure 4). Peanut cropped behind corn and cotton yielded significantly higher in four and three years, respectively, when compared with peanut behind peanut. With the exception of 2009, yield response of peanut cropped behind cotton and corn did not significantly differ. Cropping frequency impact on yield was greatest for peanut and to a lesser extent corn but not cotton. Lowest yields were noted in the peanut and corn monoculture in 2008, 2009, and 2010. In peanut, declining yields, which were evident when peanut followed peanut, were closely mirrored by increasing leaf spot intensity. Occurrence of other peanut diseases such as TSWV and stem rot was not closely tied to peanut cropping frequency. The peanut root knot nematode (*M. arenaria* Race 2) never became established at this location in peanut. While no increase in diseases, plant parasitic nematodes, or other pest systems were noted, a sharp decline in yield was noted for the corn monoculture when compared with other cropping patterns that included the peanut and cotton rotation partners. In contrast to corn and particularly peanut, similar yields that were noted across all cotton cropping patterns was due in large part to the absence of the damaging populations of the cotton root knot or reniform nematode as well as damaging disease. As is the case with cropping frequency, previous crop significantly impacted root knot nematode populations and yield of corn as well as TSWV and stem rot incidence, leaf spot intensity, and yield of peanut. In contrast, previous crop had little or no influence on root knot populations on cotton and peanut along with yield of the latter crop. Results confirm previous observations that corn and cotton, neither of which share yield robbing diseases or nematodes with peanut, are equally valuable rotation partners with the latter crop. With few exceptions, similar reductions in leaf spot intensity and to a lesser extent TSWV and stem rot intensity along with up to 20% higher yields were obtained for peanut cropped behind corn or cotton. The influence of previous crop on TSWV incidence is new. Previously, factors such as planting date, seeding rate, cultivar selection, and row spacing but not previous crop were shown to influence TSWV levels in peanut. Despite moderate stem rot pressure in several study years, previous crop had limited impact on stem rot intensity

Reports for the rotation studies at GCREC and PBU can be viewed in the AAES Disease Control Field Trial(s) 2009: Standard Fungicide Trials - http://www.aaes.auburn.edu/comm/pubs/entplp/entplp13b.pdf and AAES Disease Control Field Trials(s) Standard Fungicide Trials 2010 - http://www.aaes.auburn.edu/comm/pubs/entplp/entplp15b.pdf .

In addition, an abstract summarizing the PBU rotation study was presented at the 2010 APS Meeting (http://www.apsnet.org/meetings/Documents/2010_Meeting_Abstracts/a10ma116.htm); 2012 APRES Annual Meeting (Title - Disease and nematode activity as well as yield response of a peanut root knot and susceptible peanut cultivar as influenced by crop rotation.); and 2012 APS Annual Meeting (Title - Impact of Cropping Sequence on Diseases, Nematodes, and Yield of Peanut, Cotton, and Corn in Southwest Alabama).

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