PROGRESS REPORT
TO
NORTH CAROLINA PEANUT GROWERS ASSOCIATION, INC.

TITLE: **Reducing the Potential for Nematode Problems in Peanut Through Rotation and Cultivar Choice**

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REPORT:

Nematodes, including the northern root-knot and the peanut root-knot nematodes, can be very damaging on peanut. Until recently, standard nematode control measures, including rotation to grains or cotton, fumigation with metam sodium, and application of aldicarb (Temik) have been very effective in reducing the prevalence of nematode problems in North Carolina. However, all three of these measures are now constrained. Aldicarb is no longer available and use of fumigants for CBR control has declined. To date, there are few chemical alternatives to fumigation or aldicarb for nematode control. In addition, soybean and other non-grain crops are gaining popularity in peanut rotations. These changes point to a potential for increased nematode problems on peanut. We need to understand how to best manage nematodes on the cultivars that now dominate the Virginia-Carolina market. The objective of this research is to investigate the impacts of different rotation schemes, tillage treatments, and cultivars on the potential for nematode damage on peanut in North Carolina.

Dr. Jordan has been conducting long-term rotation studies at the Peanut Belt Research Station (PBRS) at Lewiston and the Upper Coastal Plain Research Station (UCPRS) at Rocky Mount since 1997. From 1997-2006, these studies showed that one year-rotations resulted in very high populations (> 10 million nematodes per pint of soil) of root-knot and other nematodes, but that populations were reduced to non-damaging levels when peanut was grown after three years of cotton and/or corn. These results can be found in the *Peanut Information* series.

Because soybean is a host of peanut root-knot and northern root-knot nematodes, along with many other peanut pathogens, rotations with soybean are discouraged in peanut production. However, soybean and other non-grain crops have gained popularity in peanut rotations. To account for these changes, Dr. Jordan's rotation studies since 2006 have included soybean and wheat in the rotation scheme, along with corn and cotton. In addition, there has been dramatic shift in peanut cultivars since the last time nematode data were collected. Bailey and Sugg now account for more than 50% of all peanut acres planted in the Virginia-Carolina region. Additional information about the nematode resistance or susceptibility of these new cultivars is needed.

The objective of this research was to examine the efficacy of rotation, tillage, and cultivar against nematode populations and yield loss in peanut.

This research was conducted in long-term rotation trials maintained by Dr. Jordan at PBRS and UCPRS. All plots were planted to cotton in 2012 and were planted with peanut in 2013. Peanuts were last grown in all of the plots in 2006. Four replicate plots at each location were planted in large blocks that were subdivided into split-plots to allow comparisons of the cultivars Bailey and Sugg in each set of plots. Samples were collected from the following trials:

- Standard rotation plots at Lewiston: 10 rotations x 3 cultivars (Bailey, Sugg, and CHAMPS)
- Tillage and rotation plots at Lewiston: 4 rotations x 2 tillage (conventional and strip) x 2 cultivars (Bailey and Sugg)
- Standard rotation at Rocky Mount: 5 rotations x 2 cultivars
- Tillage and rotation plots at Rocky Mount: 2 rotations x 2 tillage (conventional and strip) x 2 cultivars

Plots were sampled individually for nematodes in the fall of 2013, and the samples submitted to the North Carolina Department of Agriculture and Consumer Services (NCDA-CS) for assay. Plots were observed at digging but no galling or other nematode damage was found. Yield data were collected upon harvest.

Results

Results from the standard rotation trial at Lewiston are typical for the study overall and are presented in Tables 1 and 2 below.

Table 1. Effects of previous rotations on populations of plant parasitic nematodes and peanut yield at Lewiston in 2013. During each year from 2007 until 2011, either corn or double crop wheat and soybean were planted in all plots in that particular year. These crops were planted to simulate farmers transitioning out of peanut-based cropping systems into grain production. Cotton was planted in all crops in 2012 to simulate farmers transitioning back into a more traditional peanut-based cropping system.

Rotation 2001-2006	2006 Peanut Yield	SB cyst	Lesion	Ring	Root knot	Spiral	Stubby root	Stunt	2013 Peanut yield
	lb/a	nematodes per 500 cc soil, 2013							lb/a
corn-peanut	4250 bc	1.9	11.9	60.7 ab	21.4 a	0.4	1.0	87.5 a	6916
cotton-peanut	3950 c	1.5	7.8	295.6 a	0.3 bc	0.0	0.0	47.7 abc	6654
cotton-corn-peanut	4390 bc	2.0	10.7	30.5 ab	0.0 c	0.0	0.6	41.0 abc	6821
cotton-cotton-peanut	4790 ab	1.3	10.6	145.9 ab	0.0 c	0.5	0.0	66.6 ab	6737
soybean-corn-peanut	3210 cd	0.7	1.8	21.7 b	1.4 b	0.0	0.2	16.5	6973
soybean-cotton-peanut	3970 c	1.0	2.1	182.5 ab	0.6 bc	0.0	0.0	48.2 abc	6922
5 corn-peanut	5040 a	0.0	2.2	78.6 ab	0.3 bc	0.4	0.2	47.3 abc	6849
corn-corn-peanut	4680 ab	1.1	4.3	133.5 ab	0.0 c	0.4	0.3	38.3 abc	6118
5 cotton-peanut	4810 ab	0.0	4.6	39.7 ab	0.2 bc	0.0	0.7	21.4 bc	6681
all peanut	2600 d	0.6	3.1	149.2 ab	0.0 c	0.4	0.0	3.9 d	6435

Table 2. Effects of cultivar on nematode populations from the standard rotation trial at Lewiston in 2013.

Cultivar	SB cyst	Lesion	Ring		Root knot		Spiral	Stubby Root	Stunt		Yield
	Nematodes per 500 cc soil										lb/a
Bailey	1.2	5.1	133.0	a	0.8	a	0.4	0.2	53.1	a	6777
Sugg	0.8	4.4	125.3	a	1.6	a	0.2	0.1	39.8	a	6701
CHAMPS	0.7	5.3	37.0	b	0.0	b	0.0	0.4	17.1	b	6653

For the standard rotations, being out of peanuts for the 6 years almost negated the adverse yield impact of the short peanut rotations years before (Table 1). In the tillage and rotation trials, yields were lower for peanut in strip till compared with conventional (data not shown). In those trials rotation also influenced yield, with lower yields noted in shorter rotations. There also was no interaction of rotation and tillage. This was consistent with 2006 results.

Rotation affected some but not all nematodes, and effects were not consistent across trials. Even in cases where significant effects of rotation were found, nematode populations were not high enough to cause a yield impact on peanut. Also, the rotations from 2007-2012 were designed to minimize development of nematodes by having corn rotated with wheat and soybeans. Of the nematodes found, only lesion and root knot have impacts on peanut yield, whereas the largest differences in populations were found in nematodes that are problems on other crops, particularly corn and cotton. Some differences in variety were noted, depending on the nematode, but in general these differences did not impact yield (Table 2). In general, nematode populations were not affected by tillage, except in one case where stunt populations were higher in strip till. No other nematodes were affected by tillage.

IMPACT STATEMENT

Nematodes can be very damaging on peanut. Until recently, standard nematode control measures, including fumigation with metam sodium, and application of aldicarb (Temik) have been very effective in managing nematode problems in North Carolina. However, aldicarb is no longer available and metam sodium use has declined due to regulatory concerns and associated costs of compliance. Alternatives to these treatments are very expensive or ineffective, or both. In addition, there has been dramatic shift in peanut cultivars in the past 3-5 years due to widespread acceptance of new cultivars. Additional information about the nematode resistance or susceptibility of these new cultivars is needed.

This research examined the efficacy of rotation, tillage, and cultivar against nematode populations and yield loss in peanut. Results showed that long rotations were highly effective in reducing populations of plant parasitic nematodes on peanuts to levels that do not impact yield. Results also showed that currently popular cultivars do not support large nematode populations when grown under favorable rotations. These results suggest that growers can grow peanut profitably without incurring costs of nematode control. They also reinforce the importance of maintaining good rotations for peanut productivity. Peanut farmers do not grow peanut without other crops, and these data are useful in helping farmers predict possible impacts on corn, cotton and soybeans.