2015

ANNUAL AND FINAL PROGRESS REPORT
TO
NORTH CAROLINA PEANUT GROWERS ASSOCIATION, INC.

TITLE: **Integrated disease management on new virginia-type peanut cultivars**

LEADER(S): **Barbara Shew**

DEPARTMENT(S): **Plant Pathology**

REPORT:

The cultivars Bailey and Sugg were the first virginia-type cultivars to have resistance to several peanut diseases that are important in North Carolina and Virginia. These releases have been followed by the release of Sullivan, Wynne, and Spain. Our work has clearly shown that Bailey and Sugg can be grown with reduced inputs for leaf spot and stem rot control, but integrated disease management practices have not been tested on the more recently released cultivars. The purpose of this research was to evaluate disease development and yield of standard and new cultivars under five management regimes.

The experiment consisted of 25 treatments, with 5 levels of disease management tested on 5 peanut cultivars: Bailey, Sugg, Sullivan, Wynne, and Spain (Table 1).

Table 1. Management practices evaluated on five peanut cultivars

Management level	In-Furrow	Approximate timing					# Omega sprays
		15-Jul	29-Jul	14-Aug	28-Aug	11-Sep	
Full	Proline	Tilt Bravo	Tebuconazole+Bravo	Tebuconazole+Bravo	Headline	Bravo	2
Reduced	none	none	Tilt Bravo	Tebuconazole+Bravo	Headline	Bravo	1
No stem rot	none	none	Tilt Bravo	Headline	Headline	Bravo	1
No Sclerotinia	none	none	Tilt Bravo	Tebuconazole+Bravo	Headline	Bravo	0
No leaf spot	none	none	Tebuconazole	Tebuconazole	none	none	1

The treatments were replicated 4 times in a split-plot design. The experiment was conducted at the Peanut Belt Research Station in Lewiston, NC. A soil fungicide was applied in furrow at planting for the full management program but not for the others. The first leaf spot sprays were applied at R3 for the full management program and at R3+2 weeks for the reduced management programs. The 5-spray program included 2 applications of a soil fungicide whereas only one application was included in the reduced 4-spray programs. Plots were scouted for Sclerotinia blight starting early August and Omega was applied (full rate) at the onset of disease. A second application of Omega made in the full management program, but not in the reduced programs.

Leaf spot and defoliation were evaluated on a percentage scale. Incidence of Sclerotinia blight was determined by counting infected plants, and stem rot and CBR incidence were determined at digging. Plots were dug at maturity, harvested, and yield data collected. Data were subjected to analysis of variance and means compared by appropriate methods.

Results from 2014: The differences in management programs were consistent across cultivars for leaf spot, defoliation, stem rot, Sclerotinia blight, and yield (P > .10). In spite of conditions favorable for leaf spot development during most of the season, leaf spot incidence and defoliation were low, even in the no leaf spot control treatments (Table 2). Levels of leaf spot and defoliation were higher in these treatments than in the others. Sullivan had less defoliation than the other cultivars (Table 2). Stem rot incidence likewise was low, but differences among treatments and cultivars were significant, with highest incidence in the No Sclerotinia and No Stem Rot control treatments (Table 2). Bailey, Wynne and Sugg had the lowest incidence of stem rot, whereas incidence was highest in Spain (Table 3). Scattered incidence of spotted wilt and CBR was observed but levels were much too low to provide information about effects of the treatments on these diseases (data not shown). Conversely, incidence of Sclerotinia blight was extremely high, particularly in the No Sclerotinia Control treatments and in Spain, Sullivan and Wynne (Tables 2 and 3). Although Sclerotinia incidence was very high in all plots, Bailey and Sugg clearly had less disease than the other cultivars. No differences between the full 5-spray and reduced 4-spray programs were observed for leaf spot, stem rot, Sclerotinia blight, or yield. Among management programs, yields were lowest in the No Sclerotinia Control treatment (Table 2) and yield was most strongly correlated with incidence of Sclerotinia blight (r = -0.3668, P = 0.0002) and stem rot (r = -0.26557, P = 0.0082). Yield responded strongly to the first application of the Sclerotinia fungicide but not to the second; however, variability in the response was lower after the second spray (data not shown). Yields were highest in Bailey and lowest in Spain, with the other cultivars being intermediate (Table 3).

Results from 2015: Averaged across management programs, yield was highest in Spain, followed by Sugg (Table 4). The high yield in Spain was attributed to delayed digging due to weather in October 2015. It is likely that yield was lost in the other cultivars, which were estimated to be two weeks past optimum maturity at the time of digging, whereas relatively late maturing Spain probably gained additional yield during this period. Effects of management programs depended on cultivar for leaf spot, defoliation, and Sclerotinia blight (Table 5). In the case of leaf spot and defoliation, this dependence primarily reflected differences among cultivars when they were not treated for leaf spots. In contrast to 2014, leaf spot incidence was very high in this treatment in Sullivan; leaf spot levels also were high in Bailey and Sugg. Yield within the cultivar Sullivan depended on the management treatment, with the no leaf spot management treatment yielding lower than the others (Table 5). Leaf spot and defoliation were much lower in Spain and Wynne. In these cultivars, defoliation was not affected by any management treatment, including the no leaf spot control. Leaf spot and defoliation were low and equal among the four management treatments that included 4 or 5 leaf spot fungicide applications on all cultivars. Sclerotinia blight generally was low, with highest levels found in Spain with No Sclerotinia Control (Table 5; Table 6). The differences in management programs were consistent across cultivars for incidence of stem rot, which was lowest in the full management program and highest the program without Sclerotinia control (Table 6). Stem rot incidence was low overall, but differences among cultivars were consistent across management program, with lowest levels of stem rot in Sullivan and Sugg and highest in Spain (Table 4).

Leaf spot was the only disease variable negatively correlated with yield (r = -0.2067, P = 0.0390). Sclerotinia blight (r = 0.3257, P = 0.0009) and stem rot (r = 0.2407, P = 0.0158) were positively correlated with yield. This very unusual result was attributed to the high yield of Spain, which also had the highest levels of these diseases, relative to the other cultivars. However, the overall pressure from these two diseases was not high enough in to reduce yield Spain or any other cultivar.

In summary, results were inconclusive due to wide differences in the 2014 and 2015 growing seasons. Of particular concern was the difference between years in leaf spot incidence and defoliation in Bailey and Sullivan. Additional research is proposed to provide data to strengthen disease control recommendations for new cultivars.

Table 2. Differences among management programs in levels of leaf spot, defoliation, stem rot, Sclerotinia blight, and in yield averaged across cultivars in 2014

	Leaf spot Oct 1			Defoliation Oct 1			Leaf spot Oct 8			Defoliation Oct 8			Stem rot Oct 8			SBlight Oct 2		Yield/A	
Program	Mean		SD	Mean		SD	Mean		SD	Mean		SD	Mean		SD	LS Means			
Full	0.9	b	0.3	9.1	c	3.6	2.2	b	4.2	17.0	b	8.9	2.9	bc	2.7	48.1	b	4594	a
Reduced	1.1	b	0.4	9.0	c	2.9	3.0	b	5.8	17.8	b	7.7	2.5	c	2.0	49.1	b	4545	ab
No stem rot	1.1	b	0.2	8.4	c	3.8	2.7	b	4.3	15.0	b	6.5	3.4	bc	3.3	44.5	b	4601	a
No Sclerotinia	1.8	b	1.9	12.6	b	5.0	3.7	b	8.8	16.0	b	7.2	5.8	a	4.0	61.2	a	4281	b
No leaf spot	14.38	a	12.1	16	a	5.1	20.9	a	23.6	23.3	a	9.4	4.2	ab	4.8	49.6	b	4575	a
MSD	3.1			2.3			6.8			4.7			1.7			7.0		341	
P>F tmt	<.0001			<.0001			<.0001			0.0062			0.0019			0.1378		0.0003	

Letters indicate differences among management treatments according to Waller-Duncan, K Ratio = 100

Table 3. Differences among cultivars in response to leaf spots, stem rot, Sclerotinia blight, and in yield averaged across management programs in 2014

	Leaf spot Oct 1			Defoliation Oct 1			Leaf spot Oct 8			Defoliation Oct 8			Stem rot Oct 8			SBlight Oct 2		Yield lb/A	
CV	Mean		SD	Mean		SD	Mean		SD	Mean		SD	Mean		SD	LS Means			
Bailey	3.7	a	6.6	11.0	a	3.8	3.4	a	6.7	17.3	ab	9.4	1.5	c	1.4	41.1	b	4921	a
Spain	3.6	a	7.3	11.5	a	6.3	10.3	a	11.7	16.3	ab	6.7	7.0	a	5.2	61.1	a	4223	c
Sugg	5.8	a	12.0	11.8	a	4.8	8.5	a	15.7	20.8	a	8.2	2.6	bc	1.9	40.3	b	4402	bc
Sullivan	2.7	a	4.3	8.0	b	2.9	8.0	a	22.2	14.5	b	8.7	5.0	ab	3.4	56.3	a	4655	ab
Wynne	3.5	a	5.6	12.8	a	5.6	2.4	a	3.6	20.3	ab	7.7	2.8	bc	1.9	53.7	a	4395	bc
MSD	4.5			2.1			2.7			6.2			2.6			9.0		328	
P>F cv	0.4179			0.0042			0.2712			0.1142			0.0043			0.0008		.0043	

Letters indicate differences among cultivars according to Waller-Duncan, K Ratio = 100

Table 4. Differences among cultivars in response to stem rot and in yield averaged across management programs in 2015

	Stem rot			Yield lb/A		
Cultivar	**Mean**		**SD**	**Mean**		**SD**
Bailey	1.4	ab	2.4	5392	c	502
Spain	3.0	a	3.8	6721	a	277
Sugg	0.4	b	0.7	5880	b	598
Sullivan	0.6	b	1.6	5227	c	659
Wynne	1.9	ab	2.5	5502	bc	527
P>F cultivar	0.0843			0.0001		

Letters indicate differences among cultivars according to Waller-Duncan, K Ratio = 100

Table 5. Effects of management treatments and cultivars on in leaf spot, defoliation, Sclerotinia blight and yield in 2015

Cultivar	Management level	Leaf spot Oct 7			Defoliation Oct 7			SBlight Oct 14			Yield lb/A Oct 21		
		Mean		SD	Mean		SD	Mean		SD	Mean		SD
Bailey	Full	1.1	b	0.3	8.4	b	1.2	0.8	b	1.0	5343	a	614
	Reduced	1.4	b	0.8	11.9	b	3.8	1.5	b	1.9	5214	a	728
	No stem rot	2.0	b	1.4	11.3	b	4.8	0.8	b	1.0	5620	a	523
	No Sclerotinia	0.9	b	0.3	8.8	b	3.2	1.8	b	2.9	5389	a	158
	No leaf spot	60.0	a	9.1	19.4	a	9.2	5.0	a	4.7	5396	a	523
Spain	Full	1.1	b	0.3	14.4	a	2.4	1.3	b	1.9	6814	a	307
	Reduced	1.0	b	0.0	13.8	a	6.0	3.3	ab	2.5	6606	a	266
	No stem rot	1.0	b	0.0	13.1	a	1.3	4.3	ab	5.4	6857	a	442
	No Sclerotinia	1.1	b	0.3	16.3	a	3.2	10.5	a	12.6	6692	a	114
	No leaf spot	20.6	a	13.8	17.5	a	5.8	7.3	ab	6.3	6635	a	216
Sugg	Full	1.0	b	0.0	8.8	b	1.4	1.5	a	1.7	5763	a	1254
	Reduced	1.5	b	0.6	8.1	b	2.4	0.3	a	0.5	5895	a	256
	No stem rot	7.6	b	13.3	14.4	b	9.0	0.8	a	1.0	5981	a	461
	No Sclerotinia	1.9	b	0.9	7.8	b	3.2	0.3	a	0.5	6143	a	200
	No leaf spot	75.5	a	16.6	29.4	a	7.7	0.0	a	0.0	5620	a	398
Sullivan	Full	1.1	b	0.3	6.3	b	1.4	0.0	b	0.0	5716	a	813
	Reduced	1.0	b	0.0	8.1	b	2.4	0.3	ab	0.5	5210	ab	595
	No stem rot	1.1	b	0.3	6.9	b	3.8	0.3	ab	0.5	5255	ab	650
	No Sclerotinia	1.3	b	0.5	8.4	b	2.4	0.3	ab	0.5	5143	ab	534
	No leaf spot	82.4	a	10.6	28.8	a	19.3	0.8	a	1.0	4813	b	687
Wynne	Full	1.0	b	0.0	8.8	a	4.3	2.0	a	2.4	5451	a	562
	Reduced	10.0	ab	13.7	15.0	a	8.9	0.5	a	1.0	5630	a	734
	No stem rot	3.4	b	4.8	12.5	a	2.9	1.5	a	3.0	5541	a	590
	No Sclerotinia	1.1	b	0.3	11.9	a	3.8	1.8	a	2.9	5310	a	400
	No leaf spot	24.6	a	18.9	15.6	a	1.3	1.5	a	1.3	5580	a	562
	P>F	0.0001			0.0241			0.0271			0.0677		

Letters within a cultivar indicate differences among management treatments according to Waller-Duncan, K Ratio = 100

Table 6. Differences among management programs in levels of leaf spot, defoliation, stem rot, and yield averaged across cultivars in 2015

	Leaf spot Oct 7			Defoliation Oct 7			Stem rot Oct 14			Yield lb/A		
Program	Mean		SD	Mean		SD	Mean		SD	Mean		SD
Full	1.1	b	0.2	9.3	b	3.5	0.4	b	0.8	5817	a	874
Reduced	3.0	b	6.6	11.4	b	5.5	1.1	ab	1.8	5711	a	727
No Stem rot	3.0	b	6.2	11.6	b	5.2	1.4	ab	2.0	5851	a	743
No Sclerotinia	1.3	b	0.6	10.6	b	4.3	2.4	a	4.2	5735	a	669
No Leafspot	52.6	a	29.1	22.1	a	11.1	1.9	b	2.6	5609	a	751
P>F Program	0.0001			0.0001			0.0434			0.3423		

Letters indicate differences among management treatments according to Waller-Duncan, K Ratio = 100

IMPACT STATEMENT

TITLE: **Integrated disease management on new virginia-type peanut cultivars**

The cultivars Bailey and Sugg were the first virginia-type cultivars to have resistance to several peanut diseases that are important in North Carolina and Virginia. These releases have been followed by the release of Sullivan, Wynne, and Spain. Previous work has clearly shown that Bailey and Sugg can be grown with reduced inputs for leaf spot and stem rot control, but integrated disease management practices have not been tested on the more recently released cultivars. The purpose of this research was to evaluate disease development and yield of new cultivars under five management regimes. This project will allow North Carolina peanut growers to pick the best approach for integrated disease management on currently available cultivars. This project is expected to lead to reduced inputs for disease management on some cultivars. Specifically, integrated management on partially resistant cultivars may reduce use of fungicides for leaf spot, stem rot, CBR, and Sclerotinia blight control without reductions in yield.