2008 APPLIED PEANUT PLANT PATHOLOGY RESEARCH RESULTS

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DEVELOPMENT OF PEANUT DISEASE MANAGEMENT STRATEGIES

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Introduction

Fungal diseases are responsible for significant economic losses throughout peanut production regions of Texas. To minimize these losses, producers rely heavily on chemical fungicides and cultivar resistance. While there is a wide range of products labeled for control of peanut diseases, resistant germplasm is more limited. Optimal disease management systems should rely on an integrated approach taking into consideration, fungicide selection, timing, application methods, as well as the use of host resistance and other cultural practices known to influence disease development. Results contained within this report reflect strategies aimed at improving overall disease control and increasing economic profitability.

Seedling disease trial (Lubbock, Co.)

A field trial was conducted at the Texas Tech University Quaker Research farm located in Lubbock, TX. The soil was a Brownfield sandy clay loam that had no history of seedling disease. Soil temperature was 64.2 °F at a 6 in depth on the day of planting (16-May), with adequate soil moisture. To increase disease pressure, plots were artificially infested with ground oat seed colonized by *Rhizoctonia solani*. Plots (two 40-in rows by 35.5 ft) were arranged in a split-plot design with four replications. Whole plot treatments consisted of seed treatment, and inoculation served as sub-plots. All production practices followed Texas AgriLife Extension Service recommendations. Stand counts were recorded on 6-Jun, 13-Jun, and 20-Jun. Vigor ratings were made 20-Jun. Plots were inverted on 16-Oct and harvested 23-Oct.

Environmental conditions were conducive for seedling disease development after planting. A total of 0.7 inches of precipitation fell within the two weeks after planting, and soil temperatures averaged 72.3 °F. No treatment x inoculation interaction was observed for any of the parameters evaluated; therefore, data were pooled for analysis (Table 1). All treatments, except Kodiak, increased stand counts 21, 28, and 35 days after planting. Vigor ratings were lowest for the non-treated control and Kodiak. No differences in yield were observed. Yields for the trial ranged from 2782 to 3375 lb/A with an average of 3103 lb/A. The addition of *R. solani* had no effect on stand, plant vigor, or yield.

Leaf spot trials:

Dawson Co. Runner and Virginia miscellaneous trials: Field trials were conducted to evaluate various fungicide programs for control of peanut leaf spot in Texas. Trials were conducted at the Agricultural Complex for Advanced Research and Extension Systems (AG-CARES) located in Lamesa, TX. The field had a low history of leaf spot primarily early leaf spot (caused by *Cercospora arachidicola*). Plots (2-rows wide by 50 feet in length; 40-in row spacing) were arranged in a randomized complete block design with four replications. Every third plot was left untreated through the field, so that spores from developing lesions could serve as inoculum. Trials were planted at a rate of 6 seed per foot on 2-May. Peanut development was monitored throughout the season, and leaf spot intensity was rated three times following the onset of the epidemic using the Florida 1-10 scale. Crown rot (*Aspergillus niger*), and Southern blight (*Sclerotium rolfsii*) were observed at this location; however, diseased areas were not distributed uniformly and disease levels were minimal. Plants were inverted at maturity (27-Oct) and air-dried in windrows before being harvested (3-Nov).

For the miscellaneous trial, a total of 12 programs (including a non-treated control) were evaluated on Flavorrunner 458 (Runner market-type) and Gregory (Virginia market-type). A separate trial was conducted to evaluate varying rates (8.0 and 10.7 fl oz/A) of Provost was conducted in the runner portion of the field. Detailed descriptions of the fungicide programs evaluated are presented in Table 2. Fungicides were applied with a CO_2 pressurized backpack sprayer, using Teejet 8002EVS nozzles, and a volume of 20 gal per acre.

Dry and hot conditions dominated early in the season; however, abundant rainfall and cool temperatures were experienced during late-August and throughout September. Although disease pressure was low treatment differences in disease control were observed. All fungicide treated plots had lower leaf spot intensity ratings than non-treated control plots (Tables 3 and 4). The Abound, Folicur, Provost, Tebuzol + Topsin and Evito programs consistently provided the best level of leaf spot control by the end of the season, and had the lowest AUDPC values. Despite the harsh growing conditions experienced early in the season, yields were exceptionally high, ranging from 4029 to 5887 lb/A, and 4884 to 6118 lb/A for the Runner and Virginia trial, respectively. Significant differences were only observed for the Runner trial, in which Evito provided the highest yields. The application of fungicides did not improve grades over the non-treated control.

Dawson Co. Provost trial: Disease pressure was greater in this trial than in the runner trial mentioned previously. Leaf spot control was similar for the two Provost rates, with both being superior to the untreated control (Table 5). Yields were increased by 1343 and 1277 lb/A over the control for the 8.0 and 10.7 fl oz/A rate, respectively. No differences in grade were observed among treatments.

Erath Co. miscellaneous trial: Similar trials were conducted at the Texas AgriLife Research and Extension Center in Stephenville. This trial was conducted in a field with a history of early leaf spot, Southern blight, and Sclerotinia blight (by *Sclerotinia minor*). Plots (2-rows wide by 25 feet in length; 36-in row spacing) were arranged in a randomized complete block with four or five replications. Non-treated plots served as controls. A detailed description of the fungicide programs evaluated can be found in Table 6. Leaf spot and Sclerotinia blight were monitored throughout the season with final assessments being made just prior to digging (27-Oct). Plots were harvested on 6-Nov.

Temperature and rainfall amounts during the 2008 growing season were above and below long-term averages, respectively. However, cool wet conditions experienced late season, in conjunction with delayed maturity resulted in appreciable levels of defoliation. All fungicide programs resulted in less leaf spot compared to the non-treated control (Table 7). Significant differences among treatments were observed, the Headline/Folicur, Provost, Artisan, Tebuzol + Topsin, Bravo + Topsin, and Evito programs provided levels of control similar to the Bravo standard. Sclerotinia blight did occur late in the season. Incidence ranged from 23.0 to 52.0%; however, no significant fungicide effects were observed, indicating that the products evaluated have no activity on *S. minor*. Despite differences in leaf spot, yields and grades were similar for all treatments.

Erath Co. Provost trial. Defoliation in excess of 50% was observed in the untreated control plots. Applications of Provost reduced the amount of leaf spot observed in this trial over the untreated control (Table 8). Sclerotinia blight ranged from 26.4 to 30.0% with no treatment impacting development. Yields were highest for the two 10.7 fl oz/A Provost programs (repeat treatment), lowest for the control plots, and intermediate for Provost applied at 8.0 fl oz/A. No differences in quality were found in this study.

<u>Pod rot trials:</u>

Banded vs. Broadcast trial (Gaines Co.). A field trial was conducted to compare different application methods (banded vs. broadcast), and increasing carrier volumes (15, 30, and 45 gal/A) of the fungicides Abound, Artisan, or Provost for pod rot control. The field selected was known to have a history of pod rot. Plots (2-rows wide by 25 feet in length; 40-in row spacing) were arranged in a randomized complete block with four replications. A total of three non-treated control plots were included for comparisons. Leaf spot was assessed just prior to harvest. Plots were dug on 23-Oct, and harvested on 29-Oct.

Pod rot pressure was extremely low in the area where the trial was conducted and did not warrant rating. Adequate disease developed in other areas of the field. The application of fungicides resulted in improved leaf spot control over the untreated control (Table 9). Levels of control were similar for all fungicides, and application method did not impact leaf spot development in this study. No differences in yield were observed for any of the treatments evaluated.

Leaf spot / pod rot fungicide trial (Terry Co.). A field trial was conducted to evaluate several commercially available fungicides for control of leaf spot in West Texas. The cultivar used was Jupiter and the field had a history of Early leaf spot, Web blotch, and Pepper spot. Plots (2-rows wide by 25 feet in length; 40-in row spacing) were planted on 6-May. Treatments consisted of applications of Provost, Tilt/Bravo, Convoy, Folicur, Abound, Artisan, and Provost + Echo. Treatments were arranged in a randomized complete block with four replications. Applications were made 6-Aug and 1-Sept. All fungicide treated plots received an additional application of Echo 30-Sept to conform to fungicide resistance recommendations. Plots were dug 9-Oct and harvested 24-Oct. An appreciable level of pod rot was observed at harvest and sub-samples of grade samples were assayed for pod rot severity.

Considerable leaf spot developed in this trial late in the season with final ratings ranging from 2.5 to 7.3 (Table 11). Combinations of Provost + Echo resulted in the lowest leaf spot ratings; however, levels of control for the Provost alone and Abound programs were similar. Leaf spot intensity was similar to the untreated control in plots treated with Convoy, indicating that the fungicide has no activity on foliar diseases. All fungicides, except Convoy improved yields over the untreated control. Pod rot severity (% of rotted pods) was greatrial for the untreated control (31%) and lowest for the plots treated with Provost, Artisan, Abound, and Folicur. No differences in peanut grades were observed among treatments.

<u>Sclerotinia trials:</u>

Application timing trial (Gaines Co.): A field trial was conducted to evaluate the performance of the fungicides Omega and Endura in preventative and curative spray programs. The field had a history of severe Sclerotinia blight. Plots (2-rows wide by 50 feet in length; 40 in row spacing) were arranged in a randomized complete block design with five replications. Plots were planted on 23-Apr and peanut as well as disease development was monitored throughout the growing season. Treatments consisted of an untreated control, Omega at 1.0 pt/A, Omega at 1.5 pt/A, or Endura at 10 oz/A preventatively, as well as Omega at 1.5 pt/A, and Endura at 10 oz/A curatively. Initial preventative applications were made 9-Jul with a subsequent application made 7-Aug. Initial curative applications were made after the observation of disease symptoms (21-Jul), followed by a second application 18-Aug. A maximum of two applications were made. Plants were dug on 3-Oct; however, harvest was delayed until 21-Oct because of rain.

Sclerotinia blight pressure was moderate during the 2008 growing season. Initial symptoms were observed mid to late July. The applications of fungicides improved disease control compared to the untreated plots (Table 12). Overall, preventative applications provided superior disease control early in the season; however, final disease assessments were similar for all treatments. Applications of Endura or omega had no effect on Verticillium wilt or leaf spot. Yields were increased by as much as 1170 to 1800 lb/A when fungicide were applied. No differences in grade were observed among the treatments. Results from this study illustrate the importance of using fungicides in the management of Sclerotinia blight; however, additional studies are required to determine optimum application timings.

Sclerotinia fungicide × cultivar interaction trial (Erath Co.): A field trial was conducted at the Texas AgriLife Research and Extension Center in Stephenville to evaluate the interaction between fungicides with Sclerotinia activity and cultivars with varying disease responses. Plots (two 36-in rows by 25 ft) were arranged in a split-plot design with four replications. Whole plot treatments consisted of the fungicides Omega (1.5 pt/A), Endura (10 oz/A), an experimental product from Dupont (at a low and a high rate) and an untreated control, the cultivars Flavorrunner 458, Tamrun OL02, and Tamrun OL07 served as sub-plots. Applications were made 65 and 93 days after planting (DAP). Plots were cover sprayed with Bravo WeatherStik 79 and 117 DAP to minimize leaf spot development. Disease ratings were made throughout the growing season. Peanuts were dug and inverted 28-Oct and 6-Nov, respectively.

Initial disease ratings were similar among treatments (Table 13). Overall, disease severity was rather high in all plots late in the season; however, differences were observed late in the season. Omega and Endura provided the greatrial level of disease suppression, whereas, control for the experimental product was intermediate at both rates. Yields were generally improved with the use of fungicides. Yields were greatrial in plots treated with Endura and Omega and lowest for the untreated control.

Summary and conclusions

Diseases remain one of the major limiting factors in peanut production throughout the state. While each production region has a unique set of environmental conditions, losses from diseases such as leaf spot, Southern blight, pod rot, and Sclerotinia blight are commonly observed. Results from these studies have shown that several fungicides currently available can be integrated into a production system to minimize related losses. Continued efforts are needed to fully maximize the potential of these products for peanut disease control in Texas.

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Table 1. Effect of peanut seed treatments and artificial inoculation with *Rhizoctonia solani* on plant stands, vigor and pod yields (Flavorrunner 458)

Factor	Plants/ft[a] 6-Jun	13-Jun	20-Jun	Plant vigor[b] 20-Jun	Yield (lb/A)
Treatment mean					
1. Non-treated control………………	0.8 d[c]	1.0 b[c]	1.1 c[c]	3.8 c[c]	3083 a[c]
2. Trilex Star………………………..	1.9 abc	1.9 a	2.1 ab	6.0 b	3163 a
3. Trilex Optimum…………………..	1.7 bc	1.9 a	2.1 ab	6.6 ab	3375 a
4. Dynasty PD………………………	2.1 a	2.0 a	2.4 a	7.3 a	3061 a
5. Vitavax PC………………………..	1.6 c	1.7 a	1.9 b	5.6 b	3226 a
6. Kodiak……………………………	0.6 d	1.0 b	0.9 c	3.0 c	3031 a
7. Trilex Star + Kodiak……………..	2.0 ab	1.9 a	2.2 ab	6.3 ab	2783 a
Inoculation mean					
Natural soil ………………………………	1.6 a	1.6 a	1.8 a	5.4 a	3031 a
Artificially infested ……………………	1.5 a	1.6 a	1.8 a	5.6 a	3175 a
Split-plot analysis					
Treatment …………………………..	0.0001	0.0001	0.0001	0.0001	0.7048
Inoculation …………………………	0.2486	0.7255	0.4450	0.4549	0.4165
Treatment x inoculation ……………	0.4188	0.7749	0.7623	0.8840	0.5369

[a] Determined from counts of two, 35-ft rows per plot. [b] Plant vigor rating scale: 1 = severely stunted, 10 = healthy. [c] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05).

Table 2. Fungicide programs evaluated in the miscellaneous and Provost fungicide trials in west Texas, 2008 (Lamesa, TX; Virginia and Runner-market-types)

Trial, **treatment list**	**Rate**	**Application code**	**Date of applications**
	Miscellaneous trial		
1. Untreated control	- - - - -	- - - - -	- - - - -
2. Bravo Weatherstik	24 fl oz/A	A, B, and C	1-Jul, 16-Jul and 15-Aug
3. Bravo Weatherstik Abound	24 fl oz/A 24.6 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
4. Headline Folicur	9 fl oz/A 7.2 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
5. Bravo Weatherstik Folicur	24 fl oz/A 7.2 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
6. Bravo Weatherstik Provost	24 fl oz/A 10.7 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
7. Bravo Weatherstik Artisan	24 fl oz/A 32 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
8. Bravo Weatherstik Convoy	24 fl oz/A 32 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
9. Bravo Weatherstik Tebuzol	24 fl oz/A 7.2 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
10. Bravo Weatherstik Tebuzol + Topsin	24 fl oz/A 7.2 fl oz/A 5.0 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
11. Bravo Weatherstik Bravo + Topsin	24 fl oz/A 12 fl oz/A 5.0 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
12. Bravo Weatherstik Evito	24 fl oz/A 5.7 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
	Provost trial		
1. UTC	- - - - -	- - - - -	- - - - -
2. Bravo Weatherstik Provost	24 fl oz/A 8.0 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug
3. Bravo Weatherstik Provost	24 fl oz/A 10.7 fl oz/A	A B and C	1-Jul 16-Jul and 15-Aug

Table 3. Miscellaneous fungicide trial II (Dawson County; Runner market-type)

Treatment[a]	Leaf spot (1-10 scale)[b]			AUDPC[c]	Yield (lb/A)	Grade (%smk+ss)
	1-Jul	16-Jul	15-Aug			
1. Untreated contro	1.0	2.5 a[d]	3.4 a[d]	62.6 a[d]	4029 c[d]	74.2
2. Bravo	1.0	1.6 b	1.1 d	46.7 b	4448 bc	75.4
3. Abound	1.0	1.3 bc	1.5 cd	40.0 bc	4759 bc	75.3
4. Headline	1.0	1.1 c	1.3 cd	37.7 c	4910 b	74.4
5. Folicur	1.0	1.0 c	1.5 cd	35.5 c	4415 bc	75.1
6. Provost	1.0	1.3 bc	1.4 cd	40.0 bc	4637 bc	74.8
7. Artisan	1.0	1.4 bc	1.4 cd	42.2 bc	5075 ab	74.6
8. Convoy	1.0	2.6 a	2.3 b	64.7 a	5141 ab	74.9
9. Tebuzol	1.0	1.1 c	1.7 c	37.8 c	5059 ab	75.1
10. Tebuzol + Topsin	1.0	1.1 c	1.4 cd	37.7 c	4303 bc	73.8
11. Bravo + Topsin	1.0	1.1 c	1.3 cd	37.7 c	4986 b	75.3
12. Evito	1.0	1.0 c	1.8 bc	35.6 c	5887 a	75.1
LSD ($P \leq 0.05$)	ns	0.4	0.3	7.4	856	ns

[a] See Table 1 for a description of treatments. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] AUPDC = Area Under the Disease Progress Curve. [d] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 4. Miscellaneous fungicide trial III (Lamesa, TX; Virginia market-type)

Treatment[a]	Leaf spot (1-10 scale)[b]			AUDPC[c]	Yield (lb/A)	Grade (%smk+ss)
	1-Jul	16-Jul	15-Aug			
1. Untreated contro	1.0	2.4 a[d]	4.1 a[d]	60.5 a[d]	5953	65.9
2. Bravo	1.0	1.3 ef	1.8 d	40.0 efg	5973	66.8
3. Abound	1.0	1.1 f	1.9 cd	37.9 fg	4884	66.7
4. Headline	1.0	2.0 abc	2.3 c	53.4 abc	6118	68.6
5. Folicur	1.0	1.1 f	1.8 d	37.8 g	5233	65.7
6. Provost	1.0	1.3 ef	2.0 cd	40.1 efg	5683	65.3
7. Artisan	1.0	1.8 bcd	2.0 cd	49.0 bcd	5518	67.8
8. Convoy	1.0	2.1 ab	3.4 b	55.9 ab	5016	67.7
9. Tebuzol	1.0	1.6 cde	2.0 cd	46.7 cde	6085	67.7
10. Tebuzol + Topsin	1.0	1.5 def	1.8 d	44.5 defg	5689	67.5
11. Bravo + Topsin	1.0	1.6 cde	1.8 d	46.7 cdef	5108	67.8
12. Evito	1.0	1.5 def	1.9 cd	44.5 defg	5551	68.6
LSD ($P \leq 0.05$)	ns	0.5	0.5	8.8	ns	ns

[a] See Table 1 for a description of treatments. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] AUPDC = Area Under the Disease Progress Curve. [d] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 5. Provost fungicide trial I (Lamesa, TX; Runner market-type)

Treatment[a]	**Leaf spot (1-10 scale)**[b]			**AUDPC**[c]	**Yield (lb/A)**	**Grade (%smk+ss)**
	1-Jul	**16-Jul**	**15-Aug**			
1. Untreated contro	1.1 a[d]	4.3 a[d]	4.5 a[d]	95.1 a[d]	4049 b[d]	75.0
2. Provost (8.0 fl oz/A)	1.0 b	1.3 b	1.9 b	40.1 b	5392 a	75.1
3. Provost (10.7 fl oz/A)	1.0 b	1.3 b	1.3 c	39.9 b	5326 a	75.0
LSD ($P \leq 0.05$)	0.0	0.6	0.4	9.8	795	ns

[a] See Table 1 for a description of treatments. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] AUPDC = Area Under the Disease Progress Curve. [d] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 6. Fungicide programs evaluated in the miscellaneous and Provost fungicide trials in central Texas, 2008 (Stephenville, TX; Runner market-type)

Trial, **treatment list**	**Rate**	**Application code**	**Date of applications**
		Miscellaneous	
1. Untreated control	- - - - -	- - - - -	- - - - -
2. Bravo Weatherstik	24 fl oz/A	A,B, C,D,E, F, and G	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
3. Bravo Weatherstik Abound	24 fl oz/A 24.6 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
4. Headline Folicur	9 fl oz/A 7.2 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
5. Bravo Weatherstik Folicur	24 fl oz/A 7.2 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
6. Bravo Weatherstik Provost	24 fl oz/A 10.7 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
7. Bravo Weatherstik Artisan	24 fl oz/A 32 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
8. Bravo Weatherstik Convoy	24 fl oz/A 32 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
9. Bravo Weatherstik Tebuzol	24 fl oz/A 7.2 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
10. Bravo Weatherstik Tebuzol + Topsin	24 fl oz/A 7.2 fl oz/A 5.0 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
11. Bravo Weatherstik Bravo + Topsin	24 fl oz/A 12 fl oz/A 5.0 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
12. Bravo Weatherstik Evito	24 fl oz/A 5.7 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
		Provost	
1. Untreated control	- - - - -	- - - - -	- - - - -
2. Bravo Weatherstik Provost	24 fl oz/A 8.0 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
3. Bravo Weatherstik Provost	24 fl oz/A 10.7 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept
4. Bravo Weatherstik Provost	24 fl oz/A 10.7 fl oz/A	A,B, and G C,D,E, and F	2-Jul, 17-Aug, and 29-Sept 31-Jul, 14-Aug, 28-Aug, 11-Sept

Table 7. Miscellaneous fungicide trial (Stephenville, TX)

Treatment[a]	Leaf spot (1-10 scale)[b]	Sclerotinia blight (%)[c]	Pod yield (lb/A)	Grade (%smks+ss)
1. Untreated control	5.4 a[d]	52.0	3020	64.8
2. Bravo	2.3 de	32.5	2410	65.8
3. Abound	3.1 b	40.0	3601	65.1
4. Headline	2.5 bcde	23.0	3325	66.1
5. Folicur	2.9 bcd	34.0	2657	64.9
6. Provost	2.5 bcde	36.5	3223	64.9
7. Artisan	2.4 cde	40.5	3107	64.1
8. Convoy	3.0 bc	50.5	3136	66.4
9. Tebuzol	2.9 bcd	24.5	3659	65.3
10. Tebuzol + Topsin	2.5 bcde	40.5	3616	64.7
11. Bravo + Topsin	2.4 cde	29.5	3877	66.1
12. Evito	2.1 e	35.0	3325	65.1
LSD ($P \leq 0.05$)	0.6	ns	ns	ns

[a] See Table 6 for a description of treatments. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] Percent of row feet showing signs or symptoms of *S. minor* just prior to digging. [d] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 8. Provost fungicide trial II (Stephenville, TX; Runner market-type)

Treatment[a]	**Leaf spot (1-10 scale)**[b]	**Sclerotinia blight (%)**[c]	**Pod yield (lb/A)**	**Grade (smks+ss)**
1. Untreated control	6.3 a	30.0	2033 b	68.5
2. Provost (8.0 fl oz/A)	2.0 b	27.2	2579 ab	68.1
3. Provost (10.7 fl oz/A)	2.3 b	26.4	2800 a	70.7
4. Provost (10.7 fl oz/A)	2.2 b	29.6	2765 a	71.3
LSD ($P \leq 0.05$)	0.7	ns	547	ns

[a] See Table 6 for a description of treatments. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] Percent of row feet showing signs or symptoms of *S. minor* just prior to digging. [d] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 9. Effect of fungicide, application method, and carrier volume on leaf spot and pod yield

Fungicide, application method, carrier volume	Pod rot (%)	Leaf spot (1-10 scale)[a]	Yield (lb/A)
Abound			
Banded, 15 GPA	0	2.5 b	3736
Banded, 30 GPA	0	2.3 b	3912
Banded, 45 GPA	0	2.4 b	3848
Broadcast, 15 GPA	0	1.6 b	4135
Broadcast, 30 GPA	0	2.0 b	3938
Broadcast, 45 GPA	0	2.0 b	4418
Artisan			
Banded, 15 GPA	0	2.1 b	3951
Banded, 30 GPA	0	2.1 b	3986
Banded, 45 GPA	0	1.8 b	4243
Broadcast, 15 GPA	0	2.3 b	4474
Broadcast, 30 GPA	0	2.1 b	4132
Broadcast, 45 GPA	0	2.1 b	4258
Provost			
Banded, 15 GPA	0	2.0 b	4107
Banded, 30 GPA	0	2.0 b	4124
Banded, 45 GPA	0	2.0 b	3842
Broadcast, 15 GPA	0	1.8 b	4440
Broadcast, 30 GPA	0	1.9 b	3896
Broadcast, 45 GPA	0	2.0 b	4522
Untreated control	0	3.6 a	4023
LSD ($P \leq 0.05$)	n/a	0.8	ns

[a] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 10. Description of fungicide treatments evaluated in the Terry Co. leaf spot pod rot trial

Treatment	Rate	Application code	Date of applications
1. Provost +Echo Bravo Weatherstik	10 fl oz/A + 24 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
2. Tilt/Bravo Bravo Weatherstik	18 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
3. Convoy Bravo Weatherstik	32 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
4. Folicur Bravo Weatherstik	7.2 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
5. Abound Bravo Weatherstik	24.6 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
6. Artisan Bravo Weatherstik	32 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
7. Provost Bravo Weatherstik	10 fl oz/A 24 fl oz/A	A and B C	6-Aug and 1-Sept 30-Sept
8. Untreated control	- - - - -	- - - - -	- - - - - -

Table 11. Performance of fungicides evaluated in the Terry Co. leaf spot pod rot trial

Treatment	Leaf spot (1-10 scale)[a]	Pod yield (lb/A)	Pod rot (% diseased pods)[b]	Grade (%smks+ss)
1. Provost+Echo	2.5 e[c]	4554 a[c]	23.2 bc[c]	71.0
2. Tilt/Bravo	4.2 cd	4343 a	21.4 bc	71.1
3. Convoy	7.3 a	3551 b	27.3 ab	70.4
4. Folicur	5.5 bc	4326 a	22.9 bc	71.1
5. Abound	3.6 de	4815 a	24.5 bc	68.4
6. Artisan	5.4 bc	4491 a	21.4 bc	69.7
7. Provost	3.0 de	4481 a	19.9 c	70.6
8. Untreated control	6.6 ab	3399 b	31.2 a	77.0
LSD ($P \leq 0.05$)	1.4	591	8.7	ns

[a] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [b] Represents the percentage of pods (from the grade sample) exhibiting pod rot symptoms. [c] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 12. Comparison of preventative and curative Sclerotinia blight programs using the fungicides Endura or Omega

Treatment	Sclerotinia blight (%)[a]			Leaf spot (1-10 scale)[b]	Verticillium wilt (%)	Yield (lb/A)	Grade (%smk+ss)
	6-Aug	**3-Sept**	**1-Oct**				
1. Untreated control	12.0 a[c]	28.8 a[c]	46.0 a[c]	4.2 a[c]	32.6	2692 b[c]	75.4
2. Omega (1.0 pt/A prior)	3.0e	8.0 d	17.4 b	3.1 ab	34.8	4493 a	74.8
3. Omega (1.5 pt/A prior)	4.0 de	7.8 d	17.6 b	4.1 a	36.8	4234 a	73.7
4. Endura (10 oz/A prior)	7.0 bc	12.8 cd	20.8 b	1.8 b	34.8	4312 a	74.4
5. Omega (1.5 pt/A after)	6.0 cd	19.2 bc	16.4 b	3.0 ab	35.6	4257 a	73.7
6. Endura (10 oz/A after)	9.0 b	23.8 ab	22.0 b	3.1 ab	34.4	3871 a	73.2
LSD ($P \leq 0.05$)	2.8	9.2	10.9	1.4	ns	760	ns

[a] Percent of row feet showing signs or symptoms of *S. minor*. [b] From the Florida 1-10 scale, where 1 = no disease and 10 = dead plants. [c] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 13. Effects of fungicides and peanut cultivars on Sclerotinia blight development, pod yield, and grade

Treatment, rate/A	Disease incidence (%)[a]		Pod yield (lb/A)	Grade (%smk+ss)
	4-Sept	27-Oct		
1. UTC	6.2 a[b]	49.0 a	3688 c	66.0
2. Endura (10 oz)	4.5 a	41.7 b	4574 a	65.0
3. Omega (1.5 pt)	6.0 a	34.2 b	4308 ab	66.5
4. Exp (low)	7.7 a	46.0 ab	3775 bc	65.9
5. Exp (high)	4.8 a	43.7 ab	4150 abc	63.3
LSD ($P \leq 0.05$)	ns	9.8	613	ns
Cultivar				
FR 458	7.3 a	49.4 a	3578 b	67.2 a
TR OL02	7.8 a	56.9 a	3806 b	65.1 ab
TR OL07	2.4 b	22.4 b	4914 a	63.7 b
LSD ($P \leq 0.05$)	2.9	7.7	475	2.8

[a] Percent of row feet showing signs or symptoms of *S. minor*. [b] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

STRATEGIES FOR MANAGING VERTICILLIUM WILT IN PEANUT

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Introduction

Verticillium wilt, caused by the soilborne fungus *Verticillium dahliae*, is an economically important disease throughout the High Plains of Texas. The fungus is capable of surviving in the soil for extremely long periods of time, thus the benefits of crop rotation are somewhat limiting. The fact that the fungus is capable of infecting both peanut and cotton also poses serious problems for producers in the region. Development of Verticillium wilt and reproduction of *V. dahliae* is favored by cool soil temperatures, and increased moisture. The aforementioned conditions were encountered during the 2004 growing season resulting in significant yield losses, as well as increased populations of *V. dahliae*. The impact on cotton is characterized by significant reductions in lint yields, as well as substantial reductions in fiber quality. Likewise, significant reductions in peanut yield may be observed under severe Verticillium wilt pressure. As the disease develops, peanut vines are weakened, often requiring peanuts to be dug prematurely.

Unlike most diseases which infect peanut, there are no chemical fungicides labeled for control of Verticillium wilt. The only chemical option available to reduce soil populations of *V. dahliae* is fumigation. The level of control provided by fumigation is sporadic, and the cost itself is prohibitive. In cotton, Verticillium wilt is managed primarily by planting the most tolerant cultivars and minimizing excessive irrigation and fertility. There is currently no information available regarding the management of Verticillium wilt in peanut; therefore, research evaluating the relative susceptibility or tolerance of commercially available cultivars is warranted. In addition, the exploitation of other management practices which impact the survival of the fungus, such as the removal of crop residue infested with *V. dahliae*, may also be effective at reducing disease development in both peanut and cotton in the long term. Results from several cultivar trials, conducted in fields with varying *V. dahliae* population densities, are presented in this report. Preliminary results from the removal of crop debris are also included.

Materials and Methods

Cultivar trials: Fields with a history of the disease were identified in the winter of 2007 and sampled early spring 2008. Soil populations of *V. dahliae* were determined by plating composite soil samples from each location on a semi-selective medium. In all, four fields were indentified (three in Gaines Co. and one in Terry Co.) to evaluate the cultivars Flavorrunner 458, Tamrun OL02, Tamrun OL07, Tamnut OL06, ACI 48, McCloud, and Florida-07 to Verticillium wilt. An additional trial was conducted at the Terry Co. location to evaluate the Virginia cultivars AT07-V, Georgia-05E, Gregory, Gregory HiOL, Jupiter, NC 12-C, Perry, and Phillips. Plots (2-rows wide by 50 feet in length; 36-in or 40-in. row spacing) were planted the last week in April or the first week in May. Cultivars were arranged in a randomized complete block design (RCBD) with four replications. All production practices followed were at the discretion of the collaborating producer. Disease assessments were made throughout the growing season. Plots were inverted at maturity and allowed cure in rows prior being harvested.

Fumigation trials: Two additional trials were conducted (in Gaines Co. and Terry Co.) to evaluate the effects of increasing rates of the fumigant Vapam on Verticillium wilt development. Vapam rates of 0, 7, 10, and 20 gal/A were evaluated in the Gaines Co. trial. For this trial, plots were 4-rows wide by 50 feet in length on 40-in centers. Treatments were arranged in a RCBD with six replications. Vapam was applied using a deep tillage shank equipped with a sweep (Fig. 1). Pic-plus was applied using a commercial 4-row fumigation rig (Fig. 2). Rates evaluated in these trials included 0, 5, and 10 gal/A. Plots were arranged in a RCBD with six replications. Subsequent soil samples were collected and processed in the laboratory to determine the effect of the treatments on viable *V. dahliae* microsclerotia. All other production practices followed were at the discretion of the collaborating producer. Disease assessments were made throughout the growing season. Plots were inverted at maturity and allowed cure in rows prior being harvested.

In-furrow fungicide trial: An additional trial was conducted at one of the Gaines Co. locations to evaluate the effect of applications of the fungicides Abound and Proline, as well as the systemic acquired resistance (SAR) material Actigard. Plots consisted of 4-rows by 50 ft in length on 40-in centers. Treatments were arranged in a RCBD with three replications. All other production practices followed were at the discretion of the collaborating producer. Disease assessments were made throughout the growing season. Plots were inverted at maturity and allowed cure in rows prior being harvested.

Peanut residue trial: Microplots were constructed at the Texas Tech University Quaker Research Farm to determine the influence of peanut hay infested with *V. dahliae* on soil populations of the fungus. Peanut hay from one of the Gaines Co. trials was used to amend plots at rates of 0, 413, 825, 1650, 2475, 3300, 16500, and 33000 lb/A on 5-Mar. Treatments were arranged in a RCBD with nine replications. The susceptible cotton cultivar Stoneville 4554B2RF was planted to plots on 2-Jun. Stand counts were taken 28 days after planting, and disease development was monitored throughout the season. Soil samples are currently being conducted to determine soil populations of *V. dahliae*.

Data analysis: Data from individual field trials were analyzed using the ANOVA procedure of SAS, and means were separated using Fisher's protected LSD (P<0.05). If there was no significant trial × treatment interaction data were pooled for analysis. Regression analysis was performed on the data from the microplot studies.

Results

Runner trials: Soil populations of *V. dahliae* ranged from 8.6 to 42.0 microsclerotia/cc soil for the locations chosen for these trials (Table 1). Disease symptoms were first observed in mid-August and progressed throughout mid-October in a linear fashion (Fig. 3). Due to the lack of a significant trial × treatment interaction, data from the four trials were combined for analysis. When averaged across locations Verticillium wilt incidence was lowest for the cultivars Tamrun OL07 and Florida-07 and greatrial for Tamnut OL06 and ACI 48 (Table 2). Despite having a high level of disease (39.6%), pod yields were greatrial for ACI 48. Similar yields were obtained with Tamrun OL02, Tamrun OL07, Flavorrunner 458 and McCloud. Yields of Tamnut OL06 were negatively affected by Verticillium wilt. Peanut quality differed greatly for the cultivars evaluated. Overall, grades were highest for Flavorrunner 458, ACI 48, and Tamrun OL02 (73.0, 72.4, and 71.4%, respectively), and lowest for Tamnut OL06, Florida-07, and Tamrun OL07 (69.2, 70.0, and 71.0%, respectively).

Virginia trial: Differences in the reaction to Verticillium wilt were observed among the Virginia cultivars evaluated (Table 3). Disease incidence was greatrial for Jupiter (46.0%) and lowest for Perry (4.0%). There was a strong negative relationship between disease incidence and pod yield in this trial (Fig. 4). Yields were lowest for Jupiter (1554 lb/A). Yields were similar for AT07-V, NC 12-C, Gregory, Gregory HiOL and Perry, and intermediate for Phillips and Georgia-05E. Overall, grades were low; however, differences between cultivars were observed. Grades were lowest for Gregory (64.0%) and highest for NC 12-C, Perry, Phillips, and Georgia-05E (69.4, 68.6, 68.6, and 67.7%, respectively).

Vapam fumigation trials: Soil populations of *V. dahliae* for the Gaines Co. trial averaged 18.0 microsclerotia/cc of soil (Table 1). The application of Vapam significantly reduced populations of *V. dahliae* when soil was assayed 21 days after application; however, there was no benefit to increasing the rate (Fig. 4). Disease incidence was similar among all treatments ranging from 57.7 to 67.7% (Table 4). Likewise, the application of Vapam did not affect yield or grade. The average yield snd grade for this trial was 4359 lb/A, and 70.6%, respectively. As was the case for the Gaines Co. trial, the application of Vapam reduced soil populations of *V. dahliae* (Fig. 5); however, no differences in yield or grade were observed (Table 4).

Pic-plus fumigation trials: The application of Pic-plus had little effect on soil populations of *V. dahliae* (data not shown). Verticillium wilt incidence was numerically higher in the untreated control plots (51.0%), but did not differ when compared to plots treated with Pic-plus (Table 5). The use of the fumigant had no affect on Sclerotinia blight development. Pod yields and grades were similar for all treatments.

In-furrow fungicide trial: The use of in-furrow fungicides had no affect on Verticillium wilt development, pod yield, or grade (Table 6). Verticillium wilt incidence ranged from 60.0 to 65.5%. Yields were highly variable and ranged from 3780 to 4600 lb/A. Grades averaged 74.6±0.4%.

Peanut residue trial: Data from this experiment were transformed ($\log_{10}$+1) so that linear regression analysis could be conducted. The addition of peanut residue significantly impacted the establishment cotton stands (Fig. 6). Stands were highest in plots not receiving any peanut residue, and decreased with the addition of 825 lb/A. Increasing rates of peanut residue lead to increased Verticillium wilt development within the season (Fig. 7). Disease incidence ranged from 0 in the plots not receiving peanut residue to 27.8% for plots receiving 33000 lb/acre of residue. Soil samples have been collected from these plots, and populations of *V. dahliae* are currently being quantified in the laboratory.

Summary and conclusions

Verticillium wilt is an increasingly important disease on the Southern High Plains of Texas in both cotton and peanut production. Much information is available with regard to cultivar selection and performance as it relates to Verticillium wilt; however, information on peanut cultivars is limited. Results from these studies indicate that differences in the response to Verticillium wilt are present in both Runner and Virginia cultivars. While considerable disease can be observed in the Runner cultivars evaluated Flavorruner 458, ACI 48, and Tamrun OL07 consistently perform well in field trials. Tamnut OL06 appears to be highly sensitive to Verticillium wilt. There is strong negative relationship between the pod yield and disease incidence in the Virginia cultivars evaluated.

Acknowledgements

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Table 1. Soil populations of *V. dahliae* for five trial locations

Location (market-type)	*V. dahliae* density (propagules / cc soil)
Gaines Co. I (Runner)	18.0
Gaines Co. II (Runner)	19.8
Gaines Co. III (Runner)	8.6
Terry Co. (Runner)	42.0
Terry Co. (Virginia)	42.0

Table 2. Final disease rating, pod yields, and grades for seven Runner peanut cultivars[a]

Cultivar	Verticillium wilt incidence (%)[a]	Pod yield (lb/acre)	Grade (% smk+ss)
Flavorunner 458	38.0 bc[b]	2847 ab[b]	73.0 a[b]
Tamrun OL02	35.0 bc	2980 ab	71.4 abc
Tamrun OL07	33.7 c	2894 ab	71.0 bcd
Tamnut OL06	43.2 a	1554 d	69.2 d
ACI 48	39.6 ab	3214 a	72.4 ab
McCloud	37.6 bc	2871 ab	71.2 abc
Florida-07	34.9 c	2564 bc	70.0 cd
LSD ($P \leq 0.05$)	4.7	467	1.9

[a] Data are the means of four locations (n=16). [b] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 3. Final disease rating, pod yields, and grades for eight Virginia peanut cultivars[a]

Cultivar	Verticillium wilt incidence (%)[a]	Pod yield (lb/acre)	Grade (% smk+ss)
AT07-V	20.0 b[b]	3124 a	64.9 de
Georgia 05E	8.3 cd	2564 bc	67.7 ab
Gregory	12.0 cd	2847 ab	64.0 e
Gregory HiOL	14.8 c	2871 ab	65.7 cde
Jupiter	46.0 a	1554 d	66.5 bcd
NC 12-C	13.8 c	2980 ab	69.4 a
Perry	4.0 d	2894 ab	68.6 ab
Phillips	14.0 c	2178 c	68.6 ab
LSD ($P \leq 0.05$)	4.6	516	2.2

[a] Data are the means of four replications. [b] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD.

Table 4. Effect of increasing Vapam rates on Verticillium wilt, pod yield, and grade

Trial, treatment	Verticillium wilt incidence (%)[a]	Pod yield (lb/acre)	Grade (% smk+ss)
Gaines Co.[a]			
Untreated control	67.7	4556	73.2
7 gal/A	63.7	4188	72.8
10 gal/A	63.3	4157	73.0
20 gal/A	57.7	4536	72.9
LSD ($P≤0.05$)	ns[c]	ns[c]	ns[c]
Terry Co. [b]			
Untreated control	33.8	4078	69.6
10 gal/A	31.5	4155	70.1
20 gal/A	29.8	3988	69.9
LSD ($P≤0.05$)	ns[c]	ns[c]	ns[c]

[a] Data are the means of six replications (plots were 4 rows wide x 50 ft in length).
[b] Data are the means of three replications (plots were 4 rows wide by the length of the field). [c] ns indicates no significant differences according to Fisher's protected LSD.

Table 5. Effect the fumigant Pic-plus on soil populations of *Verticillium dahliae*, Verticillium wilt, pod yield, and grade

Treatment	**Initial *V. dahliae* populations (cfu/cc soil)[a]**	**Final *V. dahliae* populations (cfu/cc soil)[a]**	**Verticillium wilt (%)**	**Sclerotinia blight (%)**	**Pod yield (lb/A)**	**Grade (smk+ss)**
Untreated control	14.2[b]	13.5 [b]	51.0 [b]	8.7 [b]	4698 [b]	71.5 [b]
Pic-plus 5 gal/A	9.4	13.5	47.4	8.2	5064	71.2
Pic-plus 10 gal/A	12.6	10.0	45.8	9.3	5157	70.9
LSD ($P \leq 0.05$)	ns[c]	ns[c]	ns[c]	ns[c]	ns[c]	ns[c]

[a] Soil populations of *V. dahliae* were determined prior to (initial) and after (final) fumigant applications, using a semi-selective medium.
[b] data are the means of twelve replications, two trials with six replications each.
[c] ns indicates no significant differences according to Fisher's protected LSD.

Figure 1. Application of Vapam (Gaines County).

Figure 2. Application of Pic-plus in a heavy cover (Gaines County).

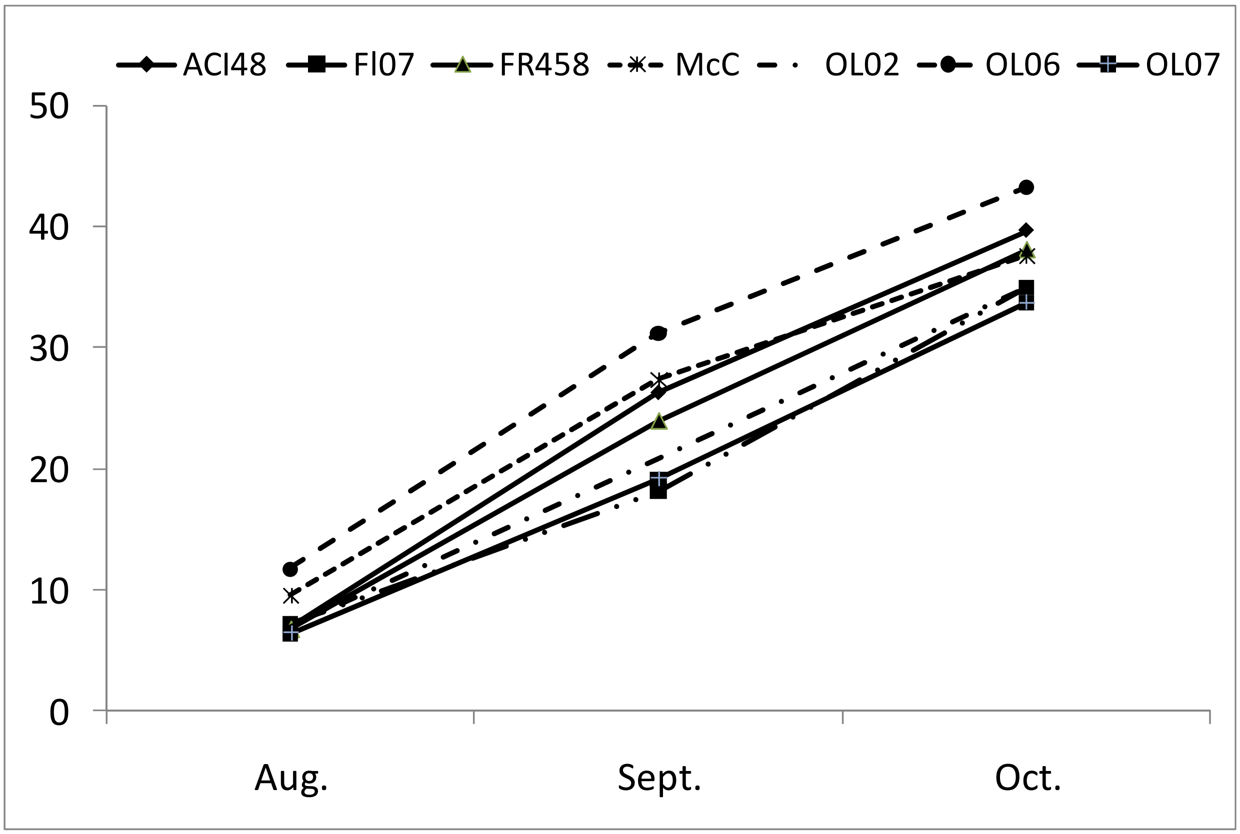

Figure 3. Verticillium wilt progress curves for seven Runner peanut cultivars. x-axis represent the rating date, and the y-axis represents the Verticillium wilt incidence (%). Data points represent the mean of four locations (n=16).

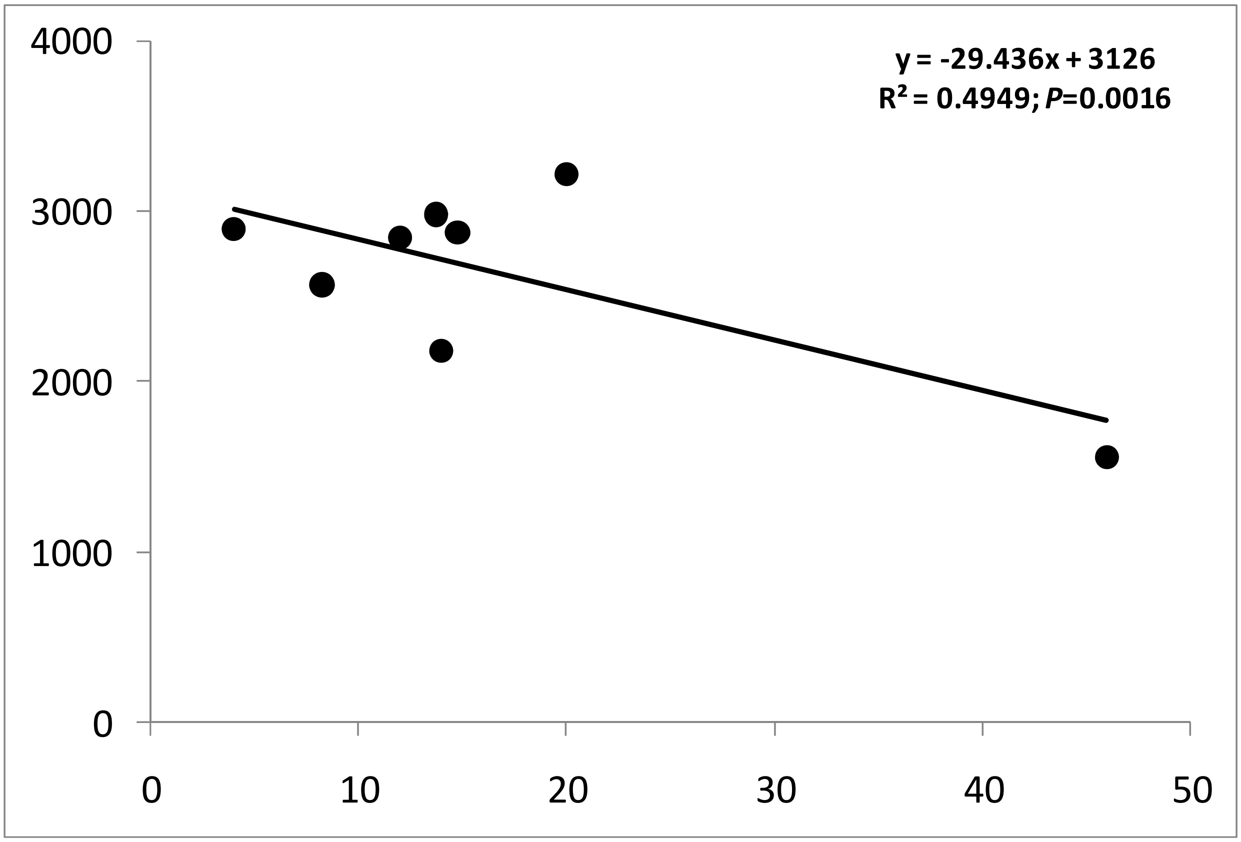

Figure 4. Relationship between Verticillium wilt incidence (%; x-axis) and pod yield (lb/A; y-axis) for eight Virginia peanut cultivars. Data points represent the mean of four observations.

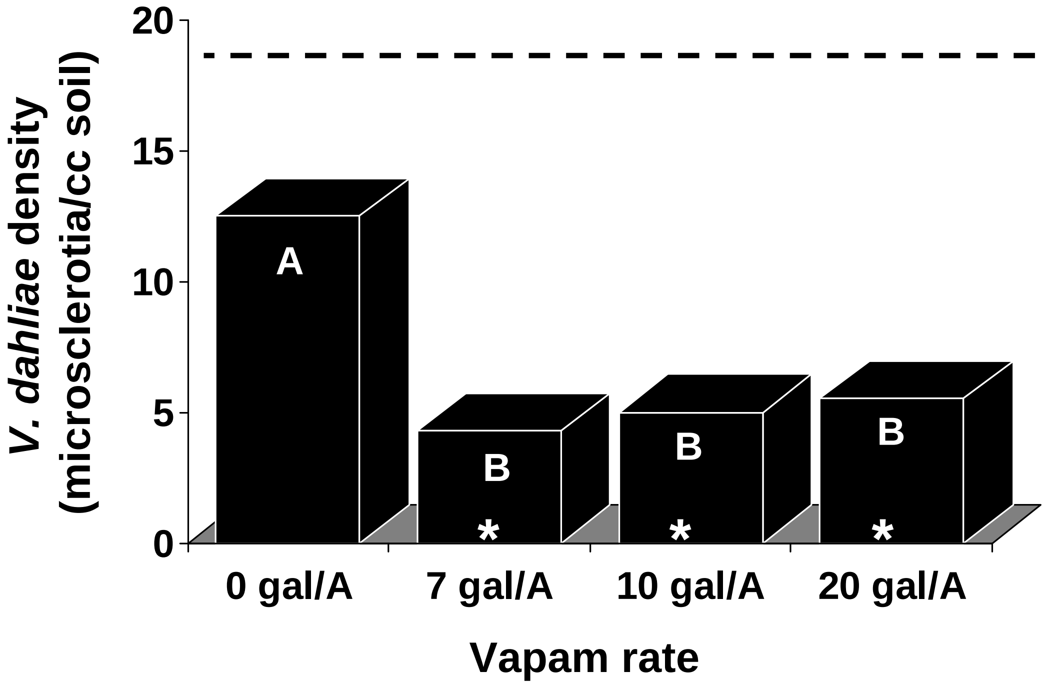

Figure 5. Effect of Vapam on *Verticillium dahliae* microsclerotia at the Gaines Co. location. Note the dotted line represents the ` populations prior to treatment. Bars represent mean soil populations after applications were made. Bars with the same letter are not significantly different according to Fisher's protected LSD. * indicates significant differences between soil populations before and after treatment.

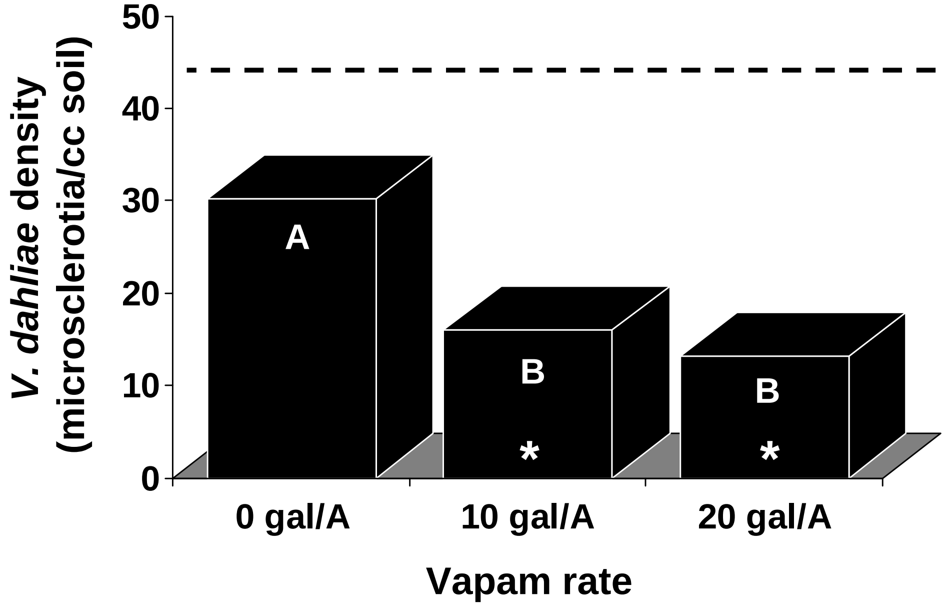

Figure 6. Effect of Vapam on *Verticillium dahliae* microsclerotia at the Terry Co. location. Note the dotted line represents the mean of soil populations prior to treatment. Bars represent mean soil populations after applications were made. Bars with the same letter are not significantly different according to Fisher's protected LSD. * indicates significant differences between soil populations before and after treatment.

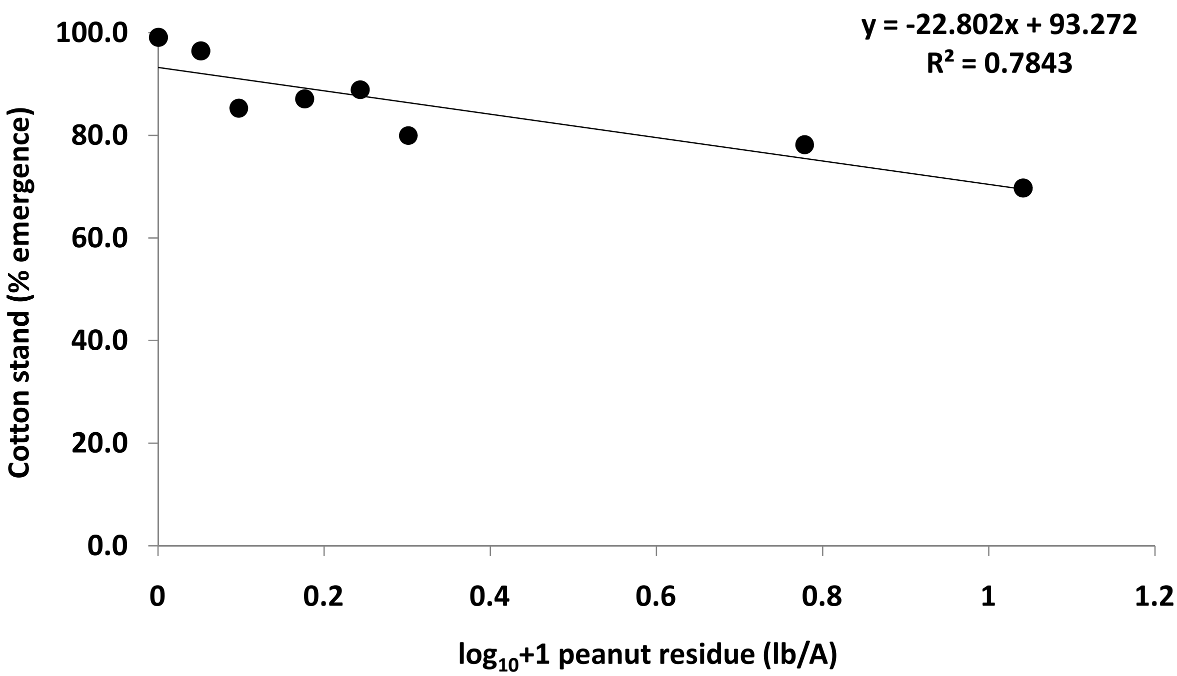

Figure 7. Effect of increasing peanut residue rate on stand establishment of Stoneville 4554B2RF.

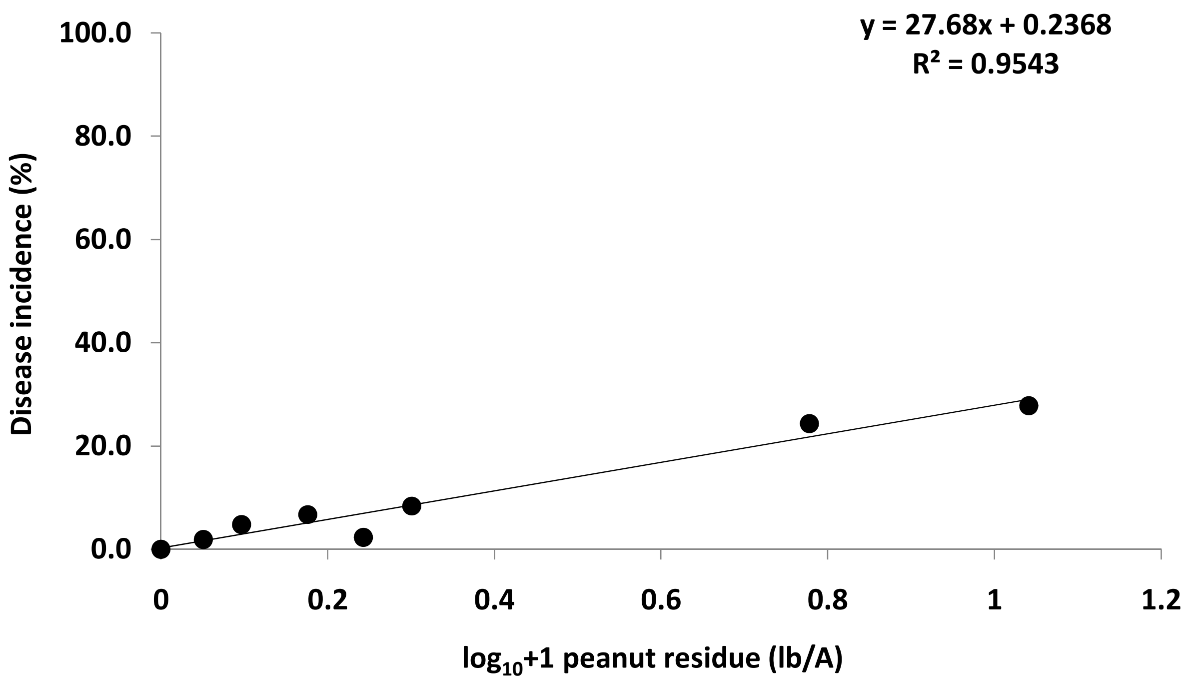

Figure 8. Relationship between increasing peanut residue rate on Verticillium wilt development in the susceptible cotton cultivar Stoneville 4554B2RF.

EVALUATION ON METHODS TO IMPROVE CONTROL OF SCLEROTINIA BLIGHT IN PEANUT

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Introduction

Sclerotinia blight, caused by the soilborne fungus *Sclerotinia minor* Jagger, is a serious threat to peanut production in portions of Gaines and Collingsworth counties. Several factors contribute to the difficulty of managing the disease. While the biology of *S. minor* has been intensely studied, the development of Sclerotinia blight in West Texas is poorly understood. Over the past three growing seasons, the onset Sclerotinia epidemics have begun by the second week of July, resulting in as many as four fungicide applications being made. Preventative applications have been found to provide superior levels of control compared to curative applications indicating the importance of proper fungicide timing. Several advisory models, which utilize environmental conditions, have been developed to aid in properly timing fungicide applications in Oklahoma and the Virginia/Carolina region; however, these models have yet to be evaluated under West Texas conditions. An additional problem facing producers is the cost of fungicides labeled for control of Sclerotinia blight, thus more cost effective application methods need to be investigated. The objectives of this research were to i) evaluate forecasting models to predict the onset of Sclerotinia blight epidemics to aid in making timely fungicide applications, and ii) compare broadcast and banded applications of fungicides applied during the day or at night.

Materials and Methods

Sclerotinia forecasting models: Three field trials were conducted in west Gaines County to evaluate forecasting models for control of Sclerotinia blight. The fields chosen for these trials had a history of severe Sclerotinia related losses. Two trials were planted to Flavorrunner 458 (a susceptible cultivar), and one to Tamrun OL07 (a moderately resistant cultivar). All trials were planted 23-Apr. Plots were 2-rows wide by 50 feet in length and planted on a 36-in row spacing. Environmental factors monitored for forecasting models included: soil temperature at a depth of 4 inches, rainfall or irrigation, and relative humidity within the canopy. Host plant growth factors including vine growth and canopy density were also monitored. Specific treatments were derived by weighing values on the aforementioned factors as they relate to Sclerotinia blight development. If the value of the factor had little impact on disease development, it was assigned a value of zero. The greater the factor's impact the higher the value assigned. These values were multiplied to provide a daily risk index and this value was summed over five days to calculate a "Five Day Risk Index" (FDI). The FDI was utilized as a trigger (threshold) to initiate a fungicide spray application. Eight treatments were evaluated for the management of Sclerotinia blight of peanut. These treatments utilized several FDI values, calendar and curative treatments (Table 1). When a fungicide application was made, the risk index was reset to zero until the 28^{th} day following application at which time the summation began anew. Treatments were arranged in a randomized complete block design with four replications. Fungicide applications were first initiated following the calendar treatment on 10-Jul. The curative treatment was first applied on 22-Jul, after the first signs of disease; this was also the trigger date for the first treatment based on the forecast model (Table 2). Fungicide applications consisted of Omega at 24 fluid ounces per acre for the first and second applications with Endura at 10 ounces per acre applied for the final application. These applications were made in a 15 inch band over the middle of the row in an effort to mimic the grower's application method. Disease assessments were made in July and September. Plots were dug on 3-Oct and harvested 10- 21-Oct.

Day and night applications of broadcast and banded fungicides: Two additional field trials (one Flavorrunner 458 and one Tamrun OL07) were conducted to compare broadcast and banded applications of the fungicides Omega and Endura applied during the day or at night. Plots were 2-rows wide by 50 feet in length on a 36-in row spacing. Treatments were arranged in a randomized complete block design with three replications. Fungicide applications were made using a CO_2 pressurized backpack sprayer on 10-Jul and 8-Aug. Banded applications used a total volume of 10 gallons per acre; broadcast applications used 22 gallons per acre. A full description of the treatments evaluated is presented in Table 4. Disease assessments were made in July and September. Plots were dug and harvested as described previously.

Results and Discussion

Sclerotinia forecasting models: Sclerotinia blight ratings were similar among treatments in July (data not shown); however, treatment differences were observed in September. Incidence of Sclerotinia blight was greatrial in the untreated control in both trials where Flavorruner 458 was planted (Table 3). This trend was not observed in the more resistant Tamrun OL07 trial. No other differences in disease control were observed in the first Flavorrunner 458 trial; however, disease control for the more conservative forecasting models (FDI= 16 and 24) was similar to that obtained when calendar applications were made. Despite differences in disease control, pod yields and grades were similar for all treatments, indicating that further refinements need to be made to the models.

Day and night applications of broadcast and banded fungicides: Disease ratings for the July rating were not significantly different among treatments (data not shown). Differences in disease control were observed in September in the Flavorrunner 458 trial (Table 4). Overall, disease incidence was lower when fungicides were banded when compared to broadcast applications. Disease control was similar for Omega and Endura. Despite differences in disease control among treatments, yields were similar for all treatments; however, yields were lowest for the untreated control. No treatment differences were observed in the Tamrun OL07 trial (Table 5). There did not appear to be any benefit to making nighttime applications; however, the leaves closing at night should allow for a more uniform distribution of fungicide in the lower canopy. Additional studies investigating this aspect are required.

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Table 1. Detailed list of treatments evaluated in the Sclerotinia forecasting model trials

Treatment	Description
1	Untreated control
2	Calendar
3	Curative
4	FDI=16
5	FDI=24
6	FDI=32
7	FDI=40
8	FDI=48

Table 2. Application dates, model reset dates for the Sclerotinia forecasting model trials

Treatment	1st application (Omega)	Reset Date	2nd application (Omega)	Reset Date	3rd application (Endura)
Untreated Control	NA	NA	NA	NA	NA
Calendar	10-Jul	7-Aug	7-Aug	5-Sep	5-Sep
Curative	22-Jul	19-Aug	20-Aug	17-Sep	17-Sep
FDI=16	22-Jul	19-Aug	20-Aug	17-Sep	17-Sep
FDI=24	23-Jul	20-Aug	20-Aug	17-Sep	17-Sep
FDI=32	26-Jul	23-Aug	22-Aug	19-Sep	19-Sep
FDI=40	26-Jul	23-Aug	22-Aug	19-Sep	19-Sep
FDI=48	26-Jul	23-Aug	22-Aug	19-Sep	19-Sep

Table 3. Effect of calendar, curative, and forecasted fungicide applications on Sclerotinia blight, pod yield, and grades in three trials conducted in west Gaines Co.

Trial, treatment	**Sclerotinia blight (%)**	**Pod yield (lb/A)**	**Grade (smk+ss)**
Flavorunner 458 (I)			
Untreated Control	2.8 a[a]	5203	70.7
Calendar	0.5 c	5638	69.6
Curative	1.5 abc	5333	69.9
FDI=16	0.3 c	5073	73.2
FDI=24	1.0 bc	4913	71.6
FDI=32	2.3 ab	5058	70.0
FDI=40	1.8 abc	5304	72.5
FDI=48	2.8 a	5725	72.4
***p*-value**	0.040	ns[b]	ns[b]
Flavorunner 458 (II)			
Untreated Control	17.3 a[a]	3913	66.7
Calendar	3.5 b	5304	70.4
Curative	7.3 b	4913	68.6
FDI=16	5.8 b	3855	69.9
FDI=24	6.5 b	3739	69.2
FDI=32	8.5 b	4159	69.2
FDI=40	8.3 b	4362	71.0
FDI=48	8.3 b	4029	69.0
***p*-value**	0.031	ns[b]	ns[b]
Tamrun OL07			
Untreated Control	2.0	4522	68.7
Calendar	0.5	5275	69.4
Curative	1.8	4913	69.7
FDI=16	1.0	4884	71.0
FDI=24	1.3	5073	72.4
FDI=32	1.3	4739	68.2
FDI=40	1.3	4522	69.5
FDI=48	0.5	4478	72.0
***p*-value**	ns[b]	ns[b]	ns[b]

[a] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD (*P*=0.05). [b] ns = not significantly different.

Table 4. Description of fungicide treatments, including application timing, fungicide and rate/A, application method, and dates

Treatment	**Application timing**	**Fungicide**	**Rate/A**	**Application method**	**Application dates**	
1	Untreated control		- - - -	- - - -	- - - -	- - - -
2	Day	Endura	10 oz	Broadcast	10-Jul	8-Aug
3	Day	Endura	10 oz	Banded	10-Jul	8-Aug
4	Day	Omega	1.5 pt	Broadcast	10-Jul	8-Aug
5	Day	Omega	1.5 pt	Banded	10-Jul	8-Aug
6	Night	Endura	10 oz	Broadcast	11-Jul	9-Aug
7	Night	Endura	10 oz	Banded	11-Jul	9-Aug
8	Night	Omega	1.5 pt	Broadcast	11-Jul	9-Aug
9	Night	Omega	1.5 pt	Banded	11-Jul	9-Aug
10	Night	Omega	1.0 pt	Broadcast	11-Jul	9-Aug
11	Night	Omega	1.0 pt	Banded	11-Jul	9-Aug

Table 5. Effect of broadcast and banded applications of the fungicides Omega and Endura applied during the day or night on Sclerotinia blight development, pod yields, and grade (Trial I)

Application timing, fungicide (rate)	Application method	Sclerotinia blight (%)	Pod yield (lb/A)	Grade (smk+ss)
Day				
Endura (10 oz/A)	Broadcast	6.0 cd[a]	4952	76.3
Endura (10 oz/A)	Banded	3.3 d	4773	75.3
Omega (1.5 pt/A)	Broadcast	6.3 cd	5594	75.9
Omega (1.5 pt/A)	Banded	5.3 cd	4990	75.1
Night				
Endura (10 oz/A)	Broadcast	8.0 bcd	4556	75.5
Endura (10 oz/A)	Banded	5.7 bcd	4628	75.4
Omega (1.5 pt/A)	Broadcast	12.3 bcd	4459	76.6
Omega (1.5 pt/A)	Banded	8.0 bcd	5387	73.7
Omega (1.0 pt/A)	Broadcast	9.0 bc	5024	76.9
Omega (1.0 pt/A)	Banded	5.0 bc	4812	75.7
Untreated control	- - - -	21.3 a	3792	75.2
	p-value	<0.0001	ns[b]	ns[b]

[a] Means within a column followed by the same letter are not significantly different according to Fisher's protected LSD (P=0.05). [b] ns = not significantly different.

Table 6. Effect of broadcast and banded applications of the fungicides Omega and Endura applied during the day or night on Sclerotinia blight development, pod yields, and grade (Trial II)

Application timing, fungicide (rate)	Application method	Sclerotinia blight (%)	Pod yield (lb/A)	Grade (smk+ss)
Day				
Endura (10 oz/A)	Broadcast	1.7	4063	70.1
Endura (10 oz/A)	Banded	0.3	4000	66.6
Omega (1.5 pt/A)	Broadcast	0.7	2667	69.3
Omega (1.5 pt/A)	Banded	0.3	3947	70.3
Night				
Endura (10 oz/A)	Broadcast	0.7	3010	68.8
Endura (10 oz/A)	Banded	2.7	3507	68.3
Omega (1.5 pt/A)	Broadcast	1.3	3884	70.5
Omega (1.5 pt/A)	Banded	0.7	3169	70.5
Omega (1.0 pt/A)	Broadcast	0.7	3560	67.1
Omega (1.0 pt/A)	Banded	0.0	2459	69.1
Untreated control	- - - -	1.0	3609	72.3
	p-value	ns[a]	ns[a]	ns[a]

[a] ns = not significantly different according to Fisher's protected LSD (P=0.05).