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 28th 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).