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Evaluating a Forecasting Model to Predict Sclerotinia Blight Development

and Maximize Fungicide Treatments in West Texas Peanuts

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Summary

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. Two field trials were conducted in western Gaines County to evaluate the potential use of a forecasting model for control of Sclerotinia blight. In the Virginia-Carolina peanut growing region, researchers developed a disease forecasting model to help predict when environmental conditions were favorable for disease development. These conditions are then communicated to growers. Growers utilizing this forecast model to advise them when to apply fungicides, have increased their economic returns. The field selected for these trials had a history of Sclerotinia blight. The tests were planted in either Flavorrunner 458 (a susceptible cultivar) or Tamrun OL07 (a partially resistant cultivar). Applying chemical management provided increased yields over the untreated control in both tests.

Objective

The objective of this applied research was to evaluate a forecasting model to predict the growing conditions favorable for disease development and thus treatment timing recommendations for Sclerotinia blight of peanut in the Texas South Plains.

Materials and Methods

Both trials were planted April 28. Plots were 2-rows wide by 45 feet (Flavorrunner 458, susceptible) or 50 feet (Tamrun OL07, partially resistant) in length and planted on 36-inch row spacing. Environmental factors monitored for the forecasting model 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 fungicide spray applications. Eight treatments were evaluated for the management of Sclerotinia blight of peanut. These treatments utilized five different FDI values plus calendar and curative treatments (Table 1). Calendar treatments were applied approximately 75 and 105 days after planting and the curative treatment was applied at the first visible symptoms of disease and again 30 days later. When a fungicide application was made, the risk index was reset to zero until the 28th day following application at which time the summation of the FDI began anew. Treatments were arranged in a randomized complete block design with four replications. Dates for specific fungicide applications are listed in Table 1. All treatments received two applications of the fungicide fluazinam (Omega 500F) at a rate of 24 ounces per acre, in a volume of 16 gallons, applied in a 15" band over the row. Final disease assessments were made prior to harvest. Plots were dug on October 5, 2010 and thrashed October 18. Disease incidence is expressed as proportion of plot expressing symptoms (feet infested/total row feet of plot) and yield is expressed as pounds per acre. Disease incidence, yield and percentage of damaged kernels are listed in Table 2.

Results and Discussion

Among the partially resistant cultivar, Tamrun OL07, there were no significant differences in disease incidence at the end of the season (Table 2). The calendar applied treatment and the FDI=40 treatments were significantly higher than the FDI=16 and FDI=24 treatments, but neither was significantly different form the untreated control (Table 2). The FDI=40 treatment was the highest yielding at 4460.1 pounds per acre; however it was not significantly different form the untreated control at 3680.8 pounds per acre. There were significant differences among the percentage of damaged kernels for the Tamrun OL07 variety. The FDI=32 was significantly higher than all other treatments except the untreated control and the FDI=16. The FDI=48 had the lowest percentage of damaged kernels, but was not significantly different from the untreated control.

Among the Flavorrunner 458 variety, there were significant differences among treatments in disease incidence; yield and percent damaged kernels (Table 2). The FDI=16 treatment was significantly lower in disease incidence than the untreated control; however it was not significantly different from any other treatment. The untreated control had the lowest yield and was significantly less than all others except the FDI=40 and FDI=32 treatments. The calendar treatment yield was significantly higher than the untreated control and the FDI=40. Among the Flavorrunner 458 variety, the FDI=48 treatment had the highest percentage of damaged kernels however it was not significantly higher than the untreated control; the calendar treatment had significantly lower damaged kernels but did not differ from the untreated control.

Conclusions

When sclerotinia blight is present in a peanut field, chemical treatments increased yield, particularly when a susceptible variety was planted. The practice of making applications based on a calendar schedule provided increased yield over no chemical treatment but was not significantly better than most other treatments in the partially resistant variety. The forecasting model utilized in the Virginia-Carolina Region did not provide better yields than making calendar based spray applications.

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Table 1. Dates of fungicide applications (fluazinam; 24 oz/ac in 15" band) and model reset dates for the Sclerotinia forecasting model trials (Gaines County).

Treatment	1st application	Reset date	2nd application
Untreated control	n/a†	n/a†	n/a†
Calendar	10-Jul	7-Aug	11-Aug
Curative	17-Jul	14-Aug	13-Aug
FDI=16	10-Jul	7-Aug	11-Aug
FDI=24	18-Jul	15-Aug	16-Aug
FDI=32	19-Jul	16-Aug	19-Aug
FDI=40	20-Jul	17-Aug	22-Aug
FDI=48	21-Jul	18-Aug	23-Aug

† n/a = not applicable.

Table 2. Forecast Model Evaluation, Gaines County 2010; treatment effects on sclerotinia blight incidence (end of season), yield (lbs. per acre) and percentage of damaged kernels.

Treatment	SB[1]	Yield/ac (lbs./ac)	DK (%)
Variety: 0L07			
Untreated Control	0.20	3680.8ab	0.73ab
Omega Calendar	0.11	4399.6a	0.42b
Omega Curative	0.11	3891.4ab	0.52b
FDI=16	0.15	3056.5b	0.78ab
FDI=24	0.16	3046.8b	0.48b
FDI=32	0.16	4002.7ab	1.13a
FDI=40	0.13	4460.1a	0.50b
FDI=48	0.16	3709.9ab	0.18b
LSD (P=0.05)	Ns	999.5	0.60
mean	0.15	3780.9	0.59
Variety: FR458			
Untreated Control	0.21a	2759.7c	0.65abc
Omega Calendar	0.07ab	4775.4a	0.18c
Omega Curative	0.07ab	4569.4ab	0.82ab
FDI=16	0.05b	4368.6ab	0.88ab
FDI=24	0.09ab	4250.2ab	0.45abc
FDI=32	0.09ab	3985.1abc	0.32bc
FDI=40	0.11ab	3452.2bc	0.37abc
FDI=48	0.14ab	4484.5ab	0.77ab
LSD (P=0.05)	0.15	1282.0	0.53
mean	0.10	4080.6	0.55

[1] Incidence of disease expressed as proportion of plot expressing symptoms. Values in the same column followed by the same letter are not significantly different at P=0.05%.