AgriLIFE EXTENSION
Texas A&M System

Developing a Sampling Protocol and Economic Threshold for Pod Rot of Peanut

Terry Wheeler, Texas AgriLIFE Research Plant Pathologist
Jason Woodward, Texas AgriLIFE Extension Plant Pathologist
Scott A. Russell, Extension Agent-IPM, Terry and Yoakum Counties
Manda Cattaneo; Extension Agent-IPM, Gaines County

Cooperators: Mr. Jimbo Grissom and Mr. Tommy Mason

Summary:

The scouting protocol portion of this trial intensely monitored two area peanut fields by sampling 101 random locations weekly. At each location, the sample consisted of 1.5 row feet of peanut pegs and pods. Peg rot was first observed in the Gaines County field 6 July 2009; in the Terry County field 26 July. The incidence of pod rot increased in both field through mid-August, reaching highs between 8 and 10 percent. From late July through 10 August, pod rot was severe when present. However, the next week, when disease had peaked for the summer, pod rot was a mixture of severely rotted and superficially rotted pods. From that point forward, most of the new infections appeared superficial, and most of the severely rotted pods were from old infections. Fungicide applications were applied in the Mason Field, Terry County, based on the grower's practice or one of three thresholds. These thresholds were two to three percent infestation as a low threshold, four to five percent as a medium threshold and six percent for a high threshold. The grower based treatment and the medium threshold each received two chemical applications, while the low threshold received three treatments and the high threshold only received one treatment. Chemicals utilized in the treatments were Abound FL or Ridomil Gold plus Provost. Pod rot protection was best with the producer timed application (the earliest that went out) and the low threshold treatment. The delay in the first application was associated with poorer control. Plots were dug and inverted on 16 October. Plots were harvested on 28 October 2009. An analysis was done comparing the seven fungicide treatments with pod rot,

averaged from 29 July through 23 August, yield, percentage of extra large kernels, grade, percentage of damaged kernels, and value of the crop (minus fungicide costs) per acre. There were significant differences between treatments in some grade categories and in yield. However, when chemical costs were subtracted from the value per acre, there were no significant differences.

Objective:

Pod rot of peanut is significant disease in the Texas South Plains. Producers and crop consultants have listed it as a major problem. Pod rot is difficult and time consuming to scout for, due to its clumped occurrence in fields. Producers who have a history of pod rot will make chemical treatments based on the calendar. The first objective of this project was to determine the optimal number of samples to collect in a peanut field to best describe the extent of peanut pod rod infestation. The second objective is to develop an economic threshold for peanut pod rot in the Texas South Plains region.

Materials and Methods:

Sampling Protocol

Two fields with a history of pod rot were scouted at weekly intervals, starting on 6 July 2009 (Grissom field, Gaines County) and 15 July 2009 (Mason field, Terry County). At each sampled point, 1.5 ft. of row was dug, and if any pods or pegs were found with symptoms of rot, then all the pegs and pods were counted, and any pegs or pods with discoloration were transported back to the laboratory for counting and fungal isolation. The percentage of symptomatic pegs and pods was determined for each sampling location. As the peanuts shifted to having more pods than pegs, eventually only pods with symptoms were counted and pegs were not. Sampling continued through mid-September.

At the Grissom field, 101 points were selected at random each week within the 120-acre field for sampling. At the Mason field, seven chemical treatments were imposed over a 168-row study area. Within this area, there were three replications of each treatment. This field was planted in a circular row pattern, on one-fourth of the pivot (30 acres), therefore plot lengths were not the

same. A total of 101 random points were selected each week for evaluation in the test area, with a minimum of 3 to a maximum of 7 points within each 8-row plot. As the plots got longer, more points were sampled per plot.

Developing an Economic Threshold for Pod Rot of Peanut

Chemical applications to aid in developing an economic threshold for pod rot of peanut were conducted on the Mason field in Terry County. Plots were eight rows wide and of varying lengths, due to the circular row pattern. The timing of chemical applications involved seven treatments, based on either a calendar application or a trigger based on the percent infected pods.

The fungicide treatments were as follows:
AA: Abound FL applied twice at the producer's normal time (based on a calendar schedule)
RR: Ridomil Gold EC + Provost applied twice at the producer's normal time (calendar schedule)
AR: Abound FL applied once and Ridomil Gold EC + Provost applied once (calendar schedule)
LT: Low threshold, RR applied 3 times based on a threshold of 1-2% pod rot
MT: moderate threshold, RR applied 2 times based on a threshold of 3-4% pod rot
HT: high threshold, Abound FL was applied one time, based on a threshold of 5-6% pod rot
N: no fungicide applied.

Results and Discussion:

At both fields, pod rot began to increase during the week of the 27th of July and increased through the week of 17 August (*Fig. 1*). There was a dramatic change in symptoms during the week of 17 August. Prior to that sampling week, pod rot symptoms had been characteristic of *Pythium*, with a very black, soft rot, and every pod with symptoms was completely consumed by the rot. However, from 17 August onwards, in both fields, a percentage of pods were identified with a more superficial rot, often of a lighter color. *Rhizoctonia* was only isolated in low frequencies from the Mason field, and hardly ever from the Grissom field, so it is likely that the more superficial discolorations were caused by unsuccessful *Pythium* attacks. *Pythium* was isolated from rotted pods frequently during this study. The rating during the week of 17 August included both rotted and superficially rotted pods. However, after that week, two categories were created, and only those pods with significant rot were included in the pod rot category. Pod rot

decreased gradually from a high of 8% on 17 August to 3% by 21 September for the Grissom field (*Fig. 1*). Newly infected pods were identified weekly, but after 17 August, most of the rotted pods were due to old infections. All sampling points for the Grissom field are seen in *Figure. 2.*

In the Mason field, there were seven different treatments that were mapped weekly. Mason A/R (Abound FL applied initially, followed by Ridomil Gold + Provost applied for the second application) was one of the most effective at reducing pod rot, while the treatment with no fungicide had more pod rot, particularly from 19 August through the rest of the season (*Fig. 1*). An analysis was done comparing the seven fungicide treatments with pod rot, averaged from 29 July through 23 August, yield, percentage of extra large kernels, grade, percentage of damaged kernels, and value of the crop (minus fungicide costs) per acre. Percent pod rot was higher for the no fungicide treatment and for the moderate and high thresholds than for the calendar applied treatments (*Table 1*). The low threshold had less pod rot than the no fungicide treatment, but was not significantly different than the other treatments (*Table 1*). The percent of extra large kernels was lowest for the no fungicide treatment compared with all but the high threshold treatment (*Table 1*). Grades were higher for the calendar treatment with Abound FL applied twice, than for the no fungicide treatment (*Table 1*). The percent damaged kernels was lower for the Abound FL calendar treatment applied twice than for the no fungicide and high threshold treatments (*Table 1*). Yield was higher for the calendar treatment with Abound FL, rotated with Ridomil Gold + Provost, and for the low threshold treatment compared to the no-fungicide treatment (*Table 1*). However, once fungicide costs were subtracted for each treatment, the gains in yield were offset by cost of products, and there were no treatment differences for value of the crop (dollars /acre) (*Table 1*). All sampling points are seen in *Figure 3,* once pod rot was found. Prior to 29 July, pod rot had not been seen.

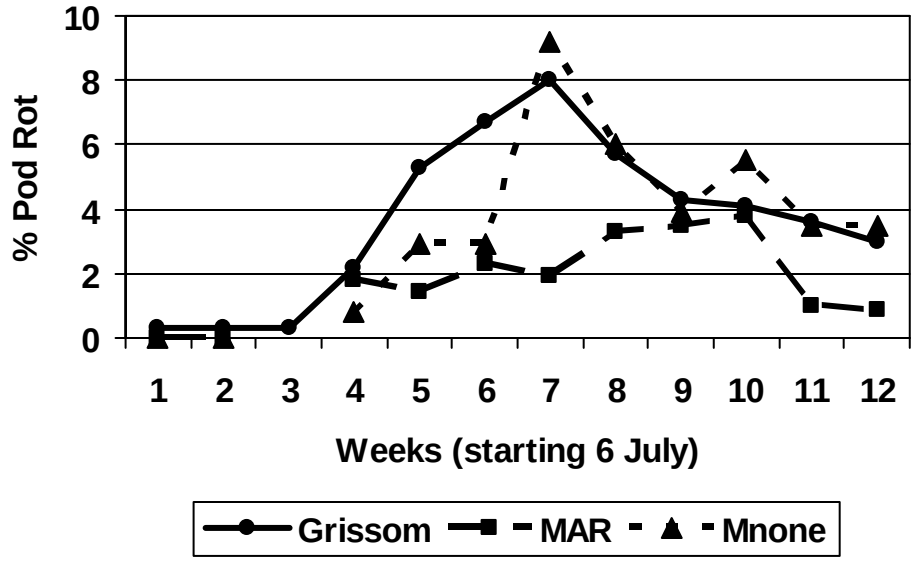

***Figure 1*. Percent pod rot based on weekly sampling at the Grissom field (●), Mason field with Abound FL/Ridomil Gold + Provost (MAR) fungicide treatment (■), and Mason field with no fungicide treatment (none) (▲).**

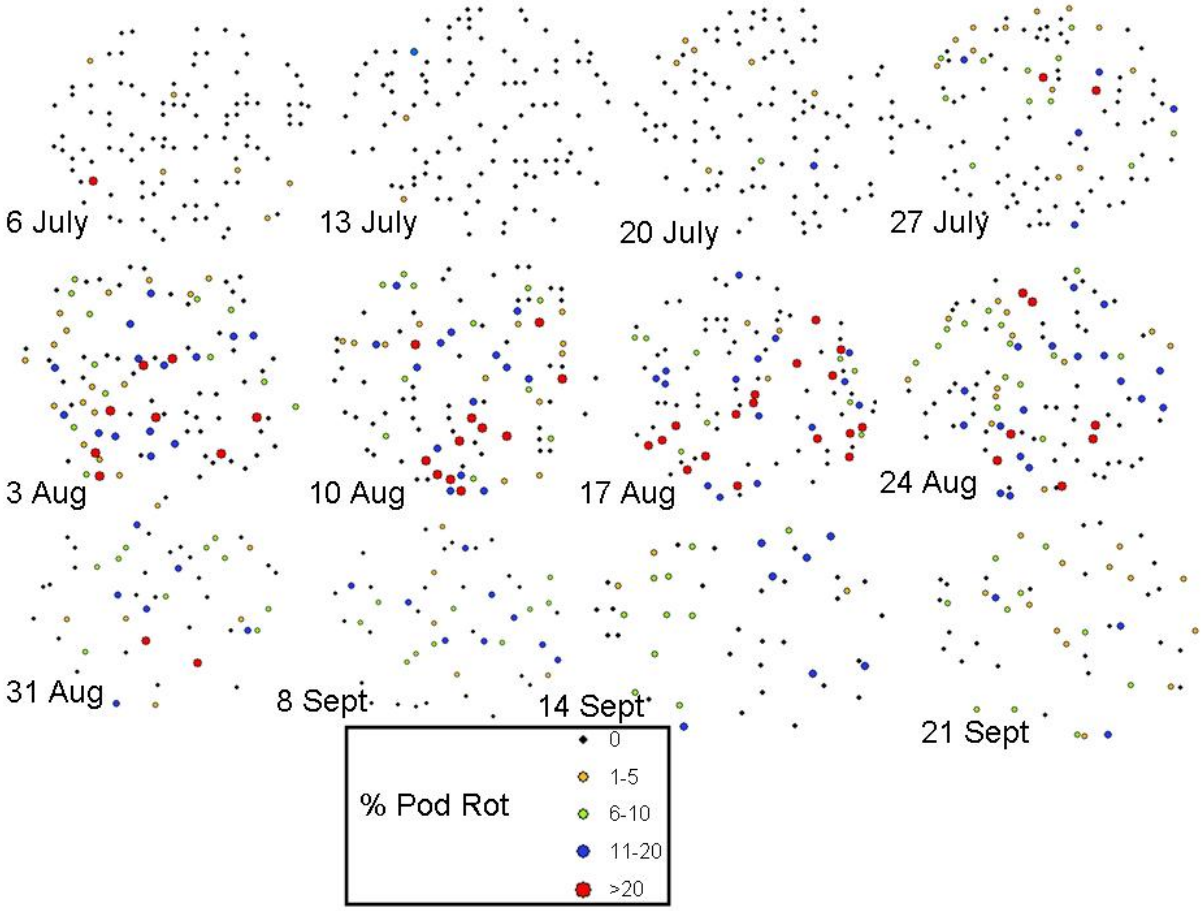

***Figure 2*. Location of sampling points at the Grissom field during the 2009 season, and amount of pod rot present at each point.**

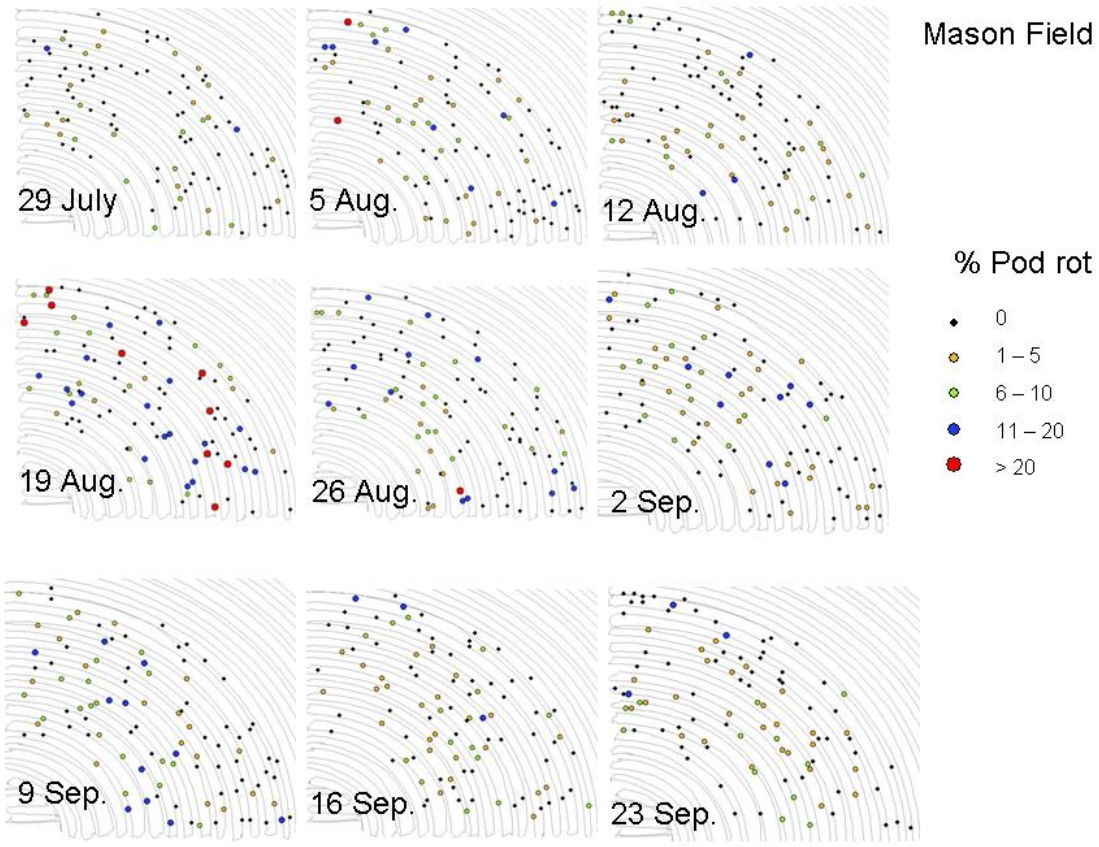

***Figure 3*. Location of sampling points during weeks when pod rot was identified at the Mason field in 2009.**

***Table 1*. Affect of fungicide treatment on pod rot, yield, and value of the crop/acre.**

Treatment[a]	# of sprays	% Pod rot[b]	% ELK[d]	Grade	%DK[e]	Yield Lbs/a	Fungicide Costs ($/a)[f]	Value[g] $/acre
AA	2	1.8 c[c]	43 a	70.4 a	0.4 b	5,653 ab	60.54	964
AR	2	2.0 c	42 a	69.8 ab	0.5 ab	5,851 a	67.29	984
RR	2	1.8 c	44 a	68.7 ab	0.7 ab	5,486 ab	74.04	910
LT	3	2.6 bc	43 a	69.6 ab	0.5 ab	5,876 a	111.06	948
MT	2	3.6 ab	42 a	69.6 ab	0.9 ab	5,769 ab	74.04	956
HT	1	3.5 ab	40 ab	69.5 ab	1.0 a	5,584 ab	30.27	966
None	0	3.8 a	35 b	66.8 b	1.0 a	5,346 b	0	917

[a]AA is Abound FL applied twice during the season based on calendar dates decided by the producer. AR was similar to AA, except Abound Fl was applied on the first application and Ridomil Gold + Provost was applied on the second application. RR was similar to AR except Ridomil Gold + Provost was applied for both applications. LT stands for low threshold and Ridomil Gold + Provost was applied three times during the season when the pod rot threshold initially reached 1-2%, and then at least once every three weeks if pod rot was > 2%. MT was a moderate threshold, where Ridomil Gold + Provost were applied when pod rot initially reached 3-4%, and then a second application was made three weeks later when the pod rot was still around 4%. HT is high threshold, and Abound FL was applied when pod rot reached 5-6% initially. None indicates no fungicides for pod rot were applied.

[b]%Pod rot was combined across sampling dates from 29 July through 23 September.

[c]Letters that are different indicate that treatments were significantly different at $P < 0.05$.

[d]ELK = extra large kernels.

[e]DK = damaged kernels.

[f]Abound FL was applied at 24.6 oz/acre banded over 20-inch row spacing, with a cost of $315/gallon. Ridomil Gold was applied at 8 oz/acre, at a cost of $795/gallon, and Provost was applied at a rate of 10.7 oz./acre, at a cost of $291.50/gallon.

[g]Value/acre is the (%ELK x $0.35/ton) + (grade x $4.949/ton) + (% other kernels x $1.4/ton) – ($3.40/ton if %DK = 2%) – fungicide costs/acre.

***Table 2*. Percent pod rot for each fungicide treatment at the Mason field over time.**

Trt[a]	7/29	8/5[b]	8/12	8/19	8/26	9/2	9/9	9/16	9/23
AA	1.0	4.0	1.0	7.9	1.4	0.5	0.6	1.1	0.5
AR	1.8	1.4	2.3	1.9	3.3	3.5	3.8	1.0	0.9
RR	0.7	4.1	1.5	4.4	1.3	1.9	2.6	1.3	1.8
LT	2.1	3.6	1.7	6.7	3.5	2.5	2.7	0.9	2.4
MT	3.0	2.7	2.1	7.5	5.1	3.5	4.5	4.1	3.1
HT	2.5	4.3	2.6	7.1	4.8	4.8	4.3	2.6	2.2
None	0.8	2.9	2.9	9.2	6.0	3.9	5.5	3.5	3.5

[a]AA is Abound FL applied twice during the season based on calendar dates decided by the producer. AR was similar to AA, except Abound Fl was applied on the first application and Ridomil Gold + Provost was applied on the second application. RR was similar to AR except Ridomil Gold + Provost was applied for both applications. LT stands for low threshold and Ridomil Gold + Provost was applied three times during the season when the pod rot threshold initially reached 1-2%, and then at least once every three weeks if pod rot was > 2%. MT was a moderate threshold, where Ridomil Gold + Provost were applied when pod rot initially reached 3-4%, and then a second application was made three weeks later when the pod rot was still around 4%. HT is high threshold, and Abound FL was applied when pod rot reached 5-6% initially. None indicates no fungicides for pod rot were applied.

[b]*Pythium* was isolated from the majority of pods tested and from all samples with pod rot, but *Rhizoctonia* was isolated from three samples on 5 Aug, from 3 samples on 12 Aug., four samples on 19 Aug., three samples on 2 Sept., six samples on 9 Sept., four samples on 16 Sept., and two samples on 23 Sept.

***Table 3*. Percent pod rot and frequency of pod rot from the Grissom field over time.**

Date	% Pod rot	% Samples With pod rot
7/6	0.3	6.9
7/13	0.3	3.0
7/20	0.3	7.9
7/27	2.2	29.7
8/3	5.3	50.5
8/10	6.7	48.0
8/17	8.0	43.6
8/24	5.7	50.5
8/31	4.3	48.0
9/8	4.1	48.0
9/14	3.6	44.0
9/21	3.0	52.0

**Rhizoctonia* was isolated from 1 sample on 8/10, and from one sample on 9/21. *Sclerotium rolfsii* was isolated from one sample on 9/21. *Pythium* was isolated from rotted pods at all sampling times when rotted pods were found.

***Table 4*. Timing of fungicide sprays at the Mason and Grissom fields.**

Field	Treatment	Spray 1	Spray 2	Spray 3
Grissom	Abound Fl, followed by Ridomil	7 July	28 July	
Mason	Calendar sprays (AA, AR, RR)	25 July	19 Aug	
Mason	Low Threshold	31 July	29 Aug	10 Sept.
Mason	Moderate Threshold	7 Aug	10 Sept.	
Mason	High Threshold	19 Aug		

Acknowledgments:

Texas ArgiLIFE would like to thank Mr. Jimbo Grissom and Mr. Tommy Mason for cooperation in this project. Thanks are also expressed to Syngenta and Bayer Crop Science for providing chemical for fungicide treatments. Funding for this research was provided by a grant through Texas Peanut Producers Board.