Evaluation of Fungicide Products and Application Timing for Control of Asian Soybean Rust (*Phakopsora pachyrhizi*) on Soybean (*Glycine max*) 2008.

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Introduction:

Soybean rust is known to cause significant yield losses where it occurs. This trial was conducted in a region of Florida where very few soybeans are grown commercially, but where soybean rust overwinters on kudzu weed. The location makes natural infection likely and disease pressure high. We conducted this research in collaboration with Dr. Don Hershman with the University of Kentucky. Our objective was to evaluate recommendations that would be given if soybean rust was detected in Kentucky during the growing season. We hope that these results will help validate and refine current recommendations.

Materials and Methods:

The soybeans were planted in a field (Kendrick loamy sand) at the University of Florida IFAS Plant Science Research and Education Unit in Citra, Florida for this test on June 25, 2008. The variety DP7330 RR was planted 5 seed per ft in rows on 15 inch centers. Plots were expected to be two parallel rows 20 ft in length separated by spreader rows planted between treatment rows. A backup plot on 36 inch centers also was planted that week.

Due to an extremely uneven stand in the 15 inch planting, the test was conducted on the 36 inch row plot. Each treatment was evaluated in five plots that each consisted of a single 20 foot row. Untreated rows were to the left and right of each plot. The treatments were assigned to plots in a randomized complete block design. All product applications were made as described in Table 1. The products were applied to these plots in 20gpa of water using a CO_2 backpack sprayer at 50 psi through a single 8002 Teejet flat fan nozzle.

A complete untreated block on each end of the test was inoculated using ***Phakopsora pachyrhizi-*** infected kudzu leaves from a nearby kudzu patch. The inoculation was made after the soybean sentinel plot on that UF research farm was confirmed positive for rust. Kudzu leaves were affixed onto the soybean leaves in the upper canopy of the plots on August 15, 2008. Each kudzu leaf and paired soybean leaf was moistened by spraying with water from a hand-held atomizer. The inoculations were made at 4:30 p.m. to ensure overnight dew period. Examination of inoculated plants for the presence of the pathogen began 14 days after inoculation. The treated rows were examined weekly for the presence of the pathogen starting after disease was observed at the inoculation sites. Disease data collected included visual estimates of percent incidence of rust on 20 randomly-selected terminal leaflets per plot and percent disease severity (% area of affected leaves). The leaf samples were collected from within the canopy at least 12 inches from the soil surface. The plot was monitored for pod maturity and harvested. Fresh weight, seed moisture content and yield were recorded.

Table 1. Treatment schedule

	Application Dates and Corresponding Growth Stage			
	08/18/2008	08/28/2008	09/16/2008	09/30/2008
	R1-2	R3	R5	R6
T1-Untreated check				
T2- Headline 9oz/A+Topguard 7oz/A	X	X	X	X
T3-Headline 9oz/A	X			
T4- Headline 9oz/A		X		
T5- Headline 9oz/A			X	
T6- Headline 9oz/A				X
T7- Topguard 7 oz/A	X			
T8-Topguard 7 oz/A		X		
T9- Topguard 7 oz/A			X	
T10-Topguard 7 oz/A				X
T11- Topguard 7oz/A followed by Headline 9oz/A+Topguard 7oz/A	X		X	
T12- Headline 9oz/A+Topguard 7oz/A		X		

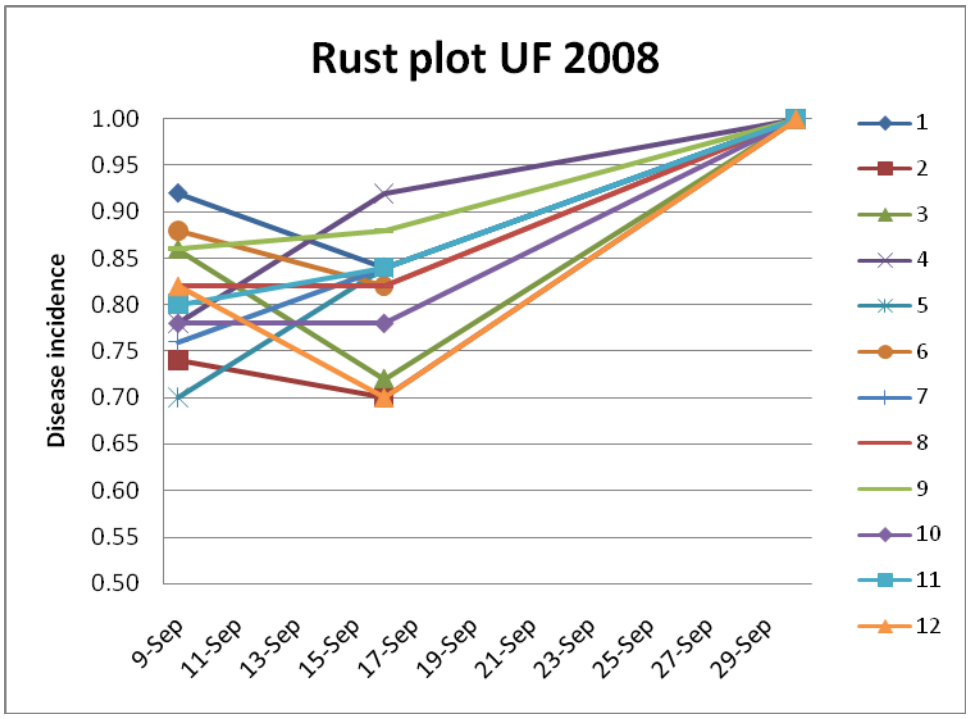

Fig 1. Rust incidence increased to 100% for all treatments by 30 Sep.

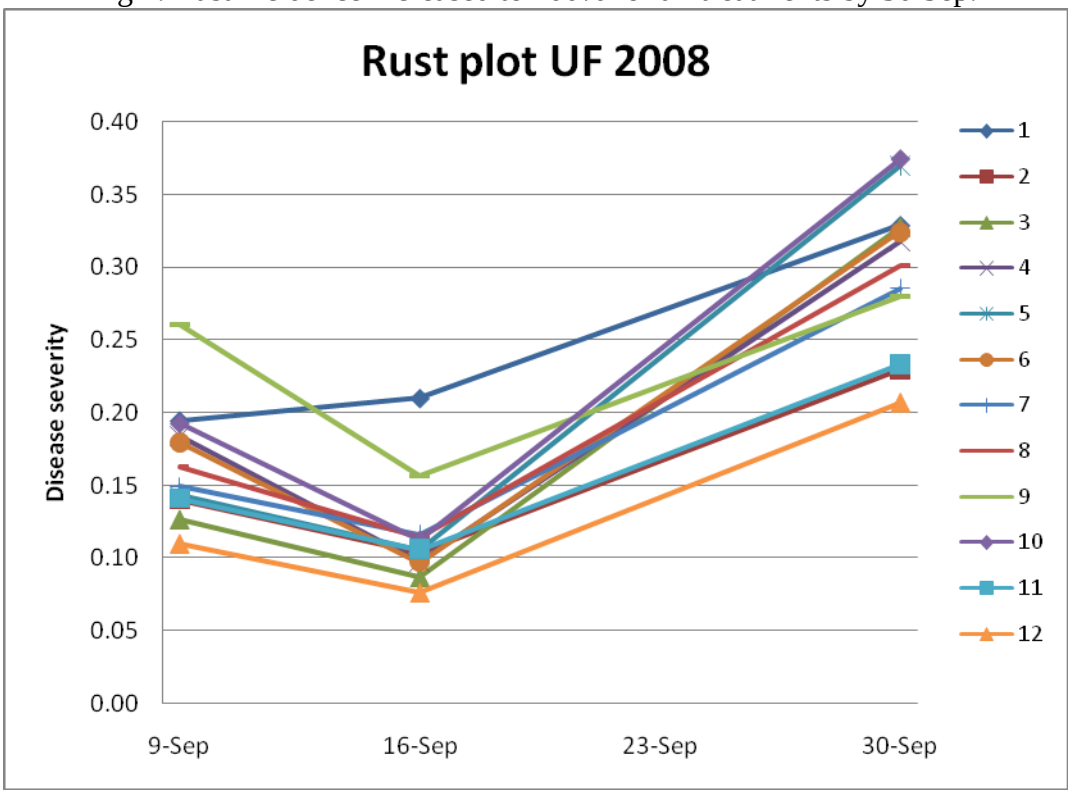

Fig.2 Rust severity increased over time, but some fungicide treated plots has less disease than others.

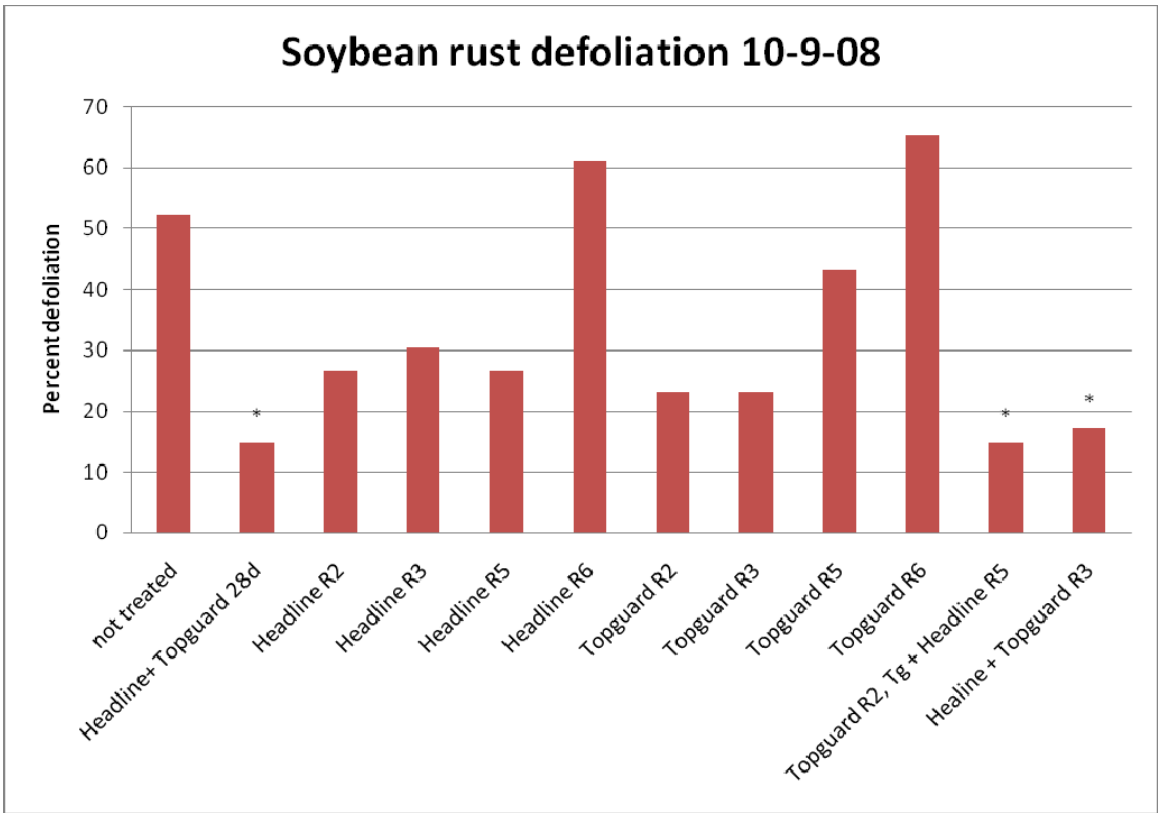

Fig 3. Defoliation occurred prematurely in some plots. Treatments with asterix above the bar had significantly less defoliation than the untreated control (*P*=0.05).

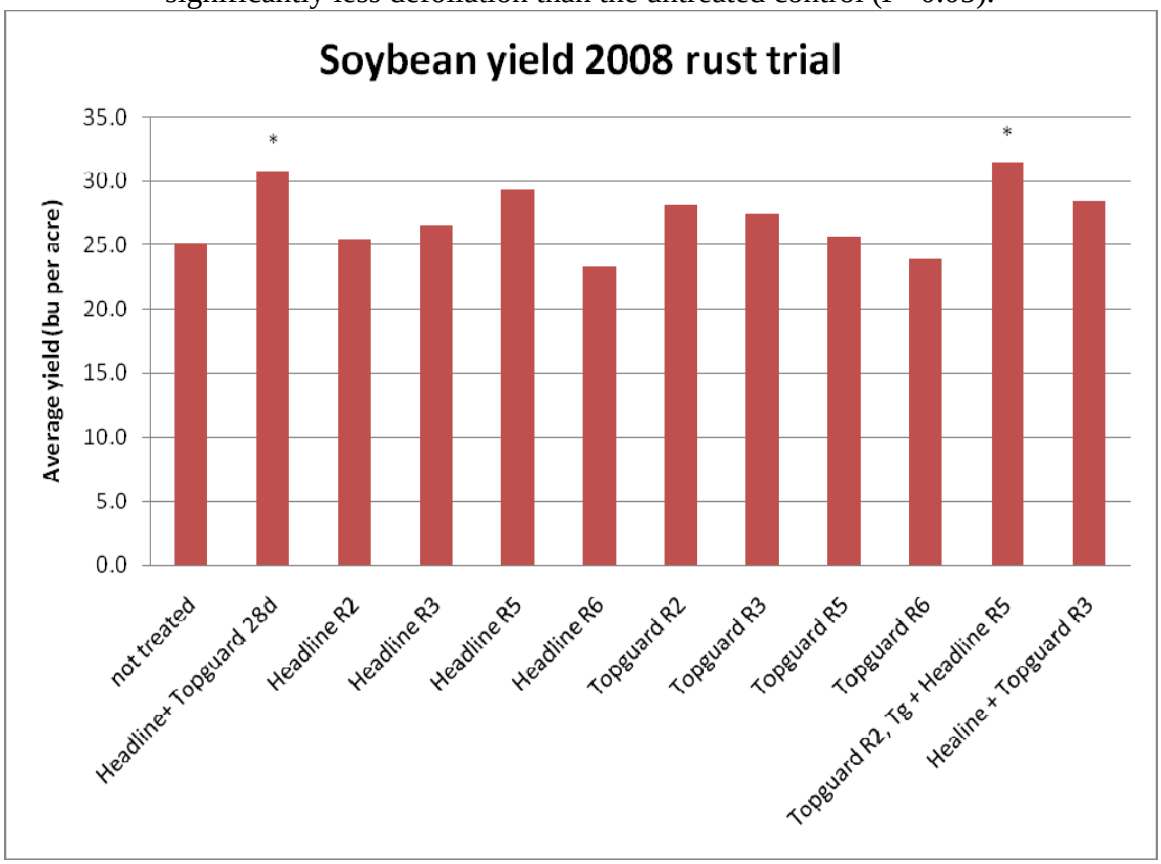

Fig 4. Trends in yield show the importance of fugnicide application timing. Only treatments with multiple applications had significantly more yeild than untreated control (*P*=0.05).

Treatments	Application times	AUDPC-Severity [A]	Yield (lbs) per Plot	Seed Moisture (%)[B]	Yield (Bu/A) Calculated [C]
T1-Untreated check		244.23A	2.08CD	12.32BC	25.2
T2- Headline 9oz/A+Topguard 7oz/A	R1-2; R3; R5; and R6	124.73D	2.55AB	13.16A	30.9
T3-Headline 9oz/A	R1-2	218.39AB	2.11CD	12.24BC	25.5
T4- Headline 9oz/A	R3	193.82ABC	2.189BCD	12.18C	26.5
T5- Headline 9oz/A	R5	245.73A	2.43ABC	12.1C	29.4
T6- Headline 9oz/A	R6	244.94A	1.93D	12.22BC	23.4
T7- Topguard 7 oz/A	R1-2	195.15ABC	2.33ABCD	12.28BC	28.2
T8-Topguard 7 oz/A	R3	198.23ABC	2.27ABCD	12.32BC	27.5
T9- Topguard 7 oz/A	R5	170.55BCD	2.12CD	12.1C	25.7
T10-Topguard 7 oz/A	R6	242.32A	1.98D	12.18C	24.0
T11- Topguard 7oz/A followed by Headline 9oz/A+Topguard 7oz/A	R1 R5	156.42BCD	2.6A	12.52BC	31.5
T12- Headline 9oz/A+Topguard 7oz/A	R3	137.49CD	2.35ABC	12.68AB	28.4

[A]AUDPC is the average area under the disease progress curve for the duration of the trial. Values in a column followed by the same letter are not significantly different at P=0.05 according to Fisher's protected LSD.

[B] Values obtained with a Steinlite moisture meter SB 900 on setting 239 Soy 85 TC and seed temperature of 59ºF

[C] Values were calculated based on a 20 ft row on 3 ft center = 0.001377 A and 60 lb of soybean seed per bushel.

Results and Discussion:

Our inoculations were very successful, and the plot developed considerable soybean rust starting in early reproductive growth stages through complete defoliation. Following disease incidence and severity for each treatment in Figures 1 and 2 is difficult and not that informative. In general the plots treated with fungicides had a temporary decrease in disease after treatment.

Premature defoliation began in early October (Fig. 3). Treatments of Topguard and Headline made after R5 were too late. These plots and untreated plots had defoliated by up to 65% on 9 October. Plots treated with multiple applications of fungicide (treatments 2 and 11) and the R3 application of a tank mix of Topguard and Headline (treatment 12) were less than 20% defoliated at this time.

Yield was negatively affected by rust (Fig. 4). The application of fungicides significantly increased yield compared to the control for treatment 2 and 11. Trends in the yield data suggest that Headline is better applied later (through R5) and Topguard is better applied earlier in the crop development. When two applications were made, using Topguard at R2, and a tank mix of Topguard and Headline at R5 (trt 11), yield was the best of the trial. The highest yield for a single app was Headline at R5 (trt 5) followed closely by and not significantly different than the Headline tank mixed with Topguard treatment 12.

Fungicides can help prevent some yield loss due to soybean rust when recommendations are followed. Application timing will depend on the timing of the pathogen introduction. In this case, the pathogen was introduced early in the reproductive stages of the crop and resulted in significant losses in yield. The plot was also irrigated in the early evening and represents an approximation of the “worst case scenario.” Under these conditions, the best plots had 34% more yield than the worst.