Final Delaware Soybean Board Report – February 2008

Title: Assessment of the Potential Damage and Economic Impact of Stink Bugs on Soybean in Delaware

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Methods

Two plots of the variety Southern States brand RT4451N were planted on June 22, 2007 at the University of Delaware's research station located in Newark, Delaware. Overall, soybean plots were 300 foot wide by 100 foot long and planted on 15 inch centers. Within each plot, three 100 ft by 100 ft blocks were established and treatments were replicated in a randomized complete block design. The Georgetown location was abandoned due to the availability of stink bugs, timing of the infestations and availability of labor in Georgetown. Stink bug populations started to increase by mid-August and field collected populations were used to infest plots. Brown stink bug populations started to crash in late August; therefore, we were only able to infest plots with brown stinkbugs at the R-4 stage of plant development. Plots were infested with stink bugs starting Aug 20 in R-4 stage soybeans and continued until September 18 for R-6 stage soybeans (Table 1). As soon as plants reached the R-4 growth stage, nylon mesh bags were placed over all the plots and used to confine one stink bug on one foot sections of row (~3-5 soybean plants). Infestations of adult green and adult brown stink bugs (R-4 only) were introduced into individual cages at three soybean growth stages: R-4, R-5, and R-6. Green and brown stink bug populations had crashed so we were not able to infest at growth stage R-7. Cages were checked daily for 4 days after introduction, and stink bugs replaced if dead or missing. Stink bugs were left to feed for three weeks, after which all insects were removed. Bags were left over the plants in each caged section of row until harvest maturity. At or near physiological maturity, plants in each bag were removed; the number and type of pods recorded, and the beans were shelled by hand. All beans were inspected for discoloration, deformation, and/or pitting caused by insect feeding. Data on bean weight and bean quality was recorded. Data were analyzed using a two way ANOVA by block and treatment.

Table 1. Stink bug Infestation and Removal Dates

Plot #1			Plot #2		
Growth Stage	Infestation	Removal	Growth Stage	Infestation	Removal
R4	8/20/07	9/14/07	R4, Block 3	8/23/07	9/18/07
R5	8/27/07	9/25/07	R4, Blocks 1 & 2	8/27/07	9/21/07
R6	9/14/07	10/9/07	R5, Block 3	8/28/07	9/21/07
			R5, Blocks 1 & 2	9/1/07	9/26/07
			R6 – all blocks	9/18/07	10/12/07

Results:

(a) Plot # 1

Stink bug Treatment	Growth Stage	Mean Number per Plant *			
		Seed Count	Dry Weight (grams)	Aborted Pods	Flat Pods
Brown Adult	R- 4	66.02a	8.59a	1.81	5.65a
Green Adult	R- 4	52.23bc	6.25bc	2.42	4.62ab
Green Adult	R- 5	58.49ab	7.52ab	1.38	3.35b
Green Adult	R- 6	55.06abc	5.92c	1.98	4.60ab
Control	----	44.82c	5.50c	1.69	5.02a
ANOVA P		0.018	0.0007	0.3198	0.0295

* Means followed by the same letter are not significantly different (LSD; P=0.05).

(b) Plot # 2

Stink bug Treatment	Growth Stage	Mean Number per Plant *			
		Seed Count	Dry Weight (grams)	Aborted Pods	Flat Pods
Brown Adult	R- 4	88.94	15.77a	0.53	1.65
Green Adult	R- 4	79.56	14.10ab	0.87	1.55
Green Adult	R- 5	72.27	12.26bc	0.61	1.54
Green Adult	R- 6	78.34	12.75bc	0.83	1.57
Control	----	70.68	11.81c	1.40	1.48
ANOVA P		0.2245	0.012	0.2323	0.8431

* Means followed by the same letter are not significantly different (LSD; P=0.05).

Conclusions: In plot #1, the number of seeds per plant and the yield (expressed as dry weight per plant) was statistically lower in the control plots compared to the brown stinkbug infested plots at the R-4 stage and green stinkbug infested plots at the R-5 stage. In plot #2, the yield was statistically lower in the control plots compared to stinkbug infested plots at the R-4 stage of plant development. Although these results were not expected, we feel there could be a number of explanations for these results including: (1) Negative impacts of the bags - All bags were placed on plants before the R-4 stage and

the control bags were left closed all season. Since the control bags were not opened up like the treatments receiving stink bugs, it appears that there was a significant effect on photosynthesis of plants in the control bag; (2) “Trampling effect” in stink bug infested plots – During the initial infestation and after the 4 day period of checking plants for stink bugs, plants surrounding the stink bug infested plots were matted down resulting in an increase in the amount of sunlight reaching plants in the stink bug infested bags. As a result, these plants may have been able to better compensate for any negative effect the bags were having on yield; and (3) Compensation - These data could also indicate that yield compensation occurred as a result of the early infestations, especially in plot # 2; however, more studies would be needed to prove this theory.

In comparison, results from a similar experiment conducted in Virginia in 2007 indicated that the total number of seeds and mature pods were lower for plants infested with stink bugs at the R-4 stage compared to the control. Their results were more similar to the 2006 University of Maryland study that indicated that stink bugs appeared to have the most effect on soybean yield at the R-4 and R-5 stages of plant development. Although it appears that the R-4 and possibly R-5 stage of plant development is the critical time for stink bug damage, further studies will be needed to verify this conclusion.