



A comparison of prophylactic and remedial approaches for soybean pest management.

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Summary

A plant health or prophylactic pest management strategy was compared to a more conservative pest density based management approach in a split plot design. Main plot was variety and split plot was soybean cultivar. The plant health approach consisted of 1.5 pts/acre Boundary herbicide pre-emerge, Cruiser Maxx insecticide + fungicide seed treatment at planting, a planned Quilt fungicide at 14 oz./acre application and a 3.2 oz. Warrior insecticide application at the R3 soybean stage of three soybean varieties (Stine 1502-4, Asgrow 2107 and Northrup King S19-L7). This strategy was compared to an insecticide application based on soybean aphid at economic threshold. Post emerge weed control (22 oz. Roundup Ultra) was the same for both management strategies. Three distinctly different SCN resistant, IDC tolerant soybean cultivars ranging from a mid Group I to an early Group II (Stine 1502-4, Northrup King S19-L7 and Asgrow 2107) were planted on May 20, 2006.

Cultivar x management strategy interactions were not observed for aphid populations, disease or yield. End of season soybean growth (height) was visibly greater where the plant health strategy was employed. Differences in soybean aphid populations were not observed by July 21. Senescence and *Septoria* brown spot differences were present but not as large as usually observed with foliar fungicide applications. Although yielding higher numerically, the plant health treatment did significant yield increase yield.

Background & Objective

The concept of plant health or calendar based fungicide and insecticide management is marketed to Minnesota soybean producers. This trial was initiated to examine the potential yield effect of prophylactic foliar fungicide and insecticide applications on the yield of soybean varieties under Southwest Minnesota growing conditions.

Site and application description

The trial was planted at the University of Minnesota, Southwest Research and Outreach Center near Lamberton, Redwood County, Minnesota. Site and treatment application details are shown in table 1 and 2 respectively. A split plot design with four replications was planted on May 20, 2006. Main plots were two management strategies and subplots were soybean cultivar. The glyphosate tolerant SCN resistant soybean varieties Stine 1502-4, Northrup King S19-L7 and Asgrow 2107, ranging from mid-Group I to early Group II respectively, were used in this trial. Plot size was 10 feet wide x 65 feet long. Plots were planted in 30 inch rows with a four row John Deere Max Emerge planter at 1.5 inch depth. The previous crop was corn.

Plant health management strategy treatments consisted of a pre-emerge herbicide (Boundary @1.5 pts/ acre); a seed applied insecticide and fungicide (Cruiser Maxx); and a planned R3 growth stage based foliar fungicide (Quilt @14 oz/acre) plus insecticide (Warrior @3.2 oz/acre). The reactive management strategy consisted of a single economic threshold based management (insecticide application based on economic pest density Warrior July 27).

Early season weather was cool and very wet resulting in a less than desirable seedbed. Detailed temperature and rainfall information for this trial can be found at: <http://swroc.coafes.umn.edu/Weather/weather.htm>.

Weed pressure in this trial was light. All plots received post emerge weed control consisting of Roundup Ultra Maxx at 22 oz/acre.

Foliar fungicide and insecticide applications were made with a Hagie high boy sprayer at 20 gallons/acre and 40 psi. Fungicides applied July 25. Logistic concerns required treating slightly before (estimated 1-2 days) before economic threshold was reached in the reactive management and separating the insecticide from fungicide applications. As a result, all plots were treated for soybean aphid on July 27.

Brown spot was present in this trial but not rated due to a relationship with disease severity and maturity. Disease pressure was moderate and symptoms of this disease were less severe in those plots that had foliar fungicide applied.

Plots were end trimmed to harvest length and harvested with a plot combine on October 7, 2006.

Table 1. Plot information

| | | | |
|----------------------------|--|-----------------------|---|
| Site information | | | |
| Location: | University of Minnesota Southwest Research and Outreach Center | | |
| County: | Redwood | Nearest Town: | Lamberton, MN |
| Soil type: | Normania | | |
| Fertility: | P(Bray): 15 | K: 159 | pH: 5.8 O.M.% 3.9 |
| Applied Fertilizer: | | | |
| Plot design: | Split plot 4 replications where main plot = prophylactic insecticide and fungicide treatment and subplot = variety | | |
| Plot size: | 10 foot x 65 foot | | |
| Plot Maintenance | | | |
| Previous crop: | Corn | | |
| Primary Tillage: | Fall 2005 | Mulch Till | |
| Secondary Tillage: | 5/18,19 | Field cultivator 2X | |
| Planting date: | May 20,2006 | Row spacing: | 30 inch |
| Seeding rate: | 160,000 | Seeding depth: | 1.5 inch |
| Planting equipment: | John Deere MaxEmerge | | |
| Cultivar: | Part of trial | Trait(s): | Roundup Ready SCN |
| Weed control: | Part of trial | | |
| | PRE | May 26,2006 | 1.5 pt Boundary plant health treatments |
| | POST | June 22,2006 | 22 oz Roundup UltraMax all plots |
| Disease control: | Part of trial | July 25,2006 | Application B Plant health treatments |
| Insect Control: | Part of trial | July 27,2006 | Application C all plots |

Table 2. Treatment application information

| | | A | B | C |
|----------------------------|--------------|-----------|------------|-----------|
| Date: | 5/26/2006 | 6/22/2006 | 7/25/2006 | 7/27/2006 |
| Wind: | NW 5 mph | WNW 6 mph | calm | SW 5 |
| Temperature (F): | 55 | 58 | 68 | 63 |
| Relative humidity % | 82 | 77 | 74 | 83 |
| Crop stage: | PRE | R2 | R3 | R3 |
| Volume: | 20GPA | 20 GPA | 20 GPA | 20 GPA |
| Pressure: | 40PSI | 40PSI | 40PSI | 40PSI |
| Nozzle: | 8002 | 8003 | 8003 | 8003 |
| Nozzle spacing: | 15" | 15" | 15" | 15" |
| Boom height: | | 18-20" | above crop | -> |
| | Plot sprayer | Hiboy | Hiboy | Hiboy |

Results and discussion

Plant injury was not observed with any of the treatments.

Bean beaf beetle pressure was minimal in this trial. Differences in stand were not observed (Data not shown).

Soybean in the plant health plots were visible taller than those in the reactive management plots but node numbers were equivalent. As typical, fungicide treated plots had slightly less disease in the lower canopy and delayed senescence. Brown stem rot was present at high incidence in this trial.

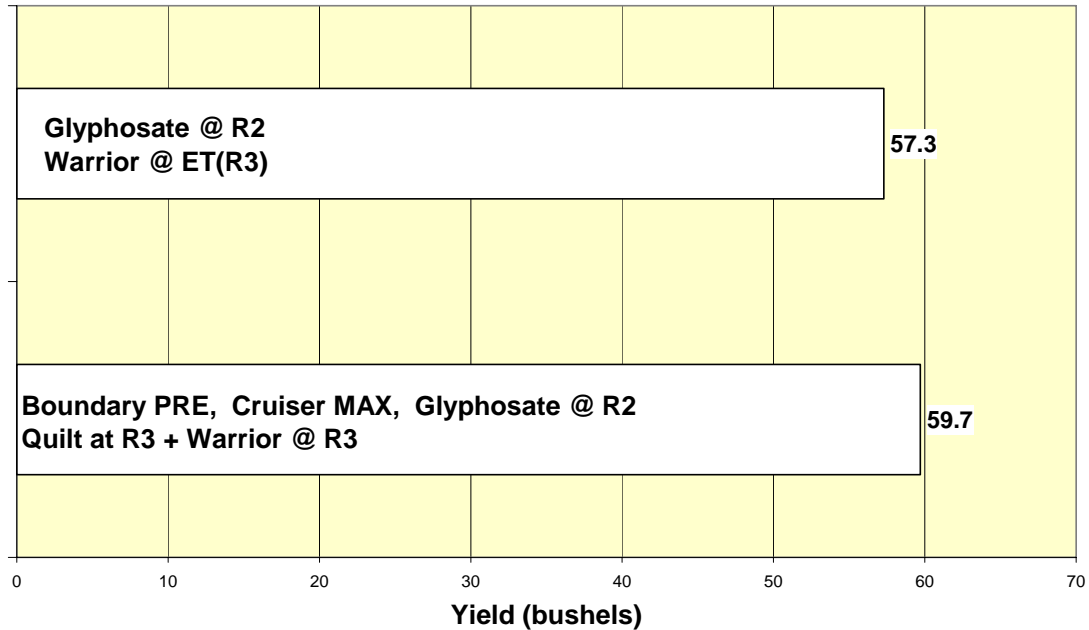
The analysis of variance (ANOVA) for pre-treatment soybean aphid populations and yield are shown in table 3. Differences in soybean aphid populations were not observed between Cruiser Maxx treated/untreated by the first SBA rating date (July 21). Soybean aphid populations did not rebound after treatment in this trial.

This trial showed a consistent but non-significant yield response for the plant health based management approach (Figure 1). However, based on the high input cost and small differences in yield, these responses would not have been profitable even if they would have withstood statistical scrutiny.

Table 3. Factorial analysis of variance (ANOVA). The effect of prophylactic seed applied insecticide and fungicide and foliar applied fungicides n soybean aphid populations and yield of three soybean varieties. University of Minnesota – Southwest Research and Outreach Center, Lamberton, MN. (2006) B. Potter

| Rating Date Crop Stage Trt | | | | SBA/plant 7/21/2006 R3 | SBA/plant 7/25/2006 R3 | YIELD 10/7/2006 R8 |
|--|-----------|----------------------|---------------|------------------------------|------------------------------|--------------------------|
| No. | Treatment | Product Rate Unit | Applied at | Prob(F) LSD (0.05) | Prob(F) LSD(0.05) | Prob(F) LSD(0.05) |
| TABLE OF R MEANS | | | | 0.0039 15.2 | 0.2698 N.S. | 0.1567 N.S. |
| Replicate 1 | | | | 44.7 | 77.5 | 58.5 |
| Replicate 2 | | | | 28.9 | 42.4 | 59.6 |
| Replicate 3 | | | | 11.2 | 79.5 | 59.5 |
| Replicate 4 | | | | 27.4 | 42.4 | 56.6 |
| TABLE OF A MEANS management level | | | | 0.0256 5.1 | 0.302 N.S. | 0.1362 N.S. |
| Prophylactic | | | | | | |
| 1 Boundary | | 1.5 pt/a | Pre | | | |
| 1 Cruiser MAXX | | | Seed | 31.4 | 67.1 | 59.7 |
| 1 Glyphosate | | | Post | | | |
| 1 QUILT | | 14 oz/acre | R3 | | | |
| 1 Warrior | | 3.2 oz/acre | R3 | | | |
| Remedial | | | | | | |
| 2 Glyphosate | | | Post | | | |
| 2 Warrior | | 3.2 oz/acre | ET R3 | 24.7 | 53.8 | 57.3 |
| TABLE OF B MEANS cultivar | | | | 0.8304 N.S. | 0.159 N.S. | 0.639 N.S. |
| 1 Stine 1502-4 | | | | 26.1 | 71.4 | 57.9 |
| 2 NK 19-L7 | | | | 29.8 | 35.4 | 58.5 |
| 3 Asgrow 2107 | | | | 28.1 | 74.6 | 59.1 |
| TABLE OF AB MEANS management x cultivar | | | | 0.0898 N.S. | 0.4985 N.S. | 0.7191 N.S. |
| 1 Prophylactic | | | | | | |
| 1 Stine 1502-4 | | | | 22.8 | 93 | 58.6 |
| 2 Remedial | | | | | | |
| 1 Stine 1502-4 | | | | 29.4 | 49.9 | 57.3 |
| 1 Prophylactic | | | | | | |
| 2 NK 19-L7 | | | | 41.1 | 35.5 | 60.1 |
| 2 Remedial | | | | | | |
| 2 NK 19-L7 | | | | 18.6 | 35.3 | 56.9 |
| 1 Prophylactic | | | | | | |
| 3 Asgrow 2107 | | | | 30.2 | 72.9 | 60.4 |
| 2 Remedial | | | | | | |
| 3 Asgrow 2107 | | | | 26.1 | 76.3 | 57.8 |

Figure 1. Yield comparison for three soybean varieties with and without seed treatments and foliar fungicide. University of Minnesota – Southwest Research and Outreach Center, Lamberton, MN. (2006) B. Potter



Acknowledgments:

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Boundary ®
Syngenta Crop Protection

Roundup Ultra®
Monsanto Company

Quilt ®
Syngenta Crop Protection

Warrior ®
Syngenta Crop Protection