Soybean Fungicide and Insecticide Seed Treatments (2006 Final Report)

Purpose:

The objective of this study was to investigate new insecticide seed treatments for soybeans. Cruiser was registered recently and Gaucho has yet to be registered in Canada. Widespread infestations of soybean aphids across Ontario in 2001 and 2003 drastically reduced yields. Although foliar insecticides can effectively control this pest, new management options such as seed treatments could aid in their control. Other insect pests are also on the rise in Ontario. The spring of 2006 saw very high over-wintering bean leaf beetle populations in the province. Fields reached threshold levels as far north as Huron County for the first time in 2006. Little research has been reported on the activity of new insecticide seed treatments on aphids, bean leaf beetles and other insect pests across multiple field locations.

In addition to the insecticides tested, a fungicide seed treatment was also included in the treatments. The use of a fungicide seed treatment on corn and wheat are standard practice. But, the majority of soybeans planted in Ontario do not receive a fungicide seed treatment. Since soybeans tend to be planted later than corn, soil conditions are generally more favourable for rapid germination and emergence. However, when conditions are wet and cool, soil borne diseases cause considerable seed and seedling damage. The extent of the damage these diseases will cause depends on moisture, temperature, overall plant health and soil type. Cold wet soils, crusting, heavy rains, compaction and even post-emergent herbicides can all cause plant stresses, which make the seedlings more susceptible to diseases.

This project was initialed in 2004 by the University of Guelph, Ridgetown College and Ontario Ministry of Agriculture, Food and Rural Affairs to evaluate the efficacy of soybean seed treatments on new and expanding pests such as aphids, bean leaf beetles, pythium root rot etc.

Methods:

Experiments were established on more than 30 fields across southern Ontario from 2004 to 2006. Multiple locations across a wide geographical area were necessary to increase the potential for fields with varied insect and disease levels. Treatments were arranged in a strip plot design, 10 feet wide by 410 feet long with 3 replications per treatment. Check plots were monitored twice a week from soybean emergence to the V2 stage for the presence of root disease and soil pest insects such as European chafer, wireworm, and seed corn maggot. Plant populations were determined in all seed treatment strips approximately 21 days after emergence. Vigour ratings were determined subjectively on a scale of 0-100%. The plots were monitored once-a-week from late-June until mid-August for additional insect pests such as bean leaf beetle, potato leafhoppers, and soybean aphids. When aphids were detected in the plots, counts were recorded. Seed yield and harvest moisture were taken.

TREATMENTS INCLUDED:

1- UNTREATED CHECK (no fungicide or insecticide seed treatment)

2- MAXIM APRON

3- MAXIM APRON + CRUISER @ 50 g per 100 kg of seed

4- MAXIM APRON + GAUCHO @ 120 g per 100 kg of seed

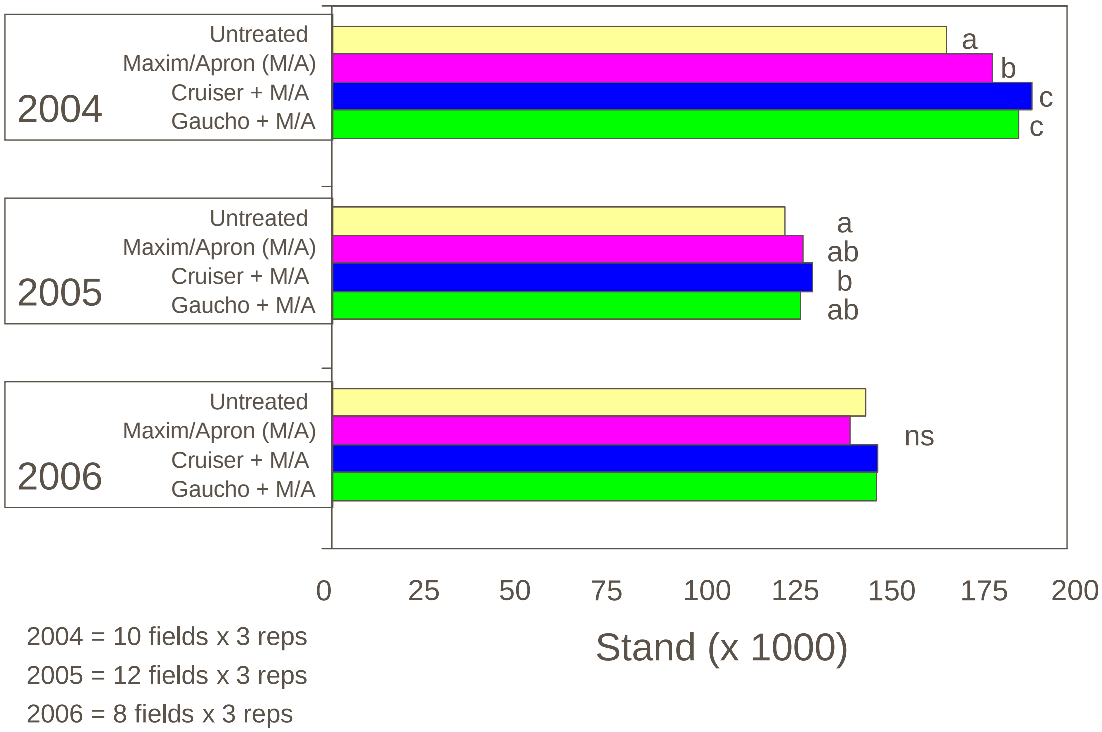

Bean Leaf Beetle


Soybean Aphids

Results and Summary:

Plant stand counts were taken approximately 21 days after seeding. Averaged across all sites plant stand counts were higher by approximately 5000 plants/acre for the Maxim Apron, 12 000 plants/acre for the Maxim Apron + Cruiser and 10 000 for the Maxim Apron + Gaucho compared to the untreated check. See graph #1.

Graph #1: Seed Treatment Effects on Soybean Plant Stand



The fungicide seed treatment showed a numerically greater plant stand count at 20 out of the 30 sites, but was only statistically significant at 5 of them ($p < 0.10$). Visual vigour ratings mirrored plant stand counts and were significant at 5 out of the 30 sites.(data not shown) Insecticide seed treatments stand counts were numerically higher at 23 of the 30 sites, but only 5 of these were statistically significant at the p=0.10 level.

Averaged across all the sites and years, modest but significant yield advantages for both the fungicide and insecticide seed treatments are notable. See table #1.

Yields were numerically higher for Maxim-Apron in 17 out of 30 trials compared to the untreated check, but yields were statistically significant at only 3 out of the 30 sites. ($p <$ 0.10). Maxim Apron plus an insecticide seed treatment yielded numerically higher at 23 out of 30 sites and 4 of these were statistically significant at p=0.10. See graph #2 for yield responses.

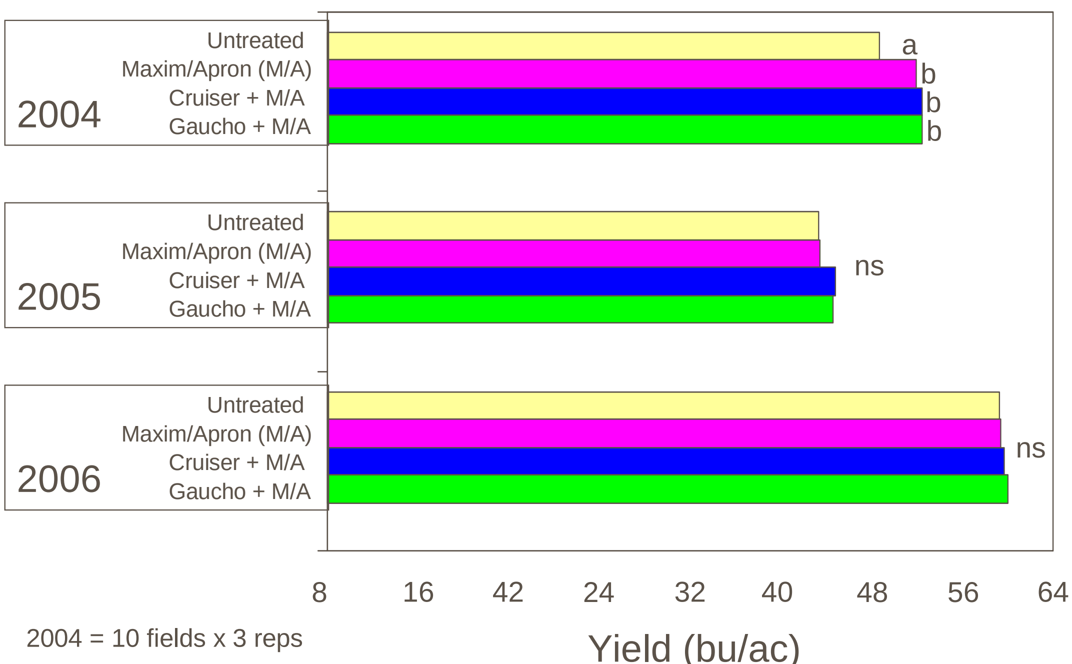
Table #1: Soybean Seed Treatment Yields (2004-2006)

	Yield (bu/ac)	Advantage (bu/ac)	
Untreated	48.7		
Maxim/Apron (M/A)	50.0	1.3	**
Cruiser + M/A	50.6	1.9	***
Gaucho + M/A	50.6	1.9	***

2004 = 10 fields x 3 reps
2005 = 12 fields x 3 reps
2006 = 8 fields x 3 reps

, * = statistically significant from untreated at p=0.01 and p=0.001

Graph #2: Seed Treatment Effect on Soybean Yields



2004 = 10 fields x 3 reps
2005 = 12 fields x 3 reps
2006 = 8 fields x 3 reps

The magnitude of soybean response to seed treatments depended mainly on the presence of root rot diseases, insect pressure, soil type and weather. Maxim-Apron increased plant stands by approximately 5000 plants/acre, and yields by an average of 1.3 bu/ac. The greatest yield response was on clay and clay loam soils. Fields that suffered from soil crusting after planting had a greater response than those with little or no emergence problems. At one site where crusting was evident, Maxim-Apron increased plant stands by 38%. At the sites with a statistically significant yield response, rhizoctonia and pythium root rot were the main diseases problems. At two sites where pythium reduced plant stands, yields were increased by an average of 32% or 11 bu/ac. Maxim Apron + Cruiser increased plant stands by 12 000 plants/acre and increased yields by 1.9 bu/ac. Maxim-Apron + Gaucho increased plant stands by 10 000 plants/acre and increased yields by 1.9 bu/acre. Seed treatments containing insecticides significantly reduced early populations of bean leaf beetle when they were present (up to a 60% reduction). Significant aphid populations were only observed during the 2005 growing season in these trials. Insecticide seed treatments kept aphid levels lower than the untreated check for the first 60 days after planting, but they had little affect on aphids after that point. Typically, soybean aphid populations have not reached threshold levels in Ontario until July or August. For this reason, insecticide seed treatments have not been an effective control measure for this pest.

In this set of experiments, the fungicide Maxim-Apron increased yields by up to 32% when high levels of root rot were present and when fields suffered from crusting. This occurred in 3 out of 30 fields across 3 years in these trials. When conditions were excellent for emergence and early growth, no yield benefit was realized. Likewise, the use of an insecticide was only beneficial when early season bean leaf beetle or seed corn maggots were a problem. Insecticide seed treatments were not effective in controlling soybean aphids beyond 60 days after planting.

Acknowledgements:

This project was conducted collaboratively among the following researchers:

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