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Insecticide Evaluations for Soybean Aphid Management

Kevin Johnson
Iowa State University

Matthew E. O'Neal
Iowa State University, oneal@iastate.edu

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Abstract
Over the last seven years we have added considerably to our knowledge and understanding of the soybean aphid. We know that the presence of the aphid is not enough to warrant the application of an insecticide. Populations below 600 aphids/plant are typically needed before measurable yield loss will occur. Based on several years of replicated field trials, we have developed a recommendation that incorporates an economic threshold of 250 aphids/plant. However, one question remains when it comes to soybean aphid management: What products offer the most consistent control of soybean aphids?

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Kevin Johnson, graduate research assistant
Matthew O'Neal, assistant professor
Department of Entomology

Introduction

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Materials and Methods

To answer this question we have evaluated the ability of various insecticides to manage soybean aphids for the past four years at the Iowa State University Northeast Research Farm in Floyd County. In 2007, we had a major soybean aphid outbreak in which we evaluated 30 products or combinations of products and 2 controls. However, only 12 that are labeled for aphid control in soybeans are shown (Table 1). The first control consisted of soybeans grown without any insecticide (untreated control). The second set of control plots was treated multiple times to prevent an aphid population from establishing; these are referred to as the 'aphid free' control. This was accomplished with a foliar insecticide that consisted of a combination of an organophosphate and a pyrethroid. This combination may prevent a spider mite outbreak that can occur when pyrethroids are used alone. By comparing the untreated control to the aphid free control, we can estimate the yield loss that occurred due to the soybean aphid. Furthermore, since the aphid-free treatment is applied when aphid populations were approximately 10/plant, we can test the effectiveness of the 250 aphids/plant threshold to protect soybean yield. Soybeans were planted on May 15 using conventional tillage practices. Aphid populations averaged 240 aphids/plant three days prior to the application of the foliar insecticides on July 28. Following the application of the foliar insecticides, soybean aphid populations were assessed every 2 to 7 days for 20 days following insecticide application. At harvest, yields were recorded and corrected to 13% moisture.

Results and Discussion

Although 2007 was the highest aphid population experienced since beginning of the insecticide evaluation program, the trends observed in this year's data are consistent with past results. The efficacy of the organophosphate (Dimethoate, Lorsban, and Penncap-M) and pyrethroid (Baythroid and Warrior) was indistinguishable from each other (Figure 1). Combining pyrethroid and organophosphate insecticides did not improve aphid control or soybean yield. This was true even for a pre-mixed product like Cobalt. Rather, the most important issue for effective soybean aphid management is the timing of a foliar-applied insecticide (250 aphids/plant) and not the product selected. This is truly remarkable given the comparison to the aphid-free control, which would represent an economic threshold of 10 aphids/plant.

Compared with the foliar insecticides, the seed-applied insecticides did not provide as great a level of protection (Figure 2). Although we did observe some evidence of control between the untreated soybeans and the seed-treated soybeans, the variability among these treatments was great. Soybean aphid control from seed applied insecticides is not sufficient to protect plants from aphid outbreaks that occur in July or August, especially for soybeans planted in May.

McCornack and Ragsdale (2006) showed that seed-applied insecticides are effective on soybean aphid, however this efficacy only lasts for the first month after planting.

Conclusions

Our recommendation for soybean aphid management continues to be to scout your fields and to apply foliar insecticides when populations are 250 aphids/plant and increasing. We are not recommending seed-applied insecticides (seed treatments) for aphid management, and we are not recommending one insecticide over another. Over the four years we have been assessing insecticide efficacy, Warrior, Baythroid, and Lorsban have performed equally well and the seed treatments have not prevented the need for a foliar insecticide in high aphid years. Multiple insecticide treatments have not protected yields compared with a single foliar insecticide application at 250 aphids/plant.

Acknowledgements

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Table 1. Insecticides and rates of the 2007 soybean aphid efficacy trials.

Product trade name	Rate[1]	Active ingredient	Timing of application[2]
Untreated control	---	---	---
Aphid free control[3]	3.2 oz	λ-cyhalothrin	
	4 oz	Chlorpyrifos	10
Cruiser	100 g	Thiamethoxam	Seed applied (SA)
Cruiser	50 g	Thiamethoxam	SA
Cruiser + Warrior	50 g + 3.2 oz	Thiamethoxam + λ-cyhalothrin	SA + 250
Warrior	3.2 oz	λ-cyhalothrin	250
Gaucho	62.5 g	Imidacloprid	SA
Gaucho + Baythroid	62.5 g + 2.4 oz	Imidacloprid + Cyfluthrin	SA + 250
Baythroid	2.4 oz	Cyfluthrin	250
Cobalt	13 oz	γ-cyhalothrin + Chlorpyrifos	250
Lorsban 4E	16 oz	Chlorpyrifos	250
NuFos	8 oz	Clorpyrifos	250
Dimethoate	8 oz	Dimethoate	250
Penncap-M	2 pt	Parathion	250

[1]Rate is formulated product/acre for foliar products and as grams active ingredient per 100 kilograms of seed.
[2]Seed applied insecticides (SA) were applied to seeds prior to planting and foliar insecticides were applied when the average aphid/plant reached pre-determine levels represented by the number in this column.
[3]The aphid free control was treated with insecticides four times (June 15, July 6 and 22, and August 13). All other foliar treatments were applied once.

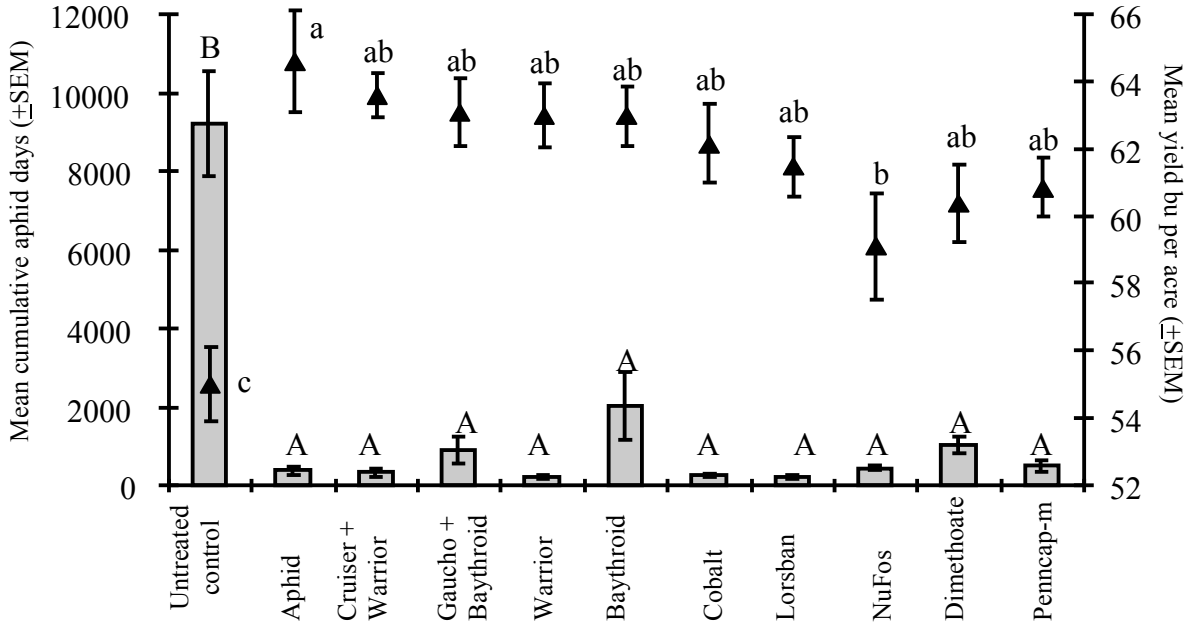

Figure 1. Impact of insecticides on mean aphid exposure and yield. Soybeans were planted on May 15 and insecticides were applied prior to planting to selected plots. The aphid free control was treated with insecticides four times (June 15, July 6 and 22, and August 13) and all other foliar applied insecticides were applied on July 28. Cumulative aphid days are represented by bars and capital letters. Yields are represented by triangles and lowercase letters. Means with a unique letter are statistically different ($P \leq 0.05$).

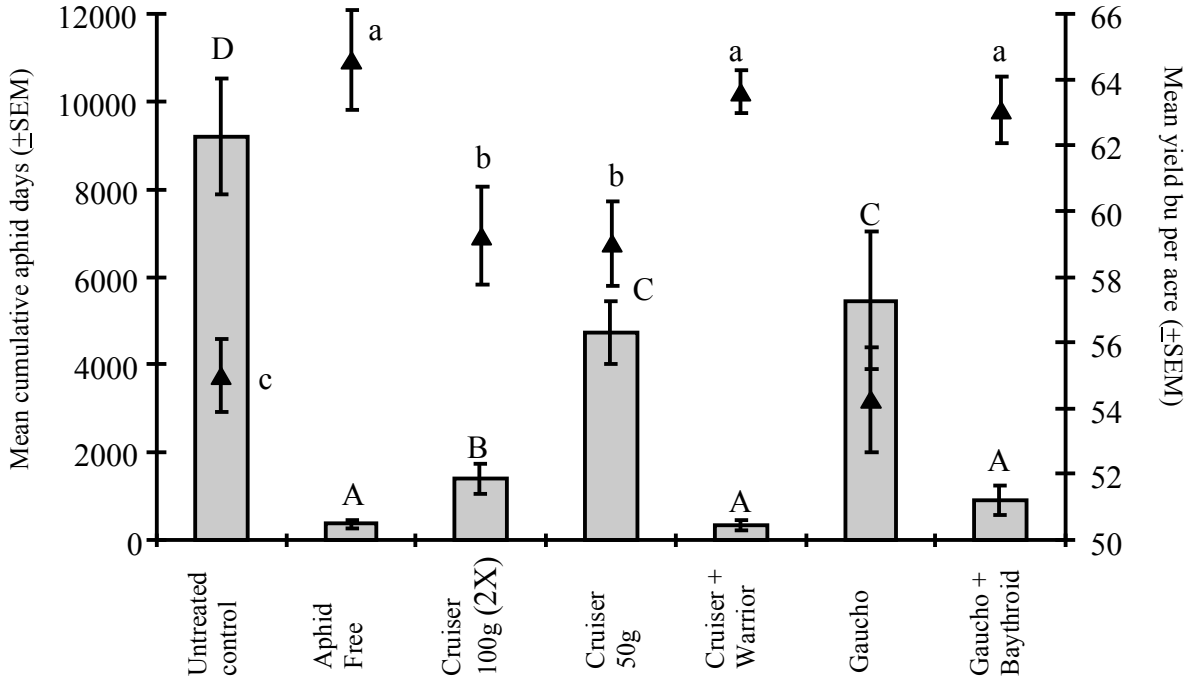

Figure 2. Impact of seed-applied insecticides on mean aphid exposure and yield. The aphid free control was treated with insecticides 4 times (June 15, July 6 and 22, and August 13). Cumulative aphid days are represented by bars and capital letters. Yields are represented by triangles and lowercase letters. Means with a unique letter are statistically different ($P \leq 0.05$).