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Insecticide and Insecticide-Fungicide Tank Mix Applications in Soybean

Rebekah Ritson
Iowa State University

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

Alison E. Robertson
Iowa State University, alisonr@iastate.edu

Daren S. Mueller
Iowa State University, dsmuelle@iastate.edu

Nathan R. Bestor
Iowa State University, bestor@iastate.edu

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Abstract
Trials were conducted at three Iowa locations (Sutherland, Ames and Nashua) over three years (2008 to 2010) to determine the effects of applications of insecticides (Asana ®, Leverage 2.7SE™) and fungicides (Stratego® YLD) applied alone or combined (i.e. a tank mix) at soybean growth stages R1 (beginning flowering) and R3 (beginning pod set) on soybean aphid populations and soybean yield in Iowa. Because these pesticides were applied based on plant growth stage, regardless of the level of fungal disease or insect pressure, these treatments are referred to as prophylactic treatments. We compared the prophylactic approaches to an integrated pest management (IPM) approach, in which an insecticide (Asana) was applied when soybean aphids reached an economic threshold of 250 aphids per plant.

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Entomology, Plant Pathology and Microbiology

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Integrated Crop Management NEWS

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Rebekah Ritson, Matt O'Neal, Department of Entomology; Alison Robertson, Daren Mueller and Nate Bestor, Department of Plant Pathology and Microbiology

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What the research shows

- All insecticide applications reduced aphid populations (Table 1).
- Using the IPM guidelines we applied insecticide only 57 percent of the time. During 2010 we did not apply insecticide as aphid populations did not reach 250 aphids per plant.
- During this study, applying insecticides at R3 or according to IPM guidelines reduced aphid populations more effectively than application at R1.
- Fungicides did not effect soybean aphid populations.
- Use of an insecticide-fungicide tank mix resulted in higher yields than use of an insecticide alone, but these differences were not statistically significant.

Table 1. Comparison of peak aphid populations and yield for soybeans grown with fungicides and insecticides, applied alone or in combination, for nine field trials in Iowa from 2008 to 2010

Application time and active ingredient	Peak aphids per plant	Yield (bu/ac)
Untreated control	1,040 a[a]	55.1 d
R1 Stratego® YLD	896 a	56.0 d
R3 Stratego® YLD	854 ab	58.1 bcd
R1 Leverage 2.7SE™	562 c	58.8 abcd
R3 Leverage 2.7SE™	292 c	61.5 abc
R1 Asana®	717 c	57.8 abcd
R3 Asana®	498 c	62.6 ab
R1 Stratego® YLD + Leverage 2.7SE™	484 c	59.3 abcd
R3 Stratego® YLD + Leverage 2.7SE™	204 c	63.5 a
Integrated pest management (IPM)[b] (Asana®)	244 c	57.6 bcd[c]

[a] Treatment means within a column followed by the same lowercase letter are not different at $P \leq 0.05$ according to least-square means tests with a Tukey-Kramer adjustment.

[b] IPM applications of insecticides were made when soybean aphid populations exceeded 250 aphids per plant. In 2010, aphid populations did not reach 250 aphids per plant, so the IPM treatment was not applied.

[c] The IPM application for 1 location-year was applied after aphids exceeded the 654 aphid per plant economic injury level (EIL), which may have resulted in a less favorable comparison with the R3 tank mix application.

Economic considerations

We conducted a simplified economic analysis based on a break-even yield gain analysis to determine the economic viability of each of the management plans used in the field trials. Costs of pesticides, costs of application and scouting services, expected crop price, and expected yield were used to calculate a gain threshold (GT). A gain threshold is the increase in number of bushels of yield required to cover the costs of the applications. We used prices that were typical for 2010 to estimate the cost of scouting and application service cost.

Application of an insecticide based on IPM guidelines resulted in approximately 80 percent probability (on average) of a yield increase great enough to surpass the gain threshold. In other words, 80 percent of the time, the use of an insecticide resulted yields being high enough to pay for the cost of the insecticide and its application. Due to differences in overall costs (i.e. increase cost for scouting) and yields, prophylactic application of an insecticide or an insecticide-fungicide tank mix at soybean growth stage R3 provided slightly higher average probability (between 86-89 percent) of recouping treatment costs. However, due to risks associated with prophylactic pesticide application, such as yield loss due to ground application (Hanna et al. 2007) and development of resistance to pesticides (Bradley 2010), we recommend that scouting still be used to ensure a pest problem is present before applying either insecticides or fungicides.

Table 2. Probability ranges and mean probabilities of breaking even with ground applied fungicides, insecticides and tank mixes for soybeans ($12 per bushel)

Timing and product	Range of probabilities (mean probability)
R1 Stratego YLD	0.17-0.99 (0.64)
R3 Stratego YLD	0.40-1.00 (0.85)
R1 Asana	0.01-1.00 (0.68)
R3 Asana	0.25-1.00 (0.86)
R1 Leverage	0.21-1.00 (0.75)
R3 Leverage	0.49-1.00 (0.87)
R1 tank mix[a]	0.22-1.00 (0.78))
R3 tank mix	0.14-1.00 (0.89)
Integrated pest management (IPM)[b] (Asana®)	0.27-1.00 (0.81)

[a] Tank mix consisted of Stratego® YLD and Leverage 2.7SE™.
[b] Range and mean probabilities calculated using the 6 location-years that the IPM treatment (Asana®) was applied.

Sources:

Bradley, C.A. 2010. Frogeye leaf spot pathogen with reduced sensitivity to fungicides found in Tennessee soybean field. University of Illinois Extension Bulletin. 24:172.

Hanna, S., S. Conley, and J. Santini. 2007. Managing fungicide applications in soybean. Purdue Extension: Soybean Productions Systems. SPS-103-W.

Rebekah Ritson is a graduate research assistant in the Department of Entomology. She can be reached at rritson@iastate.edu or 515-294-1999. Alison Robertson is an associate professor in the Department of Plant Pathology and Microbiology with extension and research responsibilities; contact at alisonr@iastate.edu or phone 515-294-6708. Daren Mueller is an extension specialist with responsibilities in the Corn and Soybean Initiative and ISU's IPM program. Mueller can be reached at 515- 460-8000 or by email at dsmuelle@iastate.edu. Matt O'Neal is an associate professor in the Department of Entomology with teaching and research responsibilities. He can be reached at oneal@iastate.edu or at 515-294-8622. Nathan Bestor is a graduate assistant in the Department of Plant Pathology and Microbiology. He can be reached at 515-294-1741 or bestor@iastate.edu.

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