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Organic bean leaf beetle management

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Abstract
Organic farming has increased to an $8 billion industry in the United States and continues to expand approximately 20 percent annually. The current 20-400 percent market premium for certified organic products has served as a powerful incentive for producers. Bean leaf beetles are one of the few insect pests lacking any natural enemies (parasites, predators, or pathogens) on organic farms in the Midwest. Because the bean leaf beetle is associated with bean pod mottle virus and fungi that stain the soybean seed coat, many soybean seeds have been rejected from the premium tofu/soymilk market since 1997.

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Agronomy, Horticulture

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Organic farming has increased to an $8 billion industry in the United States and continues to expand approximately 20 percent annually. The current 20-400 percent market premium for certified organic products has served as a powerful incentive for producers. Bean leaf beetles are one of the few insect pests lacking any natural enemies (parasites, predators, or pathogens) on organic farms in the Midwest. Because the bean leaf beetle is associated with bean pod mottle virus and fungi that stain the soybean seed coat, many soybean seeds have been rejected from the premium tofu/soymilk market since 1997. Soybean seed staining resulted in at least 5 percent of the entire organic soybean crop in Iowa to be rejected in 1998; thus, lowering organic soybean prices from $14/bushel for unstained beans to $7.50/bushel for stained beans that can enter the organic feed market.

Organic farmers use multiple tactics for bean leaf beetle management. Soybean seed is not planted until soils are sufficiently warm to permit rapid growth and ability to tolerate insect feeding. In addition, early-planted soybean serves as a trap crop for bean leaf beetles while new plantings reach an adequate growth stage before beetle colonization. Variety selection also is proving important in dealing with the bean leaf beetle problem.

Working with Heartland Organic Farming Cooperative in Stuart, Iowa, and Pioneer Hi-Bred, researchers at Iowa State University (K. Delate, J. DeWitt, and X.B. Yang) and USDA-ARS (Doug Karlen and Cindy Cambardella) examined strategies to minimize or prevent bean leaf beetle-related staining on five organic farms in 2000. High-protein, clear-hilum soybean varieties, with desirable traits for the organic soyfoods market, were grown without herbicides, according to certified organic requirements. Organic insect management treatments, including Neemix®, Garlic Barrier®, pyrethrum, humic and fulvic acid, and compost, were applied throughout the season. In addition, organic disease controls, including sodium bicarbonate and hydrogen peroxide were applied as separate treatments. The most promising treatments were Garlic Barrier and pyrethrum, although beetle populations in treated plots were not statistically lower than the controls.

Kathleen Delate (Iowa State University) determines soybean yield in organic bean leaf beetle management trials with Eric Gross (Pioneer Hi-Bred, Fontanelle, Iowa).

The experiment was repeated in 2001 at the Neely-Kinyon Farm in Greenfield, Iowa, and will be continued this year with additional products and varieties. Staining was lowest in the Northrup-King 2412 soybean (in 2000) and in Schillenger 211F in 2001 (Table 1). Staining levels ranged from 15 to 35 percent in 2000 and from 7 to 14 percent in 2001. With the relatively moderate 2001–2002 winter weather, beetles may reach 2000 levels this summer. We have found an average of two bean leaf beetles per acre in organic alfalfa fields so far this year. The development of new varieties, securing natural enemies for bean leaf beetle larvae (that feed on roots), and new organic pest controls are included in strategies recommended by organic farmers for development by land-grant researchers.

Information about this research and other organic projects is available here [1].

Table 1. Stand count, yield, bean leaf beetle population, and percentage of stained beans (Neely-Kinyon organic soybean variety trial, 2001).

Variety	Seed Stand Count	Yield (bu/acre)	Mean Bean Leaf Beetle Population	% Stained Soybean
IA 3012	145,800 ± 7,910	47.85 ± 1.07	4.00 ± 0.63	7.16 ± 0.75
Pioneer 9305	113,470 ± 6,300	43.40 ± 1.22	2.00 ± 1.05	9.52 ± 1.63
Schillenger 211F	144,330 ± 7,540	42.10 ± 1.11	3.00 ± 0.89	6.77 ± 1.23
Asgrow 2247	103,130 ± 4,990	37.66 ± 0.75	2.60 ± 0.68	8.35 ± 2.02
Schillenger 241F	159,400 ± 7,210	36.03 ± 0.63	2.80 ± 0.97	8.68 ± 0.61

US Soy 20145	94,070 ± 4,580	43.22 ± 0.31	3.40 ± 0.98	14.10 ± 1.65
Least significant difference	18,410	2.64	Not significant	4.11

All values are presented as ± standard error.

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