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Scout first-generation bean leaf beetles now

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Abstract

Bean leaf beetle feeding on soybean pods can lead to significant reductions in seed quality and yield. Management during the pod setting and filling stages can be frustrating because beetles may feed on pods for a couple of weeks before the population reaches the economic threshold. In this situation, some loss in seed quality and quantity occurs before an insecticide application can be economically justified. Larry Pedigo and his students at Iowa State University have developed research-based information to help make a management decision for second-generation bean leaf beetles based upon the population size of the first-generation bean leaf beetles.

Keywords

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INTEGRATED CROP MANAGEMENT

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Bean leaf beetle feeding on soybean pods can lead to significant reductions in seed quality and yield. Management during the pod setting and filling stages can be frustrating because beetles may feed on pods for a couple of weeks before the population reaches the economic threshold. In this situation, some loss in seed quality and quantity occurs before an insecticide application can be economically justified. Larry Pedigo and his students at Iowa State University have developed research-based information to help make a management decision for second-generation bean leaf beetles based upon the population size of the first-generation bean leaf beetles. This article explains this new management concept, which we first presented last year.

The beetle has two generations a year in Iowa. The overwintered population (not generation), which fed on soybean during May through June, is actually the second-generation beetles from last year that hibernated through the winter. Females from the overwintered population lay eggs that develop into first-generation beetles that emerge in July. First-generation adult populations usually peak in the late vegetative or the early reproductive soybean stages, whereas the second-generation adults peak during the pod-fill stage. Feeding by first-generation beetles on soybean leaves seldom results in economic yield losses, but second-generation feeding on pods in late summer can be significant.

A degree-day model was developed to estimate the occurrence of first-generation adults in the field. The degree days for the first-generation adults were estimated to be 1212 degree days with a developmental threshold at 46°F. The overwintered female beetles usually begin to lay their eggs after colonizing the bean fields. The degree-day estimation for the first-generation adults is calculated by accumulating the temperature at the week of soybean emergence. Table 1 shows the accumulated degree-days for the first-generation adults in five different areas of Iowa. Table 2 shows the dates predicted for the peak emergence of first-generation adults at these locations.

The first generation can be sampled to predict the size of the second generation. Tables 3 and 4 refer to the size of the bean leaf beetle population that is occurring in the field during mid-July. These are first-generation beetles. If this population exceeds the thresholds, the field should not be sprayed now, but instead sprayed later during the second-generation of beetles, which will appear sometime in mid-August. Sampling the fields now will help you predict the possibility of economic pod damage at the beginning of pod growth and development a month from now.

The new management concept is to sample the first-generation beetles and then to use this information to manage the second-generation beetles. Here is how it works:

1. Determine what week your soybean plants emerged from the soil.
2. Consult Table 2 (left-hand column) and find the dates that match your soybean emergence date.
3. Determine which of the five Iowa locations is closest to your field.
4. Where the date (row) and location (column) intersect represents the predicted date for peak first-generation beetle emergence.
5. Sample your soybean fields 1 week after the predicted peak emergence. If the number of beetles reaches or exceeds the threshold (Table 3 or 4), stop sampling. If the sample is below the threshold, sample the following week. If the sample remains below the threshold, sample a third and final week. If the threshold is not reached, an economic infestation of bean leaf beetles should not occur in your pod-stage soybean.
6. If the first-generation population is above the threshold, do not spray now, but scout the fields again in late August to monitor for the first emerging beetles of the second generation. When the first beetles appear, spray the field with an insecticide (45-day preharvest interval or less). Based upon the population size of the first generation, it is expected that the second generation will exceed the economic threshold. Fields can be sampled for first-generation beetles by using either a drop cloth or a sweep net.

Drop cloth

- Walk 100 feet in from the field edge and scout each field and each variety separately.
- Place a 3-foot-wide strip of cloth on ground between the rows.
- Bend the plants on one row over the cloth, and shake them vigorously.
- Count the number of beetles on the cloth.
- Repeat the procedure four times for each 20 acres of the field.
- Determine the average number of beetles per 3 foot of row.
- See Table 3 for the number of beetles per 3 foot of row necessary to justify insecticide treatment for the second-generation adults in August or September.
- If the number of beetles is below the economic threshold, sample your fields again the following week, or a third week if necessary.

Sweep net

- Walk 100 feet in from the field edge and scout each field and each variety separately.
- Take 20 sweeps.
- Repeat the procedure four times for each 20 acres of the field.
- Determine the average number of beetles per 20 sweeps.
- Table 4 shows the number of beetles per 20 sweeps that justifies insecticide treatment for the second-generation adults.
- If the number of beetles is below the economic threshold, sample your fields again on following week, or a third week if necessary.

Table 1. Degree-day accumulations for first generation bean leaf beetle adults (1212 degree-days with developmental threshold of 46°F) from the date of soybean emergence through July 9, 2001.

	Degree-Day Accumulations				
Date of	Decorah	Burlington	Des Moines	Omaha	Spencer

Soybean Emergence	(Northeast)	(Southeast)	(Central)	(Southwest)	(Northwest)
May 1-7	1280	1487	1489	1594	1302
May 8-14	1177	1329	1379	1484	1231
May 15-21	1068	1209	1251	1341	1119
May 22-28	908	1047	1091	1185	989

Table 2. Predicted dates for peak emergence of first-generation bean leaf beetle adults.

Date of Soybean Emergence	Decorah (Northeast)	Burlington (Southeast)	Des Moines (Central)	Omaha (Southwest)	Spencer (Northwest)
May 1-7	July 7	June 30	June 30	June 27	July 7
May 8-14	July 11	July 7	July 5	July 1	July 10
May 15-21	July 14	July 10	July 9	July 6	July 13
May 22-28	July 20	July 16	July 14	July 10	July 20

Table 3. Economic thresholds for first-generation bean leaf beetles (average number of beetles per 3 foot of row).

	Management Cost (\$/Acre)								
\$/bu	7	8	9	10	11	12	13	14	15
15	2.0	2.2	2.5	2.8	3.0	3.3	3.5	3.8	4.1
14	2.1	2.4	2.7	2.9	3.2	3.5	3.8	4.1	4.3
13	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.3	4.6
12	2.4	2.8	3.1	3.4	3.7	4.1	4.4	4.7	5.0
11	2.6	3.0	3.3	3.7	4.1	4.4	4.8	5.1	5.5
10	2.9	3.3	3.7	4.1	4.4	4.8	5.2	5.6	6.0
9	3.2	3.6	4.1	4.5	4.9	5.3	5.8	6.2	6.6
8	3.6	4.1	4.5	5.0	5.5	6.0	6.5	7.0	7.5
7	4.1	4.6	5.2	5.7	6.3	6.8	7.4	7.9	8.5

6	4.7	5.3	6.0	6.6	7.3	7.9	8.6	9.2	9.9
5	5.6	6.4	7.2	7.9	8.7	9.5	10.3	11.1	11.8
4	7.0	7.9	8.9	9.9	10.9	11.8	12.8	13.8	14.8

Table 4. **Economic thresholds for first-generation bean leaf beetles (average number of beetles per 20 sweeps).**

	Management Cost (\$/Acre)								
\$/bu	7	8	9	10	11	12	13	14	15
15	8.1	9.2	10.2	11.3	12.4	13.4	14.5	15.6	16.6
14	8.6	9.8	10.9	12.1	13.2	14.3	15.5	16.6	17.8
13	9.2	10.5	11.7	12.9	14.2	15.4	16.6	17.9	19.1
12	10.0	11.3	12.6	14.0	15.3	16.6	18.0	19.3	20.6
11	10.8	12.3	13.7	15.2	16.6	18.1	19.5	21.0	22.4
10	11.8	13.4	15.0	16.6	18.2	19.8	21.4	23.0	24.6
9	13.1	14.8	16.6	18.4	20.2	22.0	23.7	25.5	27.3
8	14.6	16.6	18.6	20.6	22.6	24.6	26.6	28.6	30.6
7	16.6	18.9	21.2	23.5	25.8	28.1	30.3	32.6	34.9
6	19.3	22.0	24.6	27.3	30.0	32.6	35.3	38.0	40.6
5	23.0	26.2	29.4	32.6	35.8	39.0	42.2	45.4	48.6
4	28.6	32.6	36.6	40.6	44.6	48.6	52.6	56.6	60.6

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