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Bean leaf beetle: Predicted peak first-generation dates

by Marlin E. Rice, Department of Entomology, and Rich Pope, Department of Plant Pathology



Bean leaf beetle. (Marlin E. Rice)

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. Several years ago, Larry Pedigo and his students in the Department of Entomology 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.

The beetle has two generations a year in Iowa. The overwintered population (actually the second generation from last year) feeds on soybean during May through June. Females from this overwintered population lay eggs that develop into first-generation beetles that emerge in late June or early July. First-generation adult populations usually peak in the early reproductive soybean stages, whereas the second-generation adults peak during the pod-fill stages later in the summer. Feeding by first-generation beetles on soybean leaves very rarely, if ever, results in economic yield losses, but second-generation feeding on pods in late summer can cause significant yield reduction.

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A degree-day model was developed by the Pedigo researchers to estimate the occurrence of first-generation adults. The degree days for the first-generation adults were estimated to be 1,212 degree days with a developmental base 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 and predicted dates for the peak emergence of first-generation adults for 2007.

The value of this information is that the first generation can be sampled to predict the size of the second generation. Tables 2 and 3 refer to the size of the first-generation bean leaf beetle population that may occur in the field during mid-July. Again, these are first-generation beetles, and if the population exceeds the thresholds, the field should not be sprayed at this time but instead sprayed later during the beginning of the second generation of beetles. When the soft, gray teneral beetles start to appear in August, then this is the beginning of the second generation and if the first generation thresholds were exceeded, then the second generation should be sprayed at their first appearance. The value of field scouting now is that it will help you predict the possibility of economic pod damage from bean leaf beetles at the beginning of soybean pod development a month from now.

This pest 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 the left-hand column of Table 1 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 one week after the predicted peak emergence. If the number of beetles reaches or exceeds the threshold (Table 2 or 3), 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 soybeans.
6. If the first-generation population is above the threshold, do not spray now, but scout the fields again in August to monitor for the first-emerging beetles of the second generation. When the first soft, gray beetles start to 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 technique

- 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 technique

- Walk 100 feet in from the field edge and scout each field and each variety separately.
- Take 20 sweeps down the row.
- 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 the following week, or a third week if necessary.

Table 1. Degree-day accumulations and predicted dates for peak emergence of first-generation bean leaf beetle adults (1,212 degree days with developmental threshold of 46 °F) from the date of soybean emergence through June 27, 2007.

Date of Soybean Emergence	Degree-Day Accumulations and Predicted Peak Emergence				
	Storm Lake (Northwest)	Oelwein (Northeast)	Ames (Central)	Atlantic (Southwest)	Ottumwa (Southeast)
May 1-7	1,184	1,089	1,185	1,237	1,232
	June 29	June 28	June 29	June 26	June 26
May 8-14	1,068	987	1,072	1,113	1,104
	July 3	July 7	July 3	July 1	July 1
May 15-21	937	879	942	978	985
	July 9	July 11	July 9	July 6	July 6
May 22-28	778	723	779	811	816
	July 15	July 17	July 15	July 12	July 12

Table 2. Economic thresholds for first-generation bean leaf beetles (average number of beetles per 3 foot of row).

\$/bu	Management Cost (\$/acre)									
	7	8	9	10	11	12	13	14	15	
13	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 3. Economic thresholds for first-generation bean leaf beetles (average number of beetles per 20 sweeps).

\$/bu	Management Cost (\$/acre)									
	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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