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Managing Soybean Defoliators

Michigan State University

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IPM Facts

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Managing Soybean Defoliators

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A number of pests including bean leaf beetles, green cloverworms, Japanese beetles, grasshoppers and spider mites can defoliate soybeans. Although the biology of these pests is quite different, general defoliation thresholds apply to all since they damage soybeans in a similar fashion.

Description of life stages:

Bean leaf beetles are about 1/4-inch long and vary greatly in color from reddish brown to yellow. Usually they have black wing margins and two black spots on each wing cover. All have a black, triangular spot on the forward margin of the wings.

Green cloverworms are green caterpillars with two narrow stripes down each side of the body. They have 3 pairs of legs near the head and four pairs of prolegs near the rear. Quite active, they thrash violently at the slightest disturbance. Adults are dark-brown, black-spotted or mottled moths with a wing span of about 1-1/4 inches.

The Japanese beetle has a metallic green body and coppery wing covers. Bordering the margins of these wing covers are 12 tufts of white hair. The white, C-shaped grub has a dark-brown head and three pairs of legs.

Grasshoppers are brownish-green with chewing mouthparts and jumping rear legs. Wings are frequently reddish to yellowish or brown.

Two-spotted spider mites are more closely related to spiders than insects. Adults are tiny (1/60-inch long), rounded, and have 8 rather than 6 legs. They are either white, green or red with dark spots on both sides of their bodies.

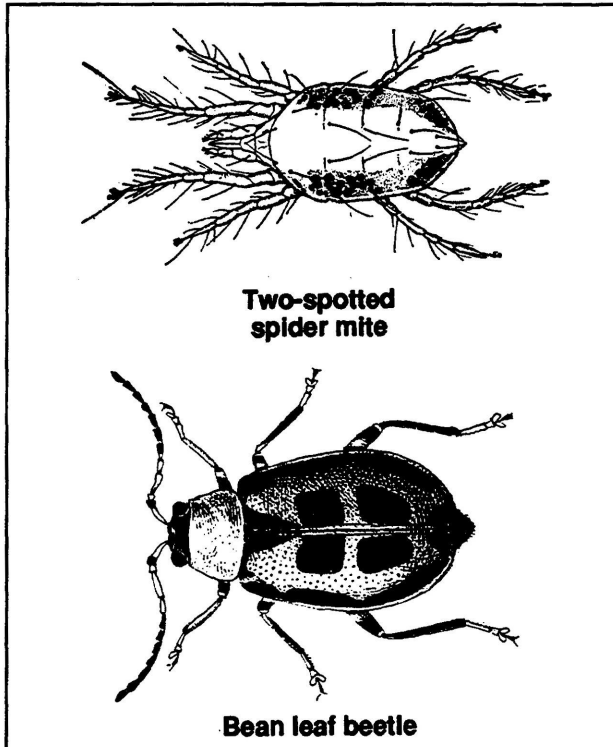
Life cycle:

Bean leaf beetles overwinter as adults in leaf litter or other vegetation, primarily in wooded areas, and emerge in early spring. They feed on

soybean seedlings and a variety of other legumes, mate and lay eggs. Each female may lay 175-250 orange eggs in clusters of 10-30 in the soil at the base of soybean plants. Larvae feed on below-ground plant parts and eventually pupate in earthen cells. Adult beetles emerge to feed on bean pods and foliage until they begin hibernating in the fall.

Green cloverworms pass the winter in either the pupal or adult stage. Females lay single eggs on the undersides of soybean leaves. Eggs produce

green worms that feed on these leaves for about



- 1 *Cerotoma trifucata* (Foster)
- 2 *Pathypena scabra* (Fabricius)
- 3 *Popillia japonica* Newman
- 4 Various species
- 5 *Tetranychus urticae* Koch

4 weeks before dropping to the ground to burrow into the leaf litter or soil where they pupate. Adult moths emerge to start the second generation.

Japanese beetles overwinter in the soil as the third larval stage and, as the soil warms, move closer to the surface to feed on fine rootlets. Following pupation, adults emerge (mostly in late July and early August) to feed and mate. Females burrow into loose, moist sod to deposit eggs. The eggs hatch after a few weeks and the grubs feed on rootlets until cold weather arrives.

Most *grasshopper* species pass the winter as eggs, laid in masses up to 2 inches below the soil surface. Containing as many as 120 elongated eggs, these are mainly deposited in field margins and roadsides, but may also be laid in legume or grass fields.

Spider mites overwinter as adults in fencerows and woodlots. They move into edges of the field in the summer, developing small colonies on the undersides of leaves. Spider mites are very small and are frequently blown from plant to plant. Eggs, nymphs and adults may all be found on the undersides of leaves at the same time. They withdraw plant juices with their sucking mouthparts and are particularly abundant during hot, dry conditions.

Damage:

Emerging bean leaf beetle adults feed on the cotyledons, unifoliate and trifoliate leaves of small soybean plants, sometimes completely defoliating the plant. They prefer to feed on the youngest plant tissue available. Adults from the next generation emerge in late July and early August. They feed on the leaves, blossoms, and developing pods, reducing pod set and seed quality. Green clover-worms, Japanese beetles, and grasshoppers all feed on foliage, giving plants a ragged look. Sometimes Japanese beetles leave behind only larger leaf veins and a stringy, black excrement. Green cloverworms may also attack the pods when infestations are heavy. Mites feed on the undersides of the soybean leaves and their repeated piercing and sucking activities give the leaves a "sandblasted" appearance. Heavy mite infestations cause the leaves to yellow, brown and eventually die. Fine silky threads spun by the

mites become particularly evident when populations are high.

Management:

Biological Control — A tachinid fly that parasitizes adult beetles aids in controlling the bean leaf beetle in some states, however, little is known about natural enemies of the bean leaf beetle in Michigan. Beneficial insects and diseases usually regulate green cloverworm populations in most soybean growing areas. Japanese beetle populations are cyclic; dry weather, natural enemies, and diseases help keep numbers below economically damaging levels. Japanese beetle populations are also kept in check by birds that feed on the beetles, and skunks and moles that eat the grubs. Grasshoppers frequently succumb to disease organisms as well as a variety of predators.

Cultural Control — Practices that promote healthy, vigorous soybean plants are effective in reducing the impact of all soybean defoliators. Soybeans grown under good conditions are remarkably tolerant of defoliation damage.

Chemical Control — Full coverage is not required when using systemic insecticides. Complete coverage is necessary for maximum efficiency when non-systemic insecticides are used. Drop nozzles may be needed for complete coverage if the canopy is large.

Scouting & Economic Thresholds:

When scouting for these pests, check 20 plants in 5 areas of the field. Estimate the percent of defoliation and determine what, if any, insects are still actively feeding. Also determine the phenological stage of soybean growth.

When scouting for mites, look for leaves that show yellowing near the petiole, especially during hot, dry periods of the season. Examine the leaf undersides for silky webbing. Estimate the percent of leaf surface damaged (yellowing) and substitute this number for the percent defoliation in the defoliation guidelines (Table 1.)

Table 1. Soybean Defoliation Threshold Guidelines.

<u>Plant Stage</u>	<u>Treat If Defoliation Exceeds</u>
Prebloom (VE-R1)	40%
Bloom-Pod Fill (R1 - R5)	15%
Pod Fill - Beginning Maturity (R5 - R7)	25%
Beginning Maturity	Defoliation at this point has little effect on yield

Table 2. Recommended insecticide applications for controlling soybean defoliators.¹

<u>Chemical</u>	<u>Formulation²</u>	<u>Rate³</u>	<u>RUP⁴</u>	<u>Precautions & Restrictions⁵</u>
<u>Bean Leaf Beetle</u>				
carbaryl (Sevin)	4 F	1/2 - 1 qt	N	PHI 0 days, do not mix with 2,4-DB herbicides.
Lorsban	4 E	1 - 2 pt	N	PHI 28 days beans. Do not feed forage.
Lannate	90 SP 1.8 L	1/2 lb 1 qt	Y Y	PHI 10 days forage, 14 days beans.
Orthene	75 S	2/3 - 1 1/3 lb	N	PHI 14 days, do not feed vines.
dimethoate (Cygon)	4 EC	1 pt	N	PHI 5 days grazing, 21 days beans.
Larvin	3.2 EC	1 1/2 pt	N	PHI 28 days, do not feed vines.
Asana XL	0.66 EC	5.8 - 9.6 fl oz	Y	PHI 21 days, do not graze or feed forage.
permethrin (Ambush, Pounce)	2 EC 3.2 EC	3.2 - 6.4 fl oz 2 - 4 fl oz	Y Y	PHI 60 days, do not feed vines. Max. 2 appl. per season.
Pennacp-M	2 EC	2 - 3 pt	Y	PHI 20 days, max. 2 appl. per season.
<u>Grasshoppers</u>				
carbaryl (Sevin)	4 F 50 WP	1/2 - 1 1/2 qt 1 - 3 lb	N N	PHI 0 days. PHI 0 days.
Lorsban	4 E	1/2 - 1 pt	N	PHI 14 days grazing, 28 days beans.
dimethoate (Cygon)	4 EC	1 pt	N	PHI 5 days grazing, 21 days beans.
Orthene	75 S	1/3 - 2/3 lb	N	PHI 14 days. Do not feed vines.
Asana XL	0.66 EC	5.8 - 9.6 fl oz	Y	PHI 21 days. Do not graze or feed.
Furadan	4 F	1/4 - 1/2 pt	Y	PHI 21 days. Do not graze or feed.
Pennacp-M	2 EC	1 - 3 pts	Y	PHI 20 days. Max. 2 appl. per season.

¹ Be sure your equipment is properly calibrated. Refer to Extension Bulletin E-1582, **Chemical Control of Insects and Nematodes in Field and Forage Crops**, available at your county Extension Office.

² Other formulations may be available.

³ Rate per acre.

⁴ Restricted Use Pesticide (N=no, Y=yes)

⁵ PHI=Pre-Harvest Interval.

Table 2 continued

Chemical	Formulation²	Rate	RUP⁴	Precautions & Restrictions⁵
<u>Green cloverworms</u>				
Lorsban	4 E	1/2 - 1 pt	N	PHI 14 days grazing, 28 days beans.
Lannate	90 SP 1.8 L	1/8 - 1/2 lb 1/2 - 1 qt	Y Y	PHI 10 days forage, 14 days beans. PHI 10 days forage, 14 days beans.
carbaryl (Sevin)	4 F 80 S	1/2 - 1 qt 1 1/4 lb	N N	PHI 0 days. Do not mix with 2,4-DB herbicides.
Orthene	75 S	2/3 - 1 1/3 lb	N	PHI 14 days, Do not feed vines.
Larvin	3.2 EC	10 - 16 fl oz	N	PHI 28 days. Do not feed vines.
malathion	5 EC	3 pt	N	PHI 0 days.
Asana XL	0.66 EC	2.9 - 5.8 fl oz	Y	PHI 21 days. Do not graze or feed.
permethrin	3.2 EC	2 - 4 fl oz	Y	PHI 60 days. Do not feed vines.
(Pounce, Ambush)	2 EC	3.2 - 6.4 fl oz	Y	PHI 60 days. Do not feed vines. Max. 2 appl. per season.
Pennacp-M	2 EC	2 - 3 pt	Y	PHI 20 days. Max. 2 appl. per season.
<u>Japanese beetles</u>				
carbaryl (Sevin)	4 F 50 WP	1/2 - 1 qt 1 - 2 lb	N N	PHI 0 days, do not mix with 2,4-DB herbicides.
ULV malathion	9.33 EC	1/2 pt	N	PHI 7 days.
Asana XL	0.66 EC	5.8 - 9.6 fl oz	Y	PHI 21 days, Do not graze or feed.
Pennacp-M	2 EC	4 pt	Y	PHI 20 days.
permethrin	2 EC	6.4 - 12.8 fl oz	Y	PHI 60 days. Do not graze or feed.
(Pounce, Ambush)	3.2 EC	4 - 8 fl oz	Y	
<u>Spider mites</u>				
dimethoate (Cygon)	4 E	1 pt	N	PHI 5 days grazing, 21 days beans.
Lorsban	4 E	1 pt	N	PHI 14 days grazing, 28 days beans.
methyl parathion	4 EC	1 pt	Y	PHI 20 days.

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² Other formulations may be available.

³ Rate per acre.

⁴ Restricted Use Pesticide (N=no, Y=yes)

⁵ PHI=Pre-Harvest Interval

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This publication contains pesticide recommendations based on research and pesticide regulations. However, changes in pesticide regulations occur constantly. Some pesticides mentioned may no longer be available, and some uses may no longer be legal. If you have questions about the legality and/or registration status for using pesticides, contact your county Cooperative Extension Service office.

To protect yourself and others and the environment, always read the label before applying any pesticide.

Illustrations courtesy of United States Department of Agriculture.



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