Biological—In the 1970s, a wasp egg parasitoid (*Anaphes flavipes*) was imported from Europe and distributed throughout Michigan. The spotted lady beetle (*Coleomegilla maculata lengi*) is an important predator that feeds on eggs early in the season. Larval parasitoids include three wasps, and a tachinid fly parasitoid attacks adults. In combination, the natural enemies of the cereal leaf beetle usually control this pest.

Chemical—Cereal leaf beetle infestations often start along field borders of winter grains, with adults moving to preferred spring grains. Begin looking for adult feeding damage in the spring after the first warm spell (above 60 degrees F). Check adult-damaged fields for eggs and larvae. The decision to manage cereal leaf beetle is based on plant stage and the number and stage of development of the larvae. (See MSU Extension bulletin E-2549, *Insect Management in Wheat and Other Small Grains*.) Timing of application is extremely important, and applications are more effective when small rather than large larvae are present.

INSECT PESTS OF SOYBEANS

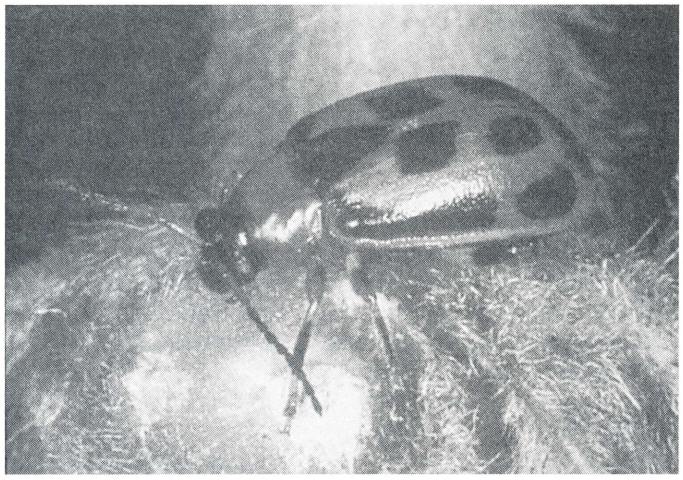
DEFOLIATORS

Many pests defoliate soybeans. Most are general feeders, capable of infesting many crops. High infestations of fall armyworms cause the most severe damage to soybeans. Fall armyworms prefer grass crops but can be a problem in weedy fields or when soybeans are double-cropped with small grains.

Taking whole-plant samples is best when you are scouting seedling-stage soybeans for defoliators. Sweep nets or ground cloths can be used for sampling larger plants. When making a management decision, it is important to consider all damage from all caterpillars (lepidopteran defoliators).

Bean Leaf Beetle (*Cerotoma trifurcata*)

Pest status: occasional.



Bean leaf beetle adult.

Characteristics and life cycle: Upon emergence in the spring, adult beetles feed on alfalfa. After the first alfalfa cutting and soybean emergence, bean leaf beetles move to soybean fields to lay eggs. Eggs are deposited in the soil and larvae feed on roots as they develop. Mature larvae build an earthen cell and pupate inside. Adult beetles emerge after approximately seven days. Usually peak emergence for this second generation is late August to mid-September. Second generation bean leaf beetles feed on soybeans and alfalfa before moving into overwintering sites.

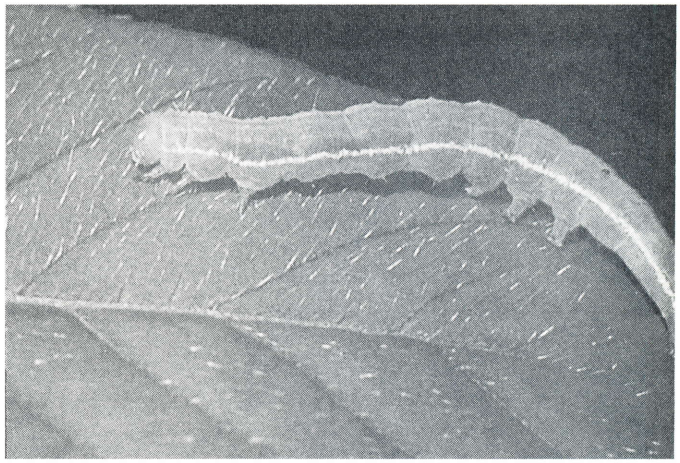
Damage: Bean leaf beetle larvae use their chewing mouthparts to eat roots, root hairs, and nodules. Adult beetles defoliate plants by chewing small, round holes in the leaves. Defoliation is a concern early in the season. Later in the season, beetles feed on pods all the way down to the seeds. This feeding damage creates lesions on the pod that remain visible at harvest and increase seed vulnerability to secondary pathogens. Seeds beneath lesions become shrunken, discolored, and sometimes moldy, resulting in loss of grain weight and quality.

Control: *Cultural*—Planting soybeans as late as possible (within the recommended planting period for a variety) can reduce bean leaf beetle colonization.

Chemical—Adult sampling should begin early in the season. Management is not usually necessary because of soybean tolerance of defoliation.

Green Cloverworm (*Plathypena scabra*)

Pest status: occasional outbreaks.



Green cloverworm.

Characteristics and life cycle: The adult moth migrates into Michigan each spring from overwintering grounds along the Gulf Coast. Eggs are laid on the undersides of leaves. The eggs turn brownish with red specks about 48 hours before hatching. Green cloverworm larvae (caterpillars) are pale green with two white stripes running horizontally along each side of the body. They have three pairs of abdominal prolegs plus one pair of **anal prolegs** (false, peglike legs near the anus of the caterpillar).

Damage: Green cloverworm larvae consume soybean foliage, giving leaves a tattered appearance.

rial. Feeding on germinating seeds, they may cause variable emergence, stand loss, or delayed development. They also create an entrance for disease organisms.

Control: *Non-chemical*—Using reduced tillage, planting later in the season, and shallow planting in a well prepared seed bed decrease seedcorn maggot damage potential.

Chemical—If a maggot problem is expected, treating seed with an insecticide before planting is the most effective and convenient control method. Though more expensive, a soil insecticide can be applied if seed and planter box treatments are not possible.

Review Questions

Chapter 5: Insect management

Write the answers to the following questions and then check your answers with those in the back of the manual.

1. Insect damage can result in:
   A. An unmarketable product.
   B. Disease transmission.
   C. Yield reduction.
   D. All of the above.

2. Molting is the process of shedding an old skeleton to reveal a new, larger exoskeleton.
   A. True.
   B. False.

3. Define metamorphosis.

4-8. Match the following forms of metamorphosis with the correct statement.

A. Simple

B. Complete

C. Both simple and complete

4. ___ Immature insects resemble adults.
5. ___ Adult and nymphs usually live in the same environment.
6. ___ Adult insects have wings.
7. ___ Immature insects do not look like the adults.
8. ___ Immature insects are referred to as larvae.

9. During which insect life stage does an insect undergo a complete change?
   A. Nymph
   B. Larva
   C. Pupa
   D. Adult

10. The corn rootworm goes through which type of metamorphosis?
    A. Simple
    B. Complete

11. Why is it important to understand an insect's life cycle for pest management?

BIENNIAL

Biennials are plants that complete their growth in two years. The first year, the plant produces leaves and stores food. The second year, it produces fruits and seeds. Biennial weeds are most commonly found in no-till fields, pastures, and fencerows that are not mowed. They are easiest to control in the seedling stage.

Bull thistle is a biennial.

PERENNIAL

Perennials are plants that live for two or more years. Perennials can reproduce by seed or vegetatively. The plant parts that allow perennials to spread without producing seeds include **stolons** (creeping aboveground stems—e.g., white clover and strawberries), **rhizomes** (creeping belowground stems —e.g., milkweed, quackgrass), **tubers** (enlarged underground stems—e.g., potato, yellow nutsedge), and **bulbs** (underground stem covered by fleshy leaves—e.g., tulip). Because perennial weeds can propagate (spread) underground, they can be the most difficult weeds to control. Removing the aboveground vegetation will not stop the weed from spreading.

Johnsongrass is a creeping perennial.

Annuals, biennials, and perennials can reproduce from seed. Many weeds produce large quantities of seeds. Seeds are easily dispersed across a field by wind, rain, machinery, animals, and people. Weed seeds can germinate after being dormant for long periods of time. They can also tolerate extremes in weather such as temperature and moisture. To prevent seed dispersal, you should control weeds before they produce seeds.

COMMON WEEDS IN MICHIGAN

GRASS AND GRASSLIKE WEEDS

Annuals

- Barnyardgrass
- Large crabgrass
- Smooth crabgrass
- Giant foxtail
- Yellow foxtail
- Green foxtail

Grassplant.

- Fall panicum
- Wild-proso millet
- Witchgrass

Perennials

- Johnsongrass
- Yellow nutsedge
- Quackgrass

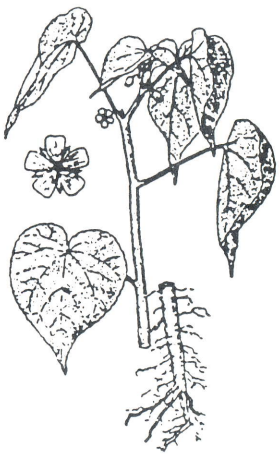
Yellow Nutsedge.

BROADLEAF WEEDS

Annuals

- Ladysthumb
- Pennsylvania smartweed
- Wild buckwheat
- Common lambsquarters
- Redroot pigweed
- Eastern black nightshade
- Common cocklebur
- Jimsonweed
- Common purslane
- Common ragweed
- Giant ragweed
- Velvetleaf
- Common chickweed
- Shepherd's-purse
- Horseweed (Marestail)
- Prickly lettuce
- Wild mustard
- Yellow rocket

Redroot Pigweed.



Velvetleaf.

Biennials

- White campion
- Wild carrot
- Bull thistle

Perennials

- Milkweed
- Hemp dogbane
- Canadian thistle
- Dandelion
- Field bindweed
- Perennial sow thistle

Additives are used primarily with postemergence herbicide applications to improve the coverage of leaf surfaces and increase herbicide penetration into the leaf. Additives do not increase the effectiveness of soil-applied herbicides.

HERBICIDE COMPATIBILITY PROBLEMS

Compatibility problems in tank mixing herbicides usually occur when applicants do not follow mixing directions. Some common causes of compatibility problems are mixing two herbicides in the wrong order (for example, adding an emulsifiable concentrate to the spray tank before suspending a wettable powder), insufficient agitation, excessive agitation, and air leaks. Problems can also occur when the carrier is a fertilizer such as 28 percent nitrogen or other non-water substances. You should test for herbicide compatibility in a small container before mixing a large tank. If compatibility problems occur, the addition of compatibility agents may help.

CHAPTER 6

Review Questions

Chapter 6: Weed Management

Write the answers to the following questions and then check your answers with those in the back of the manual.

1. Define a weed.

2. Plants that complete their life cycle in one year are:
   A. Biennials.
   B. Annuals.
   C. Perennials.
   D. None of the above.

3. An aboveground creeping stem is called a:
   A. Rhizome.
   B. Stolon.
   C. Tuber.
   D. Bulb.

4. Weeds are easiest to control at the:
   A. Reproductive stage.
   B. Vegetative stage.
   C. Seedling stage.
   D. Mature stage.

5. Which of the following is an example of a broadleaf weed?
   A. Quackgrass.
   B. Green foxtail.
   C. Wild-proso millet.
   D. Common ragweed.

6. An example of a perennial grass weed is:
   A. Quackgrass.
   B. Wild carrot.
   C. Barnyard grass.
   D. Smooth crabgrass.

7. Reducing the competition between a crop and weeds by changing the planting population of the crop is an example of:
   A. Biological weed control.
   B. Cultural weed control.
   C. Chemical weed control.
   D. Mechanical weed control.

8. Preemergence herbicides generally require rainfall within a week of application to incorporate the herbicide in the soil.
   A. True
   B. False