IPM-3

UNIVERSITY OF KENTUCKY
College of Agriculture, Food and Environment

# Kentucky Integrated Crop Management Manual for Field Crops

## "SOYBEANS"

**Section 1**
**Pages 1 - 32**

# Kentucky Integrated Crop Management Manual for Soybeans

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For additional and current information please consult the following web sites:

For more IPM information and links to many pest and crop management sites view the IPM web page at: http://www.uky.edu/Ag/IPM/

For the most current information on pests view the **Kentucky Pest News** at:
http://www2.ca.uky.edu/agcollege/plantpathology/extension/kpnindex.htm

For up-to-date weather, and crop and pest models view Ag-weather at:
http://wwwagwx.ca.uky.edu/Gisproducts.html

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## Preface

Agriculture is the world's most important industry. This level of importance will continue due to rapidly expanding populations that demand increased amounts of food and fiber. Crop protection problems associated with this increased production have become more complex. A simplistic approach to pest control leads to serious environmental complications. A truly successful pest management program must take a multi-disciplinary, multi-crop approach in order to supply the farmer with reliable pest control information. An approach to crop production based on sound economic, ecological, technical and social considerations is required to assist the farmer to achieve needed production levels, while maintaining food safety and environmental quality.

## Photo Credits

Ric Bessin. Univeristy of Kentucky. Seed corn maggots, pg. 4; Black cutworm, pg. 6; Black cutworm moth, pg. 6; Long-horned grasshopper, pg. 10; Short-horned grasshopper, pg. 10; Soybean podworms, pg.12; Green stink bug, pg. 13; Brown stink bug, pg, 13; Three cornered alfalfa hopper, pg. 15; Damsel bug, pg. 21; Orb weaver, pg. 21; Crab spider, pg. 21.

Doug Johnson. University of Kentucky. Dectes stem borer, pg. 14.

Jeremy Green. Clemson University. Kudzu bug, pg. 14. Bugwood.org.

Kansas Department of Agriculture Archive. Grape colaspis, pg. 7. Bugwood.org

David R. Lance. USDA APHIS PPQ. Brown marmorated stink bug, pg. 13. Bugwookd.org

Dan Potter. Univeristy of Kentucky. Adult Japanese beetles, pg. 9.
http://www2.ca.uky.edu/entomology/entfacts/ef451.asp

Russ Ottens. Univesity of Georgia. Green lynx spider, pg. 21. Bugwood.org

Unknown source. Big eyed bug, pg. 21.

University of Nebraska – Lincoln. Department of Entomology. Soybean aphid, pg. 10.

USDA Insect and Plant Disease Slide Set. Bean leaf beetle, pg. 4; Green cloverworm, pg. 8, Soybean podworm damage, pg. 12.

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# SOYBEAN SCOUTING

Soybean scouting techniques are similar to those utilized in corn except that the insects are sampled by using a shake cloth or sweep net and the disease sampling radius varies from 10 to 30 feet.

| Pests | Monitoring Stations | Procedure/Location |
|---|---|---|
| Insects | Random | one - 4 foot shake sample or 48 plant beat-sweep |
| Weeds | Permanent | 100 $ft.^2$ area |
| Diseases | Random | 10 to 30 ft. radius or 10 ft of two rows |

How to scout a Field:

Use the table below to determine the number of locations you need to survey. For example, 80 acre field 8 locations; 5 locations for 50 acres and 4 locations for 30 acres).

Select locations randomly so that they will represent the entire field. Don't survey along field margins or limit surveys to one side or end of a field.

IF THE SURVEY IS NOT RANDOM IT WILL NOT REPRESENT THE WHOLE FIELD and you may find a lot of problems on your return visit.

Specific survey information for each insect will follow. In general, you will either make one shake-cloth sample per location or a sweep net sample. In addition to pests, note any beneficial species present.

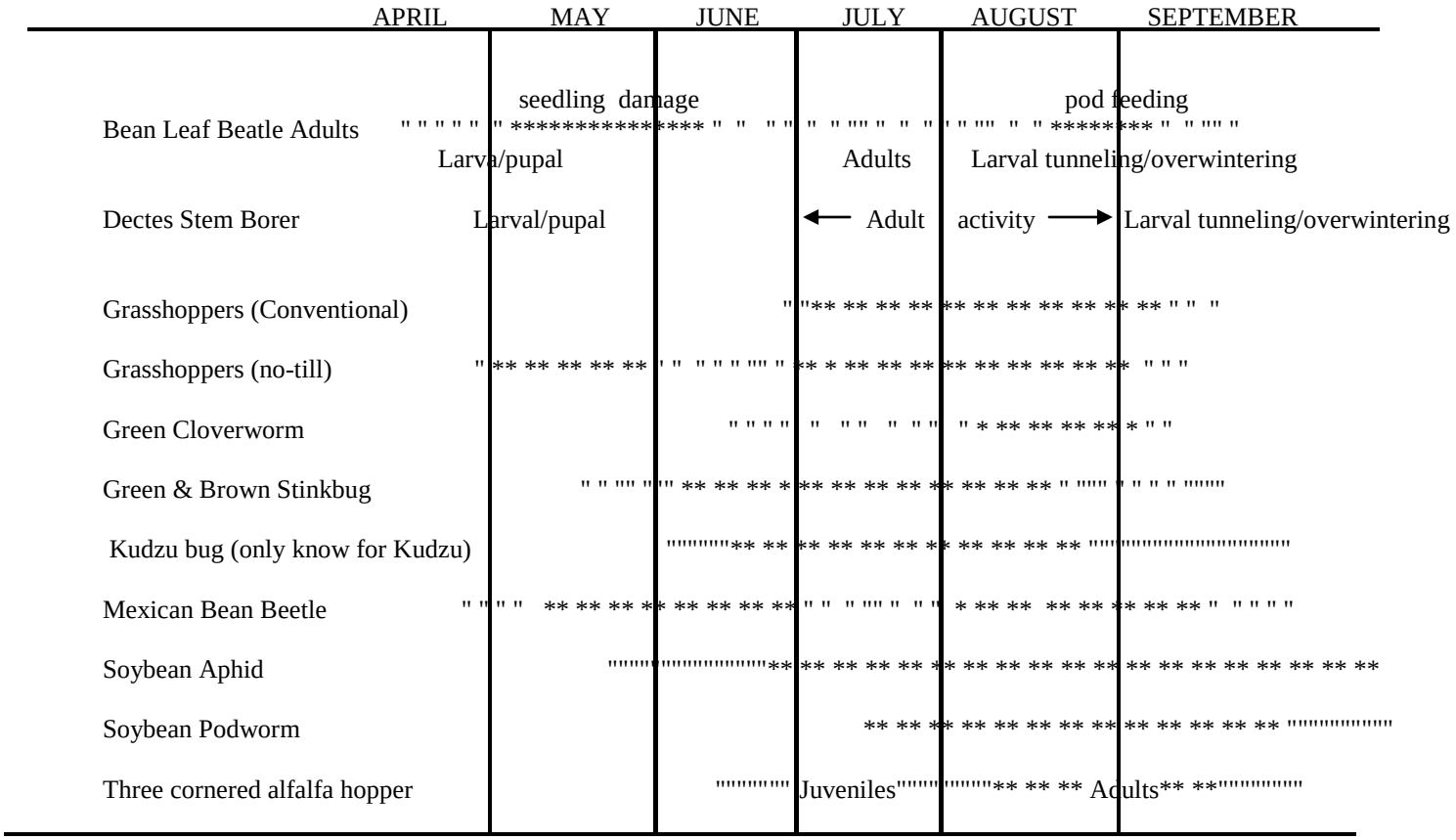
| Field Size | No. of locations | Field Size | No. of locations |
|---|---|---|---|
| 1-14 | 2 | 115-124 | 11 |
| 15-24 | 3 | 125-134 | 12 |
| 25-34 | 4 | 135-150 | 13 |
| 35-50 | 5 | 151-164 | 14 |
| 51-64 | 6 | 165-174 | 15 |
| 65-74 | 7 | 175-184 | 16 |
| 75-84 | 8 | 185-200 | 17 |
| 85-100 | 9 | 201-214 | 18 |
| 101-114 | 10 | 215-224 | 19 |
| 115-124 | 11 | 225-234 | 20 |

See: Entfact – 118, Procedure for selecting random locations for sampling.
http://www.uky.edu/Agriculture/Entomology/entfacts/pdfs/entfa113.pdf

# Scouting Procedures for Insects on Soybeans

*Doug Johnson, Ric T. Bessin and L.H. Townsend*

## SOYBEAN INSECT CALENDAR FOR KENTUCKY




*Period when economic populations are most likely to occur.

Scouting Equipment:

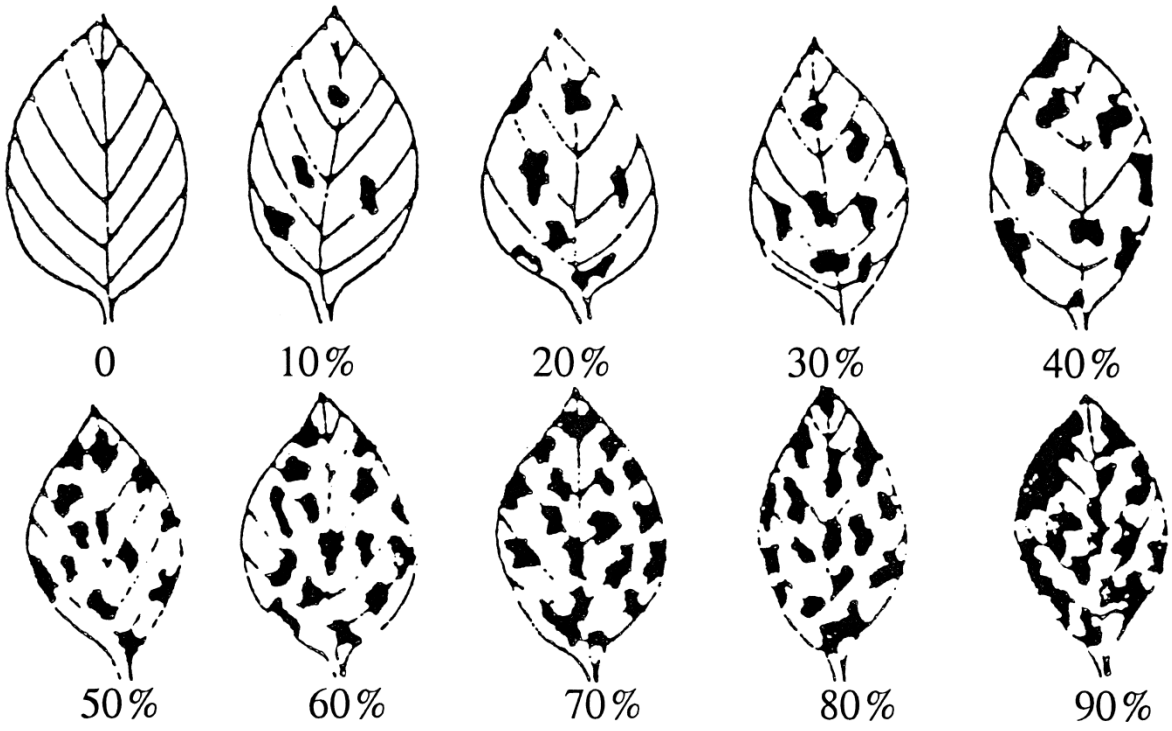
The presence of soybean insects can be determined by shaking the soybean plants over the row middle onto a shake-cloth sampler. It should be placed on the ground between the rows to make counting easier. While kneeling at the edge of the cloth, reach on the outside of one of the rows and bend an "armful" of plants over the cloth (this should normally be about 24" of row). Shake the foliage vigorously for several seconds. Repeat on the other row. Quickly count the insects and record the numbers present. You now have sampled four row feet. Pull up one plant; estimate the percent defoliation (leaf surface missing. See Percent Defoliation Estimates, page 3) and record this also. Keep in mind that plants should be placed on a light background to determine percent defoliation. Go to additional sites until you have taken the number of samples necessary for that field size.

Solid seeded soybeans cannot be sampled accurately with the shake cloth method. Instead, shake the insects from a total of 48 plants per location into a 15 inch sweep net. Hold the rim of the net up against the plants and shake them so that the insects are knocked into the net.

When plants are small several may be included each time you shake them in the sweep net. As plants grow, fewer and fewer plants may be shaken at any one time. Be sure you shake undisturbed plants because insects will move from disturbed plants.

Sweep net based sampling procedures and economic thresholds have been established for a few insect pests. Where available these specific procedures are listed in the text.

## Percent Defoliation Estimates for Soybeans




View all the leaves on the plant when estimating the average defoliation. Often leaves at the top will have the most defoliation while leaves at the bottom will have the least. You need to establish the average for the entire plant.

# Seedling Pests

## Seed Corn Maggot

Occurrence: These pests most often feed on seeds planted early into cool, wet soil with a lot of surface residue. Damage is not usually noticed until "skips" appear in the newly emerging stand.

Preventive Management: Delay planting soybeans until soil conditions favor rapid seed germination. Use an insecticide seed treatment when planting into cool wet soil.

When to scout: If skips or uneven stands are seen after plant emergence.

Description: The adult stage of the seed corn maggot looks very much like a small house fly. The larval stage is a slender, off-white maggot with a pointed head and blunt tail.

Damage: Un-germinated seed will be riddled with small holes or have the inside eaten leaving only the outer shell. If detected early, the maggots should be present.

How to scout: Look for areas of poor stand. Carefully dig up some seed and examine for the presence of insects and/or damage.

**Seed corn maggots**

Record: Estimate the area and amount of stand reduction in the comment section of the scouting form.

Economic Threshold: There is no rescue treatment for this pest. Estimate area and amount of stand reduction for reporting in Comments. This information will be useful when making a decision on replanting.

Additional Information
Entfact-133, Seed Corn Maggot in Kentucky Grown Soybean.
http://www.uky.edu/Agriculture/Entomology/entfacts/pdfs/entfa133.pdf

## Bean Leaf Beetle

Occurrence: From plant emergence throughout the season. (See soybean insect calendar for probable damage dates). Bean leaf beetles are present in most soybean fields every year. In some years, seedlings may be damaged heavily. Significant damage to larger plants is relatively rare.

When to scout: Plant emergence to 1st completely unrolled trifoliate; then, from pod set through pod fill.

Description: Adults are about 1/8 to 1/4 inch long. The body is slightly convex and the beetle is longer than wide. Color is variable, ranging from light brown

**Bean leaf beetle**

to dark red, spots and/or stripes may be present or absent. All bean leaf beetles will have a backwards-pointing black triangle behind the head as indicated by the arrow in the picture. Larvae, small worms living below ground, are seen only when digging up plants.

Damage: Bean leaf beetles feed on cotyledons and leaves and pods. Leaf feeding consists of very distinctive almost circular holes. Feeding on cotyledons and pods usually appears as scooped-out holes in the surface.

**How to scout seedlings**: Look for stand reduction (cotyledon stage) and heavy leaf feeding while crossing the field. If damage is noticed, try to establish that bean leaf beetle is the problem by looking for them on the plant. In cotyledon stage, defoliation will be obvious and characteristic.

Record: Record the percent defoliation.

Economic Threshold for seedlings: Control should be considered if 30% stand loss due to cotyledon feeding or 30% defoliation has occurred (see Table 3, page 20).

**How to scout mid-season**: The insect densities can be determined by using either the sweep net, ground cloth procedure or pod sampling. Each of the three methods is equally reliable. Sampling for beetles should not be done before mid morning or while dew is present. Economic Threshold tables are given for each of the three methods on page 20.

**Sweep net procedure.** Take 20-sweep samples at each sample location. Sweep as you walk down the row; calculate an average number of beetles per sweep; consider an insecticide application if the beetles count reaches the economic threshold.

**Ground cloth procedure.** Place a two foot wide strip of cloth on the ground between the rows; bend plants over the cloth and shake them vigorously (this provides a four foot sample); count the number of beetles on the cloth; repeat at each sampling location; determine the average number of beetles per foot row; consider an insecticide application if the count reaches the economic threshold.

**Pod sampling procedure.** At each sample location collect five plant samples (see table on page 1 for number of locations to sample); calculate an average number of pods with holes in the pod wall per five plants; consider an insecticide application if the number of injured pods reaches the economic threshold and bean leaf beetles are still present in the field.

Record: Pod Sampling Procedure- Record the number of injured pods per five plants sampled at each sample site. Note if the insect is still present in the field.

Sweep Net Procedure- Record the average number of beetles per sweep at each sample site.

Ground Cloth Procedure: record the average number of beetles per foot row.

Economic Threshold: See Table 3, page 20.

Additional Information
Entfact-131, Bean Leaf Beetle in Kentucky Soybeans.
http://www.uky.edu/Agriculture/Entomology/entfacts/pdfs/entfa131.pdf

**Cutworms**

Occurrence: Plant emergence to 2 weeks following plant emergence. Fields having one or more of the following characteristics should be watched more closely: 1) history of cutworm damage, 2) surface litter of crop residue, 3) fair to poor drainage of overflow land, 4) winter annual weeds prior to planting.

**Black cutworm**

When to scout: If cut plants are noticed during the two week period following emergence.

Description: Larvae are light gray to nearly black with a faint, narrow, mid-dorsal stripe. The skin appears to contain tiny granules. Larvae vary from 1/4 inch long after hatch to 1-1/4 to 1-3/4 inches long when full grown. They will be coiled in a compact "C" when uncovered.

Damage: Cutworms are active at night. Initial damage is usually leaf feeding. Larger cutworms cut small plants and may pull parts into their burrow. Symptoms are cut or wilted plants.

**Black cutworm moth**

How to scout: Look for stand reduction or cut plants when walking through the field. Begin making counts when cut or wilted plants are first seen. Remember the number of locations you need to make counts is based on the field size. 1.) Randomly determine each starting point. Examine 20 consecutive plants per location and write down the number of cut plants. Determine the percent plants cut by dividing the total plants cut by the total number of plants inspected. Multiply this figure by 100 and record the percent damaged plants on the report form. 2.) Look for live cutworms around damaged plants. First, check under clods around the base of the plant. Then, dig up an area three inches in diameter and three inches deep around the plant. Use a knife blade to sift through the soil. REMEMBER, DON'T CHECK PLANTS UNLESS THEY ARE DAMAGED! Place some specimens in vials containing alcohol for identification.

Record: Record the number of cut plants found per 20 plants examined at each site. Note the average length and number of live larvae found.

Economic Threshold: Control may be justified if 30% or more of the plants are lost or damaged. Infestations may be spotty within a field.

Additional Information
Entfact-132 Cutworms in Kentucky Soybeans -
http://www.uky.edu/Agriculture/Entomology/entfacts/pds/entfa132.asp

**Grape Colaspis Grubs (Soil)**

Occurrence: Larvae are active in the early spring and may be full grown by the first part of the summer (May - June). After feeding on plant roots, they pupate in the soil and emerge as beetles during June. The insect is

most likely to be found in a field that has followed a legume such as clover. Grape Colaspis grubs may also cause similar damage in corn.


**Grape colaspis**

Preventive Management: Avoid planting on a spring-plowed field of timothy or clover. Fall plowing can aid in control.

When to Scout: From plant emergence until the first trifoliate leaf appears.

Description: The larvae are small white grubs. They are 1/8 to 1/6 of an inch long and can be found in the soil near the plant's roots. The adult is a tan beetle about 1/6 of an inch long. The body of the beetle will be covered with rows of very fine evenly spaced holes.

Damage: Leaves of damaged plants turn purple, as with a nutrient deficiency or moisture stress because the larvae have eaten the root hairs from the plant. The small grubs can be found in soil surrounding the plant roots.

Feeding damage by the adult beetle appears later in the season. The rounded holes in the leaves are similar to those caused by the southern corn rootworm. One surface of the leaf will be eaten away giving a windowpane effect. Adult beetles will usually cause little economic damage, however, a large number of adults may indicate that there was a high grub population earlier.

How to Scout: Record the size of the damaged area and take a stand count. Sift through the soil and check roots, to see if grubs are still present. This information can be used when deciding whether to replant.

Record: Record if insects are still present, and note the size of the damaged area and estimated stand.

Economic Threshold: There is no economic threshold for root damage. Assess the stand to determine whether or not to replant damaged areas. Establish whether or not live grubs are still present to evaluate usefulness of insecticidal control at replant.

# Foliage Feeders

## Green Cloverworm

**Green cloverworm**

Occurrence: Mid-June through August.

Description: Larvae are slender and light green caterpillars with three pairs of white stripes running the length of the body. There are three pairs of legs near the head, three pairs of fleshy legs near the middle of the body and a pair of fleshy legs at the tail end. Green cloverworms wiggle violently when disturbed. These caterpillars are often parasitized or diseased. Parasitized larvae will have small eggs on their body often near the head. Diseased larvae may appear watery and behave sluggishly or be covered in a fungal growth.

Damage: Green cloverworms feed extensively on soybean leaves. Young larvae skeletonize the underside of the leaf. Older larvae eat all of the leaf except the largest veins.

How to scout: Shake cloth sample. Make one four-foot shake-cloth sample per location. Record the number of parasitized or diseased larvae.

Record: Record number of worms at each site and note the percent defoliation.

Economic Threshold: Treatment decisions are based on a variable threshold scheme (see Table 1). This table will correspond to the number of worms you find with each shake-cloth sample.

Additional Information
Entfact-142 Green Cloverworm in Kentucky Soybeans
http://www.ca.uky.edu/Agriculture/Entomology/entfacts/entfacts/pdfs/entfa142.pdf

## Mexican Bean Beetle

**Mexican been beetle adult and larvae**

Occurrence: Occasionally seen in soybean fields along the Ohio River.

When to scout: Plant emergence to pod set.

Description: Adults are rounded copper beetles with 16 black spots on their back. They are about 5/16 inch long and 1/5 inch wide. Larvae are oval and yellow with branched spines. Full grown larvae are about 1/3 inch long.

Damage: All stages feed on beans. Young larvae feed on the underside of the leaf. Older larvae eat through the leaf, leaving only the veins. This type of feeding gives the leaves a lacy appearance.

How to scout: Look for adults feeding on seedlings. When plants are taller use the shake cloth method. Record % defoliation.

Record: Record the total number of beetles per 4 ft. of row observed at each site. Calculate the average number for 4 ft. of row. See Table 2 for the economic threshold.

Economic Threshold for Mexican Bean Beetle:

| STAGE OF GROWTH | DATE | INSECTS/4 ROW FOOT TO JUSTIFY CONTROL |
|---|---|---|
| Seedling | June | 3 or more adults |
| prebloom | July | 20 or more larvae plus adults |
| bloom | July - August | 16 or more larvae or adults |
| pod set | August | 16 or more larvae or adults |

**Japanese Beetle**

Occurrence: Early to mid-June through August.

Description: They are metallic green and bronze beetles about ½ inch long. There is a row of white tufts on the side of the body below the bronze wing covers.

Damage: Adults are leaf feeders. They begin feeding at the top of the plant and work downward. They will chew the leaf tissue between the veins. This type of damage gives the leaves a brown lacy appearance. Infestations may start with beetles feeding on weeds, especially smartweed, then moving to soybeans.

How to scout: When Japanese Beetles are seen, estimate the amount of defoliation.

Record: Record percent defoliation.

Economic Threshold: Control should be considered if 30% or more defoliation before bloom, 20% or more defoliation from bloom to pod fill, or 30% or more defoliation from pod fill until harvest **OR** if defoliation exceeds the economic injury levels listed in Table 2.

**Adult Japanese beetles**

Additional Information
Entfact-143 Japanese Beetles in Kentucky Soybeans
http://www.uky.edu/Agriculture/Entomology/entfacts/pdfs/entfa143.pdf

## Grasshoppers

**Long-horned grasshopper**

Occurrence: Grasshoppers are likely to occur in at least two situations depending upon the tillage used. **No-tillage** - grasshoppers may occur very early in the season, and be evenly distributed across the field. This is true especially if the field was pasture or fallow before planting. **Conventional-tillage** - Grasshoppers usually are not a problem until mid-summer when they move into fields from pastures or grassy areas.

When to scout: **No-till** cotyledon to first trifoliate very important. **Conventional till**- usually during dry spells. But - insects will be present all season.

**Short-horned grasshopper**

Description: There are several species of grasshoppers present in Kentucky soybean fields. All have enlarged "jumping" legs. Mature hoppers will have wings. Some species never get larger than 1/2 to 3/4 inch. It is the **small** species that usually cause the most damage.

Damage: Grasshoppers are mainly foliage feeders which usually appears as very ragged holes beginning first on leaf margins. Under severe cases, petioles and stems will be eaten.

How to scout: Grasshoppers are active and very difficult to count. Watch for large numbers of hoppers as you move through the field. If defoliation is occurring consult defoliation Tables on page 3.

Record: Record percentage of defoliation. Estimate the number of grasshoppers per square yard.

Economic Threshold: Consult Table 2 - Percent Defoliation Charts for Determining Defoliation Required for Economic Injury to Soybeans.

Additional Information
Entfact-116 Three Common Kentucky Grasshoppers and Their Natural Enemies
http://www.uky.edu/Agriculture/Entomology/entfacts/pdfs/entfa116.pdf

## Soybean Aphid

**Soybean aphid**

Occurrence: Not completely known at this time but probably mid- to late season. Certainly late planted / late maturing beans are most at risk.

Description: Small pale to bright yellow, soft bodied, pear shaped insects. Aphids have a pair of black cornicles (tail pipe looking structures) sticking out the rear end. You may also see some small, white, aphids. However, this is the only aphid that colonizes soybeans in the US. If you find a single aphid it might be another species but if you find several aphids in a colony it is soybean aphid.

Damage: Soybean aphids have piercing sucking mouth parts. Damage is done by removing nutrients from leaf cells. Leaves will appear to yellow like a "lack of nitrogen." No foliage will be removed. Additionally, this pest is able to move viral pathogens that can cause diseases in soybean.

How to Scout:

**Direct Examination**: Examine thirty, whole plants, scattered throughout the field. For plants in growth stages V (vegetative), through R5 (beginning seed), count the total number of aphids on each plant, up to two-hundred and fifty (250).

**Speed Scouting Method:** Follow the directions on the form (page 17) to determine how many plants to examine. Count all aphids up to 40 per plant.

Record: **Direct Examination:** The number of aphids per plant, for each of the thirty plants. Then average the individual plant numbers to produce the average number of aphids per plant for the field.
**Speed Scouting Method:** Follow the directions on the Speed Scouting form, page 17, to record the number of infested plants.

Economic Threshold: **Direct Examination:** If the field has an average of two hundred fifty (250) aphids per plant during vegetative stages through reproductive stage R5 (beginning seed), 80% of the plants are infested, and the population is on the increase, a control is likely needed. Control after R5 is very unlikely to result in an economic return. See Soybean Manual Section 2, page 50 for soybean growth stages.

**Speed Scouting Method:** Follow the directions on the Speed Scouting Form to make a treatment decision.

The Speed Scouting Method does not provide as good a view of the level of infestation over the whole field, but is adequate for making control decisions.
Additionally, the absence of predators and parasitoids, the presence of honeydew and sooty mold and, evidence of plant stress, (especially drought) but also, soybean cyst nematode, & leaf and stem disease will increase the need to control the aphids.

# Pod Feeders

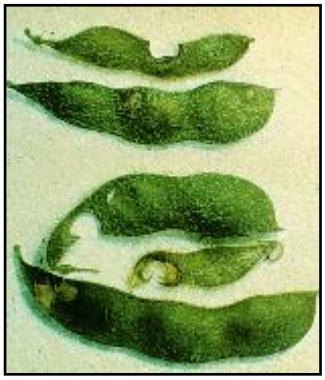
**Soybean Podworm**
(AKA: corn earworm)

**Soybean podworm**
**(AKA:Corn earworm larvae)**

Preventive Management: Soybean fields using narrow row spacing form a complete canopy sooner, so they are less attractive to egg laying moths.

When to Scout: Late bloom through maturity. Late planted fields, especially those in which a closed canopy did not develop, are at greatest risk.

Description: Adults are buff to light green moths with a wingspan at rest of about 1/2". Eggs are white to pink, about 1 /30" wide and laid singly. Larvae (worms) are very small to 1 1/2" in length when full grown. They are usually tan to pale green with several dark stripes down the back. However, color may be quite variable, with some individuals almost black.



**Soybean podworm damage**

Damage: These insects feed almost exclusively on pods. They eat away the pod wall and completely consume the seed.

How to scout: Shake cloth sample.

Record: Record the number of worms per a four foot sample area. Calculate the number of worms per foot of row.

Economic Threshold: Two worms per row foot.

Additional Information
Entfact- 144 Soybean Podworm in Kentucky Soybeans
http://www2.ca.uky.edu/entomology/entfacts/ef144.asp

**Stink Bugs**

When to scout: Beginning bloom (R1) through maturity.

Description: Adults are 1/2-inch long, green or brown insects with sucking mouthparts. The body is shield-shaped. Nymphs are wingless and quite variable in color. Be aware that the invasive brown marmorated stink bug (BMSB) is likely to be present in central and eastern KY fields. This brown stink bug can be distinguished by the two distinct white bands on their antennae. Its presence is counted like any other stink bug, but it may appear in very large numbers.


**Green stink bug**


**Brown stink bug**

**Brown marmorated stink bug**

Damage: Stink bugs feed on beans in the pod. This causes discolored, shriveled beans.

How to scout: Stink bugs are often first found in border rows along wooded areas. You may wish to sample here first before sampling the complete field.

| Method | Sample | Treatment Guidelines |
|---|---|---|
| Shake Cloth | 1 four sq.ft. sample/location | 2 or more stink bugs/4 row-foot sample |
| Sweep Net | Using a 15 inch sweep net<br>25 sweeps at each location | 3 stink bugs/25 sweeps beginning bloom(R1) to beginning pod (R3)<br>9 or more/25 sweeps full pod(R4) to full seed(R6) |

Record:
**Shake Cloth** – Record the number per four-foot sample.

**Sweep Net** – Record the number of stink bugs per set of 25 sweeps.

Economic Threshold: Chemical treatment may be needed if:
**Shake cloth** counts average two stink bugs per four row-foot sample.
**Sweep Net** counts: 3 stinkbugs / 25 sweeps from beginning bloom to beginning pod (R1 – R3) or 9 stinkbugs / 25 sweeps from full pod to full seed (R4 to R6).

## Stem and Petiole Feeders

### Kudzu Bug

Occurrence: The known distribution of this invasive pest in limited to a few southeastern counties and Christian County. It is moving into the state via the interstate corridors. Producers along I-75, I-65, and I-24 should be watching for the occurrence of this sucking bug.

Description: adult Kudzu bugs are 1/6”- 1/4” long, oblong, about the size of an English pea; are olive-green colored with brown speckles, and produce a mildly offensive odor when disturbed. The kudzu bug has a round body shape rather than the triangular to semi-elliptical body shape of our native stinkbugs as well as a distinctive head shape. Nymphs have an overall body shape similar to adults, but smaller, and they appear to be “fuzzy” or “spiny” while the adults are smooth.

Damage: Adults and nymphs use their piercing-sucking mouthparts to remove plant liquids from stems and petioles. They are NOT known to feed on pods.

How to Scout: **Sweep Net –** Using a 15" sweep net, take a series of twenty five sweeps at each location.

Record: The Number of nymphs per sweep.

Economic Threshold: On average one nymph per sweep. **Warning** adults can appear in very large numbers and spraying too early will result in multiple sprays.

Additional Information
Entfact -154, Kudzu Bug A Potential Pest of Kentucky Grown Soybeans.
http://www2.ca.uky.edu/entomology/entfacts/entfactpdf/ef154.pdf

**Kudzu bug**

**Dectes Stem Borer**
(AKA Soybean Stem Borer)

Occurrence: The exact distribution in Kentucky is not known. However, the complete soybean production area in the western third of the state is at risk.

Description: Adults are small gray beetles with long antennae. They emerge in July and lay their eggs in July and August. Larvae are small (approximately 1/2 inch) white worms. The head end is obviously wider than the remainder of the body which tapers to the rear end. A dark brown set of jaws can often be seen on the head.

**Dectes stem borer**
**(AKA Soybean stem borer)**

Damage: Larva (worm) of this pest tunnels inside plant stems. This may result in some loss but is not the main problem. As larva mature, they move to the base of the plant and form an "over wintering" chamber. In doing this the larva girdle the inside of the stem. This weakens the stem often resulting in lodged plants, the main source of yield loss.

Scouting: At each location collect ten stems. Split the stems and check them for "hollowed out" centers and the presence of the insect and excrement.

Record: Percentage of infested stems. Use this to gauge which fields are at greatest risk to lodge.

Economic Threshold: There is no established economic threshold because there is no know method of control. Heavily infested fields should be harvested as early as possible to prevent lodging and resulting harvest loss.

Control: There is no known method of control.

**Three Cornered Alfalfa Hopper**

**Three cornered alfalfa hopper**

Occurrence: May be found on soybean from plant emergence to near maturity. Populations appear to be larger on later planted and reduced tillage soybeans

Description: Adults are usually green, sometimes brown, wedged shaped insects (triangular as viewed from the top) that are about ¼ inch long. Nymphs are also wedge-shaped and have projections (spines) along the top of their body.

Damage: Both adult and juvenile stages may cause damage. On seedlings and young vegetative stage plants (less than 10-12 inches tall) insects feed using their piercing-sucking mouth parts to remove plant sap. Nymphs and adults can feed at random but often girdle plant stems and petioles by a series of punctures circling the stem or petiole.

Scouting: Using a 15" sweep net, take a series of twenty five sweeps at each location.

Record: The number of TCAHs captured/infested plants observed

Economic Threshold: Thresholds are not well established. In general treatment is warranted if ≥ 10% or more of plants less than 10-12" tall are infested; or when 50% of plants are girdled and hoppers are present; or 1 TCAH per sweep during pod setting.

Additional Information:
Entfact-153, Three cornered alfalfa hopper in Kentucky.
http://www2.ca.uky.edu/entomology/entfacts/entfactpdf/ef153.pdf

# Agronomic Practices That Favor Insect Pests of Soybeans

| | No/ reduced Tillage | Row Spacing | Early planting | Late planting | Rotation | Weed Management | Comments |
|---|---|---|---|---|---|---|---|
| Seedcorn Maggot | Y | | Y | | | | Use an insecticide seed treatment when planting into cool wet soil. |
| Cutworms | Y | | | Y | Y | Y | Cutworms are more common in fields with excessive surface litter of crop residue, winter annual weeds, and fair to poor drainage. |
| Grape Colapsis | Y | | | | Y | | More common when soybeans follow clover. Avoid planting on a spring plowed field of timothy or clover. |
| Grasshoppers | Y | | | | Y | | Reduced tillage can favor grasshoppers following pasture or a fallow year. |
| Southern podworm | | Y | | Y | | | The sooner the canopy closes, the less attractive the plants are for oviposition. Late planting and wide rows can delay canopy closure. |

# Speed Scouting for Soybean Aphid

*[developed by E. Hodgson, B. McCornack, & D. Ragsdale*
*University of Minnesota Entomology Dept.]*

Go to www.soybeans.umn.edu
for FAQs and copies of the form.

For questions in Minnesota contact:
David Ragsdale, U of M Entomology Dept.
612-624-6771, ragsd001@umn.edu

**Directions**

1. Go to the first plant at random. If less than 40 aphids are on the entire plant, mark a minus [-] for that non-infested plant. If at least 40 aphids are on the plant (STOP COUNTING when you reach 40 – this is the speedy part), mark a plus [+] for that infested plant.
2. Choose a direction at random and walk 30 rows or paces to the next plant.
3. Repeat Step #1 until 11 plants are sampled in different areas of the field.
4. Make a decision using the total number of infested plants (the total number of pluses).
5. If you must 'continue sampling' (7-10 plants with a +), sample 5 more plants and use the new total number of plants (16) to make a decision.
6. If no decision is reached, sample additional sets of 5 plants until 31 plants are sampled. Remember, always use the total number of plants to make a decision.
7. If no decision can be made after sampling 31 plants, resample the same field in 3-4 days.
8. A 'TREAT' decision must be confirmed a 2nd time 3-4 days later. If confirmed, apply insecticide in 3-4 days.

Field: _____ Date: _____ Decision: _____

Use these Notations: - = Less than 40 aphids/ plant ('non-infested')
+ = 40 or more aphids/ plant ('infested')

Total # of Infested plants:

| DO NOT treat. Resample in 7-10 days | CONTINUE sampling 5 more plants | TREAT decision, confirm in 3-4 days |
|---|---|---|
| 6 or less | 7 to 10 | 11 or more |
| 10 or less | 11 to 14 | 15 or more |
| 14 or less | 15 to 18 | 19 or more |
| 18 or less | 19 to 22 | 23 or more |
| 22 or less | 23 to 26 | 27 or more |

1 2 3 4 5 6 7 8 9 10 11 ▶ ☐

12 13 14 15 16 ▶ ___ + ___ ☐

17 18 19 20 21 ▶ ___ + ___ ☐

22 23 24 25 26 ▶ ___ + ___ ☐

27 28 29 30 31 ▶ ___ + ___ ☐

Remember: When you continue sampling, add the previous # of Infested plant to the new count to make the next decision.

Plant Stage: _____

Notes: _____

_____

_____

**STOP SAMPLING!**
Resample the same field in 3-4 days.

**CONFIRM 'TREAT' DECISION**
Resample the same field in 3-4 days
Apply insecticide in 3-4 days if confirmed

**Table 1.** The number of GREEN CLOVERWORMS per foot of row that will cause economic injury to soybeans.

Pre-bloom (5 to 6 trifoliates)- treatment recommended when defoliation exceeds 35%.

Anticipated Yield of 25 bu/A

Cost of Treatment

| Market Value | PRIOR TO BLOOM $6 | $8 | $10 | $12 | BLOOM STAGE $6 | $8 | $10 | $12 | POD FILL $6 | $8 | $10 | $12 | APPROACHING MATURITY $6 | $8 | $10 | $12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $5 | 14 | 15 | 16 | 17 | 25 | 28 | 32 | 35 | 24 | 27 | 30 | 33 | 37 | 43 | 50 | 53 |
| $6 | 14 | 15 | 16 | 17 | 24 | 27 | 31 | 34 | 22 | 25 | 28 | 31 | 34 | 40 | 47 | 52 |
| $7 | 13 | 14 | 15 | 16 | 22 | 26 | 29 | 32 | 20 | 23 | 26 | 29 | 31 | 37 | 43 | 48 |
| $8 | 13 | 14 | 15 | 16 | 21 | 24 | 27 | 29 | 18 | 22 | 24 | 27 | 28 | 34 | 39 | 44 |

Anticipated Yield of 35 bu/A

Cost of Treatment

| Market Value | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $5 | 13 | 14 | 15 | 16 | 21 | 24 | 27 | 30 | 20 | 23 | 26 | 28 | 29 | 35 | 40 | 45 |
| $6 | 13 | 14 | 15 | 15 | 20 | 23 | 26 | 29 | 18 | 21 | 24 | 26 | 27 | 33 | 38 | 43 |
| $7 | 12 | 13 | 14 | 15 | 19 | 22 | 25 | 27 | 16 | 19 | 22 | 24 | 25 | 30 | 34 | 38 |
| $8 | 12 | 13 | 13 | 14 | 17 | 20 | 22 | 25 | 15 | 18 | 20 | 22 | 22 | 27 | 32 | 36 |

Anticipated Yield of 45 bu/A

Cost of Treatment

| Market Valute | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 | $6 | $8 | $10 | $12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $5 | 12 | 13 | 14 | 14 | 18 | 21 | 24 | 26 | 15 | 19 | 21 | 23 | 24 | 30 | 34 | 38 |
| $6 | 12 | 13 | 13 | 14 | 18 | 20 | 23 | 25 | 15 | 18 | 20 | 22 | 23 | 28 | 32 | 36 |
| $7 | 11 | 12 | 13 | 13 | 17 | 19 | 22 | 23 | 14 | 17 | 19 | 21 | 21 | 25 | 29 | 33 |
| $8 | 11 | 12 | 13 | 13 | 15 | 18 | 20 | 22 | 13 | 15 | 18 | 20 | 19 | 23 | 27 | 30 |

**How to Use These Tables:**

Because of the difficulty in determining percentage defoliation, you may prefer to use the tables above for determining approximate economic injury levels of the GREEN CLOVERWORM. First select the table most nearly representing the growth stage of your beans and anticipated yield from the field. Then locate the estimated cost per acre of control (top line) and the estimated value per bushel of your beans (left-hand column). The number found at the point where these lines and columns intersect is the approximate number of GREEN CLOVERWORMS per foot of row that will cause economic injury to soybeans. Do not allow infestations of this insect to exceed this level.

For example, suppose your soybeans are at the stage of early pod-fill, anticipated yield is 35 bushels per acre. Your cost of control is $6 per acre, and the estimated market value of your beans is $8 per bushel. The correct answer is 15 green cloverworms per foot of row.

**Table 2.** Percent Defoliation Charts for Determining Defoliation Required for Economic Injury to Soybeans

Pre-bloom (5 to 6 trifoliates)-treatment recommended
when defoliation exceeds 35 percent.

Anticipated Yields 25 bu/A

Cost of Treatment

| Market Value | FULL BLOOM $6 | FULL BLOOM $8 | FULL BLOOM $10 | FULL BLOOM $12 |
|---|---|---|---|---|
| $5 | 34 | 39 | 43 | 47 |
| $6 | 32 | 37 | 41 | 45 |
| $7 | 30 | 34 | 34 | 42 |
| $8 | 28 | 32 | 32 | 39 |

| Market Value | POD FILL STAGE $6 | POD FILL STAGE $8 | POD FILL STAGE $10 | POD FILL STAGE $12 |
|---|---|---|---|---|
| $5 | 21 | 26 | 29 | 32 |
| $6 | 20 | 24 | 27 | 30 |
| $7 | 19 | 22 | 25 | 27 |
| $8 | 18 | 20 | 23 | 26 |

| Market Value | APPROACHING MATURITY $6 | APPROACHING MATURITY $8 | APPROACHING MATURITY $10 | APPROACHING MATURITY $12 |
|---|---|---|---|---|
| $5 | 37 | 43 | 50 | 56 |
| $6 | 34 | 40 | 46 | 52 |
| $7 | 31 | 37 | 42 | 47 |
| $8 | 28 | 34 | 39 | 44 |

Anticipated Yield 35 bu/A

Cost of Treatment

| Market Value | FULL BLOOM $6 | FULL BLOOM $8 | FULL BLOOM $10 | FULL BLOOM $12 |
|---|---|---|---|---|
| $5 | 29 | 33 | 37 | 40 |
| $6 | 27 | 31 | 35 | 38 |
| $7 | 23 | 27 | 30 | 33 |
| $8 | 23 | 27 | 30 | 33 |

| Market Value | POD FILL STAGE $6 | POD FILL STAGE $8 | POD FILL STAGE $10 | POD FILL STAGE $12 |
|---|---|---|---|---|
| $5 | 18 | 22 | 25 | 27 |
| $6 | 17 | 20 | 23 | 25 |
| $7 | 16 | 18 | 21 | 23 |
| $8 | 15 | 17 | 19 | 21 |

| Market Value | APPROACHING MATURITY $6 | APPROACHING MATURITY $8 | APPROACHING MATURITY $10 | APPROACHING MATURITY $12 |
|---|---|---|---|---|
| $5 | 29 | 36 | 40 | 45 |
| $6 | 27 | 33 | 38 | 42 |
| $7 | 25 | 30 | 34 | 38 |
| $8 | 22 | 27 | 31 | 35 |

Anticipated Yield 45 bu/A

Cost of Treatment

| Market Value | FULL BLOOM $6 | FULL BLOOM $8 | FULL BLOOM $10 | FULL BLOOM $12 |
|---|---|---|---|---|
| $5 | 25 | 30 | 33 | 37 |
| $6 | 24 | 28 | 31 | 34 |
| $7 | 22 | 25 | 28 | 31 |
| $8 | 21 | 24 | 27 | 29 |

| Market Value | POD FILL STAGE $6 | POD FILL STAGE $8 | POD FILL STAGE $10 | POD FILL STAGE $12 |
|---|---|---|---|---|
| $5 | 16 | 18 | 22 | 24 |
| $6 | 15 | 17 | 20 | 22 |
| $7 | 14 | 16 | 18 | 20 |
| $8 | 13 | 15 | 17 | 19 |

| Market Value | APPROACHING MATURITY $6 | APPROACHING MATURITY $8 | APPROACHING MATURITY $10 | APPROACHING MATURITY $12 |
|---|---|---|---|---|
| $5 | 25 | 31 | 35 | 34 |
| $6 | 21 | 28 | 32 | 36 |
| $7 | 21 | 25 | 29 | 33 |
| $8 | 19 | 23 | 27 | 30 |

The ability of soybean plants to sustain defoliation without yield reduction varies with the growth of the plant. Under favorable growing conditions the average percent defoliation figures given in this appendix can be used to determine economic injury levels. When the percentage of foliage removed approximates that given in the table for your particular set of variables (cost of treatment, projected yield and projected selling price of beans) treatment should be considered.

**For example**, if your beans are in bloom stage, you anticipate the yield will be 35 bushels per acre with a selling price of $8.00 per bushel and the cost of treating will be $6.00 per acre, defoliation must be 23 percent or greater to justify treatment.

## TABLE 3
## Bean Leaf Beetle Economic Thresholds for Soybeans

### A. Bean leaf beetle injured pods/ 5 plant sample[a,b]

| Market value | Management Costs $ / acre | | | |
|---|---|---|---|---|
| $ / bu | $ 7.00 | $ 8.00 | $9.00 | $10.00 |
| 5.00 | 30.8-36.7 | 35.2-42.0 | 39.5-47.1 | 43.9-52.4 |
| 6.00 | 25.4-30.3 | 29.1-34.7 | 32.6-38.9 | 36.2-43.3 |
| 7.00 | 21.6-25.8 | 24.8-29.6 | 27.7-33.1 | 30.9-36.9 |
| 8.00 | 19.5-23.3 | 22.3-26.6 | 25.0-29.8 | 27.8-33.2 |
| 9.00 | 17.2-20.5 | 19.7-23.5 | 22.0-26.3 | 24.5-29.3 |
| 10.00 | 15.0-17.9 | 17.6-21.0 | 19.7-23.5 | 22.0-26.2 |

[a]ET range is set at 67 and 80 percent of the economic-injury level.
[b]Based on a row spacing of 30 inches and approximately 8 plants per foot of row.

### B. Bean leaf beetles per sweep

| Market value | Management Costs $ / acre | | | |
|---|---|---|---|---|
| $ / bu | $ 7.00 | $ 8.00 | $ 9.00 | $10.00 |
| 5.00 | 2.9-3.5 | 3-4.0 | 3.7-4.5 | 4.2-5.0 |
| 6.00 | 2.4-2.9 | 2.7-3.3 | 3.1-3.7 | 3.4-4.1 |
| 7.00 | 2.0-2.4 | 2.4-2.8 | 2.6-3.1 | 2.9-3.5 |
| 8.00 | 1.8-2.2 | 2.1-2.5 | 2.4-2.8 | 2.6-3.2 |
| 9.00 | 1.6-1.9 | 1.9-2.2 | 2.1-2.5 | 2.3-2.8 |
| 10.00 | 1.5-1.7 | 1.7-2.0 | 1.9-2.2 | 2.1-2.5 |

ET range is set at 67 and 80 percent of the economic-injury level.

### C. Bean leaf beetles per foot of row [a,b]

| Market value | Management Costs $ / acre | | | |
|---|---|---|---|---|
| $ / bu | $ 7.00 | $ 8.00 | $ 9.00 | $10.00 |
| 5.00 | 4.6-5.5 | 5.3-6.3 | 6.0-7.1 | 6.6-7.9 |
| 6.00 | 3.8-4.6 | 4.4-5.2 | 4.9-5.9 | 5.5-6.5 |
| 7.00 | 3.3-3.9 | 3.7-4.4 | 4.2-5.0 | 4.7-5.6 |
| 8.00 | 2.9-3.5 | 3.4-4.0 | 3.8-4.5 | 4.1-5.0 |
| 9.00 | 2.6-3.1 | 3.0-3.5 | 3.3-4.0 | 3.7-4.4 |
| 10.00 | 2.3-2.8 | 2.6-3.2 | 3.0-3.6 | 3.3-4.0 |

[a]ET range is set at 67 and 80 percent of the economic-injury level.
[b]Based on a row spacing of 30 inches.

# Beneficial Insects of Soybeans

**Big eyed bug**

**Damsel bug**

## Spiders

**Crab spider**

**Orb weaver**

**Green lynx spider**

For additional information on spiders found in Kentucky visit
http://www.uky.edu/Ag/CritterFiles/casefile/spiders/spiderfile.htm

# BENEFICIAL INSECTS PICTURE SHEET

Green Lacewing Larva

Green Lacewing

Lady Beetle Larva

Lady Beetle

Syrphid Fly Larva

Syrphid Fly

Spined Soldier Bug

Damsel Bug

# Scouting Procedures for Weeds in Soybeans

*James R. Martin, J. D. Green and William Witt*

Weeds listed in this manual will be checked each week for their presence in the field. The reason for this season-long survey is to determine when these weeds begin growth in soybeans. Many of the weeds to be surveyed will not appear in any of the fields that you will survey. However, these weeds are common in Western Kentucky, and are of great economic importance to the soybean producers.

**When to survey the field**:

Start 7 to 10 days after planting, and at weekly intervals, thereafter. You will be notified when the field is planted and can plan your surveys to best fit your schedule.

**Number of locations per field**:

The number of survey sites will be determined by the size of the field. The following guide is to be used:

| Field Size | No of Locations |
|---|---|
| 1-14 | 2 |
| 15-24 | 3 |
| 25-34 | 4 |
| 35-50 | 5 |

Select the survey sites so they will cover the entire field. Never survey within 100 feet of a fence or roadway. More weeds are found in field margins than in other portions of the field and surveying in these areas could result in an incorrect recommendation being made to a producer.

**Sampling procedure**:

At each survey site selected, select one (1) row middle (the area between two (2) rows). Put a wire flag in one of the rows, then measure 75 feet and place another flag in the row. Paint may also be used to mark these areas. You may need to repaint the markers. Your survey sites will be easy to locate each time you visit the field. This will be your survey site (one row middle x 75').

When weeds begin to grow during the season, select a 100 $Ft.^2$ area (for example 40 ft. long by 30 inches wide rows) within this survey site where weeds are present, and mark with flags or paint. Survey in this same 30' strip each week. It is very important to survey the same area so that we will know when the weeds begin to grow. The number and kinds of weeds vary throughout a field, and if you do not sample the same area, you might not encounter the weeds you are counting early in the growing season, but as the soybeans grow taller, the wire flags will become more difficult to locate. Therefore, pull up the soybean plants on each side of the wire flags (about three or four feet in each direction) and mark on your field map the location of the survey sites (for example, the number of rows in from a fence, roadway, etc.).

Hopefully, there will not be a large number of weeds present in your survey site. However, if you encounter a large number of weeds in a 100 Ft.$^2$ section, it is not necessary to count all of them (in heavily grass infested field, it would not be uncommon to have several hundred plants). The following table can be used to know when to stop counting.

| Weed | Maximum number of weeds to count/100Ft.$^2$ |
|---|---|
| cocklebur | 20 |
| common lambsquaters | 20 |
| common ragweed | 20 |
| jimsonweed | 20 |
| morning glory | 20 |
| smooth pigweed | 20 |
| smartweed | 20 |
| velvetleaf | 20 |
| burcucumber | 20 |
| giant foxtail | 40 |
| johnsongrass | 40 |
| shattercane | 40 |
| fall panicum | 40 |

**How long to survey**:

The field should be surveyed **until the middles are overlapped with soybean plants**. If no weeds have appeared up to this point, then you can survey at two to three week intervals for the remainder of the growing season. Be sure and pull your flags when the last count is made. The farmer does not want any wire flags going through his combine.

**Record**: Record each weed, the number counted and the average height of each type of weed.

**Other observations in the field**:

As you walk over the field conducting your survey, not only for weeds, but also for insects and diseases, be observant. If you see a heavy infestation of weeds, either note on the survey form or another form and bring it to the attention of your supervisor. It could be that special control procedures will be needed. Certain areas of a field are more likely to have large weed numbers than others. Some of these are near fences, roadways, drainage ditches and in low areas where water tends to stand.

**Impact of weeds on soybean yield.**

The competitive ability of weeds with soybean varies depending on the weed species. The following table demonstrates that some weeds are much more competitive than others. This also demonstrates the need for correct identification of weeds during the scouting process.

**Approximate yield loss from various populations of weed species, if not controlled in first trifolialate soybean with a 40-bu/ac yield potential and uniform distribution of weeds across the field and growing with soybean for the entire season.**

| Weed Pressure category (% ground cover) | Foxtail spp. | Johnsongrass | Smooth Pigweed | Morningglory spp. | Common Cocklebur | Giant Ragweed (Horseweed) | Estimated yield loss by a single species | Estimated yield loss by all species |
|---|---|---|---|---|---|---|---|---|
| | number of weeds per 100 sq ft - | | | | | | (bu/ac) | (bu/ac) |
| Slight (0-5%) | 10 | 5 | 5 | 5 | 1 | 1 | <5 | <10 |
| Low (5-10%) | 20 | 10 | 10 | 10 | 4 | 4 | 10 | 15 |
| Moderate (10-20%) | 40 | 20 | 25 | 20 | 15 | 15 | 20 | 25 |
| Severe (20-35%) | 75 | 50 | 50 | 50 | 30 | 30 | 25 | 30 |
| Very Severe (>35%) | 150 | 75 | 75 | 100 | 40 | 40 | 30 | 35 |

# Mapping Fields for Weeds

One of your most important duties as a scout is to prepare a "weed map" of each field that you survey. This map will be of benefit to the grower in planning his weed control program for the coming years.

**Steps in preparing a "weed map"**.

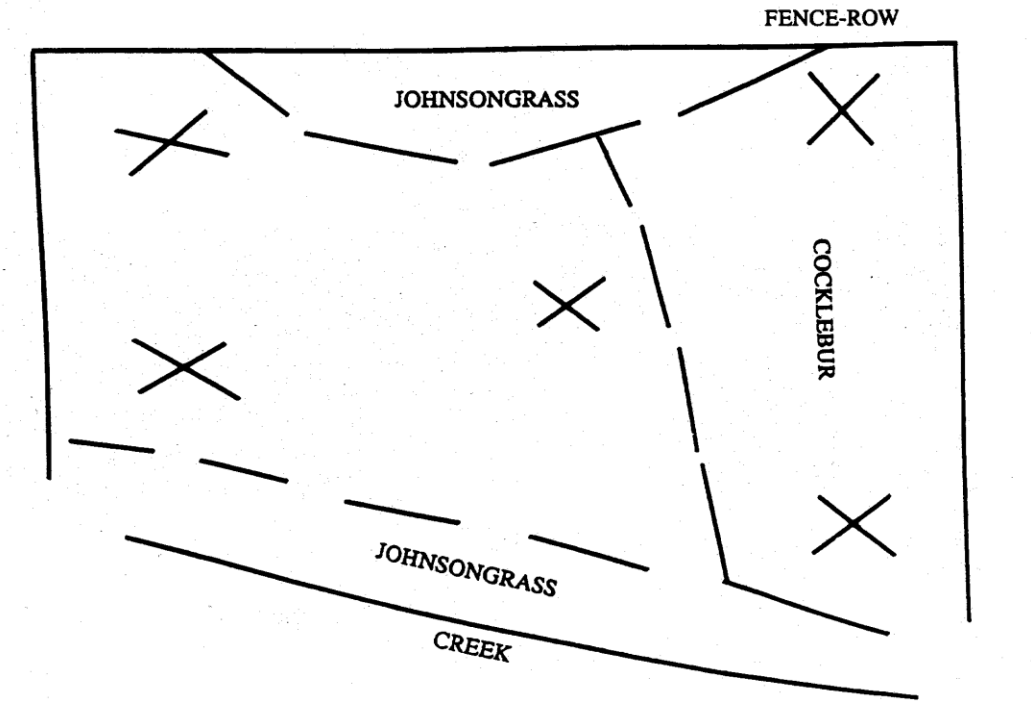
1) Outline the shape of the field on the report form. Make notations as to locations of fences, roads, woods, etc.

2) Mark the approximate locations of severe weed infestations or weeds not listed on the survey form and mark the locations where you make your counts.

3) This map should be drawn each time you scout the field.

4) Be sure and indicate any weed problems on the map that would assist the grower in making management decisions.

The following example can be used as a guide in preparing a "weed map" of your fields.

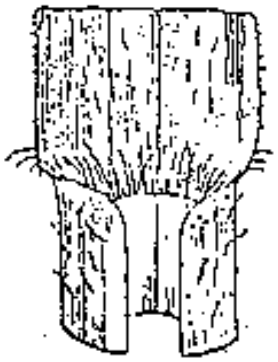


# IDENTIFICATION OF COMMON WEEDY GRASSES BY VEGETATIVE CHARACTERISTICS

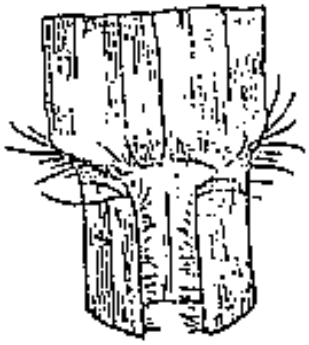
GRASS VEGETATIVE CHARACTERISTICS

| | **Ligule** | | | **Sheath** | | **Blade** | | |
|---|---|---|---|---|---|---|---|---|
| | None | Hairy | Membrane | Smooth | Hairy | Smooth | Hairy | Rough |
| Large crabgrass | | | X | | X | | X | |
| Smooth Crabgrass | | | X | X | | X | at base | |
| Giant foxtail | | X | | X | | | | X |
| Green foxtail | | X | | X | | | | X |
| Yellow foxtail | | X | X | X | | X | at base | |
| Goosegrass | | | X | | at top | X | at base | |
| Johnsongrass | | x fused | X | X | | X | | |
| Fall panicum | | at base | | X | | X | | |

**Note:**
**These are the usual characteristics; however, there may be variations.**



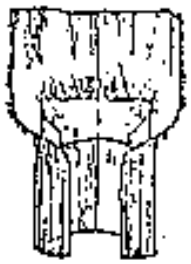
**Giant Foxtail**



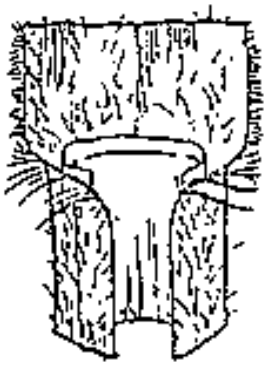
**Green Foxtail**

**Yellow Foxtail**

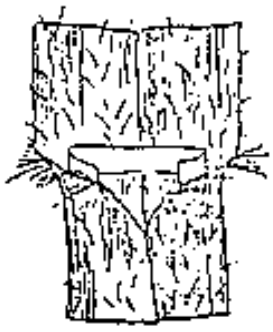
Wild Cane



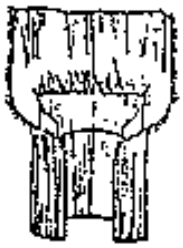
Large Crabgrass



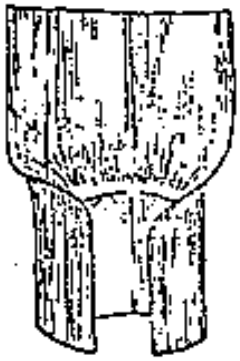
Smooth Crabgrass



Goosegrass



Johnsongrass



Fall Panicum

# IDENTIFYING CHARACTERISTICS FOR CERTAIN SEEDLING BROADLEAF WEEDS

| | Cotyledon | Leaf | Other |
|---|---|---|---|
| 1. Common chickweed | Small and thick<br>Oval shaped<br>Pointed tip | Oval shaped<br>Pointed tip<br>Opposite | |
| 2. Cocklebur | Thick<br>Long and Narrow | Oblong<br>Toothed edges<br>Alternate | |
| 3. Burcucumber | Thick<br>Oblong | Somewhat lobed<br>Alternate | Viney Stem |
| 4. Eastern Black Nightshade | Small and Spoon shaped | Oval shaped<br>Alternate | Lower surfaces of leaves often purple |
| 5. Henbit | Round | Round shaped<br>Toothed margins<br>Deep crevices in surface<br>Opposite | Square stem |
| 6. Honeyvine Milkweed | Heart-shaped<br>Opposite | Viney stem<br>Long stem | |
| 7. Hophornbeam Copperleaf | Oval shaped<br>Toothed margins<br>Opposite | | |
| 8. Jimsonweed | Thick<br>Long and narrow | Heart-shaped with smooth edges near base and irregular edges at tip<br>Alternate | Pungent odor |
| 9. Lambsquarters | Small and Narrow | First 2 leaves are opposite and subsequent leaves are alternate | Leaves appear white, especially on underside |
| 10. Morningglory Bigroot perennial | Butterfly shaped with long narrow blades | Heart-shaped<br>Hairless<br>Alternate | Viney stem<br>Established plants develop large root |
| 11. Morningglory, Entire leaf | Butterfly shaped | Heart-shaped<br>Hairy<br>Alternate | Viney stem |
| 12. Morningglory, Ivyleaf | Butterfly shaped with prominent veins | 3-lobed<br>Hairy<br>Alternate | Viney stem |

| | Cotyledon | Leaf | Other |
|---|---|---|---|
| 13. Morningglory, Pitted | Butterfly shaped with long narrow blades | Shape is variable<br>Hairless<br>Alternate | Stem and leaf margin often purple<br>Viney stem |
| 14. Morningglory, Tall | Butterfly shaped with prominent veins | Heart shaped<br>Alternate | Viney stem |
| 15. Pigweed, Redroot | Narrow and about 1/4 inch in length | Oval Shaped<br>Alternate | Taproot is red<br>Stems are hairy |
| 16. Prickly sida | Oval shaped<br>3 veins on upper surface | Oval shaped<br>Toothed margins<br>Alternate | 2 to 3 spiney projections below each node |
| 17. Ragweed, Common | Thick, spoon-shaped and small | Deeply divided<br>Hairy<br>Opposite | Emits a strong odor when crushed |
| 18. Ragweed, Giant | Thick<br>Spoon-shaped | Develop lobes with growth<br>Opposite | |
| 19. Shepherdspurse | Fleshy<br>Small (2-3 mm)<br>Round shaped | First leaves are round, other leaves are somewhat lobed | |
| 20. Smartweed, Ladysthumb | Fleshy<br>Narrow<br>3/4 inch long | Oblong and pointed<br>Alternate | Membrane sheath at node is hairy |
| 21. Smartweed, Pennsylvania | Fleshy<br>Narrow<br>3/4 inch long | Oblong and pointed<br>Alternate | Membrane sheath at node is not hairy |
| 22. Velvetleaf | Fleshy and oval shaped<br>Small hairs | Pubescent on leaf and stem<br>Alternate | Pungent odor |