Protecting Sugar Beets from Insects and Nematodes
Michigan State University Extension Service
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Protecting Sugar Beets from Insects and Nematodes

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CONTROL OF A PEST means the protection of a crop from that pest. This requires taking preventive measures **before** the damage is done. This, in turn, means that growers must:

1. learn to identify the insects and nematodes that threaten the crop.
2. check the fields regularly for the pests.
3. be prepared to apply control measures when they are needed.

This bulletin is intended to aid in these measures by describing the insect and nematode pests of sugar beets for positive identification, by noting the damage of each pest and when it should appear in the field, by indicating the amount of damage or number of the pests needed before a control measure is required, and by recommending control measures for each pest.

Getting Started

We suggest you prepare for possible insect and nematode problems by reading through the bulletin completely first. Then reread the sections dealing with each pest, noting especially the type of equipment and pesticides that are recommended. With this in mind, check your equipment to be sure that it is adequate, and check with your dealer to be sure that you will be able to obtain the pesticide if it is needed. Remember that there will be little time between detecting a pest and the need to spray or implement some other means of control. It is advisable to spend a little time to be sure that you will not be delayed if a pest appears.

Anticipating Pest Problems

Insect damage is most severe when the insects appear unexpectedly and damage the crop before they are detected. Frequent checking of the field for insects will prevent such surprises. Sugar beets are especially susceptible to insect damage when they are seedlings; therefore field checks should be especially frequent from the start of germination until the plants are fully established.

Where to Look

Some insects are most common in wet or weedy areas of a field. Check these areas more frequently for the insects than the rest of the field. Improved drainage, land fitting and weed control are in themselves beneficial to the crop, of course, and the reduced threat of insect damage is a bonus from these operations.

Other insects build up in adjacent fields of crops or weeds and then move into the beets. The crops to suspect are noted in the discussions on the specific insect pests. The insects do appear in beet fields remote from the suspect crops, but fields should be checked for them more frequently when the beet field is right next to the suspect crop.

Still other insects are most prevalent following certain crops. These crops, too, are noted in the discussion of the pests. Be especially alert for insects when beets are planted in old pasture or fields that had heavy weed growth.

Rotation of beets with other crops is needed for sound control of the sugar beet cyst nematode and will help to prevent the buildup of insects in the beets. Sugar beet cyst nematode problems are frequently found in low portions of fields that have been filled with tare soil and in fields or parts of fields adjacent to ditch banks. Equipment used in fields known to have a sugar beet cyst nematode problem should be cleaned before being used in a field not known to have this problem. Rotation is also extremely important for control of diseases and some weeds. A four-year rotation of beets with other, well-cultivated crops is strongly recommended.

The armyworm, aphids and other insects can appear in outbreaks; that is, heavy, widespread attacks. Your county agricultural extension agent and company fieldman are kept informed of the distribution and numbers of the pests through a Sugar Beet Pest Management Program. They will alert you to any imminent problem with insects. You can help by reporting to them any insect problem that you have. Your notice could help identify a serious threat before it develops.

Using the Key To Sugar Beet Insects

Correct identification of the pests is essential. Insect pests are usually scarce in sugar beets except during outbreak years. They are present in all fields, however, especially in wet or weedy areas, in low numbers every year. We suggest that you spend a little time looking for the pests so that you will recognize them and their damage on sight. A quick listing of when to check for the different pests is presented in Table 1. Your company fieldman and county agricultural extension agent will help you identify the pests.

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A SPECIAL NOTE. *If you find an insect feeding on beets that cannot be identified, turn it in to your company fieldman or county extension agent. We are always exposed to the threat of new pests. You could help meet this threat by keeping alert for strange insects and reporting them promptly.*

The key on page 2 has been prepared to aid you in recognizing the insects and nematodes that are damaging to sugar beets in Michigan. It consists of seven major categories of damage, followed by short descriptions of the different insects that could cause that type of damage. The key uses a total of 16 insects and nematodes. Some insects may "key-out" in more than one spot.

To use the key, simply read through all seven major categories (A through G). Choose the one that best fits the problem that you are observing. Then read through the short description that follows and determine which one best suits the problem. For example, if the leaves appeared "wrinkled, cupped, yellowish or bronzed," the problem could be caused by three different insects. The short descriptions that follow this heading pinpoint the insects as either aphids, tarnished plant bugs or leafhoppers.

Once you are sure of the identity of the pest, read the section in this bulletin that gives a more complete description as well as the current recommendations for control. The number in the key corresponds to the number of the section describing that pest.

KEY TO PEST IDENTIFICATION

A. Seeds fail to germinate or seedlings wilt shortly after emergence:

1. Soft, fat grubs in soil near plants ---- **white grubs**
2. Hard, slender larvae in soil near plants ---- **wireworms**

B. Young plants cut at their bases:

3. Dark, cylindrical caterpillars near plants ---- **cutworms**

C. Cotyledons or leaves chewed or cut off:

4. Round "shot holes" or corky spots on leaves; small, black, active, hard-shelled beetles on plants ---- **flea beetles**
5. Underside and margins of leaves chewed; very small, active, grayish insects on plants ---- **garden springtail**
6. Irregular holes in leaves; hard-shelled snout beetles ½ inch long or more near plants ---- **sugar beet weevil**
8. Leathery-winged, gray to black beetles on plants ---- **blister beetles**
3. Dark, cylindrical caterpillars on or near plants ---- **cutworms** ---- or **armyworms**
15. Prominent light stripe on each side ---- **armyworm**
16. Prominent yellow spots along back ---- **variegated cutworm**
3. Variously marked ---- **cutworms**

D. Leaves with blotchy white mines in them:

7. Headless, legless maggots in mines ---- **spinach leaf miner**

E. Leaves wrinkled, cupped, yellowish, or bronzed:

11. Groups of inactive, soft-bodied insects on plants ---- **aphids**
12. Oval, green to black insects about ¼ inch long on plants ---- **tarnished plant bug**
13. Slender, small insects that run sidewards on plants ---- **leafhoppers**

F. Areas of field with stunted plants or plants that wilt quickly:

1. Soft, fat grubs in soil near plants ---- **white grubs**
2. Hard, slender larvae in soil near plants ---- **wireworms**
9. Woolly masses on roots or soil near roots with groups of small, soft insects in masses; appear on crown and bases of petioles when severe ---- **sugar beet root aphid**
10. Small (pinhead size), white to brownish cysts on roots; most readily seen in July and early August ---- **sugar beet cyst nematode**
6. Legless grubs with a definite head tunneling in beets ---- **sugar beet weevil**

G. Stems (petioles) with dark spots or holes on surface:

14. Stem tunneled by legless grubs with definite heads ---- **sugar beet petiole borer**
12. No tunneling: oval, green to black insects about ¼ inch long on plants ---- **tarnished plant bug**

Sugar Beet Insect and Nematode Pests

1. WHITE GRUBS

The adults of the white grubs (called May beetles or June bugs) usually lay their eggs in grassy fields, sod, old pasture and weeds. The larvae that hatch from these eggs feed on the roots of grasses and on the roots of sugar beets that may be planted later

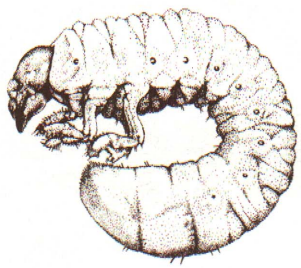

Fig. 1. White grub larva

in these fields. The larvae can persist and cause damage for two years after the sod has been plowed down. The white grubs have white, thick, soft, cylindrical bodies and curl into a C-shape when disturbed. They have a definite head, six small legs just behind the head and range up to 1½ inches in length. White grubs do not have fleshy legs near their rears.

Look for white grubs in plow furrows while fitting the land, and apply

an insecticide if they are easily found. Check the roots of wilting seedling plants for feeding and the soil around each plant for the grubs. If there is still time, these affected areas and a margin around them may be disked, an insecticide applied, and the area replanted.

Apply the insecticide as a spray or granule to cover the soil surface. Work the insecticide into the upper layer of soil immediately after application. It is a good practice to apply the insecticide just before final disking. Planting or replanting can be done immediately. Do not contaminate ponds or streams.

2. WIREWORMS

The adults of the wireworms (called click beetles) usually lay their eggs in grassy fields, sod, old pasture and weeds. The larvae that hatch from these eggs feed on the roots of the grasses and on the roots of sugar beets that may be planted later in these fields. The larvae can persist and cause damage for two years after the sod has been plowed down.

Wireworms have tan, hard, thin, cylindrical bodies. They have a definite head and six small legs just behind the head. Wireworms do not have fleshy legs near their rears.

Fig. 2. Wireworm larva

Look for wireworms in plow furrows while fitting the land, and apply an insecticide if they are easily found. Check the roots of wilting seedling plants for feeding and the soil around each plant for the worms. If there is still time, these affected areas and a margin around them may be disked, an insecticide applied, and the area replanted.

Apply the insecticide in a 7-inch band over the row at planting time. An

Table 1 — Checking sugar beet fields to avoid insect and nematode problems.

WHEN	WHERE	WHAT	WHY
Pre-fitting	Future beet field	Sod, weeds, and poor drainage	White grub, wireworm, cutworm, flea beetle, armyworm
		Soil sample from fields with nematode history	Sugar beet cyst nematode
	Surrounding fields	Fields of grains and grasses	Flea beetle, armyworm
		Vegetable gardens	Spinach flea beetle
Fitting	Plow furrow	Thick-bodied grubs	White grub
		Slender larvae	Wireworm
		White, woolly masses	Sugar beet root aphid
Germination and small seedlings	Areas of poor stands or stunted or dying plants	Thick bodied grubs	White grub
		Slender larvae	Wireworm
		Dark, cylindrical worms	Cutworm
	Leaves	Shot holes or corky spots	Flea beetle
		Margins and underside of leaves chewed	Garden springtail
Small plants	Underside of leaves	Gray eggs in a semicircle, irregular mines in leaves	Spinach leaf miner
Any time	Stems	Tunnel in stems	Petiole borer
	Leaves and stems	Oval, active insects	Tarnished plant bug
	Leaves	Curled leaves	Aphid, leafhopper
		Chewed leaves	Armyworm, variegated cutworm, blister beetle, sugar beet weevil
	Stunted areas	Bronzed leaves	Tarnished plant bug
		Woolly spots on roots	Sugar beet root aphid
		Soil sample (do not take from 2 weeks after planting through June 30)	Sugar beet cyst nematode
Dry spell	Wilted area	Woolly spots on roots	Sugar beet root aphid
		Pinhead-size cysts on roots; Stunted and deformed beets, hairy roots	Sugar beet cyst nematode
Harvest	Roots and tare soil	Pinhead-size cyst	Sugar beet cyst nematode

application may be made to the affected area and margin around it if the damage is found after planting. Cover the insecticide with soil immediately after applications. Planting or replanting can be done immediately. Do not contaminate ponds or streams.

3. CUTWORMS

Cutworms cut the stems of small plants and eat the plants. They can be expected in weedy or poorly drained fields, but they can appear in any field. The cutworms are the larvae of the miller moths. They have a round, dark head, six small legs just behind the head, and ten fleshy legs at the back end of their bodies. Their bodies are dark-colored, soft and cylindrical. They curl their bodies tightly when disturbed and may try to bite when handled; their bite is painless and harmless.

Fig. 3. Cutworm larva. There are several species of cutworms that are variously colored.

Cutworms cut the plants at night and hide in the soil surface near the plants during the day. Check fields every few days following germination for plants that are cut at their bases. Search the soil around the cut plants for the cutworms, and if they are common in the field, apply an insecticide. If not controlled, the large cutworms can destroy a stand very quickly. Do not delay applying an insecticide if it is needed. Apply insecticides, either as sprays or granules, in a band just wide enough to cover the plants.

4. FLEA BEETLES

Flea beetles are small, round, dark-colored, hard-shelled beetles that spring into the air when disturbed. The larvae live on the roots of grains, grasses and some weeds. Flea beetles can be expected in sugar beet fields that are weedy or close to grain fields. They are active insects, however, and may appear in any field. They eat small, round "shot-holes" completely through the young leaves of sugar beets or feed on the upper surfaces of the leaves, causing a round, corky spot on the leaf. Their feeding retards the early growth of the plant, and they can kill small plants if numerous enough.

Fields of sugar beets should be

Fig. 4. Flea beetle adult

checked for the damage and presence of the flea beetles at the same time the fields are checked for cutworms. Weedy areas and the edges of sugar beet fields that border on grain crops or grasses should be closely observed for flea beetles. Some flea beetles are found in all fields of sugar beets. Established sugar beets will tolerate the feeding of the flea beetles, so apply sprays only if the beets are small and nearly all plants show some sign of feeding by the beetles.

5. GARDEN SPRINGTAILS

Springtails are minute, grayish insects that feed on the lower surface and margins of the beet cotyledons. They generally feed on moist, decaying organic matter. They are attracted to the succulent growth of seedling beets, however, and can defoliate and reduce beet stands if numerous. The adults of the springtails are wingless, but they can "spring" very rapidly when disturbed. This springing is accomplished by a lever (or furcula) located on the underside of their abdomens.

Fields of beets should be checked for springtails at the same time they are checked for cutworms. Fields high in organic matter and wet areas of the fields should be checked especially carefully. Established plants will tolerate some feeding of the springtails. An insecticide is needed only if the plants are still seedlings and nearly all plants show some feeding of these springtails.

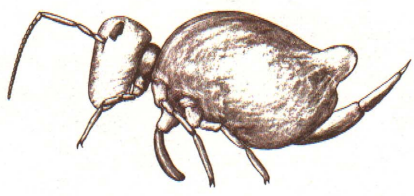

Fig. 5. Garden springtail; the furcula (or spring) is shown extended out in back. Both adult and young springtails are wingless.

6. SUGAR BEET WEEVIL

The sugar beet weevil is a pest of sugar beets in central and eastern Europe. It has a number of weed hosts as well as sugar beets. It has been found only in a few places in Michigan and has not been found feeding in sugar beets here as yet.

Fig. 6. Sugar beet weevil adult

The adult is a snout beetle that is grayish to brownish in color. It ranges in size from ½ to ¾ inches; this is enormous for a beetle. The larvae have a definite head but are legless. The adults feed on the leaves of the small beets, and the larvae tunnel into the roots.

No controls are recommended at present. We first need to know the distribution and threat from this insect. If you find insects in your beets that you suspect are sugar beet weevil, please turn in specimens of them to your county agricultural extension agent or company fieldman.

7. SPINACH LEAF MINER

The spinach leaf miner is a pest of sugar beets as well as a great number of other crops, including spinach. It can be found anywhere in a field of sugar beets but has been most commonly found near buildings. Its presence there may be caused by the proximity to the home garden where vegetables have been raised. The spinach leaf miner is the larva of a fly that looks like a small housefly. The fly lays its eggs on the undersurfaces of the leaves of small sugar beets. The eggs are small, gray, elongated, and are laid in a semicircle of about 6 to 12 or more eggs. The spinach leaf miner hatches from the eggs and tunnels within the leaf. These tunnels are small and narrow at first, but become irregularly shaped, whitened blotches on the leaves as they become larger. These mines are flecked with droppings, and the miner can be seen within them. The miners are headless and legless with white-to-yellowish, spindle-shaped bodies.

Check the undersides of the leaves

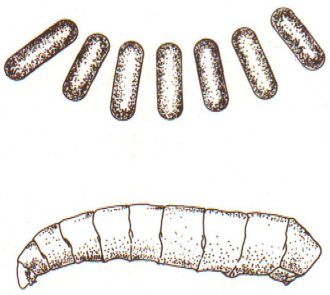

Fig. 7. Spinach leaf miner eggs (above) and maggot (below)

of small sugar beets for the eggs of the spinach leaf miner during the latter half of May and early June. A control is recommended when eggs are seen on at least about one-half the plants examined. Continue to examine a threatened field daily for signs of the first tunnel. Apply insecticides as soon as possible after the first small miners are seen.

The miner is very difficult to control once it is established within the leaves. If the pest is not noticed until nearly all of the eggs have hatched and most of the mines are large, the cost of the spray is not justified. Apply the insecticide as a spray that will cover the undersides of the leaves. A row crop sprayer is best, but a weed-type sprayer can be adjusted, with care, to give the needed coverage.

8. BLISTER BEETLES

Blister beetles have leathery, rather than hard, forewings. The beetles eat holes through the leaves of the beets. Their larvae feed on the eggs of grasshoppers, so here is an insect that is both harmful and beneficial. The blister beetle adults are medium-sized and gray to black in color. They can be detected by looking for their holes in the leaves and then looking for the beetles themselves. Fully established

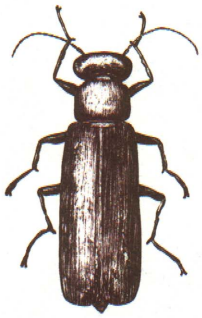

Fig. 8. Blister beetle adult. There are several species of blister beetles that are variously colored.

plants can tolerate some feeding, so no control is needed unless the beetles are abundant. Blister beetles have not been a problem in our beets for many years, but they are always present and we should remain alert for them.

9. SUGAR BEET ROOT APHID

The sugar beet root aphid feeds in colonies on the roots of the sugar beet. Its feeding causes a stunting and general lack of vigor in the plants. Its damage is most easily seen during drought when the affected areas wilt much more quickly than plants in other parts of the field. These areas are usually circular, scattered over the field, and of varying size. The roots of the plants in these areas have little mats of wax fibers on them. The root

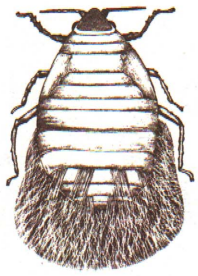

Fig. 9. Sugar beet root aphid. The woolly mass is composed of threads of wax.

aphid secretes this wax and feeds within its protection. The root aphids are soft-bodied, small, rounded and light yellow. They move very slowly when disturbed.

The roots of beets in areas of fields that lack vigor or that wilt quickly during drought should be examined for the root aphid. No practical control measures for this pest are now known. You could help in developing control measures for the aphid by informing your company fieldman or county agricultural extension agent if you find the sugar beet root aphid in your fields.

10. SUGAR BEET CYST NEMATODE

Sugar beet cyst nematode is a microscopically small roundworm (not an insect) that feeds on the roots of sugar beets, red beets, cruciferous crops and a limited number of weeds. Their feeding interferes with the up-

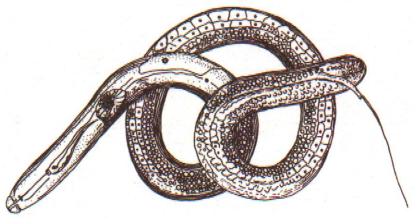

Fig. 10A. Sugar beet cyst nematode male

take of water and nutrients and lowers the vigor and yield of the beets. They live in the soil and roots and are too small to see. This makes the diagnosis of their injury difficult. Areas of beets that are stunted or that show excessive wilt from unknown causes during the season should be sampled to see if

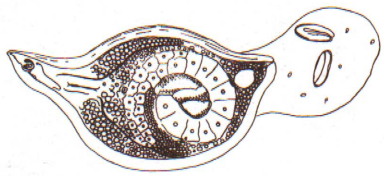

Fig. 10B. Sugar beet cyst nematode female

they are infested with nematodes. Your company fieldman or county agricultural extension agent can help you take the samples. Instructions for taking and submitting soil samples for nematode diagnosis are also given in Michigan State University Extension Bulletin E-800, "Nematode Detection," available from your county agricultural extension agent. Nematode sample containers and Diagnostic Service Laboratory forms (Figure 10 C) are also available from your extension agent. The form should be filled in as completely as possible for an accurate diagnosis and control recommendation.

Nematodes overwinter as eggs in a protective cyst formed by the body of the female and they are carried in tare soil. (Tare soil should never be dumped in fields that will be used for sugar beets.) The cysts appear as small, round objects on the feeder roots and beets. They are whitish in July and early August and darken to brownish with age. Their appearance is positive evidence of the presence of the sugar beet cyst nematode.

The eggs in a cyst can remain viable in the soil for several years. Sugar beet fields known to be infested with the nematodes should be rotated for five or more years with other crops (but

not red beets or crucifers such as cabbage). Good weed control practices should be followed to eliminate the weed hosts of the nematode. The rotation will aid in suppressing the nematode. Chemical control is needed, however, when soil samples still show cysts the fall or summer before planting a beet crop. Soil fumigation, while not used at present, will control the pest. Check with your company fieldman or county extension agent to plan for soil fumigation. The use of granular nematicides at planting time is commonly used for control of the nematode. The granule should be applied at planting in a furrow about 2 inches to the side and about 2 inches below the seed.

11. APHIDS

Aphids are small, round, soft-bodied insects found in colonies on the stems and undersides of leaves. Several species damage sugar beets. These range in color from pale green to almost black. The most common species in sugar beets is the bean aphid, which is black. Aphids suck plant juices and inject a toxic saliva

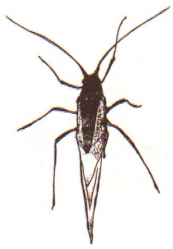

Fig. 11. Winged bean aphid. Wingless aphids are common and there are several species that are variously colored.

into the plant which causes a general weakening of the plant and a downward curling of the leaves. Aphids excrete a sticky "honey dew" that often becomes covered with a sooty fungus.

Check for aphids by looking for curled leaves and honey dew on the underside of the leaves. Examine plants for the aphids when you see this damage, and apply an insecticide when nearly all plants have aphids on them. Apply the spray to cover the foliage completely.

12. TARNISHED PLANT BUG (or LYGUS BUGS)

Plant bugs are active insects, oval to elongated in form, and range from small to ⅜ inches in length. The most common species is the tarnished plant bug. This insect is oval, about ¼ of an inch long, light gray to dark brown, and usually has a yellow V-shaped mark in the center of its back. It sucks

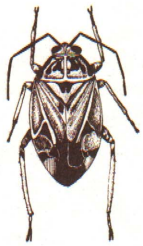

Fig. 12. Tarnished plant bug adult. Their nymphs are wingless.

plant juices and injects a toxic saliva into the plant. Its feeding lowers the vigor of the beets and causes bronzed, deformed leaves, especially in the new growth. The damage shows on the midveins near the tip of the blades as the leaves grow. In this case, the tips crinkle and turn yellow. The tarnished plant bug also lays its eggs in the petioles of the beets, and these egg stings appear as black blotches on the petioles. The bugs build up in fields of alfalfa and weeds and move into sugar beet fields.

Check the field for bronzed, curled leaves and for the tarnished plant bugs themselves. Be especially alert for the bugs in fields adjacent to weeds or alfalfa, especially following the cutting of the alfalfa. Apply an insecticide when the tarnished plant bugs can be easily found.

13. LEAFHOPPERS

Leafhoppers are feared in the western states as vectors of the curly top disease of sugar beets. This disease is not present in Michigan, and leafhoppers are a pest of sugar beets only when they are numerous enough to directly damage the beets; this occurs rarely in Michigan. Leafhoppers feed by sucking the plant juices and injecting a toxic saliva into the beets.

Several species of leafhoppers are found in our beets. The most damaging is the potato leafhopper. This pest is slender, about ⅛ of an inch long,

Fig. 13. Potato leafhopper adult. Their nymphs are wingless.

and pale green in color. It is very active and flies or runs sidewards on the leaf when disturbed. The potato leafhopper can cause leaf curling and stunted plants when it is abundant. The potato leafhopper can build up in fields of alfalfa and move into adjacent fields of beets when the alfalfa is cut.

Check fields, especially those near alfalfa fields, periodically for the curled leaves and for the leafhoppers on the leaves. Apply an insecticide if the leafhoppers are easily found on the leaves.

14. SUGAR BEET PETIOLE BORER

The larvae of the borer tunnel in the stems (petioles) of the leaves of sugar beets and some weeds. The larvae have a definite head but no legs. They are light yellow in color and are about 3/16 of an inch long when fully grown. The adults are brownish snout beetles about ¼ inch long and are hard to spot in the field. The eggs are laid in the petioles, and the egg punctures made by the female resemble those made by the tarnished plant bug. The borer is usually present in Michigan fields in low numbers and has been common (but not apparently damaging) in a few fields. No control measures are currently recommended for the borer. However, the company fieldman or county agricultural extension agent should be notified if borers are found in any number in your fields.

Fig. 14 Sugar beet petiole borer larva

15. ARMYWORM

The armyworm is closely related to the cutworm. It has a cylindrical body, a definite head, six small legs just behind the head, and ten fleshy legs near the rear end. It is usually dark with a prominent light stripe down each side. The armyworm normally feeds and builds up in numbers on grasses and small grains. They will "march" into fields of other crops

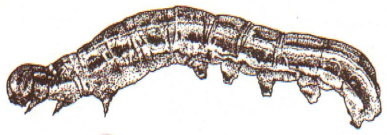

Fig. 15. Armyworm larva

when they are abundant and can cause damage to sugar beets. They feed on the leaves and deposit sawdust-like droppings (frass) under the plants. They feed mostly at night, and the worms usually hide in the surface of the soil during the day.

Fields, especially those near grain or grassy fields or fields with weed grasses in them, should be checked for chewed leaves, frass, and the armyworms on the leaves or in the soil near the plants. The armyworms are heavy feeders and can quickly damage crops. Apply a spray as soon as possible after infestation has been detected. Armyworm infestations are often widespread. Notify your county agricultural extension agent or company fieldman when you find them so that they can warn others of the threat.

16. VARIEGATED CUTWORM

The variegated cutworm was known only as a very minor early season pest of sugar beets until just a few years ago. It has appeared in great numbers in mid-season several times recently. It resembles the cutworms and armyworms in having a soft, cylindrical body, a definite head, six small legs just behind the head, and ten fleshy legs near the rear end. The variegated cutworm can be separated from the other pests by being gray to dark brown in color with prominent

Fig. 16. Variegated cutworm larva

yellow spots along its back. The variegated cutworm can cut off small plants early in the season and has been most damaging as a leaf feeder later in the season. It feeds heavily on the small leaves and soft petioles of new growth. Severely damaged plants have a "bald" appearance with the new, central growth gone and a fringe of chewed, older leaves around it.

Check the field for cut plants and the soil around them for the variegated cutworm as well as the other cutworms when the plants start to germinate. Periodically check the plants for chewed leaves and for the worms on the leaves or hiding in the central growth of the plant or in the soil close to the plant. Apply an insecticide if the pest is easily found in the field.

Insect and Nematode Control

The fact that insects and nematodes appear in damaging numbers only sporadically in beet fields indicates that we are doing something right. Rotation and good drainage, land fitting and weed contol all help in keeping the pests down. Good seed and proper fertilization that yield vigorous plants

Table 2 — Insect Control Recommendations

Pest	Insecticide	Lb Active per Acre*	Limits†
White grub	parathion	4.0	Broadcast pre-plant
	diazinon	4.0	Broadcast pre-plant
Wireworm	diazinon	1.0	7- inch band at planting
	Dyfonate	1.0	7-inch band at planting
Cutworm, armyworm,	Dylox	1.5	Beets - 14 days; tops - 28 days
Variegated cutworm	Sevin	1.5	14 days
	parathion	0.5	15 days
Flea beetles	Trithion	0.5	14 days
	Thiodan	0.5	30 days; do not feed tops
	parathion	0.5	15 days
Spinach leaf miner	Trithion	0.5	14 days
	diazinon	0.5	14 days
	Dylox	1.0	beets - 14 days; tops - 28 days
	parathion	0.5	15 days
	Thiodan	0.5	30 days; do not feed tops
Aphid	malathion	1.0	3 days
	Thiodan	0.5	30 days; do not feed tops
	Trithion	0.5	14 days
	diazinon	0.5	14 days
	Meta-Systox-R	0.5	30 days
	Systox	0.5	30 days
	parathion	0.5	15 days
Plant bug, leaf-	malathion	1.0	3 days
hopper, and	Thiodan	0.5	30 days; do not feed tops
blister beetle	parathion	0.5	15 days
	Sevin	1.5	14 days
Leafhopper	parathion	0.38	15 days
	Dibrom	1.0	5 days
	diazinon	0.5	14 days
	Meta-Systox-R	0.5	30 days
	Systox	0.38	30 days
	Sevin	1.5	14 days
Nematode	Temik	4.0	In furrow at planting

**The pounds of active ingredient to be applied per acre.*

†The time, in days, that must be allowed between application and harvest of the crop, or the type of application for soil insecticides.

that can tolerate some feeding also help in reducing damage. Good farming practices that are aimed at full yields give us the additional bonus of reduced problems with pests.

Insects and nematodes can increase rapidly. However they are subject to many natural enemies (parasites, predators and diseases) that, along with inclement weather and other factors, keep their numbers down. We notice insects during the years when they are numerous, but often fail to appreciate the role of the natural enemies in maintaining low pest numbers during most years. The natural enemies of our pests are literally naturally occurring and we have little control over their abundance.

Many of the natural enemies of insects are other insects. We can destroy them along with the pest insect when we spray to control the pest. This can lead to a quick reoccurrence of the pest ("flare-up") or to the appearance of a second pest ("pest-swapping") because of the killing of the natural enemies. Therefore, pesticides should be used only when they are clearly needed. They are poisons and must be handled with full precautions. Extension Bulletin E-1025 "Safe, Effective Use of Pesticides," available at your county agricultural extension office, outlines the steps in the safe use of pesticides. We recommend that you review this bulletin. Pesticides are also subject to strict regulations, which are also explained in Bulletin E-1025.

The best source of information on the specific pesticide that you plan to use is on the label of the pesticide. **READ THE LABEL** carefully before you buy the pesticide to be sure that you can use it safely and effectively. The pesticides recommended for the control of the different pests are shown in Table 2. Please note that these recommendations are changed frequently. Your company fieldman and county agricultural extension agent are kept informed of the changes and should be consulted before using the pesticide.

MICHIGAN COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN 48824
AND U. S. DEPARTMENT OF AGRICULTURE COOPERATING

ON-LINE PEST MANAGEMENT PROGRAM
SUGARBEET CYST NEMATODE DATA FORM

Fieldman No. _____
Grower No. _____
Field I.D. _____
Date: ___/___/___ (mo/ day /yr)

CHECK TYPES OF SYMPTOMS OBSERVED **Were cysts observed in the field? Yes_____ No____**

Wilting _____ Abnormal beets _____ Stunting _____
Yellowing _____ Hairy roots _____ Other _____

If sugarbeet cyst nematode symptoms are observed, look for white females or golden brown cysts of the sugarbeet cyst nematode on the roots and beets. Generally, these can only be observed between July 1 and September 1.

Cropping History 19___:___, 19___:___, 19___:___, 19___:___ (year of most recent sugar beet crop)

Describe the size and shape of the infested area(s):

Make a rough sketch of the field, illustrating the area(s) with symptoms or cysts.

If symptoms were observed (regardless of the results of the female and cyst observation), submit soil sample(s) for nematode analysis. Samples should be submitted according to Extension Bulletin E-800. It is extremely important to complete the history portion of the sample form.

To be completed by Michigan State University Nematode Diagnostic Service Laboratory

	Heterodera schachtii per 100 cm^3 soil	Other Nematodes	No. per 100 cm^3 soil
Cysts			
Juveniles			

Recommendations:

Bulletin:_____ Page:_____ G. W. Bird, *Extension Nematologist* O-9686

Fig. 10C. Data form to accompany soil samples for nematode diagnosis and control recommendations.

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