

A Sweet Potato Grower's Guide to Insect Pest Management

A wide variety of insects feed on sweet potato foliage, but treatment to control foliar damage is rarely necessary. This is because sweet potato plants grow vigorously, and damage to the foliage must be extensive before root growth is affected, particularly after the "root-swell" stage. However, the larvae of some foliar-feeding beetles live in the soil and occasionally do damage sweet potato roots. Damage caused by these root-feeding larvae, or grubs as they are sometimes called, may be reduced by targeting controls against the adult stage that develops on the foliage. In most cases, these controls should be applied only when adults or signs of their foliar feeding are observed, as described below.

Whitefringed Beetle

Description

Whitefringed beetle adults are flightless beetles in the "broad snout-weevil" group. Unlike other beetles, weevils have mouthparts on the end of a long snout. Whitefringed beetles have grey bodies with a white stripe along the side and are approximately 0.4 inch long (Figure 1). Adults, which are all female, emerge beginning in late June in central to north Alabama and begin laying eggs. Egg masses are laid on soil debris and require high moisture for hatching (moist, humid conditions favor development). Hatching larvae are less than $\frac{1}{16}$



Figure 1. Whitefringed beetle adults.

inch long and burrow into the soil. They are legless, white or cream in color, and have black mouthparts. Their head capsules are usually not visible. Larvae growing on sweet potato grow quickly into the medium- to large-size stages ($\frac{3}{16}$ to $\frac{1}{2}$ inch long) that can damage roots (Figure 2).



Figure 2. Whitefringed beetle grubs.

Damage

Adult whitefringed beetles chew "notches" in the leaf margins, which causes no economic damage to sweet potato, but the presence of notching indicates that there are adults in the field. Larvae that hatch any time from June to August in central to north Alabama may develop into grubs big enough to damage

sweet potato roots before harvest. Grubs hatching later in the season will overwinter in the soil and resume feeding and development the following season. The appearance of larval feeding on roots is varied. In central to north Alabama, most damage occurs late in the season (around early September) after roots have enlarged. Grubs often chew a shallow gouge or channel ($\frac{1}{8}$ to $\frac{1}{2}$ inch wide) across the surface of the root (Figure 3). Grubs may also bore straight into the root, creating a fairly deep, circular scar. Depending on the size of the hole, this damage is similar to that caused by wireworms or cucumber beetle larvae.



Figure 3. Whitefringed beetle grub feeding damage to sweet potato.

Management

In order to avoid the most serious feeding damage, which occurs late in the season, plant and harvest sweet potato as early as possible. Whitefringed beetles prefer legumes (clover, alfalfa, peanuts, soybeans, etc.) and root crops like sweet potatoes and Irish potatoes. Weevils do not survive or lay eggs well on grass cover crops or on corn and sorghum. Therefore, rotating crops from sweet potatoes to a less-preferred grass crop, or leaving the field fallow for a season, is an effective management strategy. It is important to eliminate volunteer legumes or sweet potatoes from the field during the rotation period.

Currently, the only soil insecticides registered for use in sweet potato are chlorpyrifos (Lorsban™) and diazinon (Diazinon™). At-planting soil applications of these materials have not been effective because the residues dissipate by the time grubs enter the soil and begin feeding on enlarged roots. Recent field trials to evaluate pre-plant fumigation of fields with dichloropropene (Telone II™) indicated that this practice did not effectively reduce feeding damage to roots. While fumigation may kill overwintered whitefringed beetle grubs in the field, it does not affect any new offspring of summer adults that move into the field from adjacent areas. All research in Alabama on whitefringed beetle suggests that the best management approach is to target adults if they or signs of their foliar feeding are observed.

After transplanting, monitor plants at least weekly for adult beetles or their characteristic “notching” damage on leaf margins. If you see beetles or notching, apply a registered foliar insecticide. (See the table at the end of this publication for rec-

ommended insecticides.) Spray at approximately 10-day intervals; 14-day intervals will control low-infestation levels. Discontinue spraying 3 to 4 weeks before harvest since larvae that hatch after this time will not be big enough to cause damage. Use at least 40 gallons per acre spray volume because beetles hide in the lower plant canopy and cannot be controlled by sprays that cover only the upper foliage.

Cucumber Beetles

Description

Spotted and banded cucumber beetles are the two cucumber beetle species found in sweet potato. Adults of both species are about 1/4 inch long. The spotted cucumber beetle is yellow with 12 black spots on its upper surface (Figure 4). The banded cucumber beetle is yellow with green bands. Like the whitefringed beetle, cucumber beetle adults usually do not cause enough foliar damage to result in economic loss. The soil-dwelling larvae have white or cream-colored elongated bodies and are about 0.25 to 0.4 inch long. They have six small legs in the front and a brown head. Their eggs are laid in the soil, and the larvae live about 30 days. Cucumber beetles produce several generations per year.

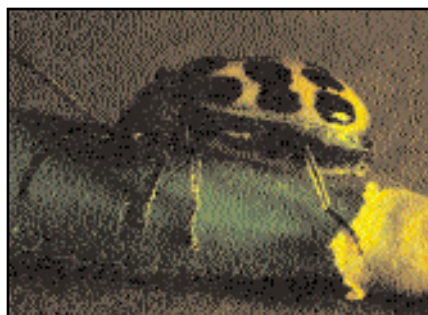


Figure 4. Spotted cucumber beetle adult.

Damage

Cucumber beetle larvae chew small holes in the roots, forming irregular cavities under the skin. Holes may be in groups and may enlarge as the roots develop.

Management

There are no truly effective cultural controls for cucumber beetles, and no treatment thresholds have been developed. Foliar sprays applied for other pests (such as whitefringed beetle and sweet potato weevil) will control cucumber beetles. Insecticide application may be warranted if adult cucumber beetles are active and feeding in the field.

Flea Beetles

Description

Some flea beetles, like those in the *Systema* genus, feed on the leaves of sweet potato plants, but most flea beetle species do not cause economic damage by foliar feeding. Flea beetle adults are very small and dark and have enlarged back legs that give them powerful jumping ability (hence the name) (Figure 5). Flea beetle larvae live in the soil and look similar to cucumber beetle larvae but are smaller. Flea beetle larvae are about 0.2 inch long, with slender white bodies and tan heads. Tiny legs, three on each

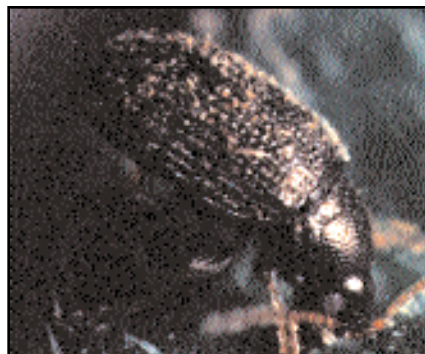


Figure 5. Flea beetle adult.

side, are visible. The sweet potato flea beetle (SPFB) migrates into fields in the spring around transplanting time and then migrates out of fields to adjacent weeds, such as bindweed, in June.

Damage

Systema flea beetle larvae eat small holes through the skin of the root. Damage is similar to that caused by cucumber beetle larvae, but holes made by flea beetles are less round and more irregular (Figure 6). *Systema* adults usually do not cause serious foliar damage. The SPFB adults may reduce sweet potato yields by feeding on foliage. SPFB larvae make small tunnels under the skin of roots; this is often called “writing” damage.



Figure 6. *Systema* flea beetle damage to sweet potato.

Management

Because flea beetles migrate from weedy borders into fields, eliminating weeds may reduce flea beetle infestations. Setting sweet potato slips later in the season will reduce the potential for flea beetle infestations, but it may increase the potential for damage by the whitefringed beetle. Applying foliar insecticides when adults or foliar damage are seen has proven effective. See the table at the end of this publication for recommended insecticides for flea beetle control.

Wireworms

Description

Adult wireworms are called click beetles and do little foliar feeding. Wireworm larvae live in the soil and cause the damage. The larvae have slender, wire-like, hard bodies, approximately $\frac{3}{4}$ inch long (Figure 7). Colors range from yellow to orange and brown. Some species have as many as 7 to 10 larval stages, and larvae can live up to 4 years in the soil.



Figure 7. Wireworm larvae.

Damage

Wireworm larvae chew small, round holes in sweet potato roots. Wireworm holes are often deeper than feeding holes made by other soil insects. As with damage by other soil insects, the scars will heal over if feeding occurs early; the holes appear more ragged if feeding occurs late.

Management

To control wireworms, remove previous crop residue to reduce alternative food sources for larvae. Because wireworms are attracted to grass cover crops, delay cover-crop planting until fall, and leave fields intended for sweet potatoes fallow in the summer. Control weeds adjacent to and within the field before and after planting. Deep plowing will also kill wireworm larvae. Because wireworms are inactive in the spring, plant fields as early as possible. As

recommended for whitefringed beetle, harvest sweet potatoes as early as possible because the potential for damage increases with time.

Evaluating new fields for the potential for wireworm problems is difficult, but you should check for wireworms when plowing and discing, and you can set wireworm bait stations in the fall or spring when soil temperatures are above 45 degrees F. Soil-sampling using a 6-inch post-hole digger gives a more accurate estimate than baiting, but it is labor intensive. Use the following procedure to make and set wireworm baits.

1. Mix a 1:1 combination of wheat:corn or wheat:oatmeal as bait.
2. Wrap a fist-sized amount of bait in a nylon stocking.
3. Bury the wrapped bait 4 to 6 inches deep, placing it in random locations in the field to obtain representative samples. Place more bait stations in suspected trouble spots, such as next to weedy or low areas. Use at least one bait per acre—the more stations, the better.
4. Mound the soil above the bait, and cover it with clear plastic if the soil is cool.
5. Mark the locations of the bait stations with flags.
6. Wait 7 to 10 days, and then dig up the bait stations and check for wireworms. Very loose treatment thresholds that have been developed for potatoes are as follows:

- 0 wireworms/bait = no control needed
- 0.5 to 2.0 wireworms = moderate chance of damage
- 3 to 4 wireworms = high chance of damage
- 5 or more wireworms = do not plant

If observations of wireworms in the field indicate that chemical treatment is warranted, broadcast soil insecticide applications are more effective than banded applications. See the table at the end of this publication for recommended soil insecticides. Soil fumigation will also kill wireworms if they are in the treated soil profile, but wireworms can burrow in the soil below the chemical residue.

Sweet Potato Weevil

Description

Adult sweet potato weevils are antlike in appearance and about 1/4 inch long. The adult head and wing covers are metallic blue, and the thorax and legs are bright orange/red. Sweet potato weevil eggs are laid on vines or roots. Larvae are white and legless, with visible light-brown head capsules (Figure 8).



Figure 8. Sweet potato weevil and damage to sweet potato.

Damage

Sweet potato weevil adults feed on any portion of the plant, but they prefer the roots. Larvae make feeding tunnels that begin just under the skin of the root. The tunnels frequently contain larvae, pupae, or newly transformed adults. Adult exit holes in the root are about the size of a match stick. Sweet potato weevil infestations may be found in the field, in storage sheds, and in propagation beds. In Alabama, control measures have made the weevil less of a problem today

than it was in the past, but infestations periodically occur, particularly when weevils are brought into the state on infested seeds or transplants.

Management

The Alabama Department of Agriculture and Industries administers a sweet potato quarantine program that places restrictions on the shipment of sweet potatoes from infested regions to weevil-free regions. Although these precautions may affect only certain counties, all Alabama sweet potato growers should be on the alert for weevil infestations. Area-wide prevention and sanitation are critically important to keep sweet potato weevils out of the state. Growers should inspect propagation beds, fields, and storage areas frequently for weevils and notify regulatory officials of the Department of Agriculture and Industries if infestations are found or suspected. Pheromone traps are commercially available for monitoring the presence of sweet potato weevil adults.

To prevent movement of weevils into the state, purchase only certified seed produced in a weevil-free area. Install propagation beds away from the area where the past year's crop was produced. If weevils are found in seedbeds, spray the beds with a recommended insecticide on a weekly schedule. Use transplants or slips that are cut an inch above the soil line, or use vine cuttings rather than pulled plants. Destroy excess plants and seed potatoes in the bed once transplanting has been completed. If weevils are found in the field or in pheromone traps around the field, spray plants with a recommended insecticide on a weekly schedule. When cultivating, throw soil around the base of the vines to prevent

adult weevils from reaching potatoes underground. Destroy all crop debris, including culls. When a sweet potato crop is not present, destroy volunteer sweet potatoes and morning-glory weeds (alternate host plants). Clean sweet potato storage houses thoroughly after each use.

White Grubs

Description

White grubs are the larvae of Scarab beetles (such as June and May beetles) that live in the soil and feed on organic detritus and plant material. They have tan or brown head capsules, curved bodies and six legs and can grow up to an inch long (Figure 9). Their bodies are white or whitish cream, and a dark food mass is often visible under the skin at the rear end of the body. They may produce one to two generations per year depending on the species. White grub larvae overwinter in the soil.



Figure 9. White grub.

Damage

White grub larvae gouge out broad, shallow areas on the root (Figure 10). The damage is similar to that caused by the white-fringed beetle, but because white grubs are larger, their feeding channels are wider.



Figure 10. White grub damage to sweet potato.

Management

Most serious white grub damage occurs when sweet potato is planted in fields that follow pasture. Therefore, avoid planting in pasture land, or if planting in pasture, use a recommended soil insecticide to help reduce damage.

Insecticides Recommended For Sweet Potato Insect Pests

Insect/ Insecticide	Amount of formulation per acre	Minimum days from last application to harvest	Comments
Flea Beetles, Cucumber Beetles			
endosulfan	1.33 pt.	1	Apply when beetles are first observed. Repeat application 7 to 10 days later. Do not exceed 3 applications per year.
PHASER	1.33 pt.	1	
THIODAN 3EC			Methyl parathion and Penncap-M are restricted-use pesticides. *Use Penncap-M for cucumber beetles only. Do not apply more than 24 pints per season.
methyl parathion			
METHYL PARATHION			
4EC	1 to 1.5 pt.	5	
PENNCAP-M 2FM*	2 to 3 pt.	5	
Sweet Potato Weevils			
Planting Bed Treatment			
endosulfan			Use pheromone traps to determine if weevils are present. If present in traps or seedbeds, spray weekly beginning at plant emergence. Do not exceed 3 applications per year.
PHASER	1.3 pt.	1	
THIODAN 3 EC	1.3 pt.	1	Methyl parathion and Penncap-M are restricted-use insecticides. Do not apply more than 24 pints per season.
methyl parathion			
METHYL PARATHION			
4EC	1 to 1.5 pt.	5	
PENNCAP-M 2FM	2 to 3 pt.	5	
phosmet			Imidan is authorized under a special local-need registration. Do not exceed 5 applications per season.
IMIDAN 70-WSB	1.33 lb.	7	
IMIDAN 70-WP	1.33 lb.	7	
Field Treatments			
carbaryl			Do not exceed 3 applications per year.
SEVIN 80WP	1.25 qt.	0	
SEVIN XLR	2.0 qt.	0	
endosulfan			Methyl parathion and Penncap-M are restricted-use insecticides. Do not apply more than 24 pints per season.
PHASER	1.33 qt.	1	
THIODAN 3EC	1.33 qt.	5	
methyl parathion			Imidan use is authorized under a special local-need registration. Do not exceed 5 applications per season.
METHYL PARATHION			
3EC	1pt.	5	
PENNCAP-M 2FM	2 to 3 pt.	5	
phosmet			Imidan use is authorized under a special local-need registration. Do not exceed 5 applications per season.
IMIDAN 70-WSB	1.33 lb.	7	
IMIDAN 70WP	1.33 lb.	7	

Insecticides Recommended For Sweet Potato Insect Pests. (cont.)

Insect/ Insecticide	Amount of formulation per acre	Minimum days from last application to harvest	Comments
Storage Treatment			
phosmet IMIDAN 5% DUST	2 to 4 oz./ 50-lb. bushel	—	Clean storage rooms thoroughly before storage. Wall and floors may be treated with 1 lb. a.i. of malathion per 5 gallons of water. Treat potatoes with Imidan dust, and store in James crates.
Whitefringed Beetle			
			Currently registered soil insecticides are not effective for control of feeding damage by soil-dwelling larvae. Foliar sprays targeted against adults will reduce damaging larval infestations.
methyl parathion METHYL PARATHION 4EC PENNCAP-M 2FM	1 pt 2 to 3 pt.	5 5	Methyl parathion and Penncap-M are restricted-use pesticides. Do not apply more than 24 pints per season.
phosmet IMIDAN 70-WSB IMIDAN 70-WP	1.33 lb. 1.33 lb.	7 7	Imidan is authorized under a special local-need registration. Do not exceed 5 applications per season.
Wireworm and Flea Beetle Larvae, White Grubs			
Soil Insecticides			
chlorpyrifos LORSBAN 15G	15.5 lb.	See label.	Lorsban 15G applied pre-plant-incorporated followed by Diasinon 14G banded over the row
diazinon DIAZINON 14G	21 lb.	See label.	at root swell provides better control than a single pre-plant application.

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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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