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NF95-217 Sugarbeet Root Maggot Management

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Sugarbeet Root Maggot Management

by Gary Hein, Extension Entomologist

The sugarbeet root maggot is the most severe insect pest of sugarbeets in Nebraska's North Platte River valley; however, it has not been found in the center pivot growing areas outside of the valley. Infestations begin in late spring and can reduce plant vigor and stand, resulting in lower yields. Management of this insect requires knowledge of the insect's life cycle and information about the current population level. This publication explains the important aspects of the life cycle and the use of the sticky stake trapping method to monitor root maggot populations.

Description

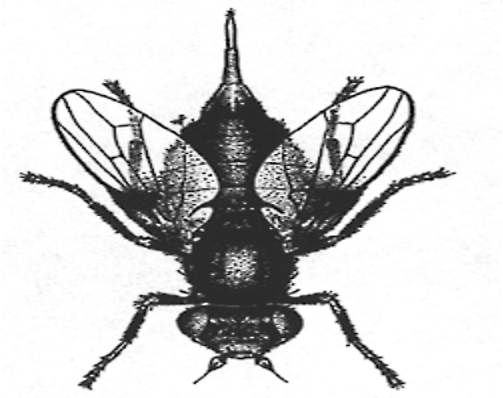

Figure 1. Sugarbeet root maggot adult. (Drawing by J. Kalisch--UNL)

Sugarbeet root maggot adult flies are similar in size and appearance to the house fly (about 1/4 inch; see *Figure 1*). However, the body is shiny black with few hairs, unlike the house fly and many other common flies which are more gray with numerous hairs. The wings of this fly are transparent with a smoky-brown patch located on the front of the wing about 1/3 the distance from the wing base. Also, the legs have yellowish-white bands on the next to last segment ("ankles"), with the rest of the leg being black. The females have pointed

abdomens and the males have rounded abdomens.

The eggs are elongate, slightly curved and white. The larvae are white, legless maggots that grow to about 1/3-1/2 inch in length. The head end is tapered to a point and the rear end is blunt. The pupae are tan to brown, elongate capsules about 5/16 inch long.

Life Cycle

Sugarbeet root maggots overwinter as full-grown larvae about 10-14 inches deep in the soil. As temperatures begin to warm in the spring, the larvae move up close to the soil surface and pupate. In western Nebraska, sugarbeet root maggots pupate in April, and flies begin to emerge in early May. The flies move from last year's sugarbeet fields to the current fields soon after emergence. The flies are not strong fliers, and generally movement is limited to localized flights to adjacent fields. Fly activity in sugarbeet fields is greatly increased under warm and calm conditions. During cool or windy periods the flies remain in sheltered areas along field margins (e.g. weedy, grassy areas or tree rows). Peak emergence and fly activity occur in late May or early June. The females lay eggs in the upper 1/4-1/2 inch of soil at the base of the sugarbeet plants. Eggs are laid in batches of a few to as many as 40, and a female will lay over 100 during her life. Survival of eggs and early larval stages is greatly reduced in dry soil conditions. The larvae begin to feed on the sugarbeet roots and continue to feed for about three to four weeks. By late June to early July, feeding ceases, but the larvae remain in the soil around the sugarbeet roots.

Damage

Root maggots feed on the surface of the sugarbeet root causing surface scarring. Deeper scarring and malformed roots may result from heavier feeding. Heavy infestations of the sugarbeet root maggot can cause severe stand loss, particularly with small plants, because the maggots feed on and sever the tap root. Severe damage is obvious because plants become severely wilted or die. If stands are not reduced, losses may still result from reduced plant vigor. Damaged plants also may be more susceptible to root diseases. Other stresses, such as hail, can severely impact beets damaged by the sugarbeet root maggot because vigorous plants are necessary for recovery.

Management

Cultural practices will not eliminate sugarbeet root maggot problems but can reduce the severity of damage. Areas where close rotations of sugarbeets are used will likely have more serious problems because the maggots move from the previous year's sugarbeet fields to the current fields. If sugarbeet fields are concentrated in an area, more flies will be emerging, and they will have to move shorter distances to new fields.

Establishing a vigorous sugarbeet plant as early as possible will also aid in reducing sugarbeet root maggot damage. The larger, more vigorous beets can withstand more damage, and stand reduction will be less likely.

Insecticidal Control

Typically granular insecticides applied at planting have been used to control the sugarbeet root maggot. Options have included Counter 20CR and 15G, Dyfonate II 20G, Lorsban 15G, and Temik 15G. Organophosphate insecticides (Counter, Lorsban, Dyfonate) sometimes have caused phytotoxicity problems when applied at planting. Counter has been shown to be the least phytotoxic of the

organophosphates, and placement of the granules behind the planter press-wheel can reduce, but not eliminate, the damage. All these products are influenced by environmental conditions, however, control by Temik 15G can be severely reduced during wet springs because of its greater water solubility.

Recent label changes for Lorsban 4E to include the lay-by control of sugarbeet root maggot have made it a more attractive control option. This product provides flexibility in managing many problems associated with the granular materials. However, proper timing is critical and must be based on fly population information obtained from sticky-trap sampling. Some leaf curling can result from Lorsban 4E applications to smaller plants (two-leaf and smaller), but under most situations plant injury is minimal. Lorsban 4E should not be applied with Betamix applications and should not be applied one to two days before a Betamix application.

Once damage begins to appear in the field, effective options to correct the situation are limited. Irrigation practices can help reduce damage once the maggots are feeding on the beets. Under moist soil conditions the maggots will move higher on the plants and are less likely to sever the tap root. Irrigation also will reduce water stress or the potential stand loss. A lay-by nitrogen application may stimulate beet growth to help plants recover from damage. The value of this practice may be questionable if adequate fertility has already been added to the sugar- beets. After damage has been observed, applying insecticides as rescue treatments likely will not be effective. Temik 15G, because of its high water solubility, can be knifed in on the water side of the row (furrow irrigation) or banded over the top of the row (sprinkler irrigation) and watered into the soil. Very little control will be obtained if watering is not an option after application.

Sampling Adult Populations

Sugarbeet growers in areas where the sugarbeet root maggot is a problem can improve their management by using the orange sticky-stake trapping method originally developed in Idaho (Blickenstaff trap). This method can be used to monitor the development of fly populations in and around sugarbeet fields in May and June. In many areas of the region root maggot populations fluctuate. Without population information it is impossible to make an informed decision on the need to treat or how to treat for sugarbeet root maggot. Growers in these areas may be caught off guard when a problem eventually develops or they may waste dollars on treatments that aren't needed. In areas where the root maggot is continuously a serious problem, growers have had serious control problems even with the use of planting-time insecticides. The sticky-stake method can be used to determine both the need and the proper timing for a supplemental lay-by treatment that will improve control in these serious situations.

The orange sticky-stake trapping method should be deployed by about May 1 in order to catch the first fly activity of the season. As the season progresses the size and duration of the fly population can be determined. Information gained from the use of the sticky-stake fly traps can be use to:

1. determine the current maggot population level in the field and assess the need for insecticide treatments in subsequent years in adjacent fields. Anyone just learning to use the trapping system should use this option. This allows one to get used to the trapping method and gain some insight into the level of the fly populations in your area. The lack of dying beets in the field is not an accurate way to determine if flies are a problem. Monitoring the flies can give you a reasonable idea as to the damage potential of the maggots in your area;
2. determine the damage potential for the current root maggot fly populations. Decisions can then be made on the need for lay-by insecticide treatments and the proper timing of these treatments.

Sugarbeet Root Maggot Trap Construction

(see *Figure 2*)

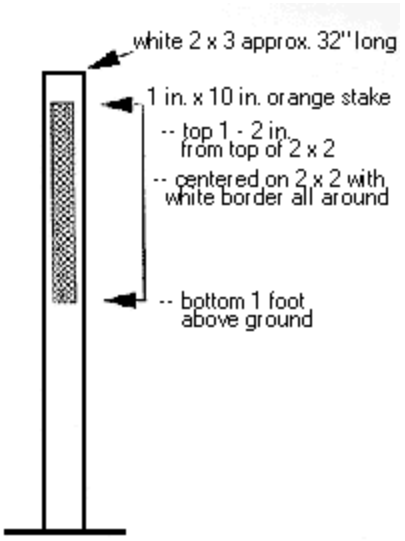

Figure 2. Construction of the sugarbeet root maggot orange sticky stake.

Traps are made from a 2"x2" wooden board that has been painted white and a garden stake, approximately 1"x10", that has been painted a bright (not fluorescent) orange. (Similar plastic orange stakes are available commercially.) Attach the garden stake to the 2x2 about 1"-2" from the top of the stake so that a white border surrounds the stake. When the 2x2 is driven into the ground, the bottom of the orange stake should be about 1 ft. above the soil surface.

Tangletrap, an insect trap adhesive, is placed only on the orange stake in a thin layer. Adding too much adhesive will only lead to a very messy trap, but care must be taken to add enough to be able to catch the flies. (Tangletrap is available through several suppliers; see *Sources of Pest Management Supplies,NF93-141*.)

Trap Placement in the Field

1. Traps should be placed out about May 1 and monitored into the second week of June.
2. Four traps should be placed around the perimeter of the current year's sugarbeet field.
    a. Traps should be placed at the edge of the field in a fence-row or next to a ditch just out of the range of the cultivator so they will not be knocked over during field operations.
    b. Two traps should face north or west and two should face south or east. This arrangement will usually allow two traps to escape being coated with dirt after a strong wind.
    c. The orange stake on the trap should face the sugarbeet field or be at a 90° angle to the field.
    d. Weeds or grass growing around the trap should be cut or pulled for about a 2 foot radius to maintain trap visibility.
3. Traps should be monitored at least twice a week.
    a. Count or record the number of sugarbeet root maggot flies for each trap.
    b. The sticky traps do collect flies other than sugarbeet root maggot flies, so correct identification is essential for an accurate control. See the earlier description of the flies.
    c. Flies should be cleaned off the trap and fresh adhesive applied. If adhesive remains clean and sticky, dead flies can be picked off and sticky material left for the next trap check. Take care to keep the adhesive material on the trap sticky. Dirt and other insects, if numerous, can limit the fly catch because of limited or no sticky surface to catch the flies. The most common problems in reduced stickiness results from dust storms or high insect numbers, particularly flies near feedlots.

Using Trap Data to Make a Decision

1. Record the number of sugarbeet root maggot flies caught on each trap at each checking.
2. Keep an accumulated total for the traps and determine the field average. The accumulated total is determined by adding the number of flies in a trap since the beginning of the season (see *Figure 3*).
3. Decisions can be made concerning the use of an insecticide the ***next year*** based on the average accumulated fly trap catch for the field.
    a. *If fly populations are very low* with a total accumulated catch of less than 20 flies for the

season, a planting time treatment would likely not be needed. However, fly monitoring the next year is necessary to determine if the population is building and if it may pose a threat.

b. *If fly populations are moderate* with a total accumulated catch of 20-80 flies for the season, the damage potential is moderate and one of several treatment options can be used.
    1. Apply a planting time soil insecticide to control the root maggot problem. This can be effective, however many factors influence the insecticide in the weeks between planting and when it is needed. Also, because of the phytotoxicity risk from some products, this option should be used only when there is demonstrated risk from root maggots.
    2. Use an early lay-by application of a granular soil insecticide for root maggot control. This option reduces the risk from phytotoxicity, but lack of water (precipitation) to move the chemical into the soil may reduce control. This would be the best option if overhead sprinkler irrigation is possible.
    3. Forego an at-plant insecticide and rely on a liquid lay-by application based on the trap- ping threshold to provide control of the maggot population. This option works well, but fly monitoring and proper timing are critical.

c. *If fly populations are very high (>80 per trap)* a planting time soil insecticide may be the best option to begin control of the root maggots. If the fly populations in a field treated at planting are very high during the season, a lay-by application of Lorsban 4E can provide supplemental control to the planting time application. This has been shown to be quite effective in situations of severe root maggot damage.

4. Decisions can be made concerning treatment need and timing for the ***current year***.
    a. If the accumulated total per trap never exceeds 40 flies, the damage potential is low.
    b. If the accumulated total per trap exceeds 40 flies by peak fly activity (before trap catches begins to drop off) a significant potential for damage exists and if no planting time insecticide was used, some type of rescue treatment would be in order. Peak fly activity usually occurs between May 20 and June 10. **Lay-by treatments should be timed according to the timing of significant fly activity.** Lay-by treatments applied after major larval activity has begun are too late and will be of little use. When using liquid lay-by treatments, timing is critical. They should be applied when the threshold of 40 flies per trap is reached. This may occur before the actual peak fly activity period is noted on the sticky traps. If an extended peak occurs, a second liquid insecticide treatment may be needed to control the later population.

The best decisions for managing the sugarbeet root maggot can only be made when you know what the potential for damage is in your fields. The best information to determine that potential can only be obtained from trapping the maggot flies with the orange sticky-stake method. Knowing the potential for sugarbeet root maggot damage is essential to saving money on unneeded insecticide applications while avoiding damage from this insect when populations build to damaging levels.

Figure 3. Sample record. An accurate sampling record is important to decision making. Note the date of peak fly activity (May 31) and when the treatment threshold is reached (May 28).

Date	Trap 1	Trap 2	Trap 3	Trap 4	Total of 4 traps	Average catch per trap	Average catch per trap per day	Accumulated total per trap

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