

## INSECT MANAGEMENT

### SUGARBEET ROOT MAGGOT

**The 2001 Growing Season:** Cool, wet soil conditions prevailed throughout much of the Red River Valley during early spring of 2001. Seed bed preparation and planting operations were delayed for many growers. Thus, a concern was that plants would be slightly smaller than optimal and more vulnerable to attack by sugarbeet root maggot (SBRM) larvae. Adult fly activity was monitored during the 2001 season by university personnel and American Crystal agricultural staff using sticky-stake traps. Fly capture rates were generally lower than the previous few years and varied from very low in the southern and central areas of the Valley to moderate levels of activity with patches of high infestations in the northern portion. Peak fly activity in current-year beet fields occurred within 1-2 days of June 13 at most monitoring sites throughout the Valley with the highest counts being recorded near St. Thomas, North Dakota. Typically, maggot fly pressure was most severe in fields established adjacently to those that had been planted to beets during the preceding season. Fly activity gradually decreased until a second peak occurred on June 22 in the Grafton/St. Thomas area. Levels fluctuated for several days after the second peak throughout the remainder of June and into the first week of July, at which only very low levels were detected. Fluctuations in fly counts, including the apparent second peak may have been an artifact of thunderstorms and associated cool and windy conditions during fly emergence, mating, and egg-laying periods.

Soil conditions, although sub-optimal in several fields, seemed to be adequate to prompt most larvae to feed at moderately shallow soil depths (i.e., away from beet tap roots and near/within insecticide-treated zones). Therefore, young beet plants were able to outgrow most SBRM feeding injury, very few tap roots were severed, and insecticides performed adequately in most cases. However, less-than-optimal levels of protection from maggot feeding injury were observed in a few isolated fields between St. Thomas and Bathgate, ND.

### **SBRM Population Forecast for the 2002 Growing Season**

The population forecast for the 2002 production season (Fig.1) suggests growers on the Minnesota side of the Red River from the Sabin/Baker area and north all the way to the U.S./Canadian border will likely experience generally low SBRM infestations with intermittent pockets of moderate pressure. Growers farming in the Grafton/Hoople vicinity in northeastern Walsh county and the Cavalier/Bathgate area in northern Pembina county of northeastern North Dakota can expect moderate to high infestations. Naturally, moderate infestations can be expected to occur in the marginal areas between those where low and high populations are projected. Proximity of current-year sugarbeets to fields previous-year beet fields can often increase the risk of damaging population levels. **It should be clearly understood that significant fly activity is likely for beets planted adjacently to previous-year beet fields that had moderate to high fly densities and/or substantial maggot feeding pressure.** Environmental conditions within the growing season can affect the precision of this forecast. Therefore, fly populations must be monitored for producers and pest managers to make that determination.

This forecast is general in nature, and will not always be precise on an individual field basis. Growers are encouraged to continue using planting-time insecticides. Fields should then be carefully monitored from late May through June for significant increases in fly activity. High activity or an extended emergence period may warrant the need for additional control tactics. Growers are encouraged to review research findings published in recent volumes of "Research and Extension Reports" to design effective management programs. NDSU extension will continue to inform growers on SBRM activity each spring via radio reports, DTN, and issues of the NDSU "Crop & Pest Report."

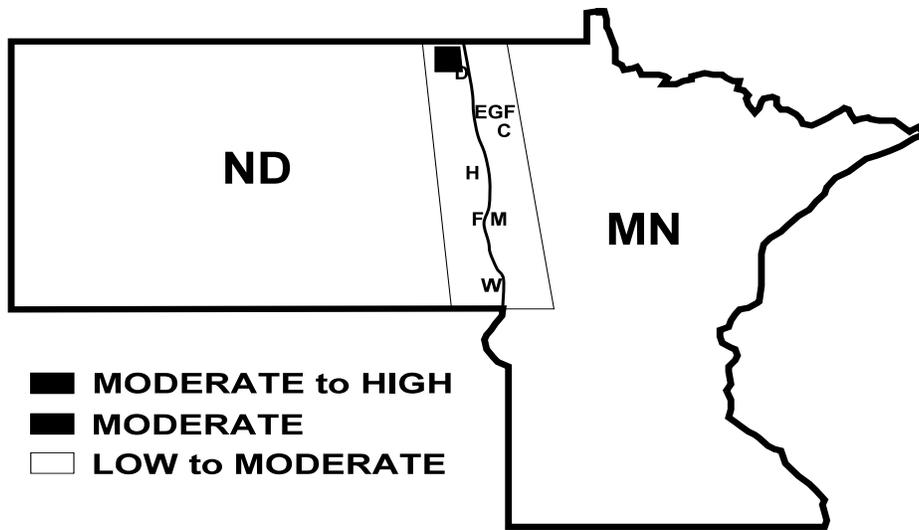


Fig. 1. Anticipated SBRM population levels for the 2002 growing season in the Red River Valley.

Terminology used in this guide and other extension publications can sometimes be confusing. The terms **first emergence** and **peak fly emergence** refer to events in previous-year beet fields. Significant **fly activity** and **peak fly activity** refer to events in current-year beet fields. The time period between emergence from old beets and activity in new beet fields is weather-dependent and varies from year to year. Continued reports through various media outlets will provide growers with our best estimate of important events throughout major areas of the Valley. However, there is no substitute for careful evaluation of SBRM population levels on an individual-field fields.

### **Cultural Control**

Early planting can result in larger sugarbeet roots at the time of most serious SBRM activity (mid-June to early July). Larger roots can withstand some maggot feeding, and may outgrow some injury if soil moisture is received. Smaller and/or late-planted sugarbeets are more vulnerable to maggot feeding. Injury can often be severe enough to kill seedlings and result in significant stand reductions or smaller roots at harvest.

The use of a rotary hoe or harrow across beet rows in June following egg deposition can help reduce maggot numbers. The use of these field implements can move eggs away from beet seedlings and, in many cases, the eggs will become more exposed to the elements. This results in drying of the eggs which can kill developing maggots before they hatch. This works best in seasons when the soil surface is dry during the egg-laying period.

Oat as a cover crop continues to show promise in reducing SBRM injury to sugarbeets. A possible explanation is that cover crop roots may serve as an additional or alternative feeding substrate for some soil insects, and therefore, beet roots may not be fed upon as extensively. Also, since cover crops provide a dense plant canopy, the shading serves to keep soils moist. This condition may keep larvae feeding higher in the soil profile (away from tap root) and allow for increased insecticide activity. Use of a cover crop can also result in protecting young beet plants from wind injury. North Dakota State University research is ongoing to evaluate other cereal grasses as possible cover crop alternatives.

## Chemical Control

**Planting-time granular insecticides** are important tools for managing sugarbeet root maggots in the Red River Valley. A few basic steps in preparation for insecticide applications can increase the probability of accuracy, effectiveness, and economical use of these products. Preparation for planting should include serious attention to the following:

1. Accurate calibration
2. Unrestricted, consistent delivery of granules
3. Even distribution of granules over the row
4. Adequate incorporation into soil
5. Protection from wind

Calibrate all granular applicators for the insecticide you will be using and for the exact registered rate you wish to apply. This is a very simple task since application rates appearing on insecticide labels and in extension materials are listed in ounces of product per 1,000 row feet. It is also recommended that you reconfirm your calibration settings with desired output a couple of times throughout the planting season. Ensure that granules are able to flow straight and smoothly down the drop tubes. Unrestricted and consistent flow of the material is essential. Incorporate granular insecticides well into the upper 1/4" of soil. Wind is a perennial complication with insecticide applications in the Red River Valley. Commonly, as much as 50% of the granules can be blown far off the row. The resulting application is more like a broadcast treatment. This can greatly reduce insecticide efficacy because the material is spread out over a much greater surface area. If it is too windy, discontinue planting. Early morning and evening conditions may be more feasible during periods of high daytime winds. If delaying planting is not practical because of anticipated weather patterns, consider installing wind protection devices for the row units of your planter. **It is our strong recommendation**

that every sugarbeet planter unit in the Red River Valley be equipped with some form of wind protection to insure proper insecticide placement.

**Growers anticipating SBRM problems should consider the following management recommendations:**

1. Use a planting-time granular insecticide application.
2. Apply these insecticides in a 5" band over the row and incorporate the granules.

RECOMMENDED APPLICATION RATES FOR PLANTING-TIME SOIL INSECTICIDES BASED ON EXPECTED SBRM POPULATION LEVEL					
Insecticide	Rate (product/ac) within population level			Timing Options	
	Low	Moderate	High		
Counter 15G <i>RUP</i>	5.9 lb	10.0 lb	11.9 lb	Planting-time or Post	
Chlorfos 15G	10.0 lb	10.0 lb	13.4 lb	Planting-time or Post	
Lorsban 15G	6.7 lb	10.0 lb	13.4 lb	Planting-time or Post	
Temik 15G <i>RUP</i>	6.7 lb	10.0 lb	14.0 lb	Planting-time & Post	

*RUP* - Restricted use pesticide

**The standard application rate (10 lb product/ac) of labeled soil insecticides is recommended in areas where moderate SBRM infestation levels are expected.** This rate should be sufficient if adequate soil moisture prevails after planting. Growers in areas where SBRM populations are expected to be high (Fig. 1.) or in fields adjacent to those where SBRM problems were evident during the preceding year should consider the high labeled rate of their preferred insecticide.

#### **Postemergence Granular Insecticides**

Any of the following conditions can warrant consideration of a postemergence granular insecticide application:

1. Re-seeding of the beet crop (postemergence insecticide is essential)
2. Heavy rainfall follows planting (a second granular application should be considered)
3. **Current-year beets are adjacent to previous-year beet fields (especially where high fly populations had existed in during the preceding growing season)**

When a second application of a granular insecticide is applied, a few important factors must be kept in mind. Incorporation of granules into the soil is essential. If the soil surface is crusted, drag chains will **not** effectively incorporate the insecticide. Moisture is also required in order to move the chemical off the carrier and into the soil. Without rain to activate the insecticide, control provided by the postemergence granule will be marginal. Granules should be applied around late May or early June. If possible, attempt to time your postemergence application ahead of an

anticipated rain.

### **Postemergence Liquid Insecticides**

Postemergence liquid insecticide applications are most beneficial and cost-effective under dry conditions, when SBRM activity is high, and if they are applied within three days of peak fly activity.

The decision to apply Lorsban 4E for fly control and larval suppression following a planting-time granular insecticide should not be made before SBRM fly numbers are determined in specific fields. Observation of posted sticky stake capture data can aid in this determination, however, it is no substitute for actual monitoring of individual fields. If conditions warrant this type of treatment, the following recommendations apply:

1. Apply according to label recommendations (preferably in a band).
2. Make the application prior to peak fly activity.
3. Make only one application per season.

Every effort should be made to help minimize insecticide usage. This can result in direct benefits by reducing production costs, as well as indirectly by minimizing the likelihood of negative impacts on the environment and beneficial organisms. Planting-time granular insecticide applications will, in most cases, provide acceptable control. However, the following factors will need to be evaluated when considering a postemergence insecticide treatment. ***Soil moisture*** - good soil moisture will enhance the effectiveness of planting-time granular insecticides and should result in excellent SBRM control. Postemergence granules work best under adequate moisture conditions, whereas, liquids may yield better results than granules under dry conditions. ***Sugarbeet size at peak fly activity*** - early planted beets may have sufficient root development and size to withstand some maggot feeding without significant stand or yield loss.

Therefore, control from a planting-time granular application may be sufficient. Sugarbeets at the 10- to 14-leaf stages of development or those with an established canopy should be generally large enough to withstand SBRM feeding. This tolerance to feeding damage can be further enhanced by good rainfall during early June and through July. **SBRM population level** - producers are encouraged to monitor radio, DTN, or other media sources for reports on fly activity and population levels during late May and through June. More importantly, growers should monitor individual fields for significant fly activity. Timing of the liquid spray application is critical. Applications made too early or too late will not produce the desired results and will not be cost-effective. To be most successful, the application should be made prior to peak fly activity. Rainfall following the application will enhance insecticide efficacy. If rain is likely within 7-10 days prior to peak fly activity, the insecticide should be made before the rainfall event.

### Insecticides Labeled for Sugarbeet Insect Pests

#### SUGARBET ROOT MAGGOT

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Counter 15G <sup>a</sup> <i>RUP</i>	0.9 – 1.8	5.9 – 11.9 lb (4 – 8 oz/1,000 row ft)	Apply in a 5-inch band or by modified in-furrow at planting time. <b>Do not place in direct contact with seed.</b> Counter 15G may also be banded over the row as a postemergence treatment. Planting-time and postemergence treatments should be incorporated lightly into soil. Only one application may be made per year. Fields must be posted.
Counter CR <sup>a</sup> <i>RUP</i>	0.9 – 1.8	4.5 – 8.9 lb (3 – 6 oz/1,000 row ft)	Apply in a 5-inch band or by modified in-furrow at planting time. <b>Do not place in direct contact with seed.</b> Counter CR may also be banded over row as a postemergence treatment. Planting-time and postemergence treatments should be incorporated lightly into the soil. Only one application may be made per year. Fields must be posted.

Chlorpyrifos Lorsban 15G <sup>a</sup>	1.0 – 2.0	6.7 – 13.4 lb (4.5 – 9 oz/1,000 row ft)	Granules must be applied behind furrow openers and ahead of press wheels as a 5-inch band at planting. <b>Do not apply in-furrow or modified in-furrow.</b> For best results, lightly incorporate behind press wheels with chains or tines. <b>Do not apply granules in direct contact with the seed.</b> The low application rate (4.5 oz/1,000 row ft if using Lorsban or Nufos; 6.5 oz for Chlorfos) should be considered if low infestation levels are expected. If bw rate is applied, monitor for higher than anticipated adult fly numbers. May be applied postemergence in accordance with label directions.
Chlorfos 15G	1.45 – 2.0	10.0 – 13.4 lb (6.5 – 9 oz/1,000 row ft)	
Nufos 15G	1.0 – 2.0	6.7 – 13.4 lb (4.5 – 9 oz/1,000 row ft)	
Lorsban 4E	0.25 – 1.0	0.5 – 2 pt	May be applied in 5- to 7-inch bands or as a broadcast treatment. When banding, apply using a minimum of 6½ gallons of finished spray per acre and <b>do not reduce the dosage for banded applications</b> (i.e., <b>apply the specified broadcast dosage within the band</b> ). Time treatments from 7 days before to 3 days after peak fly activity, and never more than 10-14 days before peak fly. Rainfall or irrigation shortly after application usually improves control. If an organophosphate insecticide was used at planting, make no more than one application of Lorsban 4E per season when adults are active. Field re-entry interval is 24 hours. Fields must be posted. Do not apply more than 8 pt/acre (broadcast basis).
<i>RUP</i>			
Nufos 4E	0.5	1 pt	
<i>RUP</i>			
Mustang 1.5EW <sup>b</sup> (suppression only)	0.05	4.3 oz (0.18 oz/1,000 row ft)	<b>For light to moderate infestations only.</b> Make a 3- to 4-inch 1-band (band over the open seed furrow) at planting in a minimum of 3 to 5 gallons of finished spray per acre. Do not apply more than 0.15 pound active ingredient per acre per season. Field re-entry interval is 12 hours. Fields must be posted.
<i>RUP</i>			
Thimet 20G	1.0 – 1.5	4.9 – 7.5 lb (3.2 – 5 oz/1,000 row ft)	Apply in a 5- to 7-inch band over the row as a postemergence treatment and incorporate lightly into soil. Make only one postemergence application per season. Fields must be posted.
<i>RUP</i>			

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Temik 15G <sup>c</sup>	1.0 – 2.1	6.7 – 14 lb (4.5 – 9.4 oz/1,000 row ft)	Apply at planting time in a 2- to 4-inch band or by modified in-furrow. Banded applications should be incorporated. Do not use in consecutive years or in suspected aggressive soils. For postemergence treatment, apply granules to both sides of row and incorporate immediately. Do not apply within 90 of root harvest or 120 days of top harvest for livestock feeding. Fields must be posted.
	<i>RUP</i>		

**RUP** - Restricted use pesticide

<sup>a</sup>Counter 15G, Counter CR, Lorsban 15G, and Nufos 15G can be used as either planting-time or postemergence treatments but only one application of either insecticide is allowed per season.

<sup>b</sup>Mustang 1.5EW may be applied as a planting-time or a postemergence treatment for various pests; however, total active ingredient applied per acre per season cannot exceed 0.15 pound.

<sup>c</sup>Temik 15G can be applied once at planting and up to twice postemergence per season; however, total product applied per acre per season cannot exceed 33 pounds.

### WIREWORMS

Wireworm larvae are smooth, somewhat hard-bodied worms varying in length from ½ to 1½ inches long. Their color ranges from yellowish-white to a light copper color. They feed on a variety of crops and weeds, and are generally difficult to detect and control. They tend to be more prevalent in light-textured soils or in soil that has been out of production for several years. Frequent cropping and working the soil helps reduce wireworm problems.

**Threshold:** Currently, there is no established threshold for wireworms in sugarbeets. The following insecticides labeled for sugarbeet root maggot control will usually provide adequate protection from wireworm injury. Refer to product labels for more information.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Counter 15G <i>RUP</i>	1.0 – 1.8	5.9 – 11.9 lb (4 – 8 oz/1,000 row ft)	Apply as a 5-inch band treatment at planting time. <b>Do not place in direct contact with seed.</b> Fields must be posted.
Lorsban 15G	1.5 – 2.0	10 – 13.4 lb (6.5 – 9 oz/1,000 row ft)	Lorsban 15G can provide suppression of low to moderate infestations at these rates.
Mustang 1.5EW <i>RUP</i>	0.05	4.3 oz	Apply in-furrow or in a 3- to 4-inch T-band (band over open seed furrow) at planting in a minimum of 3 to 5 gallons of finished spray per acre. Do not apply more than 0.15 pound active ingredient per acre per season. Field re-entry interval is 12 hours. Fields must be posted.

**RUP** - Restricted use pesticide

Do not use lindane or any other chlorinated hydrocarbon insecticide on sugarbeet seed. Check with your company field representatives before treating beet seed with an insecticide.

### CUTWORMS

Major cutworm pests of sugarbeets in the Red River Valley include the Dark-sided and Red-backed cutworms. Eggs of both species hatch into larvae during late May and early June. Early detection of larval feeding activity is essential to a good control program. Fields should be checked for wilting or dead plants at frequent intervals during periods of cutworm activity. Cutworms will generally be found within 1 to 2 inches of the soil surface near the base of wilting plants. Most feeding activity occurs at night. Young sugarbeet plants are often cut off near ground level. During periods of dry weather, larvae prefer feeding just below the soil surface as they move along beet rows; however, they will feed above the surface on beet leaves and stems during periods of excessive soil moisture.

Insecticides generally require some moisture after application for optimal performance. Very light rain showers or even heavy dew at night is generally sufficient. It is desirable to apply insecticides during late afternoon. This procedure maximizes the amount of active insecticide material in the field during the first nighttime hours following application. Bait applications may be repeated as necessary during peak cutworm feeding. Liquid formulations generally provide better control of cutworms, especially during very dry periods. If severe crusting is evident in the field, the crust should be broken up prior to or during the insecticide application.

In 2001, variegated and black cutworm infestations caused problems in late July and August. These insects begin migration into our region as moths during the spring and are capable of multiple generations within a single growing season. Variegated cutworm larvae have a distinctive row of pale yellow spots down the middle of their backs. They are a climbing cutworm species that primarily feeds in the plant canopy during evening hours. Because they feed above ground, insecticide treatment can be effective in controlling economic populations of variegated cutworms. Black cutworms can feed more than 2 inches below ground in later growth stages, therefore, control can be difficult to achieve.

**Threshold:** Control of cutworms in beets is suggested when 4 to 5% cutting of seedlings observed in fields.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Asana XL  <i>RUP</i>	0.03 – 0.05	5.8 – 9.6 fl oz	Do not apply within 21 days of harvest. Do not exceed 0.15 lb ai/acre per season. Apply with a minimum of 2 gallons of water per acre. This application is recommended during the seedling stage.

carbaryl (Sevin)	1.0 – 1.5	1 – 1.5 qt	Do not apply within 28 days of harvest. Up to 2 applications per season are allowed. Do not repeat more often than every 14 days. Do not apply more than a total of 3 quarts per acre per crop.
<b>Chlorpyrifos</b>	1.0	1 qt	Apply by air or ground equipment in sufficient water for good coverage. Do not apply within 30 days of harvest. Do not allow livestock to graze in treated areas nor harvest treated beet tops as feed for meat or dairy animals within 30 days after last treatment. Field re-entry interval is 24 hours. Fields must be posted.
Lorsban 4E			
<i>RUP</i>			
Nufos 4E			Granules must be applied behind furrow openers and ahead of press wheels as a 4 to 5-inch band at planting. <b>Do not apply in-furrow or modified in-furrow.</b> For best results, lightly incorporate behind press wheels with chains or tines. <b>Do not apply granules in direct contact with the seed.</b>
<i>RUP</i>			
Lorsban 15G	1.5 – 2.0	10.0 – 13.4 lb (6.5 – 9 oz/1,000 row ft)	
Chlorfos 15G	1.5 – 2.0	10.0 – 13.4 lb (6.5 – 9 oz/1,000 row ft)	This treatment is suggested for control of variegated cutworm only. Do not apply within 7 days of harvest. Do not feed bps to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.
Lannate LV	0.22 – 0.9	0.75 – 3.0 pt	
<i>RUP</i>			
Lannate SP	0.22 – 0.9	0.25 – 1 lb	This treatment is suggested for control of variegated cutworm only. Do not apply within 7 days of harvest. Do not feed bps to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.
<i>RUP</i>			
Mustang 1.5EW	0.028 – 0.05	2.4 – 4.3 oz	Do not apply within 50 days of harvest (tops or roots). Do not apply more than 0.15 pound active ingredient per acre per season. Apply by air or ground equipment using sufficient water to obtain full coverage of foliage (minimum of 2 gallons/ac by air and 10 gallons/ac by ground). Field re-entry interval is 12 hours. Fields must be posted.
<i>RUP</i>			

**RUP** - Restricted use pesticide



### TARNISHED PLANT (LYGUS) BUGS

Tarnished plant bugs (TPB) have caused late-season injury to Red River Valley sugarbeets since 1998. Most TPB feeding injury appears on new leaves and stems emerging from the crown region of beet plants. Feeding symptoms include curling and wilting of leaves, feeding scars on leaf petioles, and blackening of the new growth near the center of the crown. Multiple generations of TPB can develop during the growing season. Populations usually build up in other host plant habitats, then adults migrate to beets in late-July to mid-August. TPB is a sporadic pest in this region and its biological profile is not understood well enough to anticipate when or where significant infestations may occur in the future.

**Threshold:** Currently, there is no established economic threshold for TPB in sugarbeets. However, after checking 30 to 50 plants in a field and at least one third (33%) of the plants are infested with one or more TPB (adult or nymph stage) and feeding injury is observed, treatment may be justified. They have usually infested beets during August. Therefore consideration of pre-harvest interval may be a critical factor in choosing an insecticide. A number of insecticides that are approved for use on sugarbeets have TPB or *Lygus* as a target pest in their labels for other crops; however, TPB is not listed as a target pest in the *sugarbeet* portion of those labels. These insecticides include Asana, carbaryl (Sevin), Lannate, Lorsban, and malathion. It is legal to apply an insecticide if it is labeled for use in the crop; however, if the target pest is not listed for that crop, efficacy is not implied by the manufacturer and growers that choose to use the product assume their own liability for any unsatisfactory performance.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Dibrom 8	0.94	1 pt	Do not apply within 2 days of harvest. Apply by air or ground equipment. Apply in 1 to 5 gallons of finished spray per acre when treating by air. Do not apply more than 5 pts per acre per season.
Lorsban 4E RUP	0.5	1 pt	Do not apply within 30 days of harvest. Do not apply more than 8 pt/acre per season or make more than 4 applications per season. Field re-entry interval is 24 hours. Fields must be posted.

Mustang 1.5EW      0.028 – 0.05      2.4 – 4.3 oz  
*RUP*

Do not apply within 50 days of harvest (tops or roots). Do not apply more than 0.15 pound active ingredient per acre per season. Apply by air or ground equipment using sufficient water to obtain full coverage of foliage (minimum of 2 gallons/ac by air and 10 gallons/ac by ground). Field re-entry interval is 12 hours. Fields must be posted.

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**RUP** - Restricted use pesticide

### BEET WEBWORM

Beet webworms rarely occur in significant numbers in Red River Valley sugarbeet fields. Larvae are slender caterpillars and they are very active when disturbed. Early-stage larvae are dark green. Older larvae are olive green and have a dark band flanked on each side by two light-colored stripes running down the center of their back. Full-grown larvae can be up to 1½ inches long. Adults are mottled tan and brown moths with smoky grayish wing margins. The moths first appear in late May and early June, and larvae can cause problems during the first 3 weeks of June. A second brood is also possible during late August and September.

**Threshold:** The recommended treatment threshold is 1 to 2 webworms on 50 to 75% of the leaves sampled.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Asana XL <i>RUP</i>	0.03 – 0.05	5.8 – 9.6 fl oz	Do not exceed 0.15 lb ai/acre per season. Apply with a minimum of 2 gal per acre. Pre-harvest interval is 21 days.
carbaryl (Sevin)	1.0 – 1.5	1 – 1.5 qt	Do not apply within 28 days of harvest. Up to 2 applications per season are allowed. Do not repeat more often than every 14 days. Do not apply more than a total of 3 quarts per acre per crop.
Endosulfan EC (Phaser, Thiodan)	0.75 – 1.0	1 – 1.3 qt	Do not apply within 30 days of harvest. Do not feed treated tops to livestock. Re-entry interval is 48 hours. No more than two applications may be made per growing season. Do not exceed applying 2 lb a.i. per year. Fields must be posted.
Lannate LV <i>RUP</i>	0.22 – 0.9	0.75 – 3.0 pt	Do not apply within 7 days of harvest. Do not feed tops to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.
Lannate SP <i>RUP</i>	0.22 – 0.9	0.25 – 1 lb	Do not apply within 7 days of harvest. Do not feed tops to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.

Mustang 1.5EW	0.028 – 0.05	2.4 – 4.3 oz	Do not apply within 50 days of harvest (tops or roots). Do not apply more than 0.15 pound active ingredient per acre per season. Apply by air or ground equipment using sufficient water to obtain full coverage of foliage (minimum of 2 gallons/ac by air and 10 gallons/ac by ground). Field re-entry interval is 12 hours. Fields must be posted.
<i>RUP</i>			
Lorsban 4E	0.5 – 1.0	1 – 2 pt	Do not apply within 30 days of harvest. Field re-entry interval is 24 hours. Fields must be posted. Do not apply more than 8 pt/acre per season or make more than 4 applications per season.
<i>RUP</i>			

**RUP** - Restricted use pesticide

### FLEA BEETLES

The flea beetle most frequently found feeding on beets will be shiny black in color and about 1/8 inch in length. Flea beetles, in general, are oval-shaped with enlarged hind legs. When approached, they jump readily to escape. These insects overwinter as adults and emerge in late April and May. They feed first on suitable weeds and move to field crops as weed hosts are depleted. Foliar feeding injury from flea beetles consists of small, rounded holes, and gives leaves a shot-hole appearance. Severe shot-holing damage can result in stunting, wilting, and even death of seedling plants. Plant responses will be most dramatic during periods of hot, dry weather.

**Threshold:** If flea beetles threaten to reduce sugarbeet plant stands to below 35,000 plants/acre, treatments will be justified.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
carbaryl (Sevin)	1.0 – 1.5	1.0 – 1.5 qt	Do not apply within 28 days of harvest. Up to 2 applications per season are allowed. Do not repeat more often than every 14 days. Do not apply more than a total of 3 quarts per acre per crop.
Lannate LV	0.22 – 0.9	0.75 – 3 pt	Do not apply within 7 days of harvest. Do not feed tops to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.
<i>RUP</i>			
Lannate SP	0.22 – 0.9	0.25 – 1 lb	Do not apply within 7 days of harvest. Do not feed tops to livestock within 30 days of last application. Field re-entry interval is 48 hours. Fields must be posted.
<i>RUP</i>			
Lorsban 4E	1.0	1 qt	Do not apply within 30 days of harvest. Field re-entry interval is 24 hours. Fields must be posted. Do not apply more than 8 pt/acre per season or make more than 4 applications per season.
<i>RUP</i>			
methyl parathion (many trade names)	0.25 – 0.38	0.5 – 0.75 pt	Do not apply within 20 days of harvest 60 days if tops are to be fed to animals. Field re-entry interval is 48 hours. Fields must be posted.
<i>RUP</i>			

Mustang 1.5EW    0.028 – 0.05    2.4 – 4.3 oz  
*RUP*

Do not apply within 50 days of harvest (tops or roots). Do not apply more than 0.15 pound active ingredient per acre per season. Apply by air or ground equipment using sufficient water to obtain full coverage of foliage (minimum of 2 gallons/ac by air and 10 gallons/ac by ground). Field re-entry interval is 12 hours. Fields must be posted.

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*RUP* - Restricted use pesticide

### GRASSHOPPERS

In the northern plains, grasshopper egg hatch normally begins in late April to early May. Most grasshoppers emerge from eggs deposited in uncultivated ground. Sugarbeet growers should expect to find grasshopper feeding first along field margins adjacent to these sites. Beets in fields that follow late-season crops may have hatching throughout the field and should be monitored carefully if adults deposited eggs in the field during the previous fall. Later infestations may develop when grasshopper adults migrate from harvested small grain fields.

**Threshold:** Grasshopper control is advised whenever 20 or more adults per square yard are found in field margins or 8 to 14 adults per square yard are occurring in the crop.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Asana XL <i>RUP</i>	0.03 – 0.05	5.8 – 9.6 fl oz	Do not apply within 21 days of harvest. Do not exceed 0.15 lb ai/acre per season. Apply with a minimum of 2 gallons of water per acre.
Diazinon AG 500 <i>RUP</i>	0.5	1 pt	Do not apply within 14 days of harvest. Tops may be fed to beef and dairy cattle.
Lorsban 4E <i>RUP</i>	0.25 – 0.5	0.25 – 1 pt	Low rate effective on 1st and 2nd instar nymphs. Do not apply within 30 days before harvest. Do not allow livestock to graze in treated areas and do not harvest treated beet tops as feed for meat or dairy animals within 30 days after last treatment.
methyl parathion <i>RUP</i>	0.25 – 0.38	0.5 – 0.75 pt	Do not apply within 20 days of harvest; 60 days if tops are to be fed to animals. Do not enter fields for 48 hours after application. Fields must be posted.
Mustang 1.5EW <i>RUP</i>	0.028 – 0.05	2.4 – 4.3 oz	Do not apply within 50 days of harvest (tops or roots). Do not apply more than 0.15 pound active ingredient per acre per season. Apply by air or ground equipment using sufficient water to obtain full coverage of foliage (minimum of 2 gallons/ac by air and 10 gallons/ac by ground). Field re-entry interval is 12 hours. Fields must be posted.

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Calendar of Sugarbeet Insect Activity in the Red River Valley												
April	May			June			July			August		
	Flea Beetles											
	Springtails											
	White Grubs											
	Wireworms											
				Cutworms - Dingy, Dark-sided, and Redbacked								
				Beet Webworm - adults								
				Beet Webworm - larvae								
					Leafminers							
				Sugarbeet Root Maggot - adults								
				Sugarbeet Root Maggot - larvae								
											Tarnished Plant ( <i>Lygus</i> ) Bugs	

Calendar of Sugarbeet Insect Activity in the Red River Valley												
April	May			June				July			August	
												Cutworms - Black and Variegated
Estimated Price* Ranges for Commonly Used Sugarbeet Insecticides												
Trade Name		Formulation		Unit		Price Range						
Asana XL		0.66EC		gal		\$80.00 – 85.00						
Counter		15G		lb		\$1.60 – 1.75						
Counter CR		20CR		lb		\$2.35 – 2.55						
Lannate		LV		gal		\$45.00 – 50.00						
Lannate		SP		lb		\$17.00 – 20.00						
Lorsban		4E		gal		\$36.00 – 38.00						
Lorsban		15G		lb		\$1.50 – 1.65						
Malathion		57EC		gal		\$24.00 – 26.50						
Mustang		1.5EW		gal		\$180.00 – 200.00						

<b>Estimated Price* Ranges for Commonly Used Sugarbeet Insecticides</b>			
Phaser	3EC	gal	\$23.00 – 25.00
Sevin XLR Plus	4E	gal	\$24.00 – 26.00
Temik	15G	lb	\$3.15 – 3.50
Thimet	20G	lb	\$2.00 – 2.30

\*Prices listed are estimates and may vary depending on payment method (credit or cash), supplier, and time of year.