

## SUGARBEET DISEASE CONTROL

### I. Seedling Diseases / Root Diseases

Seed treatment protects seed from pathogenic fungi associated with the seed otherwise, spores of pathogenic fungi adhere to the seed. When the seed is planted, these pathogenic fungi begin to grow, invade the seed or seedling, and cause a seedling blight. Other fungi live in the soil and may cause seedling problems. Soil-borne *Pythium*, *Aphanomyces* and *Rhizoctonia* fungi can cause serious stand loss when the soil is moist or wet.

Tachigaren seed pelleting is highly effective against *Pythium* at lower rates and *Aphanomyces* at higher rates. Tachigaren persists for only 3-4 weeks and will provide protection only for the emerging seedling; it does not provide protection against mid-season infection. Commercial seed treaters apply tachigaren to sugarbeet seeds. Tachigaren can be used at 20 to 30 grams per unit (100, 000) of seed on minimum buildup pelleted seed, or 45 to 90 grams per unit of seed on standard pelleted seed. Rates greater than 45 gram of tachigaren per unit of seed may cause phytotoxicity. Use rate of 20 to 30 grams of tachigaren is recommended on fields with light to medium disease pressure. Growers with medium disease pressure, however, should be cautioned that use of 20 or 30 gram rate may be inadequate when soil is warm after a heavy rainfall or when these conditions are prolonged within 3 weeks after planting. Use rate of 45 grams of tachigaren is recommended for fields with heavy disease pressure. For season-long management of *Aphanomyces*, the best approach is to apply Tachigaren to varieties with partial resistance to *Aphanomyces*. Early planting and good drainage may also help reduce early

season losses from *Aphanomyces* seedling disease. An *Aphanomyces* soil test should be done to determine if the soil is infected with *Aphanomyces*, and the level of infection.

Rhizoctonia In severely infected fields, plant resistant varieties early, avoid “hilling” soil on sugarbeet crowns, increase the length of rotation, and rotate with non-host crops. Quadris, Vertisan, and Headline applied in-furrow will provide early season control. *Rhizoctonia* may also be controlled by applying Quadris or Proline in a 7 inch band just before infection occurs, or when the average soil temperature at the 4" depth is about 60 to 62 F. Fields with a history of severe disease may need a second post application in warm and wet conditions for season long control.

Rhizomania (Crazy Root) is caused by Beet Necrotic Yellow Vein Virus (BNYVV) that is transmitted by the soilborne protozoan, *Polymyxa betae*. *Rhizomania* is characterized by stunted taproots with masses of hairy lateral roots giving them a bearded appearance. The root is often constricted and the vascular tissues become discolored. The leaves become fluorescent-yellow (with elongated petioles) in color, similar to nitrogen deficiency symptoms. *Rhizomania* may be managed by planting approved resistant varieties early in well drained fields on a 3-4 year rotation. Select high resistance varieties for areas with known history of severe *Rhizomania*.

Fusarium yellows is typically caused by the fungus, *Fusarium oxysporum* f. sp. *betae*. However, recent research suggests that a new *Fusarium* species is also responsible for *Fusarium* of sugarbeet. *Fusarium* yellows may cause seedling death or poor growth and even death of older plants. Symptoms first appear on older leaves as chlorosis (yellowing) between the larger veins. As the disease progresses, younger leaves also become chlorotic, and the older, symptomatic leaves become necrotic. Occasionally, only half a leaf is chlorotic or necrotic (a

symptom more typical of Verticillium wilt, which also was recently identified on sugarbeet in this region). Entire leaves eventually die but remain attached to the plant and collapse in a heap around the crown.

There are no external root symptoms associated with Fusarium yellows. A transverse section through the root shows a grayish brown vascular discoloration. Infection of mature plants may not cause death, but the disease causes significant reduction in root yield and recoverable sucrose. In storage, quality of infected roots may deteriorate more rapidly compared to non-infected roots. The disease is favored by high soil temperatures. Fields that are waterlogged, or with poor soil structure provide favorable conditions for infection. Crop rotation may reduce inoculum buildup in the soil but this practice is unreliable because *F. oxysporum* f. sp. *betae* has a wide host range and chlamydospores survive for many years. Use approved fusarium resistant varieties to manage this disease. See circular PP-1247 for more information on Fusarium yellows of sugarbeet.

## II. Leaf Spots

There are various leaf spot diseases of sugarbeet. Cercospora leaf spot is the most common and destructive disease in this area. The severity of Cercospora varies from year to year depending on weather conditions, inoculum potential, and varietal resistance. Cercospora can cause losses in susceptible varieties through reduced tonnage, reduced sucrose content, increased impurities and poorer storage after harvest when the beets are in piles. Even fairly low levels of leaf spot may cause these effects. Cercospora leaf spot disease severity was low in recent years. Bacterial leaf spot generally does not cause economic damage. Bacterial leaf spot may develop in wet weather; no fungicide is registered for its control. See Circular PP-1244 for a comparison of Cercospora and Bacterial leaf spots in sugarbeet.

Leafspot Management. Management of *Cercospora* requires an integrated approach which includes early incorporation of infected debris, crop rotation, use of varieties that are less susceptible, disease scouting, timely application of fungicide, adherence to appropriate application intervals and more frequent applications when disease conditions are favorable. Avoid planting next to last year's sugarbeet. This is especially important if last year's fields had high levels of *Cercospora*. In high risk situations, select approved varieties that are less susceptible than the average. Begin checking for *Cercospora* in late June or early July, making sure to check near last year's fields or shelter belts. The first fungicide application should occur when conditions first favor disease or at disease onset.

If the first application is late, control will be difficult all season, even if shorter than normal application intervals are used once applications start. When conditions favor disease, or disease is already prevalent, fungicide applications must be more frequent than when disease pressure is low.

Resistance and Tolerance to Fungicides. The terms "resistance" and "tolerance" are often used interchangeably. However, in the following discussion they are used with specific different meanings. Resistance is used to indicate that the *Cercospora* fungus is unaffected by a level of fungicide that previously prevented growth in the laboratory. Tolerance is used to indicate that growth of the *Cercospora* fungus is reduced in the laboratory by a level of fungicide that previously prevented growth in the laboratory. Resistant isolates of *Cercospora* are not controlled by field applications of a fungicide. If tolerant strains are present, a reduced level of control will occur.

The systemic fungicide thiophanate methyl (benzimidazole) has federal registration for *Cercospora* control, and is in the benzimidazole class of fungicides. Thiophanate methyl can be used in a tank mix with TPTH, but only once in a season. The tank mix should be used as the first or second fungicide application.

Benzimidazole resistant isolates grow normally in the laboratory in the presence of 5 ppm (part per million) of benzimidazole fungicide. Sensitive isolates do not grow at all in the presence of 5 ppm of benzimidazole fungicide. Some isolates of the *Cercospora* fungus have been found that were resistant to the benzimidazole class of fungicide and tolerant to TPTH.

Strains of *Cercospora* with tolerance to TPTH were confirmed for the first time in southern Minnesota and the southern Red River Valley in 1994. Tolerance was detected in fields where control was not as good as expected. Such tolerance is difficult to distinguish from inadequate application technique or a late start in application. Tolerance is best defined as an ability of the fungus to grow in the laboratory in the presence of TPTH at 0.2 ppm or at 1 ppm. Sensitive strains do not grow at all when subjected to these levels of TPTH, but tolerant strains grow at a reduced rate compared to growth in the absence of TPTH. Effective fungicides from different classes should be alternated to delay the development of tolerant or resistant strains of the pathogen.

**Managing Cercospora Leaf Spot with Fungicides.** The fungicides, Headline, Gem (strobilurins), Proline, Inspire XT, Eminent (triazoles), TPTH, and mixtures of TPTH and Topsin, TPTH or Topsin with the triazoles or Headline, used in a rotation program, will effectively control Cercospora leaf spot. In mixtures, individual fungicides should be used at least at 0.8 times their labeled full rates or at full rates.

The first fungicide used for Cercospora control in 2013 should not be the same fungicide, or a fungicide from the same class of chemistry as the last fungicide application in 2012.

If aerial application is made, make sure that areas around power lines and trees are side-dressed by use of ground equipment. Aerial applicators should use a minimum of 5 gal water/A; 7-10 gal/A gives better coverage. Improperly sprayed areas become focal points for Cercospora spread. Best results with ground equipment are obtained by using high pressure (100-120 psi) and high volume (20 gal/A) of water.

**Pre-harvest Intervals (PHI).** Fungicides may be needed well into September to control Cercospora in some years; stopping application of fungicides before this time may result in late-season damage that can reduce tonnage, sucrose and quality. Do not allow the PHI to be an excuse for missing an application late in the season. It may be preferable to spray a field but leave the headland and a strip (or strips) in the middle untreated, thereby allowing pre-harvest in untreated areas.

**Application Intervals.** Generally, the application interval for most of the fungicides recommended is 14 days.

Variety Selection and Cercospora Management. There are differences in Cercospora susceptibility among approved varieties. Cercospora may be somewhat easier to manage on varieties with higher than average tolerance to Cercospora. Conversely, varieties that are more susceptible than the average may need an extra fungicide application in years that are highly favorable for Cercospora. Use of more tolerant varieties can be an important part of an integrated disease management plan.

Powdery Mildew Control: The triazoles, strobilurins, and sulfur fungicides will provide effective control. See circular PP-967 for more information on powdery mildew.

FOLIAR SPRAYS - LEAFSPOTS

Fungicide and Estimated Cost	Label Rate	Harvest Restrictions (PHI)	Remarks
Strobilurins			
Azoxystrobin Quadris \$/A=25.71-44.28	9.0-15.5 fl oz/A	May be applied up to harvest (0 d PHI). Re-entry interval (REI) - 4 hr	Always alternate with a non- strobilurin fungicide. Effective for 14 days.
Pyraclostrobin Headline \$/A= 27.38 – 36.51	9-12 fl oz/A	7 d PHI REI - 4 hr	Always alternate with a non- strobilurin fungicide. Effective for 14 days.
Trifloxystrobin Gem \$/A= 26.95	3.5 fl oz/A	21 d PHI REI - 12 hr	Always alternate with a non- strobilurin fungicide.
Triazole Eminent \$/A = 15.79	13 fl oz/A	14 d PHI REI - 12 hr	Always alternate with a non-triazole fungicide.
Inspire XT \$/A = 17.93	7 fl oz/A	21 d PHI REI - 12 hr	Always alternate with a non- triazole.
Proline \$/A = 23.59	5 fl oz/A	7 d PHI REI - 48 hr	Alternate with a non-triazole fungicide
Enable 2F \$/A= 13.65	8 fl oz/A	14 d PHI	Alternate with a non-triazole fungicide

FOLIAR SPRAYS - LEAFSPOTS

Fungicide and Estimated Cost	Label Rate	Harvest Restrictions (PHI)	Remarks
Benzimidazole Topsin M WSB	0.5 lb/A	Do not apply within 21 days of harvest (21 d PHI).	Resistance to benzimidazole fungicides is common. Use only in a tank mix with a protectant
Thiophanate Methyl 85 WDG	0.4 lb/A		
Topsin M4.5F \$/A =4.33	10 fl. oz/A	REI - 12 hr	Do not exceed 1 application/year. See text.
EBDC Mancozeb Manzate 75 DF	1.5-2 lb/A	Do not apply within 14 days of harvest (14 d PHI). REI - 24 hr	Effective for about 7-10 days. Do not enter treated areas within 24 hours without protective clothing
Penncozeb DF \$/A =6.03-8.04	1.5-2 lb/A		

FOLIAR SPRAYS LEAFSPOTS

Fungicide and Estimated Cost	Label Rate	Harvest Restrictions (PHI)	Remarks
Triphenyl Tin Hydroxide (TPTH) Super Tin 80WP	3.75 -5 oz/A	Do not graze or feed beet tops to livestock. REI - 48 hr. 7 d PHI	Restricted use pesticide. Use 5 oz/A rate. Do not enter treated fields within 48 hours of treating without protective clothing.  Do not exceed 15 oz/A of TPTH 80 WP per season. Ground application must be with closed cabs.
Agri Tin Super Tin 4L \$/A=5.38 – 7.17	6-8 fl oz/A		

The following are registered fungicides used for controlling Cercospora leaf spot and their class of chemistry:

<b>Strobilurins</b>	<b>Sterol Inhibitors</b>	<b>Ethylenebisdithiocarbamates (EBDC)</b>
Gem	Eminent	Mancozeb
Headline	Enable	Penncozeb
Quadris	Tilt	
	Proline	
	Inspire XT	
	Topguard	
<b>Benzimidazole</b>		<b>Triphenyltin Hydroxide (TPTH)</b>
Topsin M		SuperTin
		Agri Tin

PS: Products must be labeled before they can be used for controlling diseases on sugarbeet.

### Rhizoctonia Root Rot Control

Fungicide and Estimated Cost \$/A	Label Rate/A	Harvest Restrictions (PHI)	Remarks
Quadris \$23.72-39.70	9.2-14.3 fl oz	May be applied up to harvest (0-d PHI).  Re-entry interval (REI) - 4 hr	<u>In-furrow application for 22" rows</u>
Headline \$23.55	9-12 fl oz	7-d PHI	In-furrow application
Quadris \$23.72-39.70	9.2-16.6 fl oz	0-d PHI	<u>7" band application in 22" rows before average soil temp. at 4" depth reaches 65 F.</u>
Proline \$24.51	5.7 fl oz + NIS 0.125% v/v	May be applied to 7-d PHI	7" band application before average soil temp. at 4" depth reaches 65 F.