



MICHIGAN SUGARBEET REACH

Research & Education Advisory Council

Management Guidelines for Controlling Cercospora Leafspot in Sugarbeets - 2016

Cercospora leafspot (*Cercospora beticola*) is the most serious foliar disease of sugarbeets in our growing region. Uncontrolled Cercospora can cause yield losses of 5 or more tons per acre and reduce sugar levels by up to 3 percentage points. Yield and quality losses can be expected when leaves have 1 or more spots per square inch.

The introduction of more tolerant varieties, improvements in BEETcast, advances in sprayer technology and improved communication of research information to growers have all contributed to an improvement in Cercospora control in our area. However, the development of resistance to strobilurin fungicides (Headline, Priaxor, and Gem) has made leaf spot control more difficult.

DISEASE DEVELOPMENT

Cercospora leafspot overwinters in the soil on decomposing beet leaves from previous sugarbeet crops and on weed residues. When conditions are favorable (**high temperatures and humidity**) spores are produced which infect leaves, creating necrotic spots that are from 1/8 to 3/16 inches in diameter. The centers of spots appear ashen grey with tiny black dots (Figure 1) and a dark brown to purple ring forms around the spot. Spores from these “dots” are released which re-infect the plants. **Daytime temperatures between 75 - 90 degrees F with night temperatures above 60 degrees, coupled with wet leaves (from dew or rain) for 10-12 hours or more create Cercospora infections. Temperatures approaching 95 degrees slow Cercospora development significantly.** It generally takes about a week to 10 days for spots to form after the leaves are infected. Newly formed spots are very small but increase in size within 2-3 days. Without control measures entire leaves can become covered with spots which merge together killing large sections of leaves or entire leaves (Figure 2).

MANAGEMENT STRATEGIES

Effective control of Cercospora leafspot in

Figure 1 - Black
fruiting bodies

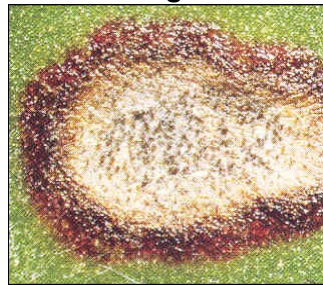


Figure 2 - Damaged



sugarbeets requires an integrated and intensive approach. The following factors should be considered when developing a Cercospora leaf spot control program:

- 1. Crop Rotation:** A longer rotation will benefit your Cercospora control program. Common weeds such as pigweed and lambsquarter also harbor the disease so they need to be controlled in rotational crops.
- 2. Variety Selection:** A few approved varieties have good Cercospora tolerance, and several others are moderately tolerant. However, some varieties (i.e. nematode tolerant) are susceptible to Cercospora (Table 1) and need more intensive management.
- 3. Cercospora Risk Zones:** We have 3 distinct Cercospora Risk Management Zones (Table 2). Red Zones have a high risk of Cercospora infestations, Yellow Zones are at a moderate risk and Green Zones have a lower disease risk. Growers in Red Zones need to pay particular attention to Cercospora, especially when planting susceptible varieties.
- 4. Fungicides:** The supply of effective fungicides are limited (Table 3). Inspire XT and Topguard (triazole fungicides) are the most effective fungicides available for Cercospora control in sugarbeets. Proline, Eminent VP, Minerva and Enable (all Triazoles) are somewhat less effective than Inspire and Topguard. Eminent VP and Minerva are essentially the same product, however, Miner-

va Duo is a mixture of Minerva and Super Tin. Triazoles are absorbed by the plant and are rain-fast when dried on the leaf. Triazoles move within the leaf and protect the upper and lower leaf surfaces, however, they do not move from leaf to leaf. Always tank mix triazole fungicides with an EBDC or copper and rotate fungicide classes properly. Protectant fungicides (Super Tin, EBDCs and coppers) are not absorbed by the leaves and are susceptible to being washed off by rainfall. Spray coverage is more important for protectants because they are not systemic. Super Tin is somewhat inferior to the triazole fungicides but is significantly better than EBDCs and coppers. The EBDCs (Manzate, Dithane, etc.) will control Cercospora but do not have long residual activity and are most useful in tank mixes and as alternate sprays so that Triazoles and Super Tin are not used back to back. In general, coppers are slightly less effective than EBDCs, however, coppers can be applied up to the day of harvest. The EBDCs and coppers are more likely to plug sprayers than are Super Tin and the triazoles. Some copper formulations mixed with Glyphosate have caused leaf burning issues. The strobilurin fungicides (Headline and Gem) and Topsin M have high levels of resistance and are not recommended.

5. Application Timing: To provide effective Cercospora leaf spot control, fungicide applications need to be applied before spots appear on leaves. Yield losses will likely occur if the initial application is delayed until after spots are found in the field. The BEETcast predictive model has been effective in timing the initial application 7 to 14 days before spots appear. Spots normally occur in the low 70's DSV range in Red Zones, in the low 80's in Yellow Zones and in the late 80's to early 90's in Green Zones. Fifty weather stations throughout the growing region provide leaf-spot spray recommendations (and other information) for the Cooperative. Daily and cumulative disease severity values (DSV's) are posted on the website www.MichiganBeets.com. A risk management map shows the Cercospora risk for different parts of the growing region. This map is color coded with Red = high risk; Yellow = moderate risk and Green = lower risk. Follow-up applications should be determined by the shorter of BEETcast DSV's or pesticide label reapplication day intervals (see Table 2).

APPLICATION TECHNIQUES

Good spray coverage is needed to provide adequate leaf spot control. Sprayers should put out at least 20 gpa and pressure should be near 100

psi. Aerial applications provide effective leafspot control. Cercospora fungicide applications are less effective when spraying wilted beets or leaves that are wet enough to cause the fungicide to run off. Protectant fungicides need better coverage than fungicides that penetrate into the leaves (i.e., triazoles).

RESISTANCE MANAGEMENT

In order to maintain the effectiveness of the fungicides that we depend upon, **the same fungicide class should never be applied back to back. It is important to tank mix triazole fungicides with EBDCs or copper.** Utilizing Super Tin in the rotation will make it possible to follow a sound resistance management program. Cercospora has developed resistance to Headline, Priaxor, and Gem (strobilurin fungicides) and to Topsin M. Lab results indicate that the triazole fungicides are in the early stages of developing resistance. To reduce the chance of resistance developing, always tank mix the triazoles with an EBDC or copper and rotate fungicide classes.

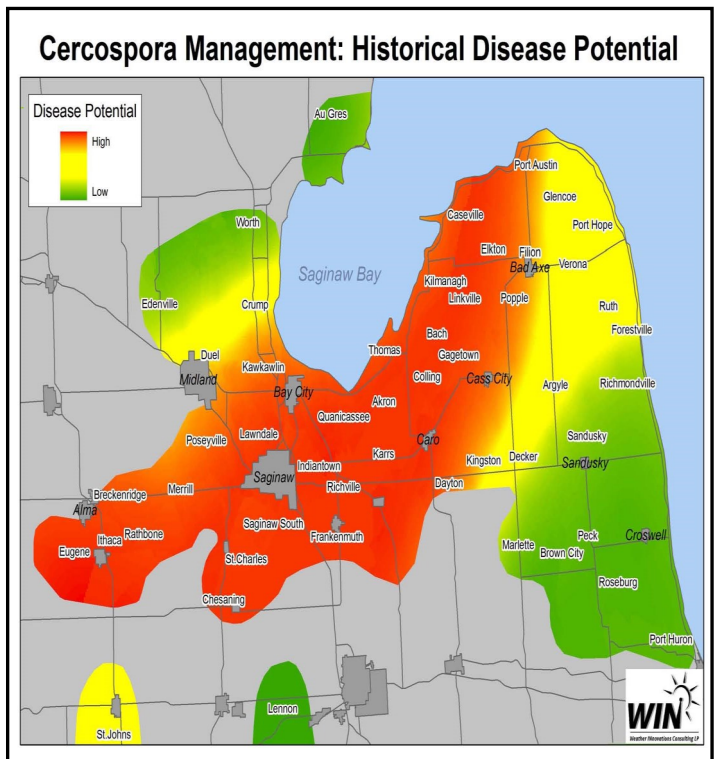
Table 1. Variety Tolerance to Cercospora Leafspot (% of Checks)

Variety	Tolerance	% Check
B-1399	Tolerant	78.9
C-RR202	Tolerant	84.0
HM-28RR	Moderately Susceptible	93.0
HM-173RR	Moderately Susceptible	93.9
SX-RR1243	Moderately Susceptible	95.0
C-RR059	Moderately Susceptible	95.4
C-G351NT	Moderately Susceptible	97.5
HM-9616RR	Moderately Susceptible	97.5
SX-RR1235N	Moderately Susceptible	101.2
SX-RR1245N	Moderately Susceptible	102.9
HM-NT9607RR	Moderately Susceptible	103.2
B-12RR2N	Moderately Susceptible	104.0
B-18RR4N	Susceptible	105.2
SX-1212RR	Susceptible	105.4
SX-1228RR	Susceptible	108.2
B-133N	Susceptible	109.6
HM-NT9617RR	Susceptible	110.8
C-G333NT	Susceptible	112.6
SX-1211N RR	Susceptible	113.1
B-149N	Susceptible	117.1

Table 2: Cercospora Fungicide Application Guidelines Utilizing BEETcast and/or Label Days

Red Zone (High Cercospora Risk)				Yellow Zone (Moderate Cercospora Risk)			
Cercospora Fungicide Application Timings Based on BEETcast DSV's and Fungicide Label (Days)				Cercospora Fungicide Application Timings Based on BEETcast DSV's and Fungicide Label (Days)			
Varietal Tolerance to Cercospora	Tolerant Variety	Moderately Susceptible Variety	Susceptible Variety	Varietal Tolerance to Cercospora	Tolerant Variety	Moderately Susceptible Variety	Susceptible Variety
	< 90% ck	90 - 105% ck	> 105% ck		< 90% ck	90-105% ck	> 105% ck
1st App. (DSV)	55	50	45	1st App. (DSV)	60	55	50
Re-apply (DSV's or Number of Days)				Re-apply (DSV's or Number of Days)			
Triazoles + EBDC or Copper	45 DSV or 21 days	40 DSV or 21 days	35 DSV or 21 days	Triazoles + EBDC or Copper	55 DSV or 21 days	50 DSV or 21 days	45 DSV or 21 days
Tin + EBDC or Copper	35 DSV or 14 days	30 DSV or 14 days	25 DSV or 14 days	Tin + EBDC or Copper	45 DSV or 14 days	40 DSV or 14 days	35 DSV or 14 days
EBDC or Copper	21 DSV or 10 days	18 DSV or 10 days	15 DSV or 10 days	EBDC or Copper	25 DSV or 10 days	21 DSV or 10 days	18 DSV or 10 days
Headline, Priaxor, Gem and Topsin	Not Recommended Due to Resistance			Headline, Priaxor, Gem and Topsin	Not Recommended Due to Resistance		

Green Zone (Low to Moderate Cercospora Risk)			
Cercospora Fungicide Application Timings Based on BEETcast DSV's and Fungicide Label (Days)			
Varietal Tolerance to Cercospora	Tolerant Variety	Moderately Susceptible Variety	Susceptible Variety
	< 90% ck	90-105% ck	> 105% ck
1st App. (DSV)	65	60	55
Re-apply (DSV's or Number of Days)			
Triazoles + EBDC or Copper	60 DSV or 21 days	55 DSV or 21 days	50 DSV or 21 days
Tin + EBDC or Copper	50 DSV or 14 days	45 DSV or 14 days	40 DSV or 14 days
EBDC or Copper	30 DSV or 10 days	25 DSV or 10 days	20 DSV or 10 days
Headline, Priaxor, Gem and Topsin	Not Recommended Due to Resistance		



SPRAY PROGRAMS: Depending on: BEETcast risk management zone, Cercospora variety resistance, fungicides selection, application timeliness, a number of effective spray program combinations can be utilized. Suggested effective spray programs from MICHIGAN SUGAR would be:

Three applications-(1) Triazole + EBDC or copper (2) Tin + EBDC (3) Triazole +EBDC or Copper

Four applications- (1) Triazole + EBDC or copper (2) Tin + EBDC (3) EBDC *alone (4) Triazole +EBDC or Copper

Five applications- (1) Triazole + EBDC or copper (2) Tin + EBDC or Copper (3) EBDC *alone (4) Triazole +EBDC or Copper (5) EBDC alone

* In a situation where Cercospora Leaf Spot has been difficult to control, start “early” (35 DSV’s), with an EBDC. Then push back the regular 1st applic. by 5 DSV’s and follow the re-treatment schedule.

* Depending on the level of resistance to strobilurin fungicides, tank mixing EBDCs with a strobilurin or biological (Ballad Plus) may or may not improve effectiveness of a EBDC alone.

Table. 3 Fungicides Information for Cercospora Leafspot Control

Fungicide	Formulation	Fungicide Class	Rate/A	Control Rating	Re-Entry (hours)	PHI (days)
Inspire XT*	EC	Triazole	7 fl oz	Good +	12	21
Topguard*	EC	Triazole	14 fl oz	Good +	12	21
Minerva Duo Δ	SC	Triazole and Tin	16 fl oz	Good +	48	21
Minerva/Eminent VP*	SL	Triazole	13 fl oz	Good	12	14
Proline + NIS*	SC	Triazole	5.7 fl oz	Good	48	7
Enable + COC*	EC	Triazole	8 fl oz	Good	12	14
Super Tin/ Agri Tin* Δ	FL	Tin	8 fl oz	Good -	48	21
Super Tin/ Agri Tin* Δ	WP	Tin	5 oz	Good -	48	21
Manzate***	FL	EBDC	1.6 qt	Fair	24	14
Dithane***	FL	EBDC	1.6 qt	Fair	24	14
Koverall	DF	EBDC	2 lb	Fair	24	14
Pencozeb	DF	EBDC	2 lb	Fair	24	14
Cuprofix**	DF	Copper	2 lb	Fair	48	0
Kocide 3000**	DF	Copper	2 lb	Fair	24	0
ChamplON**	DF	Copper	2 lb	Fair	48	0
Badge SC**	SC	Copper	2.1 pt	Fair	48	0
AGRILIFE**	Sol	Copper	38 fl oz	Fair	48	0
Ballad Plus	SC	Biological	2 - 4 qt	Poor	4	0
Priaxor****	SC	Strobilurin	8 fl oz	Resistance	12	7
Headline****	EC	Strobilurin	9.2 fl oz	Resistance	12	7
Gem****	SC	Strobilurin	3.6 fl oz	Resistance	12	21
Topsin M****	FL	Benzimidazole	20 fl oz	Resistance	12	21

* Tank mix with EBDC or Copper.

** Some Copper products cause leaf injury when mixed with Glyphosate (not recommended)

*** Dry flowable formulations are available (2 lbs/acre).

**** Not recommended. High levels of resistance exist throughout our growing region - however, the level of resistance will not be the same for all fields.

Δ Do not add any surfactants, stickers, spreaders, buffers or EC formulations.