

Sugarbeet Advancement



*Partnership Of:
Sugar Beet Growers
Michigan Sugar Company
Michigan State University
Agribusiness*



CERCOSPORA LEAFSPOT: IDENTIFICATION AND CONTROL

Cercospora Leafspot fungus (*Cercospora beticola* Sacc.) causes one of the most widespread, destructive and economically significant diseases to sugar beets in the world.

SPECIAL EDITION NEWSLETTER 2006



**Cercospora Leafspot
with black fruiting
bodies**

“... Early attacks occurring in July to August impact growth in terms of both tons per acre and sugar content.”



Uncontrolled Cercospora reduced yield by three tons per acre and sugar content by 1.8%

NATURE OF THE INJURY

The Cercospora leafspot fungus feeds on the sugar beet's sap, infecting portions of outer (older) leaves first. Subsequent loss of the whole leaf (or large leaf portions) interferes with normal root growth and sugar accumulation; decreased photosynthetic capacity lowers yield and sugar content. These are further lowered by energy expended to grow new leaves. The unnatural demand upon the sugar beet for new foliage prevents normal root development and sugar storage. This results in reduced yield, sugar content and juice purity of the root.

The degree to which yield, sugar and juice purity are reduced depends on the severity; prolongation of the leafspot attack; and the time in the season when it occurs. Early prolonged attacks are the most damaging. Early attacks occurring in July into August impact growth in terms of both tons per acre and sugar content; late August and September attacks have more impact on sugar storage than on yield. A severe attack will reduce both yield and sugar content significantly. At harvest, the economic threshold occurs when 3% of the leaf surface is covered with spots.

PATHOGEN

The most common source of infection is the remains of diseased sugar beet leaves left in the field. Prior year's residue harbors over-wintering stromata, which form conidia. These conidia

produce spores which enter the leaves through the stomata. Once inside intracellular spaces, spores continue to propagate, release toxin (cercosporin) and cause "leaky" cells.

Infection may also come from other host plants such as common lamb-quarters, redroot pigweed, curly dock, prickly lettuce and dandelion. Splashing rains and to some extent, wind, are additional means of spreading the disease.

CAUSE

Increased incidence of Cercospora leafspot is favored by high temperatures and periods of high humidity or free moisture on the leaves (i.e. rain showers, heavy dews, lingering fog or saturated soils). Environmental conditions for Cercospora to develop rapidly are day (air) temperatures of 75° F to 95° F accompanied by night (air) temperatures above 60° F, coupled with greater than 90% relative humidity. Very little infection occurs below 59° F. Ideal growth conditions are 80° F to 90° F air temperature with greater than 96% relative humidity for more than 8.5 hours (10 to 12 hours per day for three to five days). Actual visual symptoms (spots) do not develop until 5 to 21 days later. This fungus does not need sunlight to grow; it can grow in the dark.

SYMPTOMS

Recent research indicates at 77-82° it took ten days to see symptoms from the time of infection. First visible

symptoms of Cercospora are extremely small whitish spots on leaves. These spots rapidly increase in size, becoming brownish or bright purple in color, possibly in 2-3 days. Spots are scattered over the leaf surface, occurring less frequently on the stems.

First individual spots are nearly circular in outline, but become united with other spots in increasing numbers. Mature spots are 1/8 inch in diameter with border colors ranging from brown to purple. Spot centers appear ashen gray due to the many spores with small black "specs" scattered throughout (See Picture on page 6).

When spots become numerous, leaves gradually turn yellow and finally turn brown and die. Dead leaves shrivel, but remain firmly attached to the crown making defoliation more difficult at harvest.

CONTROL

Control measures for Cercospora leafspot include cultural, resistant varieties and chemical. One of the most effective cultural means to decrease leafspot infection is crop rotation. Cercospora leafspot does not attack field crops unrelated to sugar beets. A three or more year rotation coupled with clean plowdown of crop residues effectively reduces inoculum from most fields. When planting this year's crop, do not overlap into last year's beet field. Do not move inoculum from last year's sugar beet field into this year's field with secondary tillage implements.

All varieties approved for the 2006 planting season in the Great Lakes growing region have some tolerance to leafspot, thanks to the sugar beet breeders. Variety (regular and specialty) tolerance ratings for Cercospora Leafspot resistance are as follows: C-355 is **EXCELLENT**. B-5310, HM-7172RZ, HM- 2771RZ, HM-2767 and C-442 are **VERY GOOD**. C-271, C-963 and HM-2761 are **GOOD**. B-4381R, B-5833, HM-74RZ, HM-2763RZ and B-5451 are **FAIR**. B-5411R, HM-73RZ and B-5800R are **POOR**.

ECONOMIC THRESHOLD

Do not delay the first fungicide application beyond when you first see leafspot in July or August, especially if the forecast states temperatures will stay in the optimum range coupled with high humidity. Control measures are normally justified until early-mid September, depending on environmental conditions and anticipated harvest date.

Both systemic and contact chemical options are available to control Cercospora leafspot in sugar beets. Systemic compounds give longer control with 14 to 21 days before the next application. Contact (protectants) compounds must be applied more often, but are less costly.

Coverage is critical with fungicide applications; fungicides need to penetrate to the new growth in the plant's crown. **Higher gallonage (20-40 GPA) coupled with 100 to 120 PSI pump**



Late Cercospora Infection Causing Reduced Quality. (Unsprayed)

"...Recent research indicates at 77–82° it took ten days to see symptoms from the time of infection."



Excellent Leafspot Control / Healthy Foliage. (Sprayed Two Times)

Continued on Page 4.....

ECONOMIC THRESHOLD

Continued from Page 3



Unhealthy Foliage (Browning) can Reduce Yield and Quality

“Timing of first spray should never be delayed beyond first spot in the field.”



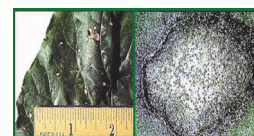
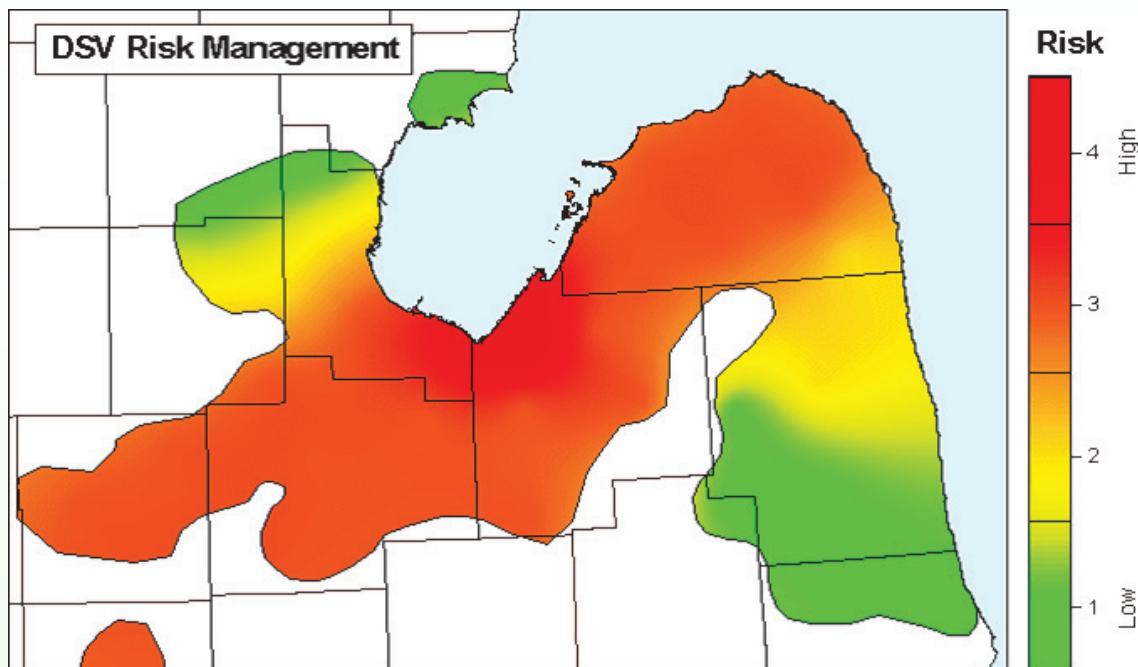
Cercospora Resistant Variety Compared to a susceptible

pressures (80 to 100 PSI at the nozzle) are best for fungicide applications, especially protectants. An aerial (airplane) application will provide some good protection (≥ 5 GPA). Always apply fungicides to dry leaf surfaces, reducing the likelihood of run-off. Do not spray “FLAT” (dry-wilted) beets. In addition, make sure spray water pH is less than 7.0. Water sensitive paper should be used to check penetration into the sugar beet canopy. Fungicide costs, recommendations, schedules, etc. are listed on the next page.

Fungicides are quite effective, if applied correctly. Economical threshold for chemical control is dependent on four conditions: timing of infection, level of infection, weather forecast and variety. Control recommendations can also be made from a weather model called “BEETCAST” in Michigan. Begin scouting early-planted fields with less tolerant varieties at canopy closure **OR** July 1st. Full canopy will occur in narrow rows before wide rows. Check places with little or no air movement first (i.e. next to cornfields, woodlots or creek bottoms). If the first Cercospora spot is visible anywhere in the field, it is economically justified to begin the first fungicide application. **TIMING OF FIRST SPRAY SHOULD NEVER BE DELAYED BEYOND FIRST SPOT IN THE FIELD.**

BEETCAST 2006

Beetcast is a Cercospora leafspot disease forecasting model available through Michigan Sugar Company. BeetCast uses temperature and leaf wetness to create a disease severity value (DSV) that models *Cercospora beticola* growth and development. Disease management recommendations have been modified to reflect the risk of Cercospora leafspot disease severity for the Michigan Sugar Company growing region. This risk is represented by a color coded map (**see map on following page**). Areas which consistently have **high levels of disease** are considered **high risk** and are colored **red and orange**. Areas with **moderate levels of disease** are considered **moderate risk** and are colored **yellow**. Areas with **lower levels of disease** are considered low risk and are colored **green**. Growers in the red and orange areas of the map should apply fungicides at 55 DSV intervals for maximum economic return. In the red area, applying fungicides first at 55 DSV's then at 35 DSV intervals have also produced high levels of economic return from leafspot management in some years. Growers in the yellow region of the map should apply fungicides at 70 DSV intervals or shorter. Applying fungicides at 55 DSV intervals have also resulted in high economic return in these areas. Growers in the green region are advised to follow one of the two scenarios. Make the first fungicide application when first spots appear in the area or 80 DSV's, which ever is first. The



Typical Cercospora Lesion

subsequent applications should be made every 55 DSV's. Inoculum levels appear to be lower in the green zone, resulting in the delay of leafspot development compared to the other regions. Once the disease is in the area, it develops at a rate similar to the other regions. Growers should contact their Michigan Sugar Company Agriculturalist to develop a leafspot management program that works best for their farm.

RESISTANCE MANAGEMENT

Michigan Growers are fortunate to have several very effective fungicides for control of Cercospora Leafspot. In order to maintain the effectiveness of the products, it is recommended to always rotate fungicides and fungicide classes. **The best strategy would be to use each fungicide class only once in your leafspot spray program.**

Currently, some level of fungicide

resistance has been identified with Topsin (Benzimidazole). To reduce the chance of Cercospora developing further fungicide resistance, apply Topsin only ONE time each year; Topsin must be tankmixed with unrelated type compounds such as EBDC, Tin or Copper; **NEVER** apply the same fungicide(s) or fungicide classes consecutively. **If Amistar/Quadris was applied for Rhizoctonia control after the four leaf stage, rotate to non-strobilurin fungicide for the first leaf spot application.**

BEETCAST

Growers, in Michigan, can access BeetCast on the website www.michiganbeets.com and, in Ontario, on the website: <http://www.ownweb.ca/lib/beetcast.cfm>.

“The best strategy would be to use each fungicide class only once in your Leafspot spray program.”

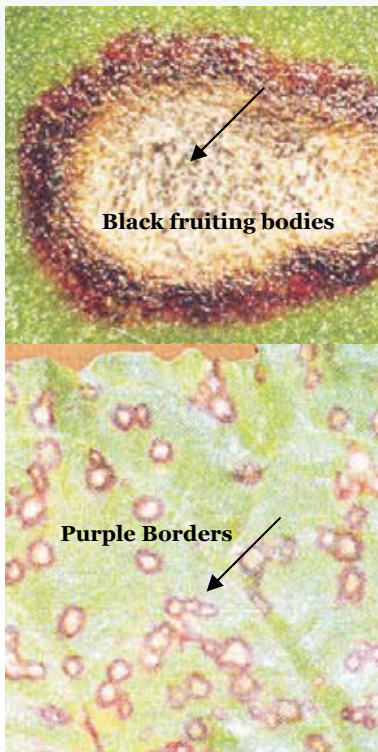


Complete Defoliation from Cercospora

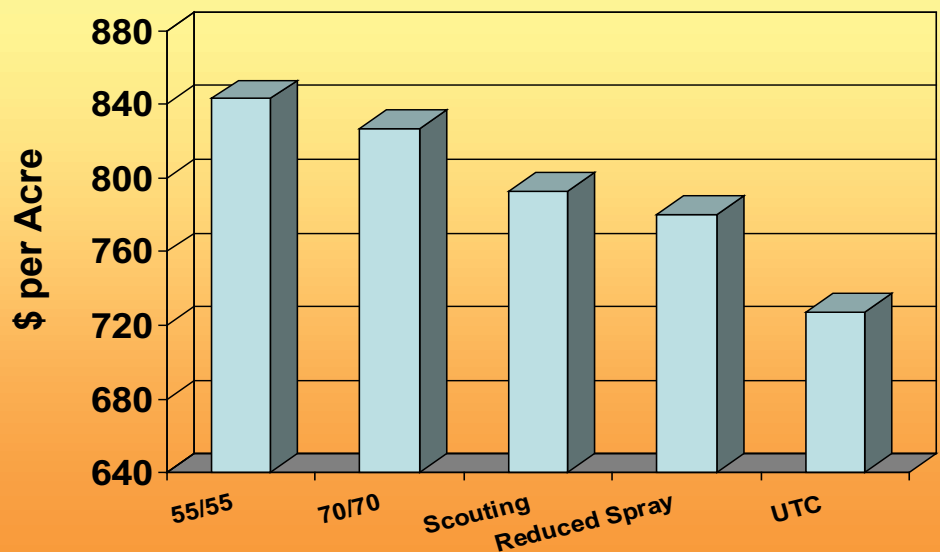
Michigan Sugar Company Fungicide Ratings and Information Sheet—2006

Fungicide	Chemical Class	Resistance Potential	Type of Activity	Cercospora Control	Rhiz Control
Headline	Strobilurin	Very High	Translaminar	Excellent	Fair
Eminent	Triazole	High	Systemic	Excellent	NA
Gem	Strobilurin	Very High	Translaminar	Excellent (-)	Fair/Good
Topsin+EBDC	Benzimidazole	Very High	Systemic + Contact	Good ¹	NA
Tin Products	Triphenyltin Hydroxide	Moderate	Contact	Good (-)	NA
Amistar Quadris	Strobilurin	Very High	Slightly Systemic	Good (-)	Excellent
EBDC	Ethylenebisdithiocarbamate	Low	Contact	Fair Short Residual	NA
Copper	Copper Hydroxide	Low	Contact	Fair Short Residual	NA

¹ Documented Laboratory Resistance to Topsin



Net Return from Cercospora Leafspot Management Average of 8 trials



Cercospora Leafspot Fungicide Costs***

Fungicide	Rate	Cost (\$/A)*	Appl Int (days)	Cost \$/A/day	REI (hours)	PHI (days)
Eminent	13.0 oz/A	\$ 17.94	14-21	1.28 (.85)	24	14
Headline	9.2 oz/A	\$ 17.31	14	1.24	12	7
Gem	7.0 oz/A	\$ 22.86	10-14	2.29 (1.63)	12	21
Gem (w/Rebate)	7.0 oz/A	\$ 15.86	10-14	1.59 (1.13)	12	21
Amistar	3.0 oz/A	\$ 17.57	10-14	1.76 (1.26)	4	0
Quadris	9.6 oz/A	\$ 19.87	10-14	1.99 (1.42)	4	0
Supertin	5.0 oz/A	\$ 11.60	10-14	1.16 (.83)	48	21
Agritin	5.0 oz/A	\$ 11.60	10-14	1.16 (.83)	48	21
Topsin M + TPTH	.5 lbs./A + 4.0 oz/A	\$ 18.44	14-21**	1.32 (.88)	48	21
Topsin + EBDC	.5 lbs./A + 2.0 lbs./A	\$ 15.49	14-21	1.11 (.74)	12	21
Penncozeb 75 DF (EBDC)	2 lbs./A	\$ 5.99	7-10	.86 (.60)	24	14
Manzate FL (EBDC)	1.6 qts./A	\$ 5.79	7-10	.83 (.58)	24	14
Dithane DF (EBDC)	2 lbs./A	\$ 5.67	7-10	.81 (.57)	24	14
Manex	1.6 qts./A	\$ 7.45	7-10	1.06 (.75)	24	14

* Cost includes approximate fungicide product only, NOT application costs; and does not reflect any discounts.

** Cost (\$/A/day) is calculated by cost per acre divided by the shortest (longest) label reapplication interval for each fungicide.

** Application interval is shortened, if tolerance is suspected.

*** Average retail price taken from multiple chemical suppliers.

Loss For Non-Control of Leafspot*

	RWSA	TON / ACRE	% Suc	% CJP
Treated	7267	29.0	17.6	93.0
Untreated	6169	26.2	16.8	92.5

* 1999-2001 Eight Sugarbeet Advancement Leafspot Trials—Significantly Different—Average # of Fungicide Applications was 2.9

Cercospora Leafspot Fungicide Summary

- 1.) The single most important Cercospora Leafspot fungicide spray is the first one. Research indicates best timing of fungicide for both control and net revenue occurs just prior to the first spot being found.
- 2.) The first application of fungicide should be applied according to the Beetcast DSV Risk Management map or never any later than first spot found in your area. Begin scouting no later than July 1st.
- 3.) Follow Beetcast DSV Spray recommendation intervals or label reapplication intervals if not utilizing Beetcast.
- 4.) Always rotate fungicide classes. Ideally do not use any chemistry more than once in a Leafspot spray program.
- 5.) Fungicides with contact mode of action (i.e. TPTH, EBDC and Copper) are most effective with thorough coverage and applied prior to the onset of disease symptoms. Apply before NOT after infection has occurred.
- 6.) Never apply Topsin more than once and always tank mix with control fungicide such as EBDC and TPTH.
- 7.) To prevent resistance to Strobilurin fungicide, it is advised not to use another Strobilurin for the first Leafspot spray if Quadris/Amistar was used after the four leaf stage for Rhizoctonia.
- 8.) Fields to be harvest after October 15th continue Cercospora Spray application until approximately September 15-21st for susceptible varieties.
- 9.) Never apply fungicides closer than labeled pre harvest interval.
- 10.) Always scout fields in conjunction with Beetcast Spray Model.

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Sincerely,



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