# Cercospora Leafspot Resistance Management in Sugarbeets

### **Description of the Problem**

Cercospora leafspot, caused by the fungus *Cercospora beticola*, is one of the most serious diseases of sugarbeets in Michigan. This disease can cause reduced tonnage and sucrose and increased impurities. Yield losses of 2 tons per acre and 1/4 point of sugar are common in our growing region. Fields that burndown will lose more than 5 tons per acre and up to 2 points of sugar.

Cercospora leafspot has been more difficult for some growers to control the past two seasons. Typically growers use Quadris (a strobilurin) for Rhizoctonia control then apply Proline, Eminent, Enable, or Inspire (triazoles) as the first leafspot spray. Headline or Gem (strobilurins) are generally the second leafspot spray and it appears that we are losing control of Cercospora at that time.

#### **Sentinel Plot**

A sentinel plot was conducted near Elkton, MI in 2011 to evaluate the efficacy of fungicides for leafspot control. Results from this trial show that Headline and Gem (strobilurins) did not provide adequate leafspot control in 2011 (Graph 1). This graph shows leafspot control for fungicides over time. Values are based on the Cercospora rating scale of 0-9 and are expressed as a percent of the untreated. At the sentinel plot in 2011, Eminent, Inspire, Proline and Super Tin provide good Cercospora control, while Headline and Gem failed to control leafspot.

Leaves from the sentinel plot were gathered and sent to Michigan State University and to North Dakota State University to analyze for Cercospora resistance. Results from both universities indicated that Cercospora spores from the sentinel plot are resistant to Headline and Gem.

Michigan Sugar Company agriculturists also sampled leaves from around the sugarbeet growing area and a high percentage of those leaves tested positive for resistance to Headline and Gem. Analysis from both universities (Fig. 1 & 2) showed that over 90% of the samples had an effective concentration (EC50) greater than 1 ppm, which indicates insensitivity (resistance).

The same question has been asked multiple times, "why did resistance happen?" This is a difficult question to answer, since many variables could lead to this resistance issue. Here

**Graph 1: Cercospora Fungicide Efficacy** 

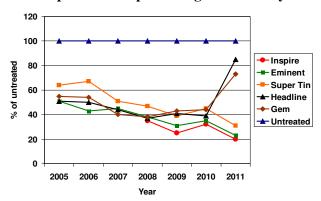


Fig 1: Red Counties Indicate Strobilurins Resistance - MSU, 2011

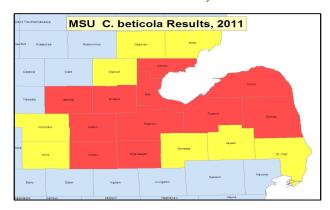
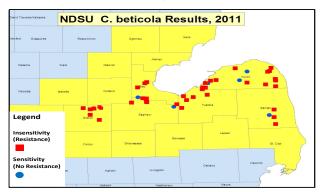


Fig. 2: Strobilurins Resistance NDSU, 2011



are some possible answers to this question.

- Increased use of susceptible varieties.
- Failing to rotate modes of action.
- Stretching spray intervals.
- Spraying other field crops (e.g. corn, soybeans, wheat, dry beans, etc) with Headline and Gem (strobilurin), and not rotating the mode of action.
- First leafspot application late.
- Poor spray techniques.
- Not tank mixing with other modes of action.
- Earlier planting dates.
- Not controlling leafspot to the end of the season.

# **Types of Fungicide Resistance**

There are two general types of fungicide resistance: quantitative and qualitative. With quantitative resistance, resistant fungus strains develop slowly and initially an increased dose or shorter spray intervals will compensate for the decreased fungicide efficacy. Triazoles (e.g. Inspire, Eminent, Proline and Enable) develop resistance in this way. Full blown resistance with triazoles develops over a long period of time.

With qualitative resistance the resistant fungus strains develop very rapidly and an increased dose or shorter spray intervals will not compensate for the decreased fungicide efficacy. When a fungicide develops qualitative resistance, the effect of spraying that fungicide to control leafspot is the same as if spraying with water. Strobilurins (e.g. Headline and Gem) develop resistance in this manner.

When different fungicides have the same mode of action the fungus does not distinguish between the fungicides. This is called cross-resistance. For example, if a fungus is resistant to Headline it will also be resistant to Gem because they have the same mode of action.

## Management for Cercospora Leafspot Resistance

Cultural Practices: Since the Cercospora fungus overwinters on infected beet leaves and on some weeds species, crop rotation is an important strategy in resistance management. A three-year to four-year rotation is recommended for reducing carryover of the fungus. Since spores can be blown several hundred feet, it is important to check with surrounding growers and see if they had poor performance with Headline or Gem (strobilurin) the previous years. Under the right conditions, spores will germinate from last years sugarbeet fields and infect adjacent sugarbeet fields.

The spores breakdown more rapidly if buried, but can survive 10 months or more if buried 8 inches or less. Burying sugarbeet litter by tillage helps reduce

inoculum survival and dispersal. Fall tillage is most effective for reducing Cercospora populations but may increase the severity of soil erosion.

Varieties: There are large differences in varietal susceptibility to Cercospora leafspot (Table 1). The disease develops slowly on tolerant varieties and normal control measures will effectively control Cercospora. However, leafspot is difficult to control with highly susceptible varieties and an aggressive spray program is required to protect the crop.

**Table 1: Cercospora Varieties Susceptibility** 

	Tolerant Varieties	Moderately Tolerant Varieties	Highly Susceptible Varieties
Best	HM 133RR HM 131RR HM 173RR SX 1281RR C RR086	B 10RR34 SX 1291RR HM 27RR HM 28RR SX 1260RR BTS 19RR90 C RR059	B 19RR1N B 18RR4N C RR827 C RR824 B 17RR32
Worst		C RR074NT	

**Fungicides:** Currently, there are two general types of registered fungicides: protectant fungicides and systemic fungicides.

Protectant Fungicides: Protectant fungicides such as Super Tin, EBDC's (e.g. Dithane, Manzate, Penncozeb) and copper products kill fungus on the leaf surface and do not penetrate the leaves. These fungicides generally have broad spectrum disease control and have several modes of action so that they do not develop resistance easily. Protectant type fungicides do not provide long residual control and are susceptible to being washed off the leaves by rain.

Protectant fungicides should be tank-mixed with fungicides with higher risks for resistance development. Used in this manner they will help slow fungicide resistance development.

Systemic Fungicides: Systemic fungicides (Headline, Gem, Enable, Proline, Eminent and Enable) are absorbed by sugarbeet leaves and are rain fast when dry. Systemic fungicides are active against Cercospora for a longer period of time compared to protectants. Systemic fungicides are highly susceptible to the development of resistance and should always be tank-mixed with a protectant fungicide. The main value of protectant fungicides in our situation is for resistance management as tank-mix and rotation partners with the triazole and strobilurin fungicides.

All of the fungicides that we use in sugarbeets should be applied preventatively because they do not cure an established Cercospora infection.

Unlike protectant fungicides, penetrant fungicides

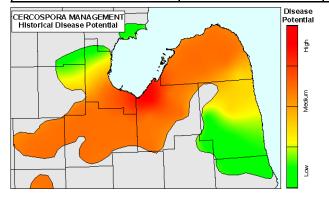
are rain fast within a few hours of application and may require less thorough application coverage to be effective. Both protectant and penetrant fungicides provide good disease control when applied before infection and are best applied on a preventive schedule.

Fungicide resistance in sugarbeets can be managed but growers will need to follow resistance management practices:

- Plant susceptible varieties only if you are willing to follow an aggressive spray recommendation.
- Use of more tolerant varieties is especially important when planting next to a field that had Cercospora problems the previous year.
- Tank mix triazoles (e.g. Inspire, Eminent, Proline and Enable), strobilurins(e.g. Headline and Gem) and Topsin fungicides with an EBDC, Super Tin, or Copper.
- Never spray with the same modes of action back-to-back.
- Use Headline and Gem (strobilurins) and Topsin only once per season.
- Use the highest labeled rates of all fungicides even in tank mixes.
- Apply fungicides in an approach to insure maximum coverage. Enhanced coverage results in improved Cercospora leafspot control.
- Use 20-25 gallons of water with 90 PSI or greater. Higher pressure and gallonage will produce the best control.
  - Minimum of 80 PSI and 20 gallons of water would be acceptable.
- Use surfactants and additives as required by product labels.
- Do not delay your first leafspot application. Follow BEETcast (Table 2) or if scouting, don't apply later than the first leafspot in your area.
- When using Headline and Gem (strobilurin) fungicides in other crops (e.g. corn, soybeans, wheat, dry beans, etc.), always tank-mix with a fungicide with a different mode of action or use available combination products.
- Longer crop rotation plays a key component in reducing Cercospora leafspot levels.
- Table 3 signifies a spray schedule in managing Cercospora leafspot.

**Table 2: Initial Spray/Subsequent Sprays** 

	High	Medium	Low
Tolerant	55/55/55/55	60/55/55/55	75/55/55
<b>Moderately Tolerant</b>	55/50/50/50	55/55/55/55	70/55/55
Highly Susceptible	50/35/35/35	55/50/50/50	65/55/55



**Table 3: Spray Schedule** 



If Headline or Gem Performed Well in 2011	If Headline or Gem Failed in 2011
Triazole tank-mix with an EBDC or Copper	Triazole tank-mix with an EBDC or Copper
Super Tin tank-mix with Topsin or EBDC or Copper	Super Tin tank-mix with an EBDC or Copper
Headline or Gem tank-mix with an EBDC	Topsin tank-mix with an EBDC
Triazole tank-mix with an EBDC or Copper	Triazole tank-mix with an EBDC or Copper
Super Tin tank-mix with an EBDC or Copper	Super Tin tank-mix with an EBDC or Copper

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#### **Summary**

Growers are doing very well with high sugar prices, high yielding and high quality varieties, disease tolerant varieties and Roundup for weed control. However, we are losing Headline and Gem for Cercospora control and will also lose Eminent, Proline, Enable and Inspire if we do not employ proper resistance management strategies. Cercospora causes losses of five or more tons per acre. At the current sugar pricing, it is safe to say 5 lbs less RWST equates to \$2 lower in payment per ton delivered. Ex. 4.5 million tons in 2012 would equal out to a loss for Michigan Sugar of \$9 million with 5lbs less RWST. This should be a wakeup call for all of us.

We need to protect our sugarbeet crop from Cercospora leafspot, and thus preserve the fungicides that we have left since there are no new fungicides coming out on the market. This is why tank-mixing and following the management program for Cercospora leafspot is an important strategy in prolonging our fungicides for Cercospora leafspot control for years to come.

# For more information contact your local Michigan agriculturist and/or REACh Research Team

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