# Cercospora Leaf Spot Biology & Management

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#### How bad was it?







- Cercospora beticola
- Other host plants: swiss chard, spinach, plants in the Amaranthus and Chenopodium genera
- Favored by warm & wet conditions
  ✓ 77-95 °F (nights above 60 °F)
  - ✓ Free moisture or relative humidity of 90-95% on leaf surface for 5-8 h (overhead irrigation!!)





• Most important & destructive foliar disease in the RRV, Michigan

 $\rightarrow$  Similar approval criteria as curly top in ID



#### Effects of Cercospora Leaf Spot



- Reduced area of photosynthesis
  → reduced sugar accumulation
  → reduced tonnage
- Need to compensate for lost leaf surface
  - → depleting accumulated sugar resources
- Reduced storability
  - $\rightarrow$  increased respiration





- Leaf spots start on older leaves
- Spots are 0.1 0.2 inches in diameter & nearly circular

 Lesion have dark brown – reddish purple margins & tan – light brown centers





• Older lesions run together to form big necrotic areas

 Advanced lesions cause yellowing & death of the leaf



• Lesions or infected plant material serve as secondary inoculum (multi-cyclic disease)



#### Multi-cyclic Disease



Source: www.sbreb.org

Survival in infected beet leaf residue

- Lesions or infected plant material serve as secondary inoculum (multi-cyclic disease)
- Lesions can produce up to 100 spores
- Spores are spread by wind (up to 1/4 mile), splashing water, insects, equipment, worker (under wet conditions)



#### Differences in leaf spots



#### Differences in leaf spots



Tan to dark brown centers with sometimes dark to nearly black border

Howard F. Schwartz, Colorado State University, Bugwood.org







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- Pseudomonas syringae pv. aptata
- Common issue but not of economic importance





- Irregular to circular spots (3/16 to 1/4 in.)
- Tan to dark brown centers with sometimes dark to nearly black border
- Mixed infection with Bacterial leaf spot and Cercospora leaf spot





- Inoculum sources:
  - $\checkmark$  debris from previous crop
  - ✓ newly infected sugar beet plants
- Other hosts include bean, barley, wheat, corn, potentially many common weeds







- Spread by splashing rainfall, mechanical and insect injuries
- Bacteria enter leaves through stomata, wounds caused by hail/wind damage, insects, farming practices, etc.
- Bacteria also enter margins of leaves through hydathodes (Vshaped lesions)





- Favored by:
  - ✓ temperatures 36 95 °F;
    optimum 77-86 °F
  - ✓ wet conditions (leaf wetness)
- Management
  - ✓ No effective controls
  - ✓ Irrigation management Reduce leaf wetness



#### Control - Cultural

- CLS can survive for at least 2 years as mycelia and spores in plant debris
  - $\rightarrow$  Crop rotations of 2-3 years
  - → Reduce early season infection by separating new beets from old residue by at least 300 ft
- Incorporate infected crop residue
  - →Under heavy infection potential pre-harvest fungicide application



#### **Control - Genetics**

- Resistant cultivars (?)
  - → Under normal conditions not necessary







- High nematode, Rhizomania and Fusarium tolerance
- Diploid variety with strong curly top tolerance
- High-performing variety with high RSA

#### **Control - Irrigation**

- Irrigation management
  - ✓ CLS is temperature AND moisture driven
  - ✓ Try to off-set irrigation so different parts of the field will be irrigated during the night
    - $\rightarrow$  will help to slow down spread of Cercospora
    - → will reduce severity of already present infection



#### **Control - Scouting**

• Determination for fungicide applications is a function of

Disease severityEnvironmental conditions(Scouting)(Weatherman)

- Applications are warranted when on average >0.5% infection (12 spots/leaf)
- Economic losses starting at 3% (80 spots/leaf)



#### **Control - Scouting**

- Scout early CLS needs 7 days from initial infection to first symptoms
- Start in June/July depending on environmental conditions
  - → think 60-90-5 (night temp, rH, hrs of leaf wetness)
- Use a zig-zag pattern but focus initially on edges of the field and low laying areas
- DO NOT walk fields that are wet from irrigation or dew

#### Control

Pathogen	Sensitive	Group
Cercospora	Super Tin (triphenyltin hydroxide)	
	Topsin (thiophanate-methyl)	1
	Headline (pyraclostrobin)	11
Tolerant		Group
	Eminent (tetraconazole)	3
	Inspire XT (difenconazole+propiconazole)	3

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	Resistant	Group
Powdery mildew	Headline (pyraclostrobin)	11
	Gem 500 SC (trifloxystrobin)	11



#### Take home message

- ✓ Cercospora can be destructive →
  Normally not a problem
- ✓ Separate new fields from previously infected areas
- Environmental conditions important
- ✓ Irrigation management to either increase / decrease severity





#### Take home message

- $\checkmark$  60  $\rightarrow$  Night time temperature
- ✓ 90  $\rightarrow$  relative humidity
- ✓ 5  $\rightarrow$  hrs of leaf wetness

- $\checkmark$  12  $\rightarrow$  lesions
  - = fungicide applications





By J. Gallian and C. M. Ocamb

For more information and chemical recommendations:

Pnwhandbooks.org/plantdisease/

Cause Cercospora beticola, a fungus perpetuated in beet refuse. It can be spread on seed produced in regions where the disease is severe. It is not a major disease in the Pacific Northwest but occasionally causes serious leaf spot, especially under sprinkler irrigation. Other crop hosts include red beet, mangel, spinach, and Swiss chard; weedy hosts include redroot pigweed, lambsquarter, mallow, and bindweed. No resistant cultivars have been adapted for the Pacific Northwest. High humidity or free moisture and high temperatures (77\*F to 95\*F days, nights above 60\*F) favor infection. Under humid conditions, conidia form on infected crop residue and are carried by wind or rain to host leaves. Spore production is optimal at 68\*F to 79\*F and 90% to 100% relative humidity. Disease can develop and spread, though more slowly, under a wider range of conditions.



Photo by Phil Hamm

Symptoms Numerous circular spots about 0.12 inch in diameter with tan to gray centers and dark brown to reddish purple-brown borders appear on leaves. The disease begins on older leaves but also appears on younger leaves as it progresses. In humid weather, spots may have a gray to steel-blue fuzzy appearance as spores are produced. Petioles also are affected. If spots are numerous, the entire leaf tends to wither and die prematurely, resulting in defoilation that reduces root growth and yield.

#### Cultural control

- · Plant at least 300 ft from last season's plantings.
- · Do not replant on the same land for 3 years.
- Plow deeply to completely bury infected refuse
- If leaf spot is serious, reduce planting density.
- Irrigate so plants dry by night.

Chemical control Sprays usually are not required if crops are rotated. Early disease detection and monitoring is essential to prevent economic loss. It is recommended that the field be sprayed when disease averages 0.5% infection (about 12 spots per leaf). Economic loss occurs if leaf spots cover at least 3% of the foliage by harvest (about 80 spots per leaf). To minimize fungicide resistance, rotate fungicides, apply them only as needed, and follow cultural control recommendations.

## Questions???

Social Media

PNW Plant Disease

Management

