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CERCOSPORA LEAFSPOT OF SUGARBEET

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Cercospora leafspot, caused by the fungus *Cercospora beticola*, is the most serious disease of sugarbeets in the Red River Valley. This disease may cause reductions in tonnage and sucrose, and increased impurities. Losses of 30 percent in recoverable sucrose are fairly common under moderate disease conditions. Roots of affected plants do not store in the pile as well as roots of healthy plants.

Many of the currently grown high-yielding sugarbeet varieties are susceptible or moderately susceptible to Cercospora. The epidemic of the 1980 and 1981 growing seasons was favored by optimum weather conditions and the very susceptible varieties grown at that time.

SYMPTOMS

Cercospora infection of the sugarbeet leaf produces circular spots about 1/8 inch (occasionally 3/16 inch) in diameter with ash gray centers and dark brown to reddish purple brown borders (Fig. 1). During warm, rainy, humid weather, the spots may coalesce to kill whole leaves, particularly on susceptible varieties (Fig. 2). In humid weather these coalescing spots may be covered with areas of steel blue to light bluish-purple fuzz. These are masses of spores of the Cercospora fungus. Severely diseased leaves wither and die, resulting in severe defoliation. The disease begins on the older leaves and progresses to the younger leaves. Diseased leaves usually remain attached to the crown of the plant.

Bacterial leafspot can be confused with Cercospora leafspot. The symptoms of bacterial leafspot (Fig. 3) frequently develop during cool rainy weather but may occur intermixed with Cercospora leaspot. Bacterial leafspot produces irregularly shaped to circular spots that are 3/16 to 1/4 inch in diameter. They have dark gray centers (Cercospora has light gray centers) with very dark to almost black borders. In areas where bacterial leafspots coalesce, portions of the leaf tend to tear, producing a ragged leaf.

To distinguish Cercospora leafspot from bacterial leafspot, examine the spots with a hand lens. The gray centers of Cercospora leafspots will usually have tiny black dots in them (Fig. 4), or if there is profuse spore production, the centers will have a fuzzy blue-gray appearance. There are no black dots or blue-gray fuzz (fungal spore mass) in the centers of bacterial leafspots.

Ramularia leaf spot may also be confused with Cercospora leaf spot. Ramularia leaf spots develop light brown centers with dark brown or reddish brown borders. The spots are slightly larger than Cercospora, about 3/16-1/4 inch in diameter. Ramularia leaf spots have a more irregular to angular appearance. In moist weather, masses of spores form tiny white dots in the centers of the spots or may even form a silver gray to white fuzzy surface – this contrasts sharply with Cercospora. Ramularia is favored by cooler weather than Cercospora.

Alternaria leaf spot may be confused with Cercospora leaf spot. Generally only yellowed leaf tissue is attacked. Spots may be 1/8 to 3/8 inch in diameter or slightly larger. Spots are roughly circular, dark brown to black, often with a target pattern of concentric rings, and a dark brown to black fuzzy growth of spores. Alternaria leaf spot usually develops first near the leaf margins, then the spots

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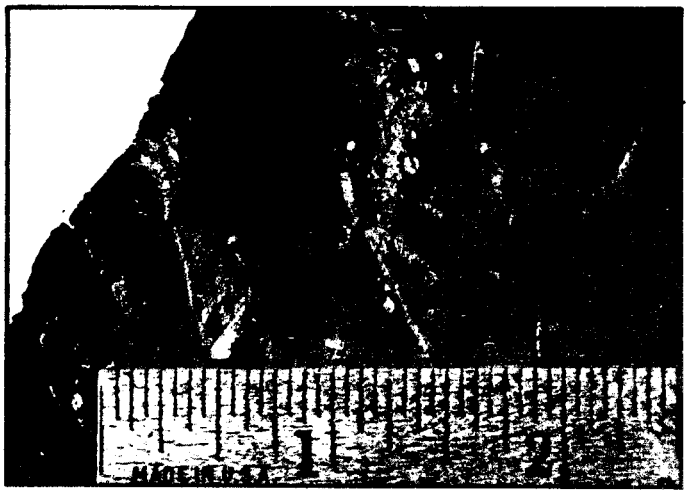

Figure 1. Cercospora leafspot.

Figure 2. Leafspots coalescing and killing large areas of leaf tissue.

spread and coalesce and occupy much of the leaf area between the main veins.

SURVIVAL AND SPREAD

The most common source of the Cercospora fungus is infected beet debris in the field. The fungus and spores survive over winter on this debris. The Cercospora spores are spread by wind, water (irrigation and rain), and insects. The fungus can also be carried on the seed, although this is usually of minor importance. The fungus may infect some common weeds such as redroot pigweed, lambsquarters, mallow, and bindweed, but there is little evidence that these weeds are important in the disease cycle.

Cercospora leafspot develops rapidly in warm, humid and rainy weather. The Cercospora spores are produced most readily at temperatures of 68-79°F and relative humidities (RH) of 90-100 percent. Spores do not form at temperatures less than 50°F. Spores germinate and the greatest infection occurs when the temperature is 75-77°F and the RH is 100 percent for at least 8½ hours. In general, day temperatures of 80-90°F and night temperatures above 60°F favor disease development. Under favorable conditions leafspot symptoms may occur in as little as five days after infection, with more spores produced in another five days.

CONTROL

CULTURAL PRACTICES

Since the Cercospora fungus overwinters on infected beet leaves, crop rotation is important. A two-year rotation (beets every other year) is certainly preferable to growing beets after beets, but this short rotation does not allow sufficient time for crop refuse to decompose and the Cercospora fungus population to decline. A three-year or longer rotation is minimal for reducing carryover of the fungus. Since plant debris and spores can be blown some distance, beets should not be planted less than 100 yards from a field that was in beets last year. This is especially important in cases where last year's beets were severely diseased. Burying beet refuse 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 during open winters.

VARIETIES

There are great differences in varietal susceptibility to Cercospora leafspot. The disease develops slowly and never becomes severe on some varieties but develops more rapidly and can cause total defoliation on others. Current performance of approved varieties requires at least a moderate level of resistance to Cercospora leafspot. Information on the susceptibility of varieties to Cercospora is available in the Sugarbeet Research and Extension Reports published annually. The published yield data, however, do not come from the same plots as the disease data, so no definite correlations can be made between yield and disease.

FUNGICIDES

Currently registered fungicides are of two types: protectant fungicides and systemic fungicides.

Protectant fungicides act on the leaf surface to **prevent** infection; they do not "cure" established infections. It takes five or more days from the time of infection before leafspots develop. If a protectant fungicide is applied immediately after a rainy, humid period, infections will already be established and it may be too late to prevent the development of leafspots several days later. Late application may result in claims that "the fungicide didn't work" or

"the fungicide wasn't applied correctly." It is essential that protectant fungicides be on the leaf before rainy or humid weather occurs. The application must be made early enough to allow spray droplets to dry before rains begin. After drying, the fungicide is not easily washed off.

In the past it was common to use a preventive spray program, particularly on highly susceptible varieties. The varieties currently grown (1987) are less susceptible than many of the varieties grown in 1980 and 1981 and are less liable to explosive development of leafspot. With currently available varieties, use of careful scouting for leafspot and use of the Cercospora prediction model can provide proper timing of fungicide treatments. The key to use of the model is early detection of the disease, monitoring of disease levels, and monitoring of weather to determine the daily infection values. Information on daily infection values is available through a network of weather monitoring equipment used by the sugar cooperatives. A complete discussion of the use of the model is presented in a separate publication. If a grower wishes to monitor his own fields, he may wish to purchase a hygrothermograph to monitor temperature and humidity and calculate daily infection values. The cost of the hygrothermograph can be saved by eliminating a single fungicide application.

Protectant fungicides registered for Cercospora control include mancozeb, maneb, triphenyl tin hydroxide, maneb plus triphenyl tin hydroxide, and copper fungicides. Research data indicate that triphenyl tin hydroxide is slightly more effective than the other protectants and is retained well on the foliage even after repeated rains. A spreader-sticker should be added to the spray tank to improve coverage and retention of wettable powder formulations of mancozeb and maneb.

Systemic fungicides are absorbed by the leaf. Those currently registered for Cercospora control include Benlate, Mertect, and Topsin M. These fungicides are related and belong to the benzimidazole class of fungicides. Resistant Cercospora strains were detected in 1981 in the Renville factory district of Minnesota and since have become widespread across the entire sugarbeet growing areas of Minnesota and North Dakota.

Benzimidazole fungicides should not be used in Minnesota or North Dakota because of the high prevalence of resistant strains. **Once resistant strains are established in an area, they persist for many years.**

A new class of systemic fungicides known as sterol inhibitors are being investigated for Cercospora control. Most sterol inhibitors are at least locally systemic, that is, they are absorbed by the leaf and distributed within the leaf. Others are more fully systemic, but most do not move into new foliage formed after the fungicide was applied. Some of the sterol inhibitors may have curative properties several days after infection, and some show promise for Cercospora control. Currently (1987), none of these fungicides is registered, but some may be in the future. Check for current recommendations, and **do not** attempt to use any of the fungicides before they are registered.

Spraying Fungicides. Once the Cercospora prediction model or scouting report indicates that fungicide spraying should begin, it should be continued as long as the weather favors disease development. This can be determined by following the daily infection values for the nearest weather observation site. Recommended rates and application intervals are stated on fungicide labels. When weather favors rapid disease buildup or when growing highly susceptible varieties, the **interval** between applications should approach the shortest ones indicated on the label, and the amount of fungicide used should approach the maximum label **rate.**

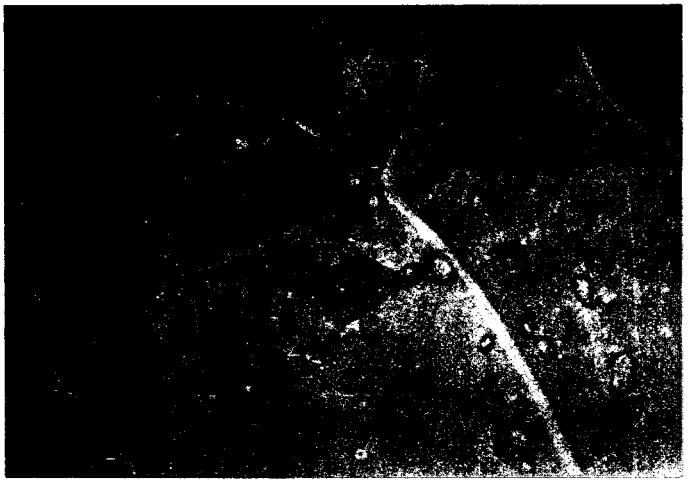

Figure 3. Bacterial leafspot. This is sometimes confused with Cercospora leafspot.

Figure 4. Single leafspot magnified 15 times to show the black fruiting bodies.

However, in the case of the tin fungicides it is not usually necessary or desirable to exceed 70 percent of maximum label rate. When disease pressure is developing slowly, minimum label rates can be used, and the interval between applications can be the longest indicated on the label.

Growers who do not use the Cercospora prediction model and/or scouting may need to use a preventive spraying program or else begin spraying at the first sign of disease in the field or area. Although preventive spraying can prevent or reduce disease losses, it may result in use of more sprays than are necessary. Use of the prediction model and scouting could prevent unnecessary spraying.

Data from other states as well as trials in North Dakota and Minnesota indicate that ground spraying will give as good or slightly better control than aerial application. Pressures for ground application should be at least 150 psi and at least 25 gallons of water should be applied per acre.

For aerial application, at least 5 gallons per acre should be applied. Swath width should be equal to the wingspan of the aircraft or slightly more (up to 10 percent). Swath width for fungicides should be the same as for desiccant herbicides. Hollow cone nozzles with D-6 to D-10 orifices and 46 or 56 cores are recommended. The boom should be 6-10 feet above the crop.

Photo credits:
Fig. 1, 2, 4 - H.A. Lamey
Fig. 3 - W.M. Bugbee

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