



Figure 1. Sugar beet leaf showing symptoms of powdery mildew (left) vs. a healthy leaf (right).
(Photo by R. Nelson, University of Minnesota Extension, Clay County)

Sugar Beet Powdery Mildew

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Powdery mildew is a sporadic fungal leaf disease of sugar beet in the Red River Valley and southern Minnesota sugar beet-production areas. It first was found in Minnesota and North Dakota in 1975. In recent years, the use of triazole and strobilurin fungicides for *Cercospora* leaf spot control has limited powdery mildew development. Recent discoveries of the sexual stage of the powdery mildew fungus in several sugar beet-producing states could lead to potential biological changes in the fungus, making it more difficult to control.

Symptoms

Powdery mildew first shows up on the older, lower leaves. The first symptoms are a wispy growth of white to light gray threadlike filaments, often radiating from a central point

(Figures 1 and 2). Early symptoms of powdery mildew are not detected easily. Symptoms may be detected more readily under full sunlight, with the sun to your back. Once the early symptoms appear, the disease may progress very rapidly in favorable weather. A powdery white or gray-white growth may cover a leaf within a week, and the mildew may begin to appear on the middle leaves. Mildew may even appear on the upper leaves that have not completely expanded when the disease is severe. A characteristic odor similar to that of a musty basement may be noted in fields with severe powdery mildew.

Powdery mildew is likely to be more severe where nitrogen levels are low. When inspecting a field for powdery mildew, look in the areas of the field that are beginning to turn light green or yellow green due to depletion of available nitrogen. Powdery mildew is not likely to be found in the rest of the field if it cannot be found in the yellowing areas.

Severely mildewed leaves may begin to turn yellow within a month of initial symptoms. Observations made near harvest time in North Dakota indicate that mildewed leaves are killed by light freezes that do not kill healthy leaves.

The sexual stage of the fungus has been observed in Colorado, Idaho, Nebraska, Wyoming and North Dakota. Structures known as ascomata are present in the sexual stage of the



Figure 2. Close-up view of a sugar beet leaf infected by the powdery mildew fungus. (Photo by C. Bradley, University of Illinois, Urbana-Champaign)

powdery mildew fungus. To the naked eye, ascomata will appear as small, dark round spots that are mixed with the threadlike filaments of the fungus (Figure 3). With a hand lens, immature ascomata are yellow to orange, while mature ascomata are dark brown to black. The ascomata are circular. (Figure 4)

Biology

Powdery mildew is caused by the fungus *Erysiphe polygoni* (formerly *Erysiphe betae*). The fungus is an obligate parasite, which means that it cannot be cultured on artificial growth medium and must have a living host for

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Figure 3. Sugar beet leaf with powdery mildew ascomata (sexual structures – dark spots). (Photo by L. Hanson, USDA-ARS, East Lansing, Mich.)



Figure 4. Ascomata on sugar beet leaf as seen through a hand lens. Yellow and orange ascomata are immature; dark brown to black ascomata are mature. (Photo by L. Hanson, USDA-ARS, East Lansing, Mich.)

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growth and reproduction. The disease is favored by long periods of dry weather, warm days, cool nights and a wide fluctuation in day/night temperatures. The most favorable temperatures for production of conidia (fungal asexual spores) are day/night temperatures of 81/54 F, but infection also has been observed under day/night temperatures of 86/50 and 90/45 F.

The conidia are formed in the morning and usually are released about noon. Germination of conidia occurs in the afternoon and early evening, depending on temperature, and the formation of appresoria (infection cushions) occurs in the evening. Conidia germinate best in the light at 86 F. Appresoria form best at 59 to 68 F. Once infection occurs, the incubation period (period from infection to development of a spore-producing lesion) can be as little as five days if temperatures are around 77 F.

What role the sexual stage is playing in the epidemiology of the disease is not known.

Management

In the western U.S, varieties are evaluated for resistance to powdery mildew, and resistant varieties are available. Because powdery mildew rarely occurs in North Dakota and Minnesota, varieties are not evaluated for resistance to this disease in this area.

When powdery mildew occurs in late July or early August and it is not controlled, significant yield reduction occurs under severe disease conditions (Figure 5). Fungicides are available to manage powdery mildew. Fungicides in the strobilurin chemistry class, such as Gem, Headline (Figure 6) and Quadris, can be used to manage powdery mildew. Sulfur fungicides such as Microthiol Disperss and Micro Sulf also can be used for powdery mildew management. The triazoles fungicides such as Proline, Inspire and Eminent also provide effective control of powdery mildew.



Figure 5. Powdery mildew on plants not treated with a fungicide. (Photo by Mohamed. F.R. Khan)



Figure 6. Powdery mildew-infected plants treated with Headline fungicide. (Photo by Mohamed. F.R. Khan)

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