Powdery Mildew of SUGAR BEETS

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Quick Facts

Powdery mildew of sugar beet is caused by a fungus that also infects swiss chard and table beet.

Powdery mildew is effectively managed by properly timed fungicide applications and cultivar resistance to reduce reliance on fungicide.

The recent appearance of the sexual stage of this fungus in the High Plains may enable overwintering, possibly resulting in earlier and more severe disease development in future growing seasons.

Increased potential for genetic recombination via the sexual stage may speed appearance of fungicide resistant fungal isolates and/or isolates that overcome cultivar resistance.

Introduction:

A major outbreak of powdery mildew occurred in the western United States in 1974. Since then, powdery mildew now appears to some degree in the western United States each year. Although powdery mildew is frequently observed on sugar beets in the High Plains production areas of Colorado, Wyoming, Nebraska and Montana, disease often appears late in the growing season, and suppression efforts are only occasionally justified. This scenario for the High Plains may change following the recent appearance of the sexual stage of the powdery mildew fungus. During years in which the disease starts early and is allowed to progress unchecked root yield losses of one to two tons per acre are common.

Symptoms:

Symptoms first appear on older, lower leaves as small, dispersed radiating whitish mats. The fungus grows on the surface of leaves and leaves appear to have been dusted with flour (**Figure 1-A**). The fungus spreads rapidly over all surfaces of leaves until all leaves appear dusty white during severe infections (**Figure 1-B**). The underlying leaf tissue may become chlorotic, eventually taking on a purplish hue. Due to the recent appearance of the sexual stage in the High Plains, small, yellow, spherical fruiting bodies visible with a hand lens may form and, if present, will eventually become dark brown to black as they mature within the areas of dusty white growth (**Figure 2**). The greatest yield losses occur in fields in which infection occurred early in the growing season and the disease was allowed to progress unchecked.

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Figures 1A and 1B. *Signs of powdery mildew on sugar beet leaves during early disease development (A) and when disease is severe (B). Spores produced by the fungus are windblown and rapidly disperse the fungus and rapidly spread disease. Timely application of fungicide at the first sign of powdery mildew is most effective for slowing disease spread.*

Causal Agent:

Powdery mildew is caused by the fungus *Erysiphe polygoni* DC (syn. *E. betae* {Vanha} Weltzien). Although many crop and ornamental plants will develop powdery mildew disease similar in appearance to that found on sugar beets, this particular fungus attacks only sugar beets, swiss chard, and table beet and does not spread to or from these other host plants.

Disease Cycle:

Powdery mildew usually first appears during mid- to late-August but may appear as early as mid-July. In production areas with milder temperatures, the fungus overwinters on sugar beets and other Beta species such as swiss chard, table beet and wild Beta species that grow throughout the winter. To date, there is no proof the fungus overwinters in the High Plains. Instead, spores from infected plants in the western and southern sugar beet production areas of the United States must blow northward into the High Plains. Spores land on leaves, germinate, and symptoms appear within several days. The fungus spreads rapidly, and most leaves are infected by harvest time. Although disease development is more rapid when plants are well supplied with water, water-stressed plants suffer greater yield loss due to rapid death of the

Figure 1B *Source: E.G. Ruppel*

less-turgid infected leaves. Temperatures of 65 to 80 degrees Fahrenheit and a relative humidity of 60 to 80 percent are sufficient for disease development. Rain and overhead irrigation does not favor this disease and actually hinders its development.

The recent detection of the sexual stage in Idaho and Colorado in 2001, Wyoming in 2002, and Montana and Nebraska in 2003, suggests the migration of another powdery mildew mating type or race into the region has occurred. The increased potential for pathogen overwintering by the sexual stage and other possible roles of the sexual stage in High Plains disease epidemiology are not yet known. Observations for Wyoming from 2002 through 2005 revealed that no unusual disease loss occurred; however, the increased potential for genetic recombination and race development by the sexual stage has serious implications for fungicide resistance management and the development of resistant cultivars through breeding programs. Therefore, High Plains sugar beet growers may experience increased losses from sugar beet powdery mildew due to earlier disease onset by overwintered isolates, the selection of isolates resistant to fungicide, and/or the selection of isolates able to overcome cultivar resistance.

Management:

Foliar fungicides applied at the first signs of disease (when small white powdery spots appear on the undersurface of leaves) are most effective at suppressing disease spread. Thorough leaf coverage is required, and a fungicide re-application may be necessary if disease reappears. Experiments in west-

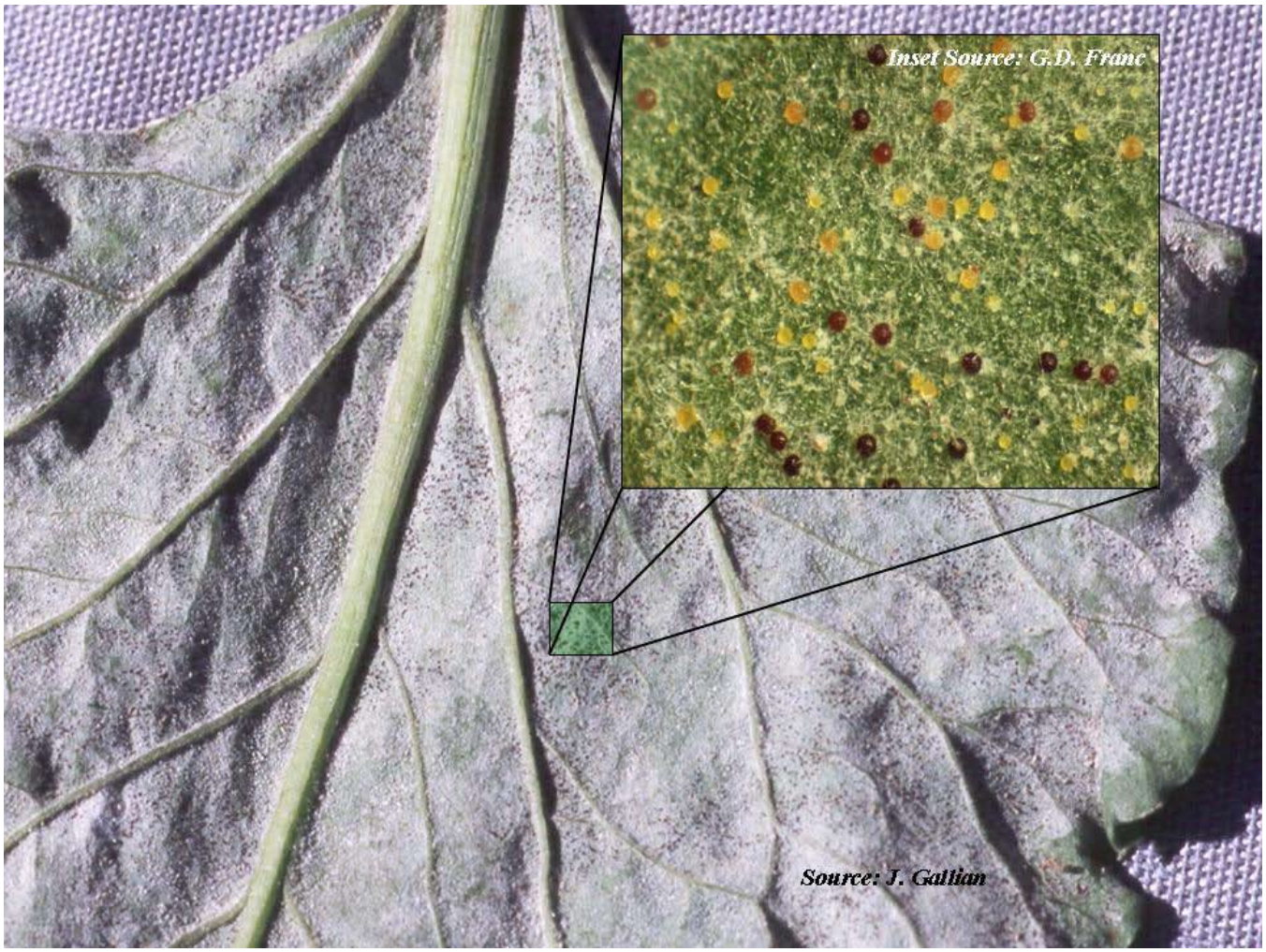

Figure 2. *The presence of the perfect (sexual) stage of the powdery mildew fungus is visible as yellow (immature) to black (mature) ascomata visible with a hand lens or microscope (inset). The perfect (sexual) stage of the powdery mildew fungus was first observed in Idaho and Colorado in 2001, southeastern Wyoming in 2002, and in southeastern Montana and western Nebraska in 2003. The formation of ascomata may enable the powdery mildew fungus to overwinter in the High Plains production region.*

ern Nebraska revealed that if the fungicide application was delayed for two weeks after disease was first observed, the yield advantage from a fungicide application was reduced by one-half. Sulfur is an effective fungicide traditionally used for powdery mildew suppression. Several other effective fungicide formulations are recently available to growers, and fungicide resistance management guidelines listed on the label must be followed to preserve the useful life of these new, highly selective, fungicides. Moderately resistant sugar beet cultivars are available and will reduce reliance on fungicide for disease suppression.

Additional Information:

Franc, G.D., R.M. Harveson, E.D. Kerr, and B.J. Jacobsen. 2001. Disease Management. Pages 131-160. In: *Sugar Beet Production Guide*. Regional Bulletin EC2001-156, University of Nebraska Cooperative Extension, Lincoln, NE. (210 pp.).