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POWDERY MILDEW OF STRAWBERRY

Powdery mildew is a common fungal disease of strawberry especially in matted-row, high tunnel, and greenhouse productions. The disease attacks leaves, flowers, and fruit of strawberry. Severe infections can cause decreased photosynthesis, reduced fruit quality, and yield losses when the environment is not adequately managed.

SYMPTOMS AND DIAGNOSTICS

A characteristic symptom of the disease is small spots or patches of white mildew (fungal mycelia and asexual conidiospores) on the lower surface of strawberry leaves (Figure 1). As the disease develops, white mildew patches coalesce and cover both the lower and upper surfaces of leaves. But powdery mildew on strawberry leaves is not as obvious as on other plants. So, the disease may remain undetected during field scouting in its early stage. Noticeable symptoms in fields include upward curling of leaves (Figure 2) and reddish-brown spots or blotches on leaves (Figure 3). In the late growing season, the fungus form chasmothecia (sexual fruiting structures) within white fungal colonies (Figure 4). Infected flowers may produce deformed fruit or no fruit at all. When fruits are infected, the fruit may fail to ripen, become hardened, and form raised seeds on the surface.

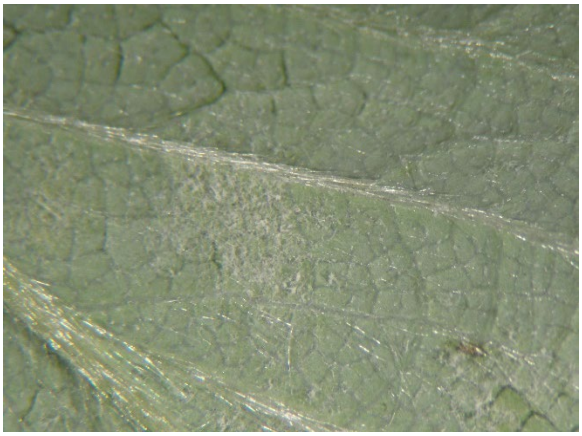

Figure 1. A thin layer of white mildew on the lower surface of a leaf.

DISEASE DEVELOPMENT

Powdery mildew of strawberry is caused by *Podosphaera aphanis* (syn. *Sphaerotheca macularis*). The fungal pathogen can overwinter as hyphae in living tissues during their dormant stage. When conditions are favorable for the disease in the spring, the overwintered fungus resumes growth and forms conidia on the leaves. The pathogen also overwinters on plant debris as chasmothecia that release ascospores in the spring to initiate the primary infection. The

Figure 2. Upward curling of leaves.

Figure 3. Reddish-brown spots and blotches on leaves.

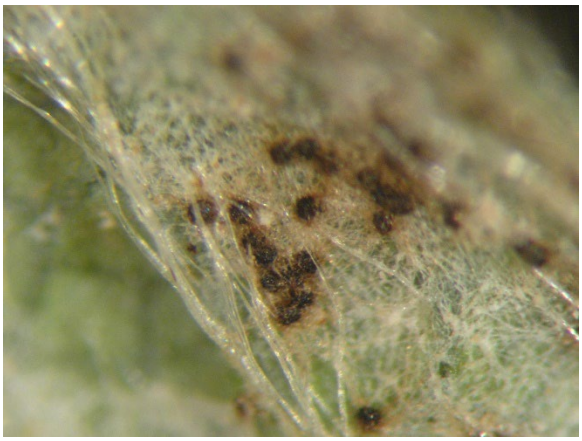

Figure 4. A micrograph of black chasmothecia in the white fungal colony

fungus produces conidia on infected leaves periodically, which is responsible for repeated secondary infections and the spread of the disease from plant to plant during the growing season. Fungal spores are dispersed through wind and air movement. The disease can be introduced in a field through infected transplants. The optimal environmental condition for the disease development is warm temperatures (60°-77°F) with high relative humidity (>75%), but less than 98%. Free water on the surface of plant tissues and strong sunlight may inhibit spore germination and colony development.

MANAGEMENT

Resistant cultivars: Although most strawberry cultivars are susceptible to powdery mildew, some cultivars, such as Allstar, Honeoye, Jewel, Wendy, and Tristar, are resistant or tolerant to the disease. Use resistant or tolerant cultivars where they are suitable.

Cultural practice: Choose a site with good sun exposure and minimal shade. Use mulches (plastic or straw) or landscape fabric to reduce humidity and control weeds. Destroy infected tissues by renovating June-bearing plantings after harvest.

Fungicide treatment: For highly susceptible cultivars growing in the field with history of the disease, fungicide applications need to be implemented preventatively or at first sign of symptoms. When conditions are conducive for disease development, multiple fungicide applications may be needed at suggested intervals. Fungicides registered for powdery mildew of strawberry include azoxystrobin, cyprodinil, fluopyram, fluoxastrobin, quinoxyfen, triflumizole, tebuconazole, difenoconazole + cyprodinil, thiophanate-methyl + propiconazole, cyprodinil + fludioxonil, and azoxystrobin + difenoconazole. To reduce the risk of fungicide resistance build-up in a field, rotate products with different modes of action. Organic fungicide options include neem oil, tea tree oil, sulfur, copper octanoate, potassium bicarbonate, polyoxin D zinc salt, extract of *Reynoutria sachalinensis*, and some strains of *Bacillus subtills* and *B. amyloliquefaciens*. Always read the label prior to applying any fungicides.