e-GRO Edible Alert

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# Gray Mold of Greenhouse Strawberries caused by *Botrytis cinerea*



*Botrytis cinerea* (gray mold) is the most recurrent and arguably most detrimental pathogen for strawberry production. Gray mold (Fig. 1) is a common disease issue in the greenhouse, as well as during storage, transport and marketing of strawberries, which is capable of causing severe rot as the fruits ripen. What makes *B. cinerea* a prominent issue is its ability to infect over 200 plant species. This fungus (which is actually a complex of species) is capable of infecting ornamental, vegetable, and fruit plants. This article discusses the visual signs, disease cycle, and management of *B. cinerea* for greenhouse strawberries.


Fig. 1. Gray powdery growth on strawberry fruit is a key sign of *Botrytis cinerea*. Photo credit: Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org Used under a Creative Commons Attribution 3.0 License.

Fig. 2. Gray mold on fruit cluster, calyx, and peduncle of strawberry. Photo credit Scott Bauer, USDA Agricultural Research Service, Bugwood.org Used under a Creative Commons Attribution 3.0 License.

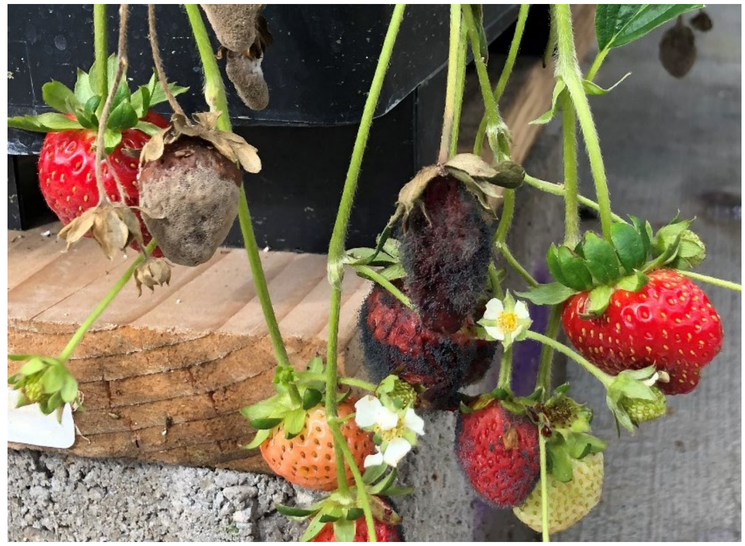

Fig. 3. Gray mold is evident on the strawberry on the upper left whereas a different pathogen *Rhizopus* is responsible for the black growth on the strawberry cluster on the right. Photo credit: Maxwell Grout, Cornell University.

## Symptoms and signs

The main diagnostic sign of this fungus is a fuzzy, grayish-colored, soft growth on the berry itself (Fig. 2). Mushy, gray-colored, soft spots may also be evident on flowers, stems and leaves. When high humidity is present these spots become covered with a gray growth of fungal sporulation. Fruits that completely decay will shrivel, and black sclerotia (compact masses of fungal filaments) up to about 5 mm in diameter will sometimes form on these rotted berries. The conidial sporulation is sometimes confused with that of *Rhizopus* sp., which has a blacker coloring (Fig. 3). Berries with Rhizopus rot also often show “leak”, whereas Botrytis causes a dry rot.

## Pathogenicity

There is an interesting interplay between the pathogen and its host, which would make a great science fiction movie. There is evidence that B. cinerea provokes its host into programmed cell death. B. cinerea produces cell-wall-degrading enzymes, toxins and compounds such as oxalic acid. This unspecialized necrotrophic fungus forms mycelium, conidiophores, and conidia on dying tissues. The mycelium in the tissue allows the fungus to absorb food from its host (the dying tissue) and the conidiophores and conidia help it to spread to new plants.

## Disease cycle

During the spring when the weather is cool as well as wet, fungal spores germinate and are spread by wind and or water. B. cinerea growth is facilitated by heavy rain or overhead irrigation along with cool temperatures. The strawberry infection rate approaches 90% when fruit or flowers are wet for 24 hours or longer. Fruit infection is mainly caused by blossom infection, but the pathogen can remain latent until the fruit ripens. This fungal infection thrives on mature fruit; after it has totally invaded the fruit, the berry will shrivel to form a "mummy berry" (berry capable of spreading infection), which produces spores capable of dispersing to infect nearby plants. B. cinerea overwinters within dead or dying plant debris. In the spring, the fungal spores are dispersed from plant debris via wind and splashing water. An excellent diagram of the B. cinerea disease life cycle is available at NYS IPM Botrytis Fruit Rot.

**Management**

Cultural management and sanitation are the primary control methods. B. cinerea can be hard to control, especially within the greenhouses, because this pathogen is capable of infecting numerous parts of the plant at nearly all life stages.

1) Remove decaying or dead plant material and fruit.

2) Ensure proper air flow over the canopy of the plant by following proper spacing practices and ensure greenhouse has adequate Horizontal Airflow Fans installed.

3) Disinfest tools, especially pruning tools.

4) Avoid overhead irrigation, overwatering or allowing water to stand in pools in the greenhouse.

5) Water during the early morning hours when temperatures are increasing and foliage has time to dry before nightfall.

6) Due to the fungus thriving in cool conditions, it is recommended to turn up the temperature around dusk 3-4 times a week to greater than 75 degrees °F.

7) The primary form of inoculum is the mature fruit: thus, removing clusters that might potentially become infected is ideal for managing Botrytis blight.

8) Most labeled fungicides/bio-fungicides for edibles are preventive, meaning they need to be applied prior to the presence of symptoms in order for them to be effective. Some materials include: Bacillus subtilis QST 713 (ex: Cease, Serenade), Potassium bicarbonate (MilStop), Streptomyces griseoviridis (ex: Mycostop), and Streptomyces lydicus WYEC 108 (ex. Actinovate AG). Always check the product label to ensure it can be used for your state, crop, and production environment. Disclaimer: mention of trademarks or brand names is for informational purposes only and does not imply its approval to the exclusion of other products that may be suitable.

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