GRAY MOLD DISEASES

by Franklin Laemmlen

Gray mold is the common name given to a large number of diseases on numerous hosts, caused by *Botrytis cinerea*. There are several Botrytis species, but *B. cinerea* is the most common. This fungus pathogen causes extensive and expensive crop losses to many field-grown and greenhouse crops. Botrytis diseases are probably the most common and most widely distributed diseases of vegetables, ornamentals, fruits, and field crops worldwide. The Central Coast of California with its moderate year-round climate and twelve-month growing season often provides ideal conditions in which this pathogen can operate and cause serious crop damage.

It would be safe to say that *B. cinerea* is a primary invader. When plants mature and die, there are a number of microorganisms which have the ability to attack sound but senescening tissues. *B. cinerea* is such an organism. Under the proper environmental conditions, this fungus very quickly colonizes wounded, dead or dying stems, leaves, flowers, and fruits (Fig. 1, 1 o'clock).

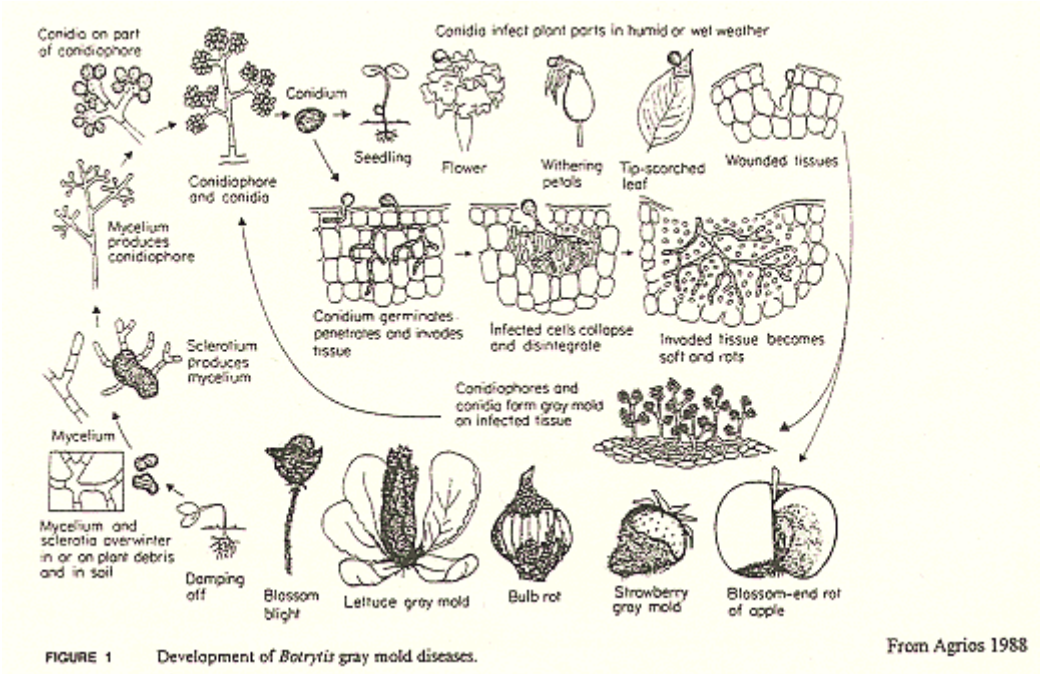

FIGURE 1 Development of *Botrytis* gray mold diseases.

Unfortunately, the Botrytis fungus does not stop when it reaches the margin of the senescent or necrotic tissues. Botrytis has the ability to kill and macerate cell tissues ahead of its advance, i.e., the fungus continues to grow into dead tissues, which it makes for itself. By this mechanism, the fungus is able to advance from the fallen flower petal into the healthy leaf on which the petal rests, from the dying cotyledon into the stem of the young seedling, from the senescent pistil into the strawberry fruit, from the senescent flower into the calyx, pedicel and twig, etc. Blossom blight, fruit rot, damping-off, stem cankers, stem rots, leaf spots; tuber, bulb, corm and root rots; neck rot, and twig blight

are all diseases of fruits, flowers, and vegetables that could be prefixed with Botrytis gray mold. Several specific diseases that occur commonly on the Central Coast are fruit rot in strawberries, head rot in lettuce and cabbage, bunch rot in grapes, flower blight in stocks and other cut flowers, gray mold in beans, stem rot in tomatoes, and flower blight in ornamental and vegetable crops grown for seed.

Usually infections begin on a small bit of wounded tissue or a senescent leaf or flower petal. The tiny lesion may be brown or tan and may be surrounded by a darker halo. The invaded tissues will disintegrate into a slimy brown rot if humidity remains high. The rotted tissues may also become a dry brown rot if the environment dries out after stems and leaves are invaded. If humidity remains high, very soon after visible lesions appear, they become covered with a dense mat of gray mold. This mat is composed of conidiophore and conidia (Fig. 1, 11 o'clock), which are the spore-bearing structures and the spores of Botrytis, respectively. Each conidiophore produces several hundred spores, so a mat of Botrytis can produce spores by the thousands, which are easily dislodged and airborne by even the slightest disturbance. Clouds of spores can be observed coming off a mat of gray mold fungus when a slight breeze rustles an infected plant.

Botrytis activity is favored by high humidity. It grows most luxuriantly during foggy and drizzly days (90%+RH). The fungus grows equally well in light or in darkness, but produces spores only in the light. Fungus growth can occur between 32° - 96°F, however, optimum temperatures for growth are between 69° and 77° with 90% or higher RH. These conditions can occur any day of year on the Central Coast.

Free moisture in the form of liquid water is necessary for germination of Botrytis spores. Moisture is also necessary for growth within plant tissues, and low humidity helps arrest growth of the fungus. However, growth can resume when moisture again becomes available.

Botrytis disease control is difficult on the Central Coast because moisture and temperature conditions are favorable for disease development most of the year. However, a few suggestions can be made. The fungus gets its foothold on wounded, senescent and dead plant material. Therefore, reducing and/or eliminating this plant debris can help reduce Botrytis proliferation. Shred and incorporate vegetable crop residues as soon after harvest as possible. Dispose of cull piles and vegetable trash daily. Keep roadways, ditches and borders free of weeds. Dead weeds can support Botrytis.

Cull piles of strawberries should be covered with several inches of soil, or the berries should be crushed so they dry up and become a less fit medium for Botrytis growth.

Since wet plant surfaces are necessary for the germination of Botrytis spores, keep overhead watering to a minimum. Also time your sprinkling, so plant surfaces dry quickly when sprinklers are shut off. This is especially true in seed crops after bloom is initiated. Drip irrigation is recommended to keep humidities in the crop canopy as low as possible. Any practice which promotes air movement and the drying of plant surfaces will help reduce Botrytis.

Finally, there are a number of fungicides which have activity against *Botrytis cinerea.* Benomyl, captan, chlorothalonil, dicloran, iprodione, maneb, mancozeb, thiophanate-methyl, vinclozolin, and zineb all show efficacy against Botrytis. Some *B. cinerea* strains have shown resistance to benomyl and thiophante-methyl. Crops and registered uses vary from label to label. Read and follow product labels carefully for best results. Also remember that sprayer calibration and nozzle configurations, which will give thorough coverage of the crop, are important to good disease suppression.

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