Watermelon anthracnose

» Anthracnose causes leaf spots, stem lesions, and fruit rot of watermelon and can result in substantial loss of marketable yield.
» Race 2 of the anthracnose pathogen is most prevalent on watermelon; host resistance is available for race 1 but not for race 2.
» A combination of cultural practices and fungicide applications are used to manage watermelon anthracnose.

Anthracnose, caused by the fungus *Colletotrichum orbiculare*, is a common watermelon disease, especially in regions with humid climates and frequent rainfall during the growing season. Cucumber, honeydew, and bottle gourd are also very susceptible to anthracnose, while cantaloupe, squash, and pumpkin are less susceptible. The anthracnose fungus infects leaves, stems, and fruit, causing substantial losses to watermelon production. Yield losses in non-treated research plots in South Carolina averaged 46% in the 1980s and early 1990s. The severity of anthracnose in commercial watermelon fields in the southeastern U.S. has increased over the past few years, likely the result of reduced use of QoI (strobilurin) fungicides for disease management.

**Symptoms**

Anthracnose lesions can develop on leaves, petioles, and vines, as well as on the cotyledons and hypocotyls of seedlings. On watermelon leaves, lesions start as yellowish, water-soaked spots, often developing near leaf veins. The spots enlarge up to ½ inch (1 cm) in diameter, become circular, and turn dark brown to black (Figure 1). The centers of the spots dry and can drop out, giving the leaf a shot-hole appearance. Lesions on the stems and petioles are tan, shallow, and elongated but usually do not girdle the affected plant part (Figure 2). Watermelon seedlings are very susceptible and may be killed by anthracnose infection.

Watermelon fruit are also very susceptible to infection by the anthracnose fungus. Fruit rot symptoms can be variable and occur on any part of the fruit, including the underside sitting on the soil surface. Fruit rot symptoms start as small, circular, raised, tan blisters that crack open. The spots enlarge to form circular to oval, black, sunken lesions. During periods of high humidity, the surface of the lesions becomes covered with masses of salmon pink-colored spores (Figure 3). If viewed with a hand lens, dark, whisker-like hairs (setae) can be seen sticking out of the spore masses.

Watermelon fruit are most susceptible to infection when they are young. However, fruit rot symptoms can continue to develop after harvest.

**Cycle and Conditions**

The anthracnose pathogen can overwinter on infested plant debris and volunteer cucurbit plants. The fungus can survive on crop debris for at least two years, and the pathogen can be seedborne. Spores of the fungus are primarily spread by splashing water, including rain and overhead irrigation. However, spores can also be spread by wind and on workers’ clothing and equipment, especially when foliage is wet from rain, irrigation, or dew. Infection and disease development are favored by warm temperatures, frequent rainfall, and humid conditions. Spore germination and fungal growth are optimal at temperatures from 72° and 80°F (22° and 27°C) and with relative humidity levels near 100% for 24 hours.

Three races of *C. orbiculare* have been identified. Race 1 can infect cucumber, muskmelon, and some open-pollinated watermelon varieties. However, most commercial watermelon varieties contain resistance to race 1. Race 2 can infect open-pollinated cucumber, muskmelon, bottle gourd, and all watermelon varieties. Race 2b is less common and not as well

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characterized, but it can infect some watermelon varieties.\textsuperscript{1,6} Anthracnose on watermelon is most likely to be race 2.

**Management**

Managing anthracnose on watermelon starts with using clean, disease-free seed and transplants to reduce the chances of introducing the pathogen into the field. The application of seed-treatment fungicides can help control seedborne inoculum.\textsuperscript{1,2,4} Crop rotation to non-cucurbit hosts for at least one year (two to three years are better) can help keep inoculum levels in the field low. Watermelon crop residue should be destroyed (plowed in) promptly after harvest to speed the process of decomposition.

Avoid overhead irrigation or apply irrigation early in the day so that the foliage can dry before nightfall. Do not allow workers or equipment to enter fields when plants are wet from rain, irrigation, or dew. Carefully inspect fruit at harvest and discard any diseased fruit to minimize the spread of the pathogen and the development of fruit rot after harvest. A post-harvest wash with chlorinated water followed by refrigerated storage can also help slow the development of fruit rot after harvest.\textsuperscript{1,2,4}

As mentioned, most commercial watermelon varieties are resistant to races 1 and 2b of *C. orbiculare*. The resistance gene Ar-2-1 was found in 1959. So far, no commercial watermelon varieties have resistance that is effective against race 2.\textsuperscript{1,7}

In addition to cultural practices, watermelon anthracnose is managed with fungicides. Fungicides may not be cost-effective when cultural control practices are used.\textsuperscript{2} Regular scouting for anthracnose should begin shortly after canopy closure. One recommendation is to examine ten leaves and five fruit in each of five random areas in the field. Fungicide applications should begin as soon as the disease is detected.\textsuperscript{5}

Both protectant and systemic fungicides are registered for use on watermelon to manage anthracnose. Protectant fungicides that are effective against anthracnose include chlorothalonil, mancozeb, and thiophanate-methyl. Some newer fungicides, including tebuconazole and a combination product containing difenoconazole and cyprodinil, are being used to replace the older fungicides. However, these newer products may not provide the same level of protection.\textsuperscript{1,8,9}

The QoI (strobilurin) class of fungicides (FRAC group 11) have been particularly effective for managing anthracnose on cucurbits, including watermelon. This group includes the fungicides azoxystrobin, fluoxastrobin, pyraclostrobin, and trifloxystrobin. The fungicides used most often to manage gummy stem blight include the DMI fungicides (FRAC group 3), such as tebuconazole and difenoconazole; the carboxamides (FRAC group 7), such as fluopyram; and the anilino pyrimidines (FRAC Group 9), such as cyprodinil, and the phenyl pyrroles (FRAC Group 12), such as fludioxonil. Unfortunately, these fungicides are not as effective against anthracnose.\textsuperscript{3,8} Some pathogens, such as the fungus that causes gummy stem blight, have developed resistance to the QoI class of fungicides. These fungicides are no longer effective for controlling these diseases, which has led some growers to stop using the QoI fungicides and switch to the fungicides mentioned above. It is thought that this change in the types of fungicides use has resulted in an increase in the severity of anthracnose on watermelon over the past few years.\textsuperscript{3,8} However, growers should not rely exclusively on the QoI fungicides for managing anthracnose, as it is possible that the anthracnose fungus could also develop resistance to this group of fungicides. The fungicides trifloxystrobin, azoxytrobin, pyraclostrobin, thiophanate-methyl, chlorothalonil, and mancozeb continue to provide consistent control of anthracnose on watermelon. Alternating or combining applications of the QoI fungicides with the protectant fungicides will help prevent or delay resistance development.\textsuperscript{3}

A disease forecast model, MelCast, was developed to help growers determine when fungicides need to be applied to manage anthracnose on watermelon.\textsuperscript{10,11} The MelCast model uses temperature and leaf wetness data to estimate when conditions are favorable for disease spread and infection.

**Sources:**


Websites verified 10/27/2021

For additional agronomic information, please contact your local seed representative.