

Anthracnose of dry beans



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Anthracnose, caused by the fungus *Colletotrichum lindemuthianum*, is a potentially devastating seed-borne disease that affects dry beans in temperate regions of the world. The disease can affect any above-ground plant part at any stage of development. However, early infections usually result in heavier yield losses and higher seed transmission rates. Weather conditions favorable to anthracnose development can result in complete loss of the crop.

Anthracnose has been present in North America at least since 1884, but it was first detected in commercial bean fields of North Dakota in the 2001 season. The disease was detected in Manitoba in the 1999 season.

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Symptoms

Anthraco­nose attacks aerial plant parts. In the early stages of disease develop­ment, lesions can be easily identified as small, elongated, dark brown areas that occur on petioles and follow the vein patterns of leaves (Figure 1). In later stages of disease develop­ment, lesions can be observed on both sides of the leaf.

When the fungus infects the pods, it usually produces small round cankers, about 1/8 inch in diameter, with a sunken center (Figure 2). In wet weather, masses of spores, salmon-tan to orange in color may cover the center of these cankers. The borders of the cankers are usually well defined and dark brown in color.

When the fungus attacks the pods in their early stages of develop­ment, it can penetrate and infect the newly forming seeds. Infected seed may be shriveled, discolored, and have dark brown to black cankers. Discolored areas are more conspicuous on white-coated seeds (Figure 3).

Infections occurring late in the season may result in infected seeds that do not show any symptoms. However, seedlings produced by symptomless seeds could become the sources of infection for new plantings. Infected seeds harbor the fungus under the seed coat where chemical seed treatments may not come in contact with the fungus to provide an adequate level of control.



Figure 1. Dark-brown anthracnose lesions following vein patterns on the lower side of a pinto bean leaf.



Figure 2. Anthracnose lesions on dry bean pods with sunken centers surrounded by reddish-brown margins.



Figure 3. Healthy (top) and anthracnose-infected (bottom) navy (left) and pinto (right) bean seeds. The disease is introduced to new fields primarily by infected seeds.

The pathogen

The fungus *Colletotrichum lindemuthianum* is almost exclusively a pathogen of dry edible beans. Conidia (spores) are produced in open structures called acervuli that are located in the center of the lesions (Figure 4). Conidia are very susceptible to dehydration and can be killed by sunlight. A water-soluble mucilaginous material covers the spores and protects them. The pathogen can survive on infected plant residues in the field for one to two years, and up to five years on infected seeds that have been stored at 40°F. The sexual stage of *C. lindemuthianum* has been observed in a few instances in eastern Canada but not in the United States. The production of a sexual stage could result in the creation of new races. These races are capable of attacking specific resistance genes incorporated in commercial cultivars. Races 7, 65, 73, and 89 have been identified in North America (Michigan and Ontario). In North Dakota only race 73 has been recently identified. The same race is present in Manitoba.

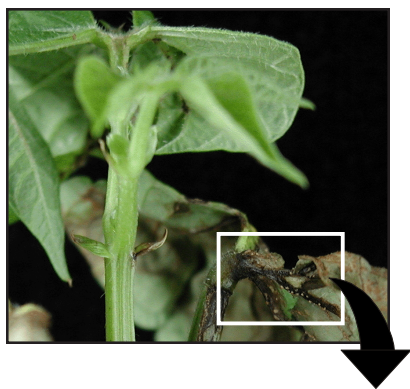
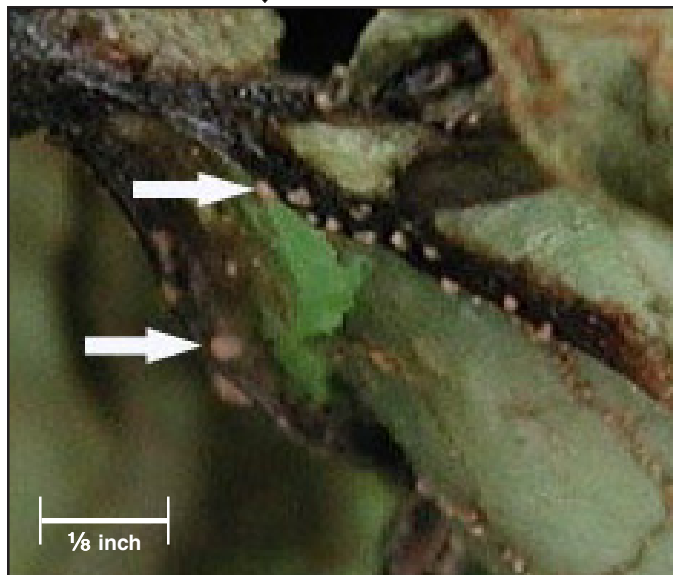


Figure 4. Infected areas on the leaves will die, and the fungus will produce abundant spores in wet masses called acervuli (arrows in magnified section). Movement of spores from plant to plant may occur by splashing water or by cultivating when the foliage is wet.



Disease cycle

Cool (65-80°F) wet weather conditions are favorable for disease development. The spores germinate readily when free water is present on the plant tissues. Rain events of 0.04 inch or more can spread spores within an area 5 feet in diameter around the infected plants. However, gusting winds could blow these spore-loaded raindrops more than 12 feet away from infected plants. Additional spores could be produced in newly infected areas in 7 to 14 days, depending on the cultivars and on weather conditions.

Since the pathogen can be seed-borne, epidemics could start at any stage of development of the crop. Spores can germinate overnight in free water produced by changes in temperature of the leaves and then continue growing during the day. Short periods of temperatures higher than 85°F can halt fungal growth, but as soon as the temperature drops under 85°F, the fungus will reinitiate growth. Late infections during pod-fill can result in seed that are infected but do not express symptoms.

Control

Prevention is the best way to manage this disease. Anthracnose is usually introduced to a field by infected seed or by machinery during cultivation or harvesting. If you believe you have anthracnose in a field, cultivate or harvest that field last. If you cannot avoid entering that field, wash your equipment very well before moving it to another field to make sure you are not bringing plant residues on the equipment to the next field.

Use certified pathogen-free seed; do not use bin-run seed.

Anthracnose epidemics usually start with a few infected seeds that were planted in the field. Seedlings produced by these seeds will infect a few plants around them. Because of their numbers, these infected plants may escape attention during that season. If you use seeds harvested from that field to plant in the following season, epidemics severe enough to reduce yield may occur.

Chemical seed treatments are not completely effective in eradicating the pathogen from infected seeds. Planting infected seeds that have been treated with fungicides may introduce the pathogen into new fields.

Foliar applications of fungicides like chlorothalonil (Bravo, Echo, Equus, Terranil) and thiophanate methyl (Topsin M, T-methyl) may help control the disease. However, under favorable weather conditions and high disease incidence, multiple applications may be required.

In the presence of the pathogen, the best option is to use resistant cultivars. The presence of physiological races of this pathogen, however, is an obstacle to producing cultivars with resistance to multiple races. Currently, most bean cultivars grown in North Dakota are susceptible to the race that was detected in North Dakota (race 73).

If you suspect that anthracnose is present in your fields, you can send plant samples to the NDSU Plant Diagnostic Lab or contact your local extension specialist. Avoid short rotations and alternate dry beans with at least two seasons of other crops, because the fungus can survive in dry bean residues for at least two seasons.

The most important step to prevent the introduction of the pathogen to your fields is to use certified anthracnose-free seed.

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