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Tomato Anthracnose Disease Caused by Colletotrichum Species

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ABSTRACT

Anthracnose disease is one of the major economic constraints to Tomato production worldwide, especially in tropical and subtropical regions. Accurate taxonomic information is necessary for effective disease control management. In the Colletotrichum patho-system, different Colletotrichum species can be associated with anthracnose of the same host. Little information is known concerning the interactions of the species associated with the Tomato anthracnose although several Colletotrichum species have been reported as causal agents of Tomato anthracnose disease worldwide. Although the management and control of anthracnose disease are still being extensively researched, commercial cultivars of Colletotrichum coccodes that are resistant to the pathogens that cause tomato anthracnose have not yet been developed.Colletotrichum gloeosporioides, Colletotrichum Phomoides, Colletotrichum coccodes, andColletotrichum dematium are the four main species of Colletotrichum that cause tomatoanthracnose.

Keywords: Anthracnose; Tomato; Colletotrichum Coccodes,C.Phomoides; Identification

I. INTRODUCTION

Anthracnose, derived from a Greek word meaning ‘coal’, is the common name for plant diseasescharacterized by very dark, sunken lesions, containing spores (Isaac, 1992).Typical fruit symptoms include dark, sunken, and circular lesion with orange conidial masses. Pathogen isolates were obtained from a diseased tomato fruits, on PDA medium forming a white to gray colonies. The cultures developed black acervuli around the center of the colony. Conidia were hyaline, aseptate, and fusiform or rarely cylindrical. Appressoria were smooth, simple, clavate to ovate, and varied from light to dark brown. Pathogenicity tests with representative isolates were conducted on symptomless, detached tomato fruits.

The genus *Colletotrichum*(*teleomorph Glomerella*)contains an extremely diverse number of fungi includingboth plant pathogens and saprophytes. Plant pathogenicspecies are important worldwide, causing diseasescommonly known as anthracnose of grasses, legumes,vegetables, fruits, and perennial tree crops. Thedisease can occur on leaves, stems, and fruits of hostplant (Sutton, 1992). Anthracnose diseases appear inboth developing and mature plant tissues. Two distincttypes of diseases are: those affecting developing fruitin the field (preharvest) and those damaging maturefruit during storage (postharvest). The ability to causelatent or quiescent infections has grouped *Colletotrichum*among the most important postharvest pathogens(Bailey et al., 1992).Anthracnose disease caused by several *Colletotrichum*spp. is a significant economic constraint on tomato(*Lycopersicon esculentum*Mill.) production worldwide.

In the *Colletotrichum* patho-system, different *Colletotrichum* species can be associated with anthracnose of the same host (Simmonds, 1965; Freeman et al., 1998; Cannon et al., 2000). Anthracnose disease can occur on leaves, stems, and both pre- and post-harvest fruits (Isaac, 1992).*Colletotrichum gloeosporioides*(Penz.) Penz. &Sacc., *Colletotrichum coccodes*(Wallr.) S.J. Hughes, and*Colletotrichumdematium*(Pers. ex Fr.) Grove are threemain species of *Colletotrichum*that cause tomato anthracnosein the United States (Dillard, 1989; Byrne etal., 1997; Sanogo et al., 1997; LeBoeuf, 2007). In Bulgaria,*Colletotrichum acutatum*J.H. Simmonds has beenreported as a causal agent of tomato fruit anthracnose(Jelev et al., 2008). The corky root of tomato caused by*Colletotrichum atramentarium*(Bert. et Br.) Taubenh.,(synonym of C. *coccodes)* has also been found in Croatia(Panjan and Lušin, 1963). Correct and accurate identification will thus ultimately lead to more effective disease control and management, e.g., selecting appropriate fungicides, or long lasting resistant cultivars (Whitelaw-Weckert et al., 2007).

Anthracnose of tomato is primarily a disease of ripe and over-ripe fruit. If left unchecked, the disease can cause serious losses in yield and marketability. Caused by several species of the fungus *Colletotrichum*, the disease is widespread and common in areas where moisture conditions promote disease development. Anthracnose also affects eggplant, pepper, and potato. *C. coccoides* is the most common pathogen of tomato fruit. *Colletotrichum* species are known as broad range pathogens as a single species is capable of infecting diverse hosts and numerous species infect a single host (*Freeman S, Katan T, Shabi E.*1998)

Morphological and culturalcharacteristics:

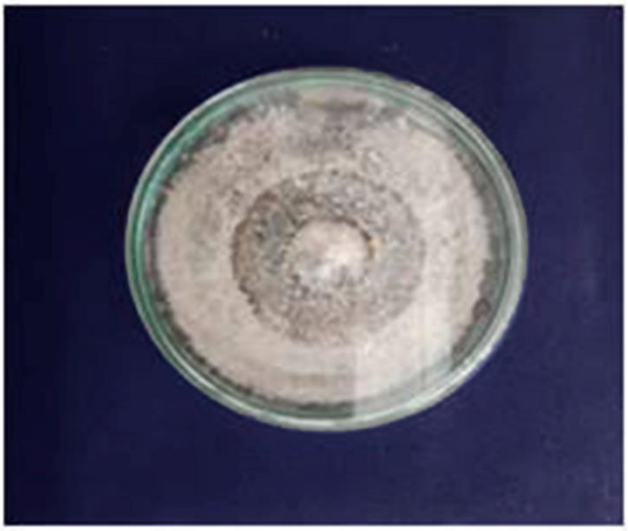
The isolates were cultured on potato dextrose agarPDA in darkness at 25oC. The appearance of the colonies,the occurrence of sectors, and the vegetative andreproductive structures were described after 10 daysof incubation. The conidia were taken from activelygrowing colonies and suspended in sterile water. Lengthand width were measured for 100 conidia, and conidial shape was recorded using the light and scanningelectronic microscopy. Appressoria were producedusing a slide culture technique, in which 10 mm2 squaresof PDA were placed in an empty Petri plate. Theedge of the agar was inoculated with spores taken froma sporulating culture, and a sterile cover slip was placedover the inoculated agar (Johnston and Jones, 1997).After 5 days, the shape and size of the 100 appressoriaformed across the underside of the cover slip were examinedmicroscopically. Morphological characteristicsof conidia and appressoria of tomato isolates werecompared with reference isolates of *C. Coccodes*and*C. gloeosporioides*.

II. RESULTS

Disease symptoms

Fruit symptoms begin as small, dark, sunken lesionsthat have a water-soaked appearance, which increasein diameter and coalesce, leaving a large sunken softarea. Under favorable temperatures, lesions on ripefruit become visible within 5 to 6 days after infection. Orange conidial masses may occur scattered or inconcentric rings on the lesion (Figure 1a). Black acervuliare produced just beneath the skin of the infectedfruit (Figure 1b).

Figure 1. Anthracnose symptoms on tomato fruit: (a) sunken necrotic lesion with orange conidial masses; (b) black acervuli on the infected fruit.



Growth of *C. coccoide* in PDA

Setae and conidia of *C. coccoide*

III. CONTROL

Select seed from anthracnose-free fruit or treat seedswith a fungicide. Hot water treatment is recommendedto destroy seed-borne fungi. Soak seed at 50 °C for 25minutes. Following treatment, plunge the hot seeds intocold water, dry on paper, and dust with thiram. Freshlyharvested seed withstands heat treatment better thanone- or two-year-old seed.Use healthy transplants. Sanitize flats if reusingthem for transplant production. Broad-spectrumfumigants can be applied to soil in seedbeds to controlthe pathogens.Rotate with nonhost crops and avoid potato,soybean, pepper, eggplant, and cucurbits. Avoiddamaging tomato roots when cultivating. Stake plantsto improve air circulation and to reduce leaf and fruitwetness. Mulch to reduce soil splash onto fruit andlower leaves. Minimize or avoid overhead irrigation toreduce periods of wetness on tomato fruit. Harvest fruitpromptly since anthracnose develops more readily asthe fruit ages. Allow infested crop debris to decomposecompletely before planting again. Weed regularly.Apply protectant fungicides to plants starting whenthe first fruit are set. This will prevent or minimize theoccurrence of latent infections. Resistant varieties areavailable.

AVRDC

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