Diseases Caused by Fungi and Fungus-Like Organisms

First Report of *Berkeleyomyces basicola* Causing Mango Root Rot and Decline in India

P. K. Shukla,[†] Tahseen Fatima, and Nidhi Kumari

ICAR-Central Institute for Subtropical Horticulture, Rehmanikhera, PO Kakori, Lucknow, Uttar Pradesh - 226 101, India

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Mango wilt has been a serious constraint in mango (*Mangifera indica* L.) production in several countries including India (Shukla et al. 2018). Although several fungal pathogens have been reported associated with the disease, species of *Ceratocystis*, *Verticillium*, and *Lasioidiplodia* have been found predominantly responsible for the wilt (Shukla et al. 2018). A 27-year-old mango tree (cv. Dashehari) at Rehmanikhera, Lucknow, Uttar Pradesh, India, suffered sudden wilt in February 2020. Although symptoms were similar to *Ceratocystis* wilt, no gummosis was observed on trunk or branches, which occurred in the majority of *Ceratocystis fimbriata*-infected trees. Infected roots of the wilted tree exhibited dark brown to black discoloration in woody portions. Severely affected roots were completely rotten. Similar symptoms of root infection were observed in an additional 16 declining trees within an orchard of 120 trees. Infected hardwood samples from live roots of 16 declining and one wilted trees were utilized for isolation by placing root tissue of discolored and normal colored tissue on surface-sterilized fresh carrot discs placed in a moisture chamber for 10 days. Of 17 tree samples, isolates of *Berkeleyomyces basicola* (Berk. & Broome) W.J. Nel, Z.W. de Beer, T.A. Duong, M.J. Wingf. (Nel et al. 2018) obtained from one wilted and nine declining trees were transferred to and maintained in pure culture on potato dextrose agar. Isolates were grown for 7 to 10 days at 23 ± 1°C in the dark. The isolates were characterized by a greyish black compact mycelial colony. Two types of spores, endoconidia (phialospores) and chlamydospores (aleuriospores or amylospores), were observed under a microscope. The endoconidia were hyaline, cylindrical in shape, and 10 to 42 × 3 to 6 µm (*n* = 50). Chains of dark-colored chlamydospores (three to seven spores in chain) of 24 to 52 × 10 to 12 µm

(*n* = 50) were apparent. Molecular identification of the fungus isolated from the wilted tree was established by amplifying the ITS1-5.8 rDNA-ITS2 region of fungal genomic DNA and the set of ITS primers (ITS 1/ITS4) (White et al. 1990) followed by sequencing. The sequence was submitted to the NCBI database as MT786402. The present isolate (MT786402) shared >99% nucleotide similarity with other *B. basicola* isolates. A phylogenetic tree was constructed using the ITS1-5.8 rDNA-ITS2 sequences of other *B. basicola* isolates and other *Thielaviopsis* spp., *C. fimbriata*, and *Chalaropsis thielavioides* through the neighbor joining method using MEGAX software (Kumar et al. 2018). The present isolate formed a distinct cluster along with other *B. basicola* isolates in a separate clade. Koch's postulates were performed under a transparent polycarbonate sheet roof net house at 14.4 and 42.2°C minimum and maximum temperatures, respectively. A 100-ml macerated culture suspension consisting of 1,000 chlamydospores and endoconidia per milliliter of suspension was inoculated in the rhizosphere of mango seedlings planted in sterilized soil filled in earthen pots, using 10 replicates for inoculated and uninoculated plants. Symptoms of necrotic root tissue were observed 90 days after inoculation and were consistent with those observed in the field. The same fungus was reisolated from infected roots, and identity was confirmed. All control plants remained symptom-free and *B. basicola* was not isolated from the roots. Thus, we conclude that *B. basicola* is capable of causing root rot disease of mango. To the best of our knowledge, this is the first report of *B. basicola* causing mango root rot and decline across the globe, hitherto unreported. The extent of the root necrosis symptoms associated with mature mango trees demonstrates the potential virulence of *B. basicola*, although its pathogenicity risk on healthy mature trees is still unknown. However, the possibility of severe losses to the mango industry in the world's number one mango producer country, India, cannot be ruled out, if found widespread.

References:

- Kumar, S., et al. 2018. Mol. Biol. Evol. 35:1547.
- Nel, W. J., et al. 2018. Plant Pathol. 67:871.
- Shukla, P. K., et al. 2018. Indian Phytopathol. 71:135.
- White, T. J., et al. 1990. Page 315 in: PCR Protocols: A Guide to Methods and Applications. Academic Press, San Diego, CA.

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[†]Indicates the corresponding author.

E-mail: P. K. Shukla; pksmush@gmail.com