

First Report of *Verticillium* Wilt Caused by *Verticillium dahliae* in Grafted Tomato in Taiwan

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Grafted tomato (*Solanum lycopersicum* L.) is widely used to manage soilborne diseases (Lee et al. 2010). In Taiwan, grafting on eggplant (*S. melongena* L.) rootstock has been extensively used to reduce bacterial wilt in tomato production. In July 2019, wilting plants were found at a cherry tomato farm (~0.5 ha) in Miaoli County. About 10% tomatoes of cv. 'Mint Shine' grafted onto eggplant rootstock displayed wilt symptoms. Numerous leaflets with chlorosis, intervein yellowing, V-shaped necrotic lesions, and withered leaves were observed on the affected plants. Some plants eventually wilted and died. A cut at the grafting site revealed vascular discolorations on both scion (tomato) and rootstock (eggplant). A fungus with a compact whitish colony was consistently isolated from the symptomatic vascular tissue by using acidified potato dextrose agar (PDA) plates. Two isolates, Ve2 from eggplant and Ve4 from tomato, grown on PDA plates were characterized. Both Ve2 and Ve4 grew slowly (ca. 2.6 mm/day at 28°C) and shared almost identical cultural and morphological characteristics. They first showed whitish mycelium and cream color in reverse within 1 week. Later, numerous microsclerotia developed evenly over the colony and the reverse turned dark black. Microscopic observations revealed hyaline hyphae with black, elongated, irregularly spherical microsclerotia measuring 31.3 to 71.5 × 16.8 to 49.0 μm (average 50.4 × 28.5 μm) on a 3-week-old PDA culture. Abundant hyaline, single-celled, ellipsoidal conidia measuring 2.7 to 4.7 × 0.9 to 3.2 μm (average 3.7 × 1.9 μm) and verticillate conidiophores were observed. The fungus was identified as

Verticillium dahliae based on the consistent morphological characteristics (Hawksworth and Talboys 1970). To confirm the identity, the internal transcribed spacer regions of ribosomal DNA, amplified by PCR with universal primers ITS4/ITS5 (White et al. 1990), were sequenced. Both strains shared the same sequences (GenBank: MZ734460, MZ736637), and BLASTn searching was 100% identical to many records of *V. dahliae* including an ex-epitype CBS130341. Pathogenicity was tested on 3-week-old seedlings of tomato cv. 'Bonny best' and eggplant cv. 'Longship' by a root dip method (Bhat and Subbarao 1999). Eighteen plants arranged into three replicates were inoculated for each host-isolate combination, and incubated in the greenhouse at 25 ± 3°C. The pathogenicity test was repeated two times. Both isolates were pathogenic to tomato and eggplant. Both isolates induced wilt symptoms in all inoculated plants within 14 days postinoculation (DPI). Severe leaf drop, wilting, and vascular discoloration occurred in all inoculated eggplant, and slight yellowing and mildly stunted growth in tomato were observed at 21 DPI. Koch's postulates were fulfilled by reisolating the same fungus from both infected tomato and eggplant. All uninoculated plants remained healthy and no *V. dahliae* was isolated from them. To our knowledge, this is the first report of *V. dahliae* and *Verticillium* wilt of grafted tomato caused by this pathogen in Taiwan. This pathogen affects over 400 plant species and has resulted in significant economic losses in many regions of the world (Subbarao 2020). It is important to investigate the distribution and extent of damage caused by this emerging pathogen on Solanaceous or other crops in Taiwan to determine the economic impact and need for disease control.

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