Reactions of Solanaceous Species to *Pseudocercospora fuligena*, the Causal Agent of Tomato Black Leaf Mold

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ABSTRACT

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A total of 137 accessions representing 26 species and five genera of solanaceous plants were inoculated with *Pseudocercospora fuligena*, the causal agent of tomato black leaf mold, under controlled conditions (growth room) and in the field. Twenty of 26 species developed symptoms after inoculation under controlled conditions. Black nightshade (*Solanum nigrum*) developed symptoms when inoculated under controlled conditions, but not in the field. Ground cherry (*Physalis* sp.), five Irish potato (*Solanum tuberosum*) cultivars, and eight tobacco (*Nicotiana tabacum*) lines remained symptomless following inoculation both under controlled conditions and in the field. Of 40 pepper accessions representing four species of *Capsicum* tested under controlled conditions, 32 developed lesions and eight were symptomless. Of 33 eggplant (*Solanum melongena*) accessions and related species representing seven *Solanum* spp. tested under controlled conditions, 24 developed symptoms and nine were symptomless. Two commercial eggplant cultivars, Pingtung Long and Farmers Long, were highly susceptible under controlled conditions and in the field. Among 46 *Lycopersicon* accessions representing 10 species that were evaluated, accessions of *L. esculentum* were the most susceptible and accessions of *L. hirsutum* were the most resistant. Five *Lycopersicon* spp., three *Solanum* spp., and four *Capsicum* spp. are reported as new hosts of *P. fuligena*.

Black leaf mold of tomato (*Lycopersicon esculentum* Mill.), caused by *Pseudocercospora fuligena* (Roldan) Deighton (Syn. *Cercospora fuligena* Roldan) (12), is widespread in the tropics (1–3,10–14), where it develops under warm, humid conditions (1,5,14). Disease symptoms begin with the development of irregularly shaped chlorotic spots on the leaves, with sporulation evident mainly on the lower surface. In advanced stages, the lesions enlarge and coalesce, with abundant dark sporulation on both surfaces. The leaves roll upward, die prematurely, and generally remain hanging on the plant with a soot-covered appearance. The fruit are not attacked. Recent reports from Taiwan demonstrated that black leaf mold can cause extensive damage to tomatoes (4,5). A yield loss of 32% was reported during the 1989–90 season on tomato cultivar Tainan Selection No. 2 (TN-2). Yield loss was due to fewer and smaller fruits produced on infected plants (5). More recently, a yield loss of more than 40% was observed in a planting of four commercial cultivars (T. C. Wang and L. L. Black, *unpublished*).

Little is known about the epidemiology of black leaf mold. For example, it is not known whether primary inoculum of *P. fuligena* originates from infected crop debris or from alternative host species. Conidia have been found to survive up to 6 months on infected tomato leaves stored in a dried condition but did not survive for 40 days on leaves maintained in moist conditions (14). Known hosts of *P. fuligena* include tomato, cultivated eggplant (*Solanum melongena* L.), and black nightshade (*Solanum nigrum* L.) (4,7). Although there has been some question as to whether the pathogen on *S. nigrum* is a different species (*Pseudocercospora atromarginalis* (Atk.) Deighton) (9), cross-inoculation studies (4,7), in addition to isozyme and polymerase chain reaction (PCR) studies (7), suggest that *P. atromarginalis* is synonymous with *P. fuligena*. The objectives of our study were to evaluate a range of solanaceous weed and crop species for their potential to serve as alternative hosts for *P. fuligena* and to evaluate accessions of crop species for potential sources of resistance.

MATERIALS AND METHODS

A series of experiments was conducted in which representatives of 26 greenhouse-grown solanaceous species were inoculated with *P. fuligena*. Inoculum consisted of a 5×10^3 conidia per ml suspension of two tomato isolates, Pf-2 and Pf-14, that were mixed in equal proportions. These isolates were collected from western and eastern Taiwan, respectively. Cultures were established by making streak transfers from stock cultures to tomato-oatmeal agar (TOA) (4). They were grown at 28°C in a fluorescent-lighted (57 $\mu E \cdot m^{-2} \cdot s^{-1}$) incubator with alternating 12-h light/dark periods. Conidia were harvested from 7- to 10-day-old cultures by adding sterile distilled water to each plate and scraping the surface lightly with the edge of a glass microscope slide to dislodge conidia, which were filtered through a 40-µm-mesh sieve to remove mycelial fragments. The conidial concentration was determined using a hemacytometer and diluted to 5×10^3 conidia per ml. Plants were atomized with the inoculum to the point of runoff and maintained for a minimum of 1 week in a growth room at 95 ± 2% relative humidity and 28 ± 2°C with 14 h of light (49.3 $\mu E \cdot m^{-2} \cdot s^{-1}$). Disease severity was assessed by averaging visual estimates of the percent leaf area affected on individual plants based on a modified Horsfall-Barratt scale (8). Incubation period, postincubation maintenance of plants, days to disease evaluation, and numbers of plants inoculated are detailed for each experiment. Data were analyzed by analysis of variance (ANOVA) and means were separated by LSD ($P \leq 0.01$).

Experiment 1: Solanaceous species. The following solanaceous species were inoculated with *P. fuligena*: pepper, *Cap-*

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