

Diseases Caused by Fungi and Fungus-Like Organisms

Root Rot and Wilt Caused by *Fusarium nygamai* of Bean (*Phaseolus vulgaris*) in Sinaloa, Mexico

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Plant Dis. 106:2748, 2022; published online as <https://doi.org/10.1094/PDIS-01-22-0123-PDN>. Accepted for publication 17 March 2022.

Bean (*Phaseolus vulgaris*) is the second most important crop in Mexico after corn due to high consumption in all regions of the country. Sinaloa state is ranked second in Mexico, producing 140,830 tons in 2020 (SIAP 2021). In October 2020, wilting symptoms (stunted growth, withered leaves, root rot, and wilt) were observed on commercial bean crops in three fields in Culiacán, Sinaloa, with an incidence of 3 to 5%. Tissue samples from symptomatic roots were plated on potato dextrose agar (PDA). Typical *Fusarium* spp. colonies were obtained from all root samples. Three pure cultures were obtained by single-spore culturing. On PDA, the colonies produced abundant white aerial mycelium, and the center of old cultures was light pink with yellow pigmentation (Leslie and Summerell 2006). Macroconidia from 10-day-old cultures grown on carnation leaf agar were slightly curved, with three septa, wide central cells, slightly sharp apices, basal foot-shaped cells, and measuring $38.5 \pm 2.5 \times 5.5 \pm 1.0 \mu\text{m}$ ($n = 40$). Microconidia were hyaline, ovoid, unicellular, and measured $12.0 \pm 1.5 \times 4.8 \pm 0.95 \mu\text{m}$ ($n = 40$). Chlamydospores were not observed. The translation elongation factor 1 alpha (*EF1-α*) gene (O'Donnell et al. 1998) was amplified by polymerase chain reaction and sequenced from isolate FNTL6P7CULSIN (GenBank accession no. OK491917). Maximum likelihood analysis was carried out using the *EF1-α* sequence (OK491917) and

other species from the genus *Fusarium*. Phylogenetic analysis revealed the isolate was *F. nygamai* (100% bootstrap). Moreover, isolate FNTL6P7CULSIN was 99.7% (648/649 bp), and 99.9% (648/650 bp) similar, respectively, with other reported *F. nygamai* sequences (GenBank accession nos. OL415419 and KR612341). Pathogenicity tests were performed on 20-day-old bean plants (cultivar Mayocoba) grown on autoclaved sandy loam soil mix. Twenty plants were inoculated by drenching with 20 ml of a conidial suspension (1×10^5 CFU/ml) in an isotonic saline solution of FNTL6P7CULSIN grown on PDA. Ten uninoculated plants served as controls. Plants were maintained for 60 days under greenhouse conditions (25 to 30°C). The assay was conducted twice. Root and stem rot similar to that observed on the infected plants in the field was observed. No symptoms were observed on uninoculated control plants after 60 days. The pathogen was reisolated from necrotic tissue from all inoculated plants and identified as *F. nygamai* by sequencing the partial *EF1-α* gene and based on its morphological characteristics, thus fulfilling Koch's postulates. *F. nygamai* was associated with *Fusarium* foot rot of rice in Sardinia by Balmas et al. (2000). Also, this pathogen was reported by Leyva-Madrigal (2015) causing root rot in maize in Sinaloa, Mexico. To our knowledge, this is the first report of root rot and wilt of bean caused by *F. nygamai* in Mexico. Bean is an important crop in Mexico, and the occurrence of this disease could threaten bean production.

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The author(s) declare no conflict of interest.

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Keywords: bean, *Fusarium nygamai*, root rot, wilt

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