Diseases Caused by Fungi and Fungus-Like Organisms

Severe Outbreak of Fusarium Wilt on Common Beans (*Phaseolus vulgaris*) Caused by *Fusarium oxysporum* in the Maule Region, Central Chile

Gonzalo A. Díaz,^{1,†} Ricardo A. Cabeza,² Ramón Amigo,² Elizabeth Llancamil,³ Osvaldo Montenegro,³ Paulina González,¹ Adrián Valdez,¹ Mauricio Lolas,¹ and Enrique Ferrada³

¹Laboratorio de Patología Frutal, Departamento de Producción Agrícola, Facultad de Ciencias Agrarias, Universidad de Talca, Chile

²Laboratorio de Nutrición Vegetal, Departamento de Producción Agrícola, Facultad de Ciencias Agrarias, Universidad de Talca, Chile

³Laboratorio de Fitopatología, Instituto de Producción y Sanidad Vegetal, Facultad de Ciencias Agrarias, Universidad Austral de Chile, Valdivia, Chile

Funding: Funding was provided by Development of functional ingredients and specialized additives for the recovery of small and medium rainfed agriculture (FIA, Chile) (PYT-2017-0490). Plant Dis. 105:2725, 2021; published online as <https://doi.org/10.1094/PDIS-12-20-2758-PDN>. Accepted for publication 28 February 2021.

Common bean (*Phaseolus vulgaris* L.) is an important grain legume cultivated worldwide as food for humans and livestock (Schwartz et al. 2005). Common beans in central Chile reach up to 3,893 ha, of which 1,069 ha are located in the Maule region. Common bean is produced by small farmers who have limited access to fertilization, technical irrigation, and crop protection. In spring 2018, bean plants initially showed a slight yellowing and premature senescence 50 days after sowing (das) until showing wilting symptoms (70 to 100 das) in Curepto fields (35°05'S; 72°01'W), Maule region. The basal part of affected plants displayed internal reddish-brown discoloration of the vascular tissues. Based on the plant external symptoms, we estimated an incidence between 15 and 45% in bean fields. Nine symptomatic plants were collected and were surface washed with sterile water and disinfested with 75% ethanol (v/v). Then small fragments (5 mm) from damaged vascular tissue from each plant were cut and placed on Petri dishes containing PDA acidified with 0.5 ml/liter of 92% lactic acid (APDA, 2%). The isolations were incubated for 7 days at 25°C. Nine *Fusarium*-like isolates from single spores on APDA (2%) became pale vinaceous, floccose, with

abundant aerial mycelium and dark vinaceous reverse colony, with a growing rate of 10.8 to 11.6 mm/day at 25°C (Lombard et al. 2019). Phialides were short, singular, growing laterally on the mycelium. Macroconidia were hyaline, fusiform, with basal foot cells shaped to pointed and apical cells tapered, two to five septate, and 28.6 to 47.6 (average 38.1) µm long × 2.2 to 3.6 (average 3.1) µm wide. Microconidia were hyaline, oval to ellipsoid, one-celled, and 4.5 to 10.9 (average 6.1) µm long and 2.2 to 3.3 (average 2.7) µm wide ($n = 50$ spores). For molecular identification, three isolates (Curi-3.1, Be-8.1, and Be-11.3) were sequenced using PCR amplification of the partial sequences of beta-tubulin (BT) and translation elongation factor 1- α gene (TEF) (Lombard et al. 2019). NCBI BLAST analysis showed 99 to 100% similarity with sequences (TEF; BT) of strain CPC 25822 of *Fusarium oxysporum*. The maximum-likelihood phylogenetic analysis placed the Chilean isolates in the *F. oxysporum* complex clade. Chilean sequences were deposited into GenBank under accession numbers MW419125, MW419126, MW419127 (TEF) and MW419128, MW419129, MW419130 (BT). Pathogenicity tests (isolates Curi-3.1, Be-8.1, and Be-11.3) were conducted under greenhouse conditions (15 to 28°C, 85% RH) on healthy bean plants ($n = 30$) of cultivar Blanco Español INIA cultivated in pots (sand/peat moss/soil) at the University of Talca. Plants that were 30 days old were inoculated using 200 µl of conidial suspension (10^6 conidia/ml) on wounded roots (crown). Control plants ($n = 10$) were similarly inoculated with sterile distilled water. After 45 days, all inoculated plants with *F. oxysporum* isolates developed necrotic lesions on vascular tissue, chlorosis, and wilting, whereas control plants remained healthy. This experiment was conducted twice. The pathogen was reisolated (100%) from diseased plants and molecularly identified as *F. oxysporum*. To our knowledge, this is the report of a severe outbreak of *F. oxysporum* causing Fusarium yellows in *P. vulgaris* in the Maule region, Chile. Previously, *F. oxysporum* has been reported affecting tomato (Sepúlveda-Chavera et al. 2014) and blueberry in Chile (Moya-Elizondo et al. 2019).

References:

- Lombard, L., et al. 2019. Persoonia 43:1.
- Moya-Elizondo, E., et al. 2019. Plant Dis. 103:2669.
- Schwartz, H., et al. 2005. Compendium of Bean Diseases. APS Press, St. Paul, MN.
- Sepúlveda-Chavera, G., et al. 2014. Plant Dis. 98:1432.

The author(s) declare no conflict of interest.

e-Xtra

Keywords: bean disease, Fusarium yellows, soil disease

[†]Indicates the corresponding author.
G. A. Díaz; g.diaz@utalca.cl