Diseases Caused by Fungi and Fungus-Like Organisms

Occurrence of Onion Smut Caused by *Urocystis magica* in Chile

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Onions (*Allium cepa* L.) are cultivated on approximately 165 ha in the Lluta and Camiña Valleys, Arica, in northern Chile. Recently, 5 to 20% of the onions have been infected by smut at the seedling stage, so it may be an emerging problem in the region. Symptoms develop first on cotyledons and young leaves with the formation of longitudinal white blisters (sori), mean of 3.8 (3 to 5) × 12.9 (10 to 15) mm, that soon turned dark. Rupture of the epidermis covering the sori exposes spore balls and dark dusty masses of teliospores. Infected plants are stunted. In 2017, three samples (Lluta 1 to 3) of infected leaves and stems were collected in Lluta Valley (18°22'08.74"S, 69°54'18.50"W, above 1,100 m), dehydrated, and kept at 20 to 22°C. Spore balls and teliospores ($n = 30$ per sample) were characterized after small pieces (2 cm in length) of infected samples were rehydrated in boiling 10% lactic acid on a microscope slide. Spore balls were globose to ellipsoid, mean of 31 (22 to 48) × 27 (18 to 34) µm in diameter, composed of one to two teliospores, surrounded by ovoid, light brown sterile cells. Teliospores were globose to ellipsoidal, dark brown, and smooth, mean of 13 (12 to 14.5) × 12.6 (11 to 14) µm. Based on host plant, symptoms, and teliospore morphology, this fungus was identified as *Urocystis magica* Pass. (= *U. cepulae* Frost) (Vánky 2012). Genomic DNA was extracted from teliospores of the three isolates. The internal transcribed spacer region (ITS), the D1/D2 domain of the 28S subunit ribosomal DNA, and the translation elongation factor 1-α (*TEF-1α*) were amplified by PCR using

primers ITS4/ITS5 (White et al. 1990), NL-1m/NL-4m (O'Donnell 1993), and TEF1-728F/TEF1-986R (Carbone et al. 1999), respectively. DNA fragments of ITS (660 to 672 bp), 28S (539 to 628 bp), and *TEF-1α* (917 to 942 bp) were sequenced (Macrogen, Seoul, South Korea) for the first time and deposited at NCBI GenBank under the accession numbers MH380193, MK468896, and MK468897 for ITS; MH380194, MK474615, and MK474616 for 28S; and MN453810, MN453811, and MN453812 for *TEF-1α*. Onion leaves ($n = 20$) of cultivar Century (Seminis) at the seedling stage were surface disinfected in 0.1% sodium hypochlorite for 10 min before being sprayed with 0.1 ml per leaf of *U. magica* teliospores (10^6 /ml) of isolate Lluta 1. An equal number of plants sprayed with sterile distilled water served as a control. All plants were transferred to small pots 24 h after inoculation and maintained at 20 to 25°C. Longitudinal white blisters and dark sori appeared on inoculated leaves 15 days after inoculation. Control leaves remained symptomless. The presence of *U. magica* was confirmed morphologically, thus fulfilling Koch's postulates. This study provides the first evidence for the occurrence of onion smut, caused by *U. magica*, in the Lluta Valley in Chile. Previously, *U. cepulae* was associated with onion smut in samples collected over 2,900 km south of Lluta Valley (Mujica and Vergara 1980). The occurrence of onion smut could have a significant impact on onion production, particularly when infection begins at the cotyledonal stage. Therefore, mitigation strategies should be applied.

References:

- Carbone, I., and Kohn, L. 1999. Mycologia 91:553.
- Mujica, F., and Vergara, C. 1980. Flora Fungosa Chilena, 2nd Ed. Universidad de Chile, Santiago, Chile.
- O'Donnell, K. 1993. Page 225 in: The Fungal Holomorph: Mitotic, Meiotic and Pleomorphic Speciation in Fungal Systematics. CAB International, Wallingford, U.K.
- Vánky, K. 2012. Smut Fungi of the World. APS Press, St Paul, MN.
- 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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