Diseases Caused by Fungi and Fungus-Like Organisms

First Report of Blueberry Leaf Rust Caused by *Thekopsora minima* on *Vaccinium corymbosum* in Peru

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Thekopsora minima P. Syd. & Syd. (Sydow and Sydow 1915) is a heteroecious rust included in the A1 list of quarantine pests for Peru. It can cause severe defoliation on blueberry (*Vaccinium corymbosum* L.), reducing the yields, and can represent a limitation in the exportation to those countries where it is regulated. Blueberry is becoming an important agricultural export commodity for Peru, showing remarkable growth and development in the last years. In 2019, 7,884 ha was planted with blueberry, with production of 89,735 t. The main production areas are La Libertad, Lambayeque, Ica, Lima, and Ancash. In 2018, leaves of blueberry showing leaf rust symptoms were observed on nine commercial fields (M1 to M9) of cultivar Biloxi from Chavimochic Irrigation in La Libertad in the north of Peru. Early symptoms on the adaxial leaf surface consisted of roughly circular orange spots that later developed brown, necrotic centers. Older lesions were more angular and sometimes surrounded by a purplish border. At later stages, lesions coalesced, spreading all over the plant, causing severe defoliation. On the abaxial side, numerous yellow-to-orange rust pustules (uredinia) were visible. Uredinia were orangish, scattered to gregarious, hypophyllous, erumpent, up to about 100 µm in diameter. Urediniospores were subglobose, obovate, oblong, or ellipsoid with yellow-to-hyaline contents and measured 17 to 26 × 15 to 19 µm (average 21.5 × 16.1 µm, $n = 50$). Cell walls measured 1.5 to 2.1 µm. Telia were not found. Based on uredinal morphology, the pathogen was preliminarily identified

as *T. minima*. To distinguish this rust from *Naohidemycetes vaccinii* (Wint.), a species also reported on *Vaccinium* spp., genomic DNA was extracted from urediniospores and used for amplification of the 5.8S subunit, the internal transcribed spacer 2 (ITS-2), and the large subunit (28S) regions, using the primers Rust2inv/LR6 (Aime 2006). The nine samples (one from each locality) carried identical sequences of fragments (1,404 bp) and were deposited in GenBank (MN736459 to MN736467). A BLAST search revealed 99.93% identity with *T. minima* (GenBank accession no. GU355675.1) from South Africa (Mostert et al. 2010). To fulfill Koch's postulates, the nine specimens were evaluated on blueberry plants of the Biloxi variety (approximately 6 months old) with a total of three plants per specimen. A suspension of urediniospores (1×10^4 spores/ml) was sprayed on leaves of healthy plants. Healthy water-sprayed plants served as controls. After inoculation, the plants were kept in a greenhouse at room temperature (21 to 24°C) and were sprayed with sterile water daily on the surface of the plant to maintain daily humidity. The experiment was repeated once. Symptoms such as pustules with uredospores and necrosis were observed 15 to 21 days after inoculation. There were no symptoms in the control plants. Leaf symptoms and initial characters were the same as those previously observed in the field. As far as we know, this is the first report of *T. minima* in Peru. In South America, the fungus was previously reported on blueberry in Colombia (Yepes and Buriticá, 2012) and Brazil (Pazdiora et al. 2019). This report is significant for phytosanitary authorities who need a diagnosis to clarify the causal agent of the disease and redefine the status of the pest within the country. Besides, it will serve as the first step to develop and implement chemical control strategies and evaluation of breeding varieties adapted to our fields against blueberry rust in Peru.

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