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First Report of Powdery Mildew on Potato Caused by *Leveillula taurica* in North America

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Powdery mildew causes losses in potato (*Solanum tuberosum* L.) production throughout much of the world (3,4). In the Columbia Basin of Washington, this disease appears most damaging in potatoes grown under furrow irrigation (3). The causal agent usually has been reported to be *Erysiphe cichoracearum* DC. (3), sometimes referred to as *Golovinomyces cichoracearum* (DC.) V.P. Gelyuta (4). In his world monograph, Braun (1) subdivided *E. cichoracearum* into several species, restricted the use of *E. cichoracearum* to species on Asteraceae, and used *Erysiphe orontii* Castagne for the segregate on Solanaceae (1). In the Middle East a different pathogen, designated as *Oidiopsis* (anamorphic state of a *Leveillula* species), also was reported on potato (2). Chorin (2) found that the two powdery mildew species occurred independently or on the same plant. During August 2004, examination of powdery mildew-infected 'Russet Burbank' potato leaves from a furrow-irrigated field in Grant County, WA, revealed two powdery mildew fungi, one referable to *E. orontii* and the other to *Leveillula taurica* (Lév.) G. Arnaud (1). This report documents, for the first time, *L. taurica* on potato in North America and provides information on distinguishing it from *E. orontii*.

Diseased leaves displayed localized, chlorotic to necrotic regions with typical powdery mildew signs consisting of whitish masses of conidia and conidiophores. Examination of periclinal, free-hand sections of leaf tissue revealed that conidiophores of the two fungi were intermixed. *Erysiphe orontii* formed superficial hyphae with nipple-shaped appressoria (Fig. 1), conidiophores with conidial chains (Fig. 2), and ovoid to short-cylindrical conidia lacking fibrosin bodies and measuring (24.0-) 27.0-33.0 (-35.5) × (13.0-) 14.0-18.0 (-19.0) µm. *Leveillula taurica* formed conidiophores (Fig. 3) emerging through stomata from internal mycelium, with single conidia that were lanceolate or cylindrical and measured (37.0-) 43.5-58.0 (-58.5) × 11.0-17.0 (-18.5) µm. Conidia and conidiophores of both fungi were observed together in microscopic slide mounts in which the conidia were distinguishable on the basis of size and shape (Fig. 4). The majority (> 90%) of conidia and conidiophores observed were produced by *E. orontii*.

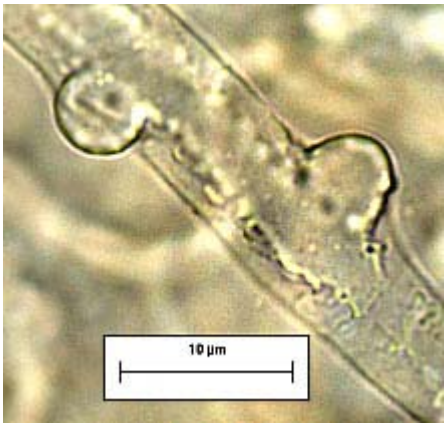

Fig. 1. *Erysiphe orontii* appressoria viewed with brightfield microscopy.

Fig. 2. *Erysiphe orontii* conidiophore with four conidia, adjacent to plant trichome, viewed with stereomicroscopy.

Fig. 3. *Leveillula taurica* conidiophore with single, cylindrical conidium viewed with stereomicroscopy.

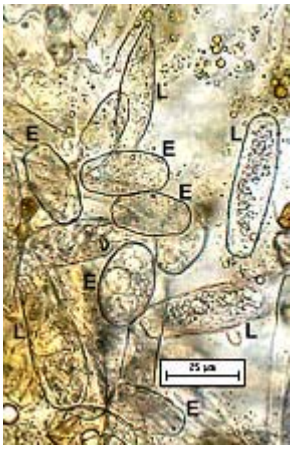

Fig. 4. Short-cylindrical to ovoid conidia of *Erysiphe orontii* (E), and cylindrical and lanceolate conidia of *Leveillula taurica* (L) viewed with brightfield microscopy.

Discovery of the two species sporulating together on diseased leaves is consistent with the similar observation made in the Middle East (2). The preponderance of *E. orontii* conidiophores and conidia tended to obscure the presence of *L. taurica*. It is possible that *L. taurica* has been overlooked in the past because its presence was masked by profuse sporulation of *E. orontii*. Easton and Nagle (3) noted that although application of sulfur dust or liquid for control of potato powdery mildew generally was successful, the applications sometimes failed to prevent development of severe symptoms. One possible explanation for variable effectiveness of fungicide treatments is that *L. taurica* and *E. orontii* might differ in their sensitivity to fungicides. Further research is warranted to assess the co-occurrence of *L. taurica* and *E. orontii* on potato crops in North America, the factors governing co-infection, and whether responses to foliar fungicide applications by the two pathogens are similar.

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