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Disease Notes

First Report of Fusarium Root Rot of Stored Carrot Caused by *Fusarium avenaceum* in Serbia

I. Stanković, K. Milojević, A. Vučurović, D. Nikolić, B. Krstić, and A. Bulajić

Affiliations

Authors and Affiliations

I. Stanković
K. Milojević
A. Vučurović
D. Nikolić
B. Krstić
A. Bulajić, Institute of Plant Protection, Department of Phytopathology, University of Belgrade-Faculty of Agriculture, 11080 Belgrade, Serbia

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Abstract

Carrot (*Daucus carota* L. subsp. *sativus* (Hoffm.) Thell., Apiaceae), a widely consumed antioxidant-rich plant, is among the major vegetable crops grown in Serbia, with average annual production of 65,400 tons on approximately 7,000 ha (4). In May 2013, a severe root rot was observed on approximately 20% of cold-stored carrot roots originating from Gospođinci, South Bačka District, Serbia. Symptoms included dry rot of the collar and crown as well as large, brown to dark brown, circular, sunken lesions on the stored roots. Frequently, abundant whitish mycelium was observed covering the surface of the colonized roots. To determine the causal agent, small pieces of infected tissue were surface-disinfested with 2% NaOCl without rinsing, air-dried, and placed on potato dextrose agar. Five single-spore isolates obtained from collar and crown tissue sections, as well as nine isolates from root sections, all formed abundant, cottony white to pale salmon fungal colonies with reddish orange pigment on the reverse surface of the agar medium when grown at 25°C under 12 h

of fluorescent light per day. All recovered isolates formed numerous, three- to six-septate, hyaline, needle-like, straight to slightly curved, fusoid macroconidia (30 to 80 × 4 to 5.5 µm, average 58.3 × 4.9 µm, *n* = 100 spores) each with a tapering apical cell. Microconidia of all isolates were generally scarce, two- to four-septate, spindle-shaped, and 15 to 35 × 3 to 5 µm (average 21.3 × 4.2 µm). Chlamydospores were observed. Based on these morphological characteristics, the pathogen was identified as *Fusarium avenaceum* (Fries) Saccardo (1). The pathogenicity on carrot was tested for isolate 19-14 by inoculating each of five carrot roots surface-disinfected with 2% NaOCl, by placing a mycelial plug into the surface of a wound created with a cork borer. Carrot roots inoculated with sterilized PDA plugs served as a negative control treatment. After 5 days of incubating the roots at 25°C, root rot symptoms identical to those observed on the source carrot plants developed on all inoculated roots, and the pathogen was re-isolated from each of these roots using the same procedure descibed above. There were no symptoms on the control roots. Morphological species identification was confirmed by sequencing the translation elongation factor (EF-1α) gene (2). Total DNA was extracted directly from fungal mycelium of isolate 19-14 with a DNeasy Plant Mini Kit (Qiagen, Hilden, Germany), and PCR amplification was performed with primer pair EF-1/EF-2 (2). Sequence analysis of the EF-1α gene revealed 100% nucleotide identity of isolate 19-14 (GenBank Accession No. KM102536) with the EF-1α sequences of two *F. avenaceum* isolates from Canada (KC999504 from rye and JX397864 from *Triticum durum*). To our knowledge, this is the first report of *F. avenaceum* causing collar, crown, and root rots of stored carrot in Serbia. Since *F. avenaceum* can produce several mycotoxins, including moniliformin, acuminatopyrone, and chrysogine (3), the presence of this pathogen on stored carrots could represent a significant constraint for carrot production in Serbia, for both direct yield losses and potential mycotoxin contamination.

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The American Phytopathological Society (APS)

3340 Pilot Knob Road, St. Paul, MN 55121

USA

+1.651.454.7250

FAX +1.651.454.0766

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