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First Report of Fusarium Root and Stem Rot of Greenhouse Cucumber Caused by *Fusarium oxysporum* f.sp. *radicis-cucumerinum* in Bulgaria

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Abstract

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A severe disease of cucumber, characterized by symptoms of root and stem rot, has been observed in 21 commercial greenhouses in Bulgaria. The pathogen was identified as *F. oxysporum* Schlechtend.: Fr. f.sp. *radicis-cucumerinum* D.J. Vakkalounakis on basis of symptoms' expression, experimental hosts range among plant species of cucurbit family and cultural and morphological characteristics of the obtained isolates. This is thought to be the first report of *F. oxysporum* f.sp. *radicis-cucumerinum* in Bulgaria.

Key words: cucumber, root and stem rot, FORC, Bulgaria

Symptoms disease identical to the *Fusarium* root and stem rot of cucumber (*Cucumis sativus* L.) were first observed in two commercial greenhouses in September 1995 when two cultivars, Sandra F₁ (Long English type) and Levina Mix F₁ (pickling type), were severely affected. By 2007, the presence of the disease was confirmed in all of the surveyed 21 cucumber-growing houses dispersed in the North, South and West of Bulgaria.

A pale yellow lesion on the stem base was often the first disease symptom most likely to occur 6-8 weeks after sowing. Later in the season, necrosis progressively

expanded until the entire crown area and basal part of the stem partly disintegrated into light orange-brown rot. Under moist conditions, the rotten tissues were overgrown with white mycelium which later became pinkish-orange due to external spore formation of *Fusarium oxysporum*. Symptomatic plants suddenly wilted during the first sunny weather to come, collapsed and died. Examination of the roots revealed yellowish-brown discoloration and rot of the cortex and xylem. Vascular yellowish to light brown discoloration extended up the stem and was especially noticeable in the leaf nodes on the lower

half of the stem. These symptoms were apparently distinct from Fusarium wilt caused by *F. oxysporum* Schlechtend.: Fr. f.sp. *cucumerinum* J.H. Owen. but rather typical of the Fusarium root and stem rot of cucumbers (3).

The causal organism was isolated at high frequency from roots, crowns and vascular tissues of diseased plants. Isolates were identified as *Fusarium oxysporum* on the basis of growth rate and characteristic salmon-pink pigmentation of colonies on Oat Agar and Potato Dextrose Agar, orange sporodochia developed at colony margins, relatively short phialides, size and morphology of typical macroconidia, presence of microconidia and chlamydo-spores. These cultural and morphological characteristics are identical to those of *F. oxysporum* Schlechtend.: Fr. f.sp. *radicis-cucumerinum* D.J. Vakalounakis (FORC) originally described by Vakalounakis (1996) and later in other works (Punja & Parker, 2000; Cercauskas et al., 2001; Vakalounakis and Chalkias, 2004). In our observations FORC was frequently found in combination with *Phytophthora*, *Pythium* and *Rhizoctonia*, or accompanied with extensive bacterial invasion.

Root-dip inoculation tests conducted with 15-day old cucumber plants confirmed the pathogenicity of all available isolates of *F. oxysporum* designated as f.sp. *radicis-cucumerinum*. Of totally 57 isolates tested, 44 caused both wilt and root and stem rot in at least one of the three cucumber cultivars used in the tests, Svezest (F₁ hybrid) and Gergana (non-hybrid), both Long English type, and cv. Martina (pickling type). The pathogen was successfully reisolated from root and stem tissues of symptomatic plants.

A disease syndrome similar to that on

cucumbers was reproduced in a range of species from cucurbit family, like courgette (*Cucurbita pepo*), cvs. Elite F₁ and Boliarka 19, winter squash *Cucurbita moschata* (Duch. ex. Lam.) Duch. & Poir., pumpkin (*Cucurbita maxima* Duch.), fig-leaf gourd (*Cucurbita ficifolia* Bouche.) and bottle gourd (*Lagenaria siceraria* (Mol.) Standl.), when artificially inoculated with representative isolates of the pathogen. In contrast, melon (*Cucumis melo* L.) cvs. Hybrid No1 F₁ and Hybrid No 15 F₁ remained visually healthy throughout our trials.

The expression of symptoms, experimental hosts range, and the identity of the pathogen provided evidence for the wide establishment of *Fusarium* root and stem rot of greenhouse cucumber in the country. To our knowledge, this is the first report of *F. oxysporum* f.sp. *radicis-cucumerinum* in Bulgaria.

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