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The association of Humicola fuscoatra with corky root symptoms in wilted glasshouse tomatoes

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Abstract

A wilt disease including severe root rot and corky rot was observed near the end of the growing season in glasshouse tomato (*Lycopersicon esculentum*) plants, growing in soilless systems. Numerous aleuroconidia of the common soil-borne fungus *Humicola fuscoatra* var. *fuscoatra* were always present in the cells of affected roots. The pathogenicity of *H. fuscoatra* was not established, but inoculation with previously used rockwool from a crop with corky root symptoms reproduced the disease. It is suggested that near the end of the growing season the artificial substrate offers favourable conditions for the development of a complex root disease in which *H. fuscoatra* may play a role.

A new root disease of glasshouse tomato (*Lycopersicon esculentum*) was observed in 1984. It affected plants growing in soilless systems, but its etiology has not yet been clarified (Loerakker and Van Kesteren, 1986; Paternotte, 1989). The symptoms became visible near the end of the growing season. Initially, greyish-brown lesions were formed especially on the finest roots, but, as infection progressed, corky root symptoms developed. The affected plants wilted as a result of a severe root rot and corky rot and lost stability in the artificial growth substrate. Numerous small aleuroconidia were always present in the cells of the affected roots (Fig. 1). The symptoms were reminiscent of those of black root rot (corky root) caused by *Pyrenochaeta lycopersici* Schneider & Gerlach on soil-grown glasshouse tomatoes. However, the characteristic symptoms associated with an infection with *P. lycopersici*, namely a sharp limitation of the root-lesions, loss of side-roots and a complete decay of the finest roots, were not observed. Laboratory examination showed that the symptoms could not be associated with *P. lycopersici*, nor with any other known root pathogen. So the symptoms were possibly associated with the unidentified fungus producing aleuroconidia in affected root cells. As we have found previously with pathogens only present in decayed roots, the causal agent was extremely difficult to isolate, and a pure culture was only obtained after numerous attempts.

Fungal growth in vitro. Colony reaching 42–50 mm on oat-meal agar after two weeks at 20 °C, with crenated outline, smoke-grey to olivaceous-grey, zonate, with similar reverse; aerial mycelium sparse, flat, cottony. Aleuroconidia 7.2–8.8(–12.0) μm

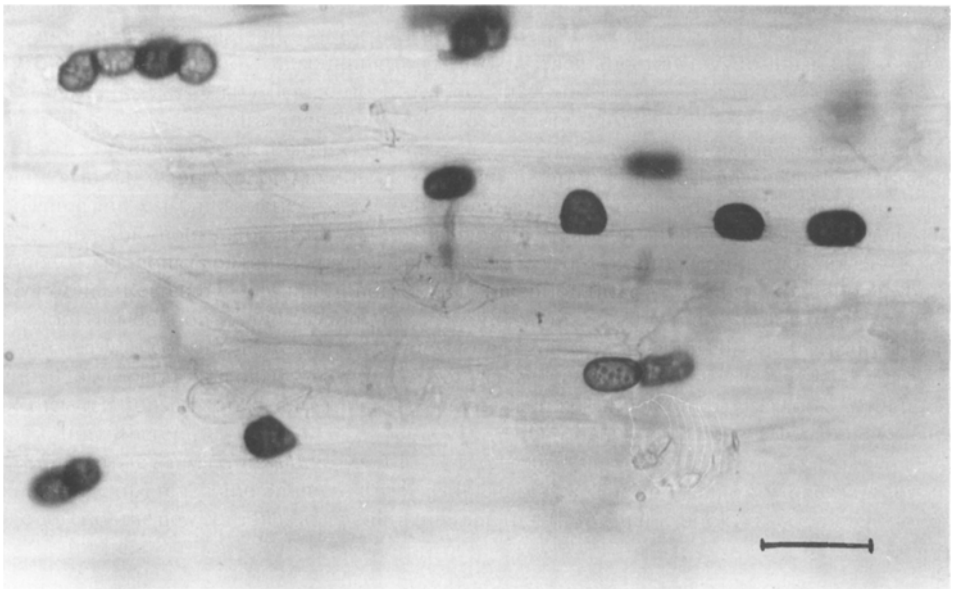

Fig. 1. *Humicola fuscoatra*. Aleuroconidia in situ (500×, bar = 20 μm).

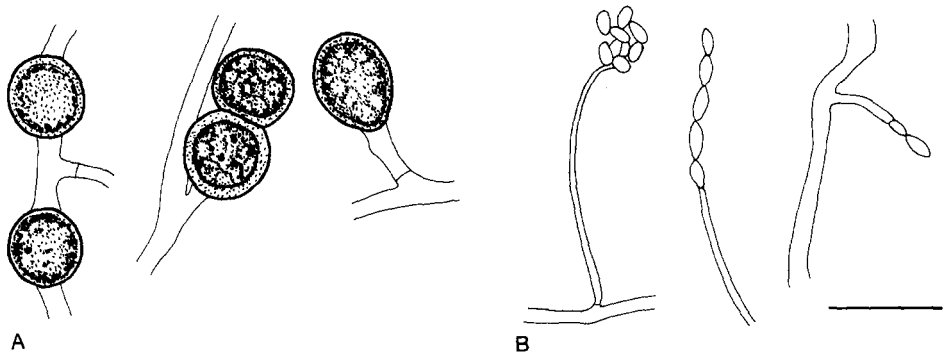

Fig. 2. *Humicola fuscoatra*. (A) Aleuroconidia, (B) conidiophores with phialoconidia (1250×, bar = 10 μm).

in diameter, intercalary or terminal, pale to medium golden brown. Conidiophores with phialoconidia, 3.2–3.6 × 1.2–1.4 μm, colourless to pale green, smooth, obovoid, aseptate, catenate or in slimy heads (Fig. 2).

The fungus was identified as *Humicola fuscoatra* Traaen var. *fuscoatra*, a widespread and well-known soil-borne species. So far, it has been known as a saprophytic decomposer of cellulose and has been reported from the rhizosphere of wheat and wilted pineapple (Watanabe, 1971; Domsch et al., 1980). *H. fuscoatra* has never been recorded as a pathogen on tomato.

Table 1. Number of tomato plants with corky roots infected by *H. fuscoatra* after inoculation with *H. fuscoatra*, *P. lycopersici*, or used rockwool (15 plants per treatment).

Treatment	Number of infected plants
(1) *H. fuscoatra*	0
(2) *P. lycopersici*	0
(3) *H. fuscoatra* + *P. lycopersici*	0
(4) Previously used rockwool with corky roots	11
(5) Controls (not inoculated)	0

Inoculation experiment. In an experiment at the Glasshouse Crops Research Station in Naaldwijk the pathogenicity of *H. fuscoatra* was tested on tomato plants. The experiment was carried out in separate systems where the nutrient solution was recirculated. Each system had its own storage tank with four 2-m-long troughs. In February, tomato plants cvs 'Dombito' and 'Blizzard' raised in rockwool cubes were planted five per trough in a staggered pattern on slabs of artificial substrate (rockwool). One week after planting, plants in three troughs in each system were inoculated, one trough remaining uninoculated. Each system contained one treatment. Treatments were: (1) *H. fuscoatra*, 20 ml suspension (3×10^5 aleuroconidia per ml) poured on the rockwool propagating cube and a quarter of an agar plate culture pressed on the rockwool propagating cube and the slab; (2) *P. lycopersici*, pycnidiospores and a quarter of an agar plate culture applied in the same way; (3) both *H. fuscoatra* and *P. lycopersici* applied in the same way; (4) rockwool from a previous crop with corky root symptoms pressed on the rockwool slab; (5) plants with no inoculum (controls).

During the early stage of the growing season, no plants with corky roots and aleuroconidia were found. In September, at the end of the growing season, most of the plants in the treatment with previously used rockwool showed corky root symptoms, mostly in the rockwool propagating cube (Table 1). Aleuroconidia were found in the roots of infected plants, but no corky root symptoms or aleuroconidia were found in roots in the other treatments. In the treatment with previously used rockwool all plants in the uninoculated trough had corky root symptoms and aleuroconidia of *H. fuscoatra* in the roots. There were no significant differences in the total yield between the treatments at the end of the experiment.

The experiment demonstrated that this root disease can be spread in a recirculating water system, but the pathogenicity of *H. fuscoatra* was not established. It is suggested that the artificial substrate (rockwool) might offer favourable conditions for the development of a complex root disease of tomato plants, in which normally harmless fungi like *H. fuscoatra* may play a role.

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