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Rhizosphere Competence of Antagonistic *Fusaria* Isolated from Suppressive Soils*

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Abstract

Saprophytic *Fusaria*, isolated from soils suppressive to *Fusarium oxysporum* f.sp. *dianthi*, actively colonized rhizosphere of inoculated radish and melon plants up to a 7 cm depth both in steam disinfected and raw soils. *Fusaria* density at the root tip was high. Benomyl treatment did not increase root colonization by antagonistic benzimidazole resistant *Fusaria*.

Introduction

Suppressiveness of different soils to several *formae speciales* of *Fusarium oxysporum* has been related to an abundance of saprophytic *Fusaria* in such soils (Alabouvette, 1986). In the case of *Fusaria* (*F. oxysporum*, *F. solani*), isolated from Italian soils, suppressive to *Fusarium oxysporum* f.sp. *dianthi*, and from rhizosphere of carnations grown in these soils, the ability to compete with the pathogen is not primarily due to competition for iron or carbon sources (Cugudda and Garibaldi, 1987). Carnations, grown in soil infested with *F. dianthi* and antagonistic *Fusaria*, had a lower number of infection, compared with plants grown in the presence of the pathogen alone, although the number of propagules of *F. dianthi* isolated from soils infested with the pathogen alone or together with antagonistic *Fusaria* was similar. In this study, the ability of antagonistic *Fusaria* to colonize plant rhizosphere was evaluated in two different host systems, in steam disinfected and raw soils.

Materials and Methods

Antagonists. Saprophytic *Fusaria*, obtained from the rhizosphere of carnations grown in suppressive soils, have been used throughout the work. Isolate 245 was

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benzimidazole sensitive (SB) and orange colored, while 233 was benzimidazole resistant (RB): benzimidazole resistance and orange color were induced by means of UV treatment. *Fusaria* were grown in shake culture on casein hydrolisate for 4–6 days at 25°C; benomyl (0.5 ppm) was in the medium with the RB isolate. Cultures were centrifuged at 2500 rpm for 15 minutes and resuspended in sterile distilled water.

Seed treatment and rhizosphere competence assay

Seeds of radish (*Raphanus sativus*, cv "Miramare") and melon (*Cucumis melo*, cv "Classic"), surface disinfected for 10 minutes in 1% sodium hypochlorite, washed in sterile distilled water and air dried, were immerged in a conidial suspension of *Fusaria* (10^8/ml), containing 1% carboxymethyl-cellulose as a sticker. Seeds were planted in split plastic tubes (8 by 10 cm) in raw or steamed (30 minutes at 100°C) wet soil, treated or not with benomyl (10 or 100 ppm). Plants were not watered during the experiment. Rhizosphere competence was tested following the procedures described by Ahmad and Baker (1987). Isolations were carried out from 1 cm root fragments (disinfected or not with sodium hypochlorite) and colony forming units (CFU) of *Fusaria* present in the rhizosphere soil at each centimeter of root were determined by plating series of 10 fold dilutions on Komada *Fusarium* selective medium, amended with 5 ppm of benomyl when plants were inoculated with RB antagonist. CFU of *Fusaria* per gram of rhizosphere soil were counted after 6 days of incubation (3 replicates/treatment).

Results and Conclusions

Antagonistic *Fusaria* actively colonized melon and radish rhizosphere: their density was significantly higher at 1–2 and 5–7 cm depth (Fig. 1A,B). No significant differences in root colonization was observed between steamed and raw soil. Sensitive orange colored and RB isolates colonized roots up to 7 cm depth (Fig. 1A–D). Benzimidazole sensitive isolate (Fig. 1C) was present at a lower density on roots of plants grown in benomyl treated (10 ppm) soil. Contrary to what observed for *Trichoderma* by Ahmad and Baker (1987), soil treatment with benomyl at 10 and 100 ppm did not significantly influence rhizosphere colonization of RB *Fusaria*. No significant differences in colonization of the rhizosphere were observed between radish (1,A,C) and melon (1,B,D). *Fusaria* were not isolated from root fragments disinfected with sodium hypochlorite. In conclusion, antagonistic *Fusaria*, isolated from rhizosphere of plants grown in suppressive soils, are rhizosphere competent: their ability to compete with pathogenic *Fusarium* could be due to their ability to rapidly follow root growth, preceding the pathogen in the occupation of infection sites. This ability could eliminate, in practice, the need to use large amounts of inoculum.

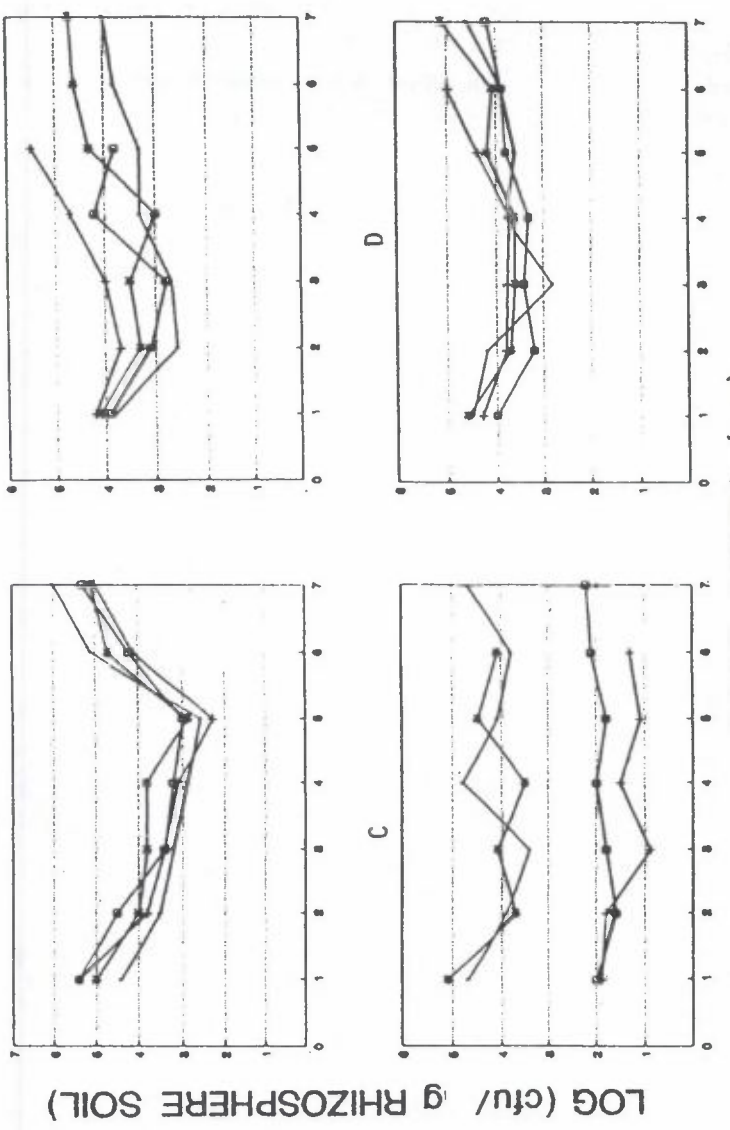

Figure 1. Population density in the rhizosphere of radish (A, C) and melon (B, D) plants inoculated with isolates of *Fusaria* SB (C) or RB (A, B, D) in soil steam disinfected (D) or not (ND), treated with benomyl (B) or not treated with benomyl (—). D-, —●—; DB—|—; ND- —*—; NDB —□—

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