Trichoderma polysporum as Possible Weak Pathogen of Tulip Bulbs and Roots

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Abstract

In the spring 2000, on tulip plantations in south-eastern Poland, spots of died-off plants were observed. The inhibited growth, wilting of leaves and yellowish necrosis on roots and scales surface occurred especially in low-lying areas. Mycological analysis indicated the presence of *Trichoderma polysporum* (Link ex Pers.) Rifai on the bulbs and roots of all tested plant samples. Pathogenicity test of 7 *T. polysporum* isolates was carried out on forced tulips cv. Merry Christmas in flower pots. After flowering, brownish necrosis (covering 5–30% of the surface) on the bulbs and roots were observed, as well as white-yellowish mycelium heaps of *T. polysporum*. Typical *Trichoderma* symptoms on above-ground plant parts like light-gray leaves tips were not observed.

Keywords: *Trichoderma polysporum*; tulip; pathogenicity

INTRODUCTION

Trichoderma species are known as pathogens antagonists and applied in biological control of ornamental bulb plants (CHET *et al*. 1982; LANGERAK 1977). However, their occurrence on roots of forced tulips in low humidity conditions can cause the disease symptoms on plants like drying-up and light-gray discoloration of leaves tips as a result of brown necrosis of the roots. The symptoms occur at the flowering time (Biul. Inf. 2001).

In the spring 2000, on tulip plantations in south-eastern Poland, spots of died off plants were observed. The disease symptoms expressed in inhibited growth, wilting of leaves and yellowish necrosis on roots and scales surface occurred especially in low-lying areas on cv. Merry Christmas flower-beds. The aim of this study was to identify the disease agent and investigate its pathogenicity.

MATERIALS AND METHODS

Mycological analysis of 10 randomly chosen diseased plants was carried out in laboratory conditions on PDA and indicated the presence of *Trichoderma polysporum* (Link ex Pers.) Rifai species (RIFAI 1969) on the bulbs and roots of all tested plant samples. To investigate the pathogenicity of isolated species on tulip bulbs, 7 *T. polysporum* isolates (M1, M2, M6, M7, M8, M10, M13) were tested in growth-chamber test on forced tulips in flower pots. In order to do that, the slice of PDA medium with a 12-day-old colony of fungus was placed under planted bulbs and used for inoculation. Ten bulbs cv. Merry Christmas showing no damage or disease symptoms were used for testing of each isolate. Before planting, the bulbs were surface-sterilized in 70% ethanol for 30 s and finally rinsed in sterile water. Tulip forcing was conducted in autumn and winter 2000/2001 in sterilized soil mixed with sand. The plants were watered with sterile water. After flowering period, the height of plants was measured and the disease symptoms on plants were characterized. Also, the percentage of necrosis on bulb scales and roots was evaluated and the mycological analysis of diseased plants was made. The fragments of diseased tissue from each bulb (5 from bulb scales and 5 from roots) were placed on PDA in Petri dishes and incubated for 7 days at 20°C. The recovered fungi were identified.

RESULTS AND DISCUSSION

After flowering, the typical *Trichoderma* symptoms on above-ground plant parts like light-gray leaves tips and then their whitening and drying up (Biul. Inf. 2001) were not observed. The height and appear-

ance of the plants in control trial without inoculation were not considerably different from trials inoculated with *T. polysporum* isolates (Table 1). However, after taking out the plants from flower pots, the yellow-brownish necrosis reaching 5–30% of the surface and white-yellowish mycelium heaps were observed on the outer fleshy bulb scales and especially on the roots. Isolates of *T. polysporum* were obtained from all inoculated trials except control and dominated between all recovered species (Table 1). The highest percentage of necrosis of bulbs and roots and the lowest height of plants were observed in trials with isolates M 6 and M 8. The obtaining of another fungi from investigated bulbs and roots indicated that the sterilization before planting was not fully effective. The absence of disease symptoms on above-ground plant parts in pathogenicity test may indicate, that in the field *T. polysporum* has found more suitable conditions for its development when the bulbs were weakened. The weakness could be the result of frost injury occurred especially in ground hollows and poor rainfall in April and May causing drying of the roots. The trials on *T. polysporum* have also showed that *T. polysporum* in the USA is restricted to the soils with low temperature and is known cause damage in cultivated shiitake mushrooms under shady conditions in the cool season (DOMSCH *et al.* 1980). By tulip forcing, when the roots grow out of forcing-box openings, they could easilly dry-up and be infected by *Trichoderma* sp. (Biul. Inf. 2000).

Table 1. Average height of plants (in cm), percentage of necrosis on bulbs, roots and fungi recovered from each combination

Isolate No.	High of plants (cm)	Necrosis (%)		Recovered fungi species	Number of isolates	
		of bulbs	of roots		bulbs	roots
Control	33.7 abc	1.0 a	0.5 a	*Penicillium verrucosum* var. *cyclopium*	17	11
				Trichoderma viride	24	7
M 1	33.1 abc	5.0 a	9.2 abc	*Alternaria alternata*	6	–
				Trichoderma polysporum	48	44
M 2	35.7 c	6.0 a	15.0 bcd	*Trichoderma polysporum*	44	28
M 6	30.8 a	15.0 a	28.5 e	*Acremonium murorum*	11	9
				Alternaria alternata	1	1
				Epicoccum purpurascens	–	1
				Fusarium oxysporum	9	–
				Trichoderma polysporum	49	29
M 7	33.6 abc	5.0 a	14.0 bcd	*Alternaria alternata*	–	12
				Penicillium verrucosum var. *cyclopium*	19	10
				Phoma pomorum	3	–
				Trichoderma polysporum	50	30
M 8	31.3 ab	13.0 a	21.0 cde	*Alternaria alternata*	–	3
				Fusarium culmorum	1	–
				Trichoderma polysporum	50	48
M 10	33.8 abc	7.0 a	22.5 de	*Acremonium murorum*	15	8
				Alternaria alternata	–	4
				Fusarium oxysporum	–	3
				Trichoderma polysporum	42	32
M 13	36.7 c	2.0 a	6.5 ab	*Penicillium verrucosum* var. *cyclopium*	19	6
				Trichoderma polysporum	38	29

Within column means followed by the same letter are not significantly different at $P = 0.05$ according to Duncan's test

The data obtained from this experiment indicates that *T. polysporum* isolates have the high ability of to colonize tulip bulbs and roots and cause their necrosis.

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