SOIL MOISTURE AFFECTING ACTIVITIES OF *RHIZOCTONIA SOLANI* AND *TRICHODERMA HARZIANUM*

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Rhizoctonia solani can survive for a long period in soil. Cultural practices including water management and biological control can reduce the survival of the pathogen and diminish the damage of root rot on beans. The purpose of this study was to investigate how soil moisture can influence the activities and dynamics of *R. solani* and *T. harzianum* when soil was infested with both microorganisms. In addition, the development of root rot on beans and the biological control with *T. harzianum* were evaluated under different water regimes for a period of one year.

MATERIALS AND METHODS

The experiments were conducted under greenhouse conditions. *R. solani* AG-4 was grown on rice grains and *T. harzianum* on wheat bran. The content of each pot (300 ml of sterilized soil-sand) was poured on a tray and carefully mixed with inoculum of both fungi. Ten seeds of the bean cultivar Dufrix were sown per pot. Treatments not infested with *R. solani* or *T. harzianum* received non-inoculated rice grains and wheat bran, respectively. Soil moisture was periodically monitored and kept at four levels varying from -0.0007 to -1.03 MPa. The pots were weighted to monitor water loss and irrigated once a day. Disease severity according to a 1 to 9 scale adapted from Van Schoonhoven and Pastor-Corrales (1987), percentage of emerged plants, plant height and dry weight were evaluated three weeks after planting. The following combinations were tested: no *R. solani*/with *T. harzianum* (rT), with *R. solani*/no *T. harzianum* (Rt), with both fungi (RT) and without both fungi (rt). For a long-term experiment, planting was carried out immediately after inoculation and at 20, 60, 180 and 360 days after inoculation (DAI). For a complementary short-term experiment, planting was done immediately after inoculation and at 3, 6, 12 and 18 DAI.

RESULTS AND DISCUSSION

The pathogen effectively survived in the soil in absence of host tissue at least one year after the soil infestation. However, severity of root rot and damage to plants were lower in the test with sowing done at 360 DAI than at the other tests (Figure 1). Soil moisture did not affect the severity of root rot. The pathogen could easily be recovered even from dryer soil, but in the presence of *T. harzianum* this was hardly possible (Table 1).

The antagonist improved the emergence of seedlings and led to higher weights of plants grown in *R. solani*-infested soil. However, when the pathogen was well established in the soil, antagonistic protection was lower. Consistent antagonistic effects were observed until 180 DAI, but at 360 DAI they were hardly detectable. The antagonist improved plant growth until 60 DAI even on plants not infected by *R. solani*. The antagonistic ability and activities of *T. harzianum*

were greater in soils held at intermediate soil moisture levels than in wet or dry soils, but were also influenced by the inoculum potential of both fungi in the soil.

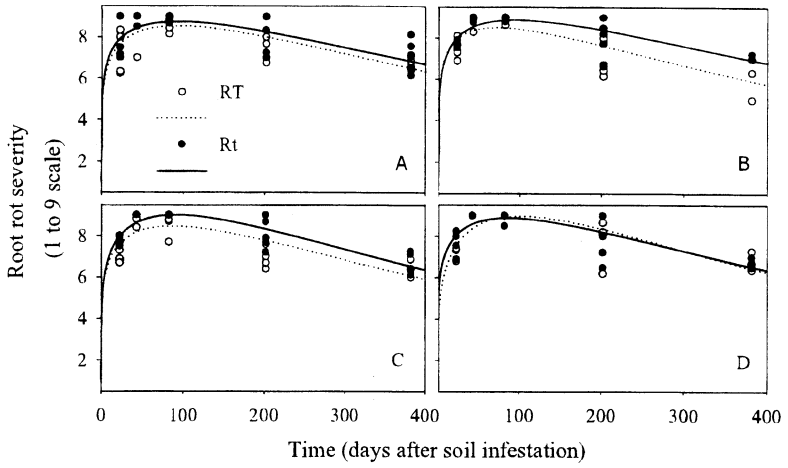

Figure 1. Root rot severity in five activity tests over time (DAI) in the treatments RT and Rt at four soil moisture levels (A = -0.0007 MPa, B = -0.005 MPa, C = -0.034 MPa, and D = -0,274 MPa). The disease severities are assigned to the evaluation day, which in each test was done at 22 DAS

Table 1. Population density of *R. solani* and *T. harzianum*, expressed as cfu/g of soil, determined at the end of the long-term experiment

Treatments	Moisture levels (MPa)	Population density of *R. solani* (cfu/g of soil)	Population density of *T. harzianum* (cfu/g of soil)
rT	-0.0007	-	3.60×10^5 a
	-0.005	-	4.46×10^5 a
	-0.034	-	3.82×10^5 a
	-0.274	-	1.28×10^5 b
RT	-0.0007	1.50 c*	6.00×10^5 a
	-0.005	2.37 b	10.40×10^5 a
	-0.034	2.13 bc	9.57×10^5 a
	-0.274	3.88 a	8.80×10^5 a
Rt	-0.0007	1.70 c	-
	-0.005	3.26 b	-
	-0.034	3.22 b	-
	-0.274	3.88 a	-

***Values are means of 10 replicates for *R. solani* and 5 replicates for *T. harzianum*. For each fungi combination, means followed by the same letter are not significantly different ($P = 0.05$)**

Reference: Van Schoonhoven, A.; Pastor-Corrales, M.A. Standard system for the evaluation of bean germplasm. Cali: CIAT, 1987.

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