

Effect of *Trichoderma Koningii* on Bean Growth

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Biological control agent *Trichoderma* spp. has been reported to show growth promotion effect on plants (Windham 1986; Baker, 1988, Liu, 1990). This growth promotion effect probably is an indirect result of suppressing plant pathogens in the rhizosphere. Recent investigation indicated that *Trichoderma* spp. produced direct effect on plant growth. *Trichoderma* spp. produced growth regulating factors which stimulated seed germination and plant growth.

The purposes of this experiment were to investigate (1) if *Trichoderma* spp. can stimulate plant growth, (2) whether the growth promotion is a direct effect of *Trichoderma* spp.

Material and Methods

Greenhouse experiment was conducted in Ventura, California in 1991. *Trichoderma koningii* was obtained from JH Biotech, Inc. The material contained 10^9 conidia/gram. Randomized Complete Block design was employed with 5 treatments and 6 replications. Soils were sterilized in an autoclave at 15 psi for 60 minutes to eliminate plant pathogens. Thirty 8-inch pots were filled with the sterilized soil at 2 pounds of soil per pot. *Trichoderma koningii* was mixed with soil according to the treatments to obtain 0, 10^5 , 10^6 , 10^7 and 10^8 conidia per gram of soil. Eight bush bean seeds were planted in each pot. After germination, the seedlings were thinned to 4 plants per pot.

Bean plants were grown in the greenhouse for 45 days. At 45 days, the plants were cut from the soil surface, dried in an oven at 75°C for 24 hours and the weight was recorded as dry matter.

Results and Discussion

The dry matter of the bean plants from each pot and the average weight for each treatment are shown in Table 1. Analysis of variance of the dry matter yields of the bean plants is shown in Table 2.

As shown in Table 1, *Trichoderma koningii* at the rates of 10^6 and 10^7 conidia per gram of soil significantly increased the dry matter yield of bean plants, Although *Trichoderma koningii* at the rate of 10^8 conidia per gram of soil increased the dry matter yield of bean plants, the increase was not statistically significant. No increase in dry matter yield was obtained by the application of *Trichoderma koningii* at the rate of 10^5 conidia per gram of soil.

Table 1. Effect of *Trichoderma koningii* on beans grown on sterilized soil

Treatment Conidia/g soil	Dry Weight (g/pot)						
	1	2	3	4	5	6	Average*
0	8.63	10.71	7.94	8.59	7.58	9.06	8.75 a
10 ⁵	8.94	9.12	8.68	7.98	9.46	8.21	8.73 a
10 ⁶	10.47	9.36	10.98	10.09	10.04	11.49	10.41 b
10 ⁷	11.08	9.38	9.42	11.75	9.74	9.43	10.13 b
10 ⁸	10.38	11.42	8.98	8.22	9.46	9.04	9.58 ab

* Means in a column not followed by a common letter differ significantly ($P \leq 0.05$) as determined by DMRT.

Table 2. Analysis of variance of bean dry matter yield

Source of Variation	df	SS	MS	F
Block	6-1= 5	2.94	0.59	0.61 ns
Treatment	5-1= 4	14.25	3.56	3.71 *
Error	20	19.24	0.96	
Total	29	36.43		

The growth promotion of *Trichoderma koningii* is related to the rates of the inoculant. At low rate (10⁵ conidia per gram of soil), *Trichoderma koningii* does not promote plant growth. At higher rate (10⁸ conidia per gram of soil) the growth promotion effect of *Trichoderma koningii* on bush bean plants is decreased. Several reports indicated that at high population densities (10⁸ cfu/g soil) *Trichoderma* spp. induced adverse effects on plant growth (Baker et al., 1984; McFadden and Sutton, 1975). Even through *Trichoderma koningii* at 10⁸ conidia/gram of soil does not stunt plant growth, a higher rate may produce similar growth stunting results as reported by other researchers.

Best promotion effect of *Trichoderma koningii* on bean growth is obtained by the rate of 10⁶ conidia per gram of soil followed by 10⁷ and 10⁸ conidia/gram. Rates greater than 10⁸ conidia/gram of soil should be further investigated for possible adverse effect on plant growth.

Since sterilized soil was used in this experiment, the growth promotion of *Trichoderma koningii* should not be related to its biological control ability. A direct growth promotion effect is induced by *Trichoderma Koningii*. *Trichoderma koningii* may produce a growth promotion substance similar to that reported in previous investigation (Liu, 1990; Windham et al., 1986). It is also possible that

Trichoderma koningii creates a more favorable growing condition which leads to a better plant growth.

Literature Cited

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