Effect of Trichoderma Spp. on Potato Growth

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Bacteria and fungi are frequently investigated for their possible growth promotion and biological control activities. Among those intensively studied microorganisms Trichoderma spp. produced highly favorable results in both biological control and growth promotion activities.

Trichoderma harzianum and *Trichoderma koningii* were reported to produce a growth-regulating factor which increased the rate of seed germination and growth of tomato and tobacco plants (Windhams et al., 1986). *Trichoderma harzianum* in the form of either conidia or a peat-bran culture formulation promoted radish growth in raw soil (Baker et al., 1984). By the addition of 10^5 cfu/g to raw soil, radish dry weight was increased by 150 to 250% after 6 weeks. Application of *Trichoderma harzianum* to either steamed or raw soil hastened flowering of periwinkle and increased the number of blooms on chrysanthemums and petunias. It also increased the dry weight of tomato, pepper and cucumber. *Trichoderma koningii* was reported to have both biological control and growth promotion activities (Windham et al., 1986 and Liu, 1990).

The purpose of this experiment is to investigate the growth promotion effect of *Trichoderma koningii* on potato.

Materials and Methods

Field experiment was conducted in 1991 in Kern County, California. Randomized complete block design was employed in the field experiment. Individual plots were 45 feet long and 6 rows wide. *Trichoderma koningii* was applied to potato seed pieces before planting at 5 different rates. Each treatment was replicated 6 times. Fertilizers were applied and disced into soil before planting at a rate of 200 pounds of N, 240 pounds of P_2O_5 and 80 pounds of K_2O per acre.

Application of *Trichoderma koningii*: *Trichoderma koningii* with 5 X 10^9 conidia/g was obtained from JH Biotech, Inc. The material was diluted with ground wheat bran to obtain 0, 10^5, 10^6, 10^7, 10^8 conidia per gram. The materials were applied to potato seed pieces at a rate of 0.5 pounds per 100 pounds of seeds. Potato seeds were planted immediately after *Trichoderma koningii* application.

Fields were irrigated with overhead sprinkler system. Petiole samples were taken weekly, starting when plants were at about 5-6 leaf stage to monitor the nitrate status. If the nitrate concentration in the petiole samples fall below the established sufficient level, nitrogen in the form of urea ammonium nitrate would be injected through the irrigation water.

Potatoes in the middle two rows of each individual plot were hand harvested and weighed for yield. Analysis of variance was employed for the interpretation of the results.

Results and Discussion

The yields of potato from each plot and the average for each treatment are summarized in Table 1. The analysis of variance of the potato yields is listed in Table 2. The differences on the potato yields among all the treatments are statistically significant.

The application of Trichoderma on potato seed pieces at the concentrations of 10^6, 10^7, and 10^8 conidia/gram significantly increased potato yields. However, Trichoderma concentration of 10^5 conidia/gram does not affect potato yield. There is no difference on potato yields among the treatments with *Trichoderma koningii* concentrations of 10^6, 10^7, and 10^8 conidia/gram. The potato yields with *Trichoderma koningii* concentrations of 10^6 and 10^7 conidia/gram are higher than the treatment with *Trichoderma koningii* concentration of 10^8 conidia/gram. However, the differences are not statistically significant.

Table 1. Potato Yields Affected by Trichoderma Koningii

Treatment (*T. koningii*/g)	Potato Yield (CWT/A)							
	1	2	3	4	5	6	Average	*
0	321	331	312	358	306	298	321	a
10^5	316	337	337	321	319	302	322	ab
10^6	365	386	307	362	369	348	356	c
10^7	342	374	336	372	341	360	354	c
10^8	338	366	329	329	354	334	342	bc

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

Table 2. Analysis of Variance of the Potato Yields

Source of Variation	df	SS	MS	F
Block	6 -1= 5	4100	820	3.10 *
Treatment	5 -1= 4	6869	1717	6.50 **
Error	20	5285	264	
Total	30 -1= 29	16254		

Plant growth stimulated by the application of Trichoderma spp. is partially due to the production of growth-regulating factor by Trichoderma spp. (Windham et al., 1986). The increase in plant growth is correspondent to the rate of Trichoderma spp. applied (Baker et al., 1984). *Trichoderma koningii* at the concentration of 10^5 conidia/gram does not affect potato yield. The production of growth stimulating factor by *Trichoderma koningii* at this concentration may not be enough to show a significant increase in plant growth. This result is in agreement with the results reported by Liu (Liu, 1990). Since there is no difference in the potato yields among the *Trichoderma koningii* concentration of 10^6, 10^7, and 10^8 conidia/gram, any of these concentrations can be used to treat the potato seed pieces.

The growth promotion of *Trichoderma koningii* can be due to either the controlling of minor pathogens by *Trichoderma koningii* in the rhizosphere or the production of growth stimulating factors by *Trichoderma koningii*. Growth stimulation on plants grown on sterilized soils indicates that Trichoderma spp. do produce growth stimulating factors. In the field conditions both mechanisms may contribute to the growth promotion of Trichoderma spp. on plants.

Literature Cited

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