Growth and Yield Response of Chinese Radish to Application of *Trichoderma harzianum*

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Abstract

The effect of *T.harzianum* strain PC 01 on Chinese radish growth and yield was investigated by adding $10x10^8$, $32x10^8$ and $53x10^8$ spores of 5 days old *T. harzianum* per pot into the planting medium and compared with the non-treated one. Results showed that the growth and yield of plants grown in the planting medium with *T. harzianum* addition gradually increased when the number of *T. harzianum* applied was increased. Significant increases in growth and yield were observed when the number of $53x10^8$ spores per pot was used. Total fresh and dry weights of Chinese radish were increased 77.47 and 56.31 per cent, respectively, over the control.

1. Introduction

The fungus *Trichoderma harzianum* has long been investigated as a biological control organism against several soilborne pathogens [1, 2, 3, 4] and shown to be capable of increasing plant growth and yields. These increases usually were attributed to the reduction of plant diseases. However, there were reports indicating that this fungus could also have the potential to stimulate plant growth independent of any plant disease [5, 6, 7, 8, 9] . Application of *T. harzianum* in plant production, therefore, can reduce the use of fungicides, growth regulators and labor which eventually will lower the production costs and environmental impact.

Nevertheless, there was no report concerning the use of *T. harzianum* as plant growth stimulator in Thailand. The objective of this study, therefore, aimed to determine the effect of *T. harzianum* strain PC 01, which was indiginously isolated, on Chinese radish growth and yield.

2. Materials and methods

T. harzianum strain PC 01 was cultured onto the potato dextrose agar (PDA) and incubated for 5 days. Planting medium was prepared by mixing sand and organic fertilizer in the ratio of 10:1 (v/v) and placed in 12 inches diameter plastic pots. Five days old *T. harzianum* from the PDA culture were harvested and added to the planting medium in the amount of $10x10^8$, $32x10^8$ and $53x10^8$ spores per pot. Non-treated planting medium was used as control to which comparisons were made. All pots were covered with plastic sheets for 15 incubation days before planting. Five seeds of Chinese radish were sown in each pot and the plants were thinned to 1 seedling per pot after emergence. Pots were arranged in a randomized complete block design with 5 replications inside the nethouse covered with 50 per cent light reduction net. No chemical fertilizer or pesticide was used.

Growth and yield response of Chinese radish to *T. harzianum* application was determined at 50 days after planting, in terms of leaf number per plant, leaf area per plant, average root diameter and length, fresh and dry weights of shoot and root. All data were subjected to analysis of variance and Duncan's multiple range test was used for mean separation.

3. Results and discussion

Application of *T. harzianum* strain PC 01 into the planting medium showed increased growth and yield of Chinese radish. Significant increases in leaf area per plant and average root diameter were recorded when $53x10^8$ spores of *T. harzianum* per pot were applied (Table 1). No significant differences in leaf number per plant and average root length were observed.

Shoot, root and total fresh weights of Chinese radish gradually increased as the amount of *T. harzianum* applied was increased (Fig. 1). The use of $53x10^8$ spores of *T. harzianum* per pot showed significantly higher fresh weights than the others and the total fresh weight of this treatment was 77.47 per cent over the control.

Similarly, application of *T. harzianum* caused increased shoot, root and total dry weights of Chinese radish (Fig. 2). Significant differences in these dry weights, however, were only observed when $53x10^8$ spores of *T. harzianum* per pot were added. The total dry weight of this application rate was 56.31 per cent over the control.

The results of this study revealed the effect of *T. harzianum* on increased growth and yield. Application of $53x10^8$ spores *T. harzianum* strain PC 01 per pot prominently increased growth and yield of Chinese radish whereas the lower amounts of T. *harzianum* treatment did not.

The increased plant growth induced by *T. harzianum* has been reported [5, 7, 8, 10] but the mechanism of this growth promotion is still unclear. Windham *et al.* [7] concluded that the *Trichoderma* spp. produced a growth-regulating factor which increased the rate of seed germination and dry

Table 1. Effect of *T. harzianum* application on Chinese radish leaf number per plant, leaf area per plant, average root diameter and root length.

Number of spores added ($x10^8$ spores/pot)	Leaf		Root	
	Number	Area (cm^2)	Diameter (cm)	Length (cm)
0	13.53 NS	562.32 b	2.64 b	13.13 NS
10	12.73	581.08 b	3.01 b	15.23
32	14.20	693.85 ab	2.71 b	14.53
53	14.63	788.22 a	3.51 a	15.65
CV (%)	8.47	17.37	10.61	14.10

NS : Non significant difference
For each column, means having the same letter are not significantly different by DMRT (P=0.05)

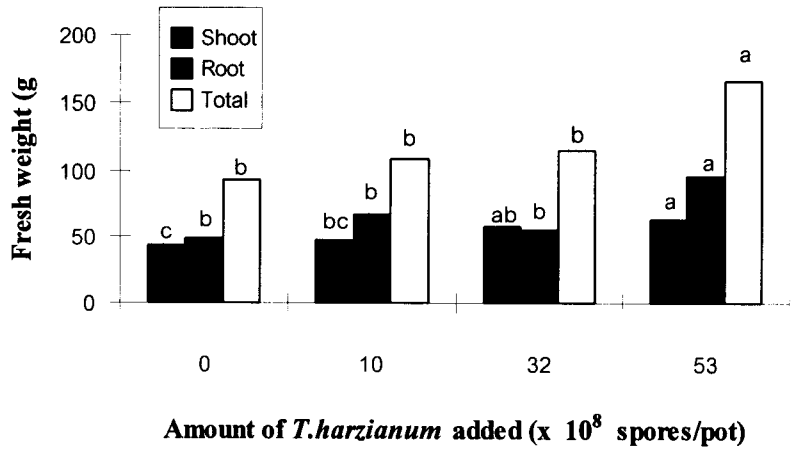

Fig. 1. Effect of *T. harzianum* application on Chinese radish fresh weights. Means separation by DMRT (P=0.05)

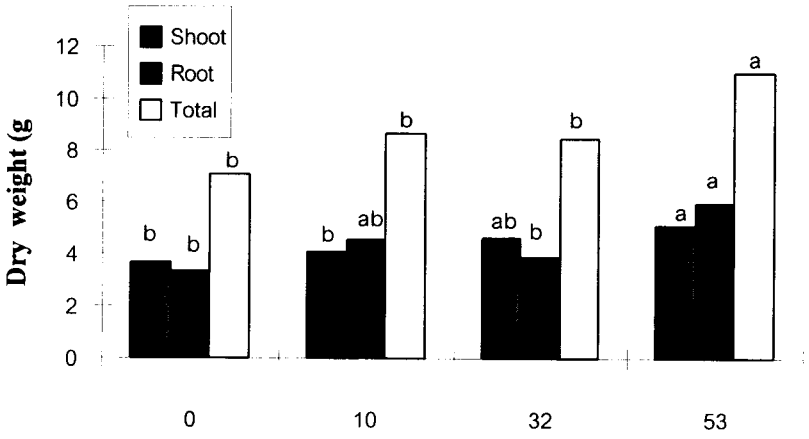

Fig. 2. Effect of *T. harzianum* application on Chinese radish dry weights. Means separation by DMRT (P=0.05)

weight of shoots and stems. Baker [10] stated that plant growth responses induced by *Trichoderma* spp. appeared to be due to both the control of minor pathogens and production of a growth-regulating factor. Penetration and colonization of *T. harzianum* in the interior of plant root was observed [8], hence, one possible mechanism for increased plant growth might be due to the effect of *T. harzianum* in increasing the efficiency of nutrient transferring from the compost to the roots in a way analogous to mycorrhizal effects [11]. Moreover, Ousley *et al.* [11] further discussed that the growth response of plants might be due to the result of the production of a heat-stable metabolite which promoted plant growth directly or due to the effect of *T. harzianum* in removing a toxic material from the soil which was inhibitory to plant growth.

4. References

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