Effects of Environmental Factors on Promoting Plant Growth by Trichoderma spp.

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ABSTRACT

This study is to investigate the factors of promoting plant growth and nutrient uptake of agricultural crops by using Trichoderma spp. There are two parts of this study. One is to determine whether Trichoderma spp are able to solubilize various insoluble or sparingly soluble minerals in vitro. The other is to determine the effect of different Trichoderma strains on nutrient uptake of various crops under different soil conditions. For sucrose-yeast extract medium tests, the results indicated that Fe2O3, MnO2, Zn, and Rock phosphate (most calcium phosphate) were sparingly solubilized by cell-free cultures, but P, Fe, and Cu concentration were reduced and Mn and Zn concentration were increased by treaded with Trichoderma spp in the culture medium. In addition, those Trichoderma strains produced the chelating substances to chelate the Cu ion and diffusible metabolites capable of reducing Fe(III) and Cu(II) to Fe(II) and Cu(I), respectively. For plant growth tests, Trichoderma strain 1295-22, R1-6 and Yam3-7 could increase significantly the dry-weight and N-uptake of cabbage plants as compared with untreated plants in acidy soil (Pincheng soil system). However, only strain 1295-22 and Yam3-7significantly increased the nitrogen uptake of radish plants in the acidy soils under controlled conditions. In alkaline soil (Chi-An soil system), all Trichoderma strains increased nitrogen uptake on cabbage and radish plants, but only strain 1295-22 might increase the plant dry-weight of cabbage in growth chamber. For greenhouse trails, Trichoderma strains significantly increased dry matters of sweet corn in silking stage under different pH soils. The dry matters of sweet corn were increased 20%, 24% and 8% in acidy soil by strain 1295-22, strain R1-6 and strain R42, respectively. In neutral soil, strain 1295-22, R1-6, and R42 could increase respectively dry matters of sweet corn to 13%, 10% and 1%. However, only strain R1-6 could increase the dry matters to 9% in alkaline soil. Similarly, the nitrogen uptake and ear yield of sweet corn treated by Trichoderma strains were also increased as compared to untreated plants. For cucumber tests, Trichoderma strains significantly reduced the pythium disease of cucmber, cused by P. aphanidermatum when the results were compared with untreated plants. When soil was amended with Trichoderma strains, there were also significantly increase in dry weight of cucumber in 98% (strain 1295-22), 51% (strain R1-6) and 95% (strain R42). Similarly, an increase of 23% and 140% of nitrogen uptake of cucumber in flowering stage and harvesting stage, respectively, were observed in Trichoderma strain 1295-22 inoculated plants.

Keywords : Trichoderma spp. ; Sweet corn ; Nitrogen uptake ; Plant growth promotion

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