

## GROWTH STIMULATION OF GREENHOUSE TOMATO PLANTS BY *PSEUDOMONAS PUTIDA* AND *TRICHODERMA ATROVIRIDE*

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### ABSTRACT

Recent work showed that *Pseudomonas putida* subgroup B strain 1 and *Trichoderma atroviride* increased the vegetative and the reproductive growth of mature tomato plants grown under hydroponic conditions in greenhouse. In this regard, they are considered as plant growth promoting microorganisms (PGPM). PGPM stimulates plant growth through different mechanisms including the synthesis of plant growth regulators. As a first step in the determination of the mechanism by which these microorganisms stimulate plant growth, this study investigated their capacity to produce or degrade IAA (indole acetic acid). The results obtained showed that both microorganisms produced IAA when grown in a medium amended with tryptophan, tryptamine and tryptophol at a concentration of 200 µg/ml (Fig. 1). *P. putida* subgroup B strain 1 produced high level of IAA and IAA-related compounds (23.4 µg/ml/DO<sub>600</sub><sup>-1</sup>) when grown in the presence of tryptamine whereas the highest level of IAA and IAA-related compounds (38.5 µg/ml) were produced by *T. atroviride* in the presence of tryptophol (Fig. 1).

Assays in growth chambers on tomato seedlings were undertaken to verify the effect of such production of IAA on plant development. For seedlings inoculated with *P. putida* subgroup B strain 1 or *T. atroviride*, the fresh weight of the shoot increased as the concentration of tryptophan increased to 0.75 mM (Fig. 2). Similar results were observed for the fresh weight of

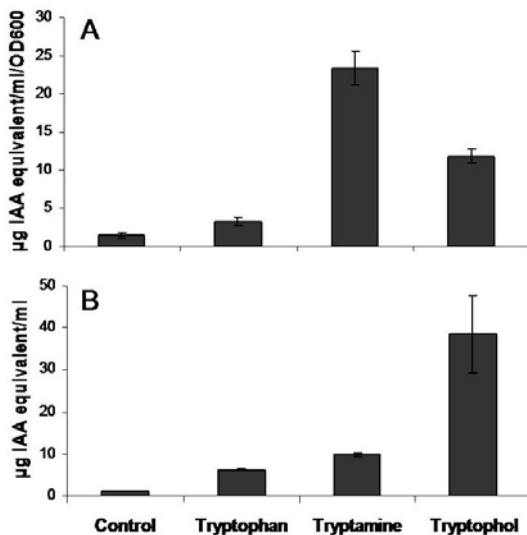


Fig. 1. Production of IAA and IAA-related compounds by *Pseudomonas putida* subgroup B strain 1 (A) and *Trichoderma atroviride* (B) in the presence of indole derivatives (200 µg/ml).

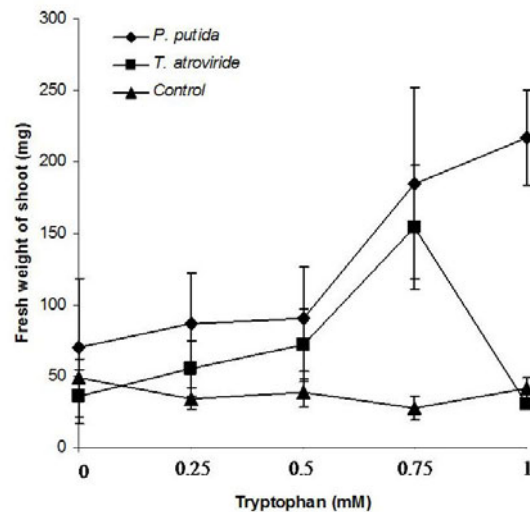
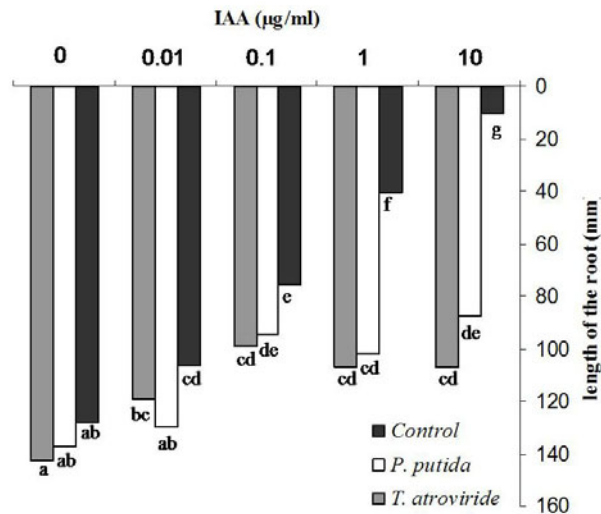


Fig. 2. Effect of tryptophan on the fresh weight of the shoot of tomato seedlings inoculated with *Pseudomonas putida* subgroup B strain 1 or *Trichoderma atroviride*.

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the roots (data not shown).

On the other hand, both *P. putida* subgroup B strain 1 and *T. atroviride* were shown to degrade IAA *in vitro* when grown in M9 minimal medium (data not shown). The microorganisms were also shown to reduce the inhibitory effect of exogenous application of IAA on tomato seedlings. As shown on Fig. 3, application of *P. putida* subgroup B strain 1 and *T. atroviride* on tomato seedlings allowed to prevent a marked reduction in root length as observed on the control seedlings treated with 1 or 10 µg/ml. Overall, this study suggests that IAA is involved in the mechanism by which *P. putida* subgroup B strain 1 and *T. atroviride* stimulates the growth of tomato plants.



**Fig. 3. Effect of exogenous IAA on the elongation of tomato roots grown in pouches in the absence and in the presence of *Pseudomonas putida* subgroup B strain 1 or *Trichoderma atroviride*. Values followed by the same letter are not significantly different according to Fisher protected LSD test (P<0.05)**