A new approach to study direct effects of rhizobacteria on plant growth

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A NEW APPROACH TO STUDY DIRECT EFFECTS OF RHIZOBACTERIA ON PLANT GROWTH

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INTRODUCTION

Some strains of fluorescent pseudomonads promote plant growth. Most studies have focused on indirect mechanisms of promotion : suppression of soilborne plant pathogens and deleterious microorganisms (Schippers *et al.*, 1987 ; Weller, 1988).

However some bacteria could promote plant growth by direct interaction with the plant (Lifshitz *et al.*, 1987 ; Kloepper *et al.*, 1991). Such a phenomenon has as yet been poorly characterized because of the difficulty to assess this effect.

Our first objective was to develop a test to evaluate stimulation of plant growth in gnotobiotic conditions by some strains of fluorescent pseudomonads.

DESCRIPTION OF THE TEST

* In sterile conditions, a rockwool plug was placed in the upper part of a glass tube containing 25 ml sterile distilled water (sdw). Seeds of tomato (cv. 'Lerica') were surface sterilized (5% Calcium Hypochlorite, 5 mn rinsed in sdw) and placed between the rockwool plug and the tube wall.
* 1 ml of log 5.5 cfu/ml bacterial suspension, *Pseudomonas putida* strain G92 (control : 1 ml of sdw) was deposited on the rockwool plug.
* First, gently shaken tubes were inclined in the dark at 22°C for 7 days ; the kinetics of root growth were measured. The tubes were then placed vertically in a growth chamber for 3 days with a 12 h photoperiod.
* The seedling root length was measured at the end of the incubation period.

RESULTS

During the first 7 days, kinetic of bacterized root growth versus control was not significantly different. However, from 5th, root elongation seemed to be stimulated by bacterial treatment (Fig 1).

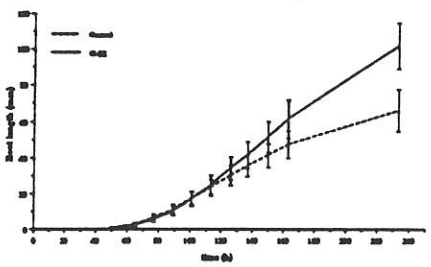

Fig 1. Kinetic of mean root growth

Ten days after inoculation, the mean root length for treated plants (101.55 mm) was significantly higher than that for control (65.77 mm). The bacterial strain increased the mean by 54%. The distribution of root length into 15 mm width classes (Fig 2) showed that 31 out of 40 treated plants developed roots longer than 75 mm, while this was only the case for 9 out of 40 control plants.

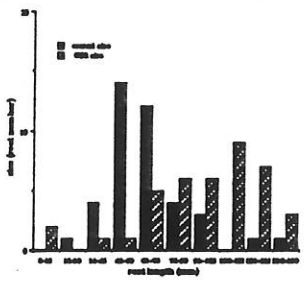

Fig 2. Final root length distribution

DISCUSSION

With the *P. putida* strain GR12-2R3, a significant increase in canola seedling root elongation was reported (Lifshitz *et al.*, 1987) in gnotobiotic conditions. A Tn5 mutant of this strain, unable to promote seedling root elongation was obtained.

This type of mutant can be used to gain a better understanding of the mechanisms responsible for root growth stimulation. However, a reproductible and sensitive test to determine root growth is necessary. Our test when improved can be used to screen bacterial deleted mutants for stimulation of tomato root growth capacity.

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