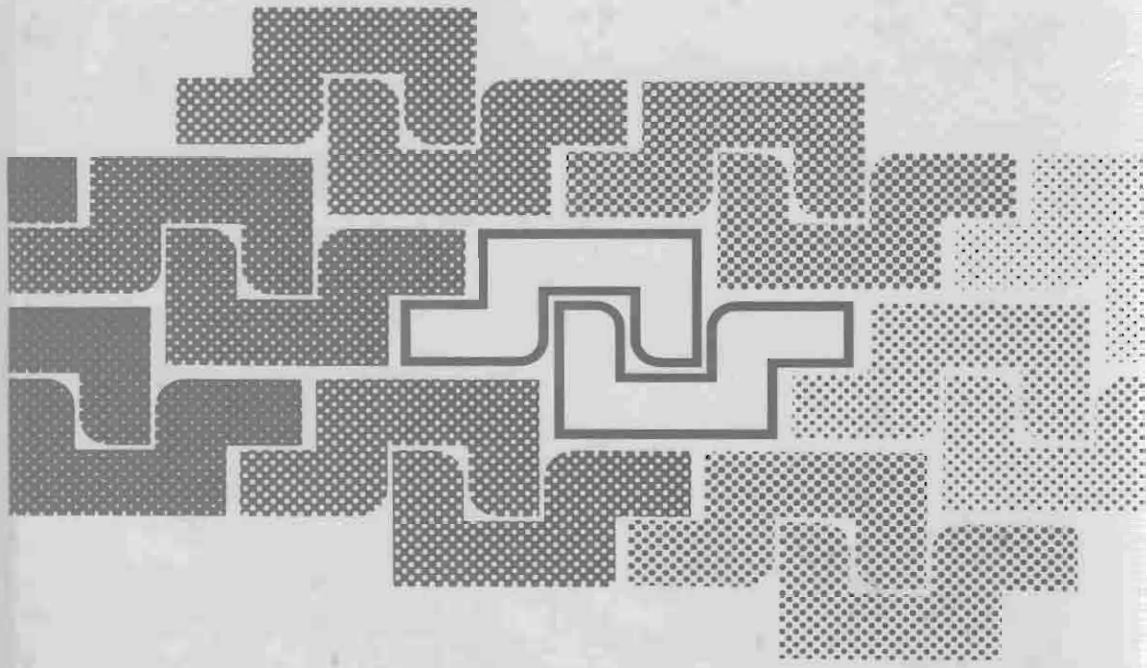

Azospirillum VI and Related Microorganisms

Genetics – Physiology – Ecology

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First Results on Individual and Dual Inoculation with *Azospirillum* - *Glomus* on Wheat

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Abstract

Wheat (*Triticum durum* L. cv. Creso) plants were grown in a soil with organic matter and available nitrogen and phosphorous. Plants were inoculated individually either with *Azospirillum brasilense* strain Cdr (rifampicin resistant), and with an arbuscular mycorrhizal (AM) fungus *Glomus* sp. strain A6 or with dual inoculation with both microorganisms. After 12 weeks plants were harvested and data recorded. Fresh and dry weigth of shoots and roots were higher in dual inoculated plants compared with individual inoculated and control.

Keywords:*Triticum durum*, *Azospirillum brasilense*, *Glomus* sp., inoculation, transplanting

Introduction

Positive effects of dual inoculation of graminaceous plants by vesicular-arbuscular mycorrhizal fungi and diazotrophic bacteria have been investigated by a number of authors (Pacovsky R.S. *et al.*, 1985; Pacovsky R.S., 1989; Pacovsky R.S., 1989; Subba Rao N.S. *et al.*, 1985; Subba Rao *et al.* 1985).

However, the presence of both mycorrhizae and *Azospirillum* spp. on the same root systems has rarely been reported for wheat plants (Singh C.S. *et al.*; Al- Nahidh S. and Gomah A.H.M., 1991).

In order to evaluate the possibility of using microbial inoculants for field experiments, the effect of single and dual inoculation of *Azospirillum* spp. and *Glomus* spp. on wheat plants was investigated in pot experiments.

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Materials and Methods

Wheat sterile seedlings: wheat seeds (*Triticum durum* L. cv. Creso) were surface sterilized 15 min with $HgCl_2$(0.1%), then rinsed in sterile water and germinated in Petri dishes on wet filter paper at 22 °C in the dark.

Azospirillum inoculum: *Azospirillum brasilense* Cdr mutant strain rifampicin resistant was used; the strain was grown in Erlenmeyer flasks on Antibiotic medium (Oxoid) supplemented with 20 μg/ml of rifampicin in a rotary shaker (180 rpm, 32 °C, exponential phase of growth). The culture was washed twice with phosphate buffer (0.1 M, pH 7.2) and resuspended in 200 ml of the same buffer to a final concentration of $7.5 \cdot 10^8$ CFU/ml.

Mycorrhizal inoculum: the mycorrhizal fungus used was *Glomus* sp. strain A6; the inoculum consisted of infested soil containing sporocarps, spores, infected root fragments and extramatrical mycelium.

Soil: the soil used was a peaty fertile soil passed through 3 mm sieve and steam sterilized for 90 min to eliminate natural endophytes.

Pots of 16 cm in diameter were filled with this treated soil and used for a pot culture experiment.

Transplanting and inoculation: two plants in each pot were transplanted placing 20g of mycorrhyzal inoculum in the transplantig hole for each pot to inoculate with the fungus while 10 ml of inoculum were distributed for each pot to inoculate with *Azospirillum*. The uninoculated treatment and inoculated plants with mycorrhizae only, received 10 ml of phosphate buffer. The plants were put outdoor and only one plant per pot was allowed to grow. After 12 weeks the plants were collected and fresh and dry weigth of shoots and roots was recorded.

Results

Shoots and roots fresh and dry weigth of the inoculated plants were slightly higher than the uninoculated treatments. Double treatments (*Azospirillum* + *Glomus*) showed the highest rate of both shoot and root dry weigth (Fig. 1,2,3,4).

Data analysed by analysis of variance on five replicates (Table 1) showed, after 12 weeks, that root dry weigth of double inoculated plants was significantly higher ($P < 0.05$) compared with those of the other treatments.

Table. 1 Shoot/Root fresh and dry weigth (values having the same letter within a column are not significantly different P > 0.05).

TREATMENT	SHOOT FRESH WEIGTH	SHOOT DRY WEIGTH	ROOT FRESH WEIGTH	ROOT DRY WEIGTH
CONTROL	3.37 a	0.84 a	3.46 a	0.45 a
AZOSPIRILLUM	5.76 a	1.00 a	6.10 a	0.85 a
GLOMUS	3.96 a	0.90 a	7.48 a	0.94 a
AZOSPIRILLUM + GLOMUS	6.33 a	1.36 a	9.29 a	1.57 b

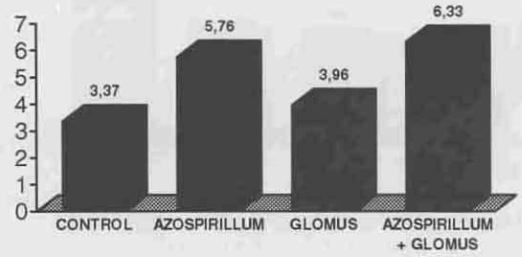

Fig. 1. Shoot fresh weigth means of five replicates (g)

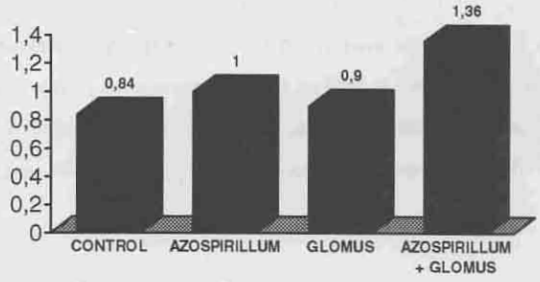

Fig.2. Shoot dry weigth means of five replicates (g)

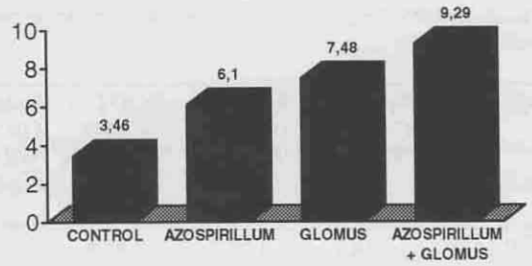

Fig. 3. Root fresh weigth means of five replicates (g)

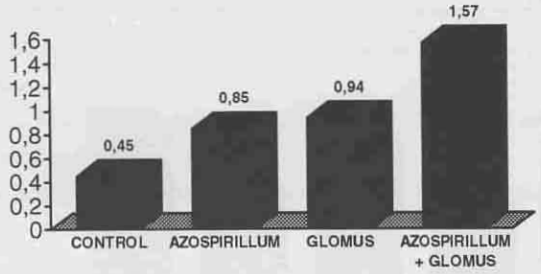

Fig. 4. Root dry weigth means of five replicates (g)

Conclusions

Dual inoculation with *Azospirillum brasilense* Cdr and *Glomus* sp. strain A6 had a positive effect on wheat plants These results showed that dual inoculated wheat plants take great advantage of the inoculation treatment as well as other graminaceous plants. These preliminary results encurage further investigations on several wheat cultivars and other *Azospirillum* and mycorrhizae strains to find the best plant-inoculants responses to be employed in field conditions.

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