

Beneficial bacteria from the olive rhizosphere promote growth of sunflower plants and reduce infection by *Orobanche cumana*



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Introduction & Objectives

Confectionary sunflower is highly susceptible to the holoparasite *Orobanche cumana* Wallr. (broomrape) (Figure 1). Until breeding programs succeed at incorporating resistance into commercial hybrids, other alternatives must be considered in the control of broomrape.

Biological control agents (BCA) constitute an eco-friendly alternative in the management of crop diseases. Some *Pseudomonas* spp. strains display *in vitro* growth inhibition of different crop pathogens and they are also able to suppress their deleterious effects in plants. Selected strains of *P. fluorescens* Migula. and *P. putida* Trevisan. have been demonstrated as effective BCA against *Verticillium dahliae* Kleb. affecting olive trees. Moreover, the ability of strain *P. fluorescens* PICF7 to colonize the roots of sunflower has been previously reported by our research group. Other BCA effective in disease suppression are *Bacillales* members such as *Paenibacillus* spp. or *Bacillus* spp.

The **objectives** of this work were: a) to assess whether bacterial BCA had any (beneficial or detrimental) effect on the growth of sunflower; and b) to analyse the potential of some *Pseudomonas* spp. and *Bacillales* strains as BCA against broomrape of sunflower.



Materials & Methods



Two experiments were conducted in the greenhouse at 22–28°C and 14-h light photoperiod for 5 weeks. Water and MgSO₄ treatments were included as controls (Figure 2).

Experiment 1. Seeds of the confectionary sunflower B117 were germinated and bacterized with suspensions of six *Pseudomonas* spp. strains and three *Bacillales* strains. Eight seedlings (replications) were planted into 250-g pots. Height and weight of the plants were noted.

Experiment 2. Eight B117 seedlings (replications) were bacterized and individually transferred into 250-g pots containing a sand:silt:peat moss mixture uniformly infested with 10 mg of parasite seeds (Oc01-15 population of *O. cumana*). Root weight and number of broomrape nodules and/or stems were assessed (Figure 3).



Results & Conclusions

The beneficial effect of *P. fluorescens* PICF6 was evidenced by significantly higher weight values of aboveground plant biomass upon bacterization. Among *Bacillales* representatives, *Paenibacillus polymyxa* PIC73 significantly decreased the height of sunflower (Table).

Remarkably, presence of *Pseudomonas* sp. PIC25 resulted in a significant reduction of the number of broomrape nodules in sunflower (Figure 4).

These results constitute the first report of the significance of the *Pseudomonas* genus on the promotion of sunflower growth as well as on the reduction of broomrape infection upon treatment with bacteria from the *Pseudomonas* genus.

Strain (Taxonomical identification)	Sunflower growth variables			
	Height (cm)	Weight aboveground biomass (g)	Weight roots (g)	
PIC25 <i>Pseudomonas</i> sp.	22.37	BC	0.46	D
PIC141 <i>Pseudomonas</i> sp.	21.56	BC	0.54	BCD
PIC105 <i>Pseudomonas indica</i>	21.62	BC	0.50	CD
PICF4 <i>Pseudomonas fluorescens</i>	26.94	A	0.69	AB
PICF6 <i>Pseudomonas fluorescens</i>	27.19	A	0.78	A
PICF7 <i>Pseudomonas fluorescens</i>	26.81	A	0.66	ABC
PIC28 <i>Bacillus thuringiensis</i>	22.19	BC	0.54	BCD
PIC167 <i>Paenibacillus</i> sp.	25.00	ABC	0.62	ABCD
PIC73 <i>Paenibacillus polymyxa</i>	21.12	C	0.45	D
MgSO ₄	25.50	AB	0.61	BCD
Water	25.62	AB	0.59	BCD

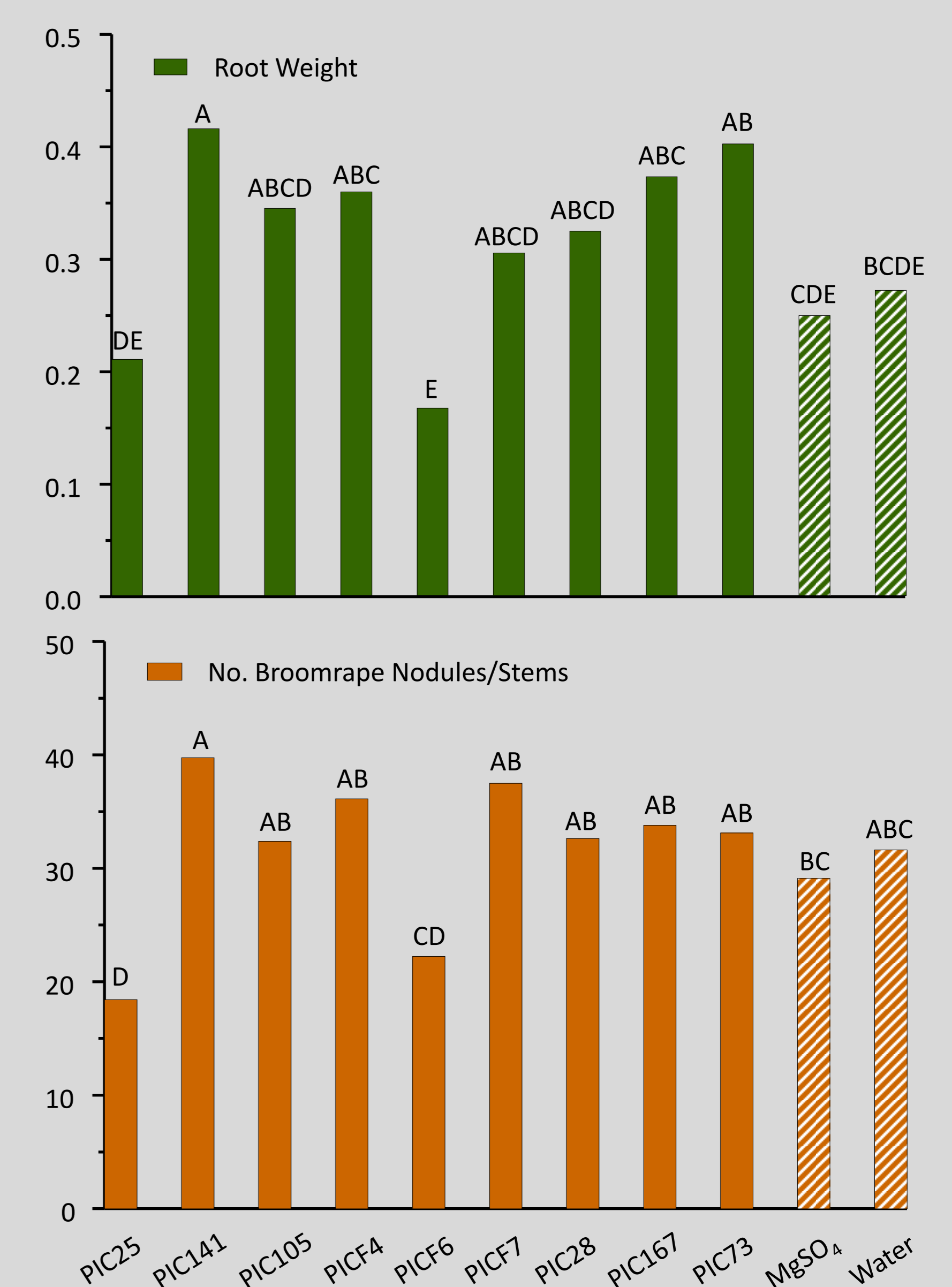


Figure 4. Effect of *Pseudomonas* spp. and *Bacillales* strains as biocontrol agents against broomrape.

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