

SHORT COMMUNICATION

Impact of biofertilizers on growth, yield and nutritional composition of Coriander (*Coriandrum sativum* L.)

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ABSTRACT

Organic farming benefits greatly from the use of biofertilizers because they are affordable, environmentally friendly and quickly increase soil fertility. Eight treatments were undertaken to evaluate the impact of *Azospirillum brasilense*, *Pseudomonas putida* and *Brevibacillus brevis* on the growth, yield and nutritional characteristics of coriander. The study used a Randomized Block Design for its execution. In comparison to the control (T_0), the treatment involving the combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T_7) exhibited considerably higher collar diameter, plant height, leaf count, fruit count, fresh weight of leaves & fruits and various nutrition. The enhanced intake of nitrogen, phosphorus and other critical nutrients for coriander growth may be the cause of the increases in growth & yield parameters and nutritional composition in treatments with biofertilizers.

Keywords: Biofertilizers, coriander, growth, nutrients, yield

Another strategy for achieving potential agriculture is the utilization of biofertilizers, which are beneficial microorganisms that play a crucial role in meeting the nutrient requirements of plants (Bhardwaj *et al.*, 2014; Raghad *et al.*, 2021). Moreover, bio-fertilizers are administered to the soil, fruit, or root and promote the establishment of microflora, enhanced nutrient availability and nitrogen fixation (Afnan *et al.*, 2021; Datta *et al.*, 2024).

Azospirillum brasilense is the most researched PGPR, which shows a great deal of promise for commercial uses. It increased the development and productivity of a wide

variety of plant species (Vidotti *et al.*, 2019; Peng *et al.*, 2021). *Pseudomonas putida* is a drought-tolerant variant having traits that encourage plant growth. Additionally, it improved the uptake of water and nutrients, which sustains the rate of photosynthesis (Tanveer *et al.*, 2023). *Brevibacillus brevis* is considered as plant growth-promoting rhizobacteria (PGPRs) and generally occurring in sediment and soil. Several research works have highlighted the impact of these bacteria as a PGPR in different types of crops (Nehra *et al.*, 2016; Dutta and Thakur, 2017).

Coriander (*Coriandrum sativum* L.) is a spice crop with a nice perfume across the entire plant and is used extensively to flavor cuisine (Kumar *et al.*, 2023). About 80% of the coriander seeds produced worldwide are grown in India, mostly in Madhya Pradesh, Gujarat, Rajasthan, Assam, West Bengal, Orissa, Andhra Pradesh and Tamil Nadu (Thakur *et al.*, 2021). Research from a variety of sources is necessary to regulate nutrients at different sites and assess the effect of biofertilizers particularly PGPR on the development and production of different crops, such as coriander. Having the above mentioned facts, the current research was conducted to estimate the effect of different biofertilizers on growth and yield attributes of coriander. According to the literature review, this is the first study on *Pseudomonas putida* and *Brevibacillus brevis* promoting plant growth of coriander.

The field experiment was carried out in Suranam village of Sivagangai district in Tamil Nadu during September 2023. The study area lies between 78.7186° E longitude and 9.6929° N latitude at an altitude of 41 m above mean sea level. The annual rainfall of this area is about 20 – 35 mm. This location has varying temperatures between 22° and 40°C. The study employed the cultivar variety *Coriandrum sativum* cv. CO₃, whose seeds were sourced from organic growers in Suranam location. For this investigation, 2 m × 2 m (4 m²) plots were prepared and each plot received 15 g of hand-sown seeds. Irrigation was applied both at the time of planting and on a regular basis starting on the third day after sowing, when the soil moisture content was reduced. Every patch was manually kept free of weeds. The experiment was laid out in Randomized Block Design with three replications. The biofertilizers employed for present research work include *Azospirillum brasilense*, *Pseudomonas putida* and *Brevibacillus brevis* and all these were procured from Department of Agricultural

Microbiology, Agricultural College and Research Institute, Madurai. The treatments consist, T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each).

After the completion of full growth circle (on 90th day after sowing), secondary growth data on collar diameter, shoot length, root length, total length and number of leaves were recorded along with number of fruits. Then the plants were uprooted carefully and clean off soil particles from roots. The fresh and dry weight of foliage, root and fruits were estimated separately by using electronic weighing balance. Fruit yield was measured by harvesting the entire crop from a net plot area, allowed to air-dry and threshed by hand. After being separated from the plant, the fruits were cleaned and weighed. The proximate analysis of coriander leaves and seeds was carried out by standard methods. Moisture content was determined by using a laboratory oven method provided by Association of Official Analytical Collaboration (AOAC) (Latimer, 2016), carbohydrate was estimated using anthrone method given by Kejla *et al.* (2023), unsaturated fat was estimated by the method given by Hauser (2023), fiber was determined by Weende method given by Association of Official Analytical Collaboration (AOAC) (Latimer, 2016) and proteins was estimated by kjeldahls method as described by Mæhre *et al.* (2018). The vitamins such as vitamin A, B₁, B₂, B₃ and C content of leaves and seeds of coriander were estimated by using the method described by Association of Official Analytical Collaboration (AOAC) (Latimer, 2016). The minerals like magnesium, iron, phosphorus, sodium, zinc and potassium in both foliage and

seeds of coriander were estimated by using standard procedures as described by Carolina *et al.* (2022). All the results obtained by present study were statistically analysed by Duncan's Multiple Range Test ($P < 0.05$) (Duncan, 1955).

Data revealed that highest collar diameter (5.35 mm) was recorded in the plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) followed by T₅ (*Azospirillum brasilense* + *Brevibacillus brevis*). The maximum plant height (53.82 cm) and number of leaves (69.25) were noted in the coriander plants inoculated with *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇). In dual inoculation, T₅ plants treated with *Azospirillum brasilense* + *Brevibacillus brevis* exposed superior collar diameter (5.20 mm), shoot length (37.30 cm), root length (11.05 cm) and number of leaves (47.0) than other dual inoculations T₄ (*Azospirillum brasilense* + *Brevibacillus brevis*) and T₆ (*Pseudomonas putida* + *Brevibacillus brevis*). Among the coriander plants inoculated with *Azospirillum brasilense*, *Pseudomonas putida* and *Brevibacillus brevis* individually, they were exhibited their own impact on various growth parameters. Overall, the growth parameters were increased by the combined application of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) contrasted with untreated control plants (Table 1). In case of yield attributes, maximum fresh weight (g/plot) of foliage (1758.56), root (140.68) and fruit (493.03) was obtained from the plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) like growth parameters. Similarly, maximum dry weight of each attributes (foliage-351.71, root-28.13, fruit-493.03 g/plot) was attained in the same plants (Table 2).

Numerous previous investigations supported the results of the current study. Davaran-Hagh *et al.* (2015) found that the

fresh weight of corn plants infected with *Azospirillum brasilense* was 30% higher than that of non-inoculated plants. Salazar-Garcia *et al.* (2022) documented that inoculation with *A. brasilense* resulted a notable raise in both waterlogged and non-waterlogged plants, demonstrating the crucial function of this bacterium in radish growth.

Tanveer *et al.* (2023) found that inoculating with *Pseudomonas putida* significantly increased root and shoot length and leaf area when compared to the uninoculated plants in canola. Bacteria that promote plant growth enhance the flexibility of the root membrane, and the improvement in root and shoot development has been related with the production of phytohormones by *Pseudomonas putida* (Chieb and Gachomo, 2023).

Brevibacillus brevis has also been studied by several researchers as a PGPR on a variety of crops. Chandel *et al.* (2010) found *B. brevis* as a potential biological control agent for reducing the impacts of *Fusarium oxysporum* ssp. *lycopersici* on tomato plants. Iqbal *et al.* (2016) conducted research in a saline area and they have found that IAA-producing rhizobacteria such as *Brevibacillus* and *Pseudomonas* greatly improved the growth, physiological traits and yield of maize plants. Rasouli *et al.* (2022) evaluated the essential function of organic fertilizers in increasing seed production of coriander. The enhancement in growth characteristics resulting from the inoculation with nitrogen-fixing bacteria has also been documented by Sahu *et al.* (2014), Sahu and Sahu (2018), Swain (2020), Ali *et al.* (2023) on coriander.

Proximate analysis of both coriander leaves and seeds showed less significant variations among the plants treated with various biofertilizers when compare to control. In case of leaves, the moisture content was in the range of 86.6–87.9%. Maximum moisture content (87.9%) was observed in the

plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) and also in *Azospirillum brasilense* + *Pseudomonas putida* inoculated plants (T₄). Likewise, the biochemical contents such as carbohydrate, unsaturated fat, fiber and protein were also have been found maximum in leaves of coriander plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) and they were determined as 6.8, 1.8, 5.5 and 3.8 g/100g respectively (Table 3). The proximate analysis of the seeds also exhibited the same results as in case of leaves of coriander thus the plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) showed maximum values in all the biochemical characteristics including moisture content (Table 3).

Regarding the vitamin content of leaves, all the vitamins of coriander inoculated with biofertilizers had significantly increased over untreated plants (Table 4). The highest vitamin A concentration (183 mg/100g fresh) was estimated in plants inoculated with *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) followed by double inoculation of *Pseudomonas putida* + *Brevibacillus brevis* inoculated plants (T₆) (178 mg/100g). The vitamins B₁, B₂ and B₃ were found maximum (1.42, 1.72 and 5.70mg/100g respectively) in the plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇). These plants also contained maximum concentration (135.9 mg/100g) of vitamin C also (Table 4). In case of seeds, the concentration of vitamin A, B₁, B₂, B₃ and C was found maximum in the plants treated with *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) as 154, 1.72, 1.96, 7.78 and 13.8 mg/100g respectively (Table 4).

By the present study, it was noted that all plants treated with biofertilizers were exhibited notable variations in the different mineral concentrations of coriander leaves and seeds when compared to plants that were not treated (Table 5). In case of calcium concentration of leaves, all treated plants showed significant variations, with the exception of the uninoculated plants. It was recorded that 255 mg/100g of calcium as highest in T₇ (*Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis*) plants. The highest concentration of magnesium (134 mg/100g), iron (6.4 mg/100g), phosphorus (95 mg/100g), sodium (0.43 mg/100g), zinc (0.98 mg/100g) and potassium (550 mg/100g) were also found in the coriander plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) (Table 5). In case of seeds, the highest concentration of calcium (350 mg/100g), magnesium (178 mg/100g), iron (8.8 mg/100g), phosphorus (120 mg/100g), sodium (0.50 mg/100g), zinc (1.82 mg/100g) and potassium (678 mg/100g) were determined in the plants treated with combined inoculation of *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (T₇) (Table 5). The overall findings regarding the concentration of minerals of seeds showed higher content when compared to leaves of coriander (Table 5). Research has demonstrated that the process of photosynthesis in plants is influenced by various nutrient elements like calcium, magnesium, iron, phosphorus, sodium, zinc and potassium. These components play a critical role in plant photosynthesis (Meng and Gao, 2011). The measured elemental content in coriander by present study indicated that the subjected microbial strains (*Azospirillum brasilense*, *Pseudomonas putida* and *Brevibacillus brevis*) enhanced the absorption of several components in treated plants. Facilitating the absorption of macroelements

and microelements in plants is a key function of PGPR. Earlier research indicated that plant hormones generated by microorganisms encourage root growth, which increases the root surface area and aids in the absorption of additional nutrients (Kumar *et al.*, 2014), which leads to the maximum growth and higher biomass.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1: Effect of biofertilizers on growth and yield attributes of coriander

Treatments	Growth and yield parameters					
	Collar diameter (mm)	Shoot length (cm)	Root length (cm)	Total length (cm)	Number of leaves	Number of Fruits
T ₀	4.10 ± 0.14	23.0 ± 1.54	7.20 ± 0.49	30.20 ± 1.70	23.50 ± 3.41	49.75 ± 4.87
T ₁	3.92 ± 0.63	26.87 ± 1.70	7.25 ± 0.20	34.12 ± 2.82	32.0 ± 2.94	114.25 ± 44.47
T ₂	4.0 ± 0.78	29.05 ± 4.86	7.87 ± 0.98	36.92 ± 3.31	32.50 ± 5.44	130.25 ± 30.26
T ₃	3.35 ± 0.36	33.97 ± 2.58	8.67 ± 2.68	42.65 ± 3.21	27.0 ± 7.39	133.0 ± 30.39
T ₄	4.17 ± 0.38	35.42 ± 5.61	9.57 ± 2.32	44.99 ± 4.18	32.75 ± 3.77	152.50 ± 48.39
T ₅	5.20 ± 0.43	37.30 ± 3.26	11.05 ± 3.03	48.35 ± 5.79	47.0 ± 4.16	201.0 ± 58.67
T ₆	4.50 ± 0.41	36.22 ± 5.11	8.32 ± 1.02	44.54 ± 6.13	42.25 ± 20.45	155.50 ± 25.54
T ₇	5.35 ± 0.34	39.70 ± 3.60	14.12 ± 2.49	53.82 ± 2.88	69.25 ± 18.31	243.25 ± 67.48

T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each). Values are Mean + Standard Error

Table 2: Effect of biofertilizers on fresh and dry weight of coriander

Treatments	Fresh weight (g/plot)				Dry weight (g/plot)			
	Foliage	Root	Fruits	Total	Foliage	Root	Fruits	Total
T ₀	908.09 ^a	72.64 ^a	200.12 ^a	1180.85 ^a	181.61 ^a	14.52 ^a	200.12 ^a	396.26 ^a
T ₁	983.17 ^b	78.65 ^a	240.29 ^b	1302.11 ^b	196.63 ^b	15.73 ^a	240.29 ^b	452.65 ^b
T ₂	998.34 ^b	79.86 ^a	300.09 ^c	1378.29 ^c	199.66 ^b	15.97 ^a	300.09 ^c	515.73 ^c
T ₃	1166.72 ^c	93.33 ^b	313.42 ^c	1573.47 ^d	233.34 ^c	18.66 ^b	313.42 ^c	565.43 ^d
T ₄	1209.84 ^c	96.78 ^b	351.57 ^d	1658.19 ^e	241.96 ^c	19.35 ^b	351.57 ^d	612.89 ^e
T ₅	1342.32 ^d	107.38 ^c	407.41 ^e	1857.11 ^f	268.46 ^d	21.47 ^b	407.41 ^e	697.35 ^f
T ₆	1301.17 ^d	104.09 ^c	362.18 ^d	1767.44 ^g	260.23 ^d	20.81 ^b	362.18 ^f	643.23 ^g
T ₇	1758.56 ^e	140.68 ^d	493.03 ^f	2392.27 ^h	351.71 ^e	28.13 ^c	493.03 ^g	872.87 ^h

T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each). Means followed by a common letter in the same column are not significantly different at 5% level by DMRT.

Table 3: Effect of biofertilizers on proximate composition of coriander leaves and seeds (per 100g)

Treatments	Moisture (%)		Carbohydrate (g)		Unsaturated fat (g)		Fiber (g)		Protein (g)	
	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds
T ₀	86.8 ^a	65.3 ^a	6.4 ^a	12.2 ^a	1.2 ^a	1.5 ^a	4.4 ^a	5.6 ^a	3.0 ^a	2.1 ^a
T ₁	87.8 ^b	67.2 ^a	6.6 ^a	14.4 ^{ab}	1.6 ^a	1.8 ^a	4.8 ^a	6.8 ^{ab}	3.4 ^a	2.2 ^a
T ₂	87.0 ^a	66.0 ^a	6.7 ^a	13.5 ^a	1.5 ^a	1.7 ^a	5.0 ^{ab}	5.9 ^a	3.2 ^a	2.0 ^a
T ₃	87.2 ^a	65.2 ^a	6.5 ^a	13.8 ^a	1.7 ^{ab}	1.9 ^a	4.6 ^a	5.8 ^a	3.2 ^a	2.5 ^a
T ₄	87.9 ^b	67.2 ^a	6.5 ^a	14.2 ^{ab}	1.7 ^{ab}	1.8 ^a	4.8 ^a	5.6 ^a	3.3 ^a	2.3 ^a
T ₅	86.6 ^a	68.5 ^a	6.8 ^a	13.0 ^a	1.4 ^{ab}	1.6 ^a	5.1 ^{ab}	6.1 ^b	3.5 ^a	2.7 ^{ab}
T ₆	86.9 ^a	68.7 ^a	6.7 ^a	13.4 ^a	1.5 ^a	1.7 ^a	5.3 ^{ab}	6.5 ^{ab}	3.4 ^a	2.8 ^{ab}

T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each). Means followed by a common letter in the same column are not significantly different at 5% level by DMRT.

Table 4: Effect of biofertilizers on vitamin composition of coriander leaves and seeds (mg/100g)

Treatments	Vitamin A		Vitamin B ₁		Vitamin B ₂		Vitamin B ₃		Vitamin C	
	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds
T ₀	162 ^a	135 ^a	1.02 ^a	0.25 ^a	1.25 ^a	0.25 ^a	1.50 ^a	3.56 ^a	120.5 ^a	11.0 ^a
T ₁	165 ^a	148 ^b	1.25 ^a	0.55 ^b	1.50 ^a	0.50 ^b	2.60 ^b	4.64 ^b	129.0 ^a	12.7 ^b
T ₂	168 ^{ab}	150 ^b	1.28 ^a	0.48 ^b	1.64 ^{ab}	0.84 ^{bc}	3.62 ^{bc}	5.68 ^c	120.6 ^a	12.9 ^b
T ₃	155 ^a	148 ^b	1.31 ^a	0.51 ^b	1.46 ^{ab}	0.48 ^b	2.70 ^b	4.78 ^b	128.8 ^a	11.9 ^b
T ₄	165 ^a	153 ^c	1.25 ^a	0.35 ^{ab}	1.30 ^a	0.80 ^c	4.54 ^d	6.54 ^d	129.8 ^a	12.8 ^a
T ₅	176 ^{ab}	146 ^b	1.32 ^{ab}	0.62 ^c	1.42 ^{ab}	0.42 ^b	3.28 ^{bc}	5.29 ^c	125.3 ^a	13.2 ^c
T ₆	178 ^b	150 ^b	1.26 ^a	0.62 ^c	1.63 ^{ab}	1.63 ^d	4.50 ^d	6.50 ^d	130.0 ^{ab}	12.8 ^b

T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each). Means followed by a common letter in the same column are not significantly different at 5% level by DMRT.

Table 5: Effect of biofertilizers on mineral composition of coriander leaves and seeds (mg/100g)

Treatments	Calcium		Magnesium		Iron		Phosphorous		Sodium		Zinc		Potassium	
	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds	Leaves	Seeds
T ₀	235 ^a	290 ^a	130 ^a	165 ^a	5.0 ^a	6.8 ^a	65 ^a	98 ^a	0.34 ^a	0.41 ^a	0.76 ^a	0.96 ^a	430 ^a	560 ^a
T ₁	246 ^a	318 ^b	133 ^a	176 ^b	5.2 ^a	7.9 ^b	70 ^b	112 ^b	0.33 ^a	0.48 ^b	0.95 ^{ab}	1.75 ^b	458 ^a	558 ^a
T ₂	251 ^a	335 ^b	132 ^a	170 ^b	5.8 ^a	8.2 ^b	85 ^b	115 ^b	0.41 ^a	0.42 ^a	0.91 ^{ab}	1.65 ^b	510 ^b	624 ^b
T ₃	230 ^a	303 ^b	131 ^a	168 ^a	5.4 ^a	7.0 ^{ab}	69 ^a	102 ^b	0.32 ^a	0.43 ^a	0.93 ^{ab}	1.40 ^b	450 ^a	590 ^{ab}
T ₄	242 ^a	310 ^b	131 ^a	171 ^b	6.0 ^b	8.0 ^b	80 ^b	118 ^b	0.36 ^a	0.47 ^b	0.72 ^a	1.54 ^b	528 ^b	648 ^b
T ₅	240 ^a	328 ^b	132 ^a	172 ^b	5.6 ^a	7.4 ^{ab}	83 ^b	115 ^b	0.32 ^a	0.45 ^a	0.80 ^b	1.43 ^b	502 ^b	657 ^b
T ₆	248 ^a	324 ^b	132 ^a	173 ^b	6.0 ^b	7.2 ^{ab}	90 ^c	113 ^b	0.35 ^a	0.43 ^a	0.83 ^b	1.35 ^b	532 ^b	645 ^b

T₀ – control (without fertilizer), T₁ – *Azospirillum brasilense* (15 g), T₂ – *Pseudomonas putida* (15 g), T₃ – *Brevibacillus brevis* (15 g), T₄ – *Azospirillum brasilense* + *Pseudomonas putida* (7.5 g each), T₅ – *Azospirillum brasilense* + *Brevibacillus brevis* (7.5 g each), T₆ – *Pseudomonas putida* + *Brevibacillus brevis* (7.5 g each) and T₇ – *Azospirillum brasilense* + *Pseudomonas putida* + *Brevibacillus brevis* (5 g each). Means followed by a common letter in the same column are not significantly different at 5% level by DMRT.