

## **Comparative performance of *Azotobacter* biofertilizers on growth and yield of Brinjal**

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### **ABSTRACT**

The inoculation of five *Azotobacter* biofertilizers from different companies product, resulted significant increase in plant height, number of branches, number of fruits per plant, and yield/ha as compared to uninoculated control. The inoculation effect was maximum in respect of MPKV *Azotobacter* biofertilizer. Significant increase in yield and yield attributing parameters were recorded by an increase in the level of nitrogen along with *Azotobacter chroococcum* inoculation. The yield obtained due to T<sub>3</sub> (75 kg N/ha) level with *Azotobacter chroococcum* inoculation was almost equal to an application of T<sub>1</sub> (100 kg N/ha) level without inoculation. It clearly indicated that 25 kg N/ha could be saved if supplemented with *Azotobacter chroococcum* inoculation. The maximum increase in plant height, number of branches, number of fruits, weight of fruits per plant were given by MPKV *Azotobacter* biofertilizer along with recommended dose of fertilizer. However, the companies product viz., Akash, Azobact and Ojas were found at par in recording plant height, number of branches, number of fruits and yield per plant obtained as compared to MPKV's biofertilizers.

**Key words :** *Azotobacter chroococcum*, Growth parameters, Brinjal.

**B**rinjal (*Solanum melongena* Linn.) is one of the most important vegetable crop widely cultivated throughout the warmer region of the world. In India West Bengal stands first in production of Brinjal. In Maharashtra, brinjal is grown on an area of 27057 hectares. Total production was 392429 tons and average yield 14.50 t/ha in the year 2004-05 (Anonymous, 2005). It is roughly estimated that *Azotobacter* spp. can fix 10 to 15 kg nitrogen per hectare. The seed germination and vigour of the young plants was also observed to improve due to *Azotobacter* inoculation (Shende *et al.*, 1975).

The ability of *Azotobacter* to enter into dormancy as cysts might help in exploring some of the great variability of plant response to inoculation and also for ace-ecological studies for biological nitrogen fixation "Nitrogenase" enzyme is very important which is sensitive to oxygen. *Azotobacter* protects this enzyme by forming slime around cell. It converts atmospheric nitrogen in cellular proteins. Then cell proteins get mineralized in soil after death of *Azotobacter* cell contributing towards the nitrogen availability to the crop plants.

The present investigation was, therefore, undertaken to study the quality of *Azotobacter* biofertilizers from different companies product with an objectives to see the effect of efficient *Azotobacter* strains on growth and yield of brinjal under field condition.

### **MATERIALS AND METHODS**

The experimental work was conducted on the

Instructional Farm Area of Post Graduate Institute, M.P.K.V., Rahuri during Kharif season of 2006. The seeds of brinjal cv. MAHYCO-10 @ 500 gm/ha were required for preparation of nursery. The experiment was carried out in Randomized Block Design with seven treatments and three replications The fertilizers for brinjal crop were applied @ 100:50:50 kg NPK/ha (recommended dose) through urea, single super phosphate and muriate of potash. Raised bed of 3 x 1 x 0.15 m was prepared and mixed with 20 kg well decomposed farm yard manure with soil. The phorate granules 10 G (@ 10 kg/ha) were applied to control thrips and jassids. On the raised beds seeds of brinjal were sown and then covered with soil. The bed was immediately irrigated with the help of water can. Further irrigations were given as and when required.

The seedlings were sprayed with insecticides viz., malathion, endosulphon (@ 10 ml/10 litre water) at an interval of 7-10 days to control the pests. The seedlings were ready for transplanting after 45 days of sowing.

The treatment details are : T<sub>1</sub> = Recommended dose of fertilizer (control), T<sub>2</sub>= 100 % recommended dose of N + MPKV *Azotobacter* biofertilizer, T<sub>3</sub>=75 % recommended dose of N + MPKV *Azotobacter* biofertilizer, T<sub>4</sub>=75 % recommended dose of N + MPKV PSB, T<sub>5</sub>=75 % recommended dose of N + Akash, T<sub>6</sub>=75 % recommended dose of N + Azobact, T<sub>7</sub>=75 % recommended dose of N + Ojas

The ability of *Azotobacter* to fix atmospheric nitrogen was studied by growing them on Jensen's broth and Burk's

broth containing sucrose for 14 days at  $28 \pm 2^\circ\text{C}$  temperature. The amount of nitrogen fixed by the strains were estimated by using modified Micro-Kjeldahl's digestion and distillation method. Observations *viz.*, plant height, number of branches, total number of fruits per plant, total weight of fruits obtained in all picking/plant, were recorded at 30, 60 and 90 days after transplanting.

## RESULTS AND DISCUSSION

The results of plant height, (Table 1) recorded at 30, 60 and 90 days were significant.

Treatments	Height of crop (cm)		
	At 30 days	At 60 days	At 90 days
T <sub>1</sub>	26.90	43.30	57.90
T <sub>2</sub>	27.10	44.50	58.30
T <sub>3</sub>	26.86	43.10	57.10
T <sub>4</sub>	24.50	40.60	53.15
T <sub>5</sub>	26.54	42.90	57.00
T <sub>6</sub>	25.65	42.60	56.40
T <sub>7</sub>	26.46	42.85	56.90
S.E. $\pm$	0.862	0.587	0.542
C.D. (P=0.05)	N.S.	1.811	1.672

N.S. = Non-significant

### Height :

The maximum plant height at 30 days of crop growth (27.10 cm) was recorded in treatments T<sub>2</sub> followed by T<sub>1</sub> (26.90 cm) whereas minimum was recorded in the treatment T<sub>4</sub> (24.50 cm). Similar trend of results were obtained at 60 and 90 days of crop growth period.

Khullar *et al.* (1978) reported that the inoculation of brinjal seedlings with *Azotobacter* increased the plant height by 63.4 per cent, leaf surface area by 75.0 per cent and number of flowers by 66.7 per cent over uninoculated control.

The inoculation with *Azotobacter chroococcum* has found to increase plant height in brinjal (Khullar *et al.*, 1978; Dhupal, 1992 and Palve (2001) in brinjal.

### Number of branches :

The result in respect of number of branches/plant is presented in Table 2. The highest number of branches (9.80) was recorded in the treatments T<sub>2</sub> followed by T<sub>1</sub> (9.10) and lowest number of branches were recorded in the treatment T<sub>4</sub> (8.40). The treatment T<sub>2</sub> was found statistically significant in recording highest number of branches with treatment T<sub>1</sub>. The inoculation of *Azotobacter* has been reported to increase number of

branches/plant in brinjal by many workers (Khullar *et al.*, 1978; Palave, 2001) Similar results were obtained in the present investigation.

### Number of fruits :

The result in respect of number of fruits/plant is presented in Table 2 which were non significant. Results revealed that treatments T<sub>2</sub> and T<sub>1</sub> were at par with each other and significantly increased the number of fruits/plant than rest of treatments. The maximum number of fruits per plant (22.3) were recorded in the treatments T<sub>2</sub>

Treatments	Number of branches/plant	Number of fruits/plants	Weight of fruits/plant obtained (kg)	Yield/ha (q)
	T <sub>1</sub>	9.10 (3.09)	21.50 (4.63)	1.86
T <sub>2</sub>	9.80 (3.21)	22.30 (4.72)	1.90	355.34
T <sub>3</sub>	9.00 (3.08)	21.40 (4.62)	1.84	342.18
T <sub>4</sub>	8.40 (2.98)	20.10 (4.48)	1.65	290.60
T <sub>5</sub>	8.90 (3.06)	21.35 (4.62)	1.80	339.32
T <sub>6</sub>	8.65 (3.02)	20.95 (4.57)	1.75	320.51
T <sub>7</sub>	8.95 (3.07)	21.30 (4.61)	1.79	338.40
S.E. $\pm$	0.034	0.059	0.097	4.45
C.D. (P=0.05)	0.105	N.S.	N.S.	13.717

N.S. = Non-significant

followed by T<sub>1</sub> (21.5) and minimum number of fruits were recorded in the treatment T<sub>4</sub> (20.10). Similar results were reported by Khullar *et al.* (1978), Raut and Ghoniskar (1980) and Palve (2001) in brinjal.

### Weight of fruits :

The results (Table 2) of weight of fruits per plant were found to be statistically non significant. The treatment T<sub>2</sub> and T<sub>1</sub> were at par. The maximum weight of fruits per plant was recorded in T<sub>2</sub> (1.90 kg) followed by treatments T<sub>1</sub> (1.86 kg) and minimum weight of fruits per plant was recorded in treatment T<sub>4</sub> (1.65 kg). The inoculation of *Azotobacter* has been reported to increase brinjal fruit yield by 12 to 14 per cent (Raut *et al.*, 1980 and Khullar *et al.*, 1978).

**Yield per hectare :**

The maximum fruit yield was produced by T<sub>2</sub> (355.34 q/ha) where the recommended dose of N + MPKV *Azotobacter* biofertilizer was applied. However, this treatment was at par with T<sub>3</sub> (342.18 q/ha) where, 75% recommended dose of N + MPKV *Azotobacter* biofertilizer was applied. This clearly indicated that there was a possibility of saving N fertilizers to the extent of 25%. The results in respect of increase in yield due to *Azotobacter chroococcum* inoculation in brinjal were in agreement with the results of several workers viz., Raut and Ghonsikar (1980) in onion and brinjal, and Dhumal (1992), Palve (2001) and Khullar *et al.*, (1978) in brinjal

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