



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(6): 2458-2459

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Received: 14-09-2018

Accepted: 18-10-2018

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## Efficacy of bio-fertilizer and the combinations with chemical fertilizers on chemical parameters of okra [*Abelmoschus esculentus* (L.) Moench]

**Jitendra Kumar, RB Ram, Satish Kumar Gautam, Manjeet Kumar and Som Prakash**

**Abstract**

A field experiment was conducted during 2017 at Horticulture Research Farm-II, BBAU, Lucknow, Studies on the "Efficacy of bio-fertilizer and the combinations with chemical fertilizers on chemical parameters of okra [*Abelmoschus esculentus* (L.) Moench]", revealed that Acidity, Ascorbic acid and moisture percent were maximized. When we use with recommended dose of fertilizers (RDF), NPK (50%), PSB (50%), Azotobacter (50%) and Azospirillum (75%).

**Keywords:** okra, recommended dose of fertilizers (RDF), NPK, PSB, azotobacter and azospirillum

**Introduction**

Okra [*Abelmoschus esculentus* (L.) Moench] is commonly known as bhindi in India and lady's finger in England, Gombo in U.S.A. belonging to the family malvaceae. It is grown in both tropical and subtropical regions of the world (Ahmed *et al.*, 2006) [1]. It has somatic chromosome number  $2n = 130$  and is an amphidiploids of *A. tuberculatus* with  $2n = 58$  and an unknown species with  $2n = 72$ . There are 38 species of the genus *Abelmoschus*. It is heat loving plant. It is one of the oldest cultivated crops and presently grown in many countries. Okra has a relatively good nutritional value and is a good complement in developing countries where there is often a great alimentary imbalance. Okra seeds contain about 20% protein similar to amino acid composition of soybean protein and 20% oil (similar in fatty acid composition to cotton seed oil). According to Awodoyin and Olubode (2009), the immature fruits and leaves of *Abelmoschus esculentus* are used in soup as a thickener because it is a rich source of vitamins and minerals. Okra is recommended for consumption by World Health Organization due to its ability to fight diseases. It is a good source of vitamin A, B, C and also rich in protein, carbohydrates, fats, minerals, iron and iodine. The green fruits (per 100 g edible portions) of okra contains 89.6 per cent of moisture, 1.9 g protein, 88 IU of vitamin A, 0.07 mg thiamine, 0.1 mg riboflavin, 13 mg vitamin C, 0.7 g minerals like 103 mg potassium, 6.9 mg sodium, 56 mg phosphorus, 66 mg calcium, 1.5 mg iron, 30 mg sulphur and other nutrients. It is an excellent source of iodine which is useful for control of goiter. It provides a delicious and favorite dish in Indian vegetable meals and attributes several medicinal and nutritional properties. Biofertilizers are the formulation of living microorganisms, which are able to fix atmospheric nitrogen in the available form for plants either by living freely in the soil or being associated symbiotically with plants. Biofertilizers are inputs containing microorganisms which are capable of mobilizing nutritive elements from non-usable form to usable form through biological processes. Biological nitrogen fixation is carried out by both symbiotic and free-living bacteria and blue green algae. Symbiotic nitrogen fixation provides 80% of the biologically fixed nitrogen on land. Nitrogen fixing bacteria are very selective in choosing roots of particular legumes species to infect, invade and form root nodules. *Azotobacter* within the plant of economics importance has been harnessed in Indian agriculture. So many workers reported that there are several free-living bacteria found the roots of plant, which convert atmosphere nitrogen to the usable ammonia cal form. *Azotobacter chroococcum*, a heterotrophic bacterium fixes atmospheric nitrogen symbiotically and used as an inoculants for plants. Besides fixing nitrogen, it produces antifungal metabolizes and certain vitamin and growth promoting substances which increase seed

germination and initial vigour in inoculated sorghum plants. The ability of *Azospirillum* to produced plant growth regulatory substances along with N<sub>2</sub> fixation stimulate growth and thereby productivity. The changes that occur in the plant roots helps in transports minerals and water.

### Material and Methods

The experimental material for the present study consisted of the seed of okra cv. (Kashi Pragti) was collected from Indian Institute of Vegetable Research Varanasi (U.P.). The experiment was conducted using Randomized Block Design (RBD) with three replications at Horticulture Research Farm II of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, (A Central University), Vidya-Vihar, Rae Bareli Road, Lucknow- 226025 (U.P.) were taken for the investigation during Kharif season of 2017-18. Treatments T<sub>0</sub> Recommended dose of fertilizers(RDF), T<sub>1</sub> *Azotobacter* + 50% NPK, T<sub>2</sub> PSB + 50% NPK, T<sub>3</sub> *Azospirillum* + 75% NPK, T<sub>4</sub> PSB + *Azotobacter* + 50% NPK, T<sub>5</sub> PSB + *Azospirillum* + 50% NPK, T<sub>6</sub> PSB + *Azospirillum* + *Azotobacter* 50%, T<sub>7</sub> *Azotobacter* + *Azospirillum* 50 %, T<sub>8</sub> PSB + *Azospirillum* 75%. Observation were recorded for Acidity (%), Vitamin-C

(mg/100gm) and Moisture content (%).The data so obtained were analysed statically.

### Result and Discussion

Data assembled towards acidity content in okra due to effect of different bio-fertilizer present in Table-1 showed that influence of NPK and bio-fertilizer decreased acidity content in okra significantly T<sub>5</sub> produced the lowest rate of acidity (0.130%) followed by T<sub>1</sub> and T<sub>6</sub> (0.540%), T<sub>8</sub> (0.560%). The highest acidity content was noted with T<sub>0</sub> (0.847%).

The maximum Vitamin-C (24.73 mg/100g) was recorded in T<sub>4</sub> (PSB + *Azotobacter* + 50% NPK) and lowest Vitamin-C (13.54 mg/100g) was noted with T<sub>0</sub> (RDF). This is agreement with the result of Upadhyay *et al.* (2007) recorded maximum vitamin C, total carotenoids, total carbohydrate and crude fiber content in comprising FYM 20 t/ha<sup>-1</sup> + PSB (T<sub>3</sub>) among 16 treatment combinations including controls.

T<sub>0</sub> (RDF) contain lowest rate of moisture (83.010%) and the highest moisture content (91.833 %) was noted with T<sub>6</sub> (PSB + *Azospirillum* + *Azotobacter* 50%). Similarly, this is quite close to the reported of Premsekhar and Rajashree, (2009) who has obtained this type of result, while maximum moisture (90.36) in the control.

**Table 1:** Efficacy of bio-fertilizer and the combinations with chemical fertilizers on chemical parameters of okra [*Abelmoschus esculentus* (L.) Moench]

Treatment	Acidity (%)	Vitamin-c (mg/100)	Moisture (%)
T <sub>0</sub> Recommended dose of fertilizers(RDF)	0.847	13.540	83.010
T <sub>1</sub> <i>Azotobacter</i> + 50% NPK	0.540	18.150	90.563
T <sub>2</sub> PSB + 50% NPK	0.643	19.547	89.447
T <sub>3</sub> <i>Azospirillum</i> + 75% NPK	0.147	23.733	90.100
T <sub>4</sub> PSB + <i>Azotobacter</i> + 50% NPK	0.183	24.730	84.580
T <sub>5</sub> PSB + <i>Azospirillum</i> + 50% NPK	0.130	21.440	90.397
T <sub>6</sub> PSB + <i>Azospirillum</i> + <i>Azotobacter</i> 50%	0.540	19.953	91.833
T <sub>7</sub> <i>Azotobacter</i> + <i>Azospirillum</i> 50 %	0.647	18.863	89.783
T <sub>8</sub> PSB + <i>Azospirillum</i> 75%	0.560	17.953	89.253
C.D. at 5%	0.106	3.056	4.512
S.E.(m)±	0.035	1.011	1.492

### Conclusion

On the basis of present investigation, it may be concluded that the application of inoculants (PSB + *Azotobacter* + 50% NPK) increased growth yield and nutritional quality of okra. Therefore, it is recommended to the okra growers for the application of inoculants (PSB + *Azotobacter* + 50% NPK) for higher production and quality of okra under Lucknow condition.

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