Biological Forum – An International Journal **14(2a): 09-12(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of Nitrogen, Organic Manures along with Biofertilizers on Yield Parameters of Okra (*Abelmoschus esculentus* L.)

Devender Kumar[1*] and Sanjay Kumar[2]
[1]PG Student, Department of Vegetable Science, MHU, Karnal (Haryana), India.
[2]Assistant Professor, Department of Vegetable Science, CCS HAU, Hisar (Haryana), India.

(Corresponding author: Devender Kumar)*
(Received 20 April 2022, Accepted 14 June, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The various challenges of study was that due to continuous use of inorganic fertilizer the natural fertility of the soil has been deteriorated and rapidly leads to contamination of soil, water and food and reduced crop yield, soil acidity and nutrient imbalance. Thus there is an increasing awareness throughout the world about the integrated supply of the nutrient.

Thus, the present experiment carried out, to understand the use of nitrogen, organic manures along with biofertilizers on growth and yield of okra crop. The investigation comprised of fourteen treatments with three replications and was laid out in a randomized block design in plot size of 3.0 × 1.8 m^2. The treatments comprised of 100 % RDN (Inorganic) + Azotobacter + PSB including control. Result reaveled that 100 % RDN (Inorganic) + Azotobacter + PSB resulted number of picking (20.33), fruit length (6.67 cm), fruit diameter (0.49 cm), weight of fruit (6.22 g), early fruit yield (7.62 kg/plot), total fruit yield (113.02 q/ha), fruiting node (3.53), number of fruits per plant (16.60) and harvest index (46.99) was recorded for maximum.

Keywords: Okra, Organic manures, Biofertilizer, Growth, Yield and Treatments.

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench] is native of Tropical Africa, belonged to Malvaceae family and grows all through the tropics and subtropics. It is a short duration crop and growth, yield parameters are influenced by appropriate nutrient management practices (Singh *et al.*, 2007; Suchitra and Manivannan, 2012; Iqbal *et al*., 2014). The soil of Rajasthan are sandy and having high pH and low N content, so applications of nitrogen is necessary for proper growth and development of plants (Middha *et al.*, 2015). Use of different kind of organic manures, such as vermi-compost and farm yard manure improves the soil physical properties, maintain the soil fertility and maintain soil micro-flora. As Vermi-composting is a safe and non-polluting method for recycling and disposal of organic waste by changing into organic fertilizers. It is a good form of natural manure, which is cost-effective, easy to make and effective in promoting waste-management. Its application could be one of the most attractive and economical methods of solving the problems like disposal of waste and the requirement to enhance the organic matter content of soil (Narkhede *et al*., 2011).

In India, mixed farming system is an integral part of crop production of farmers therefore, there is requirement of large quantity of organic matter for supplementing the nutrients. Farm yard manure (FYM) is good source of nutrient using cow dung, waste straw, cow urine and other dairy wastes. The organic manure FYM provides nutrients to the plant and by binding effect of soil aggregates, it also improves the soil texture. Organic manure increases water holding capacity, cation exchange capacity and phosphate availability of soil and also improves the fertilizer use efficiency (FUE) and increase microbial population of soil. It reduces the nitrogen lose due to slow release effect of nutrients (Tadesse *et al*., 2013). Test results revealed that the vermicompost was found to be the most advanced of all treatments in terms of growth and production parameter and it was followed by treatment with FYM.

Biofertilizers release growth promoting substance and vitamins which help to maintain soil fertility. They act as antagonist and suppresses the incidence of soil borne plant pathogens and in this way, they help in control of diseases. Nitrogen fixing, cellulolytic and phosphate mobilizing micro-organisms in biofertilizer increase the availability of plant nutrient in soil and thus, promote the agricultural production and farming system. Application of bio-fertilizer results in mineral and water uptake, root development, nitrogen fixation and vegetative growth. Some biofertilizer (e.g. *Azotobacter* sp., *Rhizobium*, BGA) stimulates the production of growth promoting substances like vitamin-B complex, Indole acetic acid (IAA) and Gibberellic acids (GA_3) etc. (Siddiqui *et al*., 2014). The presence of Azotobacter spp. in the soil has beneficial effect on plants and the abundance of these bacteria was related to many factors

like soil physical and chemical (e.g. organic matter, pH, soil moisture, temperature) and microbiological properties. Its quantity varies as per the depth of the soil profile. Azotobacter is abundant in the rhizosphere of plant than in the surrounding of soil and this abundance depend upon the crop species (Jnawali *et al*., 2015). Vegetables and the vegetable system show that vegetable crops respond well to the supply of nutrients through organic fertilizers and chemical fertilizers (Kumar *et al*., 2022).

METHODOLOGY

The present investigation was conducted at research farm of the Department of Vegetable Science, CCS Haryana Agricultural University, Hisar, during spring - summer season of the year 2019-20, with anobjective to understand the use of organic manures along with biofertilizers on growth and yield of okra crop with variety Hisar Naveen. The experiment was laid out under randomized block design with threereplications. The experiment consisted of 14 treatments *viz.*, T_1: 100 % RDN (Inorganic) + *Azotobacter* + PSB, T_2: 75 % RDN (Inorganic) + *Azotobacter* + PSB, T_3: 100 % RDN through FYM + *Azotobacter* + PSB, T_4: 75 % RDN through FYM + *Azotobacter* + PSB, T_5: 100 % RDN through Vermicompost + *Azotobacter* + PSB, T_6: 75 % RDN through Vermicompost + *Azotobacter* + PSB, T_7: 100 % RDN (Inorganic), T_8: 75 % RDN (Inorganic), T_9: 100 % RDN through FYM, T_{10}: 75 % RDN through FYM, T_{11}: 100 % RDN through Vermicompost, T_{12}: 75 % RDN through Vermicompost, T_{13}: *Azotobacter* + PSB, T_{14}: Control. Obtained findings were analyzed statistically for interpretation of results.

RESULTS AND DISCUSSION

Effect of organic manures and biofertilizers on yield parameters of plant. The results presented in Table 1 clearly shows that the maximum no. of picking (20.67), fruit length (7.03 cm) and fruit diameter (0.52 cm) was recorded under T_1 followed by T_2(20.33), (6.80 cm) and (0.49 cm) respectively. Whereas, T_{14} reported for minimum no. of picking (16.13), fruit length (5.23 cm) and fruit diameter (0.39 cm). It is suitable to mention here that sufficient supply of nitrogen to plants not only promotes the synthesis of food but also in successive partitioning in sink. The applications of nitrogen promote the metabolic and auxin activities in plant and ultimately results in increased fruit size and diameter of the plant. These findings are indistinguishable of those reported by Garhwal *et al.* (2007); Firoz (2009); Jana *et al.* (2010); Sajid *et al*. (2012); Sahu *et al*. (2014); Choudhary *et al*. (2015) in okra crop and Baba *et al*. (2018) in tomato.

Table 1: Effect of organic manures and biofertilizers on yield parameters of plant.

Treatment	No. of pickings	Fruit length (cm)	Fruit diameter (cm)
T1	**20.67**	**7.03**	**0.52**
T2	20.33	6.80	0.49
T3	20.33	6.67	0.49
T4	20.00	6.50	0.48
T5	20.00	6.63	0.49
T6	19.33	6.47	0.48
T7	20.33	7.00	0.51
T8	20.00	6.67	0.49
T9	19.33	6.57	0.49
T10	19.00	6.43	0.47
T11	19.33	6.43	0.47
T12	19.00	6.25	0.46
T13	18.00	6.10	0.45
T14	16.13	5.23	0.39
CD 5%	**1.76**	**0.58**	**0.03**
S.E. (d)	**0.60**	**0.19**	**0.01**

The results presented in Table 2 clearly shows that the maximum weight of fruit (6.58 g), early fruit yield (8.63 kg/plot) and total fruit yield (119.36 q/ha) was recorded under T_1 followed by T_2(6.34 g), (8.24 kg/plot) and (117.46 q/ha) respectively. Whereas, T_{14} reported for minimum weight of fruit (3.94 g), early fruit yield (4.80 kg/plot) and total fruit yield (65.25 q/ha). Further, organic manures increase the efficiency of added chemical fertilizers in soil and increased rate of humification. Humic acid in vermicompost enhances the availability of both native and micro nutrients in soil and thus plant growth, yield attributes and yield increased (Singh *et al.*, 2010).

The significant improvement in yield with the addition of organic manures seems to be an account of greater accumulation of dry matter right from the early stage of crop growth and at harvest by virtue of increased photosynthetic efficiency and nutrient accumulation. These results are in accordance with the findings of Anburani *et al.* (2003) in brinjal, Premsekhar and Rajashree (2009) in okra, Chetri *et al.* (2012) in capsicum, Ibrahim and Hamma (2012); Mal *et al.* (2013) in okra also observed the higher efficacy of organic manures.

The results presented in Table 3 indicates that the more no. of 1st fruiting node (3.53), maximum number of fruits per plant (16.60) and harvest index (49.59) was recorded under T_1 followed by T_2 (3.27), (15.56) and (49.47) whereas, T_{14} reported for less no. of 1st fruiting node (2.50), number of fruits per plant (11.51) and harvest index (37.29). This may be due to increase in number of fruits/plot at higher nitrogen application which results in higher competition among the plants. Brar *et al.* (1993); Kumar (2017); Vats (2011) in fenugreek reported similar results due to higher dry matter production resulted in larger source for photosynthesis and thereby more translocation of photosynthates to sink.

Table 2: Effect of organic manures and biofertilizers on yield parameters of plant

Treatment	Wt. of fruit (g)	Early fruit yield (kg/plot)	Total fruit yield (q/ha)
T1	**6.58**	**8.63**	**119.36**
T2	6.34	8.24	117.46
T3	6.22	7.62	113.02
T4	5.80	7.47	110.86
T5	5.64	7.52	110.28
T6	5.45	7.34	108.57
T7	6.49	8.56	113.77
T8	6.32	7.83	112.79
T9	5.45	6.70	107.67
T10	5.20	6.51	104.67
T11	5.30	6.62	106.56
T12	5.17	6.19	105.91
T13	4.98	5.61	80.14
T14	3.94	4.80	65.25
CD 5%	**0.51**	**0.68**	**10.87**
S.E. (d)	**0.17**	**0.23**	**3.72**

Table 3: Effect of organic manures and biofertilizers on yield parameters of plant.

Treatment	First fruiting node	No. of fruit per plant	Harvest index
T1	**3.53**	**16.60**	**49.59**
T2	3.27	15.56	49.47
T3	3.27	15.13	46.99
T4	3.13	14.26	45.31
T5	3.20	15.09	46.35
T6	3.07	13.93	45.32
T7	3.53	15.08	47.02
T8	3.20	14.07	45.98
T9	3.00	15.05	44.66
T10	3.00	14.21	44.15
T11	3.00	13.75	44.52
T12	3.00	13.65	43.54
T13	2.93	13.17	42.96
T14	2.50	11.51	37.29
CD 5%	**0.34**	**1.26**	**2.32**
S.E. (d)	**0.11**	**0.43**	**0.79**

CONCLUSION

From the above findings it is concluded that100 % RDN (Inorganic) + Azotobacter + PSB resulted maximum number of picking (20.33), fruit length (6.67 cm), fruit diameter (0.49 cm), weight of fruit (6.22 g), early fruit yield (7.62 kg/plot), total fruit yield (113.02 q/ha), fruiting node (3.53), number of fruits per plant (16.60) and harvest index (46.99) so for better yield of okra without deteriorating the soil health application of inorganic along with biofertilizers dose treatment *i.e.* (T_1) should be adopted. The application of inorganic fertilizers with biofertilizers as help in improving the soil health and high yield by improving the soil physical and chemical property and it will also help in reducing the recommended dose of inorganic fertilizer.

FUTURE SCOPE

Judicious use of fertilizer and organic manures were more beneficial in environmentally friendly cultivation of okra and also saves the cost of production and sustaining productivity.

Acknowledgement. I would like to extend my profound regards and deep sense of gratitude to Dr. Sanjay Kumar, Assistant Professor, Department of Vegetable Science, for his prudent guidance, encouragement and constructive suggestions all through the investigation and preparation of this manuscript.

Conflict of Interest. Author have no conflict of interest.

REFERENCES

Anburani, A., Manivannan, K. and Arumugam, S. (2003). Integrated nutrient management on quality parameters in brinjal (*Solanum melongena* L.) cv. Annamalai. *Plant Archives, 3*(2): 279-281.

Baba, Z.A., Tahir, S., Wani, F. S., Hamid, B., Nazir, M. and Hamid, B. (2018). Impact of *Azotobacter* and inorganic fertilizers on yield attributes of tomato, *International Journal of Current Microbiology and Applied Sciences, 7*(2): 3803-3809.

Brar, R. S., Yadav, B. D. and Joon, R. K. (1993). Effect of row spacing and seed rate on growth and seed yield of fenugreek (*Trigonella foenum-graecum). Forage Research, 19*(1): 104-106.

Chetri, D. A., Singh, A. K. and Singh, V. B. (2012). Effect of integrated nutrient management on yield, quality and nutrient uptake by capsicum (*Capsicum annum*) cv. california wonder. *Soils and Crops***,** *21*: 44-48.

Choudhary, K., More, S. J. and Bhanderi, D. R. (2015). Impact of biofertilizers and chemical fertilizers on growth and yield of okra (*Abelmoschus esculentus* L. Moench). *An International Quarterly Journal of Environmental Sciences, 9*(1&2): 67-70.

Firoz, Z. A. (2009). Impact of nitrogen and phosphorus on the growth and yield of okra [*Abelmoschus esculentus* (L.) Moench] in hill slope condition. *Bangladesh Journal of Agricultural Research, 34*(4): 713-722.

Garhwal, O. P., Fageria, M. S. and Mukherjee, S. (2007). Integrated nitrogen management in okra (*Abelmoschus esculentus* (L.) Moench) hybrids. *Haryana Journal of Horticultural Sciences, 36*(1&2): 129-130.

Ibrahim, U. and Hamma, I. L. (2012). Influence of farmyard manure and weeding regimes on growth and yield of okra (*Abelmoschus esculentus* L. Moench) in Zaria. *World Journal of Agricultural Sciences, 8*: 453-458.

Iqbal, S., Khan, H. Z., Ehsanullah and Yaseen, M. (2014). Impact of level and source of compost based organic material on the productivity of autumn maize (*Zea mays* L.). *Pakistan Journal of Agricultural Sciences, 51*(1): 41-47.

Jana, J. C., Guha, S. and Chatterjee, R. (2010). Effect of planting geometry and nitrogen levels on crop growth, fruit yield and quality in okra grown during early winter terai zone of West Bengal. *Journal of Horticultural Science, 5*(1): 30-33.

Jnawali, A. D., Ojha, R. B. and Marahatta, S. (2015). Role of Azotobacter in soil fertility and sustainability. *Advances in Plants & Agriculture Research, 2*(6): 69.

Kumar, A., Choudhary, A. S., Raj, S., Ghode, N. and Sahu, S. (2022). Effect of nutrient management on yield parameters of okra. *International Journal of Agriculture and Plant Science, 4*(1): 30-34.

Kumar, P. (2017). Effect of seed rate and row spacing on quality seed production of fenugreek (*Trigonella foenum graecum* L.) (*Doctoral dissertation*, CCSHAU).

Mal, B., Mahapatra, P., Mohanty, S. and Mishra, H. N. (2013). Growth and yield parameters of okra (*Abelmoschus esculentus*) influenced by Diazotrophs and chemical fertilizers. *Journal of Crop and Weed, 9*(2): 109-112.

Middha, Ruchi, Jain, Sonal and Juneja, Shelja K. (2015). A comparative study of physico-chemical parameters of restored and unrestored soils of two villages of Chaksu block, Jaipur, Rajasthan. *International Journal of Engineering Technology Science and Research, 2* : 2394–3386.

Nadkarni, K. M. (1927). *Indian meteriamedica*. Vol-I, Bombay Popular Prakashan, second edition, reprint 1995, 595.

Narkhede, S. D., Attarde, S. B. and Ingle, S. T. (2011). Study on effect of chemical fertilizer and vermicompost on growth of chilli pepper plant (*Capsicum annum*). *Journal of Applied Sciences in Environmental Sanitation, 6*(3): 327-332.

Premsekhar, M. and Rajashree, V. (2009). Influence of organic manures on growth, yield and quality of okra, *American Eurasian Journal Sustainable Agriculture, 3*(1): 6-8.

Sahu, A. K., Kumar, S. and Maji, S. (2014). Effect of biofertilizers and inorganic fertilizers on vegetative growth and yield of okra [*Abelmoschus esculentus* (L.) Moench]. *International Journal of Agricultural Sciences, 10*: 558-561.

Sajid, M., Khan, M. A., Rab, A., Shah, S. N. M., Arif, M., Jan, I., Hussain, Z. and Mukhtiar, M. (2012). Impact of nitrogen and phosphorus on seed yield and yield components of okra cultivars. *The Journal of Animal and Plant Sciences, 22*(3): 704-707.

Siddiqui, A.K., Shivle, R. and Mangodia, N. (2014). Possible role of biofertilizer in organic agriculture. *International Journal of Innovative Research and Studies, 3*(9): 2319-9725.

Singh, I. P. (1995). Effect of various doses of nitrogen on seed yield and quality of okra (*Abelmoschus esculentus* (L) Moench). *Annals of Agricultural Research, 16*(2): 227-229.

Singh, Laxman, Dhaka, R. S. and Mukharjee, S. (2005) Effect of nitrogen, phosphorus and gibberellic acid on vegetative growth and yield of okra (*Abelmoschus esculentus* (L.) Moench) under semi-arid conditions. *Haryana Journal of Horiculture Science, 34*(1-2): 166-167.

Singh, S.K., Kumar, S., Yadav, Y.C. and Kumar, A. (2012). Effect of NPK levels on growth, yield and quality of okra cv. Arka Anamika. *Horticulture Flora Research Spectrum, 1*(2): 190-192.

Singh, V. P., Maiti, R. K., Kalpana, K. and Hernandez-Pinero, J. (2007). Research advances in okra or bhindi (*Abelmoschus esculentus* L.) *– A review- Research on Crops, 8*(2): 261-291.

Suchitra, S. and Manivannan, K. (2012). Studies on the influence of organic inputs on the growth and yield of bhindi, vegetable cowpea in various seasons. *Indian Journal of Plant Sciences, 1*(2-3): 124-132.

Tadesse, T., Dechassa, N., Bayu, W. and Gebeyehu, S. (2013). Effects of farmyard manure and inorganic fertilizer application on soil physicochemical properties and nutrient balance in rain-fed lowland rice ecosystem, *American Journal of Plant Sciences, 4*: 309-316.

Vats, R. (2011). Effect of seed rate and spacing on seed yield and its quality in fenugreek (*Trigonella foenum-graecum* L.) (*Doctoral dissertation*, CCSHAU).

How to cite this article: Devender Kumar and Sanjay Kumar (2022). Effect of Nitrogen, Organic Manures along with Biofertilizers on Yield Parameters of Okra (*Abelmoschus esculentus* L.). *Biological Forum – An International Journal, 14*(2a): 09-12.