Biological Forum – An International Journal **14(2): 1567-1570(2022)**

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

Effect of Nitrogen and Biofertilizers on Growth Parameter 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 26 April 2022, Accepted 21 June, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The challenges of study was that due to in discriminate use of inorganic fertilizer natural fertility of the soil has been deteriorated and 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.

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 an objective to understand the use of nitrogen and biofertilizers on growth and yield of okra crop. Fourteen different treatments with three replications was laid out in a randomized block design in plot size of 3.0 × 1.8 m^2. The treatments comprised of Nitrogen, Azotobacter and PSB including control. Result revealed that 100 % RDN (Inorganic) + Azotobacter + PSB resulted minimum days to 50% flowering (39.33) and plant height at harvest (91.93 cm), number of nodes per plant (23.60), internodal length (6.90 cm), thickness of main stem (9.63 cm) and harvest index (49.59) was recorded maximum.

Keywords: Okra, Nitrogen, Biofertilizer, Treatments and Yield.

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench] is native of Tropical Africa and grows all through the tropics and subtropics. Okra or lady finger which is also known as 'Bhindi' is one of the important vegetables of India. Plant is herbaceous annual green, erect included in family Malvaceae and fruits are immature tender. The stem and mature fruits containing crude fibre is used in the paper industry. The stems and roots are used for clearing the cane juice in preparation of 'gur'. Goiter is also controlled by high iodine content of fruits. Okra is said to be a very useful against spermatorrhoea, chronic dysentery and genito-urinary disorders (Nadkarni, 1927). Nitrogen fertilizer play a vital role for increasing growth, fruit yield and quality of okra. In most of the Indian soil nitrogen is found to be deficient. It is a constituents of nucleic acid, protein and chlorophyll etc. and found to be associated with carbohydrate utilization, supply of amino acid which is required for bio-synthesis of protein and protein type enzyme, which result in better development of crop and ultimately the higher yield (Mani and Ramanathan 1980; Singh 1995). 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).

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. The experiment was laid out under randomized block design with three replications. 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 with suitable statistically for interpretation of results.

RESULTS AND DISCUSSION

Effect of nitrogen and biofertilizers on growth parameters of Plant. The results presented in Table 1 obtained on growth parameters revealed that the minimum days to50 %flowering was recorded in T_1 (39.33) followed by T_2 (39.67). While, maximum days to 50% flowering (44.00) was recorded under control. The reason behind earliest 50% flowering might be due to higher dose offer tilizer and biofertilizer applied on treated plots as compared to other treatments. The nutrients received from inorganic sources by plants lead to better earliness as compared to absolute control. Earliness might be due to growth promoting substances produced by inorganic sources which had influenced physiological activity of plant. Muhammad *et al*. (2001), Bhadoria *et al*. (2007) in tomato and Singh *et al*. (2012); Tyagi *et al*. (2016) also reported increase in 50 % flowering in okra.

The maximum plant height at harvest (91.93 cm) was recorded under T_1 followed by T_2 (91.33 cm). Whereas, T_{14} reported for minimum plant height at harvest (62.80 cm). This might be because of better nutritional environment in root zone for growth and development of plant by the applications of nitrogen. Nitrogen is considered as one of the major nutrient required for proper growth and development of the plant. It is also a main constituent of amino acids, proteins, protoplasm, cell nucleus, chlorophyll and many other metabolic products. These results of present investigation are in agreement with those of Manga and Muhammad (2006); Firoz (2009); Sharma and Choudhary (2011); Singh *et al*. (2012); Choudhary *et al*. (2015); Tripathi *et al*. (2017) in okra and Baba *et al*. (2018) in tomato.

The maximum number of nodes per plant (23.60) was recorded in T_1 followed by T_2 (22.47). Whereas, the minimum number of nodes per plant (15.80) was recorded with control. The number of nodes per plant and intermodal length decreases with decrease in nitrogen application. The evidence of increased as simulation of protoplasm resulting in greater cell division, formation of more tissues and vigour of the plant. The result of present study confirms findings of Fayaz *et al*. (1999) Firoz (2009); Singh *et al*. (2012); Kumar *et al*. (2013) in okra who reported pronounced effect of nitrogen on number of nodes per plant and intermodal length.

Table 1: Effect of nitrogen and biofertilizers on growth parameters of Plant.

Treatment	Days to 50% flowering	Plant Height at harvest (cm)	Number of nodes per plant
T1	39.33	**91.93**	**23.60**
T2	39.67	91.33	22.47
T3	40.00	83.80	21.07
T4	40.67	80.73	20.13
T5	40.33	83.53	21.07
T6	41.00	80.20	19.87
T7	40.00	82.00	23.47
T8	40.33	81.67	21.53
T9	40.33	79.60	21.07
T10	41.33	77.20	19.87
T11	41.67	78.20	20.33
T12	42.00	75.13	18.67
T13	42.00	75.00	17.80
T14	**44.00**	62.80	15.80
CD 5%	**1.92**	**11.05**	**1.87**
S.E. (d)	**0.66**	**3.78**	**0.64**

Further, results from Table 2 clearly shows that maximum intermodal length (6.90 cm) was recorded in T_1 followed by T_2 (6.67 cm). Whereas, the minimum intermodal length (4.83 cm) was recorded with control. The maximum thickness of main stem (9.63 cm) was recorded under T_1 followed by T_2 (9.10 cm), whereas, T_{14} reported for minimum thickness of main stem (6.85 cm). The thickness of main stem decreased significantly with decrease in nitrogen application. These results are indistinguishable with the findings of Singh *et al.* (2005) in okra.

The maximum value of harvest index (49.59) was recorded under T_1 followed by T_2 (49.47). Whereas, T_{14} reported for minimum value of 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 nitrogen and biofertilizers on growth parameters of Plant.

Treatment	Inter-nodal length (cm)	Thickness of main stem (cm)	Harvest index
T1	**6.90**	**9.63**	**49.59**
T2	6.67	9.10	49.47
T3	6.53	9.19	46.99
T4	6.40	8.67	45.31
T5	6.33	8.99	46.35
T6	6.27	8.26	45.32
T7	6.57	9.38	47.02
T8	6.50	9.05	45.98
T9	6.03	8.47	44.66
T10	5.73	8.25	44.15
T11	5.70	8.39	44.52
T12	5.37	8.33	43.54
T13	5.33	8.00	42.96
T14	4.83	6.85	37.29
CD 5%	**0.47**	**1.03**	**2.32**
S.E. (d)	**0.16**	**0.35**	**0.79**

CONCLUSION

From the above findings it is concluded that 100 % RDN (Inorganic) + Azotobacter + PSB resulted minimum days to 50% flowering (39.33) and plant height at harvest (91.93 cm), number of nodes per plant (23.60), internodal length (6.90 cm), thickness of main stem (9.63 cm) and harvest index (49.59) was recorded maximum so for better growth of okra without deteriorating the soil health application of inorganic fertilizers along with biofertilizers dose treatment *i.e* (T_1) should be adopted. Therefore 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

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.

Bhadoria, S. K. S., Dwivedi, Y. C. and Kushwah, S. S. (2007). Flowering and fruiting behavior is affected by Azatobacter and nitrogen in tomato. *Indian Journal of Horticulture*, *64*(3): 366-368.

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.

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.

Fayaz, A., Mohammed, I. and Sher, M. (1999). Effect of different levels of nitrogen alone and in combination with constant dose of phosphorus and potassium on growth and yield of okra cv. TV-13. *Sharhad Journal of Agriculture*, *15*(5): 405-407.

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.

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).

Kumar, T., Kumar, M., Singh, M. K., Kumar, V., Kumar, A., Kumar, S., Singh B. (2013). Impact of integrated nutrient management (INM) on growth and economic yield of okra. *Annals of Horticulture, 6*(1, 6): 114-118.

Manga, A. A., Mohammed, S. G. (2006). Effect of plant population and nitrogen levels on growth and yield of okra [*Abelomoschus esculentus* (L.) Moench]. *Advances in Horticultural Sciences, 20*: 137-139.

Mani, S. and Ramanathan, K. M. (1980). Effect of nitrogen and phosphorus on the yield of bhindi fruits. *South Indian Horticulture, 20*: 136-138.

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.

Muhammad Amjad Muhammad Anjum and Sajidhussain (2001). Effect of different sowing dates and various doses of fertilizer on juvenility and productivity of okra. *Pakistan Journal of Agricultural Sciences, 38*(1-2).

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

Sharma, G. R. (2011). Effect of integrated nutrient management on growth, yield and quality of okra [*Abelmoschus esculentus* (L.) Moench]. Thesis submitted to *Swami Keshwanand Rajasthan Agricultural University*, Bikaner.

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, A. K., Gupta, M. J., Srivastava, R. and Behera, T. K. (2005). Effect of NPK levels on growth and yield of tomato hybrids under multispanpoly house. *Indian Journal of Horticulture*, *62*(1): 91-93.

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, 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.

Tripathi, A. K., Ram, R. B., Rout, S., Kumar, A. and Patra, S. S. (2017). Effect of nitrogen levels and spacing on growth and yield of radish (*Raphanus sativus* L.) Cv. Kashi Sweta. *International Journal of Pure Applied Bioscience*, *5*(4): 1951-1960.

Tyagi, S. K., Shukla, A., Mittoliya, V. K., Sharma, M. L., Khire, A. R. and Jain, Y. K. (2016). Effect of integrated nutrient management on growth, yield and economics of okra (*Abelmoschus esculentus* (L). Moench) under Nimar Valley conditions of Madhya Pradesh. *International Journal of Tropical Agriculture*, *34*: 415-419.

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

How to cite this article: Devender Kumar and Sanjay Kumar (2022). Effect of Nitrogen and Biofertilizers on Growth Parameter of Okra (*Abelmoschus esculentus* L.). *Biological Forum – An International Journal*, *14*(2): 1567-1570.