Research Article

Effect of Integrated Nutrient Management on growth and quality characters of Okra (*Abelmoschus esculentus* (L.) Moench cultivar Kashi Mohini (VRO-3)"

V Sagar* and S Bala

Department of Horticulture, Udai Pratap Autonomous College, Mahatama Gandhi kashi Vidyapeeth,Varanasi. 221002

Abstract

The experiment was comprised of 7 treatment combination including control. Four source of nutrients viz. FYM, NPK, *Azotobacter* and PSB was given alone or in combination in a Randomized Block Design with three replication in plots. FYM, *Azotobacter* and phosphate solubilizing bacteria (PSB) was applied as seed treatment before sowing. The observation on the number of nodes, internodes distance (cm), day taken to 50% flowering ,number of fruit per plant, diameter of fresh fruit, length of fresh fruit (cm), average weight of fruit(gm), yield of fruit per hectare (quintal), T.S.S(%) and ascorbic acid(mg/100 g), were recorded at 90 days of sowing. The treatment (T_5) ie. NPK(100:50:50 kg/ha)+PSB (7.5kg/ha), showed the significant superiority in giving ,day taken to 50% flowering (60 days), number of fruit per plant (12.51),length of fresh fruit (21.15 cm), average weight of fresh fruit (13.79 gm), yield of fruit per plant (180.47 gm), yield of fruit per hectare (132.26 q/ha) , T.S.S (8.82 %) . The number of nodes per plant (17.83) and length of inter nodal distance(5.57 cm) was recorded under T_6 NPK (100:50:50 kg/ha)+*Azotobacter* (5 kg/ha) treatment, while the maximum diameter of fresh fruit (2.45 cm) and ascorbic acid (22.67mg/100g) was noted under T_6 NPK(100:50:50 kg/ha)+*Azotobacter* (5kg/ha)+PSB(7.5kg/ha) treatments. It can be concluded that the maximum growth and yield of Okra may be obtained by the application of NPK (100:50:50 kg/ha) + PSB(7.5kg/ha) in the treatment T_5 and NPK(100:50:50 kg/ha) *Azotobacter* (5kg/ha)+ PSB(7.5kg/ha) in the treatment T_6 . Hence, both the treatments of Biofertilizer are recommended for the farmers for maximum Okra production.

Keywords: FYM, Biofertilizer, Azotobacter

***Correspondence**

Author: V Sagar

Email: sagarv2013@gmail.com

Introduction

Okra is herbaceous hairy annual plant widely cultivated in tropical and sub-tropical countries. It is now being considered as one of the most indispensable commodity for export and accounts for 60% of the total export of fresh vegetable excluding onion [1]. It tolerates high temperature during summer season and resistant to-yellow vein mosaic virus under field conditions. Okra produces fruits for a longer period, therefore it requires excess and regular supply of nutrients for obtaining regular picking. Nitrogen, Phosphorous and potassium are the major nutrients and require in large quantities by plant for sustaining their life cycle and higher yield. Oxidized form of nitrogenous fertilizers cause hazard to human health and environment [2]. It is known that column of air over hectare of land contains eighty thousand tones of nitrogen but in fact this vast reserve of nitrogen could remain unutilized by crop until it is converted into available from either through industrial manufacturing or microbial fixation. Among these micro-organism Azotobacter have an important role to supplement nitrogen to the crop up to 20-30 kg/ha [3]. Phosphorous support in formation of fibrous roots which increases the capacity of absorbent nutrient from the soils neutralizes the harmful effect of nitrogen. Most of Indian soils are medium to Low in Phosphorus availability and require adequate Thus, VAM are gaining Popularity in these days, they make more nutrient available to plant and may reduce by 25-50 percent of the recommended dose of phosphorus. Mycorrhizal association helps in greater uptake of Phosphorus, zinc and copper [4]. Integration of chemical Fertilizers with organic manures is popular practice in reduction of application of chemical fertilizers. Beneficial effects of Azotobacter and VAM in crop production are well established. More interestingly, it was behold that joint inoculation of above bio-fertilizers can cause synergistic

effect [5]. The response of bio-fertilizers is not only area specific, however it may vary with soil environment factors, crop as well as its varieties. Since, Information on account of integrated nutrient management is scanty especially in vegetable crops and particularly in lady's finger. Provides balanced nutrient demand of the crop and minimizes the antagonistic effect resulting from hidden deficiencies and nutrient imbalance. Improves and sustains the physical and biological function of soil. Therefore, keeping the above point in consideration, the present investigation entitled "Effect of Integrated Nutrient Management on growth, yield and quality characters of Okra (*Abelmoschus esculentus (L.*) Moench cultivar Kashi Mohini (VRO-3)"

Materials and Methods

The present investigation was carried at Udai Pratap Autonomous College, Varanasi under Horticulture experiment field during the summer season in 2014. The soil of experimental field was sandy loam well drained loose and friable. To ascertain the nutritional status the experimental soil was analyzed on the basis of soil test, The pH of soil 7.6, EC-0.34, organic carbon 0.54%), Nitrogen 240 kg/h, phosphorus 16kg ha^{-1}, Potash 130kg ha^{-1} , calcium 4mg/litre and magnesium 5mg/litre. The details of treatment are as To: Control ,T_1: *Azotobacter* (@ 5 kg ha^{-1}),T_2: PSB (@ 7.5 kg ha^{-1}),T_3: NPK (@ 100:50:50 kg ha^{-1}),T_4: NPK (@ 100:50:50 kg ha^{-1}) + *Azotobacter* (@ 5 kg ha^{-1}),T_5: NPK (@ 100:50:50 kg ha^{-1}) + PSB (@ 7.5 kg ha^{-1}), T_6: NPK (@ 100:50:50 kg ha^{-1}) + *Azotobacter* (@ 5 kg ha^{-1}) + PSB (@ 7.5 kg ha^{-1}).The experiments were laid out in the Randomized Block Design (RBD) with three replication and seven treatments. The whole field was first divided into seven main blocks and each block representing a replication. For the inoculation of Azotobacter, a sticker solution was prepared by boiling of 5g jaggery in 50 ml of water. After cooling it, 20g *Azotobacter* culture was mixed to this solution. Solution was spread on 1 kg of seed and was mixed thoroughly in seeds to obtain uniform coating. Treated seeds were kept in shade for drying. After shade drying, seeds were sown in experimental plots immediately. *Azotobacter* was used as soil application @ 5 kg per hectare. A mixture was prepared by mixing of soil based PSB in 30 kg of well friable soil for even soil of spores. The mixture was applied to the experimental plots as per treatments and was mixed thoroughly into the soil. Biofertilizres have been recognized as the cheapest fertilizers input for developing countries as a source of supplement in place of chemical fertilizers for better crop production. Biofertilizres such as *Azotobacter* fixed atmosphere nitrogen while PSB mobilizes the phosphorus and other micro nutrients. Hence, techniques of random sampling was adopted for recording observations for Days to 50% flowering Fruit weight per plant (g),Fruit yield kg per plot, Fruit yield q per ha, Seed yield per plant (g),T.S.S (^{0}Brix),Vitamin -C (mg / 100g) as suggested by Ranganna, 1986[6]. The data recorded during the study were statistically analyzed by the methods as advocated by Panse and Sukhatme (1985)[7]. The significance of the treatment was judged with the help of F- Values.

Results and Discussion

An increase in growth parameters may be due to the stimulating and beneficial effect of biofertilizres in solubilizing and utilization of nutrients and biosynthesis of plant growth regulators like IAA, GA and cytokinins as well as vitamins an organic acids. The marked effect of N on growth have been observed due to the fact that nitrogen combines with carbohydrates in leaves leading to formation of amino acids, nucleic acids, proteins, chlorophylls, alkaloid and amides. These complex compounds are responsible for building up of new tissues and are associated in a number of metabolic steps. **Table 1**, **Figure 1** showed that in variety Kashi Mohini (VRO-3) the maximum number of nodes per plant at 60 DAS were observed in T_6 (17.83) with the application of NPK (@100:50:50kgha^{-1}) + *Azotobacter* (@5kgha^{-1})+PSB(@7.5kgha^{-1}). The treatment T_1, T_2 and T_3 are at par with each other. It is clearly showed that the treatment T_3 exhibits the maximum intermodal distance (cm) i.e. (5.57cm) with the application of NPK (@100:50:50kgha^{-1}) followed by treatment T_6 (3.77cm). The treatment T_1, T_2 both were found to be at par with each other. Okra plant required nutrient in the balance amount and recommended dose of NPK, it Provides nutrients adequate amount besides the major nutrients and trace elements. **Table 2** and **Figure 2** showed that the minimum days taken to 50% flowering was observed in treatment T_5 and T_6 i.e. 55.00 and 56.00 respectively. The application of NPK (@100:50:50kgha-1) + PSB (@7.5kgha-1) and NPK (@100:50:50kgha-1) + *Azotobacter* (@5kgha-1) + PSB (@7.5kgha-1), the maximum days taken to 50% flowering was observed in control T_0. The Earliness in flowering was attributed to simultaneous transport of growth substances like cytokinins to the axillary buds and break of the apical dominance. This resulted in a better sink for faster mobilization of photosynthates, which resulted in early transformation of vegetative phase into reproductive phase in onion[8]. The number of fruit per plant at 30 and 60 DAS of okra cultivar Kashi Mohini (VRO-3) the maximum number of Fruit per plant at 60 DAS was recorded to be 12.51 with in the treatment T_5 i.e. NPK(@100:50:50kgha^{-1}) + PSB(@7.5kgha^{-1}) followed by T_6 (12.11). The treatment T_6 and T_4 are significantly with each other. Length of the fruit (cm) were observed highest in treatment T_5 (20.55cm)

with the application of NPK (@100:50:50kgha^{-1}) + PSB(@7.5 kgha^{-1}) followed by T_6 (19.99cm) with the application of NPK(@100:50:50kgha^{-1}) + *Azotobacter*(@5kgha^{-1}) + PSB(@7.5kgha^{-1}).

Table 1 Effect of INM in the Number of nodes per plant and intermodal distance at 60 DAS of okra cultivar Kashi Mohini (VRO-3)

S.N.	Treatment	No. of nodes/plant				Internodal distance (cm)			
		R_1	R_2	R_3	Mean	R_1	R_2	R_3	Mean
T_o	Control	5.70	6.12	5.30	5.71	1.30	2.00	2.13	1.81
T_1	*Azotobacter*(@5kg-ha^{-1})	10.30	12.20	12.20	11.57	3.40	2.70	3.20	3.10
T_2	PSB(@7.5kgha^{-1})	12.38	11.30	9.25	10.98	3.25	3.40	2.40	3.02
T_3	NPK(@100:50:50kgha^{-1})	12.20	12.30	15.20	13.23	5.95	5.55	5.20	5.57
T_4	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})	15.50	19.30	17.60	17.47	1.50	2.00	3.10	2.20
T_5	NPK(@100:50:50kgha^{-1})+ PSB(@7.5kgha^{-1})	15.30	16.20	15.20	15.57	3.10	3.10	4.20	3.47
T_6	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})+ PSB(@7.5kgha^{-1})	17.70	17.60	18.20	17.83	5.00	3.20	3.10	3.77
		C.D. at 5%			2.2434	C.D. at 5%			1.2326
		S.E.(d.)			1.0295	S.E.(d.)			0.5656

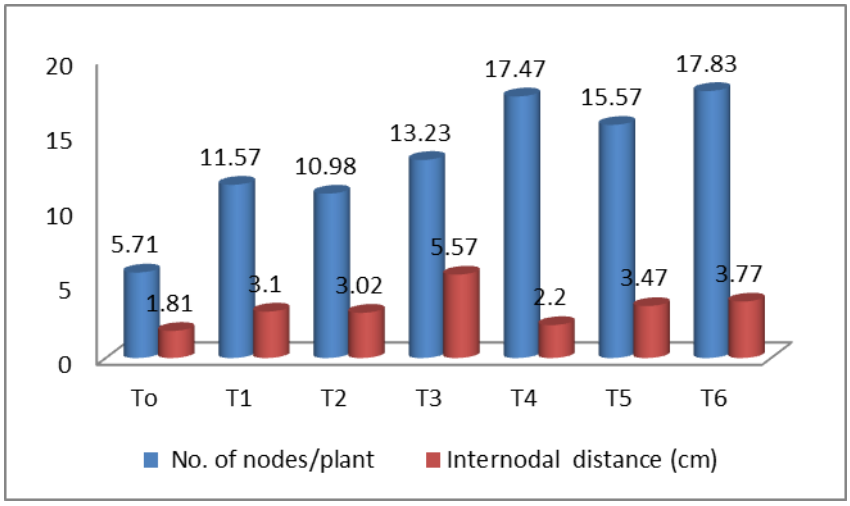

Figure 1 Effect of INM in the Number of nodes per plant and intermodal distance at 60 DAS of okra cultivar Kashi Mohini (VRO-3)

Table 2 Effect of INM in days taken to 50% flowering appearance and number of fruits per plants at 60 DAS of okra cultivar Kashi Mohini (VRO-3)

S.N.	Treatments	Days taken to 50% flowering appearance				Number of fruit per plant			
		R_1	R_2	R_3	Mean	R_1	R_2	R_3	Mean
T_o	Control	64.00	65.00	65.00	64.67	6.55	8.12	6.20	6.96
T_1	*Azotobacter*(@5kg-ha^{-1})	62.00	60.00	61.00	61.00	8.12	8.12	7.70	7.98
T_2	PSB(@7.5kgha^{-1})	62.00	62.00	62.00	62.00	8.35	9.20	8.15	8.57
T_3	NPK(@100:50:50kgha^{-1})	57.00	57.00	57.00	57.00	8.25	12.25	11.25	10.58
T_4	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})	56.00	56.00	56.00	56.00	9.10	9.79	9.30	9.40
T_5	NPK(@100:50:50kgha^{-1})+ PSB(@7.5kgha^{-1})	55.00	55.00	55.00	55.00	12.13	13.10	12.30	12.51
T_6	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})+ PSB(@7.5kgha^{-1})	56.00	56.00	56.00	56.00	13.05	12.15	11.12	12.11
		C.D. at 5%			0.8153	C.D. at 5%			1.5913
		S.E.(d.)			0.3742	S.E.(d.)			0.7303

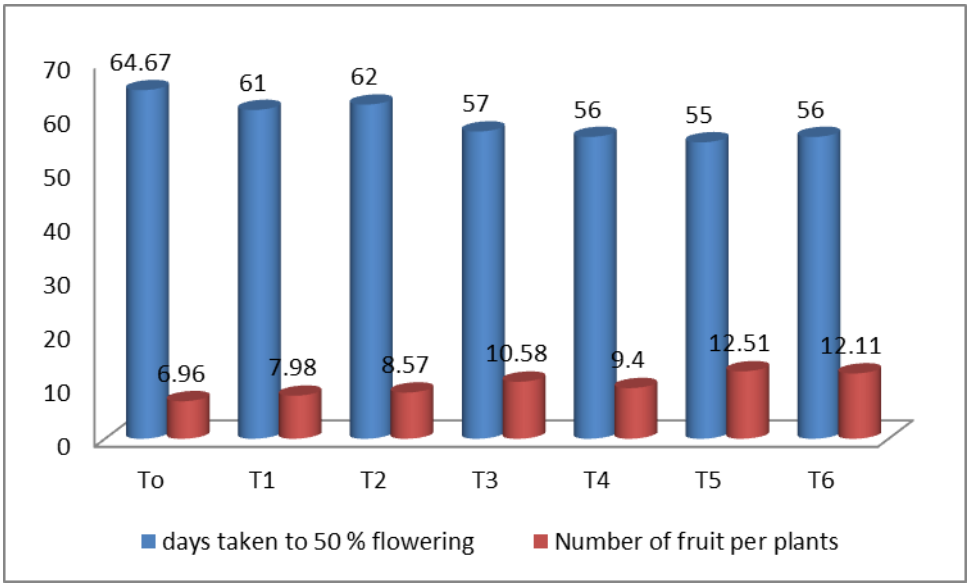

Figure 2 Effect of INM in days taken to 50% flowering appearance and Number of fruits per plants at 60 DAS of okra cultivar Kashi Mohini (VRO-3)

Table 3 Effect of INM in the length of fruit (cm) and diameter of the fruit (cm) of okra cultivar Kashi Mohini (VRO-3) at 60 DAS

S.N.	Treatments	Length of the fruit (cm) at 60 days after sowing				Diameter of the fruit (cm) at 60 days after sowing			
		R_1	R_2	R_3	Mean	R_1	R_2	R_3	Mean
T_o	Control	10.15	10.35	11.25	10.58	1.10	1.12	1.18	1.13
T_1	*Azotobacter*(@5kg-ha^{-1})	16.30	17.35	18.00	17.22	1.25	1.65	2.15	1.68
T_2	PSB(@7.5kgha^{-1})	17.35	19.20	18.20	18.25	1.25	1.70	1.40	1.45
T_3	NPK(@100:50:50kgha^{-1})	20.15	21.30	22.00	21.15	1.15	1.35	1.50	1.33
T_4	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})	19.10	21.10	18.75	19.65	1.95	2.15	3.51	2.54
T_5	NPK(@100:50:50kgha^{-1})+ PSB(@7.5kgha^{-1})	21.25	21.15	19.25	20.55	1.25	2.00	2.75	2.00
T_6	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})+ PSB(@7.5kgha^{-1})	18.37	21.45	20.15	19.99	1.65	2.03	2.45	2.04
		C.D. at 5%			1.6306	C.D. at 5%			0.6163
		S.E.(d.)			0.7483	S.E.(d.)			0.2828

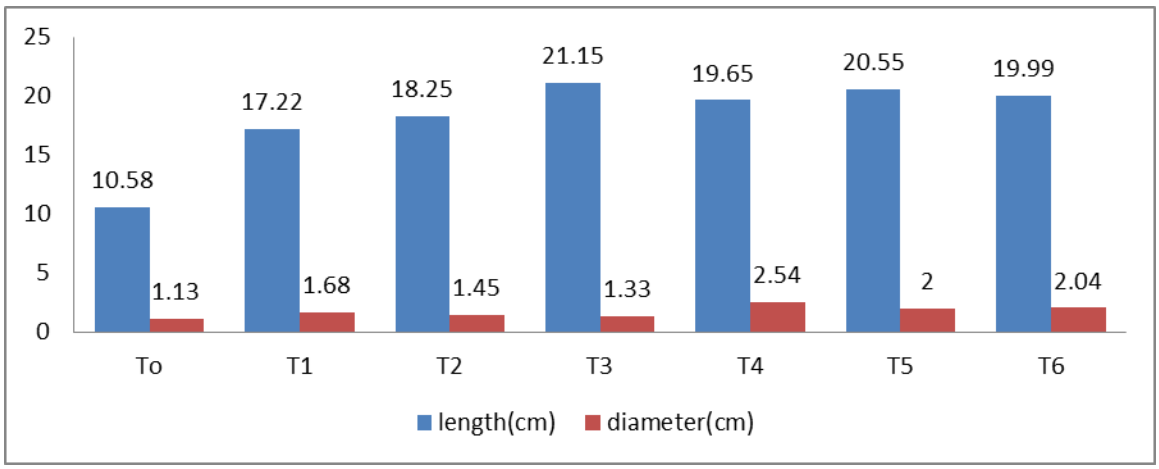

Figure 3 Effect of INM in the length of fruit (cm) and diameter of the fruit (cm) of okra cultivar Kashi Mohini (VRO-3) at 60 DAS

Table 4 Effect of INM in weight of fruit (g) at 60 DAS and yield (q/ha) of okra cultivar Kashi Mohini (VRO-3) at maturity

S.N.	Treatments	Fruit weight (g) 60 DAS				yield of fruit (q/ha)at harvesting stage			
		R_1	R_2	R_3	Mean	R_1	R_2	R_3	Mean
T_o	Control	7.35	6.30	7.98	7.21	79.35	80.32	82.72	80.80
T_1	*Azotobacter*(@5kg-ha^{-1})	11.50	10.30	9.25	10.35	100.30	104.30	97.37	100.66
T_2	PSB(@7.5kgha^{-1})	8.15	13.35	11.50	11.00	101.36	102.30	107.20	103.62
T_3	NPK(@100:50:50kgha^{-1})	10.15	12.25	11.57	11.32	120.35	123.40	122.70	122.15
T_4	NPK(@100:50:50kgha^{-1})+*Azotobacter* (@5kgha^{-1})	11.35	11.25	11.35	11.32	120.21	120.75	121.57	120.84
T_5	NPK(@100:50:50kgha^{-1})+ PSB (@7.5kgha^{-1})	16.35	15.01	14.37	15.24	129.35	132.25	135.19	132.26
T_6	NPK(@100:50:50kgha^{-1})+*Azotobacter* (@5kgha^{-1})+ PSB(@7.5kgha^{-1})	15.25	13.75	12.38	13.79	132.32	130.12	131.32	131.25
		C.D. at 5%			2.5843	C.D. at 5%			7.1325
		S.E.(d.)			1.1860	S.E.(d.)			3.2733

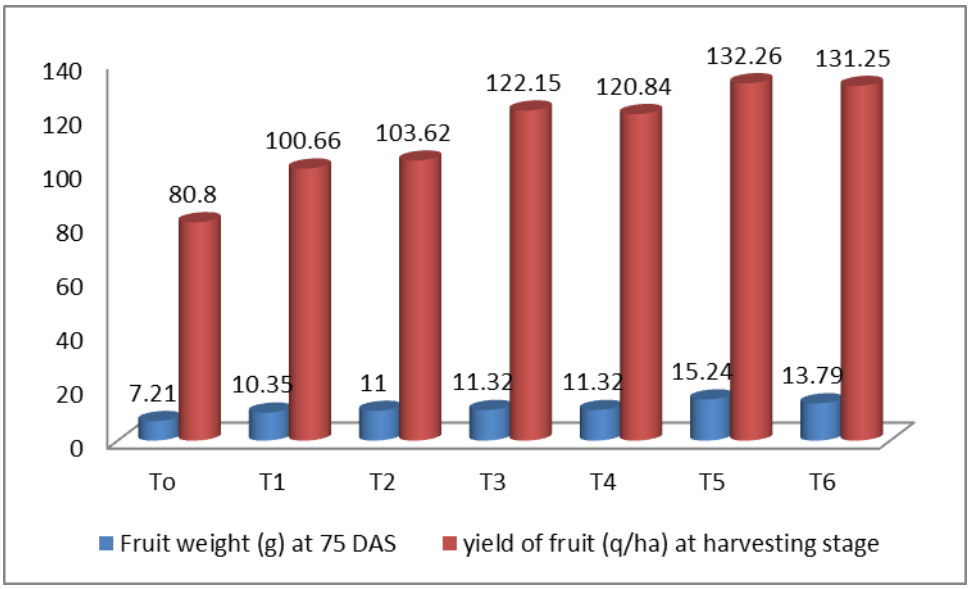

Figure 4 Effect of INM in weight of fruit (g) and yield (q/ha) of okra cultivar Kashi Mohini (VRO-3) at 60 DAS

Table 5 Effect of INM in T.S.S. (^{0}Brix) and vitamin C(mg/100g) content of okra cultivar Kashi Mohini (VRO-3) at maturity stage

S.N.	Treatment	Total Soluble Solid(TSS ^{0}Brix)				Vitamin-C (mg/100g) in analysis of okra fruit			
		KashiMohini (VRO-3)				KashiMohini (VRO-3)			
		R_1	R_2	R_3	Mean	R_1	R_2	R_3	Mean
T_o	Control	3.31	4.77	5.10	4.39	20.10	20.09	20.87	20.35
T_1	*Azotobacter*(@5kg-ha^{-1})	5.50	5.32	5.13	5.32	20.17	20.45	20.77	20.46
T_2	PSB(@7.5kgha^{-1})	6.30	6.32	6.35	6.32	20.15	20.36	20.27	20.26
T_3	NPK(@100:50:50kgha^{-1})	7.36	6.36	7.17	6.69	21.35	20.36	21.39	21.03
T_4	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})	7.34	7.30	7.12	7.25	20.35	21.26	22.37	21.33
T_5	NPK(@100:50:50kgha^{-1})+ PSB(@7.5kgha^{-1})	8.39	8.29	8.21	8.30	22.34	21.15	22.36	21.95
T_6	NPK(@100:50:50kgha^{-1})+ *Azotobacter*(@5kgha^{-1})+ PSB(@7.5kgha^{-1})	9.25	8.10	9.10	8.82	22.35	22.65	24.00	23.00
		C.D. at 5%			0.9071	C.D. at 5%			0.3977
		S.E.(d.)			0.4163	S.E.(d.)			0.1825

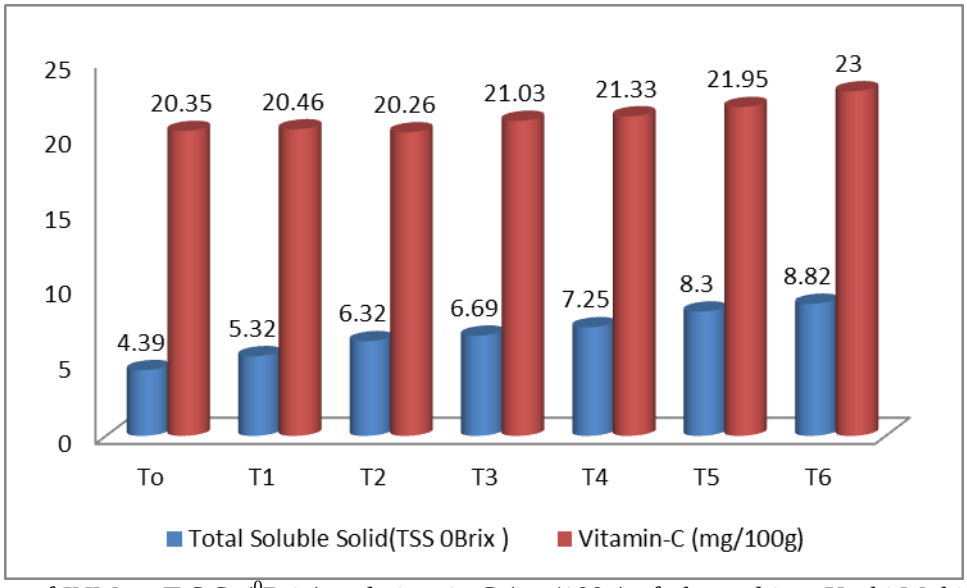

Figure 5 Effect of INM on T.S.S. (^{0}Brix) and vitamin C (mg/100g) of okra cultivar Kashi Mohini (VRO-3) at maturity stage

The treatments T_3 are T_4 and found to be significantly with each other**.** **Table 3 and Figure3** showed the Diameter of fruit was maximum in treatment T_4 (2.54cm) i.e. NPK(@100:50:50kgha^{-1}) + *Azotobacter*(@5kgha^{-1}) followed by T_6 (2.04cm) the treatment T_4 and T_6 are significantly with each other. Similar results was found that application of (30-120 kg) N/ha significantly enhanced the 50 % flowering with Bessel dose of 30 and 60 kg P_2 O_5 and K_2 O per ha on pea[9] and on Ginger [10]. [11] It was reported that effect of inorganic fertilizer with organic /biological sources increased growth of Okra. [12]It was noticed that using of FYM and NPK (100%) increased growth, yield and quality of Okra. **Table 4 and Figure 4** revealed that the maximum weight of fruit (g) at 60 DAS was recorded in treatment T_5 (15.24) respectively, with the application of NPK (@100:50:50kgha^{-1}) + PSB(@7.5kgha^{-1}) in Kashi Mohini (VRO-3). Improvement in the size and weight of fruit might to due to increased availability of nutrients during the fruiting development. The yield of fruit (q/ha) is highest in treatment T_5 i.e. 132.26 q/ha with the application of NPK (@100:50:50kgha^{-1}) + PSB(@7.5kgha^{-1}) followed by treatment T_6 (131.25q/ha). The yield may be increased due to favourable action of bioinoculents that provided nutrients in proportion. Similar result was found in tomato [13], in maize [14] for higher yield, in wheat [15] and in coriander [16]. [17]It was noticed that recommended NPK (40:50:30) kg and Azospirilium 2kg/ha gave highest pod yield (20.67 t/ha). Further, use of organic and inorganic source of nutrient and Biofertilizres increase fruit yield while significantly increased shoot dry matter, yield of Okra and tomato [18]. [19] it was reported that recommended dose of NPK (10:50:50 kg/ha) along with *Azospirillum* registered the highest fruit yield (29.71 q/ha). **Table 5** and **Figure 5** showed that the highest Total soluble solid (^{0}Brix) was recorded as in treatment T_6 i.e.8.82 with the application of NPK(@100:50:50kgha^{-1}) + *Azotobacter*(@kgha^{-1}) + PSB(@ 7.5kgha^{-1}) (T_6). The treatment T_5 and T_6 are both significantly with other. The highest Vitamin-C (mg/100g) content was recorded in treatment T_6 i.e. 23.00 with the application of NPK (@100:50:50 kgha^{-1}) + *Azotobacter*(@kgha^{-1}) + PSB(@7.5kgha^{-1}) followed by treatment T_5 (21.95) with the application of NPK(@100:50:50kgha^{-1}) +PSB(@7.5kgha^{-1}). It can be concluded that the maximum growth and yield of Okra may be obtained by the application of NPK(100:50:50 kg/ha) + PSB(7.5kg/ha) in the treatment T_5 and NPK(100:50:50 kg/ha) *Azotobacter* (5kg/ha)+ PSB(7.5kg/ha) in the treatment T_6 . Hence both the treatments of Biofertilizres are recommended for the farmers for maximum Okra production.

References

[1] Kalloo, G. and Pandey, A.K. (2000). Commandable progress in research. In: Ravi, N.(ed), Hindu Survey of Indian Agriculture. Pp. 159-163. National Press, Kasturi Buidling, Chennai.
[2] Ladha, J.K. (2002). Managing nitroen for crop producvity and environmental quality. Extended summaries vol.1 : 2nd International agronomy congress, Nov.26-30PP. 35-37, New Delhi, India
[3] Bhattacharya, P; Jain, R.K. and Polwal, M.K. (2000). Biofertilizers for vegeteble Indian Horti. 44 (2) :12-13
[4] Asokan, R; sukhada, M. and Lalitha, A. (2000). Biofertilizers and bio-pesticides for horticultural crops.
[5] Bagyaraj, D.J. and Menge, J.A. (1978). Interaction between VAM- mycorrhizae and Azotobacter and their effects on rhizosphere micro-flora and plant growth. New phytol. 80:567-573.

[6] Ranganna, S. (1986) Hard book of Analysis and quality control for fruit and vegetable products, 2nd edition. Tata McGraw-Hill Publishing Company Ltd.
[7] Panse, V.G. and Sukhatme, P.V., (1985) Statical Methods for Agrionllinal workers 4th, ed, I.C.A.R., New Delhi, 347P.
[8] Sharma, R.K., Singh, S.S. and Singh, K. (2002). Effect of biofertilizres and nitrogen on growth and yield of onion (Allium cepa L.). Indian J. Agron. 47(1): 159.
[9] Singh, V.B., Talimongba and Singh, A.K. (2004). Effect of N and biofertilizers on growth , yield and quality of ginger under foothill of Nagaland. the First Indian Horticulture Congress 6-9 Nov., Pusa, New Delhi Abstracts, 252p.
[10] Vimla, B. and Natarajan, S. (1999). Studies on effect of N, P and biofertilizers on growth, flowering and yield of Pea (Pisum sativum L. Spp.hortense). S. Indian Hort., 47(1-6): 61-64.
[11] Tripathi, P.Bhattacharya, D.Maity, T.K. (2004). Response of okra (Abelmoschus esculentus (L.) Moench. To Integreted Nutrient Management system Orrisa Journal of Horti.; 2004, 32:2, 14-18, 10 ref
[12] Mariappan, S.; Priyadarsni, S. and Padmapriya, S. (2012). Influence of integrated nutrient management on growth yield and quality of okra (Abelmoschus esculentus (L.) Monech) cv. Arka Anamika. Madras Agric. J., 99 (4-6): 322-324.
[13] Akabani, W.B., Dris, R. and Togun, A.O. (2003). Influence of compost and nitrogen fertilizer on growth, nutrient uptake and fruit yield of tomato (Lycopersicon esculentum). Crop Res., 26: 98-105.
[14] Pawar, R.B.; Patil C.V.; Prakash, S.S. and Yelledhalli, N.A. (1995). Dynamics of earthworm soil palnt relationship in semi-arid tropics. In Abstracts Seminar on Conservation of Natural Research for Sustainable Production, 16-17th November.
[15] Zaide, K. K. and Kaleem, M. (2008). Growth, yield and economics of wheat (Triticum aestivum) as influenced by biofertilizers with nitrogen levels. International J. Agri. Sci. 4 (2): 475- 476.
[16] Watane, A. , Deshmukh, M. , Padgilwar, T. and Jadhav. C.T. (2008). Effect of biofertilizres with reduced dose of fertilizers on yield of coriander. Annals Plant Physiol., 22(1): 115-116. 5 ref.
[17] Selvi, D. and Perumal, R. (2000). Effect of integrated nutrient management on yield and economics of Okra in an inceptisol. Veg. Sci. 27 (2) : 207-208.
[18] Singh R.K., Yadav B.S. (2004). Effect of vermicompost and fertilizers on productivity of gram and soil fertility Indian J. of Hort Science, 77 (11): 613-615.
[19] Jayaraman, N.; Anburani, A. and Suchindra, R.R. (2008). Growth Characters influenced by various organic manures in snake gourd var. Co 2. Veg. Sci. 35 (1): 95-96.

Publication History
Received 28th Oct 2018
Revised 24th Nov 2018
Accepted 08th Dec 2018
Online 30th Dec 2018