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Shivanand Palabhanvi
Research Scholar, Department of Vegetable Science, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

K Venkatalaxmi
Assistant Professor, Department of Horticulture, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

D Laxminarayana
Associate Professor, Department of Horticulture, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

K Nirosha
Assistant Professor, Department of Vegetable Science, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

B Naveen Kumar
Assistant Professor, Department of Soil Science, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

Corresponding Author:
Shivanand Palabhanvi
Research Scholar, Department of Vegetable Science, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, Telangana, India

Performance of Okra [*Abelmoschus esculentus* (L.) Moench] hybrid Arka Nikita with integrated nutrient management practices under Telangana conditions

Shivanand Palabhanvi, K Venkatalaxmi, D Laxminarayana and K Nirosha and B Naveen Kumar

Abstract
A field experiment was conducted during *spring-summer* season of 2021 at College of Horticulture, Rajendranagar, Hyderabad to study the Performance of Okra [*Abelmoschus esculentus* (L.) Moench] Hybrid Arka Nikita on Growth, Flowering and Quality Parameters with Integrated Nutrient Management Practices under Telangana Conditions. The ten integrated treatments consisting of chemical, organic and biofertilizer were arranged in a randomized block design with three replications. Results revealed that the application of 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}) + AMC (12.5 kg ha^{-1}) (T_6) influenced most of the characteristics significantly and recorded the highest values of plant height, number of nodes per plant) and the minimum values for node at which first flowering (2.73), number of days taken to first flowering (40.20) and number of days taken to 50% flowering (43.87) were also recorded in the same treatment. The quality parameters *viz.* crude protein content (15.25%) in fruit is also highest in T_6 treatment and ascorbic acid (18.95 mg $100g^{-1}$) content is maximum in T_9 with the combination of 50% RDN through FYM (15 t ha^{-1}) + 50% RDN through Vermicompost (7.5 t ha^{-1}) + AMC (12.5 kg ha^{-1}).

Keywords: Okra, farmyard manure, vermicompost, AMC

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is an important vegetable commonly known as lady's finger and locally known as *bhendi* in India with chromosome number 2n=130, native of tropical and subtropical Africa. It is valued for its tender fruits and is one of the most important *kharif* and *summer* season vegetable crop, belongs to the family Malvaceae. Okra is the ultimate source of carbohydrate, fiber, proteins and vitamins (Adeboye and Oputa 1996) [1]. It is an excellent source of Iodine and is useful for the treatment of goiter. Fruits are also dried or frozen for using in off-season. Dried fruit contains 13-22 per cent edible oil and 20-24 per cent protein. It has been reported that 100 g of fresh okra pod contains 89.6 per cent moisture, 103 mg of potassium, 90 mg of calcium, 43 mg of magnesium, 56 mg of phosphorus, 18 mg of vitamin C and metals such as iron and aluminium (Markose and Peter 1990) [15]. Carbohydrates are mainly present in the form of mucilage (Kumar *et al*. 2009) [13].

Fertilizer usage plays a major role to increase food production to meet the demands of the growing world population. The extent to which fertilizers are used still differs considerably among various regions of the country. But using balanced fertilizers has a positive impact on plant growth and physicochemical properties of soil. continuous application of heavy doses of chemical fertilizers without organic manures or bio fertilizers has led to deterioration of soil health in terms of physical and chemical properties of soil, declining of soil microbial activities, reduction in soil humus, increased pollution of soil, water and air.

Many research findings have shown that neither inorganic fertilizers nor organic sources (or) biofertilizers alone can result in sustainable productivity. The best option for soil fertility management and more productivity is, therefore, a combination of both inorganic and organic fertilizers, where the inorganic fertilizer provides nutrients and the organic fertilizer mainly increases soil organic matter and improves soil structure and buffering capacity of the soil. The combined application of inorganic and organic fertilizers, usually termed as integrated nutrient management, is widely recognized as a way of increasing yield and improving productivity of the soil sustainably.

Arka Microbial Consortium is a carrier-based product which contains N-fixing, P & Zn solubilizing and plant growth-promoting microbes as a single formulation. The novelty of this technology is that farmers need not apply N-fixing, phosphorous solubilizing and growth promoting bacterial inoculants individually.

Keeping the above facts and importance of the work, the present investigation was designed to study the Performance of Okra [*Abelmoschus esculentus* (L.) Moench] hybrid Arka Nikita on Growth, Flowering and quality parameters with Integrated Nutrient Management practices under Telangana conditions.

Materials and Methods

The experiment was carried out at College of Horticulture, Rajendranagar, Hyderabad, Telangana during *spring-summer* season of 2021. The experimental site is situated at the altitude of the 542.3 m above the mean sea level on 17º 19[1] North latitude and 79º 23[1] East longitude. The experiment was laid out in randomized block design (RBD) with three replications and ten treatments. Treatments consisted of T_1 - 75% RDF + 25% RDN through FYM (7.5 t ha^{-1}), T_2 - 75% RDF + 25% RDN through FYM (7.5t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_3 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_4 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_5 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}), T_6 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_7 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_8 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_9 - 50% RDN through FYM (15 t ha^{-1}) + 50% RDN through Vermicompost (7.5 t ha^{-1}) + AMC (12.5 kg ha^{-1}) and T_{10} - 100% Recommended dose of fertilizers (Control).

The field was thoroughly prepared and experimental plots of 2 m x 2 m size were made. organic manures were applied as per the rates indicated under the treatments after preparation of layout i.e., the organic manures FYM and Vermicompost were applied before sowing of the crop and AMC is mixed with organic manures followed by irrigation. Chemical fertilizers, full dose of P_2O_5 and K_2O were applied respectively through single super phosphate and murate of potash at the time of sowing. While application of nitrogen was made through urea in two equal splits i.e., 50% at the time of sowing and remaining 50% at 30 days after sowing. All other cultural and plant protection measures were done as per the recommended package of practices for the healthy crop.

The observations were recorded on growth characters (Plant height, Number of branches per plant, Number of nodes per plant), Flowering characters (Node at which first flowering, Number days taken to first flowering and Number of days taken to 50% flowering), quality parameters like Ascorbic acid and Crude Protein. The data collected were analysed statistically by following the analysis of variance (ANOVA) technique (Panse and Sukhatme 1985). Statistical significance was tested with 'F' value at 5 per cent level of significance and whenever the F value was found significant, Critical difference was worked out at five per cent level of significance.

Result and Discussion

Growth Parameters

Plant height (cm)

The data pertaining to plant height at 30, 60, 90 days after sowing (DAS) as influenced by the integrated nutrient management is presented in the table 1.

All treatments differed significantly with respect to plant height at 30, 60 and 90 DAS. Among the treatments T_6 recorded maximum plant height (23.40, 69.90 and 111.87 cm at 30, 60 and 90 DAS respectively) whereas, T_9 recorded lowest plant (20.60, 58.53 and 92.53 cm at 30, 60 and 90DAS respectively).

The significant increase in plant height in T_6 might be due to the initial requirement of N was met from the inorganic source and subsequent requirement of N through organic source assuring continuous N supply throughout growing period which favoured the consistent N uptake by plant at different growth stage favouring increase in height (Datir *et al.* 2010) [9]. The present results are in conformity with the results of Gayathri and Sundar (2013) [10], Das *et al.* (2014) [8], Choudhury *et al.* (2015) [6] and Anand *et al.* (2016) [3] in okra.

Number of branches per plant

The data recorded on number of branches per plant at 30, 60 and 90 days after sowing (DAS) as influenced by integrated nutrient management is presented in the table 1.

The treatments did not show any significant differences with respect to number of branches per plant at all stages of growth. However, the highest number of branches per plant at 60 and 90 DAS was recorded in T_6 (3.67 and 4.67 respectively). The lowest number of branches per plant was recorded in T_9 (3.13 and 4.20 at 60 and 90 DAS).

Number of nodes per plant

The data with respect to number of nodes per plant at 30, 60 and 90 days after sowing (DAS) as influenced by integrated nutrient management is presented in Table 2.

The results indicated that there was a significant difference among the treatments with respect to number of nodes per plant at 60 and 90 DAS. The maximum number of nodes per plant was observed in T_6 (11.67 and 19.93 at 60 and 90DAS) followed by T_8 (10.60 and 18.27 at 60 and 90DAS). The minimum number of nodes per plant was recorded in T_9 (8.13 and 16.47 at 60 and 90 DAS).

The increase in number of nodes per plant in T_6 may be due to better availability and uptake of plant nutrients, more specifically N, P, K in combined application of nutrients. Thus, these increased amount of NPK nutrients in plants, lead to increase plant metabolites that help to build up plant tissues of okra (Prabhu *et al.* 2002) [16]. The present findings are in Accordance with Barani and Amburani (2004) [2], Bairwa *et al.* (2009) [5] and Kumar *et al.* (2013) [13].

Table 1: Effect of integrated nutrient management on growth parameters of okra.

Treatments	Plant height (cm)			Number of branches per plant			Number of nodes per plant		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T_1	21.13	62.38	94.47	00	3.20	4.20	4.13	8.40	17.07
T_2	21.50	65.60	97.57	00	3.33	4.27	4.20	9.00	17.60

T3	21.33	64.97	98.07	00	3.40	4.27	4.27	8.93	17.20
T_4	21.67	65.77	99.97	00	3.47	4.33	4.33	9.60	17.67
T_5	22.47	67.63	100.67	00	3.53	4.60	4.40	10.13	18.07
T_6	23.40	69.90	111.87	00	3.67	4.67	4.60	11.67	19.93
T_7	22.27	66.97	100.07	00	3.53	4.40	4.47	9.87	17.93
T_8	23.33	67.83	102.67	00	3.60	4.60	4.53	10.60	18.27
T_9	20.60	58.53	92.53	00	3.13	4.20	4.00	8.13	16.47
T_{10}	21.27	63.40	96.40	00	3.20	4.27	4.20	9.00	17.20
S.Em ±	0.57	1.97	2.57	00	0.12	0.14	0.14	0.26	0.51
CD at 5%	1.72	5.86	7.65	00	NS	NS	NS	0.79	1.54

T_1 - 75% RDF + 25% RDN through FYM (7.5 t ha^{-1}), T_2 - 75% RDF + 25% RDN through FYM (7.5t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_3 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_4 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_5 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}), T_6 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_7 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_8 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_9 - 50% RDN through FYM (15 t ha^{-1}) + 50% RDN through Vermicompost (7.5 t ha^{-1}) + AMC (12.5 kg ha^{-1}) and T_{10} - 100% Recommended dose of fertilizers (Control).

Table 2: Effect of integrated nutrient management on flowering and quality parameters of okra.

Treatments	Flowering parameters			Quality Parameters	
	Node at which first flowering	Number of days taken to first flowering	Number of days taken to 50 per cent flowering	Ascorbic acid (mg 100g $^{-1}$)	Crude protein (%)
T_1	3.93	43.40	47.40	16.24	13.83
T_2	3.27	42.33	46.60	16.63	14.32
T_3	3.60	42.60	47.00	16.40	13.97
T_4	3.27	41.73	46.13	16.80	14.45
T_5	3.13	41.40	45.60	17.17	14.81
T_6	2.73	40.20	43.87	17.18	15.25
T_7	3.20	41.67	45.87	17.21	14.65
T_8	2.80	41.27	44.40	17.30	14.93
T_9	4.13	45.87	49.27	18.95	12.45
T_{10}	3.87	43.27	47.27	15.46	13.76
S.Em ±	0.10	0.94	0.80	0.50	0.49
CD at 5%	0.30	2.80	2.38	1.51	1.48

T_1 - 75% RDF + 25% RDN through FYM (7.5 t ha^{-1}), T_2 - 75% RDF + 25% RDN through FYM (7.5t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_3 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_4 - 75% RDF + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_5 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}), T_6 - 75% RDF + 12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_7 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}), T_8 - 50% RDF + 25% RDN through FYM (7.5 t ha^{-1}) + 25% RDN through Vermicompost (3.75 t ha^{-1}) + AMC (12.5 kg ha^{-1}), T_9 - 50% RDN through FYM (15 t ha^{-1}) + 50% RDN through Vermicompost (7.5 t ha^{-1}) + AMC (12.5 kg ha^{-1}) and T_{10} - 100% Recommended dose of fertilizers (Control).

Flowering Parameters

Node at which first flowering

The data with respect to node at which first flowering as influenced by integrated nutrient management is presented in Table 2.

There was significant variation recorded among the treatments with respect to node at which first flowering. However, the least number of nodes at which first flowering (2.73) was recorded in T_6 which was on par with T_8 (2.80) which is followed by T_5 (3.13), while maximum number of nodes at which first flowering was recorded in T_9 (4.13).

The significant effect on node at which first flowering appeared might be due to integration of organic and inorganic fertilizers favoured vigorous growth of plants, which in turn helped to translocate cytokinin's as well as more quantity of available phosphorus through the xylem vessels and their accumulation in the axillary buds that would have favoured the plant to enter into reproductive phase (Dange *et al.* 2002) [7]. Similar results have also been reported by Singh *et al.* (2012) [17] and Sharma *et al.* (2014) [19] in okra.

Number of days taken to first flowering (days)

The data pertaining to number of days to first flowering as influenced by integrated nutrient management is presented in Table 2.

The results indicated that there was a significant difference among the treatments with respect to number of days to first flowering. The least number of days taken for first flowering was recorded in T_6 (40.20 days). The maximum number of days taken for first flowering was observed with T_9 treatment (45.87 days).

This could be due to nitrogen and other inputs like FYM, vermicompost and biofertilizers which encouraged the differentiation of bud resulting in earlier flowering. Earliness in days to first flowering in okra was observed with the integrated nutrient application (chemical fertilizers, organic manures and biofertilizers) by Prabhu *et al.* (2002) [16] and Mal *et al.* (2014) [14].

Number of days taken to 50 per cent flowering (days)

The data with respect to number of days to 50 per cent flowering as influenced by integrated nutrient management is presented in Table 2.

Similar to the days taken to first flowering, there was a significant difference among the treatments with respect to number of days to 50 per cent flowering. The least number of days taken to 50 per cent flowering was recorded in T_6 (43.87 days). The maximum number of days taken for first flowering was observed with T_9 treatment (49.27 days).

Earliness in days to 50 per cent flowering in T_6 might be due to the enhanced production of growth promoting substances and its positive influence on the physiological activity of the plants resulting in early flowering. The result of this study is in agreement with the Shahriazzaman *et al*. (2014) [18].

Quality Parameters

Ascorbic acid (mg 100g $^{-1}$)

The data with respect to ascorbic acid as influenced by integrated nutrient management is presented in Table 2.

The results indicated that there was a significant difference among the treatments with respect to the ascorbic acid of okra fruits. The highest ascorbic acid (18.95 mg 100g $^{-1}$) was recorded in T_9 followed by T_8 (17.30 mg 100g $^{-1}$), T_7 (17.21 mg 100g $^{-1}$), T_6 (17.18 mg 100g $^{-1}$), which were on par with each other and the lowest ascorbic acid (258.20 mg 100g $^{-1}$) was recorded in T_{10}.

In our study, ascorbic acid was significantly higher in reduced inorganics irrespective of form of organic applied or inoculation or no-inoculation with microbial consortium. The higher ascorbic acid at reduced inorganic may be due to the reason that when a plant is exposed to more of N, it increases protein content and reduces carbohydrates synthesis. Since ascorbic acid is synthesized from carbohydrates, its level is also reduced. Therefore, organic or predominately organic fed crop would be expected to contain higher ascorbic acid and less protein (Worthington, (2001) [21]. The results of the present study are in close conformity with the findings of Bahadur *et al*. (2003) [4].

Crude protein (%)

The data pertaining to crude protein as influenced by integrated nutrient management was presented in Table 2.

There was significant variation observed among the treatments with respect to crude protein. However, the maximum crude protein (15.25%) was recorded in T_6 and minimum crude protein (12.45%) was recorded in T_9.

The increase in protein content was pronounced with the higher level of inorganic form applied in combination of organic form, which favoured the intense protein synthesis and its efficient storage in presence of abundant supply of available nitrogen, protein content was increased significantly by the application of inorganic fertilizers with different organic manures (Gayathri and Krishnaveni, 2015) [11]. Highest protein content in treatment receiving conjunction of inorganic fertilizers and organic manures was found by Yadav *et al*. (2006) [22] and Wagh *et al*. (2014) [20] in okra.

Conclusion

In the present investigation, supplementation of FYM, vermicompost and biofertilizers along with reduced level of chemical fertilizers improved growth, flowering and quality parameters of okra. It is recommended to make integrated use of inorganic (75% RDF), organic [12.5% RDN through FYM (3.75 t ha^{-1}) + 12.5% RDN through Vermicompost (1.875 t ha^{-1})] and biofertilizer (Arka Microbial Consortium) for okra cultivation.

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References

1. Adeboye OC, Oputa CO. Effects of galex on growth and fruit nutrient composition of okra [*Abelmoschus esculentus* (L.) Moench]. Life Journal of Agriculture 1996;18(2):1-9.
2. Amburani A, Barani P. Influence of vermicomposting on major nutrients in Bhendi (*Abelmoschus esculentus* (L.) Moench) var. Arka Anamika. South Indian Horti J 2004;52(1-6):351-354.
3. Anand B, Kadam AS. Okra crop growth and yield responses to different organic sources of nitrogen. International Journal of Agricultural Sciences 2016;8(48):2042-2044.
4. Bahadur A, Singh J, Upadhyay AK, Singh KP. Effect of organic manures and biofertilizers on growth, yield and quality attributes of broccoli. Vegetable Science 2003;30(2):192-194.
5. Bairwa HL, Shukla AK, Mahawer LN, Kaushik RA, Shukla KB, Ameta KD. Response of Integrated Nutrient Management on Yield, Quality and Physio-chemical Characteristics of okra cv. Arka Anamika. Ind. J Hort 2009;66(3,9):3-9.
6. Choudhary K, More SJ, Bhanderi DR. Impact of bio-fertilizers and chemical fertilizers on growth and yield of okra (*Abelmoschus esculentus* (L.) Moench). Journal of Environmental Science 2015;9(1&2):67-70.
7. Dange RG, Naik DM, Prabu T. Effect of organic and inorganic fertilizers on growth, yield and quality of chilli (*Capsicum annum* L.). South Indian Horticulture 2002;50:578-583.
8. Das AK, Prasad B, Singh R. Response of chemical fertilizer and vermicompost on okra (*Abelmoschus esculentus* L.) cv. Parbhani Kranti. The Asian J of Horti 2014;9(2):372-376.
9. Datir RB, Laware SL, Apparao BJ. Effect of organically chelated micronutrients on growth and productivity in okra. Asian J Exp. Biol. Sci. Spl 2010;115-117.
10. Gayathri K, Sundar PR. Effect of integrated nutrient management growth and yield of okra (*Abelmoschus esculentus* (L). Moench) *cv.* Arka Anamika. Veg. Sci 2013;40(2):246-248.
11. Gayathri K, Krishnaveni K. Effect of organic manures and inorganic fertilizers on certain quality parameters of okra [*Abelmoschus esculentus* (L.) Moench] CV. Arka Anamika. Adv. Res. J Crop Imp 2015;6(2):116-118
12. Kumar R, Patil MB, Patil SR, Paschapur MS. Evaluation of okra (*Abelmoschus esculentus*) mucilage as paracetamol suspension. International Journal of Pharmacy and Technology 2009;1:658-665.
13. Kumar T, Kumar M, Singh MK, Kumar A, Kumar S, Singh BM. Impact of integrated nutrient management (INM) on growth and economic yield of okra. Ann. Hort 2013;6(1):107-114.
14. Mal B, Mahapatra P, Mohanty S, Mishra. Growth and yield parameters of okra (*Abelmoschus esculentus* L., Moench) influenced by Diazotrophs and chemical fertilizers. J Crop. Weed 2014;9(2):109-112.
15. Markose BL, Peter V. Review of research on vegetable and tuber crops. Technical Bulletin 16. Mannuthy, Kerala Agricultural University Press 1990.
16. Prabhu T, Narwadkar PR, Sajindranath AK, Bhore MR. Effect of integrated nutrient management on yield and

quality of okra (*Abelmoschus esculentus* (L.) Moench) cv. Parbhani Kranti. Gujarat. J Applied Hort 2002;2(2):28-33.
17. Singh SK, Kumar S, Yadav YC, Kumar A. Effect of NPK levels on growth, yield and quality of okra cv. Arka Anamika. Horticulture flora Research Spectrum 2012;1(2):190-192.
18. Shahriazzaman MC, Mazed HEMK, Pulok MAI, Mehraj H, Jamaluddin AFM. Responses of Organic Manures on Growth and Yield of Okra (*Abelmoschus esculentus*). Journal of Science, Technology & Environment Informatics 2014;01(02):60–67.
19. Sharma DP, Prajapati J, Tiwari A. Effect of NPK, vermicompost and vermiwash on growth and yield of Okra. International Journal of Basic and Applied Agricultural Research 2014;12(1):5-8.
20. Wagh SS, Laharia GS, Iratkar AG, Gajare AS. Effect of INM on Nutrient Uptake, Yield and Quality of Okra (*Abelmoschus esculentus* (L.) Moench). Asian J Soil Sci 2014;9(1):21-24.
21. Worthington V. Nutritional quality of organic versus conventional fruits, vegetables, and grains. Journal of Alternative and Complementary Medicine 2001;7(2):161-173.
22. Yadav P, Singh P, Yadav RL. Effect of organic manures and nitrogen levels on growth, yield and quality of okra. Indian Journal of Horticulture 2006;63(2):215-217.