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Effect of organic, inorganic and bio-fertilizers on biochemical aspects of "Kashi Pragati" a standard cultivar of okra. [*Abelmoschus esculentus* (L.) Moench]

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Abstract
A field experiment was conducted at the Horticulture Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India during the year 2016-1017, A field experiment was conducted to study the response of chemical fertilizers on certain quality parameters like Total soluble solids (T.S.S.), Ascorbic acid, Total Sugars, Reducing Sugar and Non Reducing Sugar of okra (*Abelmoschus esculentus* L.) var. Kashi Pragati. The experiment was carried under Randomized Block Design (RBD) with three replications. A single standard variety (kashi pragati) released from IIVR Varanasi is sown with the different treatment combinations. The treatment combinations were T1 (control), T2 (FYM), T3 (Vermicompost), T4 (Neemcake), T5 (50% RDF+FYM), T6 (50%RDF+Vermicompost), T7 (50%RDF+Neemcake), T8 (75% RDF+FYM), T9 (75%RDF+Vermicompost), T10 (75%RDF+Neemcake), T11 (50%RDF+Azotobacter), T12 (50%RDF+PSB), T13 (50%RDF+VAM), T14 (75%RDF+Azotobacter), T15 (75%RDF+PSB), T16 (5%RDF+VAM). Performance with respect to yield and yield Attributing characters was best in the treatment T6 (50%RDF+ Vermicompost) and the poor performance was in T1 (Control) Treatment. On the basis of overall performance under the present investigation, it may be concluded that the application of 50% RDF+Vermicompost in Kashi Pragati increased the Growth, Yield and Nutritional Quality of Okra under Lucknow condition.

Keywords: Okra, cultivar, yield, farm yard manure (FYM), randomized block design (RBD) and quality

Introduction
Okra [*Abelmoschus esculentus* (L). Moench] is one of the most important vegetable crop in India and grown over a wide range of soil and climatic condition. It is a warm season crop and prefers a temperature between 22°C and 35°C. Okra is susceptible to frost at temperatures below 12°C Okra or Bhindi [*Abelmoschus esculentus* (L). Moench] belongs to the family Malvaceae having chromosome number 2n=2X=130 and originated in Tropical Africa. It is a warm season crop. It is also a chief vegetable crop grown for its immature pods that can be consumed as a fried or boiled vegetable or may be added to salads, soups and stews (Kashif *et al*., 2008) [7] Effect of plant population and nitrogen rates on growth and yield of okra [*Abelmoschus esculentus* (L). Moench] in Gambella region, Western Ethiopia. African Journal of Agricultural Research Okra requires heavy Manuring for its potential production and good quality green pods. However, the use of expensive commercial fertilizers as per requirements of the crop is not much affordable to the average Farmers. All parts of okra (Ladies' fingers) likes fresh leaves, buds, flowers, pods, stems and seeds can be used for different purpose and hence it is a multipurpose crop in term of its use (Gemede *et al* 2015) [4]. Okra is rich source of Iodine. And type of fruit found is capsule. Mucilage present in Okra fruit is polysaccharides i.e galacturonic and glucuronic acids. The mucilage found in okra may be used for plasma replacement or blood expender (Madison D 2008 and Maramag RP 2013) [9]. Nitrogen is a single most important nutrient which contributes to the proper growth of plant and yield. Organic manures improve the quality of green pods. Therefore, the applications of plant nutrients through organic sources like compost, farm yard manure and bio- fertilizers remains the alternative choice of the growers. For maintaining its sustainable production. The production and productivity of okra is seriously affected due to the use of low yielder local

varieties, sub optimal plant density, inappropriate planting date, and decline in soil fertility and a decreased use of organic amendments, heavy attack of various insect pests and weeds (Akanbi *et al*., 2010) [1]. Because of its richness in nutrition, taste, medicinal and industrial value okra is one of the most popular vegetables in all section of people. Immature okra fruits commonly consumed as a vegetable. The fruit composition is enriched with about 88 IU of vitamins and as high as 300 mg of different minerals per 100 g edible portion (Aykroyd, 1963) [2]. Nutrients added through combined inorganic and organic sources are better utilized than inorganic alone, besides reducing cost of production and maintaining the soil health (Sarvanan*et al*., 1986) [12]. However, nitrogen availability to plants depends on the source, soil type, and environmental conditions, which may affect crop performance (Salazar *et al*., 2011) [15]. A greenhouse study conducted by Ufere N. Uka *et al* (2013) [18] concluded that application of organic manure like cow dung and poultry manure gave better growth. Use of High Yielding Variety (HYV) and intensive agriculture depleted the nutrient status of the soil. Excessive use of chemical fertilizers to obtain high yield resulted in several hazards to the soil, deficiency of micronutrients (Kanwar and Randhawa, 1978) [5] and nutrient imbalance (Singh *et al.*, 1989) [16], ultimately resulting in the reduction of crop yield. A study conducted by K. Padma Priya (2015) [11] showed that the co-inoculation of Azospirillum and Phosphate solubilizing bacteria improved soil characters, plant growth and yield. Fertilizers are generally applied to improve the crop yield, nutritional quality and aesthetic value of crops. Among the manures, vermicompost is being a stable fine granular organic matter, when added to soil, it loosens the soil and improves the passage to the entry of air. Azotobactor is free living bacteria. It has been reported to fix 20 kg N ha-1 in field of non legume crop and also secretes some growth promoting substances. The most feasible and economically viable fertilizer package is one which improves the crop yield with ought deterioration soil health.

Material method

The field experiment with okra, cv. Kashi pragati was conducted from September to December 2016 at the Horticultural Research Farm, Department of Horticulture, at Babasaheb Bhimrao Ambedkar University Lucknow U.P. The design followed was Randomized Block Design with 16 treatments and three replications. The treatments included recommended dose of T1 (Control), T2 (FYM), T3 (Vermicompost), T4 (Neemcake), T5 (50%RDF+FYM), T6 (50%RDF+Vermicompost), T7 (50%RDF+Neemcake), T8 (75%RDF+FYM), T9 (75%RDF+ Vermicompost), T10 (75%RDF+Neemcake), T11 (50%RDF+Azotobacter), T12 (50%RDF+PSB), T13 (50%RDF+VAM), T14 (75%RDF+Azotobacter), T15 (75%RDF+PSB) and T16 (75%RDF+ VAM). The land was brought to a fine tilth through ploughing and tillage. Irrigation channels and bunds were maintained properly. The crop was raised with a spacing of 60 cm × 30 cm and plot size of 2.40m X 1.5($3.6m^2$). The seeds were sown directly to the field. Light irrigation was given after sowing. The organic manures were applied as basal dose before sowing, for proper decomposition, full dose of phosphorus and potassium and half dose of nitrogen as per treatment were applied just before the sowing. The remaining half dose of nitrogen was applied 30 days after sowing Standard cultural practices recommended for Okra was followed uniformly for all the experimental plots. The quality parameters were recorded in the five randomly selected plants in each plot were tagged to arrive mean values. Fibre content of the pod was estimated as per the procedure given by (Ranganna, 1986) [13]. For estimating ascorbic acid content in pods one gram of sample was blended with 3 per cent meta phosphoric acid and then made up to 100 ml and filtered. From the filterate, 10 ml sample was pipetted into conical flask and titrated with the standard dye to a pink end point (Ranganna, 1986) [13]. Observations were recorded on bio-chemical parameters i.e. i.e Total Soluble Solids (^{0}Brix), Ascorbic acid, Reducing sugar, Non reducing sugar and Total Sugars. The data on these parameters were subjected to statistical analysis to draw logical conclusions.

Result and discussion

The results obtained from the present investigation are presented in Table 1.

"Effect of Organic, Inorganic and Biofertilizers on chemical aspects of Okra [*Abelmoschus esculentus* (L). Moench]" presented in Table 1.

Table 1

Treatments	T.S.S (^{0}Brix)	Ascorbic acid	Reducing sugar (%)	Non reducing sugar (%)	Total sugar (%)
T1	7.18	14.59	21.14	8.85	1.65
T2	7.45	15.14	21.93	9.18	1.72
T3	7.65	15.77	22.86	9.58	1.78
T4	8.48	17.23	26.24	10.99	1.95
T5	8.54	17.35	26.40	11.05	1.96
T6	10.05	20.41	30.28	12.68	2.31
T7	9.11	18.52	27.24	11.41	2.09
T8	9.27	18.83	28.15	11.79	2.13
T9	9.37	19.04	28.41	11.90	2.15
T10	9.52	19.34	28.88	12.09	2.19
T11	9.57	19.45	29.02	12.15	2.20
T12	9.75	19.80	29.10	12.18	2.24
T13	9.81	19.92	29.25	12.25	2.25
T14	9.93	20.17	29.35	12.29	2.29
T15	9.84	20.20	29.50	12.36	2.30
T16	8.79	17.86	25.88	11.06	2.02
S.E(d)	0.50	0.88	0.64	0.64	0.18
C.D	1.02	1.81	1.32	1.30	0.38

The perusal data (table 1) of result indicated that okra plants fertilized with integrated nutrient management. Among the treatments the maximum biochemical parameters growth in terms of T.S.S is T6 (50%RDF+Vermicompost) performed best (10.05), same as respectively Ascorbic acid (20.41), total sugar (2.31), reducing sugar (30.28), Non reducing sugar (12.68). The minimum values for all above biochemical parameters were found in T1 (control). These results are closely confined with the findings of Obaji (2002) [4]; Patil *et al*. (2003) [5] and Bairwa *et al*. (2009) [2]. The reduction in ascorbic acid content by the application of inorganic fertilizer was reported by (Karitonas *et al*., 2001) [8] Organic sources of nutrients gave better quality parameters than inorganic sources. These results are supported by (Mahendran and Kumar, 1997) [10]. Surekha and Rao (2001) [17] also showed that organic amendment was effective in bringing down population of aphids in okra. Prakash *et al*. (2002) [12] also showed lower percentages of fruit borer infestation in okra when treated with organic fertilizer. The reduction in ascorbic acid content by the applicationof inorganic fertilizer was reported by (Karitonas *et al*., 2001) [6].

Conclusion

Thus on the basis of present investigation, it could be concluded that the okra var. Kashi Pragati performed well with respect to growth, yield, quality and net profit by the application of (50%RDF+Vermicompost) for highest yield per plot as well as yield per/ha.

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