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B Mishra
Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

GS Sahu
Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

P Tripathy
Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

S Mohanty
Department of soil Science, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

B Pradhan
Department of Plant Breeding and Genetics, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Corresponding Author:
B Mishra
Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Impact of organic and inorganic fertilizers on growth, yield, nutrient uptake and soil fertility in okra (*Abelmoschus esculentus* (L.) Moench) cv. Pusa A-4

B Mishra, GS Sahu, P Tripathy, S Mohanty and B Pradhan

Abstract
A field experiment was conducted at the instructional farm of Krishi Vigyan Kendra Jajpur, Odisha during 2016 to study the "impact of organic and inorganic fertilizers on growth, yield, nutrient uptake and soil fertility in okra" variety-Pusa A4. From the experiment it was observed that application of RDF (75%) + (25%) N through neem oil cake (T_7) produced maximum plant height (136.41cm), number of leaves/plant (20.98), leaf area (321.52cm^2), minimum days to first flowering (36.1), minimum days to 50% flowering (45.2), minimum days to first harvest (41.2), number of fruits/ plant (15.02) and maximum Yield (10.49 t/ha) followed by T_5 where RDF (75%) + (25%) N through vermicompost were applied. RDF was 110:50:80 NPK kg/ha. Highest uptake of nitrogen (68.48 kg/ha), Phosphorus (20.92 kg/ha), Potassium (64.82 kg/ha) were recorded in T_7 where RDF (75%) + (25%) N through neem oil cake were applied. Highest post-harvest available nitrogen (338 kg/ha), phosphorus (28.4 kg/ha), potassium (276 kg/ha) were found in T_{11} where 25% N through FYM + 25% N through vermicompost+25% N through poultry manure+25% N through neem oil cake were applied. Whereas, lowest post-harvest available nitrogen (298 kg/ha), phosphorus (14.4 kg/ha), potassium (227 kg/ha) were found was observed in T_7.

Keywords: INM, growth, yield, Neem oil cake, Vermicompost, nutrient uptake and Okra.

1. Introduction

Okra, (*Abelmoschus esculentus* (L). Moench) is a popular fruit vegetable grown round the year and fetches premium price in the market. It is one of the most important vegetable crop grown in tropical and subtropical region of the world belongs to family Malvaceae (2n= 130). It is cultivated in 0.509 M ha. area with production of 6.09 MT. in India (NHB,2017-18).

Besides the utility of its tender green fruits as vegetable, it is used in soups and curries. Okra fruits are canned green or dried for use by army at high altitudes and are also exported helping in earning foreign exchange. In Odisha okra is grown all the thirty districts as a main crop in summer and rainy season and to some extent also in winter and also fetches premium prices in the market. The production of okra is comparatively low due to injudicious application of inorganic and organic fertilizers and high incidence of disease and pest. Nutritional imbalances in the soil cause instability in productivity and hidden hunger of nutrient besides resulting in poor nutritional quality of vegetable. The maintenance of sustainability in production through integrated use of different sources of nutrients also help to maintain the fertility of soil and avoids depletion of soil organic matter and plant nutrients besides suppression of some insect, pest and diseases. Integrated nutrient management (INM) system envisages use of organic manures, green manures, bio-fertilizers along with chemical fertilizers. From the stand point of crop yield and quality, nutrient supply from both organic and inorganic sources is important. The INM help to store and sustain soil fertility and crop productivity. It may also help to check the emerging deficiency of nutrient other than N, P and K. In the present Indian Agriculture, keeping in view the inadequate availability of organic sources of nutrients and expected yield decline at least in the initial years, complete substitution of chemical fertilizer is not necessarily warranted. Rather organic sources should be used as partial replacement of the chemical fertilizer. Thus, a strategy for judicious combination of both organic and inorganic sources of nutrient is the most viable option for nutrient management in okra. It will be economically viable and also help in attaining sustainability in production and maintaining soil health and environment. The use of organic amendments applied to soil not only enhances its nutrient status but also reduces the incidence of pest. (Adilakshmi *et al*., 2008) [1].

Materials and methods

A field experiment was conducted at the instructional farm of Krishi Vigyan Kendra Jajpur, Odisha during 2016 to study the impact of organic and inorganic fertilizers on growth, yield, nutrient uptake and soil fertility in okra, variety-Pusa A4. The experiment was laid out in randomized block design (RBD) with three replications and twelve treatments. Treatments involved were T_1 (100% RDF), T_2 (100% RDF + FYM 1.5 t / ha), T_3 (RDF (75%) + *Azotobacter* + *Azospirillum* + PSB (2kg/ha each), T_4 (RDF (75%) + (25%) N through FYM), T_5 (RDF (75%) + (25%) N through vermicompost), T_6 (RDF (75%) + (25%) N through poultry manure), T_7 (RDF (75%) + (25%) N through neem oil cake), T_8 (RDF (50%) + (25%) N through FYM + (25%) N through vermicompost), T_9 (RDF (50%) + (25%) N through FYM + (25%) N through poultry manure), T_{10} (RDF (50%) + (25%) N through FYM + (25%) N through neem oil cake), T_{11} (25% N through FYM + 25% N through vermicompost + 25% N through poultry manure + 25% N through neem oil cake), T_{12} (25% N through FYM + 25% N through vermicompost + 25% N through poultry manure + 25% N through neem oil cake + sea weed extract 15kg/ha), where RDF was recommended dose of fertilizers (110:50:80 NPK kg/ha.). The land was brought to a fine tilth through ploughing and tillage. Irrigation channels and bunds were prepared according to layout. The seeds were soaked overnight and sown in the field directly. Light irrigation was given just after sowing of seeds. Organic manures were applied one week before sowing. Full dose of phosphorus, potassium and half dose of nitrogen as per treatments were applied just before sowing. The remaining half dose of nitrogen was applied twenty five days after sowing. All cultural practices were followed regularly during crop growth and observations were recorded on yield and yield attributing characters. The data on these parameters were subjected to statistical analysis to draw logical conclusions.

Results and discussion

Growth and yield parameters

From the experiment it was observed that plant height, number of leaves per plant, leaf area, days to first flowering, days to 50% flowering, days to first harvest, number of fruits per plant and Yield differed significantly due to various treatments. Application of RDF (75%) + (25%) N through neem oil cake (T_7) produced maximum plant height (136.41cm), number of leaves per plant (20.98), leaf area (321.52cm^2), minimum days to first flowering (36.1), minimum days to 50% flowering (45.2), minimum days to first harvest(41.2), maximum number of fruits/ plant (15.02) followed by T_5 where RDF (75%) + (25%) N through vermicompost were applied. It was due to supply of 75% RDF through chemical fertilizer and 25% RDF through neem oil cake which resulted in less incidence of sucking pest and disease occurrence for which the source- sink relation and photosynthesis was somewhat normal resulting in increase in plant height. Initial requirement of N was met from the inorganic source and subsequent requirement of N from organic source assuring continuous N supply throughout growing period favored consistent N uptake by plant at different growth stage favoring increase in height, number of leaves per plant, leaf area. The present findings are coroborated with the findings of Shelar (2011) [14], Ghuge *et al*. (2015) [7], Anand *et al*. (2016) [3]. Combined effect of chemical fertilizers along with neem oil cake helped to absorb nutrients which was utilized for early initiation of the flowering bud and ultimately develop more flower within a shortest possible period. The present findings are in conformity with the reports of Kumar *et al*. (2017) [9]. Availability of nutrients helps the plant to bear more number of flower and reduces the chances of flower drop resulting in more number of fruits per plant. Similar result was obtained by Bairwa *et al*. (2009) [4].

Fruit yield was found to be maximum with T_7 (10.49 t/ha) receiving 75% RDF + 25% N through neem oil cake which was at par with (T_5) 75% RDF + 25% N through vermicompost (9.85 t/ha) and was found minimum in T_{11} (7.30 t/ha) where only organic fertilizers were applied Application of neem oil cake along with chemical fertilizer significantly increased the number of fruits per plant, fruit weight which result in increasing yield. This is due to the better availability and uptake of plant nutrients for a longer time of crop growth due to neem cake as compared to other combination of fertilizer. The application of neem cake not only increased the N status of soil but also improved the rate of multiplication of beneficial microorganism, which in turn helped in the decomposition of applied manures. Similar findings were obtained by Adilakshmi *et al*. (2008) [1] Tripathy *et al*. (2008) [16], Sachan *et al*. (2017) [15] and Singh *et al*. (2018) [11].

Soil parameters

Nutrient uptake by okra plant as well as post harvest availability of N, P_2O_5, K_2O significantly influenced by different treatments is shown in Table 2. Highest uptake of nitrogen (68.48 kg/ha), Phosphorus (20.92kg/ha), Potassium (64.82kg/ha) were recorded in T_7 where RDF (75%)+ (25%) N through neem oil cake were applied. This might be due to the solubilization of organic acids produced during decomposition of organic manures (neem oil cake) improved aeration and root proliferation which helped in increased uptake. Moreover better nutritional atmosphere of rhizosphere with respect to nutrients might have increased nutrient uptake (Khankhana and Yadav, 2003) [8]. Similar findings were obtained by Barani and Amburani (2002) [5], Sharma *et al*. (2009) [13], Wagh *et al*. (2014) [17] and Amiry *et al*., (2018) [2]. Highest post harvest availability of N (338 kg/ha), P_2O_5 (28.4 kg/ha), K_2O (276 kg/ha) were found in T_{11} where 25% N through FYM + 25% N through vermicompost + 25% N through poultry manure + 25% N through neem oil cake were applied. Whereas, lowest post harvest availability of N (298 kg/ha), P_2O_5 (14.4 kg/ha), K_2O (227 kg/ha) were found in T_7. The lower content of available nitrogen in soil might be due to higher uptake of nutrients by the plants. The use of neem oil cake and vermicompost might have supplied an addition dose of N besides causing an improvement in microbial activity, stabilization of soil structure and associated benefits. It was also observed that the available nitrogen content after harvest of crop due to its high uptake, decreased but, has maintained the available nitrogen in soil sufficiently at higher level indicating slow and steady release of nitrogen which is essential for sustainable soil fertility and productivity. The present findings corroborate with Salvi *et al*. (2015) [12]. The increase in available P might be due to the mineralization of insoluble compounds through action of organic acids released during the decomposition of organic manure. The present findings is in accordance with same type of result were reported by Sharma *et al*. (2009) [13]. The increase in the availability of K through addition of organic manure was also reported by Choudhary *et al*. (2015) [6], Kumar *et al*. (2017) [9] and Amiry *et al*. (2018) [2].

Table 1: Impact of organic and inorganic fertilizers on growth, yield in okra

Treatment	Plant height (cm)	No. of leaves/ plant	Leaf area (cm^2)	Days to first flowering	Days to 50% flowering	Days to first harvest	No. of Fruits/ plant	Yield/ha (ton)
T_1	118.32	18.02	276.84	39.1	47.8	43.2	12.96	8.72
T_2	121.3	18.18	298.78	37.2	46.1	42.1	13.61	9.52
T_3	107.23	16.52	256.18	39.8	49.4	44.4	11.45	8.27
T_4	116.24	17.26	236.86	38.2	48.4	43.8	12.48	8.58
T_5	134.62	20.46	281.23	38.8	48.2	43.1	14.69	9.85
T_6	119.2	17.12	243.64	38.9	48.1	44.2	13.21	8.99
T_7	136.41	20.98	321.52	36.1	45.2	41.2	15.02	10.49
T_8	121.45	17.94	238.46	37.9	47.4	43.2	12.86	8.62
T_9	112.22	18.26	302.18	38.2	47.6	43.8	12.20	8.35
T_{10}	132.82	19.44	301.36	37.1	46.8	42.4	14.45	9.65
T_{11}	102.35	16.82	218.72	40.2	50.2	45.2	10.72	7.30
T_{12}	105.29	16.64	266.32	40.3	51.4	45.2	11.15	7.49
SE(m)±	4.18	0.51	15.90	0.58	0.75	0.62	0.38	0.31
CD(0.05)	12.25	1.50	46.64	1.69	2.20	1.82	1.12	0.91

Table 2: Impact of organic and inorganic fertilizers on nutrient uptake and soil fertility in okra

Treatment	Nutrient uptake (kg/ha)			Post-harvest soil availability of nutrients (kg/ha)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T_1	53.21	12.42	45.76	318	21.8	257
T_2	56.62	14.91	53.67	311	17.3	242
T_3	43.18	8.68	35.98	326	25.2	269
T_4	47.80	10.56	40.13	327	23.5	264
T_5	64.32	18.67	61.21	307	15.6	229
T_6	54.12	13.72	48.64	316	19.2	256
T_7	68.48	20.92	64.82	298	14.4	227
T_8	49.42	11.67	42.26	321	22.7	259
T_9	45.34	9.79	38.95	331	24.4	267
T_{10}	63.22	16.89	55.54	308	16.3	238
T_{11}	36.45	7.23	29.63	338	28.4	276
T_{12}	39.64	7.65	31.36	334	27.4	272
SE(m)±	1.38	0.50	1.43	4.74	1.08	5.22
CD(0.05)	4.04	1.45	4.18	13.89	3.18	15.32

Conclusion

From the experimental result it was observed that integrated application of 75% RDF in the form of chemical fertilizers and 25% N through neem oil cake was found best in producing more plant height, more number of leaves, maximum leaf area, minimum days to first flowering, 50% flowering, minimum days to first harvest, more number of fruits per plant with higher yield followed by T_5 where 75% RDF in the form of chemical fertilizers and 25% N through vermicompost were applied. It also improved the soil health. Therefore, T_7 has been considered as best treatment for sustainable production, higher profit can be adopted under field condition.

References

1. Adilakshmi A, Korat DM, Vaishnav PR. Effect of organic manures and inorganic fertilizers on insect pests infesting okra. Karnataka Journal of Agricultural Sciences. 2008; 21(2): 287-289.
2. Amiry Mohammad Nader, Anjanappa M, Ibaad MH, Indiresh KM, Patil S, Anil kumar S *et al*. Influence of integrated nutrient management on soil nutrient status, nutrient uptake and quality of okra (*Abelmoschus esculentus* (L.) Moench.) cv. Arka Anamika under drip irrigation. International Journal of Pure & Applied Bioscience. 2018; 6(1):1012-1015.
3. Anand Ballal, Kadam AS. Okra crop growth and yield responses to different organic sources of nitrogen. International Journal of Agricultural Science. 2016; 8(48):2042-2044.
4. Bairwa HL, Shukla AK, Mahawer LN, Kaushik RA, Shukla KB, Ameta KD *et al*. Response of integrated nutrient management on yield, quality and physio-chemical characteristics of okra cv. Arka Anamika. Indian Journal of Horticulture. 2009; 66(3):310-314.
5. Barani P, Amburani A. Influence of vermicomposting on major nutrients in bhendi (*Abelmoschus esculentus* L. Moench). var. Arka Anamika, South Indian Horticulture. 2004; 52(1-6):351-354.
6. Choudhary K, More SJ, Bhandevi DR. Impact of Biofertilizers and chemical fertilizers on growth and yield of okra (*Abelmoschus esculentus* L. Moench). The Ecoscan. 2015; 9(1-2):67-70.
7. Ghuge MB, Lekhi R, Karcho S, Kumar A. Influence of integrated nutrient management on growth and seed yield of okra (*Abelmoschus esculentus* L. Monech) cv. VRO-6. Environment and Ecology. 2015; 83(3):1073-1076.
8. Khankhana PJ, Yadav BP. Comparative manurial performance of FYM, biogas slurry and sewage sludge. Annals of Agricultural Research. 2003; 24(1):148-150.
9. Kumar V, Saikia Jumi, Nath DJ. Effect of integrated nutrient management on growth, yield and quality of okra (*Abelmoschus esculentus* (L). Moench cv. Arka Anamika. International Journal of chemical Studies. 2017; 5(5):2001-2003.
10. National Horticulture Board, 2017-18.
11. Sachan S, Singh D, Kasera S, Mishra SK, Tripathi Y, Mishra V *et al*. Integrated Nutrient Management (INM) in Okra(*Abelmoschus esculentus* (L.) Moench) for Better Growth and Higher Yield. Journal of Pharmacognosy and Phytochemistry. 2017; 6(5):1854-1856.
12. Salvi VG, Manalshinde, Bhureand, MH Khanvikar. Effect of integrated nutrient management on soil fertility and yield of okra in coastal region of Maharashtra. An Asian Journal of Soil Science. 2015; 10(2):201-209.
13. Sharma RP, Datt N, Chander G. Effect of vermicompost, farm yard manure and chemical fertilizers on yield, nutrient uptake and soil fertility in okra (*Abelmoschus esculentus*)-onion (*Allium cepa*) sequence in wet temperate zone of Himachal Pradesh. Journal of Indian Society of Soil Science. 2009; 57(3):357-361.
14. Shelar RB, Kadam AS, Patil VK, Narsude PB. Studies on effect of different sources of nitrogen on growth and yield of okra (*Abelmoschus esculentus* L. Moench).

International Journal of Agricultural Science. 2011; 7(1):70-73.
15. Singh Smriti, Ram RB. Biochemical study on Kashi Pragati of Okra cultivar in respect with organic, inorganic and Biofertilizers. Current Journal of Applied Science and Technology. 2018; 27(5):1-5.
16. Tripathy P, Maity TK. Impact of integrated nutrient management on fruit quality and yield of okra hybrids. Crop Research. 2008; 37(1-3):101-106.
17. Wagh SS, Laharia GS, Iratakar AG, Gajare AS. Effect of INM on nutrient uptake, yield and quality of okra (*Abelmoschus esculentus* L. Moench. An Asian Journal of Soil Science. 2014; 9(1):21-24.