Effect of integrated nutrient management (INM) on economics of okra (*Abelmoschus esculentus* L) cultivation

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ABSTRACT

The present investigations were conducted at Research Farm, Rama University, Kanpur, Uttar Pradesh in 2018. Total 11 treatments, each replicated three times were applied and the experiment was laid out in randomized block design. The highest gross return (Rs 35,166/ha), net return (Rs 18,934/ha) and benefit-cost ratio (2.17) were recorded in the treatment comprising 50 per cent recommended dose of inorganic fertilizers + 50 per cent N through vermicompost as compared to all other treatments. The total cost of cultivation in this case was Rs 16,232. Thus for integrated nutrient management in okra the 50 per cent recommended dose of inorganic fertilizers + 50 per cent N through vermicompost could be recommended.

Keywords: Economics; INM; cultivation; okra; returns; fertilizer

INTRODUCTION

Okra (*Abelmoschus esculentus* L), commonly known as lady's finger belonging to the family Malvaceae is one of the important summer vegetables grown widely in sub-tropical region of the world for its tender pods. Okra is one of the most important vegetable crops grown extensively throughout the country during summer and rainy seasons due to its high adaptability over a wide range of environmental conditions. It is one of the economically important vegetable crops grown in India especially in southern states. It is widely adapted vegetable in Indian kitchens and can be grown throughout the year.

A strategy for judicious combination of both organic and inorganic sources of nutrients is the most viable option for nutrient management. It is environmentally safe and economically viable and also helps in attaining sustainability in production by maintaining the soil health and environment. Okra being a short duration vegetable crop, its growth, yield and quality are largely influenced by the application of fertilizers. It requires proper and sufficient N, P and K for regular fruiting and subsequent pickings (Premsekhar and Rajashree 2009). It is well known fact that organic manures, inorganic fertilizers and micronutrients are essential to increase the yield of vegetable crops. Day by day the cost of fertilizers has been going up and ultimately farmers receive only a marginal profit. Owing to increased cost of fertilizers, their short supply and sustainability issues it is felt essential to reduce the dependence on chemical fertilizers. Therefore it is imperative that chemical fertilizers, organic manures as well as micronutrients are utilized properly and effectively not only as source of nutrients but also for increasing nutrient use efficiency without adversely disturbing the soil health.

Under integrated nutrient management (INM) in bhendi Kumar et al (2017) recorded the highest number of branches per plant (1.80), leaves per plant (14.66), leaf area index (1.36), chlorophyll content of leaf (0.210 mg/g), fruit length (14.62 cm), fruit girth (4.64 cm), fruit weight (12.56 g), fruit yield per plant (190.96 g) with the B-C ratio of 3.89 with the application of recommended dose of fertilizer (RDF) (50:50:50 kg NPK/ha + FYM @ 10 tonne/ha).

Sachan et al (2017) studied the growth, yield and quality of okra as influenced by the INM using 12 treatments. The treatment NPK 75 per cent + FYM

2.5 tonnes/ha + poultry manure 2.5 tonnes/ha + vermicompost 2.5 tonnes/ha was found best among all the treatments at all successive growth stages in almost all the traits viz plant height (154.0 cm), number of branches per plant (4.91), fresh weight of plant (17.11 tonnes/ha) and dry weight of plant (2267.67 kg/ha) as growth parameters whereas number of pods per plant (12.44), single pod weight (15.17 g), length of pods (11.58 cm), dry weight of pods (1039.33 kg/ha) and total pod yield (14.29 tonnes/ha) as yield related traits and protein content (16.61%) and TSS (2.44°Brix) as quality parameters.

Kumar et al (2013) studied the integrated nutrient management in okra applying twenty seven treatments. The treatment comprising 75 kg N + 40 kg P_2O_5 + 40 kg K_2O + 5 tonnes vermicompost + 20 kg $ZnSo_4$/ha gave maximum plant height (84.70 cm), number of nodes (18.94), number of pods per plant (15.07), length of pod (14.31 cm), diameter of pod (1.69 cm), fresh weight of the plant (352.24 g), dry weight of the plant (286.14 g) and yield of green pods (72 g/plant). Gross income of Rs 58,600, net return of Rs 25,677 and cost-benefit ratio of 1:0.77 were also recorded in the same treatment.

Singh et al (2018) studied the integrated effect of bio-inoculants, organic and chemical fertilizers on growth, yield and economics of okra involving sixteen treatments. The results revealed that the application of 75 per cent recommended dose of N through chemical fertilizers + 25 per cent N through vermicompost + *Azotobacter* 20 g/kg + phosphate solubilising bacteria 20 g/kg of seed influenced most of the characteristics significantly and recorded the highest values of plant height, number of branches per plant, fruit length, average fruit weight, number of fruits per plant, yield per hectare and B-C ratio (1.62). The quality parameters viz the ascorbic acid, TSS and crude protein content in fruit were also highest in the same treatment.

Yadav et al (2016) conducted a field experiment to evaluate the integrated nutrient management in okra. Among 10 treatments under study 75 per cent RDF + 25 per cent vermicompost + Biogen recorded maximum values for TSS (2.71%) and fiber content (1.75 g), maximum total yield per hectare (46.09 q), net return per hectare (Rs 76,915.75) and cost-benefit ratio (1:3.00).

MATERIAL and METHODS

The present investigations were conducted at research farm of the Faculty of Agriculture and Allied Industries, Rama University, Kanpur, Uttar Pradesh during rabi season of 2017-18. The experimental farm falls under the Indo-gangetic alluvial tract of central Uttar Pradesh. The farm is situated in the central part of the state and subtropical tract of north India between latitude ranging from 25°56' to 28°58' North and longitude 79°31' to 80°34' at an elevation of 125.9 meters amsl in gangetic plain. Here the seasonal rainfall of about 629.5 mm is received mostly from second fortnight of June or first fortnight of July to mid-October with a few showers in winter season. The maximum and minimum temperature in the rabi season usually occurs 35°C and 10°C respectively. The mean weather data such as weekly average temperature, relative humidity (RH), wind speed and total rainfall etc were recorded during crop season from meteorological observatory located at student instructional farm of the university of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur Uttar Pradesh.

The experiment was conducted in a randomized block design replicated thrice. There were eleven treatments involving different organic manures along with chemical fertilizers. The different inorganic and organic fertilizer treatments tried were T_1 [100% inorganic RDF (N:P:K 120:60:80)], T_2 [50% inorganic RDF + 50% N through farmyard manure (FYM)], T_3 [50% inorganic RDF + 50% N through poultry manure (PM)], T_4 [50% inorganic RDF + 50% N through vermicompost (VC)], T_5 (25% inorganic RDF + 75% N through FYM), T_6 (25% inorganic RDF + 75% N through PM), T_7 (25% inorganic RDF + 75% N through VC), T_8 [100% N through FYM (16.0 tonnes/ha)], T_9 [100% N through PM (5.0 tonnes/ha)], T_{10} [100% N through VC (7.0 tonnes/ha)] and T_{11} [Control (without inorganic or organic sources of nutrition)].

The seeds were sown at a spacing of 45 cm between the rows and 30 cm within the rows. Bold and healthy seeds of okra cv Arka Anamika were dibbled at two seeds per hill. The field was irrigated immediately after sowing. Gap filling was done after one week of sowing. Vermicompost, farmyard manure and poultry manure were applied to the soil as a basal dose as per the treatments. Nitrogen was applied in the form of urea in two equal splits viz as basal dose

and subsequent dose at flowering stage. Phosphorus and potassium were applied as a basal dose only in the form of single super phosphate and muriate of potash respectively.

RESULTS and DISCUSSION

The total cost of cultivation, gross return, net return and benefit-cost ratio were recorded at maturity and the data are presented in Table 1.

Total cost of cultivation

The data show that the total cost of cultivation was highest (Rs 18,302/ha) in T_8 [100% N through FYM (16.0 tonnes/ha)] followed by Rs 17,002/ha in T_{10} [100% N through VC (7.0 tonnes/ha)] while the lowest total cost (Rs 13,502/ha) was involved in T_{11} (Control).

Gross return

The gross return was observed highest (Rs 35,166/ha) in T_4 [50% inorganic RDF + 50% N through vermicompost (VC)] followed by T_2 [50% inorganic RDF + 50% N through farmyard manure (FYM)] (Rs 33,220/ha) and T_3 [50% inorganic RDF + 50% N through poultry manure (PM)] (Rs 30,474/ha) as compared to all the treatments. The lowest gross return was noticed in control T_{11} [Control (without inorganic or organic sources of nutrition)] (Rs 11,440/ha).

Net return

The net return was observed highest in T_4 [50% inorganic RDF + 50% N through vermicompost (VC)] (Rs 18,934/ha) followed by T_2 [50% inorganic RDF + 50% N through farmyard manure (FYM)] (Rs 16,338/ha) and T_3 [50% inorganic RDF + 50% N through poultry manure (PM)] (Rs 14,992/ha) while lowest was found in T_{11} [Control (without inorganic or organic sources of nutrition)] (Rs -2062/ha).

Table 1. Effect of integrated nutrient management on economics of okra

Treatment	Total cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C
T_1	15,462	28,614	13,152	1:1.85
T_2	16,882	33,220	16,338	1:1.97
T_3	15,482	30,474	14,992	1:1.97
T_4	16,232	35,166	18,934	1:2.17
T_5	15,192	26,106	10,914	1:1.72
T_6	14,242	22,786	8,544	1:1.60
T_7	14,867	26,760	11,893	1:1.80
T_8	18,302	18,900	598	1:1.03
T_9	15,502	15,906	404	1:1.03
T_{10}	17,002	20,266	3,264	1:1.19
T_{11}	13,502	11,440	-2,062	1:0.85

T_1 [100% inorganic RDF (N:P:K 120:60:80)], T_2 [50% inorganic RDF + 50% N through farmyard manure (FYM)], T_3 [50% inorganic RDF + 50% N through poultry manure (PM)], T_4 [50% inorganic RDF + 50% N through vermicompost (VC)], T_5 (25% inorganic RDF + 75% N through FYM), T_6 (25% inorganic RDF + 75% N through PM), T_7 (25% inorganic RDF + 75% N through VC), T_8 [100% N through FYM (16.0 tonnes/ha)], T_9 [100% N through PM (5.0 tonnes/ha)], T_{10} [100% N through VC (7.0 tonnes/ha)], T_{11} [Control (without inorganic or organic sources of nutrition)]

Benefit-cost ratio

The highest benefit-cost ratio was obtained higher in T_4 [50% RDF inorganic + 50% N through vermicompost (VC)] (1:2.17) followed by T_2 [50% RDF inorganic + 50% N through farmyard manure (FYM)] and T_3 [50% RDF inorganic + 50% N through poultry manure (PM)] (1:1.97 each). The minimum benefit-cost ratio was recorded in T_{11} (Control) (1:0.85).

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