Original Research Article

Effect of different level of NPK Fertilizers, FYM and Vermicompost on Yield attributes of Okra(*Abelmoschus Esculentus* L.) var. Devika

ABSTRACT

The field experiment was carried out at soil science research farm of Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during *kharif* season 2022. The soil experimental area was sandy loam in texture. The design was laid out in randomized block design with three levels of NPK (0%,50%, &100%), three levels of FYM and three levels of Vermicompost (0%, 50%, & 100%) respectively. The results obtained with treatment T_9-[120:60:50 Kg NPK + 25 t FYM + 6 t Vermicompost] showed highest plant height, number of branchesplant^{-1}, number of leaves plants^{-1}, number of fruits plant^{-1}, total fruit yield. No significant was observed in yield and growth of okra under control. Application of Organic manures well as its mixture with full NPK considerably increase in growth and total yield attributes of okra. In contrast to all other treatments, joint use of 100% NPK, 100% FYM and 100% Vermicompost shows the most significant impact on okra growth.

Comment [um1]: Indicate numerical and statistical results. Results are indicated through adjectives such as major or significant impact.

Keywords: NPK: Nitrogen, Phosphorus, Potassium, FYM: Farmyard manure, Vermicompost, Yield attributes etc.

Comment [um2]: Delete

INTRODUCTION

Be it deep or shallow, red or black, sand or clay, the soil is the link between the rock core of the earth and living things on its surface. It is the foot fold for the plants we grow, therein lies the main reason for our interest in soilsSimonson[1].India ranks first in the World with production of 6416.0 thousand metric tonnes (74% of the total world production) with an area of 523 thousand ha of okra. It is also cultivated in Nigeria, Sudan, Pakistan, Ghana, Egypt, Benin, Saudi Arabia, Mexico and Cameroon. Gujarat is the leading okra producing state which has production of around 1019.42 thousand tons from an area of 85.15 thousand

hectare, with a productivity of 11.97 t ha^{-1}. It is followed by Uttar Pradesh (335.86 thousand tonnes from 24.80 thousand hectare with 13.54 tonnes ha^{-1}productivity) National Horticulture Board[2].Okra is an important vegetable crop which supplies higher nutrition, the green pod per 100g edible portion of okra contain moisture 89.6g, carbohydrates 6.6g, protein 1.9g, fat 0.2g, fibre1.2g, mineral 0.7g, calcium 66mg , magnesium 43mg, phosphorus 56mg, potassium103 mg, thiamine 0.07mg, riboflavin 0.1mg, nicotinic acid 0.6mg, vitamin-C 13mg, Oxalic acid 8mgChoudhary *et al*., [3].Okra fruit is principally consumed freshly cooked and is a major source of vitamins A, B, C, mineral, iron and iodine and important vegetable source of viscous fibre but it reportedly lows in sodium saturated and cholesterol Singh*et al*.,[4].Okra is a rich source of iodine and other vital minerals and vitamins. Mucilage present in okra is polysaccharides *i.e.*, galacturonic and glucuronic acids Singh and Ram[5].Nitrogen is an essential macro nutrients and determinant in growth and development of crop plants. Nitrogen plays a vital role in chlorophyll, protein, nucleic acid, hormones and vitamins synthesis. Nitrogen also helps in cell division, cell elongation and linear increase in green pod yields of okra Das *et al*.,[6].Organic manure increases cation exchange capacity, water holding capacity and phosphate availability of the soil beside improving the fertilizer use efficiency and microbial population of soil, it reduces nitrogen loses due to slow release of nutrients Tadesse *et al*.,[7].Phosphorus is a key element in the formation of high energy compounds, such as AMP, ADP and ATP, which play an essential role in photosynthesis and respiration. It is a vital component of nucleic acids and phospholipids. Plants take up phosphorus in the inorganic form, mainly as the orthophosphate ion. Phosphorus supports early phase of crop development, synchronizes the germination process and leading to enhance the final yield, especially in P deficient soil Meena *et al*.,[8].

METHODOLOGY

Comment [um3]: • Indicate number of plants per treatment
•The techniques used in the measurement of response variables are not indicated

A field experiment was conductedin the year 2022 during the Kharif seasonat research farm of Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology andSciencesPrayagraj (Allahabad) 211007 U.P., India. The soil of experimental area falls in order Inceptisol and the experimental field is alluvial in nature.The design applied for statistical analysis was carried out with 3^2factorial randomized block design having three levels of NPK @ 0, 50 and 100 % ha^{-1},three levels of FYM @ 0, 50 and 100 % $ha^{-1}$and three levels of Vermicompost @ 0, 50 and 100 % ha^{-1} respectively. The details of the treatment combinations are given below Table No.1. and observation were recorded

plant height, number of leaves plant^{-1}, number of branches plant^{-1}, number of fruits and total yield of fruits.

The source of inorganic nutrients sources as Urea, SSP, MOP and organic nutrients sources as FYM and Vermicompost. Basal dose of fertilizer was applied in respective plots according to treatment allocation in furrows opened by about 5cm depth before sowing seeds in soil at the same time of sowing of seeds was shown on well-preparedbeds in shallow furrows, at the depth of 5 cm , row to rowdistance was maintained at 30 cm and plant to plant distance was 45 cm, during the course of experiment, observations were recorded as mean values of the data.

RESULTS AND DISCUSSION

Plant Height

The response of plant height of okra recorded at 30 DAS, 60 DAS and 90 DAS detailed results were in shown in Table 2 as influenced by different levels of NPK FYM and Vermicompost. The plant height of okra was found to have increasedsignificantly with the age of plants and increase in the levels of inorganic fertilizers and organic manures. The maximum plant height was recorded as 23.6 cm, 90.2 cm and 117.2 cm in T_9 at 30 DAS, 60 DAS and 90 DAS respectively and the minimum plant height was recorded as 20.2 cm, 83.0 cm and 107.0 cm in T_1-[Absolutecontrol] at 30 DAS, 60 DAS and 90 DAS respectively.Inorganic fertilizer and organic manure play an important role in increasing production, improving quality of vegetables and sustaining soil fertility. Organic manure contains all nutrients which are required for healthy growth of crops and helps to improve physical, chemical and biological properties of soil Ola *et al*.,[9].

Number of Leaves

The number of leaves of okra at different days after sowing (DAS) at 30, 60 and 90 detailed results were in shown in Table 2 as influenced by different levels of NPK FYM and Vermicompost were found significantly in treatment T_9 was 18.6, 44.2 and 45.2 respectively. While the minimum values of the result were found in treatment T_1-[Absolute control]12.2, 36.8 and 39.4 respectively.The effect of different doses of NPK fertilizers on growth of okra regarding number of leaves and height of had significant superiority over other meansKhetran*et al.*, [10].

Number of Branches

The response of number of branches plant^{-1}recorded at 30 DAS, 60 DAS and 90 DAS detailed results were in shown in Table 2 as influenced by different levels of NPK FYM and Vermicompost. The Number of branches plant^{-1}of okra was found to have increasedsignificantly with the age of plants and increase in the levels of inorganic fertilizers and organic manures. The maximum number of branches plant^{-1} was recorded as 1.8,2.4 and 2.6 in T_9 at 30 DAS, 60 DAS and 90 DAS respectively and the least number of branches was recorded as 0.6, 0.8 and 1.0 in T_1-[Absolute control] at 30 DAS, 60 DAS and 90 DAS respectively.

Concluded that the use of organic manure in combination with inorganic fertilizers in the production of vegetables like okra should be encouraged as it is beneficial for the physical growth of okra plantsGayathri *et al.*, [11].

Number of Fruits

The response of number of fruits plant^{-1}recorded and detailed results were in shown in Table 2 as influenced by different levels of NPK FYM and Vermicompost. The number of fruits plant^{-1}of okra was found to have increasedsignificantly with the application of inorganic fertilizers and organic manures. The maximum number of fruits plant^{-1} was recorded as 23.2 in T_9 and minimum number of fruits plant^{-1}was recorded as 14.0 in T_1-[Absolute control].

Potassium is one of the three major nutrient elements (N, P and K) required by plants. Potassium imparts vigour and disease resistance to the plant and plays an important role in crop productivityGinindza*et al.*,[12].

Fruit Yield

Highest yield of fruits due to influence of NPK FYM and Vermicompost was recorded as 178.50 in $T_9$and minimum yield was recorded as 110.81 in T_1-[Absolute control].

The requirements of fertilizers in okra are important for the early growth and total yield of fruit. Integrated use of Organic and Inorganic fertilizers can improve crop productivity. The soil enriched withvermicompost provides additional substances that are not found in chemical fertilizersMal*et al.*,[13].

Table.1:Treatment combination

Treatment	Treatment combination
T_1	Absolute Control
T_2	[NPK @ 0% + FYM @ 0% + Vc @ 50%]
T_3	[NPK @ 0% + FYM @ 0% + Vc @ 100%]
T_4	[NPK @ 50% + FYM @ 50% + Vc @ 0%]
T_5	[NPK @ 50% + FYM @ 50% + Vc @ 50%]
T_6	[NPK @ 50% + FYM @ 50% + Vc @ 100%]
T_7	[NPK @ 100% + FYM @ 100% + Vc @ 0%]
T_8	[NPK @ 100% + FYM @ 100% + Vc @ 50%]
T_9	[NPK @ 100% + FYM @ 100% + Vc @ 100%]

Note:NPK 100% (100:60:50), FYM 100% (25 t) and Vc 100% (6 t)

Table 2:Effect of different level of NPK FYM and Vermicompost on Yield attributes of Okra

Comment [um4]:
•In Table 2 no statistical analysis is observed. Numerical data are shown, but not statistical. This is repeated in all the measured variables

Treatment	Plant height(cm)			Number of leaves			Number of branches			Number of fruits	Fruit Yield (q
	30DAS	60DAS	90DAS	30DAS	60DAS	90DAS	30DAS	60DAS	90DAS		
T_1	20.2	83.0	107.0	12.2	36.8	39.4	0.6	0.8	1.0	14.0	110.81
T_2	21.2	84.0	107.6	13.0	37.4	40.0	0.8	1.0	1.2	14.2	117.84
T_3	20.8	85.2	108.0	13.4	38.4	40.0	0.8	1.2	1.4	14.6	120.56
T_4	21.6	86.4	109.8	14.0	39.2	40.8	1.0	1.4	1.6	15.4	122.38
T_5	22.0	87.2	111.0	14.8	39.2	41.8	1.2	1.6	1.8	16.2	130.60
T_6	22.0	87.4	111.4	15.4	41.0	42.4	1.4	1.8	2.0	18.0	136.70
T_7	22.4	87.8	112.6	16.0	41.8	43.0	1.4	1.8	2.2	19.6	150.35
T_8	23.0	89.0	115.6	17.2	43.2	44.2	1.6	2.0	2.4	20.8	174.55
T_9	23.6	90.2	117.2	18.6	44.2	45.2	1.8	2.4	2.6	23.2	178.50
F-test	S	S	S	S	S	S	S	S	S	S	S
S.Em. (±)	0.35661	1.15136	1.55396	0.30157	0.54027	0.75387	0.01611	0.02102	0.01669	0.23018	1.61692
C.D. (P= 0.05)	1.13091	3.46592	4.67787	0.90781	1.62638	2.26938	0.0485	0.06327	0.05024	0.69291	4.8674

CONCLUSION

Comment [um5]: •Write as an inference, as no analyzes were performed to verify this statement. Since there were no replicate treatments

It revealed from the trial that application of NPK FYM and Vermicompost in treatment T_9 was found best in increasing growth and yield of okra. Since the results is based on one season experiment, further trail is needed to substantiate the result.

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