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Methods of poultry and vermicompost manure application and its effect on growth and yield of red okra (*Abelmoschus esculentus* L.) in Bundelkhand

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Abstract

The present investigation was carried out to study the effects of vermicompost and poultry manure on growth parameters, yield and yield attributes of okra during *Kharif* 2023 at Organic Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Bundelkhand University, Jhansi. The experiment was laid out in Randomized Block Design (RBD) 8 treatments comprising three replications each. Observations on Plant height (cm) [30, 60, DAS and at harvest] recorded that high application of organic nutrients might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. Observations on Stem diameter (cm) revealed that the application of organic nutrients might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. It was noticed that number of leaves and branches per plant increased with increasing plant height successively with the increasing levels of nutrient. Combination of organic nutrients also recorded maximum plant height and number of leaves and branches also which helped the plants in better photosynthesis to attain vigor. Observations on Days to first flowering (DAS), Days to 50% flowering (DAS), Days to first pod setting (DAS), Number pods per plant and Days to first pod picking (DAS) reported that Integration of organic nutrition favored vigorous growth and synthesized more these hormones in plants, which might have helped to the translocation as well as more quantity of available phosphorus through the xylem vessels and their accumulation in the auxiliary buds that would have favored the plant to enter reproductive phase. Observations on Average pod weight (g), Pod length, Average pod diameter (cm), Pod Yield per plant (kg/plant), Pod Yield per plot (kg/plot), Average Pod yield per hectare (t/ha), Seed index [1000-seed weight (g)] and Total soluble solid (0Brix) found that Organic nutrition plays an important role in improving productivity and quality of fruit. Doses of Organic nutrition increased the vigour of plants, assimilating area, size of fruit, thereby resulting into higher weight of fruit.

Keywords: Organic, vermicompost, poultry manure, organic nutrition

Introduction

Organic farming is a concept or approach to make agriculture near to nature, simple, sustainable and safe to the society. This concept is based on one universal fact that food is the basic need of living beings and it can only be produced through biological process, essentially with the help of nature. It is a system of farm design and management to create an ecosystem which can achieve sustainable productivity without the use of artificial external inputs such as chemicals, fertilizers and pesticides. Organic farming combined with high input technology reduces dependence for health hazardous agro-chemicals. It promotes and enhances agro-ecosystem health including biodiversity, biological cycles and soil biological activities. Red okra (*Abelmoschus esculentus* L.) is a variant of the traditional green okra (ladyfinger or bhindi). It is a warm-season vegetable known for its edible green or red pods. The red color in the pods is due to the presence of pigments called anthocyanins, which also have potential health benefits. Okra is the most important vegetable crop in the tropical and subtropical parts of the world.

It is also known as lady's finger or bhindi, belongs to family Malvaceae and originated in tropical Africa. The okra plant is erect, herbaceous annual green, stem with radish tinge. Okra is an important vegetable crop which supplies higher nutrition. The green pods (per 100 g edible portion) of okra contains moisture 89.6 g, carbohydrates 6.4 g, protein 1.9 g, fat 0.2 g, fiber 1.2 g, minerals 0.7 g, calcium 66 mg, magnesium 43 mg, phosphorus 56 mg, potassium 103 mg, Vitamin-A 88 IU, Vitamin-C 13 mg etc.

Materials and Methods

Effect of 8 treatments viz., T₁ - 2t/ha poultry manure (ring method), T₂ - 4t/ha poultry manure (ring method), T₃ - 2t/ha poultry manure (broadcasting method), T₄ - 4t/ha poultry manure (broadcasting method), T₅ - 2t/ha Vermicompost (ring method), T₆ - 4t/ha Vermicompost (ring method), T₇ - 2t/ha Vermicompost (broadcasting method) and T₈ - Water Spray (Control) was evaluated to study the effects of vermicompost and poultry manure on growth parameters, yield and yield attributes of okra. The variety was used Kashi Lalima for the experiment. The experiment was conducted under field conditions in 2.4m×2.25m plot using randomized block design with three replications. Plots sprayed with plain water served as check/control.

Treatments

T₁ 2t/ha poultry manure (ring method)
 T₂ 4t/ha poultry manure (ring method)
 T₃ 2t/ha poultry manure (broadcasting method)
 T₄ 4t/ha poultry manure (broadcasting method)
 T₅ 2t/ha Vermicompost (ring method)
 T₆ 4t/ha Vermicompost (ring method)
 T₇ 2t/ha Vermicompost (broadcasting method) T₈ Water Spray (Control)

The experimental data recorded during the investigation were subjected to statistical analysis of "Analysis of Variance (ANOVA)" technique for drawing comparison. The significance and non-significance of the treatments were judged with the help

of „F“ test. The significance differences between the means were tested with the critical difference (CD) at 5% probability level.

Results and Discussion

Observations on Plant height (cm) [30, 60, DAS and at harvest] recorded that high application of organic nutrients might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. Observations on Stem diameter (cm) revealed that the application of organic nutrients might have improved the soil physical and chemical properties and leading to the adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth while the minimum plant growth was due to non-availability of nutrients. It was noticed that number of leaves and branches per plant increased with increasing plant height successively with the increasing levels of nutrient. Combination of organic nutrients also recorded maximum plant height and number of leaves and branches also which helped the plants in better photosynthesis to attain vigor. Observations on Days to first flowering (DAS), Days to 50% flowering (DAS), Days to first pod setting (DAS), Number pods per plant and Days to first pod picking (DAS) reported that Integration of organic nutrition favored vigorous growth and synthesized more these hormones in plants, which might have helped to the translocation as well as more quantity of available phosphorus through the xylem vessels and their accumulation in the auxiliary buds that would have favored the plant to enter reproductive phase. Observations on Average pod weight (g), Pod length, Average pod diameter (cm), Pod Yield per plant (kg/plant), Pod Yield per plot (kg/plot), Average Pod yield per hectare (t/ha), Seed index [1000-seed weight (g)] and Total soluble solid (0Brix) found that Organic nutrition plays an important role in improving productivity and quality of fruit. Doses of Organic nutrition increased the vigour of plants, assimilating area, size of fruit, thereby resulting into higher weight of fruit.

Table 1: Effect of organic nutrition on plant height (cm) of the Red okra.

Treatment Notation	Treatment details	30 DAS (cm)	60 DAS (cm)	At Harvest (cm)
T ₁	2t/ha poultry manures (ring method)	42.61	71.91	104.98
T ₂	4t/ha poultry manures (ring method)	48.47	82.35	115.60
T ₃	2t/ha poultry manures (broadcasting method)	53.49	83.40	114.52
T ₄	4t/ha poultry manures (broadcasting method)	51.57	77.38	110.50
T ₅	2t/ha Vermicompost (ring method)	54.43	85.16	115.37
T ₆	4t/ha vermicompost (ring method)	36.37	65.30	98.42
T ₇	2t/ha Vermicompost (broadcasting method)	44.46	74.60	106.49
T ₈	Water Spray (Control)	24.32	53.28	85.33
	Mean	45.97	74.80	106.33
	'F' Test	S	S	S
	S.E.(m)	0.27	0.17	1.17
	C.D. at 5%	0.76	0.37	3.60

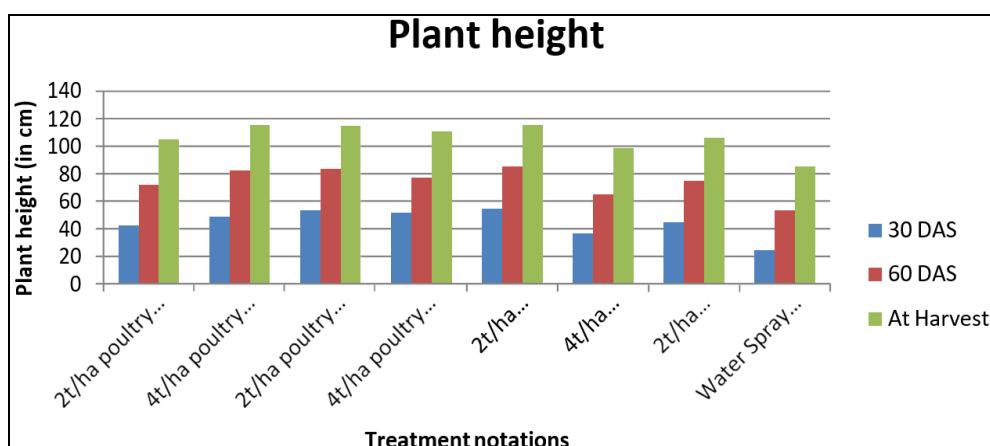


Fig 1: Histogram of effect of organic manures on plant height (cm) of red okra

Table 2: Effect of organic nutrition on stem diameter (cm) of Red okra.

Treatment Notation	Treatment details	Stem diameter (cm)
T ₁	2t/ha poultry manures (ring method)	8.67
T ₂	4t/ha poultry manures (ring method)	8.35
T ₃	2t/ha poultry manures (broadcasting method)	8.52
T ₄	4t/ha poultry manures (broadcasting method)	7.99
T ₅	2t/ha Vermicompost (ring method)	8.77
T ₆	4t/ha vermicompost (ring method)	7.97
T ₇	2t/ha Vermicompost (broadcasting method)	8.09
T ₈	Water Spray (Control)	7.27
	Mean	8.15
	'F' Test	s
	S.E.(m)	0.23
	C.D. at 5%	0.70

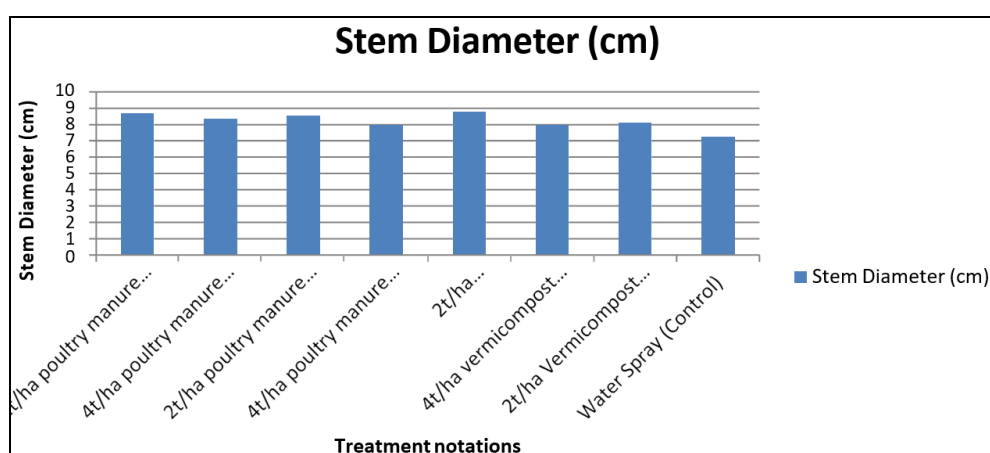


Fig 2: Histogram of effect of Organic nutrition on stem diameter of the Red okra.

Table 3: Effect of organic nutrients on days to first flowering of Red okra.

Treatment Notation	Treatment details	Days
T ₁	2t/ha poultry manures (ring method)	44.21
T ₂	4t/ha poultry manures (ring method)	42.65
T ₃	2t/ha poultry manures (broadcasting method)	41.81
T ₄	4t/ha poultry manures (broadcasting method)	42.86
T ₅	2t/ha Vermicompost (ring method)	38.75
T ₆	4t/ha vermicompost (ring method)	41.83
T ₇	2t/ha Vermicompost (broadcasting method)	39.85
T ₈	Water Spray (Control)	45.09
	Mean	41.51
	'F' Test	S
	S.E.(m)	0.48
	C.D. at 5%	1.29

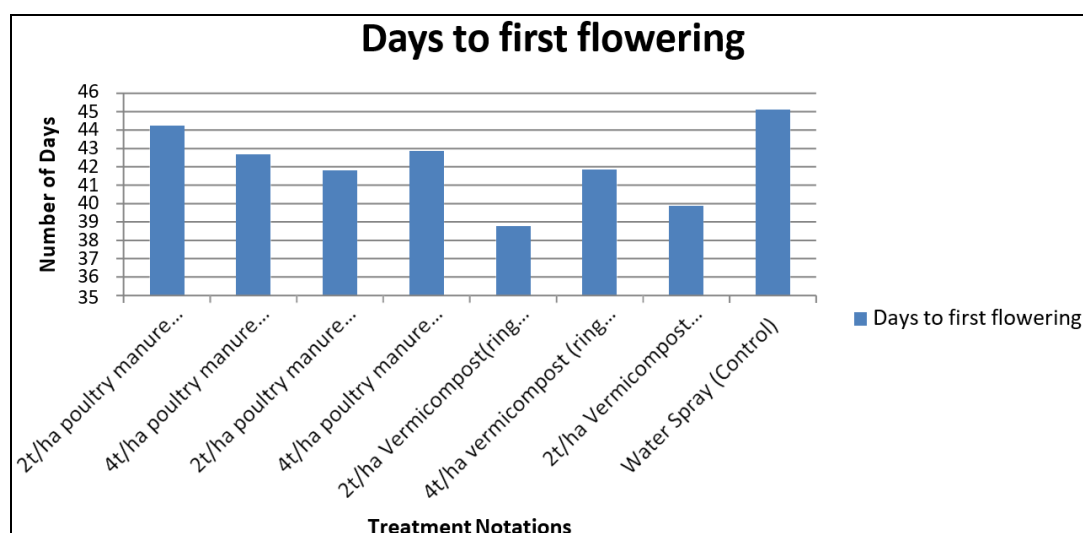


Fig 3: Histogram of effect of organic nutrition on days to first flowering of the Red okra.

Table 4: Effect of organic nutrition on Pod Yield per plot (kg/plot) of red okra

Treatment Notation	Treatment details	Kg/plot
T ₁	2t/ha poultry manures (ring method)	13.78
T ₂	4t/ha poultry manures (ring method)	14.43
T ₃	2t/ha poultry manures (broadcasting method)	14.71
T ₄	4t/ha poultry manures (broadcasting method)	15.27
T ₅	2t/ha Vermicompost (ring method)	16.81
T ₆	4t/ha vermicompost (ring method)	18.22
T ₇	2t/ha Vermicompost (broadcasting method)	13.66
T ₈	Water Spray (Control)	11.31
	Mean	14.02
	'F' Test	S
	S.E.(m)	0.87
	C.D. at 5%	2.39

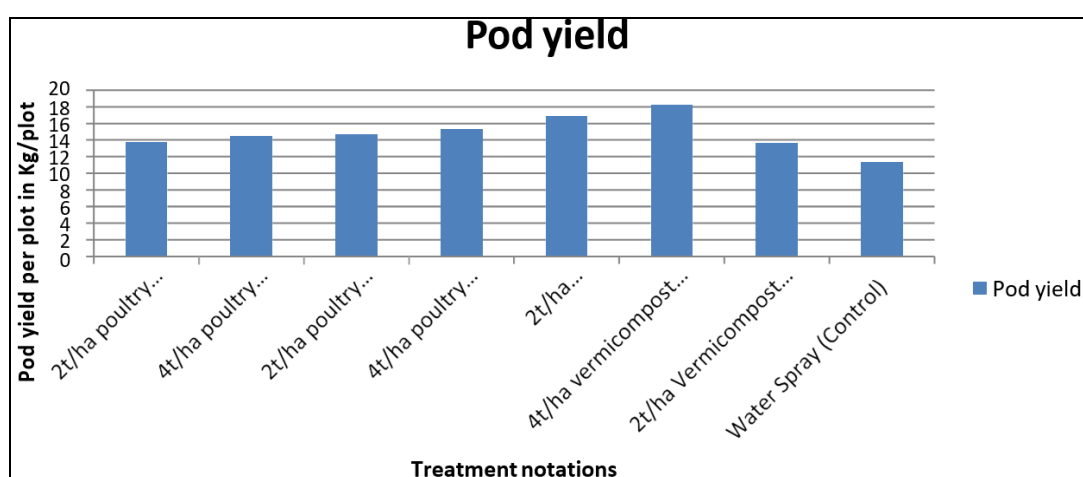


Fig 4: Histogram of effect of organic nutrition on pod yield per plot (kg/plot) of the red okra.

Conclusion

The study conducted during Kharif 2023 at the Organic Research Farm of Bundelkhand University, Jhansi, demonstrated the significant effects of vermicompost and poultry manure on the growth and yield of okra. The experiment, structured under a Randomized Block Design (RBD) with eight treatments and three replications, highlighted the positive impact of organic nutrition on various growth parameters and yield attributes of okra.

The application of organic nutrients, particularly at higher doses, significantly enhanced soil physical and chemical properties, leading to improved nutrient availability. This improvement

resulted in increased plant height, stem diameter, and the number of leaves and branches per plant. The optimal levels of organic nutrients not only promoted vegetative growth but also advanced the reproductive phase by influencing key flowering and pod-setting milestones.

Results indicated that vermicompost and poultry manure, especially when applied at higher rates and using ring methods, contributed to a higher average pod weight, pod length, and diameter, as well as increased pod yield per plant and per plot. The integration of organic nutrients also positively affected the total soluble solids, enhancing the fruit's quality. Notably, the highest productivity was observed with the application of 4 t/ha

of vermicompost using the ring method.

Overall, the findings underscore the efficacy of organic nutrition in enhancing both the productivity and quality of okra. The use of organic fertilizers not only boosts plant vigor and fruit size but also aligns with sustainable agricultural practices by reducing reliance on synthetic chemicals. Future research should focus on optimizing the application methods and rates to further improve the efficiency and sustainability of organic fertilization in okra cultivation.

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