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RESEARCH ARTICLE

EFFECT OF ORGANIC SOURCES OF NUTRIENTS ON SOIL FERTILITY, GROWTH AND YIELD OF ELEPHANT FOOT YAM (*AMORPHOPHALLUS PAEONIIFOLIUS* L.)

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ABSTRACT

A field experiment was conducted during the Kharif Season of 2024-2025 to evaluate the effect of different organic sources of nutrients on growth and yield of elephant foot yam and influence of nutrient sources on status of soil fertility. The experiment was laid out in ten treatments and three replications with RBD. Organic nutrient sources included wheat straw, flower waste, compost,vermi compost, farm yard manure (FYM) and poultry manure applied at different rates.Results revealed that vermi compost@ 40 t ha^{-1}recorded the highest plant height (68.00 cm) T_4 and maximum corm yield T_4(18.55 t ha^{-1}). Soil fertility parameters such as organic carbon, available nitrogen, phosphorus, potassium and sulphur were significantly influenced by the application of organic treatments. T_7 (Compost @20tha^{-1}) resulted to increase the highest available nitrogen (338.69kg ha^{-1}). While T_6 (FYM @40 t ha^{-1}) recorded maximum Available phosphorus (21.79 kg ha^{-1}). T_2(flower wastes @ 60 t ha^{-1}) recorded maximum available potassium (331.89 kg ha^{-1}) and T_4(Vermicompost @ 40t ha^{-1}) resulted to increase the highest available sulphur (2.44mg kg^{-1})organic manures, particularly vermicompost and FYM improved crop productivity and soil health making then suitable for sustainable elephant foot yam cultivation.

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INTRODUCTION

Elephant Foot Yam (*Amorphophallus paeoniifolius* L.) is commonly known as *Suran* or *Jimmikand* and *Oal* and grown in almost all the States and commercially popular and widely cultivated member of edible aroids. It is a rich in carbohydrates and is a good source of proteins and vitamins (Bradbury and Holloway, 1988). It is also a good sources of water soluble Vitamin A. Rich in dietary fibre and has several valuable medicinal and therapeutic value (Chattopadhyay *et al*. 2001).It is effective in the treatment of piles, dysentery asthma, swelling of lungs, vomiting and gastrointestinal disorders.In addition it is used in pharmaceutical preparations. Especially in Ayurvedic Medicines.It is known that corms are highly susceptible to water logging. Needs well drained and well aerated soil.Soil should be rich in organic matter with adequate amount of available plant nutrients.It has been repeatedly confirmed that continuous sole and imbalanced use of chemical fertilizers leads to deterioration of the soil health and ecological imbalance due to decrease in the nutrient uptake efficiency (Saravaiya *et al* .2010). In this way it might eventually result in stagnation or planning of crop yield. Fertilizers are one of the most important inputs. His necessary to adopt appropriate nutrient management practices which help to supply nutrients in quantities adequate to just meet crop diamond and minimize losses.

Thereby increasing the nutrient use efficiency. Applying organic sources of nutrients is one of the environmentally viable approaches to maximize the elephant foot yam production. Productivity and quality while maintaining soil fertility (Suja and sundaresan.2008). Organic sources of fertilizers. Sahoo *et al*.2015). Keep in view the above fact the experiment was laid out.

MATERIALS AND METHODS

The experiment was conducted during May 2024 to 2025 at the Agricultural farm of Shri Murli Manohar Town P.G. college, Ballia. Ballia district lies between the Parallel of 25°33' and 26° 11 N latitude and 83°38' and 84°39` E longitude and 59 m above the mean sea level. The mean annual rainfall ranges from 900-1131.3 mm. The winter is cold and minimum temperature reaches as low 6.1°c in December to January. Occasionally light rains are experienced in this region during the winter season.The initial composite soil sample (0-15 cm) depth was collected from college agriculture farm district Ballia, analyzed. The collected soil was subjected to initial analysis of physicochemical and chemical properties of the soil. Elephant foot yam crop variety Gajendra-1 was used as test crop. Ten treatments consisting of different organic nutrients sources were evaluated under a Randomized Block

Design with three replications. Treatment combination T_1 wheat straw @ 60 t ha^{-1}, T_2 Flower waste @ 60 t ha^{-1}, T_3 Compost@4o t ha^{-1}, T_4 Vermi compost@ 40t ha^{-1},T_5Poultry manure @ 20 t ha^{-1}, T_6 FYM @ 40 t ha^{-1},T_7 Compost @20 t ha^{-1}, T_8 FYM @ 20 t ha^{-1},T_9 Vermi compost @ 20 t ha^{-1}, T_{10} Poultry manure @10 t ha^{-1}.Growth Parameters (plant height, Pseudo-Stem girth) and yield were recorded post-harvest soil samples were analyzed for pH, EC(Jackson 1973),Bulk density (Kanwar and chhopra 1993). Organic carbon (walkley and Black 1934), available nitrogen (Subbiah and Asija, 1956), available phosphorus (Olsens *et al* .1954), available Potassium (Muhr *et al.*1965),available sulphur (Williams and Steinberg's 1969) and calcium carbonate (Puri 1930) using standard procedures. Data were statistically analyzed using RBD Tools for the text of significance method sited by (Gomez and Gomez 1987).

RESULTS AND DISCUSSION

Plant attributes

Growth attributes: Plant height and Pseudo-stem girth were significantly influenced by different organic nutrient sources. The highest plant height (68.00cm) was recorded under T_4 (Vermi compost @ 40 t ha^{-1}) treatment. Which might be due to improved nutrient availability and enhanced microbial activity.The maximum Pseudo-stem girth (11.50 cm) was observed with T_1(wheat straw @ 60 t ha^{-1}) might be due to supply of nutrients up to long duration. Corm yield (t ha^{-1}), corm yield differed significantly among the treatments T_4 (Vermi compost @40 t ha^{-1}) showed the highest yield (18.55 t ha^{-1}) followed by T_7 Compost @20 t ha^{-1} (16.83 t ha^{-1}). The lowest yield (8.50 t ha^{-1}) was observed in T_3(Compost @40 t ha^{-1}). Higher yield under Vermi compost application might be attributed to improved soil structure nutrient availability and enhanced root growth.

Table 1. Initial soil properties of experimental plot soil

S.N.	Parameters	Content
1	pH	7.6
2	EC (dSm^{-1})	0.980
3	Organic Carbon (%)	0.63
4	Available N (kg ha^{-1})	288.51
5	Available P(kg ha^{-1})	13.50
6	Available K (kg ha^{-1})	325.68
7	Sulphur S (mg kg^{-1})	1.95
8	Calcium carbonate (%)	0.09
9	Bulk density (Mgm^{-3})	1.45

Table 2. Plant height (cm) and pseudo-stem girth(cm) and yield (t ha^{-1}) influenced by different organic sources of nutrient

S. N.	Treatments	Plant height (cm)	Pseudo-stem girth (cm)	Yield (t ha^{1})
T_1	Wheat straw @ 60 t/ha	65.34	11.50	11.29
T_2	Flower wastes @ 60 t/ha	62.16	10.5	13.68
T_3	Compost @ 40 t/ha	59.02	11.26	8.5
T_4	Vermi compost @ 40 t/ha	68.00	8.43	18.55
T_5	Poultry manure @ 20 t/ha	64.92	9.6	13.66
T_6	FYM @ 40 t/ha	59.43	10.2	15.03
T_7	Compost @ 20 t/ha	65.76	10.03	16.83
T_8	FYM @ 20 t/ha	62.8	8.3	17.01
T_9	Vermi compost @ 20 t/ha	59.24	9.8	14.47
T_{10}	Poultry Manure @ 10 t/ha	48.05	8.13	16.37
C.D.0.05		11.03	1.90	8.19

Table 3. Effect of organic sources of nutrients level on soil pH, EC (dSm^{-1}) and bulk density (Mgm^{-3}) in elephant foot yam grown soil

S. N.	Treatments	EC (dSm^{-1})	pH 1;2.5	B.D. (Mgm^{-3})
T_1	Wheat straw @ 60 t/ha	0.980	7.73	1.62
T_2	Flower wastes @ 60 t/ha	0.947	7.78	1.54
T_3	Compost @ 40 t/ha	0.964	7.74	1.52
T_4	Vermi compost @ 40 t/ha	0.963	7.65	1.55
T_5	Poultry manure @ 20 t/ha	0.946	7.56	1.57
T_6	FYM @ 40 t/ha	0.986	7.67	1.51
T_7	Compost @ 20 t/ha	0.964	7.71	1.56
T_8	FYM @ 20 t/ha	0.974	7.76	1.64
T_9	Vermi compost @ 20 t/ha	0.970	7.73	1.63
T_{10}	Poultry Manure @ 10 t/ha	0.977	7.74	1.51
C.D. 0.05		0.02	2.46	0.13

Table 4. Effect of organic sources of nutrients level on soil organic carbon (%), calcium carbonate (%) and available sulphur (mg/kg) in elephant foot yam grown soil

S. N.	Treatments	O.C (%)	$CaCO_3$ (%)	Available S (mg kg^{-1})
T_1	Wheat straw @ 60 t/ha	0.51	0.093	2.02
T_2	Flower wastes @ 60 t/ha	0.63	0.076	2.22
T_3	Compost @ 40 t/ha	0.57	0.09	1.95
T_4	Vermi compost @ 40 t/ha	0.47	0.08	2.44
T_5	Poultry manure @ 20 t/ha	0.54	0.07	1.56
T_6	FYM @ 40 t/ha	0.51	0.08	2.12
T_7	Compost @ 20 t/ha	0.44	0.09	2.05
T_8	FYM @ 20 t/ha	0.55	0.10	1.81
T_9	Vermi compost @ 20 t/ha	0.57	0.09	1.92
T_{10}	Poultry Manure @10 t/ha	0.50	0.10	2.23
C.D. 0.05		0.19	0.02	0.16

Table 5. Effect of organic sources of nutrients level on soil available N, P and K (kg/ha) in elephant foot yam grown soil

S. N.	Treatments	Available N (kg ha^{-1})	Available P (kg ha^{-1})	Available K (kg ha^{-1})
T_1	Wheat straw @ 60 t/ha	286.42	17.70	331.06
T_2	Flower wastes @ 60 t/ha	247.744	17.02	331.89
T_3	Compost @ 40 t/ha	321.96	15.19	328.90
T_4	Vermi compost @ 40 t/ha	286.421	13.94	259.46
T_5	Poultry manure @ 20 t/ha	280.149	19.37	261.33
T_6	FYM @ 40 t/ha	249.141	21.79	285.6
T_7	Compost @ 20 t/ha	338.688	21.05	254.98
T_8	FYM @ 20 t/ha	237.29	16.18	236.69
T_9	Vermi compost @ 20 t/ha	259.242	12.51	228.48
T_{10}	Poultry Manure @ 10 t/ha	295.82	17.14	231.84
C.D. 0.05		39.34	2.54	18.81

Soil Fertility status: Soil pH was showed slight variation among treatments and ranged from 7.56 to 7.78 but effectively T_5 (Poultry manure @ 20 t ha^{-1}) was found most suitable to balance the soil pH among the treatments. It might be due to release of organic acids. The EC of the soil Under the study soil was ranged from (0.947-0.986 dSm^{-1}) in all the treatment. Comparatively higher EC value was noticed in treatment T_6(FYM @ 40 t ha^{-1}). While the lower EC value (0.907) was observed by application of T_2 (Flower waste @60 t ha^{-1}). Bulk Density (mgm^{-3}) Bulk density was increased in organic sources treatment due to increase in physical condition. Highest bulk density value(1.64 mgm^{-3}) was recorded with application of T_8 (FYM @20 t ha^{-1}) Organic Carbon (%) Content was highest (0.63%) with T_2 (Flower waste @60 t ha^{-1})and T_7(Compost @ 20 t ha^{-1}) as compared to Vermicompost and compost application. It might be due to decomposition and enrichment of organic carbon in soil. Calcium carbonate (%) The treatment of different organic material showed the significant variation in calcium carbonate value (0.10) formed in T_{10} (Poultry manure @10 t ha^{-1})and T_8 (FYM @ 20 t ha^{-1}) where lower calcium carbonate value (0.07) was observed with application of T_5 (Poultry manure @20 t ha^{-1}) might be due to release of organic acid.

Available Sulphur the effect of organic source on available Sulphur content in soil was significant among the treatment T_4 (Vermi compost @40 t ha^{-1}) was recorded maximum content (2.44 mg kg^{-1}) while the lowest value of sulphur in (1.56 mg kg^{-1}) increasing available sulphur by application of T_5 (Poultry manure @20 t ha^{-1}). The soil available nitrogen due to application of different organic sources a significantly greater amount of available nitrogen (338.688 kg ha^{-1}) was observed by application of T_7 (Compost @ 20 t ha^{-1}).While loweravailable nitrogen (237.290 kg ha^{-1}) was observed by application T_2 (Flower waste@ 60 t ha^{-1}). A significantly maximum amount of available phosphorus content (21.70 kg ha^{-1}) was observed by application of T_6 (FYM @ 20 t ha^{-1}) and minimum content (12.51 kg ha^{-1}) in T_9 (vermicompost @ 20 t ha^{-1}) the similar Findings have been given by Sayen *el al*. (2017). Available Potassium (kg ha^{-1}) Status in soil varied due to various organic sources. The performance showed that available potassium content was significantly increased (331.89 kg ha^{-1}) in T_2 followed by application of (flower waste @ 60 t ha^{-1}). The lowest value of available Potassium was recorded significantly in T_9(Vermi compost@ 20 t ha^{-1}) in (228.48 kg ha^{-1})

CONCLUSION

The application of different organic sources of nutrients significantly improved growth,yield and soil fertility of Elephant Foot Yam. And enrichment of organic carbon in soil .Vermicompost @ 40 t ha^{-1} was most effective in enhancing crop yield while higher dose of flower waste as compared FYM andCompost to improved soil nutrient Status. As well as soil fertility at Sandy loam soil.

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