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Effect of nitrogen and potassium levels on yield and nutrient uptake of colocasia (*Colocasia esculenta* var. *esculenta*)

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ABSTRACT

Optimum levels of nitrogen and potassium fertilization for tuber yield in colocasia were found to be 79.62 kg N and 114.79 kg K_2O/ha. Maximum uptake of nitrogen (115.25 kg/ha) and potassium (264.54 kg/ha was recorded by treatment combination of 120 kg N and 120 kg K_2O/ha. However, application of 80 kg N in combination with 120 kg K_2O/ha gave significantly higher net return per rupee investment.

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Key words : Black sand, Seedling vigour index, Shoot : Root ratio, Vermicompost

INTRODUCTION

A field experiment was conducted during summer season of 2003 and 2004 to study the nitrogen and potassium levels on yield and nutrient uptake of colocasia (*Colocasia esculenta* var. *esculenta*) in Farrukhabad. Among the tuber crops, the tubers of colocasia (*Colocasia esculenta* var *esculenta*) commonly known as Arvi, Chia, and Pechai etc. are a rich source of carbohydrate and they also contains sufficient quantity of protein, Acrid Juice of leaves is used against colic constipation and styptic while corm is mild laxative, diuretic and generally used to piles. Even though it has so much economic importance, information on the requirement of major nutrient in the growing of this crop, is very meagre. Since both N and K play a vital role in the nutrition of tuber crops, an attempt was made to study the effect of nitrogen and potassium levels on yield and nutrient uptake of colocasia.

MATERIALS AND METHODS

An experiment was conducted in a Randomized Block Design with three replications during the summer season. There were 16 treatment consisting of four levels of each of nitrogen and potassium (0, 40, 80 and 120 kg/ha). Half of the nitrogen and full dose of potassium as per treatment alongwith common dose of 12.5 tonnes farm yard manure and phosphorus @ 60 kg/ha was given as basal. The planting was done adopting a spacing of 60 x 40 cm. The cultural and plant protection measures were taken up uniformally in all plots as and when required and remaining half of the nitrogen was given as top dressing at the time of earthing. The tuber yield and uptake of nutrients recorded at harvest. The nitrogen content was estimated by colorometric method (Lindner, 1944) and the potassium content was determined from the digested acid used for nitrogen estimation of flame photometer (Jackson, 1973). Uptake of nutrients was calculated by multiplying the nutrient content into the plant parts and their dry matter.

Total uptake of nitrogen and potassium was calculated by adding the nutrient uptake by leaves, stem and cormel. Economics of treatments was also calculated. The data were analysed as per procedure suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Increasing levels of each of nitrogen and potassium markedly increased the tuber yield of colocasia (Table 1). Significantly higher yield of (27.49 tonnes/ha) was recorded under the treatment combination of 80 kg nitrogen and 120 kg potassium /ha (Table 2). It may be probably due to higher demand of theses nutrients for Arvi crop. Similar findings have also been made by Abit *et al.* (1979). The response of tuber yield to nitrogen and potassium levels was found to be quadratic and response equations were the optimum levels of nitrogen and potassium were found to be 79.62 kg N and 114.79 kg K_2O/ha.

Increasing levels of nitrogen and potassium either

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Table 1 : Main effect of nitrogen and potassium on yield and nutrient uptake of colocasia

Treatments	Yield (t/ha)	Total uptake of nitrogen (kg/ha)	Total uptake of potassium (kg/ha)
N_0	14.97	45.27	113.27
N_{40}	19.77	63.24	165.23
N_{80}	22.75	79.19	208.00
N_{120}	23.69	90.01	216.14
S.E. ±	0.360	0.408	0.481
C.D (P=0.05)	1.06	1.18	1.39
K_0	14.64	48.45	120.00
K_{40}	20.01	69.89	180.86
K_{80}	22.22	75.68	193.69
K_{100}	24.32	83.64	208.07
S.E. ±	0.360	0.408	0.481
C.D (P=0.05)	1.06	1.18	1.39

Table 2 : Interaction effect of nitrogen and potassium on yield and nutrient uptake of colocasia

Treatments	Potassium (kg/ha)			
	K_0	K_{40}	K_{80}	K_{120}
Tuber yield (t/ha)				
N_0	12.18	14.54	16.10	17.07
N_{40}	14.80	19.05	21.25	24.00
N_{80}	15.49	23.05	24.09	27.49
N_{120}	16.10	23.41	26.54	28.73
		N x K		
S.E. ±		0.730		
C.D (P=0.05)		2.13		
Total uptake of nitrogen (kg/ha)				
N_0	35.21	46.75	48.74	50.44
N_{40}	44.61	66.09	69.36	72.94
N_{80}	54.45	79.16	87.05	96.16
N_{120}	59.60	87.61	97.63	115.25
		N x K		
S.E. ±		0.016		
C.D (P=0.05)		2.37		
Total uptake of potassium (kg/ha)				
N_0	81.89	119.10	123.74	128.37
N_{40}	113.13	173.70	182.53	191.56
N_{80}	139.75	211.70	232.76	245.87
N_{120}	145.30	218.98	235.73	264.54
		N x K		
S.E. ±		0.962		
C.D (P=0.05)		2.80		

alone or in their combinations significantly increased the uptake of nutrients. Maximum uptake of nitrogen and potassium by the colocasia crop was recorded as 115.25 kg and 264.54 kg/ha respectively, by the application of 120 kg N + 120 kg K_2O/ha followed by 80 kg N + 120 kg K_2O/ha (Table 2). It may be due to increased availability of both the nutrients in rhizosphere which promoted their absorption, accumulation and their content in plant and dry matter. These findings are in close conformity with the findings of Portiels *et al* (1982).

Table 3 : Response of nitrogen and potassium interaction on economics of crop

Treatments	Yield (t/ha)	Total cost of cultivation (Rs./ha)	Gross income (Rs./ha)	Net return (Rs./ha)	Net return per rupee investment (Rs.)
N_0K_0	12.18	9505.50	10962.00	1456.50	0.15
N_0K_1	14.54	9707.50	13086.00	3378.50	0.34
N_0K_2	16.10	9869.50	14490.00	4620.00	0.46
N_0K_3	17.07	10002.00	15363.00	5361.00	0.53
N_1K_0	14.80	9832.50	13220.00	3387.50	0.34
N_1K_1	19.05	10129.00	17145.00	7016.00	0.69
N_1K_2	21.25	10323.00	19125.00	8802.00	0.85
N_1K_3	24.00	10544.50	21600.00	11055.50	1.04
N_2K_0	15.49	10063.00	13941.00	3878.00	0.38
N_2K_1	23.05	10525.00	20745.00	10220.00	0.97
N_2K_2	24.09	10706.00	22421.00	11785.00	1.10
N_2K_3	27.49	10915.00	24741.00	13826.00	1.26
N_3K_0	16.10	10289.00	14490.00	4200.00	0.40
N_3K_1	23.41	10739.00	21069.00	10330.00	0.96
N_3K_2	26.54	10979.50	23886.00	12906.80	1.17
N_3K_3	28.73	11173.00	25857.00	14684.00	1.31
C.D. (P=0.05)					
N x K					0.17

The highest cost of cultivation (Rs. 11173.00), gross income (25857.00) and net return per rupee investment (Rs. 1.31) were recorded with treatment combination of 120 kg N+ 120 kg K_2O/ha followed by 80 kg N + 120 kg K_2O/ha. However, difference between both the treatment combinations was found to be in significant with respect to net return per rupee investment (Table 3). Cost of cultivation may probably be increased due to costly input of nitrogen and potassium but due being its higher demand for Arvi crop improved growth and development which resulted in higher yield and ultimately net return per rupee investment.

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