

Effect of different levels of nitrogen, phosphorus and potassium and split application of N on growth and yield of turmeric (*Curcuma longa*)

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Received: April 2000

ABSTRACT

A field experiment was conducted at Agricultural Research Station, K. Digraj, Sangli, in western Maharashtra, on medium-deep black soils during 1988-89 to 1992-93, to study the nutritional requirement of major nutrients (NPK) and time of split application of nitrogen fertilizer to turmeric (*Curcuma longa* L.) crop. Application of different levels of NPK recorded significant increase in the rhizome yield compared with the control. Among the various levels of major nutrients, application of 200, 100 and 100 kg N, P_2O_5 and K_2O /ha recorded the maximum plant height (109 cm), number of leaves (9.8/plant), length of leaf (62.8 cm), yield of green rhizome (0.53 g/plant) and (41 tonnes/ha). The same treatment recorded highest net returns (Rs 30,227 /ha) and benefit : cost ratio (1.62). Split application of N at different growth stages was significantly superior to single application of N. Application of N in 3 splits at 6, 12 and 18 weeks after planting recorded highest rhizome yield (38.5 tonnes/ha), maximum net returns and benefit : cost ratio.

Key words : Turmeric, Rhizome yield, Major nutrients (NPK), Split application

The productivity of turmeric is very low (2.75 tonnes/ha) compared to the potential yields. Poor nutrient management is one of the important reasons of low productivity. In Maharashtra, majority of the farmers apply only organic manure, though very few farmers apply chemical fertilizers in varying proportions to the turmeric crop. Hence with a view to find out nutritional requirement of turmeric and considering

the life-span of the crop, an experiment was conducted to study the effect of different levels of major nutrients (NPK) and split application of nitrogenous fertilizers at different growth stages on growth and yield of turmeric.

MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station, K. Digraj,

Sangli, from 1988–89 to 1992–93. The experimental soil was clay loam having pH 8.2, EC 0.38 mmhos/cm, organic carbon 0.52%, available N 218 kg/ha, available P_2O_5 8.42 kg/ha and available K_2O 524 kg/ha. The experiment was laid out in randomized block design with 20 treatment combinations in 3 replications. There was 5 levels of major nutrients (NPK) comprising 0:0:0, 120: 60: 60, 160:80:80, 200:100:100 and 240 : 120 : 120 kg N : P_2O_5 : K_2O /ha respectively and 4 levels of split application of nitrogenous fertilizer (urea) at different growth stages, viz. all N in 1 application 6 weeks after planting (WAP), N in 2 splits at 6 and 12 weeks after planting, N in 3 splits at 6, 12 and 18 weeks after planting, and N in 4 splits at 6, 12, 18 and 24 weeks after planting. Farmyard manure was applied @ 25 tonnes/ha before planting uniformly to all the plots. All the quantity of P_2O_5 and K_2O was applied through single superphosphate and muriate of potash basal at the time of planting and N was applied through urea as per the treatments. The plot size was 6.0 m $\times$ 3.75 m with spacing of 37.5 cm $\times$ 30 cm. Planting of 'Krishna' variety was done in the first week of May during all the 5 at same location. All other recommended package of practices were followed. Five plants were selected at random at 120 days after planting for recording the growth observations.

RESULTS AND DISCUSSION

Effect of nitrogen, phosphorus and potassium

Growth attributes : Growth-attributing characters, viz. plant height, leaves/ plant length and breadth of leaf and tillers/plant,

were significantly increased with application of different levels, of major nutrients compared with the control (Table 1). Application of 200:100:100 kg N: P_2O_5 : K_2O /ha slightly reduced plant height, number of leaves and length of leaf except leaf breadth and number of tillers (Table 1). Mohanty *et al.* (1988) also reported increase in the growth attributes due to application of 100:60:60 kg N: P_2O_5 : K_2O /ha compared with the control.

Yield and economics: Application of different levels of NPK recorded significant increase in the rhizome yield compared with the control (Table 2). Maximum yield of green rhizome was recorded with application of 200 : 100 : 100 kg N : P_2O_5 : K_2O /ha. The same treatment recorded highest net returns and benefit : cost ratio. However, further increase in the dose of NPK reduced the rhizome yield significantly. Bala Shanmugam and Subramaniam (1991) and Thakur *et al.* (1997) reported significant increase in the rhizome yield of turmeric with NPK. Mohanty *et al.* (1988) reported no significant difference in the turmeric yield due to application of NPK levels, however, highest benefit of Rs 1.82/rupee investment due to application of 75:50:50 kg N : P_2O_5 : K_2O /ha as compared with the control (Rs 1.72/Rupee investment).

Effects of split application of nitrogen

Split application N at different growth stages significantly superior to single application of N at 6 weeks after planting. Application of N in 3 splits at 6, 12 and 18 weeks after planting recorded the highest rhizome yield. This treatment was on a par with application of N either in 2 or 4 splits.

Table 1. Effect of different levels of major nutrients (NPK) and split application of nitrogenous fertilizers on growth attributes of turmeric

Treatment	Plant height (cm)	Leaves/plant	Leaf length (cm)	Leaf breadth (cm)	Tillers/plant	Green rhizome yield (g/plant)	Green rhizome yield (tonnes/ha)	Net return (Rs/ha)	Benefit : cost ratio
<i>P₂O₅ : K₂O : N (kg/ha)</i>									
0 : 0 : 0	91.5	9.3	53.8	14.0	1.3	0.44	290	10,750	1.24
120 : 60 : 60	102.4	9.8	58.9	14.4	1.4	0.48	342	18,568	1.39
160 : 80 : 80	107.2	9.6	61.0	14.8	1.6	0.50	366	22,451	1.47
200 : 100 : 100	109.0	9.8	62.8	14.8	1.6	0.53	410	30,227	1.62
240 : 120 : 120	106.4	9.7	61.5	15.2	1.7	0.51	347	17,085	1.35
CD (P = 0.05)	4.01	0.32	2.75	0.62	0.20	0.05	6.94		
<i>Split applications of N at WAP*</i>									
1 at 6 WAP	100.1	9.5	60.0	14.6	1.6	0.49	301	12,280	1.63
2 at 6, 12 WAP	100.8	9.5	60.1	15.0	1.6	0.49	363	20,000	1.75
3 at 6, 12 and 18 WAP	105.2	9.7	59.1	14.6	1.6	0.52	385	23,000	1.80
4 at 6, 12, 18 and 24 WAP	107.2	9.9	58.5	14.8	1.4	0.50	386	23,500	1.79
CD (P=0.05)	3.58	0.29	NS	NS	NS	NS	NS		
Interaction	NS	NS	NS	NS	NS	NS	NS		
CV (%)	6.15	5.32	7.24	14.74	18.00	15.70	15.80		

*WAP, Weeks after planting

Economic analysis revealed that application of N in 3 splits showed the maximum net returns and benefit : cost ratio (Table 2). Ahmed Shah and Muthuswamy (1981) reported that application of N in 5 splits, at planting, 30,60,90 and 120 days after planting, was beneficial over single application and recorded additional returns of Rs 2,904/ha.

It was concluded that in western Maharashtra on medium-deep black soils, an application of 200 : 100 : 100 kg N : P₂O₅ : K₂O/ha as all P₂O₅ and K₂O through single superphosphate and muriate of potash as basal dose at the time of planting and application of N in 3 splits at 6, 12 and 18 weeks after planting was advantageous for

higher rhizome yield of turmeric.

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