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Economic net returns per hectare area from the turmeric genotypes applied with nitrogen and potassium levels

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Abstract

The fresh yield of rhizomes (101.72 q/ha) and dry matter recovery (37.39%) were found to be significantly higher in case of Roma genotype of turmeric over PCT-8 and Suroma. The genotype Suroma produced the significantly lowest turmeric yield (96.13 q/ha), 5.59 q/ha less than Roma. The dry matter recovery was also lowest (35.24%) in case of Suroma. The maximum fertility level ($N_{200}K_{200}$) recorded significantly higher fresh yield of rhizomes (100.90 q/ha) over all the remaining fertility levels. The treatment interactions were found to be non-significant for both these parameters. Amongst the three genotypes, Roma gave maximum net income up to Rs.474564/ha with B:C ratio 4.50. The second best genotype was PCT-8 giving net income up to Rs.461350/ha with B:C ratio 4.40.In case of fertility levels, the increasing fertility levels from $N_{100}K_{100}$ to $N_{200}K_{200}$ resulted in increase in net income as well as B:C ratio. Thus the maximum dose ($N_{200}K_{200}$) gave the highest net income of Rs.468560/ha, whereas it was only Rs.449210/ha from $N_{100}K_{100}$. Based on two years mean values, the extra net income from $N_{200}K_{200}$ over $N_{100}K_{100}$ was up to Rs.19350/ha. Similarly the net income was upto Rs.15870/ha from $N_{200}K_{150}$ over $N_{100}K_{100}$. The increased net income under highest NK level was due to increased rhizomes yield/ha which fetched higher market value.

Keywords: Genotypes, fertility levels, yield, Net income and B: C ratio

Introduction

Turmeric is an important flavouring spice of daily diet, used in the treatment of several ailments (Sterlin and Kinsela, 2005; Dwivedi *et al.*, 2008) [9] and exhibits antibacterial, antiparasitic, antibiotic and antiseptic properties. India accounts for 80% of the world output of turmeric, though major part of its produce is being utilized within the country. Despite its excellent 45% export potential, the output of turmeric has not kept pace with increasing domestic and export demand for one or the other reasons *viz.*, marginal farming, unscientific techniques of cultivation and incomplete nourishment with the essential plant nutrients. Many turmeric genotypes have been developed in India possessing a high genetic diversity towards production potential and medicinal qualities under a given set of agro-climatic and environmental conditions. Consequently, their nutritional requirement towards major nutrients is also varied. Therefore, the scrutiny of such improved genotypes was essential for securing higher productivity and quality of turmeric under the soil and climatic conditions of Rewa region. Looking to the higher depletion of plant nutrients from the soil resulting in poor soil fertility, the adequate and balanced fertilization is necessary to increase the productivity of turmeric in the silty-clay soils of Rewa region of M.P.

Materials and Methods

The present investigation was carried out during two consecutive rainy-cum-winter seasons of 2011-12 and 2012-13 at the Private Agricultural Farm, Beenda-Samaria Road, Rewa (M.P.). The experiment was conducted in split plot design with three genotypes of turmeric as main plot treatment and nine fertility levels as sub plot treatments in three replications as given below-

Genotypes: 1. Roma 2. PCT-8 3. Suroma

Fertility levels: 1.$N_{100}K_{100}$ 2.$N_{100}K_{150}$ 3.$N_{100}K_{200}$ 4.$N_{150}K_{100}$ 5.$N_{150}K_{150}$ 6.$N_{150}K_{200}$ 7. N200-K100 8.$N_{200}K_{150}$ 9. $N_{200}K_{200}$

60 Kg P_2O_5/ha was applied as basal uniformly to all the treatments.
Fresh weight of rhizome/ha was recorded at harvest, dry matter recovery (%) was also worked out. Gross return, net monetary returns (Rs/ha) and Benefit: cost ratio was calculated.

Results and Discussion

Turmeric yield per hectare is the final expression of physiological and metabolic activities of plants. Turmeric yield is the product of cumulative action of all the factors. Judicious supply of essential plant nutrients alongwith soil moisture status contributes to better growth, thereby effectively increasing the yield per plant and ultimately the yield increase per hectare.

The data summarized in Table indicate that the fresh yield of rhizomes (101.72 q/ha) and dry matter recovery (37.39%) were found to be significantly higher in case of Roma genotype of turmeric over PCT-8 and Suroma. This may be due to higher yield-attributing parameters in Roma over PCT-8 and Suroma genotypes. The genotype Suroma produced the significantly lowest turmeric yield (96.13 q/ha), 5.59 q/ha less than Roma. The dry matter recovery was also lowest (35.24%) in case of Suroma. The rhizome yield is the resultant of coordinated interplay of growth and development characters. Thus the productivity parameters are based on the cumulative effect of the genetic ability and production efficiency of the genotypes, their fertility management and the agroclimatic conditions where these genotypes are grown. The yield of any crop depends on its capacity to accumulate photosynthates per unit time and its ability to remobilize the photosynthates towards the sink. In this respect, the genotype Roma took a lead over PCT-8 and Suroma genotypes.

The effective development of plant parts and dry matter production are the pre-requisite for better expression of inherent potential and better utilization of environment and soil resource to develop economic sink by any variety. So it is important to know about the assimilatory surface and distribution of assimilates. A plant with better partitioning ability and high remobilization of accumulated assimilates to develop underground rhizome may lead to high rhizome yield.

The genotypic variability amongst the turmeric genotypes towards their productivity parameters have also been reported by many researchers (Raveendra *et al.*, 2005; Sasikumar *et al.*, 2005; Sinkar *et al.*, 2005 and Tomar *et al.*, 2005) [6, 7, 8, 10].

As regards with the applied N and K nutrients, the maximum productivity viz. fresh yield of rhizomes (100.90 q/ha) was recorded in case of $N_{200}K_{200}$ being significantly higher to the preceding N plus K levels. The increase in this productivity of turmeric due to higher fertilizer levels was mainly due to increase in yield-attributing characters as mentioned earlier. There were no any significant changes in the dry matter recovery due to NK levels.

The highest improvement in the yield and yield attributory traits may be ascribed to the maximum improved vegetative growth due to $N_{200}K_{200}$ fertilization, thus facilitating increased photosynthesis thereby increasing translocation of organic food materials towards the sink from stem and leaves which accelerated the formation and development of greater sink size and weight, thus increasing the rhizome yield. The present results agree with those of many research workers (Baskar and Sankaran, 2005; May *et al.*, 2005; Harinkhede, 2005 and Haque *et al.*, 2007) [2, 5, 3, 4].

Ahirwar (2010) [1] who carried out experiment at Rewa (M.P.) also found that the combination of 200 kg/ha each of N and K recorded maximum rhizome yield (318.35 q/ha) as well as net income, followed by $N_{200}K_{150}$. The sole effect of N and K and their interactions on plant height was not significant but a general increase in height was registered due to N applications, indicating its influence on vegetative growth. On the other hand, the combined application of N and K levels have pronounced effect on vegetative characters, suggesting augmenting effect of N and K availability. The application of K reduced the fixation of NH_4 and thereby increased the utilization of N by the growing plants. Potassium is able to exchange NH_4 ions to make it more available to plants (Krishnamoorthy and Pothiraj, 1974). For this reason, increase in vegetative growth, due to higher level of K application, was more pronounced at the higher level of N application. Influence of N on vegetative growth was also recorded by several workers (Ahmed Shah and Muthuswami, 1981 and Balashanmugam and Chezhiyan, 1986). Moreover, the importance of NPK fertilization in turmeric was reported by various workers in relation to quality and productivity of the crop (Tayde and Deshmukh, 1986).

The treatment interactions were found to be non-significant in case of dry matter recovery as well as in case of fresh yield of rhizomes/ha. However, the best treatment interaction was Roma grown with $N_{200}K_{200}$ which gave non-significantly higher productivity parameters over all of the remaining interactions.

The ultimate aim of any spice grower is to secure maximum income out of the present resources. It is a general understanding that applications of newly developed genotypes with high fertility level not only produce highest and sustainable crop yields but also maintain the soil fertility as well as productivity and improves the quality parameters. Keeping all these points in view, the present experiment was taken up with optimum N and K levels for the high yielding varieties of turmeric.

Out of three genotypes, Roma gave maximum net income upto Rs.474564/ha with B: C ratio 4.50. The second best genotype was PCT-8 giving net income upto Rs.461350/ha with B: C ratio 4.40. Thus Suroma recorded the third position in giving net income upto Rs.441094/ha with B: C ratio 4.25. Thus Roma and PCT-8 gave additional net income upto Rs.44370 and Rs.20256/ha as compared to that of Suroma genotype. The net income was in accordance with the turmeric yield obtained from the genotypes which fetched market value.

In case of fertility levels, the increasing fertility levels from $N_{100}K_{100}$ to $N_{200}K_{200}$ resulted in increase in net income as well as B:C ratio. Thus the maximum dose ($N_{200}K_{200}$) gave the highest net income of Rs.468560/ha, whereas it was only Rs.449210/ha from $N_{100}K_{100}$. Based on two years mean values, the extra net income from $N_{200}K_{200}$ over $N_{100}K_{100}$ was upto Rs.19350/ha. Similarly the net income was upto Rs.15870/ha from $N_{200}K_{150}$ over $N_{100}K_{100}$. The increased net income under highest N and K level was due to increased rhizomes yield/ha which fetched higher market value. The net income was further augmented upto maximum extent from Rs.461300 to Rs.506420/ha in both the years when Roma was fertilized with highest N and K level ($N_{200}K_{200}$). The net income was higher when Roma was grown with each of the fertility levels as compared to those when PCT-8 and then Suroma was grown with each of the fertility levels. This was in accordance with the rhizome yields obtained from such treatment combinations.

Table 1: Yield, income and B; C ratio of turmeric as influenced by genotypes and fertility levels

Treatments	Fresh yield of rhizomes (q/ha)	Dry matter recover (%)	Net income (Rs./ha)	B:C ratio	Difference in net income (Rs/ha)
Genotypes					**Over Suroma**
Roma	101.72	37.39	474564	4.50	33470
PCT-8	99.51	36.33	461350	4.40	20256
Suroma	96.13	35.24	441094	4.25	--
CD (P=0.05)	0.39	0.73	--	--	--
Fertility levels					Over $N_{100}K_{100}$
$N_{100}K_{100}$	97.30	36.14	449210	4.34	--
$N_{100}K_{150}$	98.00	36.20	452880	4.35	36.70
$N_{100}K_{200}$	98.14	36.31	453210	4.34	4000
$N_{150}K_{100}$	99.09	36.26	459320	4.40	10110
$N_{150}K_{150}$	99.16	36.31	459230	4.39	10020
$N_{150}K_{200}$	99.33	36.46	459760	4.38	10550
$N_{200}K_{100}$	99.94	36.28	463770	4.42	14560
$N_{200}K_{150}$	100.24	36.40	465080	4.42	15870
$N_{200}K_{200}$	100.90	36.53	468560	4.43	19350
CD (P=0.05)	0.39	NS	-	-	-
Interaction	NS	NS	-	-	-

Reference

1. Ahirwar, Kamlesh, Singh, Jagdish, Kumar MM. Effect on nitrogen and potassium on growth and yield of turmeric. Annals of Plant and Soil Research. 2010; 12(1):71-72.
2. Baskar K, Sankaran K. Effect of humic acid (potassium humate) on growth and yield of turmeric (*Curcuma longa* L.) in an alfisol. Journal of Spices and Aromatic Crops. 2005; 14(1):34-38.
3. Harinkhede DK. Response of turmeric varieties to nitrogen and phosphorus levels. Vaniki Sandesh. 2005; 29(1):30-31.
4. Haque MM, Rahman AKMM, Ahmed M, Maksud MM, Sarker MMR. Effect of nitrogen and potassium on the yield and quality of turmeric in hill slope. International Journal of Sustainable Crop Production. 2007; 2(6):10-14.
5. May A, Cecilio Filho AB, Cavarianni RL, Barbosa JC. Turmeric (*Curcuma longa* L.) development and productivity in functioning at nitrogen and potassium doses. Revista Brasileira de Plantas Medicinais. 2005; **7**(3):72-78.
6. Raveendra BH, Amaresh YS, Divatar AB. Studies on rhizome characters influencing on yield of different cultivars turmeric (*Curcuma longa* L.). Advances in Plant Sciences. 2005; 18(1):183-188.
7. Sasikumar B, George KJ, Saji KV, Zachariah TJ. Two new high yielding, high curcumin, turmeric (*Curcuma longa* L.) varieties ‘IISR Kedaram’ and ‘IISR Allepey Supreme’. Journal of Spices and Agromatic Crops. 2005; 14(1):71-74.
8. Sinkar PV, Haldankar PM, Khandekar RG, Ranpise SA, Joshi GD, Mahale BB. Preliminary evaluation of turmeric (*Curcuma longa* L.) varieties at Konkan region of Maharashtra. Journal of Spice and Aromatic Crops. 2005; 14(1):28-33.
9. Sterlin D, Mark, Kinsela, Geori M. Traditional use of turmeric (*Curcuma longa*) as medicine in South Asia and Tropical Pacific. Ethnobotany. 2005; 17(1, 2):49-63.
10. Tomar NS, Nair SK, Gupta CR. Character association and path analysis for yield components in Turmeric (*Curcuma longa* L.). Journal of Spices and Aromatic Crops. 2005; 14(1):75-77.