



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SPI: 3096-3098

Sumit Raizada
Assistant Field Officer, Soil and
Land Use Survey of India,
Ahmedabad, Gujarat, India

Ashok Kumar
Professor (Soils), SVPUAT,
Meerut, U.P., India

Nirmal Kumar Katiyar
Assistant Plant Protection
Officer Chemistry, Regional
Pesticides Testing Laboratory
Kanpur, U.P., India

Pramod Kumar
SRF Krishi Vigyan Kendra,
Muzaffarnagar U.P., India

Effect of organic and inorganic nutrient on growth, yield and profitability of turmeric (*Curcuma Longa L.*)

Sumit Raizada, Ashok Kumar, Nirmal Kumar Katiyar and Pramod Kumar

Abstract

A field experiment was conducted during 2011-12 and 2012-13 at HRC of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut. To investigate the effect of different organic and inorganic nutrients on growth, yield and economics of turmeric cultivation. The experiment was laid out in Randomized Block Design with ten treatments combination and three replications. Application of different combinations of organic and inorganic nutrients influenced the growth and yield of turmeric variety AZAD HALDI-1. The results revealed that the combined applications of 125% NPK (188: 75: 135 kg ha⁻¹) i.e. T₆ increased plant height, number of leaves/plant, number of shoot/Plant, weight of rhizome and dry yield of rhizome. While minimum of these were observed in the absolute control i.e. T₁. Highest rhizome yield (11.54 & 12.15 t ha⁻¹) with maximum benefit- cost ratio (3.5 & 3.8) was obtained in the treatment combination T₆ and the lowest yield (5.75 & 5.93 t ha⁻¹) was obtained in the treatment T₁ with minimum benefit- cost ratio (1.4 & 1.5).

Keywords: organic and inorganic nutrient, turmeric

Introduction

Turmeric (*Curcuma longa L.*) is an important spice crop of India and many other Asian countries. Turmeric grows well in Andhra Pradesh, Maharashtra, Orissa, Tamil Nadu, Karnataka, Kerala, Utter Pradesh and some parts of North East India. Turmeric is widely cultivated mainly for its rhizomes. It is used both as spice and as raw material for dye making and cosmetic industries. It is also used in religious ceremonies and for culinary purposes. Curcumin, the primary pigment of turmeric, is generally used in various food industries as a food colourant. It is one of the basic components of curry powder which is available in the market. The use of turmeric for colouring and flavouring food items and its medicinal properties has been reported from the time of ancient Vedic culture of India. It is rich in dietary fibre, iron, potassium, magnesium and vitamin B6. The farmers usually don't use any fertilizers and chemicals and purpose of cultivation is mostly for consumption. But to maintain the soil health and sustainability for longer period, organic manures and other organic and inorganic fertilizers are important. Combined application of different nutrients (organic & inorganic) results in to high yield and quality rhizomes. Application of organic and inorganic nutrient has various advantages like improving soil physical properties, water holding capacity and organic carbon content apart from supplying good quality of nutrients (Singh *et al.*, 2009). The present research was conducted to evaluate the significant and effect organic and inorganic nutrient on the growth, yield and profitability of turmeric variety Azad Turmeric-1.

Materials and Methods

The field experiment was conducted at the Horticulture Research Center of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP during the season of 2011-12 & 2012-2013. The site is located 29°04' N latitude and 77°02' E longitude at an altitude of 237 meter above the mean sea level (MSL). (To achieve the objectives 10 different treatments were tested in randomized block design with three replications. The treatments description is) T₁- (Control), T₂- (100 %NPK RDF) 150 :60 :108 kg ha⁻¹, T₃- (125 %N+RDF PK) 188 :60 :108 kg ha⁻¹, T₄- (125 %P +RDF NK) 150 :75 :108 kg ha⁻¹, T₅- (125 %K +RDF PN) 150 :60 :135 kg ha⁻¹, T₆- (125 %NPK) 188 :75 :135 kg ha⁻¹, T₇- (100 %NPK +FYM @20tha⁻¹), T₈- (-75 %NPK +FYM @30tha⁻¹), T₉- (50 %NPK +FYM @50tha⁻¹ and T₁₀- (25%NPK +FYM @80tha⁻¹. Observations on plant height (cm) and number of leaves/ plant were recorded at 45, 95 & 135 DAP and weight of rhizome, number of shoot per plant and dry yield of rhizome were recorded at the time of harvest. The data on different parameters were recorded from a sample of five randomly chosen plants. The raw data collected for all parameters at

Correspondence
Sumit Raizada
Assistant Field Officer, Soil and
Land Use Survey of India,
Ahmedabad, Gujarat, India

different crop stages during the course of investigation was compiled and subjected to statistical analysis using the analysis of variance technique (Gomez and Gomez, 1984). The critical difference (at 5 % level of probability) was computed for comparing treatment mean in cases where effect came out to be significant by F- test as follows.

Result and Discussion

The study revealed that different combinations of nutrients (organic and inorganic) treatments showed variation in growth and yield characters of turmeric. Significant differences were observed among the ten different treatments for growth and yield characters viz., plant height, Number of leaves/plant, weight of rhizome, number of shoot/plant and dry yield of rhizome. Among different nutrients and their combinations tried, combined application of 125% NPK (188: 75: 135 kg ha⁻¹) (T₆) was found to be the most effective followed by application of 100% NPK + FYM @20tha⁻¹ (T₇) and 125% N+RDF PK (188: 60: 108 kg ha⁻¹) (T₃). Maximum plant height (85.77, 81.33 cm) was obtained in T₆ while minimum was in T₁ (37.40, 35.33 cm). Similarly maximum weight of rhizome (38.48, 40.5 g) were observed in T₆. The highest yield (11.54, 12.15 t/ha) was obtained in the treatment T₆ and minimum (5.75, 5.93 t/ha) was obtained in T₁ (Table 1 and 2). The improvement in growth and yield parameters in the treatment combination (T₆) might be due to combined application of N, P & K that influenced the physical, chemical and biological properties of soil through supplying macro and micro nutrients leading to better plant growth and development which support the findings of Nath and Korla (2000), Khalil *et al.* (2002) Patidar and Mali (2004), Singh *et al.* (2009) and Sarma *et al.* (2011) Compared to the availability of nutrients from most of the bulky organic

manures, the release of nutrients from NPK is more and could be the reason for higher plant heights (Bhende *et al.*, 2013). These results showed that the improvement in plant growth parameters could probably be due to increase in enzymatic activity, increase in microbial population and activity, increase in soil moisture holding capacity, accelerating the population and activity of earthworm and easy availability of macro and micro nutrients by application of vermicompost, FYM, organic and inorganic fertilizers (Mascolo *et al.*, 1999; Albiach *et al.*, 2000; Arancon *et al.*, 2006; Prabha *et al.*, 2007; Azarmi *et al.*, 2008 and Ekinici and Dursun, 2009). The higher and easily available nutrient content in organic and inorganic fertilizers and their uptake by the plants might be one of the reasons for the highest rhizome yield in T₆. Besides influencing the physico chemical properties of soil, organic and inorganic fertilizers is also known to contain growth promoting substances, enhance microbial activity and prevent nitrogen loss by leaching (Sultan, 1995 and Shinde *et al.*, 1992). Organic and inorganic fertilizers, vermicompost, FYM and Bipfertilizers improves the overall soil health, nutrient retention and their availability (Sreenivas *et al.*, 2000). Favourable influence of vermicompost and organic and inorganic fertilizers on the availability of all the essential plant nutrients during the crop period was also reported by Sharma *et al.* (2004).

Perusal of the data (Table 3) revealed that the cost of cultivation of turmeric varied from Rs. 149300.00 to Rs.198996.00. The maximum gross return Rs. 1421640.00 was found in the treatment combination T₆ due to maximum yield of rhizome and minimum Rs. 701280.00 in the treatment T₁. The highest benefit-cost ratio (7.3) was obtained in the treatment combination T₆ and the lowest was found in the treatment T₁ (2.9).

Table 1: Influence of organic and inorganic manure on plant height of turmeric and number of leaves at different stages of crop growth

Treatments	Plant height (cm)						Number of leaves					
	45 DAP		95 DAP		135 DAP		45 DAP		95 DAP		135 DAP	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
T ₁	20.33	18.40	29.67	29.07	37.40	35.33	2.00	2.67	3.00	3.33	3.33	4.00
T ₂	35.67	32.90	53.33	51.93	66.73	63.00	3.25	3.67	4.67	5.00	3.33	3.67
T ₃	40.67	37.63	61.00	59.33	76.27	72.33	4.00	4.75	5.50	5.70	5.00	6.00
T ₄	32.67	30.07	48.67	47.47	66.60	64.33	3.43	3.90	5.33	5.67	7.00	8.00
T ₅	30.67	28.23	46.00	44.50	65.77	65.33	3.20	3.66	5.20	5.32	6.00	6.33
T ₆	46.00	42.33	69.00	66.73	85.77	81.33	5.00	5.67	7.67	7.83	5.33	6.33
T ₇	38.67	35.73	58.00	56.33	83.63	79.00	4.33	4.87	5.90	6.11	8.33	9.33
T ₈	35.67	32.90	53.33	51.93	66.73	63.00	4.20	4.60	5.67	5.83	7.67	9.00
T ₉	30.67	28.23	46.00	44.50	57.20	54.00	3.67	4.67	5.07	5.20	7.00	8.00
T ₁₀	25.67	23.50	38.33	37.07	47.67	45.00	3.30	3.33	4.17	4.31	6.33	7.33
SE (m) ±	3.18	3.35	5.41	5.25	6.02	5.51	0.28	0.34	0.38	0.54	0.71	0.83
CD (p=0.05)	6.68	7.04	11.37	11.08	12.64	11.57	0.58	0.72	0.79	1.14	1.49	1.75

Table 2: Influence of organic and inorganic manure on yield and yield attributing characters of turmeric

Treatments	Weight of rhizome		Number of shoot		Dry yield of rhizome (t/ha)	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
T ₁	19.18	19.78	2.00	2.00	5.75	5.93
T ₂	31.41	33.07	4.33	5.30	9.42	9.92
T ₃	34.32	36.13	5.00	6.00	10.3	10.84
T ₄	33.18	34.93	5.00	5.00	9.95	10.48
T ₅	33.92	35.7	4.30	5.30	10.18	10.71
T ₆	38.48	40.5	6.00	7.00	11.54	12.15
T ₇	37.61	39.59	5.67	6.33	11.28	11.88
T ₈	33.35	35.1	3.67	5.33	10.01	10.53
T ₉	29.7	31.26	3.33	4.00	8.91	9.38
T ₁₀	28.01	29.48	2.67	3.33	8.4	8.84
SE (m) ±	0.16	0.17	0.70	0.59	0.05	0.05
CD (p=0.05)	0.47	0.51	1.48	1.23	0.14	0.15

Table 3: Economics of cultivation of turmeric under different treatments

Treatments	Cost of cultivation during 2011-12 and 2012-13.	Gross return (Rs./ha)		Grand Total both year	Net return (Rs./ha)		Grand Total both year	Benefit : Cost ratio		Grand Total both year
		2011-12	2012-13		2011-12	2012-13		2011-12	2012-13	
T ₁	149300	345240	356040	701280	200540	211340	411880	1.4	1.5	2.9
T ₂	156085	565380	595260	651790	413745	443625	857370	2.7	2.9	5.6
T ₃	156592	617760	650340	127116	465618	498198	963816	3.1	3.3	6.4
T ₄	156518	597240	628740	1225980	445172	476672	921844	2.9	3.1	6.0
T ₅	156841	610560	642600	1253160	458169	490209	948378	3.0	3.2	6.2
T ₆	157781	692640	729000	1421640	539309	575669	1114978	3.5	3.8	7.3
T ₇	168085	676980	712620	1389600	512145	547785	1059930	3.1	3.3	6.4
T ₈	172389	600300	631800	1232100	430561	462061	892622	2.5	2.7	5.2
T ₉	182692	534600	562680	1097280	353358	381438	734796	1.9	2.1	4.0
T ₁₀	198996	504180	530640	1034820	304834	331294	636128	1.5	1.7	3.2

References

- Albiach R, Canet R, Pomares F, Ingelmo F. Microbial biomass content and enzymatic activities after application of organic amendments to a horticultural soil. *Bioresour. Technol.*, 2000; 75:43-48.
- Arancon NQ, Edwards CA, Bierman P. Influences of vermicompost on field strawberries: Part 2. Effects on soil microbial and chemical properties. *Bioresour. Technol.*, 2006; 97:831-840.
- Azarmi R, Giglou MT, Taleshmikail RD. Influence of vermicompost on soil chemical and physical properties in tomato field. *African J Biotechnol.* 2008; 7(14):2397-2401.
- Bhende, Siddhesh Shamrao, Jessy kutty PC, Duggi, Shrishail, Magadam *et al.* Studies on growth, yield and economic parameters of kashthuri turmeric (*Curcuma aromatica* Salisb.) under organic manuring practices. *Internat. J Advancements Res. & Technol.* 2013; 2(5):414-420.
- Ekinci M, Dursun A. Effects of different mulch materials on plant growth, some quality parameters and yield in melon (*Cucumis melo* L.) cultivars in high altitude environmental condition. *Pakistan J Bot.* 2009; 41(4):1891-1901.
- Gomez KA, Gomez AA. *Statistical Procedures for Agric. Res.*, 2nd edition, John Wiley and Sons, New York, 1984.
- Khalil FA, EL-Hamd AS, Mohamed EI, Hassan MAM. Response of onion crop var. Shandaweel-1 to some sources of organic and inorganic fertilizers. *Assiut Journal of Agricultural Sciences.* 2002; 33:73-83
- Mascolo A, Bovalo F, Gionfriddo F, Nardi S. Earthworm humic matter produces auxin like effects on *Daucus carota* cell growth and nitrogen metabolism. *Soil Biol. & Biochem.* 1999; 31:1303-1313.
- Nath B, Korla BN. Studies on effect of biofertilizers in ginger, *Indian Journal of Horticulture.* 2000; 57(2):168-171
- Patidar M, Mali AL. Effect of farmyard manure, fertility level and biofertilizers on growth, yield and quality of sorghum (*Sorghum bicolor*). *Indian J Agron.* 2004; 42:117-120.
- Prabha KP, Loretta YL, Usha RK. An experimental study of vermin-biowaste composting for agricultural soil improvement. *Bioresour. Technol.* 2007; 99:1672-1681.
- Sarma I, Phookan DB, Boruah S. Effect of organic inorganic fertilizers on yield and economics of cabbage, *Brassica oleracea* var. *capitata*. *J Eco-friendly Agric.* 2011; 6(1):6-9.
- Sharma V, Kanwar K, Dev SP. Efficient recycling of obnoxious weed plants (*Lantana camera* L.) and congress grass (*Parthenium hysterophorus* L.) as organic manure through vermicompost. *J Indian Soc. Soil Sci.* 2004; 52:112-113.
- Shinde PH, Naik RL, Nazirkar RB, Kadam SK, Khaire VM. Evaluation of vermicompost. Proceedings of national seminar on Organic Farming; 19-21 April, Pune, College of Agriculture, Pune, 1992, 54-55.
- Singh SP, Choudhary R, Mishra AK. Effect of different combinations of organic and inorganic fertilizers on growth and yield of ginger *Zinziber officinale*. Rose.). *J Eco-friendly Agric.* 2009; 4(1):22-24.
- Sreenivas C, Murlidhar S, Rao MS. Vermicompost-a viable component of IPNSS in nitrogen nutrition of ridge gourd. *Ann. Agric. Res.* 2000; 21:108-113.
- Sultan I. Earthworms in soil fertility management. In: Thampan, P.K. (ed.), *Organic in soil health and crop production*. Peekay Tree Crops Development Foundation, Cochin, 1995, 78-100.