



# EFFECT OF ORGANIC AND INORGANIC MANURIAL COMBINATIONS ON TURMERIC (*CURCUMA LONGA* L.)

T. Chamroy\*, V. B. Rajwade<sup>1</sup> and V. V. Bajad<sup>2</sup>

Department of Horticulture, Dr. P.D.K.V., Akola - 444 104 (Maharashtra), India.

<sup>1</sup>Department of Agricultural Entomology, Dr. P.D.K.V., Akola - 444 104 (Maharashtra), India.

<sup>2</sup>Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad - 211 007 (Uttar Pradesh), India.

## Abstract

The present experiment was conducted during the year 2011-2012 at Vegetable Research Farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences (SHIATS), Allahabad (U.P.), India; to evaluate the effect of organic and inorganic manurial combinations on turmeric (*Curcuma longa* L.).

The different treatment combinations were-  $T_0$ : full dose of RDF with chemical fertilizers (60 : 50 : 120 kg NPK/ha),  $T_1$ : 75% N through urea + 25% N (Vermicompost),  $T_2$ : 75% N (urea) + 25% N (Poultry manure),  $T_3$ : 75% N (urea) + 25% N (Farmyard manure),  $T_4$ : 50% N (urea) + 50% N (Vermicompost),  $T_5$ : 50% N (urea) + 50% N (Poultry manure),  $T_6$ : 50% N (urea) + 50% N (Farmyard manure),  $T_7$ : 25% N (urea) + 25% N (Vermicompost),  $T_8$ : 25% N (urea) + 25% N (Poultry manure) and  $T_9$ : 25% N (urea) + 25% N (Farmyard manure). The results clearly indicate that the treatment  $T_5$  significantly increased plant height, leaf length, leaf width, leaf area, number of leaves/plant and number of tillers/clump followed by  $T_4$  over the control. The highest fresh rhizome yield (154.18 q/ha), dry rhizome yield (34.73 q/ha) and curcumin content (5.2%) were recorded in the treatment  $T_5$ .

**Key words** : Turmeric (*Curcuma longa* L.), organic and inorganic manures, randomized block design (RBD).

## Introduction

India is the largest producer of turmeric, supplying 94% of the world's demand. India dominates the world production scenario contributing to approximately 75% of world's total production producing 6,00,000 tonnes of turmeric annually. The area under turmeric cultivation is about 183 thousand hectares annually. India produces about 792 thousand tonnes of turmeric in 2010. Turmeric occupies 6% of the total area under spices and condiments in India (Rai and Yadav, 2005). Andhra Pradesh is the leading turmeric producing State in India contributing about approx. 47% of total production followed by Tamil Nadu and Kerala.

India has been a traditional producer, consumer and exporter of turmeric, but the productivity of turmeric in India is lowest in the world. In the present day agriculture, supplementary and complementary role of organics is being increasingly felt for sustainable productivity and keeping the soil health in order (Modgal and Singh, 1990).

Turmeric responds to applications of organic matter and experimental evidences are available on the beneficial effects of organic matter either alone or in combination with inorganic fertilizers on growth, productivity and quality of turmeric (Rao *et al.*, 1975 and Gopalakrishna *et al.*, 1997). Its nutrient requirement is quite high due to shallow rooting and capacity to produce large amount of dry matter per unit area. Therefore, the need-based application of plant nutrients through organic and inorganic manures is essential to optimum growth. Integrated use of inorganic with organic manures are necessary for sustaining soil fertility and productivity. Hence, keeping the above aspects and importance in view the present study was taken up to evaluate the effect of different forms of organic and inorganic fertilizer combination on growth, yield and quality of turmeric.

## Materials and Methods

The experiment was conducted at Vegetable Research Farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and

\*Authors for correspondence : E-mail : tchamroy@gmail.com

**Table 1 :** Effect of organic and inorganic manurial combinations on growth parameters of turmeric (*Curcuma longa* L.) cv. Rajendra Sonia.

Treatment no.	Plant ht. (cm) 120 Days	Leaf length (cm) 120 Days	Leaf width (cm) 120 Days	Leaf area (cm <sup>2</sup> ) 120 Days	No. of tillers/plant 120 Days	Days to 50% sprouting
T <sub>0</sub>	17.33	27.00	10.03	167.05	1.50	26.00
T <sub>1</sub>	18.45	29.45	11.02	197.78	1.90	24.33
T <sub>2</sub>	20.56	29.00	11.27	198.57	1.70	24.66
T <sub>3</sub>	19.50	30.13	11.18	199.07	1.90	25.66
T <sub>4</sub>	20.33	30.20	11.62	201.50	1.90	24.43
T <sub>5</sub>	20.78	30.75	11.65	210.02	2.15	26.66
T <sub>6</sub>	19.20	29.50	11.08	200.27	1.76	25.00
T <sub>7</sub>	18.13	27.50	11.19	196.87	1.86	25.66
T <sub>8</sub>	18.76	27.05	10.57	196.70	1.70	25.66
T <sub>9</sub>	18.56	29.50	11.59	180.50	1.70	25.00
F- test	S	S	S	S	S	S
S.Ed.	0.04	0.05	0.04	0.63	0.07	0.41
C.D. (0.05)	0.08	0.11	0.09	0.13	0.14	0.871

**Table 2 :** Effect of organic and inorganic manurial combinations on yield and quality parameters of turmeric (*Curcuma longa* L.) cv. Rajendra Sonia.

Treatment no.	No. primary fingers/ clump	No. secondary fingers/clump	Weight of rhizomes/plant (g)	Fresh rhizome yield (q/ha)	Dry rhizome yield (q/ha)	Curcumin content (%)
T <sub>0</sub>	2.93	3.13	153.27	122.59	27.58	4.95
T <sub>1</sub>	3.33	3.87	175.72	140.58	32.19	4.94
T <sub>2</sub>	3.20	3.80	165.47	132.39	29.52	4.90
T <sub>3</sub>	3.27	4.00	167.41	133.78	29.86	4.95
T <sub>4</sub>	3.33	4.27	189.37	151.50	33.91	5.13
T <sub>5</sub>	3.40	4.67	192.72	154.18	34.73	5.20
T <sub>6</sub>	3.67	3.27	182.93	146.32	33.65	4.96
T <sub>7</sub>	3.20	3.27	159.37	127.20	29.13	4.96
T <sub>8</sub>	3.07	3.73	155.02	124.01	27.90	4.95
T <sub>9</sub>	3.33	3.83	179.23	143.39	32.40	4.94
F-test	S	S	S	S	S	S
S.Ed.	0.04	0.04	0.10	0.08	0.02	0.09
C.D. (0.05)	0.09	0.09	0.22	0.18	0.04	0.18

Sciences (SHIATS), Allahabad (U.P.), India, during the year 2011-2012. The trial was laid out in randomized block design (RBD) with 10 treatments replicated thrice. The treatments consisted of T<sub>0</sub> (full dose of RDF with inorganic fertilizers; 60:50:120 kg NPK/ha), T<sub>1</sub> (75% N through urea + 25% N through Vermicompost), T<sub>2</sub> (75% N through urea + 25% N through Poultry manure), T<sub>3</sub> (75% N through urea + 25% N through Farmyard manure), T<sub>4</sub> (50% N through urea + 50% N through Vermicompost), T<sub>5</sub> (50% N through urea + 50% N through Poultry manure), T<sub>6</sub> (50% N through urea + 50%

N through Farmyard manure), T<sub>7</sub> (25% N through urea + 25% N through Vermicompost), T<sub>8</sub> (25% N through urea + 25% N through Poultry manure) and T<sub>9</sub> (25% N through urea + 25% N through Farmyard manure). Manures (vermicompost, poultry manure and farmyard manure) and full dose of phosphorus and potassium and one fourth of nitrogen (urea) were applied at the time of planting as basal. The remaining nitrogen was applied in 3 equal splits.

The healthy rhizome bits weighing about 20-25g each were planted during July at a spacing of 45 × 25 cm in

1.5m × 1.5m flat beds. Other cultural practices of turmeric cultivation were adopted as per recommendation.

The observations recorded were; days to 50% sprouting, plant height (cm), leaf length (cm), leaf width (cm), leaf area (cm<sup>2</sup>), number of leaves/tiller and number of tillers/plant (at 30 days interval), days to harvesting, number of primary fingers/clump, number of secondary fingers/clump, weight of rhizomes/plant (g), rhizome yield/plot (kg), fresh rhizome yield (q/ha), dry rhizome yield (q/ha) at harvest and curcumin content (%) estimated as per method suggested by Sadasivam and Manickam (1996). The total yield of rhizomes obtained from different treatments were calculated and converted to per hectare yield.

## Results and Discussion

The results of organic and inorganic sources of nutrient application showed significant influence over the control on growth, yield and quality attributes in turmeric.

The increased growth parameters were recorded with organic manures in combination with inorganic treatments over the RDF (inorganic fertilizers alone). The minimum number of days to 50% sprouting (24.33 days) was recorded in the treatment  $T_1$  while maximum days (26.65 days) was recorded in  $T_5$  (table 1). Most of the growth parameters such as plant height (20.78 cm), leaf length (30.7cm), leaf width (11.65 cm), leaf area (210.73 cm<sup>2</sup>), number of tillers/plant (2.15 tillers) were found maximum in the treatment  $T_5$  followed by  $T_4$ . While the minimum values pertaining to these parameters were recorded in  $T_0$  (table 1). These results are in conformity with the earlier findings in ginger (Dhasade *et al.*, 2010). They also reported that 50% N (urea) + 50% N (vermicompost) significantly improved all the growth and yield components than the absolute control. The minimum number of days to harvesting (196.33 days) was observed in  $T_0$ .

The yield parameters were significantly higher in organic manures and inorganic fertilizer combination over the RDF (inorganic fertilizers alone). The improvement in the physical and biological conditions on account of addition of organics, which also would have facilitated better absorption of nutrients from the soil, might be the reason for increased yield attributes.

The maximum number of primary fingers per clump was obtained in  $T_5$  (3.67 fingers) while the minimum was obtained in  $T_0$  (2.93 fingers). The maximum number of secondary fingers per clump was observed in  $T_5$  (4.67 fingers) followed by  $T_4$  (table 2).

The maximum weight of rhizomes per plant (192.72 g), fresh rhizome yield (154.18 q/ha), dry rhizome yield

(34.73 q/ha) were observed in  $T_5$  followed by  $T_4$ , while minimum was found in  $T_0$  (table 2). Similar results were reported by Dhasade *et al.* (2010) and Roy *et al.* (2007).

The maximum curcumin content (5.20%) was found in  $T_5$  followed by  $T_4$  (5.13%). The significant increase in growth, yield and quality of turmeric in the treatment  $T_5$  (50% N through urea + 50% N through poultry manure) over the control may be due to advantage of using poultry manure, which contains 3.03% N, 2.63% P<sub>2</sub>O<sub>5</sub> and 1.4% K<sub>2</sub>O. In addition to this poultry manure improved the physical, chemical and biological properties of soil, which helps in better growth of plants and development of rhizomes.

## Conclusion

Based on the results of the experiment, it may be concluded that treatment  $T_5$  was found most suitable in relation to growth, yield and quality of turmeric (*Curcuma longa* L.) cultivation under the agro-climatic conditions of Allahabad. However, since these findings are based on one year experiment, further trials may be needed to substantiate the results.

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