

# Evaluation of turmeric (*Curcuma longa* L.) cultivars for growth and yield in southern dry zone of Karnataka

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**ABSTRACT:** Turmeric (*Curcuma longa* L.), a zingiberaceous perennial herb is an important major spice and medicinal crop native to South East Asia. India is the largest producer and exporter of turmeric contributing 78 per cent of the world production and 45 per cent of world trade. Turmeric is an ancient spice crop, most valued and sacred spice of India. The underground rhizome of processed turmeric is used as spice and condiment, dye stuff, in drugs and cosmetic industries. Therefore, it is essential to standardize production techniques for its growth and yield for high productivity. An experiment was conducted to evaluate the performance of growth and yield parameters of sixteen cultivars of turmeric for commercial production in southern dry zone of Karnataka. The experiment was laid out in Randomized Complete Block Design with three replications at the College of Horticulture, Mysore. Cultivar Salem recorded highest plant height (37.07 cm) and number of tillers (3.80), cultivar CLT-325 recorded highest number of leaves (17.67), the cultivar Cuddapah recorded highest leaf area (55.83 dm<sup>2</sup>) and leaf area index (7.40) at 180 days after planting. Maximum yield components were recorded in Salem, Rajapuri, Prathibha, CLT-325 and Cuddapah. Maximum fresh rhizome yield of 33.67 t ha<sup>-1</sup> was observed in Salem followed by Rajapuri (32.67 t ha<sup>-1</sup>), Prathibha (32.56 t ha<sup>-1</sup>) and CLT-325 (32.49 t ha<sup>-1</sup>). Cultivar Salem, Rajapuri, CLT-325 and Prathibha were significantly better cultivars in terms of growth and yield parameters, they should be grown for commercial production of turmeric in southern dry zone of Karnataka.

**Key Words :** Evaluation, Turmeric, Growth, Yield, Dry zone

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**T**urmeric (*Curcuma longa* L.) is one of the important tropical rhizomatous spice crops, native to tropical South-East Asia and belongs to the family Zingiberaceae. It is believed to symbolise well being and good fortune. Hence, in India it is widely used in religious functions and ceremonies.

*Curcuma longa* L. contributed 96 per cent of total turmeric production and it is valued for deep yellow colour and aromatic flavour due to the presence of colouring matter 'curcumin'. In Karnataka, turmeric is cultivated largely in Chamrajnagar, Mysore, Belgaum, Bidar, Davangere, Dakshin Kannada, Mandya, Chickmagalore and Kodagu districts (Lokesh and

Chandranth, 2003).

Turmeric is one of the important spice crops grown in India. Turmeric plays an important role in earning foreign exchange for the country. As a medicine, turmeric is used extensively in India. It is also used as food preservative, colouring agent and in cosmetics. India is world's largest producer, consumer and exporter of turmeric. It is grown in Karnataka state in 15,320 ha area and producing about 93,817 million tonnes of cured turmeric per year. The southern dry zone areas of Karnataka comprising of Chamrajnagar (3379 ha), Mysore (1246 ha), Mandya (639 ha) and Hassan (486 ha) are the important districts, growing turmeric over area of 5750

ha which accounts for more than 38 per cent of the state's area under turmeric (Anonymous, 2009).

In Mysore (Southern Dry Zone), the turmeric crop is mainly cultivated as an intercrop in coconut plantation and also as sole crop under protective irrigated conditions, taking the advantage of monsoon rains. The protective irrigation is necessary to get higher yield and income, by adopting suitable high yielding cultivars.

The performance of any crop or variety largely depends upon its genetical make up. Further, the performance of the crop depends upon climatic conditions of the region under which it is grown. As a result, cultivars which perform well in one region may not perform well in other regions of varying climatic conditions. Hence, it is very much necessary to collect and evaluate all the available cultivars in order to select suitable and high yielding cultivars for southern dry zone of Karnataka condition. Keeping this in mind this study was conducted to find out the suitable cultivars in this region.

## RESEARCH PROCEDURE

The materials consisting of sixteen turmeric cultivars *viz.*, Co-1, Salem, Prabha, Krishna, Rajapuri, Prathibha, PTS-24, Cuddapah, Alleppey, Bidar-1, Bidar-4, CLI-327, CLI-14, CLT-325, Belgaum Local and Erode Local, were evaluated for their performance in RCBD with three replications. The study was conducted at College of Horticulture, Mysore (Karnataka) under University of Horticultural Sciences, Bagalkot in year

2012-13. The planting was done on raised beds spaced row to row 30 cm with plant to plant distance of 25 cm and the net plot size was 1.5 x 0.9 m, in the month of May, 2012. The used turmeric cultivars were harvested in February, 2012 *i.e.* eight months after planting. The soil of the experimental field was red sandy loam with medium fertility level. Recommended package of practices and plant protection measures were followed to raise a healthy crop.

The observations were recorded for growth parameters *viz.*, plant height (cm), number of tillers per plant, number of leaves per plant, leaf area (dm<sup>2</sup>), leaf area index, yield parameters *viz.*, number of mother rhizomes per plant, primary fingers per plant, secondary fingers per plant, fresh weight of mother rhizomes (g), primary fingers (g) and secondary fingers (g), fresh weight of rhizomes (g plant<sup>-1</sup>) and fresh rhizome yield (t ha<sup>-1</sup>). The data were analysed as per statistical procedure given by Panse and Sukhatme (1985).

## RESEARCH ANALYSIS AND REASONING

Significant differences were observed in growth parameters of different cultivars of turmeric (Table 1). Significantly highest plant height (37.07 cm) was observed in Salem cultivar which was at par with CLT-325 (36.93 cm). The least plant height (30.60 cm) was observed in CLI-14. Salem recorded highest number of tillers per plant (3.80) which was at par with Prathibha (3.77), CLT-325 (3.63) and Rajapuri (3.53). While the least number of tillers were found in Krishna (2.43).

Table 1 : Different growth parameters in turmeric cultivars					
Cultivars	Plant height (cm)	Number of tillers per plant	Number of leaves per plant	Leaf area (dm <sup>2</sup> )	Leaf area index
Co-1	33.73	3	12.73	48.8	6.47
Salem	37.07	3.8	16.7	55.8	7.4
Prabha	30.87	2.57	9.2	47.67	6.3
Krishna	31.53	2.43	11.6	39.97	5.3
Rajapuri	36.4	3.53	16.53	48.73	6.47
Prathibha	36.53	3.77	16.6	48.4	6.43
PTS-24	32.33	2.67	13	50.87	6.7
Cuddapah	35.73	2.87	15.67	55.83	7.4
Alleppey	33.13	2.97	10.93	55.17	7.33
Bidar-1	34	2.7	16.73	44.77	5.9
Bidar-4	31.14	2.73	14.73	48.67	6.43
CLI-327	35.67	2.73	14.2	44.93	5.97
CLI-14	30.6	2.9	13	41.84	5.53
CLT-325	36.93	3.63	17.67	51.63	6.83
Belgaum local	31.2	2.63	13	54.74	7.23
Erode local	33.09	2.73	14.13	44.77	5.93
S.E. ±	0.31	0.12	0.38	1.78	0.23
C.D. (P=0.05)	0.91	0.35	1.11	5.13	0.68

Highest number of leaves per plant (17.67) was found in CLT-325 which was at par with Bider-1 (16.73), Salem (16.70) and Prathibha (16.60) and least no of leaves in Krishna (9.20). The cultivars Salem (55.80 dm<sup>2</sup>) and Cuddapah (55.83 dm<sup>2</sup>) being at par recorded maximum leaf area. Leaf area index (7.40) was found highest with Salem and Cuddapah. Increase in number of leaves and leaf area helped in better synthesis of carbohydrates and their utilization for building up of new cells. Such variations in growth among different cultivars of turmeric were reported by several workers in turmeric grown under different agro-climatic regions (Hegde *et al.*, 1997; Kumar and Yadav 2001; Jagadish, 2000; Anusuya, 2004; Hanchinamani, 2012).

#### Yield and yield components :

Significant differences were observed with respect to number of mother rhizomes per plant, number of primary fingers per plant and number of secondary fingers per plant (Table 2). Maximum number of mother rhizomes were found in Rajapuri (2.80). Highest number of primary and secondary fingers were found in Salem (9.67 and 17.27, respectively) which were at par with Rajapuri (9.10 and 16.56, respectively), CLT-325 (9.03 and 16.47, respectively), Prathibha (9.13 and 16.28, respectively). The minimum number of rhizomes recorded in CLI-14 (5.60 and 8.13, respectively). Among the cultivars Salem (88.56 g) recorded maximum fresh weight of mother rhizomes and was par with CLT-325 (86.80 g), Rajapuri (84.13 g). The lowest fresh mother rhizomes weight of 48.85 g was found in CLI-14. The cultivar Salem (183.61g and 107.57 g, respectively) recorded highest

fresh weight of primary and secondary fingers which were at par with Rajapuri (179.93 g and 105.73 g, respectively), Prathibha (181.27 g and 103.04 g, respectively) and CLT-325 (178.33 g and 104.13 g), while the least fresh weight of primary and secondary finger were recorded in Krishna (83.13 g and 48.93 g, respectively). Among different cultivars, the cultivar Salem (517.28 g) recorded maximum fresh weight of rhizome per plant which was at par with CLT-325 (513.64 g), Rajapuri (511.67 g) and Prathibha (510.06 g). The lowest fresh rhizome yield recorded in Krishna (195.69 g).

The fresh rhizome yield per hectare differed significantly among different turmeric cultivars. Cultivar Salem (33.67 t ha<sup>-1</sup>) registered highest fresh rhizome yield which was at par with, Rajapuri (32.67 t ha<sup>-1</sup>), Prathibha (32.56 t ha<sup>-1</sup>) and CLT-325 (32.49 t ha<sup>-1</sup>), while lowest yield of fresh rhizome yield was found with cultivar Krishna (16.75 t ha<sup>-1</sup>). Highest fresh rhizomes yield of these cultivars could be attributed to the maximum plant height, number of tillers, leaves and LAI which are the important components of growth and had a positive and significant correlation with yield. Further, maximum rhizome yield from these cultivars may also relate to weight of mother rhizomes, primary and secondary fingers as they had positive and significant correlation with yield. Thus, it could be concluded that yield of rhizome is mainly dependent on vigour of the plants and yield components. The variation in yield of different cultivars grown under different agro-climatic conditions has been reported by Patil *et al.* (1995), Naidu *et al.* (2000), Yadav

**Table 2 : Different yield and yield attributing components of turmeric cultivars**

Cultivars	No. of mother rhizome	Wt. of mother rhizome	No. of primary fingers /plant	Wt. of primary fingers/plant	No. of secondary fingers per plant	Wt. of secondary fingers per plant	Fresh weight of rhizomes (g plant <sup>-1</sup> )	Fresh rhizome yield (t ha <sup>-1</sup> )
Co-1	1.87	75.37	8.33	136.74	15.87	95.29	262	30.54
Salem	2.63	88.56	9.67	183.61	17.27	107.57	517.28	33.67
Prabha	1.91	62.27	8.67	128.41	16.13	58.92	507.64	21.54
Krishna	1.62	58.13	6.73	83.13	15.75	48.93	195.69	16.75
Rajapuri	2.8	84.13	9.1	179.93	16.56	105.73	511.67	32.67
Prathibha	2.47	83.73	9.13	181.27	16.28	103.04	510.06	32.56
PTS-24	2.31	81.49	8.67	176.37	15.8	93.53	464	26.65
Cuddapah	1.79	82.56	7.47	177.46	13.03	75.06	507	29.95
Alleppey	2.02	77.47	7.13	171.86	11	47.43	386.99	26.2
Bidar-1	1.96	69.03	7.73	151.44	9.6	49.76	322.31	28.19
Bidar-4	1.6	67.53	7.54	165.07	13.67	92.4	500	27.72
CLI-327	1.8	57.45	7.81	113.49	12.6	65.44	470.67	25.96
CLI-14	1.7	48.85	5.6	94.72	8.13	69.83	361.67	19.22
CLT-325	2.57	86.8	9.03	178.33	16.47	104.13	513.64	32.49
Belgaum local	1.67	80.47	6.97	122.67	12	68.1	424.67	25.04
Erode local	1.49	71.1	7.2	135.2	13.87	73.64	492.71	28.93
S.E. ±	0.08	1.71	0.21	2.16	0.36	1.97	3.06	0.52
C.D. (P=0.05)	0.23	4.93	0.61	6.24	1.03	5.68	8.83	1.5

(2002), Anusuya (2004) and Hanchinamani (2012). Randhawa and Mishra (1974) while studying the effect of seed size in turmeric reported that large sized rhizome weighing approximately 100 g gave significantly higher yield ( $61 \text{ q ha}^{-1}$ ) than small sized rhizomes ( $53.3 \text{ q ha}^{-1}$ ) of 50 g weight. Similar results were also obtained by Singh *et al.* (1988); Rashid *et al.* (1996) and Shashidhar and Sulikeri (1996).

With the present investigation it can be concluded that, the genotypes exhibited differences with respect to growth and yield parameters. Among sixteen cultivars Salem, Rajapuri, CLT-325 and Prathibha, cultivars performed well growth and yield characters, these four cultivars were found to be suitable for commercial production of turmeric in southern dry zone of Karnataka state.

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