

Evaluation of Turmeric (*Curcuma longa* L.) Genotypes for Growth, Yield and Yield Attributes

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Received: 17.04.2017 | Revised: 26.04.2017 | Accepted: 27.04.2017

ABSTRACT

India is the major producer and exporter of turmeric but the productivity is very low due to presence of high variation among the cultivars, lack of hybridization programme due to non/shy flowering habit and non seed setting nature of commercial varieties of long duration types, growing under different agro climatic conditions and cropping systems. It is needless to state that all the varieties may not be adaptable in different agro-climatic conditions. However, the genetic diversity that exists in the present collections would greatly facilitate the selection of better types. The acquisition of superior varieties by introducing them from other areas and acclimatizing them under local conditions accomplish the same purpose as evolving superior varieties by planned breeding programme.

Key words: Zingiberaceae, Gnotypes, Cropping systems, Hybridization.

INTRODUCTION

Turmeric (*Curcuma longa* L.) is one of the important spice crops grown in India since times immemorial. It is regarded as a symbol of well being and widely used in ceremonies and religious functions. It is an erect, herbaceous perennial belonging to the family Zingiberaceae and native to South East Asia. Turmeric of commerce is the dried underground rhizome, valued for its deep yellow colour and pungent aromatic flavour due to the presence of colouring matter 'curcumin' and an volatile oil 'termerol'. It is also an important condiment which finds a

unique place in culinary arts and as colouring agent in textile, food, confectionary, cosmetics and drug industries, of late in the preparation of anticancer medicines. Turmeric is being largely grown in India, Pakistan, Myanmar, Japan and China. India is the major producer of turmeric, which occupies fifth place in area under spices and ranks second in production next to chillies. It occupies 6.3 per cent of spice area and shares 16.91 per cent of spice production. In India it is being cultivated in more than 20 states in an area of 1,94,000 ha with an annual production of 9,71,000 MT¹.

Cite this article: Dodamani, S., Sharatbabu, A.G., Dharamatti, V. and Hussain, M.D.S., Evaluation of Turmeric (*Curcuma longa* L.) Genotypes for Growth, Yield and Yield Attributes, *Int. J. Pure App. Biosci.* 5(2): 1138-1143 (2017). doi: <http://dx.doi.org/10.18782/2320-7051.2925>

In India, it is mainly grown in Andhra Pradesh, Orissa, West Bengal, Tamil Nadu, Assam, Maharashtra, Karnataka, Bihar and Kerala. Among these, Andhra Pradesh occupies 34.90 per cent of total area and 43.51 per cent of total production of the country. The national productivity of crop is 5 tons per hectare¹.

Turmeric is either grown as a pure crop or inter/mixed crop in coconut, arecanut and coffee plantations. The average productivity of the crop is however very low as against the state yield average. Lack of suitable cultivar and package of practices for a particular agro-climatic conditions and cropping systems are reported to be the reasons of the low productivity. Very limited attempts have been made on the evaluation of turmeric genotypes under varied agroclimatic conditions. Several studies revealed existence of significant variability in turmeric genotypes with regard to growth, yield and quality attributes when grown under different agro climatic conditions.

The performance of any crop or variety largely depends upon its genetic makeup. Further, the performance of the crop depends upon climatic conditions of the region under which they are grown. As a result, genotypes 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 genotypes in order to select suitable and high yielding genotypes for a given agroclimatic condition. Considering the importance of turmeric, research on this crop is very much necessary to find out the suitability of different genotypes for a particular region.

Evaluation of turmeric genotypes for growth attributes

Jagadish⁹ observed that the turmeric var. Suvarna (5.86) produced highest number of tillers but it did not differ from BSR-1 (5.60). This was followed by Bangalore Local (4.67), Amalapuram (4.26) and Bidar-1 (4.20) while the lowest number of tillers was recorded from Dakshina Kannada Local (2.80) and also observed no significant variation in petiole

length in turmeric cultivars at different stages of crop growth. The cultivar Bangalore Local (19.00) produced the maximum number of leaves per plant, which was on par with Cuddapah (18.73), Bidar-1 (18.60) and Suvarna (18.30).

Jana and Bhattacharya¹⁰ evaluated 22 cultivars of turmeric in terai belt of West Bengal during kharif 2000 and the genotype PTS-19 (160.13 cm) recorded the highest plant height followed by Suroma (156.11 cm) and Duggirala (155.96 cm).

Kumar and Yadav¹² evaluated 23 turmeric cultivars under Manipur conditions and observed highest primary finger length was recorded in PCT-8 (21.8 cm) and the lowest in Sikkim Yellow (13.2 cm).

Mini *et al.*¹⁴ observed that sufficient numbers of tillers (4.75) were produced by *C. amada* after 5 months of planting and statistically on par with Local I, Morangia, R.H.5 and Rajendra Sonia. The production of tiller was late in PCT-II with only 0.50 numbers/clump even after 5 months of planting.

Anusuya³ reported the higher plant height in turmeric genotype Salem (66.06) which was on par with Alleppey (63.06) and PTS-24 (62.66 cm) while the lower plant height was observed in PCT-8 (36.73 cm), PCT-13 (37.86 cm) followed by black turmeric (43.26 cm). Maximum leaf area was observed in Mango ginger (53.40 dm²) followed by Cuddapah (47.36 dm²) and Alleppey (46.20 dm²). Minimum leaf area was observed in Black turmeric (24.66 dm²) followed by Krishna (28.06 dm²).

Sinkar *et al.*²³ evaluated 21 varieties of turmeric and among which the maximum length of primary rhizome was recorded in CLI-333 (10.73 cm) followed by Salem (10.33 cm) and CLI-332 (10.12 cm) and the lowest length of primary rhizome was recorded in CLI-362 (7.15 cm).

Hrideek *et al.*⁷ reported the highest leaf length (44.27 cm) and breadth (40.83 cm) in IISR Prabha followed by IISR Kedaram (40.87 length and 40.25 breadth).

Singh and Prasad²² reported significant differences among turmeric varieties with respect to plant height and maximum plant height was recorded in ACC-657 (119.67cm) followed by ACC- 585 (198.98cm). However, there was non-significant difference for number of tillers per plant. Cultivars had significant differences in maturity and ACC-657 and ACC-585 took longer period i.e. 262 and 238 days, respectively.

Dhatt *et al.*⁶ found significant difference for plant height. The highest plant height was recorded in 'PH 3' (113.61 cm) and 'PH 5' (105.57 cm) was at par but significantly higher than the other clones. Turmeric cultivar Krishna recorded the highest plant height of 99.63 cm. Maximum tiller per plant was recorded in the cultivar Krishna (5.99). The maximum length and girth of mother rhizome in 'PH 4' (6.66 cm and 3.09 cm respectively) and the minimum length and girth of mother rhizome was recorded in Narendra Sonia (4.89 cm and 2.50 cm respectively).

Deshmukh *et al.*⁵ reported that among eight turmeric cultivars evaluated, the maximum number of leaves per clump was recorded by Krishna (12.55) and also more leaves per tiller (5.99) under Nagpur conditions of Maharashtra.

Jilani *et al.*¹¹ reported that among three turmeric cultivars maximum number of leaves was recorded in Krishna (13.74) and the least was observed in Duggirala (10.50).

Singh *et al.*²¹ reported that among the 13 genotypes evaluated, IT-2 (114.60 cm) recorded maximum plant height followed by IT-1 (105.80 cm) while the minimum was recorded in TCP-11 (87.60 cm).

Rajyalakshmi and Umajyothi¹⁸ reported that the variety Suprabha (50.60 cm) recorded maximum plant height, while the lowest was recorded in Varada (32.73). Maximum number of leaves (18.87) and tillers per plant (10.17) were recorded in variety Suprabha, while the minimum were recorded in Chintapalli Local (13.93) and Varada (4.13), respectively.

Evaluation of turmeric genotypes for yield and yield attributes

Jagadish⁹ observed that maximum fresh rhizome yield per hectare was recorded in turmeric var. Suvarna (18.20 t/ha) and which was on par with Bangalore Local (18.06 t/ha), BSR-1 (17.35 t/ha), Rajapuri (17.46 t/ha), Bidar-1 (16.06 t/ha) and Amalapuram (16.00 t/ha), while the lowest fresh rhizome yield per hectare was recorded in Dakshina Kannada Local (9.13 t/ha) and highest curing percentage was recorded by Suvarna (26.20 %), Bangalore Local (25.40 %), BSR-1 (25.00 %), Alleppey (25.20 %) and Prathibha (24.50 %), these cultivars were on par, the lowest curing percentage was recorded by cultivars Amalapuram (19.00 %) and Cuddapah (19.00 %).

Naidu *et al.*¹⁵ observed that turmeric variety BSR-1 exhibited maximum productivity of fresh rhizome (36.5 t/ha) and it was at par with the productivity of the selection PTS-62 (27.36 t/ha).

Shanmugasundaram *et al.*¹⁹ reported highest yield in turmeric genotype PTS-43 (7.17t/ha) followed by Roma (5.69t/ha) and BSR-2 (4.48 t/ha) under coimbatore (Tamil Nadu) conditions.

Kumar and Yadav¹² evaluated 23 turmeric cultivars and found the highest primary finger length was recorded in PCT-8 (21.8 cm) while lowest was recorded in Sikkim Yellow (13.2 cm).

Yadav²⁴ reported that turmeric cultivar PTS-43 recorded the maximum fresh rhizome yield (255.9 q/ha) which was closely followed by JT5-2 (251.2 q/ha), Acc. 360 (246.9 q /ha), Rajendra Sonia (234.9 q/ ha) and JT5-1 (231.6 q/ha) under Chattisgarh conditions.

Anusuya³ reported that the maximum fresh rhizome yield (49.95 t/ha) was recorded in Mango ginger (*Curcuma amada*) followed by Bidar-1 (35.60), Cuddapah (35.40 t/ha), CO-1 (33.65 t/ha), PTS-24 (33.34 t/ha), Salem (32.98 t/ha), Amalapuram (31.99 t/ha) and Rajapuri (31.45 t/ha) whereas the lowest fresh rhizome yield was recorded in Black turmeric

(4.94 t/ha) followed by Kasturi turmeric (10.24 t/ha).

Jadhao *et al.*⁸ recorded greatest yield of mother rhizome in turmeric variety Krishna (2.42 per cent) and weight of fresh mother rhizome (60.67 q/ha) and dry yield of mother rhizomes (51.29 q/ha). The highest curing percentage and curcumin content in turmeric variety Suvarna (20.54%) were observed.

Sinkar *et al.*²³ reported that maximum weight of primary rhizome was recorded in turmeric cultivar Salem (208.92 g) which was on par with Krishna, CLI-333 and CLI 332 (121.91, 110.80 and 107.60 g, respectively) while the minimum weight of primary rhizome was recorded in CLI-362 (48.88 g).

Hrideek *et al.*⁷ reported that turmeric var. Prabha showed superiority for yield and yield contributing traits followed by Kedaram under Idukki (Kerala) conditions Prathibha took maximum days for maturity followed by Kedaram. Prabha had maximum curcumin content (5.06%) followed by local variety (2.08 %).

Singh and Prasad²² reported that turmeric cultivar RH-5 produced maximum yield of 49.76 tonnes per hectare as compared to other cultivars and it gave significantly higher yield (5.69 t/ha) of fresh rhizome which was 12.91 per cent higher over check "Rajendra Sonia".

Manohar *et al.*¹³ reported that the long duration turmeric genotype Duggirala produced highest fresh rhizome yield (168 g/plant) while Armour had the highest curing percentage (20.26). The maximum curcumin content was recorded in short duration genotype PCT-14 (4.06 %).

Pirjade *et al.*¹⁷ evaluated six turmeric cultivars and observed that yield and contributing characters, *i.e.* weight of mother rhizomes per plant, per plot and per hectare, weight of fresh fingers per plant, per plot and per hectare were found maximum in Krishna.

Dhatt *et al.*⁶ reported that among the five elite turmeric clones the maximum length and girth (cm) of primary finger was recorded in 'PH3' (7.84 and 4.79 cm) whereas the minimum length and girth of primary finger

was recorded in Narendra Sonia and 'PH 5' (6.85 cm and 2.53 cm, respectively).

Chaturvedi *et al.*⁴ reported that among seven varieties of turmeric tested, Barua Sagar recorded maximum fresh rhizome of 33.50 t/ha and it was at par with the production of Azad Haldi-1 (32.60 t/ha).

Negi *et al.*¹⁶ reported that yield per plant was highest in Suroma (258.69 g). The rhizome yield was maximum in Suroma (227.64 q/ha) followed by Azad haldi-1 (218.94 q/ha) and Barua Sagar Local (217.89 q/ha) under Madhya Pradesh conditions.

Singh²¹ reported that among the 13 turmeric genotypes evaluated, TCP- 11 recorded maximum yield per hectare (20.30 t/ha) followed by TCP- 82 (18.80 t/ha) compared to check IISR var. Prabha (14.30 t/ha).

Rajyalakshmi and Umajyothi (2014) evaluated eight ginger varieties and observed variations for different characteristics. The variety Suprabha was found to give higher fresh rhizome yield (21.71 t/ha) followed by Chinthapalli local (17.04t/ha). Higher heritability was observed for rhizome yield (94.60). Positive significant correlation of rhizome yield with number of finger rhizomes/plant, number of mother rhizomes/plant and number of tillers/plant was observed.

Crop duration

Jagadish⁹ observed that the number of days taken from planting to harvest varied from 212 to 240 days. The turmeric cultivar BSR-1(240 days), Cuddapah (233 days), Bidar-1 (232 days) and Bangalore Local (230 days) were on par and grouped as slightly late maturing types compared to other cultivars.

Singh and Prasad²² reported among 16 turmeric cultivars that ACC-657 and ACC-585 required a longer period to maturity (262 and 238 days, respectively).

Singh *et al.*²⁰ reported that among 11 turmeric genotypes evaluated, Megha turmeric (233 days) recorded maximum days to maturity followed by Rashmi (231.9 days) while the minimum was in Rajendra Sonia (204.3 days) under Mizoram conditions.

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