Research Paper

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 3 | Issue 2 | December, 2012 | 99-101

Effect of different grades of rhizomes on growth and yield of turmeric (*Curcuma longa* L.)

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ABSTRACT : Turmeric (*Curcuma longa* L) plant species produces different sizes of mother rhizomes and finger rhizomes. Rhizomes are used as propagating material in turmeric cultivation. The effects of seed rhizome size on growth and yield of turmeric was evaluated. Mother rhizomes of 10- 15g to 45-50g and finger rhizomes of 5-10 g to 25-30g were tested. The heavier the mother rhizome (45-50 g), better the plant growth. Plants from mother rhizome (25-30g) and finger rhizomes (25-30g) grew similarly well. The seed rhizomes with a greater diameter developed vigorous seedlings. The plants grown from mother rhizome (45-50g) reported the highest plant growth characters like plant height (31.43 cm), number of leaves (7.20), number of tillers (2.81), stem girth (9.14 cm) and leaf area (21012 cm^2 m^{-2}), which were significantly higher than those from lighter finger rhizomes. Finger rhizomes (10-15g) was easily broken at the time planting, and had secondary and tertiary finger rhizomes, which developed thinner plants and resulted in a lower yield. The yield and dry weight were maximum in the plants grown directly from mother rhizome (45-50g) and lower in the plants grown from finger rhizomes (10-15g). This study indicates that the turmeric seed rhizome should be (45-50g) with a larger diameter.

Key Words : Seed rhizome, Mother rhizome, Finger rhizome, Growth, Yield

How to cite this paper : Padmadevi, K., Jothi, L. Jeeva, Ponnuswami, V., Durgavathi, V. and Parveen, I. Rijwana (2012). Effect of different grades of rhizomes on growth and yield of turmeric (*Curcuma longa* L.), *Adv. Res. J. Crop Improv.*, **3** (2) : 99-101.

Paper History : Received : 16.06.2012; **Revised :** 25.08.2012; **Accepted :** 20.10.2012

Turmeric (*Curcuma longa*) is a small perennial herb native to India. It is used as condiment, dye, drug and cosmetic in addition to its use in religious ceremonies. Turmeric belongs to Zingiberaceae family and is cultivated extensively in Asia especially India, China, and other countries. India is a leading producer and exporter of turmeric in the world. In India, Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are the important states which cultivates turmeric, of which, Andhra Pradesh alone occupies 35.0 per cent of area and 47.0 per cent of production. In India, turmeric is cultivated under 1, 80,960 ha with the production of 7, 92,980 MT (NHB database, 2011). The active constituent present in turmeric is curcumin, which comprises 0.3-5.4 per cent (Leung, 1980). Curcuminoids in turmeric have anti-inflammatory, antimutagen, anticancer, antibacterial, anti-oxidant, antifungal, antiparasitic and detoxifying properties (Herrmann and Martine, 1991; Nakamura *et al.*, 1998; Osawa *et al.*, 1995; Sugiyama *et al.*, 1996; Uechi *et al.*, 2000). Normally turmeric is propagated through a small portion of rhizomes known as seed rhizome or seed sets (Dupriez and De leener, 1992; Borget, 1993; Ravindran *et al.*, 2005). The seed rhizome gives the economic yield. The planting material used affects the growth and yield of the crops. Therefore, selecting the right size of planting material (length, weight and number of growing buds per seed) is a very critical factor in the cultivation of turmeric. The use of large seed rhizomes is generally found to increase the final yield of rhizomatous spices such as ginger (Whiley, 1990; Borget, 1993). Large sized seed rhizomes of ginger give significantly higher yield than planting of small pieces (Nybe and Raj, 2004). Hossain *et al.* (2005) found high yield of turmeric from using 30-40 g seed rhizomes compared to 10 and 20 g seed rhizomes. Therefore, the objective of this study was to determine the optimum seed rhizome size of turmeric with respect to its growth, yield.

RESEARCH PROCEDURE

The field experiment was carried out at Horticultural College and Research Institute Periyakulam (TNAU) during 2011-2012. The variety used for the study was BSR2. The

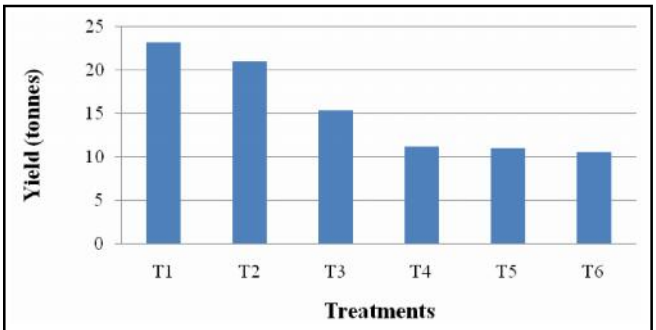
treatments comprised of different grades (based on weight) of mother rhizomes and finger rhizomes as given below.

Table A : Details of treeatment	
Treatments	Rhizome size (g)
Treatment(T_1)	Mother Rhizome -45 to 50
Treatment(T_2)	Mother Rhizome-25 to 30
Treatment(T_3)	Mother Rhizome-10 to 15
Treatment(T_4)	Finger rhizome - 25 to 30
Treatment(T_5)	Finger rhizome -10 to 15
Treatment(T_6)	Finger rhizome - 5 to 10

The experiment was laid out in Randomized Block Design (RBD) with four replications and a spacing of 30x15 cm. Cultural practices were followed as per the recommended package of practices. Observations on growth and yield attributes were recorded. The data were subjected to statistical analysis (Panse and Sukhatme, 1985).

RESEARCH ANALYSIS AND REASONING

The results obtained on growth performance of turmeric are presented in (Table 1 and Fig. 1). The growth characters of turmeric with respect to different parameters such as, plant height, number of tillers, stem girth, number of leaves and leaf area were observed. Seedling emerged at almost the same time irrespective of the size of seed rhizomes. Mother rhizome (45-50g) seedlings were healthier because larger rhizomes had larger buds and diameter. In the different grades of rhizome, the mother rhizome (45-50g) recorded the highest plant height (31.43 cm). Larger seed rhizomes contain larger amount of reserves that enhanced seedling growth, which ultimately resulted in a taller plant. In tropical soda apple and spring wheat Akanda *et al.* (1996) and Stougaard and Xue (2004) reported that larger seeds produce longer coleoptiles, and had higher reserves, which



T_{1-} Mother Rhizome -45 to 50g, T_2- Mother Rhizome-25 to 30 g, T_3- Mother Rhizome-10 to 15 g, T_4- Finger Rhizome -25 to 30g, T_5- Finger Rhizome -10 to 15g, T_6- Finger Rhizome - 5 to 10 g

Fig. 1 : Yield characters of different sizes of rhizomes

Fig. 2 : Different grades of rhizomes

Table 1 : Effect of different grades of rhizomes on vegetative and reproductive characters of turmeric

Treatments	Plant height (cm)	Number of leaves	Number of tillers (Nos.)	Stem girth (cm)	Leaf area ($cm^2 m^{-2}$)	Rhizome dry weight ($g m^{-2}$)
T_1	31.43	7.20	2.81	9.14	21,012.00	75.34
T_2	26.52	6.56	2.73	7.16	12,975.00	63.53
T_3	24.07	6.06	2.21	5.92	7,807.00	49.50
T_4	26.59	6.19	2.41	6.29	11,045.00	61.10
T_5	20.92	6.06	2.23	5.66	7,396.00	43.90
T_6	20.03	5.83	1.86	4.74	3,784.00	25.12
Mean	24.93	6.31	2.38	6.48	10,608.21	52.89
S.E. $\pm$	0.16	0.03	0.01	0.04	175.18	0.59
C.D. (P=0.05)	0.34	0.08	0.03	0.09	373.40	1.27

improved seedling establishment. The mother rhizome (45-50g) has reported the highest number of tillers (2.81) and leaves (7.20). The number of leaves increased as the seed size increased, because the plants from the larger seeds were longer and had a larger number of tillers. The shoot with a larger leaf number and larger leaf size received a higher solar energy for photosynthesis, which ultimately resulted in a larger shoot biomass. This result is in agreement with the report of Sarker *et al*. (2001) on rice plant. Among the different grades of rhizome, the mother rhizome (45-50g) recorded the maximum stem girth (9.14 cm) followed by mother rhizome (25-30g) (7.16 cm). In leaf area, mother rhizome (45-50 g) has recorded the highest (21012 $cm^2 m^{-2}$). Mother rhizome (45-50 g) reported the maximum yield (23.15 tonnes). This was because of larger shoot biomass production (Hossain *et al.*, 2000).The highest weight of mother rhizomes, had positive and significant correlation with rhizome yield. Plants from larger seeds had bigger shoot base and it produced a higher number of daughter rhizomes, which ultimately increased the yield of turmeric. From this experiment, mother rhizome (45-50 g) gave the best performance in all parameters because of sufficient food reserves which probably encouraged vigorous plant growth that should have eventually translated into yield.

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