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Rapid multiplication of Kasthuri turmeric (*Curcuma aromatica* Salisb.) through minisett technique and nursery management

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Abstract

The experiment was conducted at Vellayani (Kerala) during 2014 with an objective to standardize minisett method of propagation and nursery techniques for rapid mass multiplication of *Kasthuri* turmeric. The investigation was taken up as two experiments. In experiment I best pre-sprouting treatments for rhizomes and in experiment II best soil-less coir pith based nursery mixtures for growth of *Kasthuri* turmeric seedlings were studied. The result indicated that rhizome bits with three node (approximate weight -7g) subjected to pre-treatments with benzyl adenine 100 ppm for 24 hrs was recorded the highest sprouting (95.60%).The improved method of protray seedling production using sprouted rhizome bits and coirpith + vermicompost + *Trichoderma* (1:25) media in 1:1 combination resulted in sturdy, uniform and healthy seedlings for transplanting in the main field.

Keywords: *Curcuma aromatica,* minisett, nursery mixtures, plant growth regulators, pro-tray seedlings

Curcuma aromatica Salisb known as *Kasthuri* turmeric is a valued aromatic cum medicinal plant. *Kasthuri* turmeric has been widely used as an effective skin care cosmetic and ayurvedic medicine. In spite of the multifarious applications and good export potential of the crop, its cultivation has not become wide spread and is getting slowly depleted from cultivation due to ignorance about the true identity of the crop, limited availability and high cost of planting materials. Pro-tray seedling raising and transplanting is promising in other *Zingiberaceous* crops like ginger and turmeric (Shylaja *et al.* 2016). Similar attempt has been made to standardize propagation technique and nursery management for *Kasthuri* turmeric in this experiment.

Local *Kasthuri* turmeric variety was used in this study and experiment conducted during May–June 2014. In the 1st experiment, rhizome bits with two node (S_1 - approximate weight 5g) and three node (S_2- approximate weight 7g) was prepared and it was subjected to chemicals/ growth regulators treatments such as Benzyl adenine (BA- 25ppm,50 ppm and 100 ppm for 24 hrs), Ethrel (125 ppm for 30mts and 250 ppm for 15mts), Potassium nitrate (KNO_3 – 2000 ppm

for 30 mts) and Urea (5000 ppm for 30 mts) with an absolute control (no pre-soaking treatment) to find out the best sprouting treatment. The design used was CRD with 16 treatment combinations in five replications.

The best pre-sprouted rhizome bits of both two node (S_1) and three node (S_2) from experiment I was planted separately in pro-trays of 5 cm diameter plug holes filled with coir pith and two different organic manures *viz*., cowdung and vermicompost in 1:1 ratio and *Trichoderma* in 25:1 ratio. The design used was factorial CRD with 4 treatment combination in five replication. The treatment in first factor are S_1: Rhizome bit with two nodes and S_2: Rhizome bit with three nodes; and in another factor the treatments are M_1 –Coir pith + Cowdung + *Trichoderma* and M_2 –Coir pith + Vermicompost + *Trichoderma*

The pro-trays were kept in a shade net house and irrigated regularly. Based on the morphological characters of the seedlings best media combination was identified.

The number of sprouted rhizome bits as well as morphological characters of the seedlings and roots was recorded. The size of rhizome bits and pre-treatments were significantly influenced sprouting (Table 1). Rhizome bits with three node showed better sprouting (72.5%) than two node bits (64.13%). The increasing trend of sprouting with increasing weight of planting material was reported in banana (Hernandez *et al*. 1988). One of the favourable factors like high content of reserve food material in larger seed bits may induce early sprouting and higher sprouting percentage.

The pre-treatments soaking three node rhizome bits in benzyl adenine 100 ppm (T_3S_2) for 24 hrs was recorded higher sprouting (95.60%) followed by 24 hrs soaking of benzyl adenine 50 ppm (T_2S_2, 91.20%). The pre-treatment using 0.2% KNO_3 (T_7S_2, 45.80%) has resulted in lowest sprouting which was on par with control (no pre-soaking treatment) (T_8S_2, 54.00%). Higher benzyl adenine concentrations (50 and 100 mg l^{-1}) broke dormancy and enhanced sprouting in rhizome halves of achimenes (Vlahos 1985). Cytokinins are known to induce bud break on many kinds of plants on both aerial and below-ground parts (Criley 2001). Comparing all the other treatments the increase in sprouting percentage as a result of BA treatment might be due to optimum absorption of chemicals by rhizomes, which might have been further utilized for physiological processes to influence

Table 1. Effect of pre-treatments and rhizome bit size on sprouting (%)

Treatment	Sprouting (%)		Mean
	S_1	S_2	
T_1 (BA 25 ppm for 24 h)	79.80 (8.93)*	88.60 (9.41)	84.20
T_2 (BA 50 ppm for 24 h)	84.80 (9.20)	91.20 (9.54)	88.00
T_3 (BA 100 ppm for 24 h)	89.20 (9.44)	95.60 (9.77)	92.40
T_4 (Ethrel 125 ppm for 30 min)	50.00 (7.07)	61.80 (7.86)	55.90
T_5 (Ethrel 250 ppm for 15 min)	53.60 (7.31)	51.20 (7.15)	52.40
T_6 (2000 ppm KNO_3 for 30 min)	40.40 (6.35)	45.80 (7.66)	43.10
T_7 (5000 ppm Urea for 30 min)	67.80 (8.23)	79.00 (8.88)	73.40
T_8 (No pre-soaking treatment)	47.40 (6.88)	54.00 (7.34)	50.70
Mean size	64.12 (7.93)	72.52 (8.93)	68.32
CD($P<0.05$)		1.657	

*Figures in paratheses denote transformed values

the sprouting parameters and also the increase in quantum of alternate respiration in rhizomes due to these treatments.

Seedlings emerged at almost same time irrespective of the size of seed rhizomes. In general, it was observed that seedlings of both two node and three node rhizome bits planted in M_2 (Vermicompost + Coirpith + *Trichoderma*) media were taller and they were vigorously growing and produced more leaf area , roots and root length compared to seedlings planted in M_1 (Cowdung + Coirpith + *Trichoderma*) media combination (Table 2). Similar result was reported by Prasath *et al.* (2014) in black pepper. Among the different nursery media combinations, coir pith with *Trichoderma* and vermicompost recorded significantly higher growth parameters of pepper cuttings.

Besides, growing media are often formulated from a blend of different materials in order to achieve the ideal properties of the growth medium. This may be attributed to higher moisture retention capacity, porosity and nutrient status of coir pith (Nagarajan *et al*. 1985) and presence of plant growth promoting hormones and easy availability of nutrients in vermicompost (Ushakumari 2004). Vadiraj *et al.* (1992) observed that application of vermicompost as potting mixture for cardamom has promoted the growth characters of seedling.

The application of vermicompost and *Trichoderma* to coir pith enhanced root initiation and root elongation. The better root growth might have promoted nutrient uptake and might have resulted in better growth attributes. These results are also in conformity with the findings of Rakhee (2002) in turmeric.

The morphological characters of the seedlings increased with increasing seed size. This increase in plant height on increasing seed size was also reported in ginger by Korla *et al.* (1983).

It is concluded that, raising of protray seedlings using three node cuttings treated with benzyl

Table 2. Effect of media and rhizome bit size on seedling height, leaf area and number and length of roots in *Curcuma aromatica* Salisb after eighth week of planting

Treatments	Height (cm)	Leaf area (cm^2)	No. of roots	Length of root(cm)
Rhizome size (S)				
S_1	23.96	31.15	6.90	7.09
S_2	26.89	32.01	7.81	7.40
Media (M)				
M_1	25.33	30.20	7.21	7.15
M_2	25.52	32.96	7.50	7.34
Interaction effects				
$S_1 M_1$	23.96	30.13	6.80	7.04
$S_1 M_2$	23.97	32.16	6.96	7.14
$S_2 M_1$	26.71	30.26	7.62	7.26
$S_2 M_2$	27.08	33.76	8.00	7.54
Treatment mean	20.34	31.577	7.345	7.24
CD ($P<0.05$)				
S	0.147	0.456	0.006	0.223
M	0.147	0.456	0.006	0.223
S x M	0.220	0.645	0.120	0.315

adenine 100 ppm for 24 h in vermicompost and *Trichoderma* enriched coir pith mixture produced uniform and healthy seedlings for transplanting in the main field, which ultimately lead to saving of seed material.

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