

## **GROWTH RESPONSE OF COCOA (THEOBROMA CACAO L.) SEEDLINGS TO QUARRY SAND IN THE POTTING MEDIUM**

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Use of healthy, vigorous, quality planting material is one of the basis for higher productivity of crops especially for a perennial crop like cocoa. Cocoa is mainly propagated through seedlings raised out of seeds. The quality of seed and the type of potting medium decide the rate of growth of seedlings. The growing medium must provide anchorage, required nutrients, optimum conditions for root growth and ensure drainage of excess water. The composition of the potting medium for raising cocoa seedlings to satisfy the above needs has been standardized as 1 part soil, 1 part sand and 1 part farm yard manure (Prasannakumari Amma et al., 2009). Among the different ingredients, sand helps to increase the porosity of the medium enabling easy root penetration and drainage of excess water. Over exploitation of river sand for ever increasing construction purposes causes concerns of environmental risk. This resulted in shooting of river sand price to unimaginable levels, creating scarcity and imposing restrictions on river sand collection. This necessitates finding an alternate material to replace river sand in potting medium. Some preliminary studies indicate the feasibility of quarry sand, which is cheap and abundant, for replacing sand (Old field, 2002, Thankamani et al. 2008). Under this back ground, a trial was carried out at the Cocoa Research Centre, Kerala Agricultural University, Vellanikkara to find out the possibility of using quarry sand for partial or complete replacement of river sand in the potting medium for cocoa.

The experiment was laid out during January-July, 2011 in completely randomized design with 12 treatments and 50 plants in each treatment using seeds collected from the polyclonal gardens maintained at Cocoa Research Centre, Vellanikkara. The treatments consist of different proportions of soil (1, 2 and 3 parts), river sand ( $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  part), quarry sand ( $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  part) and farm yard manure (1 part). Potting mixture as per treatments was filled in 200 gauge thick polythene bags of 8'x 6' size with 8 perforations at the bottom 1/3 portion. The growth parameters of cocoa seedlings viz., seedling height, seedling girth and number of leaves at 6 months after planting were recorded and the seedling vigor was worked out. The data were analysed statistically.

Cost of preparing the potting mixture to raise 1000 seedlings in different treatments was worked out based on the market price of soil, river sand, quarry sand and farm yard manure. The other costs viz., cost of polybags, labour charges for potting, sowing, irrigation using sprinkler system established in cocoa nursery of the Kerala Agricultural University, plant protection and cost of hybrid seeds were estimated based on Kerala Agricultural University norms. The sale price of hybrid cocoa seedlings in Kerala Agricultural University is Rs.15/- per seedling. Based on the cost of production and return, the benefit cost ratio was worked out and the data are presented in Table-1

Table -1. Effect of composition of potting medium on the growth of cocoa seedlings and economics of production

Treatments	Seedling height (cm)	Seedling girth (cm)	Seedling vigor (HD <sup>2</sup> )	Number of leaves	Economics (per 1000 seedlings)		
					Cost of potting mixture (Rs.)	Total cost of production (Rs.)	B : C ratio
T <sub>1</sub> -1:0:1:1	58.22	3.34	67.90	20.51	356	2971	5.04:1
T <sub>2</sub> -1: 1/4 : 3/4 :1	61.11	3.37	71.63	22.11	450	3065	4.89:1
T <sub>3</sub> -1: 1/2 : 1/2 :1	67.87	3.22	72.90	21.71	544	3159	4.74:1
T <sub>4</sub> -1: 1/4 : 1/4 :1	65.89	3.21	70.38	22.49	639	3254	4.61:1
T <sub>5</sub> -1:1:0:1	57.78	3.31	65.80	19.78	733	3348	4.48:1
T <sub>6</sub> -2:0:1:1	64.40	3.42	77.80	21.82	317	2932	5.11:1
T <sub>7</sub> -2: 1/4 : 3/4 :1	63.89	3.30	73.21	19.82	388	3003	4.99:1
T <sub>8</sub> -2: 1/2 : 1/2 :1	50.36	3.44	64.42	15.93	458	3073	4.88:1
T <sub>9</sub> -2: 3/4 : 1/4 :1	56.89	3.44	71.27	15.58	529	3144	4.77:1
T <sub>10</sub> -2:1:0:1	54.69	3.17	59.10	17.98	600	3215	4.66:1
T <sub>11</sub> -3:0:1:1	54.76	3.16	58.42	14.93	293	2908	5.16:1
T <sub>12</sub> -3:1:0:1	52.82	2.95	47.21	17.84	520	3135	4.78:1
CD	3.77	0.23	10.28	1.77			

The data showed that the potting medium had a significant influence on the growth and vigour of cocoa seedlings. Among the various proportions of river sand and quarry sand with 1 part of soil (T<sub>1</sub>, T<sub>5</sub>), 1/2 replacement of river sand with quarry sand (T<sub>3</sub>) recorded the highest seedling height and seedling vigor with higher number of leaves, whereas use of river sand without quarry sand (T<sub>5</sub>) recorded the lowest of all the above parameters. Moreover, complete replacement of river sand with quarry sand (T<sub>1</sub>) recorded numerically higher seedling height, seedling girth, seedling vigor and number of

leaves compared to the present recommendation of using river sand (T<sub>5</sub>) which showed the superiority of quarry sand over river sand in the potting medium and the possibility for replacement of river sand with quarry sand.

Among the various proportions of river sand and quarry sand with 2 parts of soil (T<sub>6</sub>- T<sub>10</sub>), complete replacement of river sand with quarry sand (T<sub>6</sub>) recorded higher seedling height and seedling girth, highest seedling vigor and number of leaves, whereas use of river sand without quarry sand (T<sub>10</sub>) recorded significantly lowest of all the above parameters. This also showed the

superiority of quarry sand over river sand in the potting medium and the possibility for complete replacement of river sand with quarry sand.

With 3 parts of soil also ( $T_{11}$ - $T_{12}$ ), use of quarry sand ( $T_{11}$ ) was found more advantageous over river sand ( $T_{12}$ ) by way of expressing higher seedling height, seedling girth and significantly higher seedling vigor which again showed the superiority of quarry sand over river sand in the potting medium for raising cocoa seedlings.

Economics of different treatments presented in Table-1 showed that 3 parts of soil with 1 part of quarry sand and 1 part of farmyard manure recorded the highest B : C ratio followed by 2 parts of soil with 1 part of quarry sand and 1 part of farmyard manure and 1 part of soil with 1 part of quarry sand and 1 part of farmyard manure.

Among the various treatments, considering the influence on growth and B : C ratio, using 2 parts of soil, 1 part of quarry sand and 1 part of farm yard manure in the potting medium was found to be the best for the commercial production of healthy, vigorous, quality cocoa seedlings which is the primary requirement for their subsequent growth and yield.

The greater influence of quarry sand compared to river sand on the growth of cocoa seedlings is due to its higher mineral composition

and their availability to plants. Thankamani *et al.* (2008) reported that the nutrient content in granite powder is more compared to sand. They also found that granite powder can be successfully substituted for sand in black pepper nursery mixture and soil: granite powder : farmyard manure in 2:1:1 proportion was found to be the best for the economic production of healthy, vigorous black pepper rooted cuttings. Increased vigor of seedlings of *Casurina obesa* and *Eucalyptus gomphocephala* in potting medium containing granite powder compared to those in ordinary potting medium was observed by Old field (2002) also.

#### References

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