Tissue-cultured sandalwood

Sandalwood (*Santalum album* L.) is one of the important trees of commercial value. Annual world requirement of sandal oil is about 200 tonnes, which is equal to ten thousand tonnes of wood. Only ten per cent of this is met from the natural resources. Sandalwood production in the state of Karnataka has come down considerably during the last decade. This is attributed to many factors, including the spike disease caused by mycoplasma. The losses caused by spike disease are alarming. Despite the economic importance of sandal and considerable effort, progress in the study of spike disease has been very slow and is hampered by lack of accurate information about the causative agent. Since 1969, it has been known that the disease is not caused by virus, but by a self-duplicating microorganism that resembles mycoplasma. It has been found that application of antibiotics to infected plants in experimental plots suppresses symptoms of sandal spike, but the presently available treatments are neither adequate nor economically justified for field applications. Venkatesh and Kedarnath[1] have suggested a programme for breeding strains of sandal inherently resistant to the disease. However, no experimentally proved resistant strains have been reported so far, but there are reports of apparently healthy and disease-free trees occurring in otherwise heavily infested stands. One possible approach to solving the disease problem is to have suitable methods of vegetative propagation of disease-free sandal plants. Since the conventional vegetative propagation is difficult, other approaches like tissue culture were considered. Cloning by conventional or *in vitro* techniques is especially valuable for propagation of heterozygous, sexually incompatible and sterile genotypes.

My laboratory initiated tissue-culture studies in 1976 to develop clonal propagation methods for superior selected plants. Emphasis was on mature-tree explants since clonal propagation from seedlings will not be desirable as the genotype of the progeny need not necessarily be the same as that of the parent. We made initial explants from mature adult trees, developed callus cultures and obtained viable plantlets by the method of somatic embryogenesis[2,3]. Plantlets thus obtained were established in the ground. The tissue-cultured plants were grown in the forest nursery at Mudigere.

Normally sandal seeds germinate in 8–14 days. The seedlings grow rapidly when well protected, and are about 20–30 cm in height at the end of the second year. Our data in Table 1 and Table 2 clearly indicate that the selected and cloned tissue-cultured plants are performing better. Tissue-cultured plants have grown to a height of 3 m in two years, and after about eight years they are showing the girth of a 50–60-year-old tree. Superiority can be established only if the formation of the scented heartwood is seen. The scented heartwood is the most valuable portion of the sandal tree. Under favourable conditions heartwood formation begins in nature in the tenth year when the tree attains a girth of 24 cm and a height of 3 m, and is rapid from about 20 years onwards and is at its prime when the trees are between 30 and 60 years old, when they vary from 40 to 60 cm in girth. We took core samples from tissue-cultured trees and conventionally grc plus trees (superior trees) selected by forest department. The natural trees growing nearby. The tissue-cultu plants showed heartwood format from the seventh year onwards (Table Although the core samples are not equal lengths, there is clear indicatior heartwood formation. Although m plants other than sandalwood h been grown in culture and transfer to soil, no data detailing their perf mance in the field are available exc for a few trees like conifers. Our d suggest that it may be possible reduce the harvesting period in sand wood from 50 years to 20 years. Lar scale plantations of tissue-cultured pla must be planted to assess the quality the plants further. At present we studying the progeny of the tiss cultured plants.

Table 1. Rate of growth of natural sandal trees

	Mysore Plantation		Javadi and Yelagiri Hills Plantation, Tamil Nadu	
Age (years)	Mean girth (cm)	Height (m)	Mean girth (cm)	Height (m)
10	13.2	2.1	7.9	1.9
20	30.4	4.0	23.9	4.6
30	43.1	5.5	43.0	6.3
40	53.3	6.8	62.2	NA
50	60.9	8.1	74.9	NA

From *Wealth of India*
NA, Not available

Table 2. Performance of tissue-cultured sandal plants

Age (years)	Girth (cm)	Height (m)
2	23	3.04
4	51	4.57
7	61	6.09
8	68	7.62

Table 3. Measurement of core sampl

	Tissue-cultured tree	Natural sanc plus tree
Age	7 years	50 year
Core sample	8 cm	11 cm
Heartwood	5 cm	7 cm
Sapwood	3 cm	4 cm
Girth	61 cm	60 cm

1. Venkatesh, C. S. and Kedarnath, *Indian Forest. Bull.*, 1964, **14**, U243.
2. Lakshmi Sita, G., Raghava Ram, N. and Vaidyanathan, C. S., *Plant Sci. L* 1979, **15**, 265.
3. Lakshmi Sita, G., in *Biotechnology Agriculture and Forestry* (ed. Bajaj, Y. P. Springer, Berlin, 1986, pp. 363–374.

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