

TROPICAL TREE FARMING

At the meeting of 2 August 2000, the full title for the talk presented by Dr Andrew Radomiljac was "Tropical tree farming including Kimberley Sandalwood production". Andrew spoke from a background of six years spent in the Kimberley, mostly in the Ord Valley, working for CALM researching the growing of Indian Sandalwood, *Santalum Album*. In May 2000, he left CALM and went into private employment with a forest production company.

Andrew showed slides throughout to illustrate his talk. He mentioned 16 species of *Santalum* (sandalwood) existing throughout the world, with four of them occurring in WA. *Santalum* is a root hemi-parasite that grows with a range of vegetation types, including many wattle (*Acacia*) species. *Santalum spicatum*, which grows in all areas of the State apart from the Kimberley and the South West, was more important than gold, wheat or wool in the early days of the colony. In the 1840s they exported four tons to China and, by the 1920s, this had increased to 14,000 tons. The proceeds from this lucrative trade helped to fund the building of our road and rail networks. Initially, the majority of sandalwood was obtained from areas close to Perth, eg Northam, York and Beverley, but, as supplies diminished, harvesting moved further inland to the wheatbelt and then into the semi-arid regions of the Goldfields and Midwest. Today, the industry is much smaller and harvesting occurs mainly in the pastoral regions.

Sandalwood grows throughout Asia and the Pacific Rim. Within Asia, sandalwood powder is still extensively used to make incense (joss) sticks. Sandalwood oil, contained in the heartwood, is also a desirable product in the perfume industry. There is a global decline in sandalwood supply and this is causing an increase in pressure to over-harvest the remaining stocks. The result is loss of industrial opportunities and sandalwood substitution.

In 1994, CALM started putting sandalwood back into production in the tropical Kimberley using irrigation and the faster growing Indian species *Santalum album*. They mostly used the host *Sesbania Formosa*, the large white flowered Dragon Tree, a good host since it also releases nitrogen back into the soil by way of its nitrogen-fixing bacteria. A plantation format was developed often using a small herb called *Alternanthera nana* as a pot host. The fine feeder roots of the sandalwood search for suitable host roots and, when successful, form cup-like connections, called haustoria. From these the parasite draws water and nutrients.

During the course of the research programme the plantation was visited by a group of growers from India looking for ways to improve their sandalwood production. Andrew was also sent to East Timor, Mysore in India, Papua New Guinea and New Caledonia to provide assistance to producers.

In the search for suitable hosts some Acacia and Eucalyptus species were tried such as *A. Trachycarpa* and *A. ampliceps* and *Eucalyptus camaldulensis* along with teak and *Pterocarpus*. The acacia and eucalyptus species proved to be unsuitable. In India the preferred hosts are local trees such as Cassias and *Desmanthus* etc. The trees are sexually mature at age three or four years and are usually pollinated by ants.

Indian Sandalwood is harvested at age 15 years, depending on growth, and is worth up to \$15,000 per ton. Our own species is worth approximately \$5,000 per ton. Another point made by Andrew is that our species of sandalwood, *Santalum Spicatum*, is pulled up roots and all since one third of the tree is underground and the oldest part of the tree, the base of the root, is where the most oil is found. The quality is affected by rate of growth, which in turn depends on the climate. Steam distillation is used to extract the oil and some of the larger trunks are retained for carving.

Kununurra has 13,000 hectares of arable land under cultivation, mainly to cotton and sugar but also to sorghum, vegetables, fruit and nut trees. Forty hectares of the land is devoted to tropical forestry, mainly Indian Sandalwood, *Santalum Alba*, with *Sesbania Formosa* as host. The soils are mainly light clays and cockatoo sands.

Our own northern variety of sandalwood, *Santalum lanceolatum*, has no oil or aroma but produces a sweet fruit very rich in Vitamin C. Some Santalums are being planted in the wheatbelt for salinity control. *Santalum Spicatum*, much reduced in its natural state, is now being supplemented by trees grown in plantations on two pastoral leases, Burnerbinmah and Goongarrie, recently acquired by CALM. These experimental plantations, together with those being developed in the Kimberley, may help to safeguard the survival of sandalwood species and provide a viable commercial industry at the same time.

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