Sandalwood Research Newsletter

January 2000 | Issue 9 | ISSN 1321-022X

Sandalwood work on 'Eua, Kingdom of Tonga

Sione Kaufusi[a], Sitiveni Harmani[a] and Lex Thomson[b]

[a] *Forestry and Conservation Division, Ministry of Agriculture and Forestry*
[b] *SPRIG Project*

Current Status

Sandalwood (*Santalum yasi*) or ahi, as it is locally known, remains an important cultural plant in Tonga. The fragrant heartwood is frequently used to scent coconut oils and during wedding ceremonies the bride and groom are dusted with powdered heartwood. The most recent commercial exploitation of ahi on 'Eua was in 1996-97 when some small scale utilisation occurred. The price paid to cutters was 2-3 Paanga ($Aust 2-3) per kilogram of heartwood.

Ahi is common and widespread on the island of 'Eua in the southern part of the Tonga. This is in contrast to other Tongan island groups where ahi is now quite rare. On 'Eua ahi mainly occurs as immature trees (about 3-6 m tall) in secondary forest and old garden areas. Most trees are growing in open areas and have a bushy, multistemmed form which may limit their future value for production of heartwood. Plants often have a yellowish appearance, possibly due to growing in the open with sub-optimal host plants.

Most farmers on 'Eua don't appreciate the commercial value and potential of ahi and frequently clear and destroy young trees when establishing gardens. Some farmers protect ahi saplings and small trees during garden development but there is limited interest in replanting ahi.

In recent years the Forestry and Conservation Division has been actively replanting ahi in the 'Eua Forest Plantation estate. Several thousand ahi have been planted. Trees are very healthy with bright green, bushy tops, and appear to have good relationships with remnant vegetation, including the naturalised weed tree *Cordia alliodora*. Plants are being regularly form-pruned to aid development of a single main bole (following advice and training provided by Yves Ehrhardt, CIRAD-Foret).

Research

In March 1999, the Forestry and Conservation Division/SPRIG Project established a small trial planting of *Santalum album* and *S. yasi* on 'Eua. The main aim of this trial is to evaluate the growth of different Indian seed sources of *S. album* and compare with the growth of the local species. The stand will also be useful later on as a seed stand, and includes the most genetic diversity of the highly promising *S. album* in the South Pacific. In February 2000, it is planned to establish additional field trials of *S. album*, *S. austrocaledonicum* (ex New Caledonia) and *S. yasi*.

Conservation, management and development of ahi genetic resources

A strategy to conserve and sustainably manage the genetic resources of ahi in Tonga and Fiji is currently being developed in consultation with stakeholders and in collaboration with Fiji Forestry Department through the SPRIG Project (South Pacific Regional Initiative on Forest Genetic Resources).

Our work suggests that ahi has outstanding potential to provide valuable income to villagers living in remote, outer islands such as Ha'apai. A key objective of the Division's work in the second phase of SPRIG will be to develop the economic potential of ahi for the benefit of Tongans.

inside...

Propagation of ahi seedlings, Hafu nursery, 'Eua

Santalum album in the Top End, Northern Territory, Australia

Tanya Vernes

Department of Conservation and Land Management, Kununurra

The following is a summary of a pilot study undertaken in August/ September 1999 in the Top End of the Northern Territory, northern Australia, to locate and assess populations of S. album as part of an ACIAR collaborative project.

Distribution

The Australian distribution of the genus *Santalum* is represented over much of the arid and semi-arid regions of mainland Australia (Applegate & McKinnell 1993). *Santalum album*, however, is only recorded in the Northern Territory (NT) at scattered coastal locations on the mainland and adjacent islands between Darwin and Nhulunbuy and south to Groote Eylandt.

There are no recorded populations of naturally occurring *S. album* in the states of Queensland or Western Australia within the same climatic or habitat zones. The remote nature of the rugged north Australian coast makes locating these populations more problematic and it is not unlikely that over time, more populations will be detected.

ACIAR sub-project

An ACIAR funded collaborative project between Institute of Wood Science and Technology (IWST) in Bangalore, India, and Department of CALM, Kununurra, Australia, is researching mid and end rotation issues of *S. album* plantation development. One sub-project aims to identify a number of genotypes from Australia and India for inclusion within a sandal tree improvement program. It is anticipated that this progeny trial will assist in determining families with superior oil content yields at harvest with the potential application of reducing rotation length. Although the project is not due to start until January 2000, preparation for the trials began in July 1999.

Assessment

A survey of the Northern Territory *S. album* populations was carried out in August/September 1999 to identify potential individuals for inclusion in the progeny trial.

Fifteen locations were visited, however only eight individuals were selected for seed collection due to the low seeding ability of some trees and the inability to relocate individuals. Most individuals had very low numbers of fruits at the peak August/ September fruiting. It was not uncommon to find only a handful of fruits on the tree, a phenomenon recorded in the past with the Northern Territory populations (Dunlop, Griffith pers. com.). It is unknown whether this could be related to a water or nutrient deficiency, predation or inherent genetic traits of the Northern Territory populations.

On Groote Eylandt and around the Nhulunbuy coast, none of the previously recorded *S. album* individuals could be relocated, however, it was interesting to note the presence of other Santalaceae such as *Exocarpos latifolius* and *S. lanceolatum*. It is possible that the frequent occurrence of uncontrolled

wildfires has diminished the resource in some areas.

The locations visited were fairly uniform in terms of habitat and floristic classification. *S. album* was found to have an uncommon occurrence in open vine thickets adjacent to the sea, or behind mangal communities. In all cases *S. album* occurred just above the high tide mark with sandy surface soils.

Coastal vine thickets in the Northern Territory occur on a variety of mainly seasonally dry substrates, especially sandy or shelly beach ridges and lateritic landforms, showing no particular requirement for deep soils. Although there is a seasonal scarcity of water during the dry season, coastal vine thickets are often associated with fresh underlying groundwater.

The community has a canopy typically less than 10 metres, however, on particularly harsh sites canopy height may drop to as low as 1-2 metres (Brock 1997).

S. album was found in association with species such as *Hibiscus tiliaceus, Exocarpos latifolius, Capparis sepiara, Sterculia quadrifida, Diospyros spp., Abrus precatorius, Flagellaria indica, Mimusops elengi* and *Pongamia pinnata.*

All of these species are possible hosts for *S. album*, however, the species noted most frequently adjacent to the sandalwood were *Pongamia pinnata, Hibiscus tiliaceous* and *Capparis sepiara.* No root excavations were undertaken to determine specific host associations.

The individuals assessed were typically stunted with yellowish leaves. All individuals occurred under a filtered canopy of approximately 20-30% projective foliage cover. Typically the height of the *S. album* varied from 2.5 to 6 metres (average of 4 metres), with the

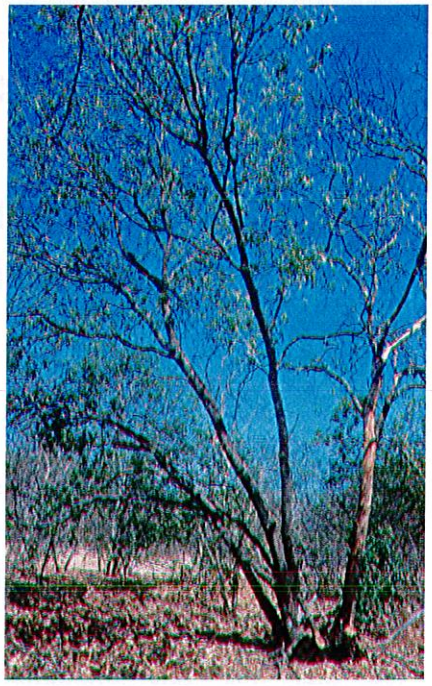

Figure 1: *Santalum album* at East Point, Darwin, with *Pongamia pinnata* host trees.

height to crown break at approximately 1.5-2 metres. Diameter (DBH) varied from 3-16 cm with seven of the eight individuals measuring between 9-12 cm. Wood core samples were taken from trees and are presently being analysed for heartwood oil content. Age could not be determined from the core sections.

Follow up

To enable a sufficient number of seeds to be collected for the replication of the progeny trial in India and Australia, the same trees will be visited again in March/April and August/September 2000 to slowly build the stock. Additional locations will also be assessed to increase the demographic span of the progeny within the trial.

Further research is being undertaken into the distribution, growth, heartwood characteristics and seed phenology of naturally occurring *S. album* populations in Australia through the ACIAR project. Additional results will be published in the SRN as the project progresses.

Figure 2: *Santalum album* heartwood visible at the base of the East Point tree.

Acknowledgements

Thanks to Clyde Dunlop (Parks and Wildlife Commission, Northern Territory, Australia), Lex Thomson and Andrew Griffith (Australian Tree Seed Centre, CSIRO) for their advice and assistance with planning this field study.

References

- Applegate, G.B. & McKinnell, F.H. (1993) The management and conservation status of *Santalum* species occurring in Australia. ACIAR Proceedings No. 49: Sandalwood in the Pacific Region, pp 5-12.
- Brock, J. (1997) Native plants of northern Australia. Reed Books.
- Dunlop, C. Senior Botanist, Darwin Herbarium, Parks & Wildlife Commission, NT, Australia.
- Griffith, A. Australian Tree Seed Centre, CSIRO, Canberra, Australia.

For a full explanation of this research experiment see:
Radomiljac, A.M. (1998) The influence of pot host species, seedling age and supplementary nursery nutrition on *Santalum album Linn.* (Indian sandalwood) plantation establishment within the Ord River Irrigation Area, Western Australia. Forest Ecology and Management 102: 193-201.

* * * * * *

Call for information - *Santalum* Projects

The SRN is currently establishing a database on sandalwood related research, conservation and development projects throughout the world. Summaries of projects including the following information are being sought:
Project name:
Location:
Organisation(s) involved:
Project leader name and correspondence details:
Summary of project details:
Please send all correspondence to the Editor, SRN. This database will be updated and published regularly in the SRN.

Farewell from the previous editor - Andrew Rado

It has been a very rewarding experience establishing the SRN in 1993 and evolving the newsletter and associated network. My present position as Assistant Manager in CALM sharefarming (Midwest region) has steered me away from sandalwood research and into Maritime Pine *Pinus pinaster*. It is obvious then to hand over the role of Editor to Tanya Vernes who has recently been appointed Sandalwood Research Officer in Kununurra. I am confident she will continue to notarise the SRN for the promotion of sandalwood research, conservation and development.

Andrew Radomiljac
Editor, 1993-1999

* * * * * *

Introduction by the new editor Tanya Vernes

Welcome to Issue 9 of the Sandalwood Research Newsletter. It has been a year since the last publication which has made many subscribers wonder if they had been scrubbed from the SRN mailing list! There have been a number of changes in the Department of CALM and staff responsibilities over 1999, which has unfortunately resulted in postponing issue 9.

I recently accepted the role of editor from Andrew Radomiljac who has been instrumental in the development of the SRN since its inception in 1993. On behalf of the SRN and its many readers, I wish Andrew good luck in his new position. I am very excited at the opportunity as editor to contribute to sandalwood conservation and development around the world. I hope to maintain the standard Andrew has set, continuing to bring together a range of informative articles and promoting the SRN as a conduit for global networking.

This edition of the SRN concentrates on the distribution and status of indigenous populations of *Santalum* in Tonga and northern Australia, with a research note on the *S. album* trials in Kununurra.

I appreciate the correspondence I have had from various organisations and individuals regarding contributions for this edition. Authors are encouraged to send articles for the May edition by 31 March 2000. Feedback, queries and comments are also welcome.

I hope this latest edition continues to inspire global communication and cooperation in the research, conservation and development of sandalwood.

Tanya Vernes
Editor

Articles on a range of *Santalum* species research and management issues are welcomed by the Sandalwood Research Newsletter. If you wish to contribute an article to the SRN or wish to be included on the SRN mailing list please write to the Editor stating your name, organisation and postal address.

Editor: Ms Tanya Vernes
Department of Conservation and Land Management
PO Box 942
Kununurra 6743
WESTERN AUSTRALIA

Phone: + 61 8 9168 4200
Fax: + 61 8 9168 2179
email: tarnyav@calm.wa.gov.au

The Sandalwood Research Newsletter is produced by the Department of Conservation and Land Management, Western Australia.
Editor - Tanya Vernes
Typesetting and publishing - Shani Owens