## RESEARCH NOTES

**Progress on the Vegetative Propagation of Agathis:** A report by T. C. Whitmore, A. Garton and J. Steel. Commonwealth Forestry Institute, Oxford University.

*Agathis*, a genus of 13 species of conifers (family Araucariaceae), mainly found in the Eastern tropical rain forests, has great potential as a plantation tree where high value timber is required. A detailed study has been made and a limited international trial set up of 9 provenances at 23 locations by the CFI (Whitmore 1977, Bowen and Whitmore 1980a,b). Hilleshög of Sweden are currently developing further the work begun at Oxford. Seed of any given provenance is always likely to be in limited supply. Here we report work on vegetative propagation and show that this is now a realistic possibility for multiplication.

Cuttings from *Agathis* seedlings were first successfully rooted by A. K. Longman at Edinburgh. It was found that main stem cuttings rooted better than cuttings of lateral shoots, and the younger the stock the greater the success. Rooted cuttings were successfully introduced to Peninsular Malaysia and were doing well after two years. These studies have been reported by Whitmore (1977) and Bowen and Whitmore (1980a). The work has since been extended using a mist propagator with bed temperature 25°C at Wytham near Oxford.

In Peninsular Malaysia the plagiotropic seedlings never became orthotropic. This suggests that it is necessary always to strike cuttings from orthotropic shoots if, as is usually likely to be the case, vertical trees are wanted. In this trial, all the *Agathis robusta* died at *c.* 3 years from planting, perhaps after a spell of dry weather. This is a subtropical species and in Malaysia was growing well outside its normal climate. Records of scattered trials throughout the tropics show *A. robusta* to have grown faster than others (Whitmore 1977). These trials were almost certainly on trees grown from seed.

We have conducted two experiments. The first one, on *A. macophylla Fiji Provenance* (formerly *A. vitiensis*) also showed rooted plagiotropic cuttings did not become orthotropic with age. This experiment also showed that:

(1) when a seedling is decapitated bigger shoots are produced by cutting at a top node than a lower one;
(2) bigger shoots root better than small ones and can form roots in 2 months; but
(3) very big cuttings have a tendency to rot below soil level. It was also found that good rooting resulted from dipping cuttings in *Seradix* brand rooting hormone (grade 2, pink, for softwood cuttings) and planting in the mist propagator into an equal mixture of 'Perlite' brand polystyrene granules and coarse sand. Calloses develop and then roots. Most cuttings had developed roots by 4 months, the remaining cuttings rooted over the next few months. Once rooted, the cuttings were potted on and grew slowly. After a year, there had been very few deaths.

The second and main experiment used the same techniques. It was aimed to discover how many orthotropic cuttings can be obtained from a single stock plant. Seedlings growing in 6 inch pots, *c.* 45 cm tall and grown in a humid tropical glasshouse were used. They were decapitated to an upper node which stimulates the growth, from dormant buds near the apex, of several orthotropic shoots. These were themselves cut off and rooted. The stock plants produced more orthotropic shoots which were cut off. In total 5 decapitations were made. The first four decapitations were followed by the growth of new shoots on the stock plants.

The interval between successive decapitations needs to be *c.* 4 months to permit new shoots 4–5 cm tall to grow. The first three decapitations were followed by the growth every time of about the same numbers of new shoots, there were fewer of the fourth generation and none, by 4 months, of the fifth generation.

Results differed slightly between the species tested. *A. macrophylla Aneityum (Vanuatu) Provenance* (formerly *A. obtusa*) stock was 48 months old at the outset. It produced *c.* 7, 5, 6 and 3 shoots in successive generations. For silviculture, this is potentially the best taxon and it is therefore good that it did well. About equal was *A. macrophylla Ndendo Provenance* with *c.* 4, 4, 7 and 6 shoots from stock seedlings of 38 months age initially. Third best was *A. moorei* (49 months old stock) with 3, 3, 2 and 4 shoots. Finally *A. robusta* spp. *nesophila* (stock 38 months old) seedlings died at the first decapitation.

We conclude that, even with stock seedlings several years old at the outset and in the conditions of a north temperate glasshouse, useful numbers of cuttings can be made for several generations of 3 out of the 4 taxa tested, and several generations a year are possible.

Finally, we draw attention to experiments in Holland on vegetative propagation of *A. dammara Javan provenance* by Smits (1983) who successfuly rooted very small leaf cuttings made from 7 month old, 30 cm tall seedlings. Like us he found plagiotropic shoots produced plagiotropic cuttings. They developed a 'Pen' (*i.e.* tap) root, unlike his and our stem cuttings. He claims trees grown from these would be less likely to be blown over by a high wind. No one has yet demonstrated though whether the spreading lateral roots of *Agathis* develop vertical 'sinker' roots, as was shown recently to be found in many species in a Sarawak rain forest (Baillie and Manit 1983).

## REFERENCES

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**A note on Early Observations of *Leucaena leucocephala*:** (N. LACKHAN; Director, Northern Range Reafforestaton Project, Trinidad and Tobago).

The Northern Range Reafforestation Project, in a continuing programme of evaluating species for watershed rehabilitation, received a small quantity of seeds of the K8 variety (Hawaiian Giant) of *Leucaena leucocephala* from the Department of Horticulture of the University of Hawaii. This request was made because the literature indicates that excellent results are being obtained in countries where watershed rehabilitation is being undertaken with this species.