Spectrum

More seed from 'miniature' eucalypts

Australia's magnificent eucalypts represent more than an essential element of our distinctive flora: they are also important sources of quality wood for building, pulpwood for paper-making and so on. But improving eucalypts for commercial uses involves considerable time and effort for foresters and scientists.

Many commercially important species grow to heights of at least 20 m, making collection of seed possible only with machinery such as cherry-pickers. Some are also notoriously poor producers of seed, so it is difficult to obtain viable quantities of seed from individual trees with desirable characteristics.

Collecting seed from 'wild' eucalypts is difficult; often cherry-pickers must be used to reach seed-bearing branches.

Time is the third disadvantage: commonly, eucalypts are 5 years old before they flower for the first time, and 7 years old before they produce enough seed for collection. Even then, many flower only every second or third year, so collecting seed from the best tree in a forest means long years of waiting — by which time the tree has grown so high that machinery is needed.

It's no wonder that eucalypt seed is so valuable: the seed of shining gum (*Eucalyptus nitens*), for example, sells for about $2000 a kilogram, and seed from some other species costs even more.

Since 1987, CSIRO's Division of Forestry has been addressing these problems in a deceptively simple way: by growing 'miniature' eucalypts that produce seeds rather than vegetative growth. Within the Hardwood Plantations Program led by Mr Robin Cromer, and with support from Australian Pulp and Paper Mills Ltd, Mr Michael Moncur and Mr Peter Burgess have spent the past 4 years developing a management system that involves growing major plantation species of *Eucalyptus* — including *E. globulus*, *E. grandis* and *E. nitens* — on espaliers (in much the same way as grapes are grown). The program aims at increasing the amount of seed each tree produces, enhancing the speed of genetic improvements through controlled cross-pollination and enabling plantation managers to harvest seed more easily and in less time.

First the researchers looked at shortening the juvenile–intermediate–adult growth period by grafting shoots of selected eucalypts to older rootstocks and applying hormones to reduce vegetative growth. When the grafted trees had reached about 2 m — a convenient height for seed collection by hand — the researchers applied paclobutrazol, a synthetic hormone that 'shuts off' growth and stimulates bud (and hence seed) production. Tying the trees to espaliers made pruning easier, exposed more young shoots (which produce buds) to sunlight and enabled changes in the number of buds to be measured more efficiently.

Adding paclobutrazol to shining gum and southern blue gum (*E. globulus*), for example, meant these trees produced buds within 3 years rather than 5–7 years. Regardless of treatment, however, it takes a year from the first appearance of a bud to the flowering stage, and foresters must wait a further year to obtain mature seed.

In an attempt to reduce the juvenile phase from seed germination to first bud, Mr Moncur grew shining gums in large pots and placed them in a warm glasshouse. When they were 18 months old, he exposed them to a normal Canberra winter to induce the production of flower buds.

The results were impressive. Whereas buds under field conditions can take a year to develop flowers and a further year to ripen and form mature seed, grafts grown in the glasshouse produced flowers after 6 months and mature seed 6 months later. Adding these reductions to the savings effected by applying paclobutrazol means plantation managers can begin collecting seed in an average of 3-5 years rather than 7. Further down the line, a more rapid rate of genetic improvement will also reduce costs.

The researchers are confident that they will be able to produce further reductions, and it may be possible to grow plantation trees from seed to seed-producers in less than 2 years. Even more important, however, are the spectacular increases they have effected in the amount of seed produced by each tree. A plot of untreated shining gums in the espalier orchard produced an average of only four seed capsules each, while trees treated with paclobutrazol produced an average of 560 capsules each — an improvement that could mean welcome savings in the cost of seed, and an equally welcome boost to Australia's tree-seed export industry.

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Growing eucalypts on espaliers to 2 m instead of 20 m makes seed collection easy.