

Propagation of the Wollemi Pine

Glen Fensom and Catherine Offord

Mount Annan Botanic Garden, Mount Annan Drive, MOUNT ANNAN NSW 2567

The Wollemi pine, *Wollemia nobilis*, is a newly discovered genus and species of the southern hemisphere family Araucariaceae. It is a rare and endangered species, with fewer than 40 adult trees existing in the wild. There is considerable horticultural interest in this species and research at Mount Annan Botanic Garden is concentrating on propagation of this species by seed, cuttings, and tissue culture. Of these techniques, cutting propagation of orthotropic juvenile shoots is the most promising.

INTRODUCTION

The Wollemi pine (*Wollemia nobilis* W.G. Jones, K.D. Hill, and J.M. Allen) was discovered in a rough and difficult-to-access gorge in the Wollemi National Park by park worker David Noble in late 1994. Wollemi National Park is located 150 km north-west of Sydney, the largest city in Australia. Only two small populations of the species have been discovered and the number of trees total no more than 40.

The existence of the Wollemi pine was previously only hinted at by fossil records and its closest relative is found as a fossil record from Bass Strait and is dated to 2 million years BP (Hill, 1996). It belongs to the family Araucariaceae, once a widespread conifer group during part of the Cretaceous–Jurassic period (94 to 30 million years BP), that is now confined to parts of the southern hemisphere such as eastern Australia, New Guinea, New Caledonia, and South America. Many of these species have economic value for forestry or ornamental horticulture. The Wollemi pine is unique and it is so different from the other extant species of Araucariaceae, *Agathis* (the Kauri pines) and *Araucaria* (which include the Norfolk Island pine and monkey puzzle tree), as to be classified as a new genus (Jones et al., 1995).

The restriction of the Wollemi pine to a sheltered gorge, may be the result of the frequent fire regime that accompanied the drying of the Australian continent over time rather than a preference for this type of habitat. The plants existence there is tenuous due to the fragile soil, rock falls, and now, by the discovery by man. The Wollemi pine is extremely rare and endangered, but paradoxically its discovery has generated an enormous amount of interest in it as subject for cultivation, which may in fact further endanger the species through pressure to view and cultivate the plant.

The New South Wales National Parks and Wildlife Service and Royal Botanic Gardens Sydney have devised strategies for conservation of this species which include limited access to the site (Offord, 1996). Very few seeds are produced and material for vegetative propagation is also limited. Therefore, a propagation research project is in progress at Mount Annan Botanic Garden (the Australian Native Plant Garden of the Royal Botanic Gardens, Sydney) which aims to eventually produce plant material for distribution. Emphasis is on minimal collecting from the natural site and mass propagation from stock plant material.

SEED PROPAGATION

The Wollemi pine is monocious and bears female cones high up in the crown of the tree, whilst male cones are located some metres below. All cones are borne terminally. Male cones release their pollen in spring and the embryos develop for approximately 18 months before the cones ripen and shatter, dropping seeds over a period of weeks. Very few potential seeds develop in the cones and there are only approximately 10 seeds per cone. Trees do not produce many cones, and, as there are very few trees, the total number of seeds that can be harvested is inadequate for large-scale propagation.

Only a small amount of seed has been collected. However, there has been enough to determine the basic parameters for germination. Adequate germination is achieved through sowing fresh seed at 25C. There is a considerable lag period for all seeds to germinate and studies are now concentrating on breaking dormancy through temperature control and chemical treatment. Plants propagated by seed are being studied for growth characteristics and used as a source of cutting material. They are also being used for DNA fingerprinting studies to determine the genetic variability within the species.

VEGETATIVE PROPAGATION

By far the best material for propagation is the juvenile orthotropic (upright) material that is found growing on the trunks of the trees. This material is in short supply in the wild and we have now produced stockplants from which this material can be harvested. Juvenile material is easily distinguished in this species because of the two-ranked leaves arranged on either side of the branch, similar to *Cephalotaxus* branches, whilst adult material has four ranks on each branch. It is necessary to use the orthotropic material to achieve the "seedling" or upright shape of the plant. Wollemi pines axillary buds appear to be strongly determined in their orientation, as for many conifer species, and plagiotropic (lateral) branches continue to grow sideways giving a lopsided plant that may have some use as ground cover or rockery specimen.

Cutting material can be propagated using a range of auxin treatments and glasshouse environment conditions, and the optimum conditions for propagation are currently being examined.

TISSUE CULTURE

There are very few reports of successful propagation of species of Araucariaceae and research so far indicates that the use of this method will be limited for Wollemi Pine. Axillary bud growth and root production is slow. Cell lines have been established from cotyledons and organogenesis and somatic embryogenesis are being investigated.

LITERATURE CITED

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