

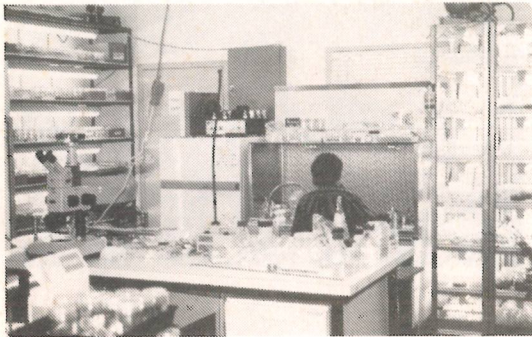
KINGS PARK AND BOTANIC GARDEN MICROPROPAGATION AND PLANT RESEARCH LABORATORY



KINGS PARK
AND BOTANIC
GARDEN

The development of plant tissue culture and micropropagation for research and commercial nursery production has demonstrated the value of these techniques for mass propagation of plants. In addition, use of tissue culture techniques may provide solutions to breeding barriers, allow long term preservation of a species where seed is not available and permit multiplication of plants which cannot be propagated by seed, cuttings or division. The importance of these techniques for the management of botanical collections led to the creation of a micropropagation laboratory in Kings Park.

The laboratory was established in 1980 with the charter to attempt propagation of Western Australian flora which would not propagate by conventional means or could not be maintained as true breeding lines (e.g. colour variants of the red and green Kangaroo Paw *Anigozanthos manglesii*).



The micropropagation laboratory

Since opening the laboratory has extended its programs to include emphasis on the micropropagation and *in vitro* preservation of some of the 238 declared rare and endangered species found in Western Australia. Many of these species have horticultural merit for garden or cut flower culture. However the laboratory propagates all rare species regardless of their horticultural status. In many cases the selection of plant material and media for propagation requires considerable empirical research. Over 50 specialised formulations have now been developed for micro- and symbiotic propagation of nearly 200 species representing 33 families of Western Australian plants.

Development of a micropropagation protocol can involve a few months to 4 years research effort. For critically rare species dedicated funding for micropropagation research has been obtained from government and private sources. However as more taxa become threatened the pace of micropropagation research will increase. The programs of research also involve complete studies of the biology and ecology of a species. Information from these investigations will be vital for the management of rare species including habitat reestablishment programs. The main groups of plants being investigated include:

ORCHIDS

Our native ground orchids include the beautiful spider orchids, donkey orchids and sun orchids. All are difficult to propagate from seed using conventional means. Methods have now been developed by the Kings Park laboratory which have harnessed the symbiotic benefits of fungi and bacteria that live with the root systems of all native orchids. The procedure involves

- Collection of underground parts (usually those of one plant is sufficient).
- Cleaning of soil and organic matter likely to have contaminating fungi and bacteria.
- Careful sectioning of the roots or stems, and removal of the fungus to sterile agar media.
- Combining orchid seed with the cultured fungus.

All these procedures occur under sterile conditions. The result is many thousands of seedlings can be grown from a single orchid seed capsule in 4-12 weeks depending on the species. Some orchids have to be grown without a fungus. In those cases in which the fungi cannot be obtained, media are used which contain all the nutrients the fungus would provide to the orchid plant. The orchid propagation program has also developed tissue culture using vegetative material from the parent plant. Flower stems including sections of unfertilised ovary yield a large number of clones of the parent plant. This procedure is particularly valuable for preserving the genetic diversity of wild populations of orchids without endangering the donor plant.



Diuris purdiei

Examples of successes with species of high conservation value include, Purdie's Donkey orchid (*Diuris purdiei*) several rare *Caladenia* species and *Thelymitra* species. Techniques used for orchid propagation now include a non-laboratory germination procedure. Using specially prepared 'fungal spawn' and pasteurized compost, nurseries or the home enthusiast will now be able to grow many Western Australian species from seed.

RARE AND ENDANGERED SPECIES

90 species of rare Western Australian plants have been propagated by tissue culture means. Some of these species are naturally rare and highly restricted such as the Mountain Bells from the Stirling Ranges. The Bindoon Star Flower (*Asterolasia niveus*) is restricted to only a few plants growing on a roadside north of Perth and is rare because of extensive land clearing in its former habitats.

Propagation material for tissue culture can be taken from actively growing apices at the ends of branches (shrub species) or rhizomes. These explants are then rinsed free of soil, sterilised to rid the material of surface contaminants and then placed on agar media. The medium contains growth regulators which cause the buds to grow and proliferate. When enough shoots have been produced they are transferred to other media which promote rooting and then potted into soil.

The laboratory has pioneered a method of extracting seed embryos as a source of propagating material when shoots are not available. Many relatives of the Boronia family (Rutaceae) and thirty species of native rush (Restionaceae family) and sedge (Cyperaceae family) have been brought into propagation by this means.

Examples of rare species which have been successfully propagated include the Corrigin Grevillea (*Grevillea scapigera*) a species close to extinction; the Gin Gin Pea (*Ptychosema pusillum*) which is restricted to one small and vulnerable population; the rare hidden beard heath (*Leucopogon obtectus*) the first member of the Native Heath family (Epacridaceae) to be micropropagated; and the miniature Green Kangaroo Paw (*Anigozanthos viridis* var *terraspectans*)

NATIVE HEATHS

Over 400 species of the native heath (Epacridaceae) family occur in Western Australia. Except for a few species most are difficult to propagate and grow on. A program of research has shown that tissue culture of excised seed embryos provides a ready source of explants and that special fungi (ericoid mycorrhiza) may be important in establishment and growth of plantlets.

NATIVE RUSHES AND SEDGES

Western Australia has one of the world's most diverse and species rich rush and sedge floras. A number are rare and the families are often important components in the understorey in many ecosystems. The Velvet Rush and Chinese Puzzle are harvested from wild stands for the fresh and dry cutflower trade.

Until now none of the 70 species of native rushes have been reliably propagated by conventional means. Using excised seed embryos and appropriate media up to 20 fold multiplication rates have been achieved for thirty species of native rushes. Habitat reestablishment is now possible for these plants, some of which are important for preventing soil degradation.

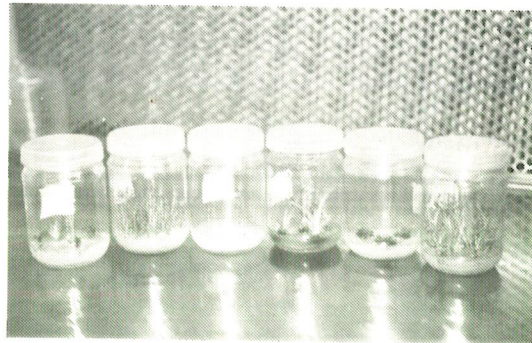
EXCHANGE PROGRAMS

To minimise the risk of 'losing' rare species exchange programs have begun with key botanical gardens both in Australia and overseas.

The plants are dispatched in axenic culture and so do not present any problems with quarantine regulations. In vitro exchanges of rare species of high conservation value are underway with the micropropagation unit at the Royal Botanic Gardens Kew. This procedure is one important means of ensuring the best possible chances for long term ex situ conservation of a rare species.

OTHER PLANTS

In addition to the groups of plants discussed above a range of other vulnerable or 'potentially at risk' species are propagated. Yellow Bells (*Geleznowia verrucosa*) is a popular cut flower but extensive picking from wild stands and habitat clearing threaten the long term survival of the species. Post graduate research have investigated in vitro propagation of Yellow Bells and other species and provided clues for the in vitro propagation of these species. The outcome of these programs will help alleviate picking pressure on wild stands by providing a propagation solution for development of row managed production.



Some rare and endangered species in tissue culture at Kings Park.

FURTHER INFORMATION

The laboratory is continuing to research in vitro propagation methods for many species. The results of this research is published in national and international journals. In this way, research undertaken in the laboratory will be more readily available for the use of Kings Park and Botanic Gardens staff and other institutions.

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