An Experience with Propagation of Rare and Native Plants in Western Australia

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INTRODUCTION

The flora of Western Australia is famed for its diversity and consists of about 20,000 species of flowering plants. Some of the hard-leafed vegetation include *Eucalyptus*, *Banksia*, *Hakea*, *Grevillea*, *Dryandra*, and *Acacia* that dominate Australian flora. There are about 600 *Acacia* species restricted to Australia and at least 400 species of *Acacia* are recorded for Western Australia.

I had the opportunity to spend 7 weeks in Perth, Western Australia, and another 2 weeks in Tasmania at Westland Nurseries While at Perth (Mediterranean desert), very constructive time was spent both at the Department of Plant Sciences, University Western Australia, and Micropropagation Laboratory at King's Park and Botanic Garden (KPBG). The primary objective of my visit to Australia was to learn new propagation techniques of arid and native Australian plants The second objective was to work on a short-term project related to the tissue culture of rare and endangered semi-arid and arid plants The third objective was to do research to find new tree species that can be grown and introduced in Arizona's climatic conditions.

SEED COLLECTION AND SEED STORAGE FACILITY

While the trees/shrubs were at flowering stage, the plants at various locations were marked with colored ribbons according to the uniform intensity of flowering to obtain seeds of uniform maturity. After the seed collection and cleaning process, seeds were dried in an oven at 35C packed in aluminum foil bags, carbon dioxide was filled into the bags, and bags were sealed. Seeds were stored at room temperature as well as at -18C freezer Seed germination and seed viability tests were performed routinely at the laboratory

GRAFTING AND CUTTING PROPAGATION OF AUSTRALIAN ARID-ZONE TREES

Various grafting techniques were used to graft *Darwinia macrostegia* on the rootstocks of *D citriodora* and *Verticordia grandis* on the rootstocks of *Darwinia* species, etc The grafted plants were placed in a bell jar or plastic bag covered over the potted plant and these were misted occasionally Four to six weeks later, a union had formed and new growth began on successful graft unions.

Cutting propagation of some drought tolerant trees and shrubs including clones of *Grevillea* species were conducted at KPBG as well as at Westland Nurseries, Tasmania A few techniques were different; for example, a new form of rooting hormone was used called "Esi-root", a formula containing hormone in gel. Esi-root contains two active ingredients: indole-3-butyric acid (IBA) and naphthalene acetic acid (NAA), contains no alcohol, exhibits anti-fungal activity, and contains wetting agent. A wet thick blanket or moist bed of sand (6 inches deep) was placed over the bottom heat cables on the propagation bed and this provided even heating and moist

heat to the root zone of cuttings. Rainwater (30 ppm salts) was collected in tanks and used for mist propagation. Rooting trials on difficult-to-root grevellia clones, were conducted using pre-treatment of cuttings with smoke water before application of various hormones. Rooting trials on *Stylidium adnatum* (trigger plant), *Lochonontia* hybrid, and *Westringia dampieri* cuttings were also done and most of them rooted successfully. Two weeks were spent at Westland Nurseries, Hobart, Tasmania to gain experience with cutting propagation of cool climate flowering plants and some semi-arid plants Large-scale cutting propagation of some familiar species such as *Verbena*, *Myoporum parvifolium*, *Anisodontea*, *Rhododendron* (azalea), *Gazania*, *Hardenbergia*, *Dianthus* (carnation), *Rosa* (mini roses), *Dodonaea*, and other Australian natives was performed under a fog system

MICROPROPAGATION OF WESTERN AUSTRALIAN FLORA

The majority of my time was spent on projects related to tissue culture of rare and endangered arid-zone plants of Western Australia at the Micropropagation Laboratory at KPBG The team leader of this internationally acclaimed research facility is Dr. Kingsley Dixon. This facility is well known for innovative plant conservation research including tissue culture, cryostorage, genetic DNA fingerprinting, and ecology of rare and endangered plants. In vitro rooting trials were performed with two rare and endangered species of the family Lamiaceae, *Hemiandra gardneri* and *Hemigenia exilis.* These arid- or semi-arid-zone plants are difficult to propagate vegetatively (i e , cuttings), and there is very little information on availability or germination of seed The optimization of in vitro root induction of these species is of great importance to the endangered plant program at KPBG In vitro rooting trials were performed on shoot tips of these species. After experiments with various growth hormone treatments, 20% to 40% of *Hemiandra gardneri* shoots rooted in vitro after 4 weeks Rooted shoots were transplanted and acclimatized in the glasshouses Although root induction was low, this work has provided valuable information for further in vitro studies on these highly recalcitrant species.

TISSUE CULTURE AND PLANT BREEDING OF FLOWERING PLANTS, PLANT SCIENCES DEPARTMENT, UNIVERSITY OF WESTERN AUSTRALIA, PERTH

I had the opportunity to work with a group of researchers at the Plant Science Department at the University on a project related to plant breeding and tissue culture of *Boronia* and waxflower.

The two leading native Australian plants, Geraldton waxflower (*Chamelaucium uncinatum*) and flowers of genus *Boronia* and its wide range of colorful forms grow from mild damp to extremely arid soils of western Australia, are used worldwide for floriculture market. Waxflower is present in large populations in the wild and there are several reports of interspecific and even intergeneric hybrids from within the *Chamelaucium* alliance, therefore, breeding offers enormous potential for improvement While crosses produce viable embryos, seeds do not germinate readily or embryos abort during development. Some *Boronia* species are used for striking flower color while other species are used for extraction of perfume oils The University of Western Australia researchers have been breeding new varieties of Boronia. However, there are obstacles in breeding *Boronia* because of a very poor germination rate of most Boronia species (Plummer and Concidine, 1995) The

Boronia and waxflower embryos can be removed after fertilization and grown in aseptic cultures on filter paper bridges The researchers were able to optimize conditions for shoot multiplication on germinated embryos of the hybrids and later in vitro root induction on shoots.

NATIVE PLANT CONSERVATION PROGRAM

I was able to visit Geraldton mining site with research ecologists who were conducting research on germination of native arid vegetation in response to plant-derived smoke. KPBG has pioneered research on the promotive effect of smoke (derived from burnt native vegetation) on seed germination of western Australian plants (Dixon et al , 1995) which had previously been recorded as extremely difficult or impossible to germinate using conventional techniques. A 3-day visit was made to Anaconda Nickel's Murrin-Murrin (Leonora) project mining site, one of the world's largest nickel projects. The rare species of *Hemigenia exilis* was discovered in 1895 This exists in Leonora as only seven to eight populations in the world. This species was rediscovered in Anaconda Nickel's Murrin-Murrin South Project development area in 1995 and was listed as Declared Rare Flora I was accompanied by research ecologists of KPBG laboratory to collect seeds and cuttings for conducting seed germination trials, cutting propagation, and tissue culture of this rare species.

The experience of visiting this arid desert (Leonora), called "Acacia Country", was very exciting. Thousands of trees of *A. notabilis*, *A. murrayana* (syn. *jennerae*), *A. quadrimarginea*, *A tetragonophylla*, seven subspecies of *A. aneura*, *A. craspedocarpa*, sandalwood tree, some species of *Casuarina*, *Banksia*, *Melaleuca*, and *Hakea* were growing in similar climatic conditions as that of Arizona. However, the soil in the entire area was of distinct reddish brown color, rich in iron but characteristically depauperate in most other minerals. Most of these *Acacia* species were very familiar because these have been introduced into Arizona.

To summarize, I had a fascinating experience learning about wonderful Australian flora and wildflowers of Western Australia The research programs at KPBG and their efforts to rescue and restore rare plants is unique and very impressive.

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LITERATURE CITED

Dixon, K.W., S. Roche, and **J.S. Pete .** 1995. The promotive effect of smoke derived from burnt native vegetation on seed germination of Western Australian plants Oecologia. 101 185-192

Plummer, J. and **A. Concidine.** 1995 New boronias — more colours, better oils Austral Hort 93 35-36