



*fostering research into
the biology and cultivation
of the Australian flora*

Newsletter

No. 2

New Series

November 2004

Summaries of Final Reports

Each year the Australian Flora Foundation funds a number of grants for research into the biology and cultivation of the Australian flora. While the grants are not usually large, they are often vital in enabling such projects to be undertaken. Many of the projects are conducted by honours or postgraduate students, hopefully stimulating their interest in research into the flora.

Presented here are brief summaries of recently completed projects. This work is only made possible by the generous support of donors and benefactors.

Pollination and fruit production of native species in fragmented vegetation.

David Duncan *et al*, School of Botany and Zoology, Australian National University, Canberra

There is international concern that native plant pollination systems may be disrupted as a result of habitat loss and fragmentation processes. One important way that habitat fragmentation may endanger plant populations is by reducing the number of available mates (reducing plant density). Below critical density levels, sexual reproduction in a population can fail. Sustained reproductive failure could lead to population declines and ultimately extinctions of native plant species.

The Black-Anther Flax Lily (*Dianella revoluta*), a common understorey species, was used to look at how local mate density effects the deposition of outcross pollen (pollen from a mate, non-self pollen). The number of flowers that form fruit is greatest when outcross pollen is deposited on the stigma, and poor with only self-pollen. Yet the average pollinator visit in dense patches of mates results in twice as much self-pollen on the stigma as outcross pollen.

In experimental arrangements of manipulated flowers, the deposition of outcross pollen declines significantly with distance from a pollen source. However, pollen load from other co-pollinated species did not decrease with distance, indicating that pollinator visitation to *D. revoluta* flowers was relatively constant irrespective of isolation from a potential mate. This demonstrates how fragmentation could detrimentally affect reproductive processes in even common species with adequate pollinator service.

In Australia we have little or no formal knowledge of important pollinating species for the vast majority of our flora. Therefore, we have no baseline with which to assess the ongoing health of our overall pollination service. This is of great concern and it is fundamentally important that we gather quality data on plant-pollinator relationships whenever the opportunities arise. Future research on the plant-pollinator interactions, and on effects of habitat fragmentation on the pollination ecology of natural systems, and the spatial scale of concern of these interactions is critically important to conservation and management.

Development of somatic embryogenesis as a propagation method for ornamental eucalypt hybrids.

Professor Margaret Sedgley *et al*, Department of Horticulture, Viticulture and Oenology, Adelaide University.

Experiments were conducted to produce plants via tissue culture of ornamental eucalypts, as clonal propagation of superior genotypes is essential to perpetuate horticultural characteristics. The plants chosen for initial study were *Eucalyptus erythronema*, *E. stricklandii*, and hybrids between *E. erythronema* and *E. stricklandii*. Most work was conducted on seedling material, in order to develop suitable methods for the hybrids, of which limited material was available. Successful production of callus, buds, shoots and roots was achieved using the plant growth regulators BAP and NAA. Micropropagation was also successful. No somatic embryos were produced, but this was not seen as a problem, as successful production of plants in vitro had been achieved via organogenesis and micropropagation.

Future work is required to harden off plants produced in vitro, and to apply the successful techniques to superior hybrids between *E. erythronema* and *E. stricklandii*.

Investigating sterility in the clonal shrub *Hakea pulvinifera*: comparative studies of reproductive biology, floral development and genetic variation.

Jennifer Smith and Acram Taji, School of Rural Science and Agriculture, University of New England.

This study confirmed sterility and identified the causal factors associated with sterility in *Hakea pulvinifera*. Early tapetal degeneration resulting in incomplete pollen formation and very low anther dehiscence prevents fertilisation of viable ovules. In addition, extremely low pollinator visitation resulting from poor floral resources limits the potential for pollen transfer, despite low pollen viability. The confirmation that the only known population of *H. pulvinifera* is composed of a single plant has implications for its endangered status and management: *H. pulvinifera* may be one of the rarest species in the world. It is likely that the species is a sterile hybrid, whose progenitors are either extinct or now geographically distant due to extensive destruction of the intervening habitat between *H. pulvinifera* and other 'corkwood' species. Information compiled on comparison species, *H. ednieana*, provides knowledge of the previously little studied Lorea group of Hakeas.

This report has condensed the outcomes of a PhD thesis funded by an Australian Postgraduate Award. Operating funds were contributed by the Australian Flora Foundation and the industry partner, NSW National Parks and Wildlife Service. Further information will be available in the completed PhD thesis, due for submission in July 2004 (Smith, in preparation).

Thanks to donors

The Council would like to sincerely thank the following donors to the Research Fund: F. King (Wildflower Society of WA), J.W. and H.E. Demster, G. and A. Long, Tess Heights, Elvira King, SGAP Mackay Branch, Rhonda Daniels, R.A.D. Mackenzie, Ms J.M. Duraz, Australian Plants Society Newcastle Group, Mr P. Urbonas, Prof. A. Taji, Dr P. McGee, Dr M.L.Reed, Mr W.E. Reed, Dr A Wheeler, Dr P. Goodwin, Dr G.L. Unwin, Ms M.Eason, Mrs M. Watts, Prof. T. Clifford, Ms B. Buchanan, Mrs D. Snape, Dr P.V.Lightfoot, Mrs W. O'Brien, Mr F. Gleason. The Foundation would not be able to carry out its research objectives without the support of donors and benefactors. Donations for research of \$2 and over are tax deductible.

Sincere thanks are also due to the Grevillea Study Group of the Association of Societies for Growing Australian Plants, which has agreed to fully fund the 2004/05 research project *The Role of Phytohormone Auxin in Adventitious Rhizogenesis in Grevillea*. This project, approved by the Foundation in 2003, will be carried out by Ms Krisantini Sanjaya, School of Agriculture and Horticulture, University of Queensland, and will investigate the auxin uptake, transport and metabolism and control of root formation (rhizogenesis) in *Grevillea* species.

Vale Val Williams

Val Williams, who was the Hon Secretary and a Councillor of the Australian Flora Foundation for many years, passed away on 23rd June 2004. Val worked tirelessly for the Foundation and will be greatly missed by her colleagues. Although she had a great many interests, she had two overriding passions – the promotion of Australian plants, and their conservation. In her dedicated work for the Foundation, she found it possible for both of these ideals to be satisfied.

For the best part of two decades Val was active within the Australian Plants Society, serving in several office-bearing capacities with the North Shore Group in Sydney, including President for two years. In 1998 she was elected NSW President, and held this position for three years. She was involved in various committees of the Society at state level, such as Publishing, Growth and Promotion and Conservation.

Val was an avid traveller, and made several trips to outback areas of Australia. She was a keen photographer of Australian plants, especially rare plants of the Sydney area. She took part in field work and surveys of native plants around Sydney, and participated as a speaker in the walks and talks program at the Ku-ring-gai Wildflower Gardens. Val was also interested in history, literature, painting and fine music. She is survived by her son Dion and daughter Claudia.

Meet the Councillors

In this issue we feature two recently appointed members of Council, Professor Acram Taji, and Dr Elwyn Hegarty.

Professor Acram Taji holds a Bachelor of Agricultural Science (First Class Honours) from the University of Tehran, Iran, Graduate Diploma in Horticultural Science from the University of Sydney, a PhD in Plant Physiology from Flinders University in South Australia, and a Certificate in Higher Education Management from Harvard. Acram has been involved in tertiary education

in a number of universities in Australia, in the University of the South Pacific in Fiji (and its Tonga and the Solomon Islands Centres), the University of Colombo in Sri Lanka, at Osaka Prefecture University in Japan and in the University of California-Davis. Currently, she holds the position of Professor of Horticultural Science at the University of New England in Australia.

Acram's research centres around agronomy, physiology and ecology of plants, in vitro propagation, and pollination biology and seed set of many Australian plant species with floricultural potential. She is actively involved in tissue culture for conservation of rare and endangered Australian plants as well as the development of native plant species for floriculture using in vitro breeding techniques.

During the 15 years of her professional life Acram has been honoured by a number of international and national research and teaching awards including "The Lecturer of The Year" in the University of the South Pacific in Fiji, the Japanese Prime Minister Senior Research Fellowship for Foreign Specialists, the prestigious inaugural Australian Award for University Teaching, the Australian Society of Plant Scientists' prize and the Australian College of Education and NSW Minister for Education and Training Quality Teaching Award. She is the author of over 200 articles and author or editor of seven books mostly in the area of in vitro plant breeding, floriculture and horticulture. Her latest book titled "Teaching in the Sciences: Learner-centred approaches" is due for release later this year by Haworth Press in USA.

Dr Elwyn Hegarty has been nominated to join the Australian Flora Foundation Council following the December AGM. This was at the suggestion of the Association of Societies for Growing Australian Plants Inc. (ASGAP) to facilitate liaison between their member organisations from each State and the Foundation. Matters of common interest include priorities for research into native plants, and possible local sources of financial support. Ian Cox has been performing this duty for some years, but has undertaken other responsibilities.

Elwyn is a botanist from Queensland, with particular interests in rainforest species, especially vines, plant distribution patterns and ecology, and bushfood plants, their safe selection and uses. A member of SGAP (Qld Region) since 1963, she has been their Technical Officer and regional AFF Liaison Officer for approximately three years, as well as a continuing member of some ASGAP study groups.

Following a varied career in botany and other areas of interest, including a period as chairman of the Museum Board in Queensland, she and her husband, a toxicologist, set up a private company, Plantchem Pty Ltd, (previously "Plantchem") in 1994, which advises food, beverage and cosmetic manufacturers about suitable selections and safe uses of native plants in commercial products. Their 2000 report to RIRDC (jointly with Professor Wills of Newcastle) entitled "Food Safety of Australian Plant Bushfoods" is at <http://www.rirdc.gov.au/reports/NPP/01-28.pdf/reports/NPP/01-28.pdf>

Australian Flora Foundation
PO Box 1566
University of Queensland, Gatton Qld 4343.