ISSN-0811-529X

Association of Societies for Growing Australian Plants

EREMOPHILA STUDY GROUP NEWSLETTER No. 95

November 2008

The FJC Rogers Seminar, held in Horsham on the weekend of 4-5 October, was a great success, with over 300 registrants attending. To the credit of Maree Goods, Russell Wait and Norma Boschen the book which they published was very well received and many copies were sold. A review is printed in this Newsletter.

Dr Bob Chinnock was the Keynote Speaker. He gave registrants a valuable insight into the history of the Myoporaceae in Australia in the opening address; referring to historical collections, showing us illustrations of herbarium specimens from early collectors, such as Robert Brown, who collected in South Australia.

On Sunday bus-loads of enthusiasts visited a selection of nurseries and private collections. The collections of Norma Boschen and Maree Goods were on the itinerary – the buses went in opposite directions, meeting for lunch at the Wail Nursery. Both Norma's and Maree's collections were in full flower and the selection of species and hybrids in cultivation raised the enthusiasm of visitors; whetted by the valuable PowerPoint presentations in the lecture hall. There will be many pictures circulated in the next month or so if the number of cameras seen during the garden visits is any indicator.

Workshops relating to propagation, by seed, cutting and grafting were well-supported as were the Floral Work & Pruning sessions. The Digital Photography sessions were overcrowded – it seems that there were many questions relating to the 'correct' use of digital cameras and how to get the best out of them.

In mid-October I received an email from Hans Griesser who is Professor of Surface Science and Deputy Director of the Ian Wark Research Institute at the University of South Australia. Hans is also an active member of the Eremophila Study Group.

The article was ready to be published in *Chemistry in Australia*. Whilst much of the information was of a highly technical nature, Hans offered to prepare a 'lay-person' summary of the findings for the Newsletter and I have printed what Hans has provided in this Newsletter.

In short:

> "Researchers at the University of South Australia describe a number of approaches to the fabrication of thin coatings that confer resistance to colonization of bacteria. These coatings are intended for application onto biomedical devices to prevent device-related infections caused by bacterial biofilms."

The article refers to the increasing number of biomedical implants being used, especially in the area of hip & knee replacements; as well as the increased use of stents, heart valves, vascular grafts and other organ replacements. The use of short-term biomedical implants such as catheters, orthopaedic screws etc. is also on the increase. The paper then refers in depth to the research conducted using several *Eremophila* species as the source of the extracts obtained and tested, some with excellent results.

EREMOPHILAS FOR THE SYDNEY REGION

Eremophila Study Group – Sydney Branch.

It was once said that it was difficult to grow eremophilas in Sydney. The Sydney Branch of the Eremophila Study Group has been growing this genus for quite a number of years. We have seen these eremophilas come through five years of drought magnificently and on occasions, extreme weather conditions. We wondered how, with very little moisture in the ground these eremophilas continued to grow and bloom. Throughout autumn and early winter there always was a species in flower. Then from mid-winter to late summer the gardens came alive as species after species burst into full bloom.

As the drought continued some of the *Eremophila* species started showing signs of stress – but they survived. One unanswered question is - what will happen when the weather pattern changes?

Well change it did; the July – August 2007 period saw 300mm and more of rain dumped on Sydney and its suburbs. Again our eremophilas responded magnificently. But as the rain continued throughout summer 2007 and winter 2008 some losses did occur but the majority survived. To be honest, we expected a worse result, but it seems that eremophilas are more resilient then we expected them to be.

From our experience in growing eremophilas in the Sydney region we believe that quite a number of *Eremophila* species can be grown. Some species that are reliable on their own roots are:

E. alternifolia	*E. bignoniiflora* x *polyclada*
E. calorhabdos	*E. debilis*
E. dempsteri	*E. dichroantha*
E. divaricata	*E. divaricata* x *polyclada* ('Summertime Blue')
E. drummondii	*E. drummondii* x *nivea*
E. glabra (various species)	*E. laanii*
E. latrobei	*E. longifolia*
E. maculata	*E. nivea* x *christophorii*
E. oppositifolia	*E. polyclada*
E. purpurascens x *alternifolia*	*E. serpens*
E. 'Yanna Road'	*E. youngii*

The following species are considered to be more reliable when grafted:

E. bowmanii subsp. *latifolia*	*E. complanata*
E. gilesii	*E. glabra* subsp. *tomentosa*
E. macdonnellii	*E.malacoides*
E. miniata	*E. nivea*
E. pantonii	*E. psilocalyx*
E. saligna	*E. splendens*
E. sturtii	*E. tetraptera*
E. tietkensii	*E. viscida*
E. youngii	*E. youngii* subsp. *lepidota*

Recent grafted additions that have responded quite well to the wet conditions. These species are planted in full sun:

E. adenotricha	*E. dalyana*
E. delisseri	*E. freelingii*
E. pterocarpa	*E. spectabilis*
E. willsii	

For small courtyards try growing the following grafted species in large or larger pots in a sunny, sheltered position (especially during rainy periods and frosty winter nights.)

E. hygrophana	*E. fasciata*
E. mackinlayi	*E. warnesii*

Charles Farrugia

TWO NEW DESIGNATIONS

Since the publication of the Bob Chinnock's book there has been another *Eremophila* species described, *Eremophila grandiflora*, and one raised to sub-specific status.

Eremophila grandiflora is like *E. galeata*. The leaves are similar, being large and shiny and covered in resin. The major difference is that the sepals are narrower. With the specific epithet 'grandiflora' one would have expected the flowers to have been large: well they could have been a fraction larger when I saw it this year!

The sub-species that has been described is the upright form of *E. densifolia*, which has been in cultivation for years. This is now recognised as *E. densifolia* subsp. *erecta*. The main difference, other than the plant being about 1.2 to 1.8m high is the glandular hairs towards the apex of the sepals.

I had another good trip to Western Australia this year. I found a couple of species new to me; including *E. grandiflora* and an undescribed species similar to *E. spathulata*, but with red, tubular flowers.

There was good growth on most plants after some very good rains last February-March, but not all species had flowered or were going to flower.

Russell Wait,
Natya, Vic

Antibacterial Activity of *Eremophilas*

For the past four years, a team of researchers at the University of South Australia has been studying the antibacterial activity of chemicals extracted from Eremophilas and possible new applications of such chemicals. For such research, expertise in several areas is necessary; our team comprises biologists from the University's Sansom Institute and chemists from the Ian Wark Research Institute, also at UniSA. In this article, I will provide a summary of research to date and where we are heading now.

As happens so often in research, this activity came about via a chance meeting, when I attended a talk on plants used for medicinal purposes by Australian Aboriginal peoples. Susan Semple, the speaker, had studied extracts of some *Eremophila* species for antibacterial activity in the late 1990s while she was in Enzo Palombo's research group at Swinburne University in Melbourne. At that time, however, the chemical compounds responsible for the antibacterial action in the extracts were not identified. Therefore, we decided to attempt separation of the various chemicals that would be present in the extracts, and identify their chemical structures.

Another question of interest was why, according to available records, Aboriginal peoples had used only a few of the more than 200 species for the medicinal purposes of skin lotions and throat washes, which are suggestive of antibacterial action. One likely explanation was that the species they had used had a wide distribution and therefore were useful for nomadic people, as opposed to the many *Eremophila* species with very limited distributions. Another possibility of course is that knowledge may have become extinct, particularly in WA. However, we decided to check experimentally whether comparable antibacterial activity could also be obtained with extracts of species for which there is no documented traditional medicinal usage.

For this purpose, we screened for antibacterial activity of the leaves of some 70 species. The results showed that many more *Eremophila* species possessed antibacterial activity. All the grey-leaved species showed no activity, whereas species with sticky or waxy resinous coatings on leaves and stems showed varying levels of activity. Interestingly, substantial antibacterial activity was found in species from several sections (Virides, Pulchrisepalae, Scariosepalae, Stenochilus, Eremaeae and Australophilae), suggesting that the genetic basis for production of these chemicals is a trait that did not evolve very recently. Among the strongest activities were found with extracts of *E. gibbosa, serrulata, neglecta, virens*, *complanata*, and *drummondii*, but several other species also had similar strengths. Thus, many *Eremophila* species are candidates in the search for novel medicinal chemicals.

Interestingly, chemists, particularly Emilio Ghisalberti in WA, had extracted many interesting chemicals from Eremophilas and used chemical analysis techniques to elucidate the chemical structures of more than 120 compounds, but no connections had been made between the chemicals and medicinal effects. We chose three species with very active extracts (*E. serrulata, E. neglecta,* and *E. duttonii*), mainly for reason of availability of sufficient quantities of plant material; 2 kilograms or more are needed to extract usable amounts of antibacterial chemicals. It would be interesting to investigate species with extremely high amounts of sticky resin coatings on leaves and stems, such as *E. fraseri* and its allied species, if enough plant material could be sourced.

Using chemical separation techniques, PhD student Chi Ndi separated the crude extracts into many fractions and tested each fraction for antibacterial activity. Active fractions were then further separated into individual chemical compounds, a rather tedious and time-consuming process. Eventually, however, active chemicals were obtained in pure form and their chemical structures elucidated by using several chemical analysis techniques. In each of these three species, 3-4 antibacterial chemicals were identified. Interestingly, all the chemicals were different in these three species, even though they shared a common structural "backbone". Some of these antibacterial chemicals were identical to chemicals isolated earlier by Ghisalberti and others, while other chemicals we found had not been reported before. Equally fascinating was that one of these chemicals had previously been found in the American plant *Capraria biflora*, a member of the *Scrophulariaceae*. As discussed in Bob Chinnock's book, some botanists have argued that the family *Myoporaceae* should be incorporated into the family *Scrophulariaceae*.

There are many antibiotics on the market now, so why would we be interested in some new antibacterial chemicals that are tedious to extract and thereby expensive? One reason is that our new chemicals were found to be active in solution against multi-drug resistant strains of key bacteria causing hospital infections; the increasing resistance of some bacterial strains, for example of *Staphylococcus aureus* (the notorious Golden Staph), to treatment with established antibiotics is a cause for concern among health care authorities and has given rise to fears of "superbugs". Chemicals that can be used for treatment when established antibiotics fail, are of great interest and may save lives. The question of cost remains for the time being, but PhD student Jessica Cook is now working on devising a laboratory chemical synthesis, guided by Professor Michael Perkins of Flinders University.

Our main research interest is, however, not primarily on providing new antibiotics. We see greater promise in using the chemicals from Eremophilas for the fabrication of ultrathin protective layers on medical implants, to fight bacterial infections of implants. Many established antibiotics do not work when coated onto surfaces of implants. However, the infection of implants is a considerable concern in human health care. Over the past two decades, the number of artificial hip and knee implants has increased markedly, but, according to statistics in several countries, around 3-4 % of such implants become infected. Often, such infections are detected when bacterial infection has progressed to the stage where bacteria have produced a capsule that protects them against antibiotics. For such advanced infections, antibiotic treatment often is ineffective, and the infected implant must be removed and a new one implanted. For patients already weakened by age and a previous operation, such infection and re-operation is traumatic and has resulted in death in a number of cases. Stents, heart valves, vascular grafts, and other organ replacements can also become infected, although apparently much less often. Shorter-term biomedical devices such as catheters, orthopaedic screws, and others also become infected, but can be exchanged more easily. Finally, contact lenses can also become colonised by bacteria, but most people (except for example one boxer) have the common sense to remove itchy contact lenses early enough to avoid complications. As the Australian population ages, the demand for medical devices continues to increase, and clinicians and patients would much appreciate infection-resistant devices.

As bacterial biofilm infections attached onto medical devices are much more difficult to eradicate than circulating bacteria, a different strategy seems advisable. Our approach for fighting implant infections is to prevent the initial attachment of bacteria to implants, by coating implants with an extremely thin coating that should not interfere with other events such as wound healing. To achieve long-lasting activity, we tie the antibiotic molecules onto the devices by strong links, what chemists call "covalent bonds"; this ensures that they do not float off with time. PhD student Hardi Ys has developed procedures for making such coatings that can be applied onto metallic and plastic medical devices. Our work to date has indeed shown that when we tie a new chemical extracted from *E. neglecta* onto model materials and expose them to bacterial broth, the coated layer completely prevents the attachment of bacteria. This promising result has led us to patent this new use of these chemicals, and several companies are interested in our research.

What next? So far, we have shown that these chemicals are effective against "superbugs" both in solution and as thin coated layers on model devices. The next question is: do they affect human cells? If they irritate human cells, then the healing of wounds after surgery could be negatively affected. Initial tests done in a laboratory culture setup with mouse cells by Stefani Griesser and Hardi Ys show promising results, but more research is needed until we can be sure that our new chemicals are safe for use on human medical devices. We are now undertaking a range of bio-safety tests that are essential before clinical testing could be envisaged even in animals. It would also be of interest to understand at a molecular biochemical level how these chemicals work against bacteria, and we are now looking to set up a collaboration with Enzo Palombo to study this – it needs several brains and skills to tackle difficult questions !

Finally, while multinational companies prefer laboratory chemical synthesis to produce antibiotics, the possibility should also be explored to set up an Australian venture for the procurement of these antibiotics in an "organic" process by the extraction from plantation-grown *Eremophila* species with high loadings of antibacterial compounds. The ability of these plants to grow on land of little use for other horticulture would lend itself to inexpensive land being used for plantations, and this might also provide an excellent opportunity for involving the traditional owners of the medicinal knowledge that has partly inspired our research. However, efficient propagation, reliable growth, and an efficient extraction process would be required, and we are looking into ways of studying these issues. It is also not clear at present whether the growth conditions, time of year, watering, soil, and other factors might lead to variability in the resins and the amounts of these chemicals. This needs to be studied too. There is plenty of scope for assistance by experienced growers of Eremophilas !

For those who would like to read more details, so far we have published results in these reports; I'd be happy to provide copies on request:

C.P. Ndi, S.J. Semple, H.J. Griesser and M.D. Barton, Antimicrobial activity of some plant species from the Australian genus *Eremophila*. *Journal of Basic Microbiology*, **47**, 158-164 (2007).

C.P. Ndi, S.J. Semple, H.J. Griesser, S.M. Pyke, M.D. Barton, Antimicrobial compounds from the Australian desert plant *Eremophila neglecta*. *Journal of Natural Products*, **70**, 1439-1443 (2007).

C.P. Ndi, S.J. Semple, H.J. Griesser, S.M. Pyke, M.D. Barton, Antimicrobial compounds from *Eremophila serrulata*. *Phytochemistry*, **68**, 2684-2690 (2007).

H.J. Griesser, H. Ys, C.P. Ndi, L. Britcher, K. Vasilev, M. Jasieniak, S.S. Griesser, S.J. Semple, Combating Infections at Biomedical Implants and Devices by Antibacterial Coatings. *Chemistry in Australia*, **75** (10), 5-8, 2008.

EREMOPHILA MITCHELLII – FALSE SANDALWOOD

You may recall that an article was written several years ago regarding the use of posts of *E. mitchellii* being used as fencing posts to avoid the ravages of termites in outback areas of NSW and Queensland.

In a television report on Today Tonight (Channel 7) on 18.11.08, reference was made to this fact and it appears as if further work has been done on the extraction the essential oils which are the active ingredient(s). These extracts have been tested on timber and shown to be effective in the prevention of termite attack on a range of timbers.

The report commented on the non-toxic nature of the extracts and so they are considered suitable for use on timber being used in and around humans and domestic or farm animals without the complications associated with other chemical treatments, often using highly toxic, and in some cases suspected carcinogenic compounds. It is anticipated that commercial production could be as close as two years away.
The report mentioned a research company BioProspect, working in conjunction with the CSIRO and Southern Cross University (NSW).

Colin Jennings

FROM YOUR LETTERS

Anne Langmaid – Keilor, Victoria

Anne wrote: "My dear husband had opened the A2 section to an article by Diana Snape about our beloved eremophilas and what a great job the Study Group has done in promoting and supplying plants. The wonderful Fred Rogers was named along with my latest prized possession "the book" and its authors. I have searched out the transcript. I don't think that it can be copied verbatim due to copyright, but I would have hated to miss it, thought you might too. Unfortunately the photos don't copy and the text form is irritating."

The article to which Anne relates is titled "Queens of the desert". Members may wish to locate it on the website of *The Age* newspaper. To help in your search the following may be of help:

Author: Diana Snape
Date: 08.11.2008
Section: A2
Page: 30

Essentially what Diana has said is:

That eremophilas are perfect plants for our changing climate, needing little water, once they are established.

Diana refers to the enthusiastic members of the APS Eremophila Study Group who, for over thirty years, have studied the genus. In her reference to the members she also comments on the many collections made, under license, and to the trials conducted in many gardens and parks under their guidance.

The FJC Rogers Seminar was given a good report as were the gardens and nurseries visited in the Wimmera District during the weekend of the conference. Diana goes on to congratulate the three authors of the book which was launched at the seminar, praising them all for the excellent contribution both to the text and the photography.

The Arid Lands Botanic Garden is also noted: Diana encourages those who are travelling in the area to visit the garden "to see the wonderful range growing there."

Diana then goes on to refer to a range of eremophilas, pointing out that they range from groundcover, to low and medium shrubs to tall shrubs, with a range of flower colours and leaf shapes and colours.

I encourage those who can, to have a look at the original article. It is great to have the praises of eremophilas sung in the public press. Too often we hear, even from the so called 'experts' that native plants are too difficult, too short-lived or plain boring. With the increasing demands on a limited water supply it is becoming more and more essential to grow plants which are less demanding of our water supplies – Eremophilas certainly allow us to do this and with such a great range of species there is plenty of scope. It is only a pity that there are so few nursery resources. This article and others which are occasionally published go a long way to putting the facts before the public. Thank you Diana!

Colin Jennings

Australia's Eremophilas
changing gardens for a changing climate

Publishers: Boschen, N., Goods, M. & Wait, R.
Consultants: Bloomings Books Pty. Ltd.
271pp: photo-illustrated, indexed.
Flexicover
ISBN 978 1 876473 65 5
Available:
Private Bag 2197
HORSHAM, VIC 3400
AUSTRALIA eremophilas@skymesh.com.au www.nativegrowth.com.au
Price: $49.95 rrp

Three amateur enthusiasts, each members of the ASGAP Eremophila Study Group, have produced this book; having seen the need for growers of this diverse genus of Australian Native plants to have available a resource which can be used both for photo-identification and a basis upon which to build their knowledge about cultivation and propagation. They saw the opportunity to further promote the genus approximately two years ago when the Wimmera Growers Group was invited to host the FJC Rogers Seminar, "Eremophilas 2008", in Horsham in October 2008. Norma Boschen, Maree Goods and Russell Wait, using their own experiences and photographs, supplemented by assistance from a number of other enthusiasts have produced a magnificent book. It will prove to be a valuable educational tool as well as being an attractive book, filled with photographs to be appreciated by expert and amateur alike.

Collating their immense knowledge of the genus through many years of personal involvement, both in the field and in their extensive gardens, they have pieced to together a valuable resource for all to appreciate and learn from. Not only will this book be of value to hobbyists, but it will provide valuable information for landscapers and garden designers as well as being a resource which professionals can use – a very worthwhile supplement to the publication *Eremophila and Allied Genera* Chinnock R J (2007).

In the Foreword, Dr Bob Chinnock, refers to the changing practices which need to be exercised by those who grow plants in their gardens and parks. He congratulates the authors for their forethought in producing the book and commends it to readers as a valuable source of information: a complete guide to the cultivation of *Eremophila*.

A brief history of the genus is presented. The Question: "Why Grow Eremophilas?" is posed; followed by the fundamental requirements of cultivation, propagation, and a brief review of pests and diseases as they relate to eremophilas.

The body of the presentation is conveniently divided into four sections, Small Trees and Large Shrubs, Medium Shrubs, Small Shrubs and Prostrate Shrubs; based on the 'habit' of the plant.

Within each section, species are accurately described and superbly illustrated. In most cases a full page treatment is given for each entry. A brief etymology treatment is given at the beginning of each entry, followed by a compact, but comprehensive description with comments on the distribution of the species. Each species is discussed in detail with regard to its cultivation and growing hints are supplied. A summary is provided, giving the reader an overall perspective of the plant. In addition each taxon is illustrated by photographs, many taken in the field, illustrating the *in situ* habitat of the plant, together with the detailed macro-view of individual flowers, taken either in the field or from cultivated plants. Colour forms are often illustrated.

Overall the photographic record is excellent and will be a valuable tool for readers to be able to identify plants in their collections or seen in the field, without recourse to extensive keys or text references. Hybrid plants are to be found both naturally and in cultivation. Those which are now recognised as useful garden plants have been recorded, with a note that more will be used in the garden when they have been proven as horticultural subjects. Eremophilas of the future are recorded in the final chapter; species listed include several which are not currently in collections but could be in the future.

This publication is highly recommended, and from the number of books sold at the Seminar, it is already well established as a resource for those currently interested in this unique genus and will no doubt prove to encourage others to use these popular plants in their gardens.

Colin Jennings

Colin Jennings
Leader, ASGAP Eremophila Study Group,
4 Kinnaird Cres, Highbury SA 5089 cje97694@bigpond.net.au