

DRYANDRA STUDY GROUP

NEWSLETTER NO. 31



Dryandra borealis subsp. *elatior*

ISSN: 0728-151X

OCTOBER, 1996

SOCIETY FOR GROWING AUSTRALIAN PLANTS

This was formerly called ASG No. 20 or Species H. From the Three Springs - Arrino area. This bushy shrub with prickly leaves is outstanding in flower. The long bracts are greenish-yellow, the styles bright yellow and the limb a rich golden yellow. See N/L No. 27.

DRYANDRA STUDY GROUP

LEADER

Mrs. Margaret Pieroni
16 Calpin Crescent
ATTADALE
W.A. 6156

NEWSLETTER EDITOR

Mr Tony Cavanagh
16 Woodlands Drive
OCEAN GROVE
VIC 3226

Please excuse the lateness of this issue of the Newsletter. Between conferences and school holidays, there have been delays in getting everything together, but I hope that you will find something of interest in it.

We have had lots of compliments about the Illustrated Key in the last newsletter and I know the special Occasional Publication No. 3 that I produced for sale has required several reprints. I am very grateful to Margaret for all her work in compiling the illustrations and to Alex George for providing the key. We hope that it helps to identify those difficult species.

Because this is the third newsletter for 1996, it is a little thinner than usual. Margaret describes a trip in May to locate the elusive *D.longifolia* subsp. *archeos* - successful in locating and photographing flowering specimens. Then follow three reports on members experiences with germination - from Hartley Tobin in Victoria, Lloyd Carman in South Australia and Anne Cochrane and Anne Kelly at the Threatened Flora Seed Centre at the WA Herbarium. I was very pleased to receive their results as the table of germination data and plots of germination vs time give us a very good guide to expected germination behaviour under controlled conditions. Lloyd's information on the need for a minimum level of nutrients for successful growing of all species (especially the need for some phosphorus) is well worth keeping in mind. Hartley's comments on the use of fungicides and the need for a satisfactory potting mix and water regime in the pot to minimise losses is also worth following up. I have finished up with some short notes on growing dryandras in pots, *Dryandra* on the 'Net', an update on identification of species in the *D.pteridifolia* complex and a report on the Proteaceae conference I attended.

I have also included a financial statement for the Group to 30/6/96 - as you can see, a healthy situation thanks to Margaret. Albeit a little late (and I know that many of you have already paid), it is subscription time for 1996-1997. Please forward all cheques to Margaret.

I have held over a couple of items for next newsletter including an index from a new member, David Lightfoot to compliment David Randall's species index.

Happy dryandra growing,

Tony Cavanagh.

Tony Cavanagh
Newsletter Editor

In Search of *Dryandra longifolia* subsp. *archeos* - May 1996

In late April I began getting chest pains and went to hospital and was put in coronary care. I was pretty devastated, not the least because I thought I wouldn't be able to go to Mt. Ragged. Brian Moyle had promised to take me months ago and I'd got information from Alex George and had booked accommodation at Duke of Orleans Bay for 10th-11th May. I had been in touch with the ranger at Cape Arid who, it turned out was Alan Rose whom I'd met when he was at the Stirlings. He re-discovered *V. carinata* so both Elizabeth George and I know him well. I sent photos and drawings of *D. longifolia* but at the time Alex hadn't given me precise information on the location of subsp. *archeos*. Alan told me that a CALM person had just collected a specimen in flower when I first rang, so we brought forward the trip. Originally it was planned for 1st June.

After being on medication for angina for almost 2 weeks and feeling very weak, tired and depressed I had an exercise stress test and the cardiologist decided there was probably nothing wrong with my heart after all. When I told him I wanted to go way the other side of Esperance to climb a mountain he asked why. I told him about the dryandra and it turned out he not only knew a lot about them, but is about to go into the cut flower growing business, on the side and wanted to know all about growing *D. formosa*. It occurred to me afterwards that he'd done more consulting of me than the other way round! I was determined to go on with the trip and I knew I needed a break, despite the fact that, in the meantime, I'd spoken to Alan again and he'd been to Mt. Ragged and couldn't find any *Dryandra longifolia* in flower. He said he found the plants but none were flowering since the fire of 4 years ago. What's more, the woman who collected it only found that one flower. I told Brian the first bit of news but I said Alan might not have found the right plants or been at the right place. I had a photo from Alex by then with the spots marked - one on top of Tower Peak and the other about a third of the way up from the camping area.

We set off about 6 am on Friday only stopping for coffee and lunch breaks at a couple of likely looking spots and a place where I hoped to find *D. pteridifolia* in flower. Most of the plants were still in bud but Brian found one flowering well. It had a few seeds on it too.

I wanted some prints of several other dryandras, so we stopped for those; *D. cirsiodes* and *D. pallida* and 20 kms east of Ravensthorpe on the main road we found a population of magnificent *D. quercifolias*. Apart from several banksia species and *Hakea laurina* there wasn't much in flower till we reached Esperance and drove up to Dempster Head. There was *Verticordia minutiflora*, *Hakea clavata* and other things in flower. *D. longifolia* subsp. *calcicola* was still in bud. The plant I photographed in '89 was gone and most of the plants we saw were small ones, clinging to the sides of a trench that had been cut in the limestone for a pipe from one of the reservoir tanks. It was pitch dark when we got to Duke of Orleans Bay at 5-30, being so far east but we woke fairly early on Saturday and set off for Mt. Ragged. From the Fisheries Road, which crosses Cape Arid National Park and ends up at Israelite Bay, we took the Balladonia Road which goes straight there. For the whole 47 kms you can see Mt. Ragged straight in front in the distance. The closer we got the steeper it looked until

we got there, when it didn't look quite so far to the spot where we wanted to climb. We reached the camping area about 11 o'clock. The track to Mt. Ragged was very rough. It had deep white sand, gravel, corrugations, mud puddles, clay puddles, limestone rocks and now and then, a few good smooth parts. The number of flowers we saw astounded us. We had to keep stopping to photograph and collect specimens: 3 *verticordias*, a *boronia*, *acacias*, *banksias* and a lovely red *styphelia*, *Styphelia hainesii*.

We started climbing a sharp ridge of quartzite on the southern end of the mountain towards the spot Alex had shown me. First of all we found a 'new' *Hakea* then I noticed that a *dryandra* that looked like *D. armata* but without a lignotuber was in flower and to me it is more like *D. hirsuta*. We photographed and collected that. We soon found small plants of *D. longifolia*. Some had what appeared to be aborted buds. Except for the mallee eucalypts most of the plants had re-grown from seed. The fire must have been intense as the whole area had been burned even where there were large quartzite boulders. I had been hoping to find a *dryandra* or two among the rocks that had escaped the fire, but didn't. Thinking that the eastern face of the ridge might be a better prospect we made our way around to it and Brian found a plant in flower! One branch had several inflorescences in various stages so we took photographs. The limbs had rusty hairs on the tips like *subsp. calcicola* I had in my garden. Just as we were making our way back Brian found another plant with all-yellow flowers. More photos!

I began thinking that the *hakea* we'd found might be a hybrid. There was only one. It was like *H. laurina* but with long thick leaves. Soon I found *H. pycnoneura* in flower and then I was pretty sure it was a cross between those two. *H. laurina* is common almost everywhere we went down there. When I told Alex about it, he said it sounds like one that has already been collected there.

After leaving Mt. Ragged we took the track to Israelite Bay. It was worse than the first one, with very long stretches of limestone and puddle after puddle to drive around. There were quite a few saplings across the track as well. It hadn't been driven on for quite a while. Eventually the track improved and we reached Israelite Bay, had a quick look at the ruins of the old telegraph station and headed back across Nuytsland Nature Reserve and Cape Arid National Park on Fisheries Road, which until the western edge of the national park is a sandy track with innumerable boggy patches. It was dark long before we left Cape Arid National Park but we saw still more interesting plants new to us. The whole area is a low scrub with an amazing variety of plants, Proteaceae well represented. The other *dryandras* include *D. cuneata*, the *aff. (?) armata* and *D. cirsioides*.

There had been some rain and we had an odd shower but otherwise the weather was ideal. Any more rain and the track would have been impassable even with 4 wheel drive so, you see, the trip was successful and, as most trips do, it exceeded our expectations.

Germination Records for 28 Rare and Threatened West Australian Dryandras

As previously mentioned in Newsletter No. 26, July 1994, staff at the WA Department of Conservation and Land Management's Herbarium in Perth are involved in the collection of seed from rare and threatened *Dryandra* species. Many of these plants are threatened by dieback disease or are known from only a few populations with limited numbers of plants in each population. The primary objective of this "genebank" or seed storage facility is to maintain genetically representative collections of seed from Western Australia's rare and threatened plant species that face extinction in the wild within the next 10-20 years. It is envisaged that the stored seed will be available for use in re-establishment programmes following removal of the threats.

In response to Tony Cavanagh's Report on *Dryandra* Cultivation Survey 1995 in the February 1996 Newsletter (No. 29), we would like to provide the *Dryandra* Study Group members with updated results of our germination work. Over the past 3 years 28 taxa of rare or threatened dryandras have been collected and tested in the seed store. The germination response of these dryandras has been good and is generally over 70% under controlled laboratory conditions. And it would appear that this genus is responding well to life in the fridge and freezer.

All seed that enters the genebank is fumigated, cleaned and tested before being refrigerated in their follicles at 4°C. Some seeds are frozen at -18°C if they have been extracted from their follicles. The seed is stored in impermeable foil packets filled with carbon dioxide. Germination testing of samples of seed from each species is used as a simple method of checking the viability of that seedlot. Small samples (subsamples) are stored separately to the main seedlot (the base) and are taken out of storage at yearly then 5 to 10 yearly intervals for monitoring of the viability. Seed is sterilised before being placed on an agar mixture in glass petrie dishes in incubation cabinets with a 12 hour photoperiod and constant 15°C temperature. In earlier tests sterilisation was not routine and vermiculite was used as a medium for germination. The use of agar allows us to maintain a constant moisture environment for the seeds, as compared to vermiculite that requires periodical watering. It should be noted that these changes in procedure may account for some of the differences seen in the results discussed below. Protocols used in the genebank are in a developmental phase and until these are firmly in place, comparisons between the base and subsamples will be limited.

Table 1 shows the germination response of each of the 28 taxa soon after seed collection (base) and again after one year in storage at 4°C or at -18°C (sub).

Four species (*D. nivea* ssp. *uliginosa* 00219, *D. acanthopoda* 00081, *D. erythrocephala* var. *inopinata* 00085 and *D. conferta* var. *conferta* 00087) had similar germination results for both the base and the subsample (see Figures 1-4). This suggests that storage at 4°C (and -18°C in the case of *D. acanthopoda* and *D. nivea* ssp. *uliginosa*) is not detrimental to the viability of these species. *D. ferruginea* ssp. *pumila* 00072, *D. octotriginta* 00084 and *D. foliosissima* 00105 and 00106 showed significant reductions (27-47%) in germination after storage at 4°C (Figures 5-7). It is not known whether this reduction is due to an imposed dormancy or a loss of viability in the seed due to storage conditions. In the case of *D. octotriginta* the addition of the growth hormone Gibberelic Acid (GA) improved germination but the final result was still lower than that of the base.

Germination appears to have been significantly improved after storage in *D. epimicta* 00086 (17%) and in a more minor way (6-12%) in *D. meganotia* 00083, *D. pteridifolia* ssp. *vernalis* 00168, *D. stricta* 00165, *D. serratuloides* ssp. *perissa* 00167 and *D. fraseri* var. *oxycedrus* 00162 (Figures 8-13). The additional procedure of sterilising the seed in all subsample tests of these species may account for the improved results. It is worth noting that in some cases collections of the same species have reacted in a different manner (for example, *D. corvijuga* 00104 and 00107, *D. seneciifolia* 00071 and 00080 and 00037 and *D. squarrosa* ssp. *argillacea* 00063, 00062 and 00189) (see Figures 14-17). The addition of GA appears to have improved the germination of *D. borealis* ssp. *elatior* 00163 and *D. serratuloides* ssp. *serratuloides* 00166 after storage (Figures 18-19), although sterilisation of the seed of the subsamples may be implicated in the improved germination results. Employment of sterilisation techniques may account for the higher germination seen in a later base collection of *D. serratuloides*

Other interesting data include *D. corvijuga*'s 00104 imposed dormancy after a period of 12 months in dry storage (Figure 14). This was alleviated by the addition of GA to the seed. The rare *D. ionthocarpa* has also produced some noteworthy responses. Figure 21 shows the results of germination from recently collected seed (00039, 0092 and 00093) and compared with seed retained at room temperature storage for 3 years prior to germination (00024). This has led us to believe there may be a need for a period of after-ripening following collection to attain maximum germination for this species.

Also of note is the similarity in germination of seed from live, dead and half dying plants of *D. nivea* ssp. *uliginosa* 00284 (Figure 22). This means that dying and recently dead plants may be the source of seed material without the need to unduly stress live plants during seed collection.

It is also of interest to note that a number of species (*D. acanthopoda* 00081 and *D. squarrosa* ssp. *argillacea* 00189) showed an increased rate of germination for the subsample when compared to the base (see Figures 2 and 17). Yet, other species (eg *D. erythrocephala* var. *inopinata* 00085, *D. squarrosa* ssp. *argillacea* 00063 and *D. serra* 00075) show the base collections exhibiting a more rapid rate of germination than the subsamples (Figures 3, 17 and 23).

Germination tests have allowed us to compare different sites and seasons for a range of species within the genus. *D. nivea* ssp. *uliginosa*, *D. foliosissima* and *D. serra* show similar results for different sites from collections carried out in the same season (Figures 1, 7 and 23). *D. acanthopoda*, *D. lepidorhiza* and *D. anaton*a shows comparable germination results for collections from the same site in different years (seedlots 00081 and 00237, 00082 and 00236 and 00070 and 00170 respectively) (see Figures 2, 24 and 25). Conversely, two base collections of *D. squarrosa* ssp. *argillacea* collected in different years from the same site show differing results (00189 at 96% vs. 00062 at 73%) (Figure 17).

Unfortunately, the small sample sizes used for these tests limit the use of statistics to analyse the data. While the results begin to indicate a number of trends, given the varied responses recorded so far we can offer no firm conclusions. Further research is required and will hopefully shed more light on the response of this genus to long term storage. Future testing will include more consistent use of Gibberellic Acid to ascertain its ability to increase germination, and the routine use of standard sterilisation techniques.

We would be very interested to hear whether any members' have any suggestions as to why the dryandra species discussed have reacted in such varied ways.

Over the past years Margaret Pieroni has been a most helpful assistant in the field and we would like to express our thanks to her for her efforts in assisting us in our work.

Anne Cochrane and Anne Kelly
Threatened Flora Seed Centre, WA Herbarium,
Department of Conservation and Land Management,
P.O. Box 104, Como WA 6152

Table 1: *Dryandra* Germination Data

Species	Seedlot No.	Status #	Collection Date	Initial % Germination (base)	Storage Temp.	% Germination after 1 year storage (subsample)
<i>Dryandra "Little Darkin Swamp"</i>	n/a	-	26/04/94	100%	4C	-
<i>Dryandra acanthopoda</i>	00237	P2	13/06/95	88%	-18C	-
<i>Dryandra acanthopoda</i>	00081	P2	14/09/93	90%	4C	93%
<i>Dryandra anatona</i>	00070	P2	18/08/93	83%	4C	-
<i>Dryandra anatona</i>	00170	P2	01/09/94	83%	4C	-
<i>Dryandra borealis ssp. elatior</i>	00163	P1	26/07/94	72%	4C	100%
<i>Dryandra conferta var conferta</i>	00087	-	17/09/93	92%	4C	95%
<i>Dryandra corvijuga</i>	00104	P1	01/12/93	54%	4C	62% (69%)
<i>Dryandra corvijuga</i>	00107	P1	02/12/93	70% (84%)	4C	60 (62%)
<i>Dryandra epimicta</i>	00086	P2	16/09/93	70 %	4C	87% (96%)
<i>Dryandra erythrocephala var. inopinata</i>	00085	P2	16/09/93	73%	4C	71% (77%)
<i>Dryandra ferruginea ssp pumila</i>	00072	P2	19/08/93	95%	4C	45%
<i>Dryandra foliisissima</i>	00105	P2	01/12/93	83%	4C	36% (53%)
<i>Dryandra foliisissima</i>	00106	P2	02/12/93	83%	4C	55%
<i>Dryandra fraseri var oxycedra</i>	00162	P1	26/07/94	91%	4C	97%
<i>Dryandra fuscobractea</i>	00334	P1	25/07/94	100%	4C	-
<i>Dryandra ionthocarpa</i>	00039	C	23/01/93	50%	-18C	50%
<i>Dryandra ionthocarpa</i>	00093	C	11/11/93	60%	-18C	79% (88%)
<i>Dryandra ionthocarpa</i>	00024	C	26/11/90	100%	-18C	63%
<i>Dryandra ionthocarpa</i>	00092	C	11/11/93	60% (77%)	-18C	24% (60%)
<i>Dryandra lepidorhiza</i>	00236	P1	13/06/95	88% (100%)	4C	-
<i>Dryandra lepidorhiza</i>	00082	P1	14/09/93	90%	4C	85% (94%)
<i>Dryandra meganotia</i>	00083	P2	15/09/93	34%	4C	44% (47%)
<i>Dryandra mimica</i>	00089	E	09/11/93	25%	4C	0%
<i>Dryandra montana</i>	00139	C	20/04/94	19%	-18C	-
<i>Dryandra nivea ssp. uliginosa</i>	00219	P1	13/02/95	91%	-18C	92%
<i>Dryandra nivea ssp. uliginosa</i>	00190	P1	15/12/94	88%	-18C	100%
<i>Dryandra' nivea ssp. uliginosa</i>	00284	P1	12/12/95	98%	-18C	-
<i>Dryandra octotriginta</i>	00084	P2	15/09/93	78%	4C	61%
<i>Dryandra pteridifolia ssp vernalis</i>	00168	P3	28/07/94	75%	4C	84% (95%)
<i>Dryandra seneciifolia</i>	00080	P3	24/08/93	92%	-18C	75%
<i>Dryandra seneciifolia</i>	00071	P3	19/08/93	71%	4C	90% (95%)
<i>Dryandra seneciifolia</i>	00037	P3	22/01/93	83%	-18C	73%
<i>Dryandra serra</i>	00074	P4	21/08/93	75%	4C	-
<i>Dryandra serra</i>	00075	P4	21/08/93	85%	4C	84% (89%)
<i>Dryandra serra</i>	00114	P4	08/09/93	18%	4C	38%
<i>Dryandra serra</i>	00043	P4	31/01/93	85%	4C	59% (61%)
<i>Dryandra serratuloides ssp. perissa</i>	00167	V	28/07/94	94%	4C	100%
<i>Dryandra serratuloides ssp. serratuloides</i>	00166	V	25/07/94	66%	4C	95%(97.5%)
<i>Dryandra serratuloides ssp. serratuloides</i>	00239	V	24/08/95	94%	4C	-
<i>Dryandra sp. Fitzgerald</i>	00130	-	11/02/94	73% (92%)	4C	65%
<i>Dryandra sp. Fitzgerald</i>	00131	-	13/02/94	73% (84%)	4C	65% (77%)
<i>Dryandra squarrosa ssp. argillacea</i>	00063	P1	21/07/93	80%	4C	80% (84%)
<i>Dryandra squarrosa ssp. argillacea</i>	00062	P1	20/07/93	73%	4C	83%
<i>Dryandra squarrosa ssp. argillacea</i>	00189	P1	14/12/94	96% (98%)	-18C	100%
<i>Dryandra stricta</i>	00165	P1	27/07/94	75%	-18C	85%
<i>Dryandra viscida</i>	00110	P3	03/12/93	52%	4C	67%

Status Code:

C - Critically endangered (declared rare)

E - Endangered (declared rare)

V - Vulnerable (declared rare)

P1 - Priority 1 (known from < 5 populations which are under threat and need further survey)

P2 - Priority 2 (known from < 5 populations some of which are under threat and need further survey)

P3 - Priority 3 (known from several populations which are not under threat but need further survey)

P4 - Priority 4 (adequately surveyed, currently not threatened but require monitoring)

Figure in brackets after % germination is the viability figure derived from adding any remaining hard seed to the actual number of germinants. These seeds are presumed viable. Where the same species is listed more than once, seed was collected from different populations or in successive years. A number of species have no germination record for a subsample. This is due either to the lack of seed available for retesting or the seedlot has not yet been a year in storage, and has therefore not been retested.

Dryandra nivea ssp. *uliginosa*

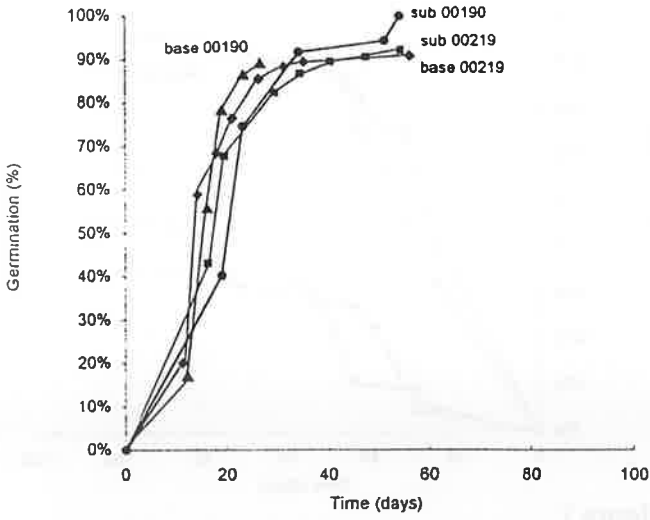


Figure 1

Dryandra acanthopoda

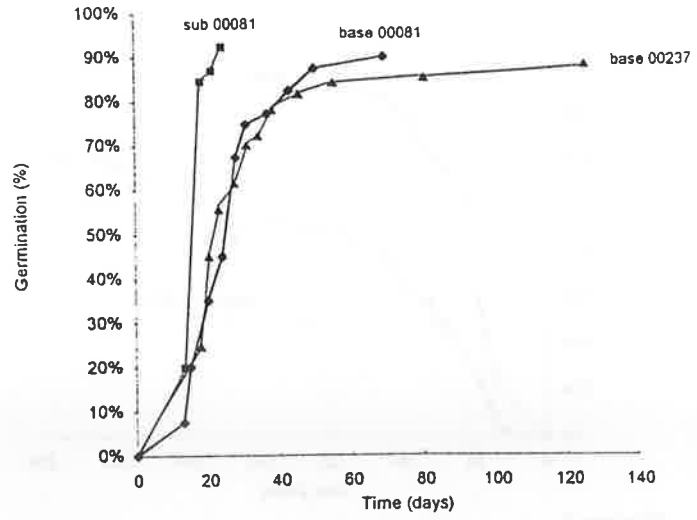


Figure 2

Dryandra erythrocephala var. *inopinata* 00085

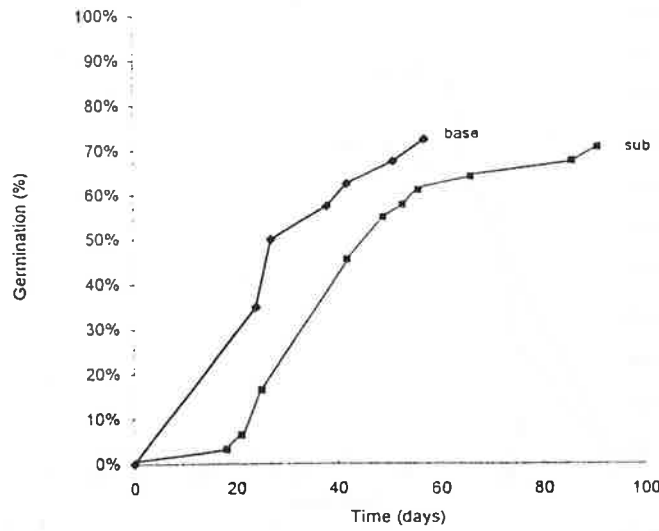


Figure 3

Dryandra conferta var. *conferta* 00087

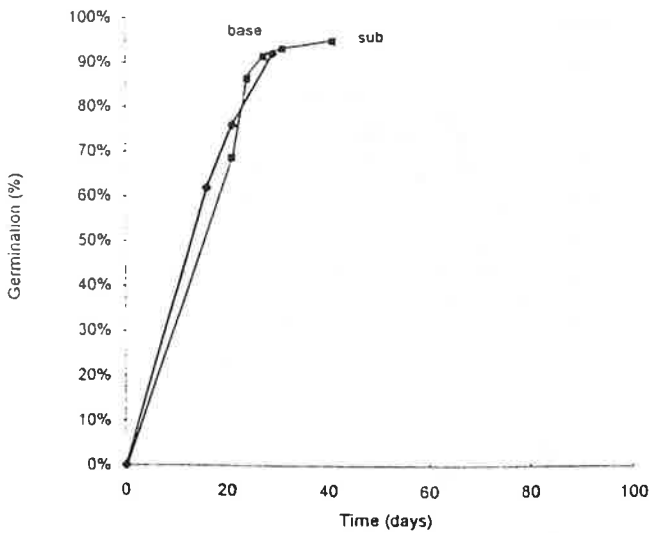


Figure 4

Dryandra ferruginea ssp. *pumila* 00072

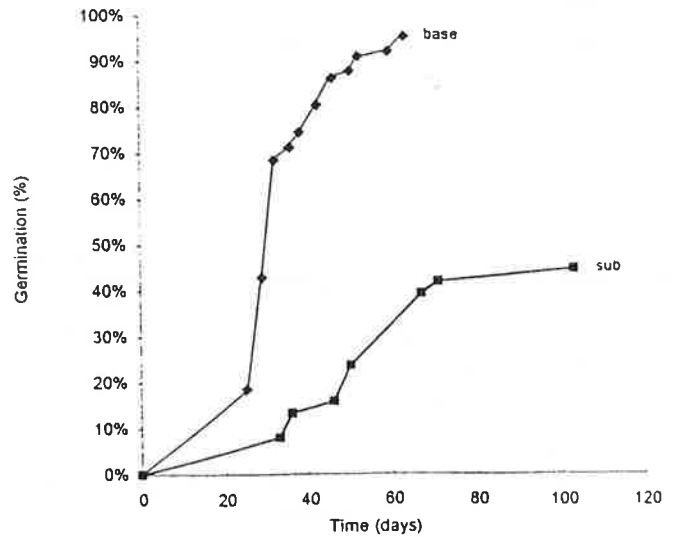


Figure 5

7

Dryandra octotriginta 00084

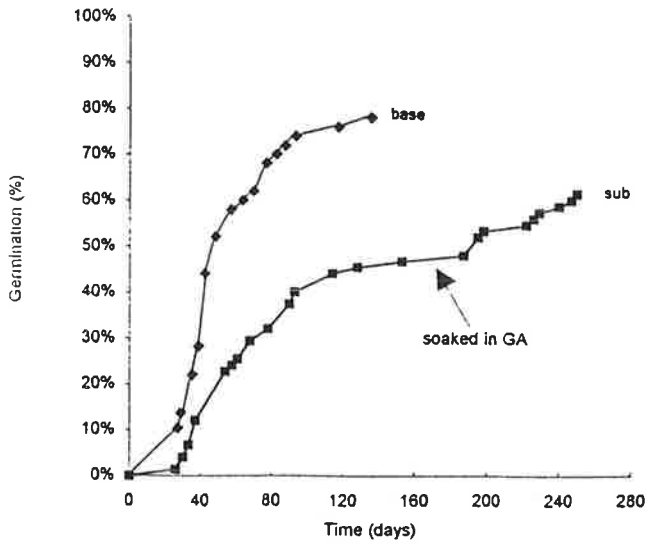


Figure 6

Dryandra foliosissima

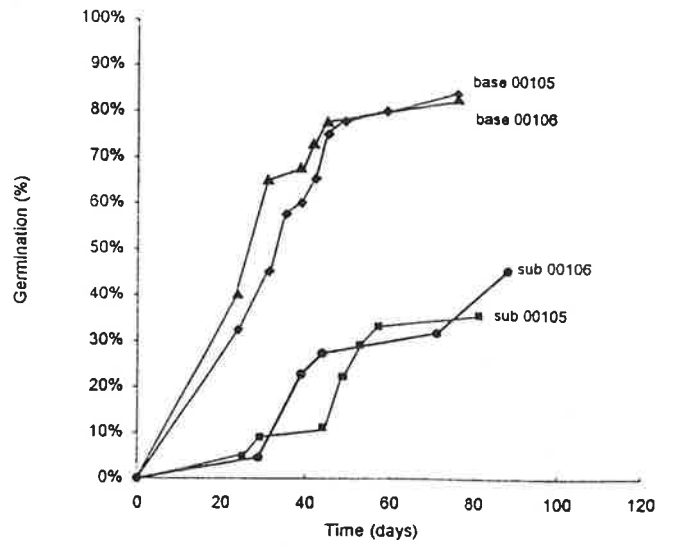


Figure 7

Dryandra epimicta 00086

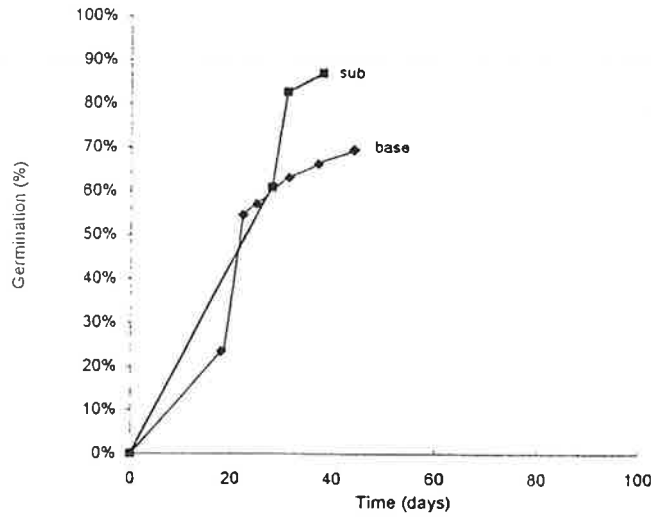


Figure 8

Dryandra meganotia 00083

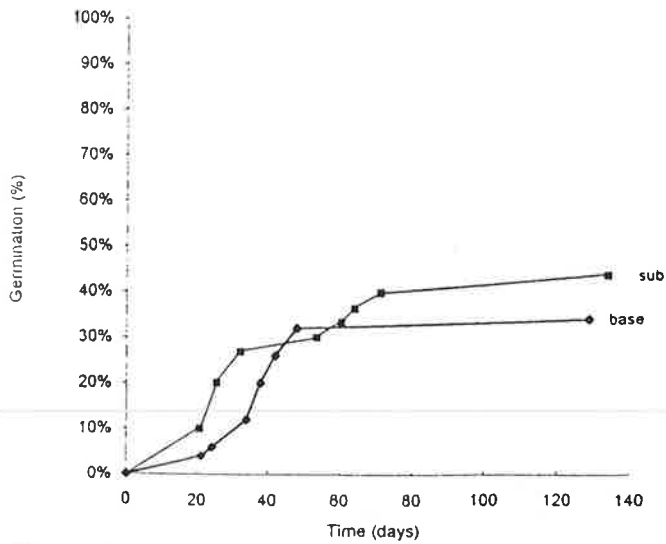


Figure 9

Dryandra pteridifolia ssp. *vernalis* 00168

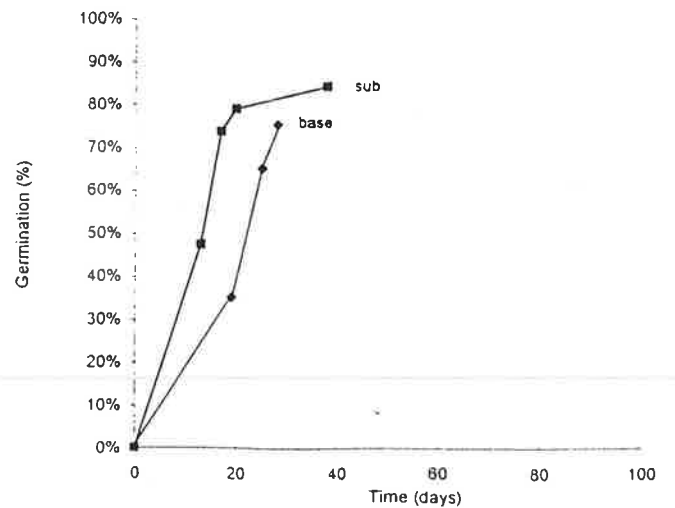


Figure 10

Dryandra stricta 00165

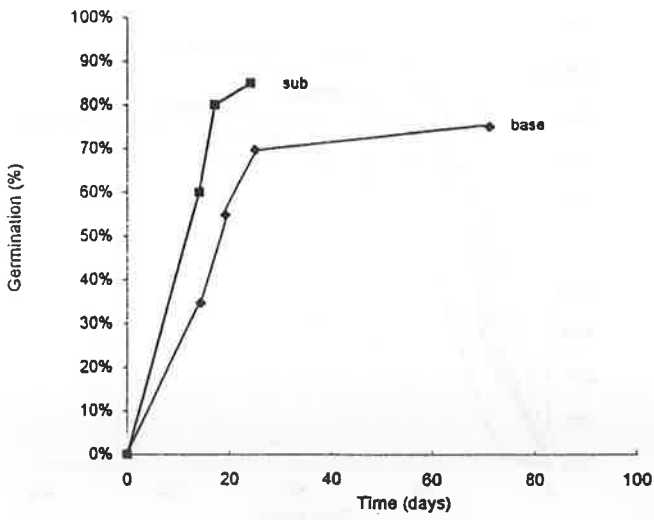


Figure 11

Dryandra serratulooides ssp. *perissa* 00167

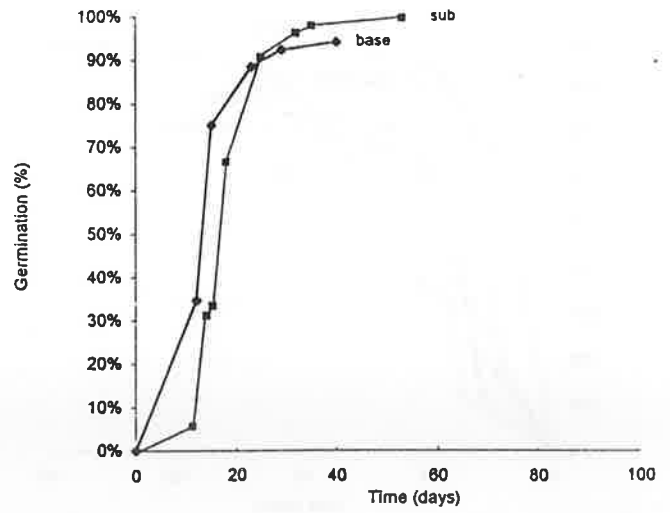


Figure 12

Dryandra fraseri var. *oxycedrus* 00162

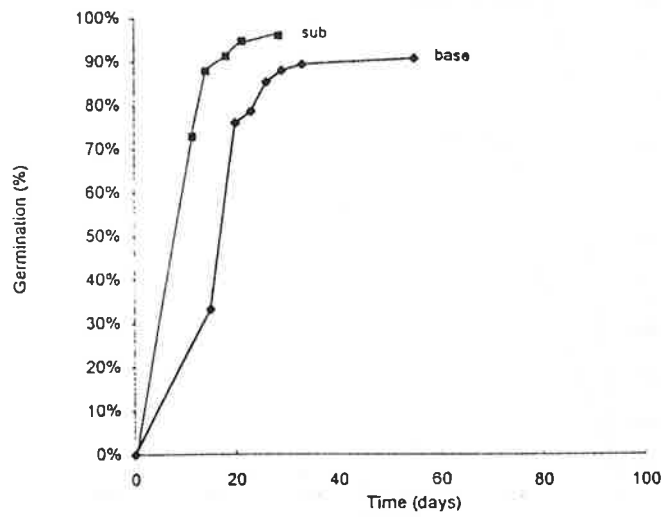


Figure 13

Dryandra corvijuga 00104

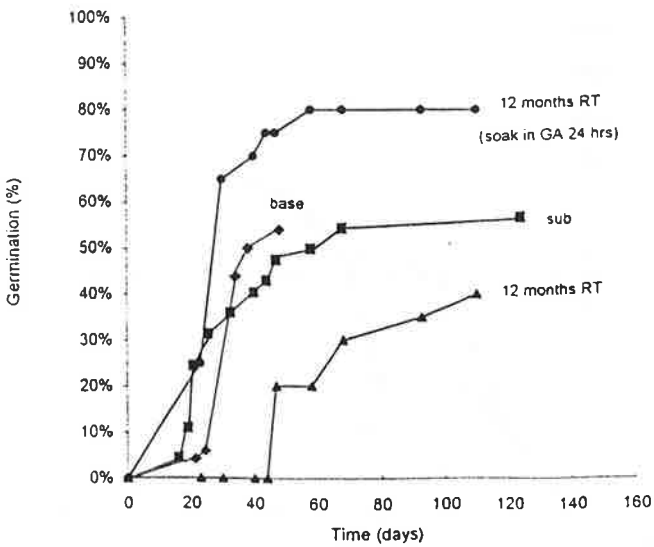


Figure 14

Dryandra corvijuga 00107

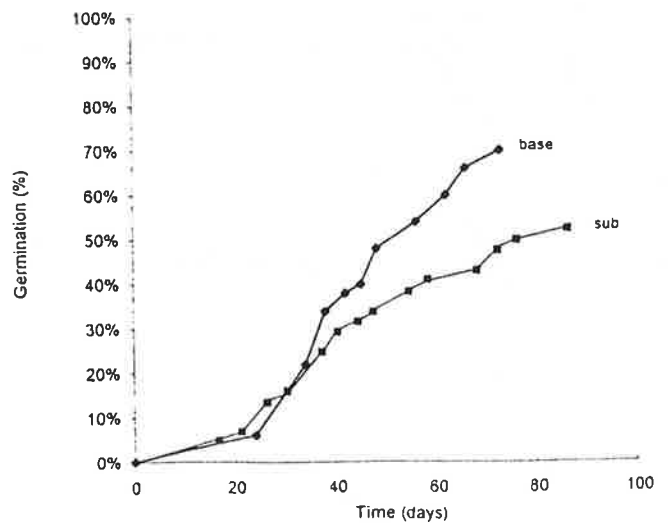


Figure 15

9

Dryandra senecifolia

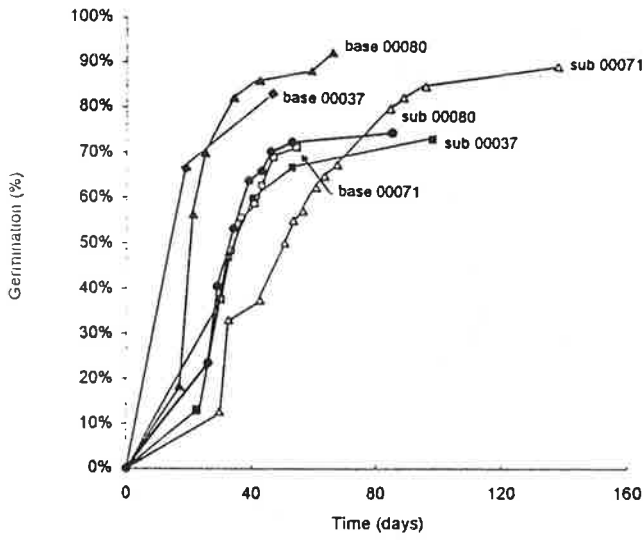


Figure 16

Dryandra squarrosa ssp. argillacea

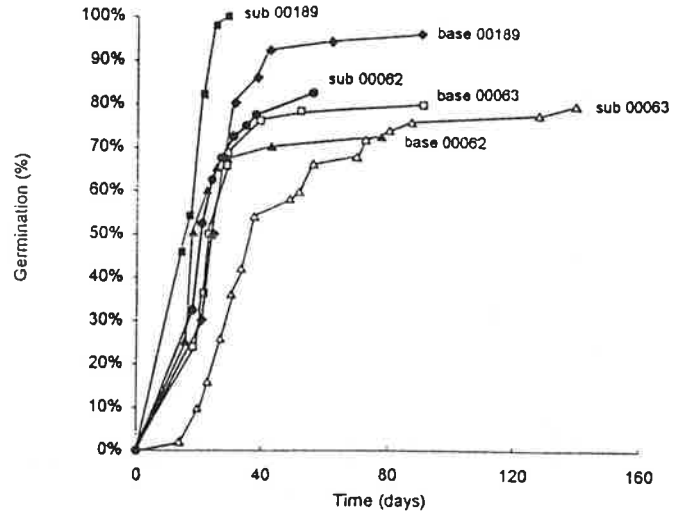


Figure 17

Dryandra borealis ssp. elatior 00163

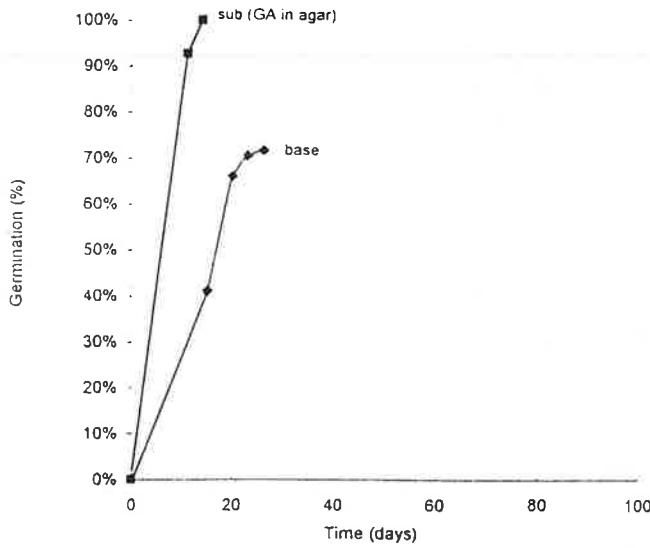


Figure 18

Dryandra serratuloides ssp. serratuloides

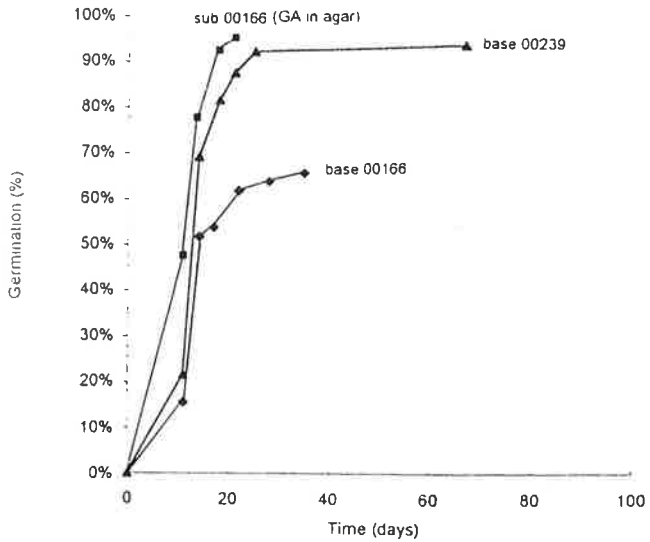


Figure 19

Dryandra viscida 001110

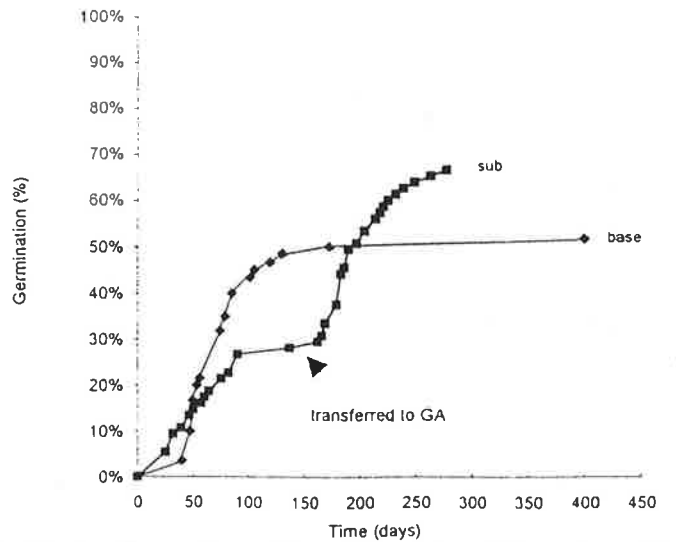


Figure 20

10

Dryandra ionthocarpa

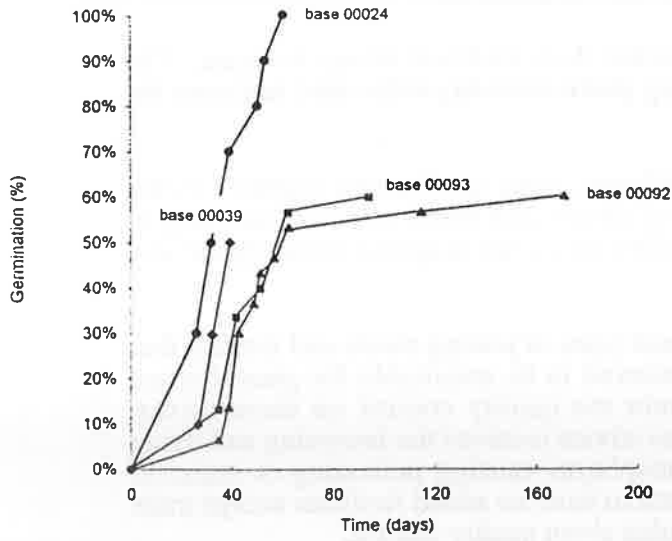


Figure 21

Dryandra nivea ssp. uliginosa 00284

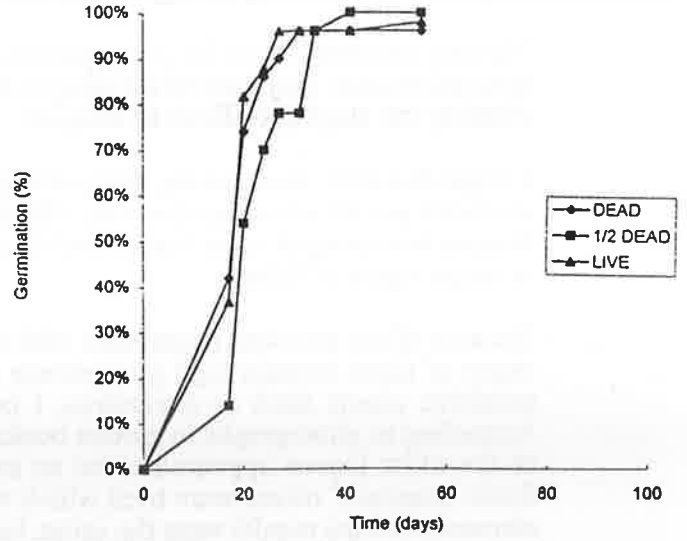


Figure 22

Dryandra serra

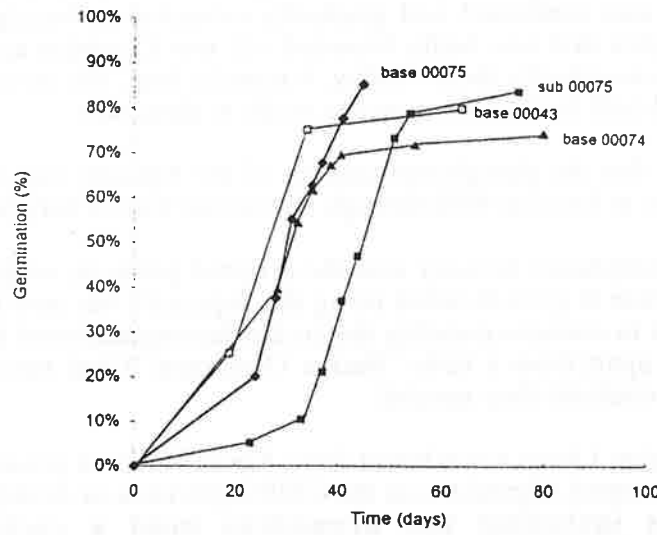


Figure 23

Dryandra lepidorhiza

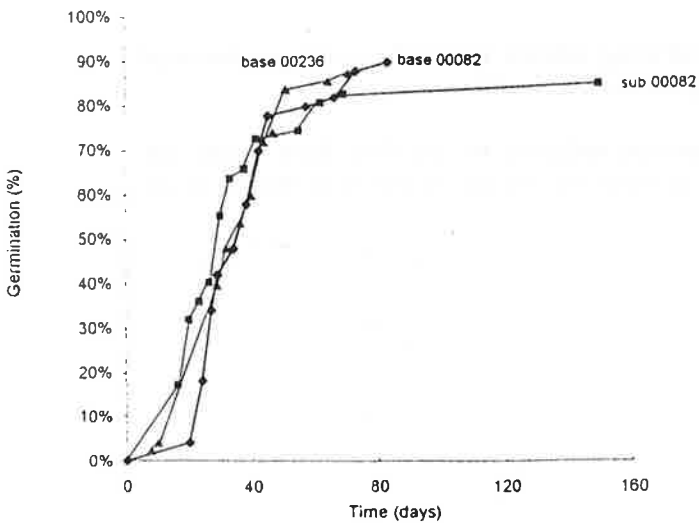


Figure 24

Dryandra anatona

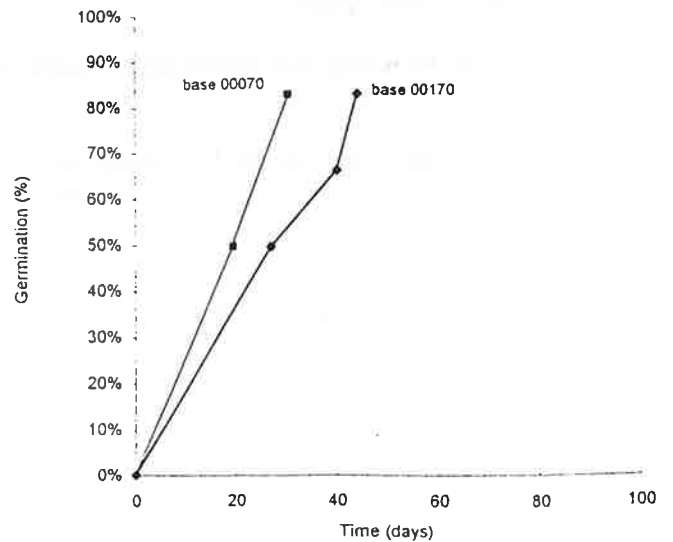


Figure 25

Experiences with potting mixes and fertilizer on Dryandras

My past experiences in the propagation of dryandras has been mediocre to say the least. The frustrations one may face in the simple task of raising plants from dryandra seed and onto the planting-out stage is difficult to imagine.

Fungal diseases, seed raising and potting mixes, fertilizers, water quality and exposure to the elements are all variables that can affect the health of plants, and when small plants being to display browning of older leaves and then slowly to die how do we diagnose correctly the true or major cause of failure.

Because of my previous experience with many different types of potting mixes and the fact that many of them contain high phosphorus contents believed to be unsuitable for phosphorous sensitive plants such as dryandras, I began to doubt the quality control on these mixes. According to photographs in garden books and various advice received the browning and dying of the older leaves appeared to be an excess of phosphorus causing poisoning or toxicity. Basic 'standard' mixes were tried which were supposed to have no added fertilizer except trace elements and the results were the same, hence my doubts about quality control.

Then I heard that a 'Specialist Native Mix' was available from our local Nu-ERTH which again was with trace elements but little else. And, guess, what, young dryandras showed browning of leaves, but not as bad as other mixes. Additions of iron sulphate didn't help, so in desperation I tried using 'Aquasol' at about 1/3 to 1/2 strength on a weekly basis. After 2 or 3 weeks of this the dryandras began to put on new growth (without browning of leaves) therefore the treatment was continued and gradually extended to fortnightly and monthly intervals. The only species that was badly browned off was *D.nobilis* and this one was the slowest to recover, some eventually died. Today, 4 months later, the remainder of species is healthy and growing well (still in the same pots but ready to plant out).

At first I was concerned that the phosphorus content of the Aquasol may be too high but by reducing the concentration to less than 40% through that at that level it may be safe.

Though I thought that phosphorus toxicity was the original problem, on further thought and observing the rapid increase in growth when using the Aquasol I am now inclined to believe that the mix was deficient in nitrogen possibly due to the decomposition of the pine bark in the mix and to the fact that apart from a little 'Native Osmocote' I had not given the plants a continuous supply of the nutrients they needed.

This leads me to relate what I have since learnt from Kevin Handrek (co-editor of the SGAP SA Journal and Senior Research Chemist with the CSIRO Division of Soils) and that is that **all the proteaceous plants including the dryandras need a certain balance of nutrients, including phosphorus, for healthy growth** [emphasis mine - editor]. Some species require less than others, but to give them zero phosphorus will inhibit their growth (this is for soil-less potting mixes). Practical tests that I assisted Kevin with in December 1995 on seedlings of proteaceous plants from zero to high levels of phosphorus showed that the healthiest plants (including dryandras) occurred in the low to medium phosphorus ranges.

Kevin Handrek has published a book called '*Gardening Down Under*'. I can recommend this book to anyone wishing to learn more of potting mixes and fertilizers.

Therefore, the results following additions of Aquasol indicate to me that they were not receiving sufficient nutrients thus causing browning of older leaves and in many cases the death of the dryandras.

Lloyd Carmen,
Eden Hills, South Australia

FURTHER NOTES ON DRYANDRA AT THE GURDIES

Margaret's article on The Stirlings and comment on the stand of *D.formosa* on the Stirling Range Drive drew my attention to a comment Keith Alcock had made when he visited me many years ago. I think those plants Margaret mentioned are the parents to the ones I now have growing at The Gurdies. Keith had commented on the quality of the flowers and the deep brown colour of the bracts. In more recent years I have noticed that those flowers are often superior to those that appear on the commercial flower market. I have planted a few *D.formosa* which I assume came from another source so when they flower I hope to be able to do a comparison.

Through articles in Australian Horticulture, (February 1995, being the first one), I have been following some of the work by Margaret Sedgley in relation to colour variation in *B.menziesii*. I have found what she reports is so for some of the other Banksias and wonder if it might have some implications to colour variation in Dryandras. The main points she makes are:-

1. In relation to *B.menziesii*, flower colour varies - pink, red, apricot, yellow, bronze and brown.
2. There is variation in the colour of individual flowers within a bloom.
3. There is variation in the colour of blooms on individual bushes.
4. There is variation in the colour of blooms produced by many individual plants during the flowering season.

I find with *B.serrata* there is a tendency for plants to produce stronger coloured blooms early in the season and paler ones later, I must try to follow this through with other plants. Having made that statement, I now find that some plants are flowering way out of season (May-June) and although most flowers are pale there are a few that are very strongly coloured. It might all be tied up with the fact that last summer was a very poor season for *B.serrata* flowers with almost 50% of our trees failing to produce any flowers at all. I think some of the trees flowering now are ones that did not flower last summer.

Well back to Dryandras. In the garden there has been some 'ups' and 'downs'. I found one of my *D.bipinnatifida* had flowered while another had been mistakenly pulled out with weeds. I lost a large *D.praemorsa* which dropped a lot of seed before I removed most of the branches to a fairly new garden bed for mulch. The result was scores of seedlings in both places. Some in the garden bed are surviving and one or two might be lucky to survive in the original spot.

On the propagating side of things feel there is some improvement but I'm still not getting many plants to survive planting out. I have managed to plant out a *D.tenuifolia* var. *tenuifolia* and *D.conferta*. I didn't get *D.arborea* beyond pricking out stage so I'd be interested to know if David Randall had any more success with the seed I sent him. A mouse got into my seed store and caused havoc, not only eating it but mixing it up. The result was I took all that was left and planted it in a seed tray. A number of different species germinated (different first leaves) but the change to cold weather seems to have finished survival chances. I find I'm in a 'catch 22' situation. The majority of seedlings cannot stand cold damp conditions so if I put them in my poly house to keep them warm and reasonably dry, fungus quickly attacks. Soaking the plants with a fungicide helps for a while but many plants do not like being kept wet all the time and the extra moisture creates humidity which encourages fungus again. When I put the plants outside it becomes obvious that many do not like the

cold of our winter and our rainfall keeps pots permanently damp, which is great for fungus on warm days. I sometimes feel silly doing it but I do water the already damp pots with a fungicide on a regular basis. I am now trying planting some very small seedlings (first true leaf stage) directly into garden beds to see if, with a little protection in the early stages, they might find it easier to establish themselves in a more natural environment.

I decided not to persist with the idea that smoke might be a stimulant for seed germination but instead try one of the other ideas suggested by my contact in South Africa.

That one is the soaking of the seed prior to planting.

Soak seed in hot water at 50°C for 30 minutes. Spread out to dry and dust lightly with fungicide such as Thiram or Benlate. Germination time for hard coated seed can be decreased by soaking seeds in a 1:2 solution of Hydrogen peroxide (10 vols.) immediately prior to sowing.

My variation to this was to use the solution of Hydrogen peroxide combined with a fungicide solution. I allowed the seed to soak for 24-72 hours. The extended time occurred as a result of other demands on my time but seemed to have no detrimental effect on the seed. As a matter of fact 48 hours seemed to be best as by then much of the seed seemed to 'firm up'. The seed that really swelled would burst with a little pressure. That of course was the seed that was already infected with fungus and it would have been a waste of time and space sowing in a seed tray.

In most cases I used cell trays or individual 30mm tubes. Germination seemed much improved but then I had already discarded the seed that was certain to fail. I'm sure if I examine the seed more closely after soaking I could possibly find other signs that would indicate that the seed would not germinate.

In autumn I followed temperature forecasts for 8 weeks and by shifting trays of seedlings from the poly house to the shade house and back again I managed to keep the difference in day and night temperatures to about 12°C or more. I actually tried to have day temperatures reach 22°C as sometimes the night temperature was as low as 3-4°C. Although I have the list of species planted and germinated, I unfortunately seem to have mislaid the actual numbers of seeds planted and germinated. As April was the first of three extremely wet months survival after germination was almost zero. My general impression was that it was not worth worrying about controlling the temperature range as I tend to react naturally to the effects of a hot day on the poly-house or a cold night in the shade-house. I have enclosed sheets showing germination for my autumn and spring plantings.

Though I was pleased with the germination results, I still experience huge losses from fungal attacks, insect attacks and ????. I have an improved program for fungicide application which has been of some benefit but I think I need to go back to basics and be meticulously careful in potting up making sure that the potting mix and water regime in the pot are appropriate for the plant. As a result I have altered my potting mix and seed raising mix. Hopefully I will be able to comment favourably on that in my next correspondence.

Notes and News on Dryandras

Dryandras in Containers

Julie McGregor has recently taken over as Leader of the ASGAP 'Australian Plants for Containers' Study Group. She is anxious to learn of any Dryandra species that members have grown successfully in pots, together with details of their requirements eg potting mix, fertiliser, climatic conditions,, lifespan, plant size, health and flowering.

This is one area in which we have had little feedback or information. If anyone has experience of successful pot culture, can you please contact Julie direct at :
Julie McGregor
14 Bellevue Crescent
Terrigal NSW 2260

If you also send me a copy, I will publish it in our Newsletter. At the moment, I am experimenting with *D.nivea* and *D.arctotidis* as pot plants.

Dryandra on the 'Net'

Members with an interest in the Internet may already know that there is an electronic version of *Australian Plants*. Called *Australian Plants Online* it is assembled by New South Wales member Brian Walters. AT the ASGAP Conference in Ballarat in 1995, NSW Region was given the responsibility of setting up an Internet site of behalf of ASGAP to determine the costs and benefits involved. Brian is doing a great job and has already produced two Newsletters. A third is under way.

Another project in which Brian is heavily involved in is compiling 'plant pages' for specific plant genera. Because of space limitations, the coverage is fairly general in nature and only 6 or 8 species from each genus are included. Brian prepares his material in conjunction with Study Group leaders and so far has covered *Banksia*, *Acacia*, *Callistemon* and *Grevillea*.

Dryandra Study Group members will be delighted to know that Dryandras are to be the next group and Brian has nearly completed his information. Margaret has supplied slides which Brian has scanned in glorious living colour so those of you with colour monitors will be able to view them in their full beauty.

The 'Dryandra Page' should be available in the next month or so and will be linked to the Society's Homepage.

If you have the right equipment, you might like to visit the Society's site on the World Wide Web at: <http://www.ozemail.com.au/~sgap/index.html>

The '*D.Pteridifolia*' Complex

In Newsletter Number 16, Margaret discussed the very confusing group of species and forms which constituted the 'pteridifolia complex'. This was an update of an earlier article by Keith Alcock (NL No. 12). Now that Alex George has completed the revision, I asked Margaret to update the various forms illustrated with leaf prints in Keith's original article. (These are also reproduced on pages 6 and 7 (forms 2, 6, 7, 8) and pages 12 and 13, (forms 1, 2, 3, 4, 5) of the Newsletter Number 16).

The names of these forms from Alex's revision are:

Form and Page No. (NL 16)	'Old' identification	Revision Name
1 (p.12)	'pteridifolia'	<i>D.nervosa</i>
2 (p.12, 6)	'pteridifolia'	<i>D.pteridifolia</i>
3 (p.13)	prostrate 'pteridifolia'	<i>D.blechnifolia</i>

4 (p.13)	large, upright 'pteridifolia'	<i>D.shanklandiorum</i>
5 (p.13)	prostrate, ground covering 'pteridifolia'	<i>D.porrecta</i>
6 (p.6)	ASG No. 14	<i>aff. filiboba</i>
7 (p.7)	ASG No. 22	<i>D.pteridifolia subs vernalis</i>
8 (p.7)	ASG No. 39	<i>D.fililoba</i>

The *International Symposium on the Biology of the Proteaceae* (Melbourne Sept. 29 - Oct. 2, 1996) OR *When does a dryandra become a banksia?*

I was fortunate to be able to attend some sessions of this scientific congress, held as part of 1996 Commemorative Conferences Series of the Royal Botanic Gardens, Melbourne. The 'excuses' for holding the series were the 150th anniversary of the founding of the Botanic Gardens and 100th anniversary of the death of Ferdinand von Mueller, the first Victorian Government Botanist.

The sessions were all botanical/biological with almost no horticulture, although several speakers reported on experimental work on pollination of proteaceae and others presented papers on ecological aspects, mainly of banksia and South African species. For the first time there were several scientific papers on *Dryandra*. One reported on pollination experiments with *D.sessilis* to attempt to explain the low fruit set of this species while another reported on work on the breeding systems of *D.quercifolia* and *D.formosa*. The aims of this work were to develop a better understanding of the breeding systems in *Dryandra* for the cut-flower industry (as has been done by Margaret Sedgley for *Banksia* over a number of years). The research is still in its infancy and I am endeavouring to obtain copies of the papers. I hopefully can report on them in more detail in another newsletter.

What really frightened me were the group of earnest, young (ie mid twenties) researchers who were using advanced genetic and computer techniques to compare proteaceous species, both within and between genera. With words like 'molecular phylogeny', 'cladistics', 'non-coding DNA spacer sequences' and 'phylogeography' flying around, it is no wonder that a friend described one of these sessions as 'a bit heavy'. What was also intriguing was that several of these people were from the University of Wisconsin (USA), yet they were working on 'our' flora - *Banksia*, *Dryandra*, *Grevillea*, *Persoonia*, *Isopogon* and the like.

Much of their work is still tentative but one really dumbfounding result from two papers suggested that based on the characters analysed, some species of *Dryandra* had closer affinity with some species of *Banksia* than other *Banksia* species had with those *Banksias*! In other words, *Dryandra*s and *Banksia*s might be the same (at least phylogenetically) - as one author concluded '*Dryandra* appears to have arisen within a south western clade of *Banksia* (possibly multiple times)!!' Where some of the 'old hands' and doubters (and there were many of them!) took heart was when they saw that in these analyses, *B.grandis* and *B.pulchella* placed next to each other - and one can hardly imagine two more disparate species. So maybe these exotic systems still are not sufficiently precise to do anything but give broad, general indications. Time will tell.

Research Project on *Dryandra* in Western Australia

Finally, just a brief note about a research project being undertaken by Leonie Monks, a Masters student at Curtin University. She is working on *D.mimica*, *D.ionthocarpa* (Kamballup) and *D.serra*, with the eventual aim of developing management plans for these species, the first two of which are endangered, while *D.serra* grows in restricted localities. Leonie has an extensive plan of field work mapped out, including transplanting seedlings to test whether 'seeds from different seed sources grow equally well across the range of the species as they do in their original population'.

We look forward to learning the results of Leonie's work.

Tony.

DRYANDRA STUDY GROUP

Financial Statement 1/7/95 - 30/6/96

Cash in hand at 1/7/95		\$1,756.84
Income	Members Subscriptions	281.00
	Donations	49.30
	Sale of newsletters etc	120.50
	Bank Interest	<u>39.34</u>
		\$ 490.14
	Total	<u>\$2,246.98</u>
Expenditure		
	Newsletter expenses	309.45
	Bank Charges	1.22
	Seed Envelopes	57.60
	A.N.P.C. Subs	50.00
	Filing Cabinet	<u>195.00</u>
		<u>613.27</u>
	Less petty cash in hand & stamps	<u>32.50</u>
	Total	<u>580.77</u>
Cash in hand at 30/6/96		<u>\$1,666.21</u>

SUBSCRIPTIONS FOR 1996 - 1997

The group's year runs from July 1, 1996 to June 30, 1997. Subscriptions are \$6.00 for Australian members and \$10.00 for overseas. Please make cheques payable to the Dryandra Study Group and forward to Margaret. Thanks to all those who have already paid.

Name: _____

Address: _____

COMMENTS OR SUGGESTIONS FOR INFORMATION:

