Association of Societies for Growing Australian Plants
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Greetings! Its all happening here folks. Dean Nicolle has been kind enough to give us a run down of his activities at Currency Creek Arboretum. Angus Stewart has contributed an article about seed germination. Tony Cox supplied a photo and description of his E. *eximia* 'nana', Some other members germination methods are scattered throughout. Lindsay Daniels talks about Tree Identification and books he finds helpful. Gus Iglesias talks about hybrids.
Along with this Newsletter you should have the list of available seeds. As has been pointed out, the seeds are not guaranteed viable or correctly identified as there is no provenance or collection dates or other details on most of the seeds. Still, there are a lot of potential trees here and I think it is a worthwhile experience to try and grow some of them. Donations of seeds with correct ID, location and date would be appreciated. People who are able to ID Eucs at 20 paces (with the help of bud, fruit and leaf samples) would be applauded if they stepped forward to offer their occasional services.
Maybe we should have a panel of experts to call on? Regards, Tam.

The Currency Creek Arboretum Eucalypt Research Project

Dean Nicolle

September 2001, amended from *Currency Creek Arboretum Eucalypt Research* Vol. 1, D. Nicolle, March 2000.

Currency Creek Arboretum (CCA) is a specialist eucalypt research arboretum located near Currency Creek, south of Adelaide in South Australia. Established by the author in 1992, the site was purposely chosen for a eucalypt research arboretum. Research currently and able to be undertaken at CCA include eucalypt systematics, taxonomy, ecology, physiology, cultivation and conservation.

Named after the nearby geographical feature and town of Currency Creek, Currency Creek Arboretum is being developed as a specialist eucalypt (*Angophora, Eucalyptus* and *Corymbia*) arboretum with its main purpose being research into Australia's most dominating natural group of plants, the eucalypts.

Major plantings have taken place each year since 1993. All seed has been wild collected by D. Nicolle, along with accompanying herbarium specimens of the parent (seed) individual (mostly housed at Adelaide SA, Perth WA and Canberra ACT) and including GPS locality information and other field recorded individual and site data, including associated eucalypt taxa, which helps when identifying and isolating hybrid seedling progeny.

Eight seedlings of each collection are grown, with four planted out at CCA and the remainder being pressed and dried as a seedling specimen and housed at Adelaide or Perth. A complete voucher is therefore present for every collection at CCA:

1. the parent herbarium specimen(s) (the "mother" of 3 below)
2. the seedling herbarium specimen(s) ("siblings" of 3 below)
3. the live individuals at CCA - a "whole plant" voucher

Unlike many arboreta, multiple plants have been planted out from each seed plant (usually four), giving a more accurate representation of the taxon's variation. Information on all collections at CCA has been recorded since the project's beginning. Such records include survival, health and growth rates, time to first bud initiation and flowering, and the potential of all collections for various uses.

The location of CCA was chosen because of its ability to grow a very large diversity of eucalypts outside their natural distribution, from low rainfall desert mallees to high rainfall forest trees and from frost sensitive tropical taxa to alpine snow gums.

Three important factors ensure CCA is an accurate, useful and important resource for eucalypt research:
1. The complete history and detailed origin of every individual is known.

2. Multiple individuals of each collection are planted.
3. Curation and all seed/specimen collections for plants at CCA is undertaken by a specialist eucalypt worker.

CCA statistics as at March 2000

Number of individual vouchered plants: >4000
Number of different vouchered collections: 1083
Number of taxa (species, subspecies and varieties):

All eucalypts	854 terminal taxa (726 species and 128 subspecies) from 938 DN recognised taxa.
Angophora	5 terminal taxa (4 species and 1 subspecies) from 12 DN recognised taxa.
Corymbia	60 terminal taxa (54 species and 6 subspecies) from 106 DN recognised taxa.
Eucalyptus	789 terminal taxa (668 species and 121 subspecies/varieties) from 820 DN recognised taxa .

As the above numbers were produced 18 months ago, the figures have changed, with the total number of terminal taxa being grown at CCA being near 900 from perhaps 1000 odd DN (D. Nicolle) recognised taxa.

A complete list of the successful eucalypts growing at CCA as at September 2000 is available from Tam. "Successful" here indicates that one collection of the species or subspecies listed has flowered. A total of 397 taxa (species and subspecies) have flowered, 7 are *Corymbia* and 390 *Eucalyptus*. A further 96 taxa (not listed) have initiated flower buds but have not yet flowered, 4 are *Corymbia* and 92 *Eucalyptus*. No *Angophora* species have initiated buds to date.

A second volume of *Currency Creek Arboretum Eucalypt Research*, updating all information from volume 1, is planned for release in early 2002. The release will be publicised on the CCA web site at: http://www.chariot.net.au/~vo/cca.html

Eucalypts of South Australia, an A5, 208 page softcover book describing 95 South Australian species; illustrated with hundreds of full colour photographs, detailed descriptions all with distribution maps, is available from the website or via me for $20.00! (Plus postage and packaging)
The photographs are excellent, *in situ* shots that I will be reproducing in the newsletter at various times.

Tropical eucalypts

By far the most difficult eucalypts to establish at CCA are those from the tropics. There has already been success with several tropical species such as *E. brassiana* (a red gum) and *E. cullenii* (an ironbark) from Cape York Peninsula in Queensland and *E. atrata* (a recently described blue-leaf ironbark), *E. leucophylla* (a box) and *E. lockyeri* (a recently described red gum) from northern Queensland. Many other tropical species are also showing promise but are yet to flower, including the extra-Australia *E. deglupta*.

Arid area eucalypts

CCA has had much success with eucalypts from extreme arid environments, perhaps highlighted by the success of species such as *C. eremaea* (hills bloodwood), *E. sparsa* (a box) and *E. normantonensis* (a box), all of which are relatively widespread in the arid central ranges of central Australia. *E. xerothermica* (the recently described Pilbara box) of hot, dry habitats in the Pilbara of W.A has also been successful. Many species, some highly ornamental, from the Great Victoria Desert are also successful at CCA, including *E. gypsophila, E. kingsmillii* ssp. *alatissima, E. pimpiniana* and *E. youngiana.*

Ornamental eucalypts

CCA is showing that some eucalypts that are either unknown or poorly known in cultivation have high appeal for ornamental and garden plants. Such examples include:

E. deflexa, a 1-2 metre tall dense shrub with delicate cream buds, flowers and fruits.

E. kingsmillii ssp alatissima, with its red flowers that are superior to the creamy yellow flowers of ssp. *kingsmillii.*

E. macrocarpa ssp. *elachantha* which is like a dwarf form of ssp. *macrocarpa* and would make an ideal small garden or large pot plant.

E. perangusta, with its crown of very fine leaves that resemble that of a broom bush (Melaleuca uncinata). At 1-2 metres maximum height, it is the smaller garden equivalent to the related *E. formanii.*

E. preissiana ssp. *lobata*, far superior to ssp. *preissiana* because of its larger leaves, flowers and fruits and its more bushy form.

E. synandra, a mallee with a very open, weeping crown or narrow leaves and delicate flowers that open cream and fade to pink with age. This is a very rare species from the northern wheatbelt of W.A.

Other unusual eucalypts

Other unusual eucalypts that have flowered to date at CCA include:

E. infera, a rare, recently named mallee red gum from southern Queensland that occurs as an understorey to larger forest eucalypts. Grows very well in full sun at CCA.

E. surgens, a recently discovered and named eucalypt from above the Nullarbor Cliffs in W.A., apparently not in cultivation elsewhere. Has huge potential as a low windbreak or screen, being a very dense shrub 1 metre tall and flowering prolifically at an early age.

An overview of Eucalypt seed germination

Angus Stewart

Eucs are generally very easy to propagate by seed. Gumnuts of most species remain closed while they are still attached to a living branch on the tree. It is only if the branch dies that the seeds are released such as after a fire when ideal seed bed conditions prevail. Step 1 in collecting seed is to simply find gumnuts on the tree that have not opened. There are valves (botanical term for the little doors that open to release the seed) either inside or protruding from the top of the gumnut.

Flower bud initiation to seed maturity may take from 2 to 6 years (or longer, depending on the species) From flowering to seed maturity varies in length from 6 to 16 months.

Next put the gumnuts in a paper bag (not plastic as this will cause the gumnuts to sweat and go mouldy). Put the bag in as warm sheltered spot. The dashboard of a car on a sunny day will cause them to open within hours for instance.

What comes out of the gumnut is a mixture of seed and chaff, generally the seed is darker in colour. Sometimes this can be separated out using a sieve if the chaff and seed are of different sizes, this is not always the case however. In any case it is not necessary to separate seed and chaff, they can be sown together without any ill effects.

Immature seed and chaff are soft and pale compared to mature seeds which are usually black grey or brown in colour and both seed and chaff or dry and hard.

Seed will grow happily in commercially available seed raising mixes. A mix of 50% fine sand and coconut fibre ('coco peat') is also a successful alternative. Some species are very susceptible to damping off diseases caused by fungi such as Phytophthora, Rhizoctonia and Pythium. If you are having a lot of trouble with seedlings collapsing in the first few weeks after germination a preventative drench with a fungicide such as Fongarid will generally help a lot.

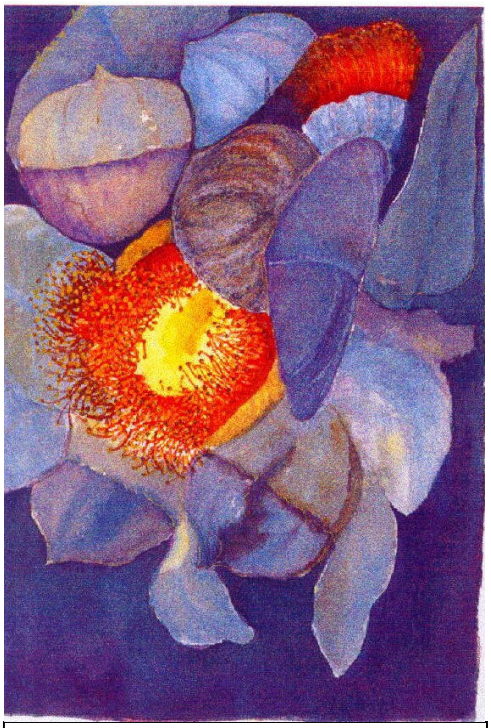
Some species flower better in some years than they do others, often occurring in cycles of approx. 2 – 4 years. Some species have relatively low seed set. Some shed their seeds within months, others will take as long as 2 – 4 years.

Special propagation tubes often known as "tree tubes" or "forestry tubes" are specially designed for raising tree seedlings. They are much taller than the more common 50mm standard propagation tubes and have a special hollow bottom that discourages root curling and girdling which creates trees with permanently impaired root systems in my opinion. Several seeds can be placed into each tube and then thinned out to the strongest one, this will produce the best root system possible and is my preferred option rather than planting seed into community pots and transplanting into individual tubes when they are large enough - this strategy often leads to damaged root systems. It is certainly an option but in my opinion not the best one.

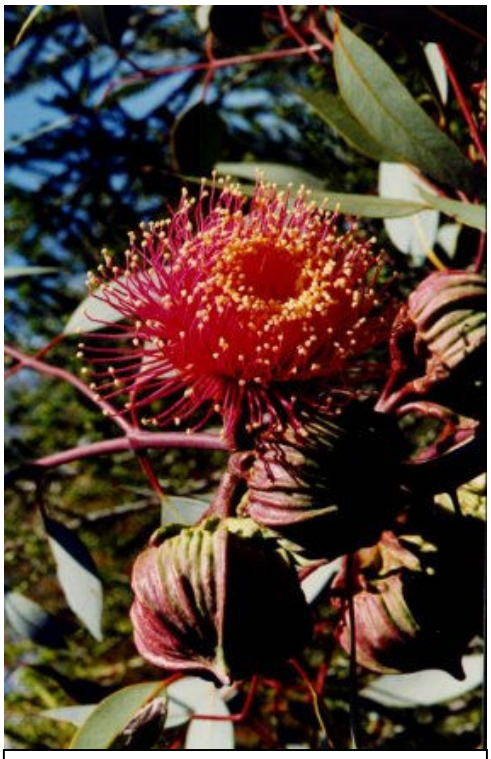
Most species germinate freely within a couple of weeks and have no special treatment requirements. the only exception I know of to this is some of the sub-alpine species such as E. *pauciflora*. Apparently these benefit from what is known as a stratification treatment where seed is mixed with moist fine sand and placed in the non-freezer part of the fridge to simulate the natural chilling the seed would receive in the soil over winter.

Seed sizes. Eucalyptus seeds come in many shapes and sizes.

I asked *Hugh Seeds* what his method of seed collection was: "I gather the seeds when the tree is flowering to be sure that they are at least one year old; I follow the branchlets back to the two year old nuts if they are available.
I sow in pans in 2:1 sand and peat. I sow the seed with the chaff on the surface of the pans. This year I'm watering from underneath in trays of sand. I prick out as soon as the first true leaf appears into 2" sq by 5" deep pots (approx 5cm sq x 13cm) or root trainers. The potting mix is 2:2:1 of sand, peat and garden soil after sterilisation in the oven. In the hottest part of summer in WA I find I need double shade cloth.
The seedlings don't seem to like being a whole year in tubes. I usually sow in November or December and plant out in May, removing the shadecloth in April."

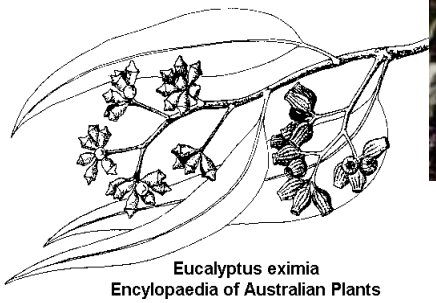


Painting of Eucalyptus *tetragona* by Rose McDonagh



Eucalyptus *youngiana* from Hugh Seeds garden (1997)

In response to the comment in Newsletter 32 regarding E. *eximia* 'nana' *Tony Cox* sent the photo below to illustrate the floriferous nature of the species and explains "I got it from the Fairfield Native Plant Nursery at Yandina north of Brisbane in May 1991 as a pot plant, perhaps 8 years old. It is planted adjacent to my garage in rather poor soil (supporting an existing flora of Queensland Blue Gums and Ironbarks) Now ten years on, at times it has required treatment with iron chelate and magnesium sulphate, but other than that it is a healthy, vigorous young tree some 15 – 20 feet tall. Like most Bloodwoods its floral efforts fluctuate with one good display every 2 to 3 years – this year being the best yet. The fluctuation may be due to the variable climate conditions."



Eucalyptus eximia
Encylopaedia of Australian Plants

The Chill and Traipse Method of Raising Eucs **from *Leigh Murray***

I particularly wanted to plant a *Euc. torquata* at our new holiday house and for a long time I couldn't find a plant to buy. I tried raising one from seed but I ran into all sorts of troubles with my first batch of seedlings (chewing insects, accidents etc) and then the next batch or two of seeds I planted didn't germinate. A friend suggested cold stratification. Aha, what an interesting idea, I thought. (*Euc. torquata* does not, of course, come from a cold region.) I put a couple of *Euc. torquata* seeds in a pot of damp sand in the fridge. When nothing happened for a while, I stopped checking frequently. Then I found a good source of tubestock eucs, including *Euc. torquata*, and I forgot about the seeds in the back of the fridge. Finally I remembered to look again: a single *Euc. torquata* seedling was languishing, lankily. The seedling was so delicate it could hardly hold its head up and it had several near-death experiences whenever it wasn't kept very moist. The only way I could keep it alive was to take it with us to our holiday house in its own mini-glasshouse (an upended bottle). For months it travelled back and forth. Eventually I decided to risk planting out the still fragile tiny tree - all 2 inches of it - and it settled in well, protected by gutter guard against strong winds. Eighteen months later, this *Euc. torquata* is a couple of feet tall. It's a much slower grower than our other (purchased) *Euc. torquatas*, but it really is doing quite nicely. I'm very fond of it. Yes, I raised it from seed. But no, I wouldn't recommend the method I used. Now I use the bog method and keep a better eye on germination results!

My Slightly Improved Method of Seed Raising

In my version of the bog method, I plant a few seeds of each eucalypt directly into tubestock pots filled with a mix of (mainly) washed coarse river sand plus some (leftover) peat or cocopeat, and then stand the pots in a couple of inches of water until seeds germinate. I don't get high germination rates but enough seeds germinate and survive for me to plant out the occasional baby tree (some of which have been promptly snaffled by marauders). I tend to plant out seedlings when they are very small indeed, and some of them have definitely been too tiny (one bite and they were gone); often they're smaller than purchased tubestock (which is the source of most of the eucalypts I plant). The main reason I plant seedlings out so young is that they don't exactly thrive in their pots: they grow very very slowly. *(Has anyone got any hints to fix this problem?)* In the past, I haven't used any fertilisers on seedlings, but I'm thinking of trying slow-release fertilisers on the next batch I raise because many of the tubestock plants I buy come fully equipped with slow-release granules, and these plants certainly look a lot stronger than my seedy little seedlings.

I get my seed from several sources. I've bought small quantities of seeds from Nindethana Seeds (eg *Euc. torquata*), got some from the Canberra or NSW APS Seed Banks (eg, *Euc. olsenii*), or collected them from our own trees (such as *Euc. viridis*). Seed from all of these sources have germinated for me using the bog method. I had much poorer results before I started using this method. Eucs I've raised from seeds (but not necessarily to adulthood owing to the aforementioned chompers) include *E. burdettiana, E. doratoxylon, E. olsenii, E. sepulcralis, E. torquata*, and *E. viridis*.

I can't use any normal fungicides (owing to chemical allergies) so I use chamomile tea in a spray bottle to prevent damping off. This works well for the small numbers of seedlings I deal with. [To make the tea, I pour a cup of boiling water over about 2 tablespoons of chamomile flowers, let it steep overnight, strain and then top up with another cup or two of water to fill a small spray bottle.]

Promoting eucalypt seed production

Newly published research findings from the Division of Forestry confirm that the growth-retardant chemical paclobutrazol offers great benefits to the eucalypt plantation industry. For example, Eucalyptus *nitens* treated at 2 years of age initiated flower buds in year 3 and produced a good seed yield in year 5. Untreated, the species normally takes 5 years to initiate buds and seed production does not become significant until about year 10. The treated trees gave heavy and consistent yields - quite different from the species' characteristic low and erratic seed production.

According to Divisional researcher Mike Moncur, paclobutrazol has become a standard management tool for major plantation enterprises over the past 2 or 3 years. "Anything that shortens the time between establishing seed orchards and getting seed, and makes yields more reliable and larger, is extremely beneficial", he said. Earlier and increased seed production is of major benefit in both the breeding of better trees and the establishment of plantations.

Paclobutrazol has long been used to enhance flowering and control vegetative growth in horticultural crops, but its value to forest growers is a relatively recent discovery, flowing from research begun by CSIRO in 1984. Rod Griffin - then with the Division, now with Shell in the UK - initiated an experiment that year to test the chemical's impact on vegetative growth in eucalypts. Although effects on flowering and seed production were not part of the original brief for the experiment, he noticed that something was happening in this area that might be worth pursuing. As a result, he initiated a new set of trials in 1988 in collaboration with APM and ICI (the manufacturer of paclobutrazol). Their findings pointed to the potential of the chemical as a plantation forestry management tool.

Since then, experiments by Mr Moncur and colleague Peter Burgess with espaliered E. *nitens* grafts have shown that paclobutrazol can produce spectacular increases in seed production, and that soil drenching is the most effective application method.

The chemical is used in extremely small quantities: 0.02 mL of active ingredient per cm of tree circumference is a relatively high dose. Diluted in water, it is poured into the soil around the tree.
Applications extend beyond plantation forestry. By encouraging flowering and seed production it could assist in the conservation of endangered eucalypt species. It could also boost the use of eucalypts in the cut flower and pot plant trade. **Courtesy of Mr Mike Moncur from CSIRO**

Lindsay Daniels. Queensland:
"For those of us who wish to study or propagate Eucalypts the first essential is to learn species identification. I believe the best and most comprehensive books are *'Field Guide to Eucalypts' Vols 1, 2 & 3* by Brooker

and Kleinig. Other books that I have found useful include *'Forest Trees of Australia'* by various authors; *'Eucalypts, an Illustrated Guide to Identification'* by Brooker and Kleinig; *'Eucalypts Buds and Fruits'* by Chippendale; and the 'Forestry Series Leaflets' by CSIRO. Good books give detailed descriptions of the characteristics necessary for identification.

For local, practical field ID I find that farmers, forestry workers and some government and council employees, as well as ESG members, have a good knowledge of Eucalypts.
I was fortunate that I spent my childhood on my fathers cattle property near Emerald, Central QLD. I was about 4 years old when I started learning the common names of plants and I knew the common names of most trees and shrubs before I started school. My father and some of the stockmen had a wide knowledge of native plants and animals. By learning the common names first it was easier to learn the botanical names later; although there is some variation in common names in different areas most common names of Eucs are fairly well known and widely used and can be used for basic identification.
I like to divide the natural growing Eucalypts into three groups:
1) Those that are common, well known or widespread
2) Less common and widespread but still well represented, and
3) Rare and confined to specific localities in the area

When I try to identify a naturally growing species the things that I consider include the soil type and locality, form, bark type, shape, texture and colour of leaves, and most importantly, the buds and fruit, number and type of valve are all taken into consideration to get a positive identification."

Werner Kutsche. South Australia:
"I am growing eucalypts in two areas with vastly differing soil/climate etc. At home we are on heavy clay (pH 7-7.5) and have E.*preissiana*, E.*watsonia*, E.*scoparia*, E. *lansdowneana*, E.*leucoxylon* ssp *megalocarpa* (Monarto mallee form), E. *erythronema* and E. *websteriana* all growing fairly well. Rainfall is ca 540mm per annum.

The other property is near Mannum, with sandy loam (pH 8.5+) and rainfall ca 250mm. We have planted eucalypts from all over Australia with the S.A., W.A. and N.T. species doing best. The only QLD species to do fairly well are E. shirleyi and E. melanophloia. E. polyanthemos is best of the VIC species while the E. globulus didn't appreciate the conditions even with summer watering. Some of the more unusual species include E. *diversicolor*, E. *ptychocarpa* , E. *dichromophloia* and E. *leucophloia*, all with summer watering once a fortnight."

"One of my projects this year has been to grow Eucalypts for a farmer friend of ours who wants to re-forest some of his land - not necessarily with local species but with prominent flowering ones. To get things under way I planted seeds in winter and kept them inside on our underfloor heating. Even so they germinated much more slowly than in summer and once outside in my hot house, stopped growing altogether. With the spring, growth has started again, however I have lost many seedlings and have decided that it is not worth raising seedlings in the winter down here." **Lorraine Haig**. Tasmania.

Elspeth Jacobs. Victoria: "I usually put seed straight into a forestry tube and then remove excess seedlings if too many come up. That seems to work better than disturbing them.
This season, I am going to fill the tube 2/3 full with potting mix, and then top it up with sandy seed raising mix...the theory being that as soon as the seed puts down its roots, there is some "food " there for them. A small amount of Osmocote can then be added, and even some liquid fertiliser suitable for Aus. plants. Also, I find it best to have the tubes in a water holding container, and water from the bottom with just enough water to keep them damp, but not wet. I find the best place to keep them is on an east facing verandah, where they get direct morning sun, but are protected from the hot westerly sun."

"I usually start seeds in plastic take-away containers filled with a base of moist cocopeat topped with perlite. I sprinkle the seeds on the surface and water in with a fine mist. I keep the surface fairly moist. When the seeds germinate I may or may not add a tiny amount of nutrient to the spray bottle for when I water them. If I use too much nutrients the seedlings become spindly and weak so spraying it over the surface tends to even out the distribution and stops me from giving them too much. I pot into tree tubes sometime after the plants have developed their first true leaves. I feel that I am far too impatient for the plants most of the time and suffer from over watering and transplanting too soon. Also I tend to not stick to a regular regime which seems important for their well being ☺" **Tam Kendall.** Victoria.

Lindsay Daniels. Queensland: "I am interested in tree identification growing eucalypts from seed; gradual hybridisation and inter-grading; associated plants and the area that each species grows in; and also the growing and study of species outside their natural habitat."

The natural ability of many eucalypts to hybridise is a fact. It may be a big problem if you get seed from a stand that has several species that are able to pollinate and generate a "genotype mix", so you can be getting seed from a certain species whose genotype has encoded characters from another species. The perfect natural seed source would be a tree that fits the phenotypic and environmental requirements that you want to get which also belongs to a pure stand as isolated from another potential hybridising species as possible.
These "genetically pure" seed sources would be the best to propagate, and even then you have to count on the genetic variability always present in every species.
If you get several seed sources such as this, and you install a seed orchard based on their progeny, you have to be careful with other pollen sources close to it, or you will have natural hybridising happening again - unless you take controlled pollination strategies, which means an intensive management and no 100% safety.

Its almost impossible to have this eutopic seed orchard "free of hybrids" for several species together unless you have a really big place to keep them all together, so I guess the only chance to minimize risk is putting those species that do not hybridise naturally together; or separate those that can hybridise a certain distance farther than the average pollen dissemination distance.

Seed merchants must be really careful with this, since they can be selling seed supposed to match certain quality levels which is not really what's supposed to be. That's what differentiates a reputable merchant from other seed providers. The continuous test for hybrids is the only way to keep those quality levels high.
Gustavo Iglesias. *Escola Universitaria de Enxeñería Técnica Forestal. Escola Politécnica Superior de Lugo. Universidade de Santiago de Compostela. (Galicia. Spain)*

That's all I have room for this time. Thanks for all the contributions that people have made. More information about your seed germinating exploits and your methods of identification would be handy for the next issue. Also, we have a member struggling with preserving E. *pulverulenta* foliage for the Florist trade, anyone got any good advice/sound methods?
And write in and tell us about a favourite Eucalyptus you have grown or want to grow. Anyone else growing a Eucalyptus *eximia* 'nana' they could compare with Tony's?
More advanced, technical Euc information has a place here – there are quite a few 'Eucaphyles' that would benefit from the knowledge and the rest of us would be interested to read it, I'm sure… Well, I would! ☺

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