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S.G.A.P. EUCALYPTUS STUDY GROUP
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Dear Members,

The 1985 A.S.G.A.P. Biennial conference was held in Brisbane a few weeks ago, and I was lucky enough to be able to attend. It was a marvellous experience; not only a chance to learn more about native plants by way of the informative lectures and wonderful outings and garden visits, but also a great opportunity to meet and talk with SGAP members from all over Australia. About ten Euc study group members were there, most of whom I met for the very first time. Unfortunately, eucalypts did not feature prominently during the conference, but we were treated to plenty of rainforest.

Welcome to the following new members who have joined since July:

A list of all other financial members appears on Page 6. Now down to more mundane matters. Several members have not yet sent in their $4 for 1985/86 subs. A cross at the top of the page indicates that your subscription is overdue.

Eucalypt Plantations in Australia

Plantation forestry in Australia is based largely on Pinus spp. In contrast, plantations of native species, especially hardwoods, have been minor in extent. This low level of eucalypt plantation appears to be due to two main factors; one, the availability of natural forest resources for logging and, two, the almost complete concentration of forestry investment in softwood production with the aim of making Australia self sufficient. The lack of eucalypt plantations in Australia is increasingly at variance with overwhelming overseas evidence that many eucalypts exhibit very fast growth under intensive silviculture.

Below is a summary of an experiment recently carried out by C.S.I.R.O. Division of Forest Research, at Mt Gambier in South Australia. The results quoted are relevant only to that area, but the principles are applicable Australia-wide.

In South Australia the forest industry has become almost entirely dependent on radiata pine plantations. Previous assessments in the 1950's suggested there was little future for hardwood production in the region but these studies were based on very limited experimental data. Nevertheless this view has prevailed for the past three decades. This paper reports early growth measurements of 36 species of eucalypts on one site near Mount Gambier in the south-east of South Australia. Seed for each species of eucalypt was obtained from between one and five natural provenances. These provenances were chosen to very broadly cover the geographical range of each species. Each provenance was represented by a row plot of five trees replicated across eight randomised complete blocks. Stem height and diameter were measured after 18 months from planting, and again after four years. From this, stem volume was calculated as a simple conical function.

The means of provenances involved in the four year measurement were tabulated. The best of the provenances of E.nitens (from Mt Erica in Victoria) and E.globulus (Otway Range, Victoria) had outstandingly high mean annual increments of 45.5 and 38.8 cubic metres per hectare, respectively. Another striking feature of the results obtained is the very substantial differences in growth among provenances of some species. For instance, the Mt Erica provenance of E.nitens exhibited almost three times the volume growth of the Errinundra Plateau provenance. The Mawbanna provenance of E.obliqua exhibited twice the volume growth of the Styx River provenance. Other species such as E.globulus, saligna and viminalis also showed fairly large interprovenance variation at the trial site. Clearly in the case of several species, particularly E.nitens and E.obliqua, correct choice of provenances would be critical for maximum utilization of potential for growth in the Mt Gambier region.

The annual increments of around 42 cubic metres per hectare which were obtained for the best provenance of E.nitens and E.globulus in the Mt Gambier region are comparable to yields from the fastest growing plantations overseas. These results illustrate the point that given intensive plantation management, eucalypt growth in Australia can at least equal the annual increments achieved overseas. Certainly the growth rates attained in the present study far exceeded the 10 cubic metres per hectares or less which are common for existing eucalypt forests in Australia.

All of the 13 eucalypt species and most of the provenances measured at four years exhibited faster growth than would be expected for Pinus radiata of the same age at

Mount Gambier. For instance, a plantation of P.radiata planted in June 1979 on a similarly fertile site neighbouring the present trial site, and grown under intensive silviculture (including weed control and fertilising), had a mean annual increment of 17 cubic metres per hectare for volume growth to four years.

If the growth rates of the better euc species (including E.globulus, botryoides, nitens and viminalis) can be sustained for around 10 years, and there is no reason to believe they cannot, then there must be great economic potential for short-rotation eucalypt plantations in the Mt Gambier region. Pulpwood, veneers, plywood, sawn timber for house and heavy construction, and fuelwood are possible end uses for such plantations.

Although the soil types, climate and euc species will differ in other parts of Australia, the main concepts persist:

- growth rates/volume increments of the best species will far exceed those obtained using Pinus spp.
- euc plantations can achieve volume increments at least equal to those achieved overseas.
- careful provenance selection (within species) is very important to achieve maximum results.

The article on "Forestry in Central Australia" in the latest volume of "Australian Plants" (Vol 13, No 103) is very interesting and illustrates that even in semi-arid areas, timber can be grown, once water is available. The best species at Alice Springs appears to be E.camaldulensis. Being a species from watercourses, it is more able to exploit extra water resources. Average heights of 8.7 metres after three years are exceptional, and the potential is obviously great.

Eucalypt plantations should be a viable proposition in many parts of Australia, and they will surely become an increasing trend in the years to come.

Eucalypts for central western N.S.W.

by Malcolm Hunt

I run a nursery at Wellington for the Forestry Commission of NSW and grow approximately 30,000 plants per year. About 10,000 of these would be eucalypts. Following is a list of eucs that I propagate. This will show the reader the types that are grown in the Wellington, Mudgee, Bathurst and Orange areas which I supply:-

agglomerata, albens, astringens, bicostata, blakelyi, bridgesiana, caesia, calophylla, camaldulensis, camaldulensis var obtusa, cinerea, citriodora, cladocalyx, erythronema, crebra, eremophila (+ var grandiflora), forrestiana, globulus (+ var compacta), intertexta, lansdowneana, leucoxylon 'rosea' (+ ssp megalocarpa), macrocarpa, rossii, macrorhyncha, maculata, maidenii, mannifera, melliodora, microcarpa, nova-anglica, nicholii, nitens, polyanthemos, salmonophloia, scoparia, sideroxylon, torquata, viminalis, woodwardii.

Now that I have waded through the list I shall try to add a bit of information about the trees. I find that the most popular trees in this area for windbreak and stock shade are E.camaldulensis, E.cam. 'obtusa', E.sideroxylon and E.nicholii.

For group plantings in paddock corners etc, the box group eg. albens, melliodora seems to be most in demand, mainly I think because the timber can be used for firewood or fence posts in later years.

The most hardy euc I am growing is E.camaldulensis var obtusa. Six were planted on the Wellington Soil Conservation Research station approximately five months before the drought in 1982. After planting in a heavy clay, they were only watered about every 8-10 weeks during the drought. They have grown about 2m/yr since 1982.

The most popular trees for gardens and for attracting honeyeaters seem to be E.caesia, E.leucoxylon, E.macrocarpa and E.torquata.

A Hybrid swarm involving E.crenulata

E.crenulata is a rare and distinctive species which is known from only two very small stands 64km apart, one near Buxton and the other near Yering, in Victoria. At both sites, the morphologically very different E.ovata is the only other eucalypt present and trees clearly intermediate in morphology between the two species occur. In a paper by Dianne Simmons and R.F.Parsons, strong evidence is supplied that these trees are hybrids between the two species. The essential oils of E.crenulata and E.ovata are distinctly different. Chromatogram oil patterns of the 'hybrids' appear intermediate between those of the 'parents'. The authors suggest that the study of leaf oils may be much more valuable as characters in Eucalyptus taxonomy than has previously been thought.

Early Flowering Eucalypts

I was delighted by the response on this topic. Many members wrote and reported their observations. Some of the eucalypts reported to be budding and/or flowering were planted-out specimens while others were in pots or tubs. But in all cases, the plants were less than three years old, and sometimes as little as 14 months.

Those eucalypts most commonly mentioned as being early flowering were: E.torquata, E.'Torwood', E.occidentalis and E.woodwardii. Interestingly, Torwood is a hybrid between torquata and woodwardii.

The following species were also mentioned: elata, oxymitra, leucoxylon, citriodora, kruseana, pruinosa, stricta, forrestiana, obtusiflora, lansdowneana ssp albopurpurea, orbifolia, megacornuta and deglupta.

Most of these are small trees or mallees, but citriodora, elata and deglupta are large trees, so their early flowering performance is even more remarkable.

It seems to me that the next step would be to clone or vegetatively propagate these early flowering individuals (see article on veg. propagation in N/L No 9), and to study the effect of nutrition, water stress, and other environmental factors, on floral initiation.

The production of flowering eucalypts as pot plants would seem feasible, even if only a few species prove to be suitable.

Eucalyptus Oils

Essential oils are the aromatic 'essences' found in various plant parts. Because they evaporate when exposed to the air at ordinary temperatures they are called volatile or essential oils. These oils possess characteristic odours, are colourless, insoluble in water and are separated from plant material by steam distillation or solvent extraction.

Essential oils from the leaves of eucalypts have attracted interest since the earliest days of settlement in Australia. One of the first articles of export from the newly established colony of New South Wales in 1788 was a quarter of a gallon of an essential oil steam-distilled from the leaves of a eucalypt (E.piperita) growing on the shores of Port Jackson.

The therapeutic properties of the Australian flora so fascinated the botanist Baron Ferdinand Von Mueller that he prompted a Victorian pharmacist colleague, Joseph Bosisto, to investigate the commercial production of eucalyptus oil. Bosisto responded and, in 1852, commenced operations at Dandenong, Victoria. This was the beginning of the Australian essential oil industry. Between 1854 and 1891 Bosisto displayed commercial eucalyptus oils at no less than seventeen exhibitions around the world. Through his pioneering efforts the eucalyptus industry spread to other states as the demand grew and its products became known in world trading centres. By 1900 the industry was firmly established, and for the next fifty years Australia remained the world's largest supplier of eucalyptus oil.

One problem confronting the industry from the outset was the variation in the oils marketed. At the turn of the century, new light was thrown on the problem by two early curators of the Museum of Applied Arts and Sciences, Sydney, in a series of investigations into the botanical classification of the eucalypts and their oils. Further progress was made by successive curators at the Museum with the discovery of chemical variation within species, a phenomenon which had been troublesome to distillers. The curators found that populations of E.dives at Braidwood yielded piperitone and phellandrene, whereas cineole-rich oils were obtained from populations of the same species at Tumbarumba.

There are over 600 species and varieties of Eucalyptus but only about 20 have been exploited commercially and less than a dozen are presently of economic importance. The commercial eucalyptus oils are broadly divided into three classes; medicinal, industrial and perfumery oils, according to their specific uses.

Medicinal oils - the active therapeutic agent of medicinal oils is cineole, of which a minimum of 70% is required to meet commercial specifications. Medicinal oils are graded on their cineole content, and it is common practice to improve them by blending and purification. These oils are used for inhalants, embrocations, soaps, gargles, sprays, lozenges and dentrifices. Eucalypt species which contain commercial quantities of cineole are Eucs polybractea, radiata, dives, sideroxylon, leucoxylon, goniocalyx, viridis, smithii, cneorifolia, globulus, dumosa and oleosa.

Industrial oils - these contain phellandrene and piperitone as the principal constituents. Phellandrene oils are used in the manufacture of inexpensive disinfectants, household and industrial liquid soaps, and germicidal preparations. Piperitone oils provide the base material for the manufacture of synthetic menthol and thymol. Species used to provide these oils are E.dives, elata and radiata.

Perfumery oils - only two species of eucalypt have been exploited to supply oils for the perfumery industry: E.citriodora for citronellal and E.macarthurii for geranyl acetate and eudesmol. Extraction of these oils in Australia is no longer economically viable.

Next N/L: The Eucalyptus Oil Industry in Australia - present and future.

Members Letters

Rod Anderson from Canberra is a keen observer of his local eucalypts (cultivated and bush). He mentions that E.bicostata and E.nicholii are used widely, and probably overused. On a recent field trip, Rod found E.stenostoma, a rare eucalypt which grows west of Bodalla. He managed to collect a little seed of this species, and this is now in the seedbank.

Rita Diehl from Dublin, S.A., reports that there is a very active "Greening Australia" committee in her area, working under the umbrella of the local council. The group planted over 3000 trees during 1984/85 and hopes to plant a similar number during 85/86. Also, they are endeavouring to organise a project through the local C.E.S. to plant 5000 trees along the railway line that runs between two of the major towns in the area.

Barbara Henderson (Legana, Tas) has been waiting FOUR years for the flower buds on her E.alpina (Grampians Gum) to open; which they finally did earlier this year, "much to the delight of the resident Little wattle birds."

Judy Smith from Blaxland, NSW, has recently carried out a koala survey in an area near Sydney, as part of her work. She reports that the most important koala food trees in the area are E.punctata (Grey Gum), E.robusta (Swamp Mahogany) and E.botryoides (Bangalay). Others recorded to be important are E.paniculata (Ironbark) and E.haemastoma (Scribbly Gum). Judy also mentions "Angophora reserve" which contains what is claimed to be the world's biggest Angophora costata. It is apparently a very impressive tree.

Two new eucalypts

Eucalyptus ornata is a new species recently described by Dr Michael Crisp. It is a small silver-barked tree with very ornate fruits. It is related to the Silver Mallet (Euc falcata).
E.ornata is a straight trunked tree to 10m high. The bark is smooth throughout; white to grey in colour. Leaves are narrow, green and glossy. The buds and fruits are prominently ribbed, with the ribs thickened into large "knuckle-like" protuberances.
This species is restricted to a quite small area of W.A., namely north-east of Kondinin and south of Hyden.
It is closely related to E.falcata, a species which is widespread in south-western W.A. E.falcata has buds and fruits which are smooth or only slightly ribbed. Intermediate forms have been found however, and these require further study.

Eucalyptus quadricostata. This is an ironbark tree to 15m high with hard, grey to black furrowed bark to the small limbs. Juvenile leaves are broad (to 10x5cm), grey-green. Adult leaves are lanceolate (to 15x2cm), dull green, concolourous. Buds are distinctly stalked, strongly ribbed. The hypanthium is square in cross-section and the operculum is smooth and pyramidal. The fruits are barrel-shaped with 4 prominent ribs continuing along the pedicel, up to 14 x 8mm.
This species is restricted to a small area north-west of Pentland, in North Qld. It is very common along the Pentland-Wanda Vale road, on stony plains, slopes, and low hills. The large ribbed buds and fruits are very distinctive.

Use of Local Plants

We have so many beautiful plants in Australia that we are all tempted to try and cultivate species from widely differing climatic areas, often unsuitable for our local conditions. Most of us accept the fact that such plantings are "experimental", and it is not too disastrous when these plants far from home decide to die. In a garden situation you are able to grow a wide range of species because of specialised attention and modification of the microclimate.

But in a large scale planting where high survival and growth rate is desirable and maintenance is low or nil, the use of local plants is most advantageous. Why?

Local plants are well adapted to local soils and climate. Many non-local plants grow well initially, but eventually prove to be short-lived eg. Tuart (E.gomphocephala) from W.A. grows well in many areas of S.A., but has a tendency to succumb to borers and is therefore short-lived (20-25yrs) compared to the local eucalypts.
Planting local species minimises interbreeding. Growing species together from widely separated areas allows interbreeding/hybridisation which eventually reduces the integrity of the parent species.
Planting local trees and shrubs also can provide suitable habitats for local animals. Some animals are very specific in their habitat requirements, and local plants are

most likely to recreate the appropriate habitat. Finally, the use of local plants helps to retain the character of a rural area. Remember that your local species too, are unique.

There are certain circumstances, however, where it may not be possible to re-establish the local tree species. This is where the environment has been significantly altered:

- where soil erosion and salinity have changed the properties of the soil
- where repeated application of fertilisers and animal excreta have created high levels of nitrogen and phosphorus
- disease affected soils eg. those with Phytophthora cinnamomi, the cinnamon fungus.

Eucalyptus doratoxylon (Spearwood Mallee)

This is a beautiful species from Western Australia. It is a mallee or small tree up to 4.5 metres high. The bark is smooth throughout, white and powdery. This contrasts effectively with the reddish branchlets. The leaves are opposite (an unusual feature of this species) and light glossy green in colour. The buds (and flowers) are borne in groups of seven along the stems. The peduncles are recurved, so that the flowers, which are white, face downward. They are therefore in full view to anyone standing under the tree. The fruits (gumnuts) which follow in profusion are almost globular, about 8mm across, brown and glossy. It is a spring flowering species.

E.doratoxylon grows along the south coast of W.A., from the Stirling Ranges to Israelite Bay. It does not appear to be in cultivation, except in botanic gardens or arboreta. I find this puzzling, as it is such a beautiful species. It is probably only moderately resistant to drought and frost. It forms a graceful shrub in cultivation, and should be suitable for coastal plantings.

In its natural habitat, it can be seen on the peaks of the Stirling Ranges (especially Toll's Peak and Mt Trio), and in the Cape Le Grande N.P. near Esperance.

The Meaning of Eucalypt names - Part 5

The Greek root xylon means wood, timber or log.

haematoxylon - refers to the colour of the heartwood haema (blood)
doratoxylon - refers to the use of the timber dory (shaft, spear)
melanoxylon - refers to the colour of the heartwood melas (black, dark)
leucoxylon - colour of the heartwood leucos (white)
sideroxylon - refers to the very hard wood sideros (iron)

fera (Greek) and gera (Latin) mean bearing, carrying

clavigera - refers to bud shape clavus (club)
gummifera - refers to gum produced by the tree gummi (gum)
coccifera - coccus infected foliage on the first material collected
resinifera - refers to resin produced by the tree
mannifera - refers to exudations from the tree manna (a morsel, gum of a tree)
urnigera - refers to the buds and fruits urna (urn)

The Greek root corys means helmet, cap. In three species this root is used to describe the operculum.

brachycorys - short operculum brachys (short)
microcorys - small operculum micro (small, little)
erythrocorys - red operculum erythros (red)

A few other interesting names are:

decorticans - L.decorticans (with the bark peeling off) This refers to the conspicuous way in which the bark is shed from the medium size and smaller branches of the crown.
gracilis - L.gracilis (slim, slender) refers to the branch and stem habit
oreades - Oreades is the mythological name of mountain nymphs (Greek). This refers to its mountain habitat
rugosa - L.rugosus (wrinkled) refers to the buds and fruits.
campaspe - Application not given by the author. Campaspe was a mistress of Alexander the Great. The artist Apelles used her as a model for a statue of Aphrodite and perhaps the allusion is of her body to the mealy whiteness of the tree.
salubris - L.salubris (wholesome(chiefly of climate, air etc.)) Refers to what F.Mueller considered the'sanitary importance of the tree'.