

	<i>Cordyline fruticosa</i>	ti pore	SE Asia, Polynesia
	<i>Ruscus aculeatus</i>	butcher's broom	Europe
	<i>Yucca guatemalensis</i>	spineless yucca	Central America
<b>Pandanaceae</b>	<i>Freycinetia banksii</i>	kiekie	New Zealand
<b>Poaceae</b>	<i>Bambusa balcooa</i>	borak bamboo	India
<b>Strelitziaceae</b>	<i>Strelitzia nicolai</i>	giant bird of paradise plant	South Africa
<b>Xanthorrhoeaceae</b>	<i>Aloe bainesii</i>	aloe tree	Southern Africa

## Liquidambar (*Liquidambar styraciflua*) beginning to move?

Ewen K Cameron

Liquidambar or sweet gum (*Liquidambar styraciflua*) of the witch-hazel family (Hamamelidaceae, or more recently placed in the Altingiaceae) was being sold in Auckland in 1888 by D. Hay & Son of Montpellier Nursery (Hay's Catalogue 1888-89) for 1/6 to 2/- each. Aptly advertised by Hay's as: "one of the finest American trees, beautiful in all stages of growth. Somewhat resembling the maple, leaves star-shaped and a beautiful glossy green in summer, which changes in autumn to a deep purplish crimson. An elegant and desirable hardy tree." It is now grown as an ornamental species throughout New Zealand.

The oldest New Zealand herbarium specimen located was from a cultivated tree in Rotorua, collected in 1951 (NZFRI 4040, *K M Bibby*, 3 Oct 1951, Forest Research grounds). The first wild collection of liquidambar in New Zealand was of scattered seedlings by the parent tree in Auckland City by Peter de Lange in 1997 (AK 231349, see Appendix 1 & Figure 1) and published by Heenan et al. (1999). In 2000 there were two more collections from Auckland City and one from Te Puke (Appendix 1) all published by Heenan et al. (2002). All were young plants near adult trees. The next collections were in 2004: four from Auckland and one from Hamilton (Appendix 1). Seedlings were also locally common by an adult tree on the Auckland University campus in February 2004 before being weeded (P J de Lange pers. comm.).



**Figure 1. Herbarium sheet (AK 231349) of the first wild liquidambar seedlings collected in New Zealand.**

*Liquidambar* is a small genus of 3-5 species. All the species are monoecious. In cultivation *L. styraciflua* reaches 28 m in height, with a trunk c.1m diameter (Mitchell 1994, Salmon 1999). The grey bark is furrowed, and for young trees Mitchell (1994) records it as pale grey, or if raised from root suckers as dark brown with corky wings, later becoming dark grey. The species is deciduous, with palmately (3-)5-lobed leaves arranged alternately, not opposite as in some of the similar looking maples (*Acer* spp.). There are various cultivars available, generally exhibiting different coloured autumn leaves. Liquidambar flowers lack petals and appear with the new leaves in spring: male flowers are in spikes, and the females in dense clusters (wind pollinated). The softly spined subglobular fruit (c.3cm diam.) hang on 3-6.5cm long peduncles and stay attached for at least 6 months. The spines are formed from the persistent styles. As the fruit ripens it changes from green to brown and the seeds are released via openings between the paired spines. The flattened seeds are winged, to 10mm long x 2.5mm across (including the wing). But the four fruit that I investigated contained only a few winged seeds and mainly chaff variously shaped and c.2mm across (unfertilised ovules?)(Figure 2). There is the potential of a seed bank held in the fruit hanging

on the tree and on the ground. Brown fruit on the ground in autumn from the previous season (c.1 year old) contained a few seeds with what appeared to be good endosperm (viability not tested).



**Figure 2. Contents of a ripe liquidambar fruit: a few winged seeds and chaff.**

Although liquidambar has been grown in New Zealand since at least since 1888, the first documented instance of naturalisation occurred 109 years later. This 'acclimatisation phase' before naturalising is a common feature of long-lived woody species. For example, an historical study of woody species in Germany showed that the lag phase between the introduction of a new cultivated plant and the first wild seedling averaged 170 years for trees and 131 years for shrubs (Kowarik 1995). Factors affecting naturalisation would include the delay to reach sexual maturity. Liquidambar is slow growing and many of the 8-10m tall trees I have seen lacked fruit altogether. Perhaps pollination increases with outcrossing, and abundant good seed is set only where there is more than one adult tree of different genetic stock (i.e. not the same cultivar or clone)? Mass plantings of one species increases the probability of naturalisation (Lee et al. 2000) (Figure 3). Of the nine wild records (Appendix 1) there is more than one adult tree present except at the Mt Albert site (AK 231349) where there is a single very large tree. Based

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#### References

- Heenan, P. B.; de Lange, P. J.; Glenny, D. S.; Breitwieser, I.; Brownsey, P. J.; Ogle, C. C. 1999: Checklist of dicotyledons and pteridophytes naturalised or casual in New Zealand: additional records 1997–1998. *New Zealand Journal of Botany* 37: 629–642.
- Heenan, P. B.; de Lange, P. J.; Cameron, E. K.; Champion, P. D. 2002: Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 1999–2000. *New Zealand Journal of Botany* 40: 155–174.
- Kowarik, I. 1995: Time lags in biological invasions with regard to the success and failure of alien species. In: *Plant invasions – General aspects and special problems*. Pysek, P.; I'rach, K.; Rejmanek, M.; Wade, M. (eds): 15-38. SPB Academic Publishing, Amsterdam.

on aerial photographs and notes this tree appears to have been present since the late 1920's and now throws numerous seedlings every year (P.J. de Lange pers. comm., May 2004).



**Figure 3. Row of planted adult liquidambar trees in Alderman Drive in Henderson which have frequent seedlings underneath. If non-clonal, mass plantings like this increases the probability of naturalisation. Photo: 14/02/04.**

#### The Future

During the 2003/04 summer in northern New Zealand there has been an increase in the number of liquidambar seedlings recorded. I'm sure with more observations this present known abundance and distribution would be increased. Time will tell if we are seeing the beginning of this important cultivated species becoming a problem in the natural environment or if it the result of a short-term suitable climate for seed-set and germination. So far there are only wild seedling and sapling records within 30m of cultivated adults, and no records invading native habitats. But as Lee et al. (1999) pointed out: plant invasions in urban environments are the key to limiting weeds in New Zealand. We should watch this species as its environmental tolerance seems to be wide, it is extensively planted and it has potentially good method of dispersal (i.e. the wind). Present evidence suggests that it will slowly fully naturalise and become a minor nuisance in modified habitats, including shrublands and open forest close to adult trees. Eradication could be complicated by the ability of this species to root sucker.

Lee, W.G.; Williams, P.A.; Cameron E.K. 2000: Plant invasions in urban environments: the key to limiting weeds in New Zealand. In: *Managing urban weeds and pests*. Suckling, D.M. & Stevens, P.S (eds): 43-60. Proceedings of a NZ Plant Protection Society Symposium.

Mitchell, A. 1994: *Collins field Guide: Trees of Britain & northern Europe*. HarperCollins, Hong Kong.

Salmon, J.T. 1999: *The trees in New Zealand: Exotic trees, the broadleaves*. Reed Books, Auckland.

## Appendix 1. Wild records of liquidambar

### Auckland Region

AK 231349, Auckland City, Mt Albert, *P J de Lange 3251*, 12 Feb 1997, seedlings adjacent to a large adult (Figure 1);  
AK 245592, Auckland, Waikumete Cemetery, *P J de Lange 4278*, 2 Feb 2000, ×1 seedling, adult 30m away;  
AK 251449, Auckland City, Wakefield Street, *P J de Lange 4295*, 14 Feb 2000, ×1 seedling, adults adjacent;  
AK 284809, Auckland, Waikumete Cemetery, *E K Cameron 12279*, 30 Jan 2004, ×1 1.4m sapling, adults adjacent;  
AK 284882, Auckland City, Epsom, *E K Cameron 12279*, 8 Feb 2004, ×3 seedlings, adults 20m away;  
AK 284969, Auckland, north Henderson (Lincoln), *E K Cameron 12284*, 14 Feb 2004, ×1 seedling under adult, another adult close by;  
AK 285546, Auckland, Henderson, Alderman Drive, *E K Cameron 12317*, 14 Feb 2004, frequent seedlings under a row of adults (Figure 3).

### Waikato Region

AK 285421, Hamilton City, Hamilton East, *P J de Lange 5899*, 21 Feb 2004, abundant seedlings, adults adjacent.

### Bay of Plenty Region

AK 251539, Te Puke, *E K Cameron 10326 & D B Rogan*, 5 Dec 2000, seedlings to 0.7m tall, adults 20m away on other side of road.

## Notes towards an Excursion Flora: *Rubus* (Rosaceae), the bush-lawyers

Rhys Gardner

### Introduction

Not much interest has been taken in our bush-lawyers since the days of Cockayne (1910) and Allan (1927, 1928), and perhaps rightly so — Nancy Adams' artwork is all that is needed to identify these five good species outdoors (Poole & Adams 1964). But the Flora NZ descriptions (Allan 1961; Webb et al. 1988) need improving, and a start is made on this here utilizing published data (Sampson & McLean 1965; Webb & Simpson 2001) and some notes of my own.

The odd man out of the five is *Rubus parvus*, a large-flowered, bisexual, mat-forming plant of river-valley gravels in the western South Island. Wardle (1991) asserted a lianoid ancestry for *R. parvus*, but in habit, form of the prickles, bisexuality and other features it more nearly resembles small shrubby plants like *R. fernandi-muelleri* of montane New Guinea (van Royen 1969).

So, the synopsis below first distinguishes *R. parvus* from *R. australis*, *R. cissoides*, *R. schmidelioides* and *R. squarrosus*. Then these four, and also the frequently cultivated hybrid, *R. xbarkeri* (supposedly *R. australis* × *R. parvus*) are keyed out. Newly recorded features are concentrated on, and some information has been omitted, notably the details of the indument. This in general consists of simple pointed hairs and sessile or stalked gland-hairs. Our species are glabrescent on most parts so for their full description new growth is required. Such knowledge might help solve what remains the most vexing alpha-taxonomic problem, of deciding whether a piece of foliage (particularly juvenile) is hybrid or not.

Having examined only the material in AK herbarium I have not been able to refine the Flora NZ distributions. Except for *R. parvus* each species is said to be found on all our three main islands, but their regions of greatest abundance are not clear to me. The most sporadically distributed is the leafless lawyer, *R. squarrosus*, which would appear to be most frequent in rocky places in the lowlands of the eastern South Island. It is found locally in northern New Zealand, for example around the Hokianga, Whangarei and Kaipara Harbours, but is unknown in the Waitakeres. Likewise, *R. schmidelioides* is uncommon in the north (Mangakahia Valley; Hikurangi Swamp), although there is a Cheeseman collection from the Auckland Domain (wild or cultivated ?) and another made by Carse from Mauku.

Unpublished chromosome counts by Peter de Lange (pers. comm.) are  $2n=28$  for all five species; the chromosomes are very small but there must be karyotype differences otherwise why would *R. xbarkeri* be sterile?

### Synopsis

Relatively small prostrate creeping plants, stems rooting at nodes; flowers bisexual. Stipules constantly present, linear-lanceolate, sometimes slightly foliose. Prickles straight. Leaves apparently simple, margins dentate-serrate, lateral veins spreading at almost right angles to midrib, domatia lacking, midrib armed below; petiole broadly channelled above, rarely armed. Inflorescence of a solitary flower or a cymose pair, axes rarely armed. Sepals ± acuminate to a glabrous flattened or slightly foliose tip (cf. Connor & Penny 1960), reflexed in fruit. Petals white, relatively large