

## REVIEW

### History of the lantanas in Australia and origins of the weedy biotypes

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#### Summary

The history of introduction of *Lantana camara* and *L. montevidensis* into Australia is reviewed, as are their escape from gardens and spread as weeds. Suggestions are made about the origins of the weedy lantanas now present in Australia.

#### Introduction

The genus *Lantana* contains up to 150 species of woody plants in the family Verbenaceae (Airy Shaw 1973) and originates in the warmer parts of the Americas. A number have been developed as showy ornamentals, and nine species are listed as weeds in various tropical and subtropical countries by Holm *et al.* (1979). At least two species were introduced into Australia in the 19th century and both have persisted here as ornamentals and as weeds. These are lantana (*L. camara* L.) and creeping lantana (*L. montevidensis* (Spreng.) Briq.).

The definition and identification of 'species', varieties, cultivars and biotypes in the main weedy and ornamental taxon *L. camara* is almost impossible. Hundreds of 'species', varieties and cultivars have been named since the 17th century, many of which are synonymous (Howard 1969) and most of which today are included in the broad species *L. camara*. They are generally referred to as biotypes in this paper, and it is useful to divide them into two main groups: those with spines on the stems and those without spines.

Most, if not all, of the weedy biotypes of *L. camara* in Australia are thorny and set seed freely, whilst the

present-day Australian ornamental biotypes are thornless or nearly so and set very little seed. Loudon (1830) recognized this important difference by dividing the 'species' then grown in Britain into the two groups *Aculeatae* (stems prickly) and *Inermes* (stems not prickly). Although it is dangerous to assume that all the 19th century 'species' discussed below would have been synonymous with those recognized by the same names by Loudon, his book was widely known and used in 19th century horticulture and some degree of synonymy may be presumed.

Nineteenth century 'species' of *L. camara* discussed below and which are listed by Loudon as spiny or spineless are followed by (*Ac.*) or (*In.*) respectively after first mention in the text; those not listed by Loudon are annotated (—).

The main weedy and ornamental species is *L. camara* which was described by Linnaeus in 1753 from a garden plant in Europe. The material which he described was thornless, as are most of today's ornamental biotypes. *L. camara* was probably first introduced into Europe from Brazil about 1640 (Howard 1969), in which country Schauer (1851) considered both the prickly and non-prickly forms to be native, common and widespread. The early introductions into Europe were supplemented by further introductions from throughout the American tropics in the 17th, 18th and especially the 19th centuries (Loudon 1830; Johnson 1872; Howard 1969), and also, no doubt, by accidental and deliberate hybridization in Europe and by the vegetative reproduction of somatic mutations. Howard considered that the material grown in Europe in the early 19th cen-

tury included in its parentage a number of different American taxa, a view shared by Stirton (1977).

*Lantana* was a favourite garden shrub in Europe and the United States during the second half of the 19th century, when there was a great increase in the number of biotypes available to the public (Table 1). *Lantana* was dispersed as an ornamental shrub throughout the colonies of the European powers (Howard 1969; Stirton 1977), and various biotypes would have been sent to different colonies at different times. Hybridization and somatic mutation would then have occurred in each new geographical region, followed by natural and artificial selection to suit the different local environments. The resulting regional populations have by now diverged from each other enough to be recognizably different groups of biotypes (Stirton 1977).

Creeping lantana was also widely distributed by man in the 19th century, but it has only become a weed in Australia (Holm *et al.* 1979) and perhaps in America (Bailey 1927). It was introduced from Montevideo to Europe in 1828 (Johnson 1872) and to Australia by 1851 (Shepherd 1851). Both triploid and tetraploid forms now occur in Australia (Henderson 1969), the former as garden ornamentals and the latter as weeds. Only the tetraploid form produces viable seed, and Australia is perhaps the only country outside South America to possess this form of the plant.

**Table 1** Dates of first records of varietal names of lantanas (from Howard 1969).

Period	Number of new varietal names recorded
1771-80	2
1781-90	0
1791-1800	0
1801-10	2
1811-20	0
1821-30	3
1831-40	2
1841-50	4
1851-60	49
1861-70	113
1871-80	70
1881-90	90
1891-1900	75
1901-10	86
1911-20	10
1921-30	23
1931-40	10
1941-50	14
1951-60	21
1961-67	13

The two species of lantana are cultivated for their ornamental flowers, which in lantana occur in showy multi-coloured heads on compact, sprawling or scrambling bushes. Lantana is also important as a slope stabilizer in south-eastern Queensland, but is not planted for this purpose. Creeping lantana is a prostrate or trailing subshrub with lilac to mauve flowers, often with a white centre.

### Introduction and spread of lantana

**1840–1850.** The earliest published reference to lantanas in cultivation in Australia was in 1841, when *L. mista* (presumably = *L. mixta* (In.)) was listed as flowering in June (mid-winter) in the old Botanic Gardens in South Australia (Bailey 1841). Bailey brought plants with him when he left the employment of Loddiges in 1839 (P. M. Kloot, pers. comm. 1983), and it is likely that he brought this lantana among them. *L. Cammara* (sic) (In.) was cultivated by Macarthur at Camden near Sydney in 1843 and 1845 (Anon. 1843, 1845). Bailey's (1845) list of plants in his Hackney Nursery in Adelaide includes *L. Cammara* but not *L. mista*. Only *L. camara* and *L. mista* appear, therefore, to have been cultivated in Australia in the 1840s.

**1850–1860.** Fresh introductions about 1850 allowed Shepherd to advertise *L. involucrata* (In.) (a pink form (Johnson 1872)), and *L. crocea* (In.) *grandiflora* (copper-coloured, Johnson 1872) for sale at his Darling Nursery in Sydney in 1851 (Shepherd 1851). In the same year Guilfoyle was offering *L. mutabilis* (—), and *L. crocea grandiflora* for sale at Double Bay (Guilfoyle 1851). The first list of plants in the Melbourne Botanic Gardens was published in 1852 and included *L. speciosa* (—), *L. mutabilis*, and *L. crocea* (Ginn 1852). Three 'species' of lantana were cultivated at Camden Park, near Sydney, in 1857: *L. Cammara*, *L. crocea grandiflora*, and *L. trifolia* (In.). (Anon. 1857). The listing of *L. trifolia* for Camden in 1857 and elsewhere later on is interesting, since this species seems to have disappeared from cultivation in Australia, although it is still regarded as a weed in Africa, Central America and Indonesia (Holm *et al.* 1979). It was regarded as an annual by Hill (1875). Two annual species of lantana were recognized in cultivation in the 19th century: *L. trifolia* L. and *L. annua* L. Both were apparently brought into cultivation in 1733, the former from South America

and the latter from the West Indies (Loudon 1830; Johnson 1872). Schauer (1851) lists *L. annua* as a synonym for *L. trifolia* but does not describe it as annual. No three-leafleted or annual lantanas are known in cultivation in Australia today.

The second plant list for the Melbourne Botanic Garden (Anon. 1858) lists *L. crocea* Jacq. and *L. mixta* L. Loudon (1830) describes *L. mixta* W. (sic) as being of mixed colours. The Victoria Nursery at Richmond, Victoria, advertised lantanas by English names in 1855, viz. 'changeable' and 'saffron-coloured' (Rule 1855), and it is likely that *L. mista*, *L. mixta*, *L. mutabilis* and 'changeable lantana' were all the same taxon. The second Government Botanic Garden in Adelaide produced its first catalogue in 1859 and included *L. alba* (In.) (white flowered (Loudon 1830)), *L. cammara* L. and *L. crocea* Link (Francis 1859).

Seven forms of lantana were grown in Australia by 1859: *L. involucrata*; *L. crocea*/*L. crocea grandiflora*/'saffron-coloured lantana'; *L. camara*; *L. mista*/*L. mixta*/*L. mutabilis*/'changeable lantana'; *L. speciosa*; *L. alba* and *L. trifolia*.

**1860–1870.** Two more 'species' of lantana made their appearance in the Government Botanic Gardens in Sydney in the 1860s: *L. nivea* B.M. (Ac.) and *L. Youngii* (—) (Anon. 1866). If Loudon's 1830 descriptions were being followed, this *L. nivea* was the first prickly form of lantana listed in cultivation in Australia. It may, however, have been synonymous with the white flowered thornless biotype Snowflake which is on sale in Australia today. Bennett (1865) records that 'The *Lantana aculeata* flowers profusely (in Sydney) and forms an excellent protection as a fence inside the palings of the gardens'. This was obviously a spiny form.

**1870–1880.** The Adelaide Botanic Gardens produced catalogues in 1871 and 1878 (Schomburgk 1871 and 1878) with slightly different lists of 'species'. The only new 'species' listed in the 1871 catalogue was *L. odorata* (In.), a sweet-scented variety according to Loudon (1830) and Johnson (1872). The 1878 catalogue includes *L. urticaefolia* Mill. (—). The Queensland Botanic Garden issued its first catalogue in 1875 (Hill 1875), extending the recorded range of cultivated lantanas into the area in which they are such a pest today. *L. alba*, *L. camara* and *L. trifolia* were all included, as were two apparently prickly 'species' new to Australia — the

scarlet-flowered *L. coccinea* Lodd. (Ac.) and the purple-flowered *L. purpurea* Horm. (Ac.)

**1880–1890.** During the 1880s the fashion for lantana began to wane, at least in Brisbane where the plant was by then recognized as a menacing weed (Bentham 1870; Bailey 1879). In Victoria (where it is too cold for lantana to become weedy) new 'species' were still being introduced, since in 1883 the Melbourne Botanical Gardens were growing *L. coccinea*, *L. crocea*, *L. mixta*, *L. purpurea*, *L. urticaefolia*, *L. bicolor* (—) (two-coloured lantana), *L. grandiflora* (—) (great-flowered lantana) and *L. grandiflora* var. *alba* Hort. (white-flowered lantana) (Guilfoyle 1883). The last four appear to have been of horticultural origin and may have been local selections. The two metropolitan gardens in Brisbane, by contrast, simply list *L. camara* in cultivation at the Brisbane Botanic Garden and at the Bowen Park Garden of the Queensland Acclimatization Society (Bailey 1885).

**1890–1950.** Lantana continued to be grown as an ornamental in Australia in the first half of the 20th century. Lord (1945) promoted the use of the ornamental biotypes in temperate Australia. Lantanas had by then become recognized as varieties within the broad species *Lantana camara*, and Lord recommended nine varieties for planting in the southern states: Chelsea Gem ('easily the most popular'), Goliath, Magenta Orange, Golconde, Gol Gol, Snowflake, Mini (or Minnie) Basle, Diadem and Drap D'Or. Mini Basle is an interesting inclusion, since it was first recorded as a varietal name by Howard (1969) from G. Brunning and Son's Nursery in Victoria in 1896, and so may be of Australian origin. It is one of the spiny forms that have become weeds (Smith and Smith 1982).

**1950–1983.** The Botanic Garden of Adelaide published a centenary catalogue listing the plants under cultivation in 1954. It included *L. camara* and its garden forms, *L. camara* var. *aculeata* and *L. kisi* ('from Abyssinia') (Anon. 1955). The 1962 catalogue of plants in the Botanic Garden of Brisbane lists six varieties of *L. camara* — Chelsea Gem, Diadem, Drap D'Or, Golconde, Gol Gol, Snowflake and var. *variegata* (Anon. 1962). All six of these varieties are still used ornamentally for street and park plantings by the Brisbane City Council, as well as Goliath and 'Cream Seedling' (R. McKinnon, pers. comm. 1983). Chelsea Gem and

Drap D'Or are frequently planted in gardens in south-east Queensland, together with Diadem, Fire King, Snowflake, Dwarf Orange, Dwarf Pink and others, all of which are spineless and appear to set very little seed. Drap D'Or, Calypso Pink, Dwarf Orange and Chelsea Gem were offered for sale by a Darwin nursery in 1983 (M.O. Rankin, pers. comm. 1983), and these and other varieties of *L. camara* are widely available through nurseries in most cities and provincial centres.

### History of lantana as a garden escape and weed in Australia

**1860–1870.** Lantana appears to have become established in the wild in Australia by the late 1850s. The earliest herbarium specimen is in the National Herbarium in Melbourne and was apparently collected on the Brisbane River in August 1861, but the writing is unclear and the sheet lacks the collector's name. There is also a specimen with small thorns collected by B. T. Lowe in 1862 and labelled 'Near Sydney, common, an introduced species' in the herbarium of the Royal Botanic Gardens at Kew in England (R. Filson, pers. comm. 1983; C. H. Stirton, pers. comm. 1984).

There are several undated collections of lantana in the National Herbarium in Melbourne from this period. The most important of these is the thorny specimen collected by Dr Beckler on the Hastings river, north-eastern New South Wales. This is labelled 'Lantana. Immigrated. Hastings R. Dr H. Beckler' and is the only specimen quoted by Bentham in the 'Flora Australiensis' (1870), with the note that lantana was by then 'frequently cultivated for ornament, and, escaping from gardens, now naturalized on the Hastings and Clarence Rivers (Beckler), and probably in other parts of New South Wales and Queensland'. Smith and Smith (1982) date this collection to about 1869, but it was probably collected a little earlier since delays would have occurred between the collection of specimens by Beckler and printing in 1870 (Kynaston 1981). Smith and Smith suggest that this specimen is of the biotype Common Pink, but there are no colour notes with any of the early specimens, the flowers of which are as blackened as those of most dried lantanas.

**1870–1880.** There is an undated specimen in Melbourne labelled 'Immigrated. Brisbane R.' in Mueller's handwriting which was probably collected by one of his field collectors or correspon-

dents (Kynaston 1981), as well as a thorny specimen of the same era labelled 'Brisbane R.' Lantana was collected at Bulli in New South Wales by S. Johnson in 1875, and attached to this sheet in the National Herbarium in Melbourne is a herbarium label wrapped around a few lantana fruits marked '1875. Geograph Bay'. The collector of these fruits is unknown, since Mueller did not visit the area in Western Australia until 1877 (Willis 1949). The fruits may have come either from a garden plant or a garden escape. Mueller was heavily involved in seed exchange at the time (Willis 1949; Kynaston 1981), and these may have been vouchers for, or part of, such an exchange.

Lantana was not recorded as a garden escape in the Brisbane area until Bailey and Tennison-Woods (1879) noted that it was flowering all summer along the river. Bailey vilified the plant 'as a huge rambling shrub and a most troublesome weed which has spread to an alarming extent, and forms an impenetrable thicket on the banks of streams, deserted farms, and the edges of scrubs. It is equally abundant all round Port Jackson. Its abundance of showy flowers all year round is a poor compensation for the good land it encroaches upon' (Bailey 1879).

**1880–1890.** Bailey (1883) noted in his 'Synopsis of the Queensland Flora' that lantana was by then 'naturalized in many scrubs'. In his later report as Colonial Botanist he remarks: '*Lantana camara* Linn. Black Currant Shrub. This is perhaps the most troublesome of all our naturalized plants, as it occupies the land to the expulsion of all else. Mr W. S. Campbell, speaking of this plant in his Report on the Richmond River says: "On each side of the road from Wyralla to Lismore, and also for some miles around Lismore, hundreds of acres of land that had once been cleared of timber have become utterly useless from the spread of this shrub"'. (Bailey 1889).

**1900–1910.** In Part 4 of the 'Queensland Flora' Bailey (1901) noted that *L. camara* was naturalized and a great pest; he also listed *L. crocea* as being naturalized but not troublesome. His description of *L. crocea* is interesting: 'This species closely resembled *L. camara*, but is much shorter and more compact, the heads about the same size and form, but the colours are apt to sport, some plants producing white, others blue, the normal colour being bright red, orange and yellow towards the centre of the head'.

It seems likely that Bailey's *L. crocea* embraced a number of biotypes now considered to be distinct, including some which were escaped garden ornamentals ('shorter and more compact . . . some plants . . . white'). The name *L. crocea* appears to have been used for a number of taxa that were included in *L. camara* by both Everist (1981) and Smith and Smith (1982). Both of the specimens now labelled *L. tiliifolia* in the herbarium at the Royal Botanic Gardens in Sydney were originally identified as *L. crocea*. The difference between *L. camara* and *L. tiliifolia* appears to lie in the degree of hairiness of the stem and other surfaces (Bailey 1949), and since this is a variable character *L. tiliifolia* is assumed to be within *L. camara* in this discussion.

Bailey (1906) was more optimistic about lantana later on when he wrote that 'The plant has overrun many of the river scrubs and become a well-known pest. However, it is easily got rid of, and the land is none the worse, and often better for its occupation'. He referred to it again in 1909 as 'a pest and noxious weed', adding that 'some plants may at times be seen with pretty variegated foliage', a character not otherwise noted except in the list of ornamental biotypes currently grown by the Brisbane City Council. *L. crocea* was by then 'not a troublesome weed, although it had run out in a few localities where it had been used for hedge making; the flowers are showy and of various colours' (Bailey 1909).

**1910–1920.** Although no discussion of lantana as a weed in New South Wales occurs before 1920, specimens exist in the herbarium of the Royal Botanic Gardens in Sydney which were collected in Sydney in 1902, at Kempsey in 1913 (*L. crocea* now re-identified as *L. tiliifolia*), at Newcastle in 1919 and at Coff's Harbour in 1926 (again *L. crocea* re-identified as *L. tiliifolia*). Lantana was, however, recognized as being sufficiently important to be proclaimed noxious in 18 municipalities and 22 shires by 1919, and Maiden (1920) considered it to be the tenth most important noxious weed in the State based on the number of places that had declared it noxious.

**1920–1930.** White (1929) tried to define the lantanas naturalized in Queensland at that time and determined that there were but two biotypes present. He described *L. camara* as having flowers which opened pale cream with a dark yellow centre and died off lilac or purplish, although elsewhere in the same article he referred to it as the

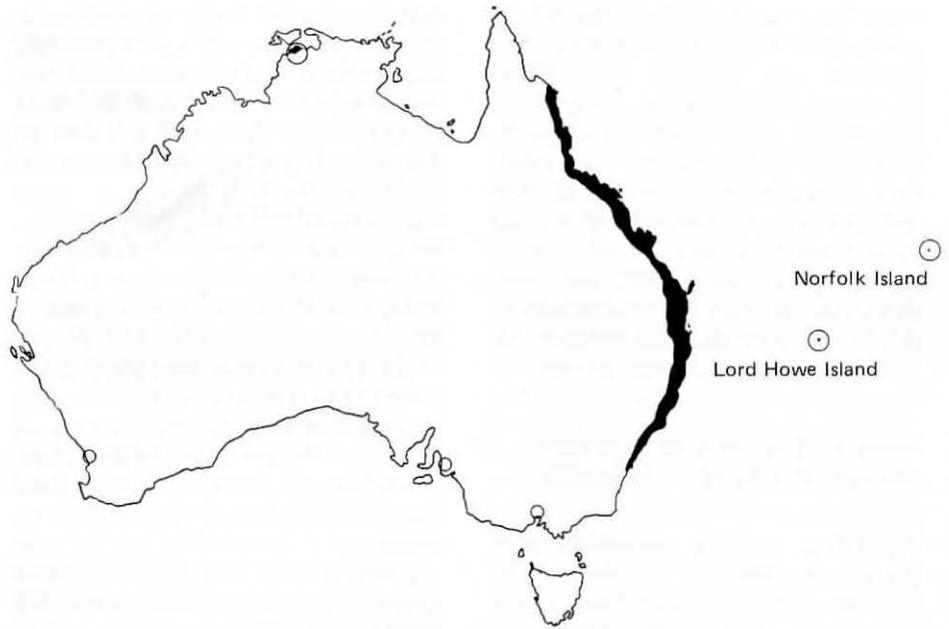
pink-flowered form. He also recognized *L. camara* var. *sanguinea* as having flowers that opened yellow and turned bright red. White considered that the red-flowering lantanas of Queensland were *L. camara* var. *sanguinea* rather than *L. crocea* (although remarking that the two forms were very close) and considered it to be widespread and in some places the dominant form. Although White's diagnoses were rejected as valueless for taxonomic purposes by Everist (1981) and Smith and Smith (1982), they indicated a growing awareness of and frustration with the taxonomy of this most difficult species.

**1930–1970.** By the 1950s lantana had spread over more than 1600 km of the eastern Australian coastline (Everist 1959) and wherever soil and climate were favourable to its growth it had become an aggressive weed after man had cut down the original forest and provided it with a suitable habitat. Everist took the balanced view that the plant was 'doing good work on many of the steep hillsides which should have been left in forest'. So little new work had been done on lantana in eastern Australia between 1930 and 1965 that Whittet (1968) could imply that there was only one form of the weed in New South Wales and that 'the flowers of this species are pale cream with dark yellow centres, becoming lilac', a description which very closely echoes White's description of *L. camara* nearly 40 years before.

Lantana was probably introduced into the Northern Territory in the 1930s or 1940s, since it grows around army buildings of that era in the Adelaide River area (M. O. Rankin, pers. comm. 1983). The earliest collection from the Northern Territory is in the Alice Springs Herbarium and was made in 1958.

**1970–1983.** Lantana was first listed as an established exotic in the Northern Territory by Chippendale (1971). Holmes (1973) noted that it did not appear to be aggressive in the Darwin area, an opinion still held by the Department of Primary Production (I. L. Miller, pers. comm. 1983). The plant exists in the Darwin area in forests, open areas, home gardens and around buildings, with flowers of 'orange and red', 'orange to red and yellow', and 'cream inner flowers with deep yellow centres'.

The number of naturalized forms of lantana recognized in eastern Australia rose rapidly with the researches of D. A. White between 1965 and his



**Figure 1** Distribution of the *Lantana camara* complex in Australia. The larger circles emphasize outlying well-established infestations; the smaller circles indicate areas in which it is a localized garden escape of little significance.

sudden death in 1970 before completion of the project. As finally published by Smith and Smith (1982), 29 biotypes of the plant are considered to be naturalized along the coastal strip between Ulladulla south of Sydney and Cooktown north of Cairns. Two or three of these are flowery, compact, almost thornless forms which are plainly ornamental garden escapes, but the great majority are vigorous, spiny, scrambling shrubs of aggressive weediness, quite unfit for garden culture. Smith and Smith provide accurate maps of the distribution of the 10 most widespread biotypes, whilst Jacobs and Pickard (1981) record lantana as naturalized throughout coastal New South Wales and recognize *L. tiliifolia* Cham. as a distinct species in the central and northern coastal districts.

Lantana is present as a weed on both Lord Howe and Norfolk Islands. The dates of introduction remain unknown, but were probably in the mid- to late 1800s during its widespread distribution as a garden ornamental. Its presence on Lord Howe Island is noted by Jacobs and Pickard (1981), and a single 1902 specimen from Norfolk Island is in the Herbarium of the Royal Botanic Gardens in Sydney. More recently it has been described as a most vigorous and aggressive weed on Norfolk Island (C. A. H. Helston, pers. comm. 1983).

Lantana exists in Western Australia, South Australia and Victoria only as an occasional garden escape. It was listed as a naturalized plant in Western Australia by both Gardner (1930) and

Green (1981), although it seems to be restricted to the Perth metropolitan area (G. Perry, pers. comm. 1983). In South Australia it was collected from Waterfall Gully, 10 km from Adelaide, by J. M. Black in 1910, but has not been collected in that State since then (A. A. Munir, pers. comm. 1983), although it is widely cultivated as a garden ornamental. In Victoria J. H. Willis (1972) noted that it 'sometimes appears in suburban gardens as a result of bird-dropped seed, but never becomes the rampant weed that it does under the milder, more humid conditions of eastern coastal gullies in New South Wales and Queensland'. B. H. Hyde-Wyatt and D. I. Morris both assert that, although lantana is widely grown in gardens in Tasmania, it never escapes from cultivation (pers. comms. 1983).

The distribution of *Lantana camara* as a weed in Australia is shown in Figure 1.

### Introduction and spread of creeping lantana in Australia

Creeping lantana was introduced into Australia as an ornamental trailing shrub and subsequently escaped to become a minor weed in coastal and subcoastal New South Wales and Queensland. It exists in Australia in two forms — a triploid with 36 chromosomes and a tetraploid with 48 (Henderson 1969). The former is a free-flowering seedless form which is very widely grown as a garden ornamental,

being non-aggressive and capable of being trimmed into a low neat hedge or left to trail attractively over rocks and banks. It is propagated only by stem cuttings. The tetraploid form is similar but less flowery, more prostrate and widespreading in habit, and it readily roots at the nodes when in contact with the ground. It sets seed freely and can be reproduced by seed, cuttings or division of established plants.

Creeping lantana was known as *L. sellowiana* Link & Otto from its introduction into Australia until the first quarter of this century. The name *L. montevidensis* (Spreng.) Briq. was recognized as having priority in 1904 but was not applied to the species in Australia for another 30 years.

Creeping lantana appears to have come into cultivation in Europe in 1828 (Johnson 1872), although early mentions are without adequate description (Howard 1969). It was occasionally referred to as *L. delicatissima* in 19th century horticultural literature (Bailey 1927; Howard 1969). The species was not listed as being cultivated in Australia before 1850, with the first mention in 1851 in the catalogues of the Sydney nurserymen Guilfoyle and Shepherd (as *L. Sellowii* and *L. Selowiana* respectively).

Creeping lantana became well known throughout south-eastern Australia, appearing in the list of the first Melbourne Botanical Gardens in 1852 and under various spellings in virtually every botanical garden and nurseryman's catalogue thereafter. It was first listed in Adelaide in 1859 and in Brisbane in 1875 (Francis 1859; Hill 1875). None of the lists indicate any varietal forms, although a variegated form is grown in the Brisbane Botanic Gardens. The triploid form is widely grown throughout temperate and tropical Australia.

Australia appears to be the only country in which creeping lantana is a weed (Holm *et al.* 1979), although Bailey (1927) states that it 'seems to be an escape in Florida'. The first writers to mention creeping lantana as a garden escape or weed in Australia were Bailey and Tennison-Woods (1879) who listed it as a summer-flowering plant of the Brisbane River. An undated specimen in the Brisbane Herbarium bears the note 'A naturalized plant about Brisbane River' in Bailey's handwriting, but it could have been collected at any time up to 1915 (J. Sawyer, pers. comm. 1983) and has no seeds; hence is not safely assignable to either the weedy or non-weedy form. A fruiting plant in the Brisbane Herbarium was collected by J. H. Sim-

monds at Ipswich in 1888 and bears the note 'Naturalized and from South America'.

F. M. Bailey (1883, 1890, 1901, 1909) mentioned the species several times but generally added nothing about its status or distribution, apart from noting that it was 'frequently seen on the pasture lands near our southern towns as a stray from garden culture' (Bailey 1906). The weedy form of the plant must have been spread rapidly throughout coastal Queensland soon after the turn of the century, for specimens in the Queensland Herbarium were collected near Gayndah in 1913 and 1917, near Cairns in 1918, and at Rockhampton in 1925.

Unlike lantana, White (1929) had no difficulty with the species and his description and identification are still acceptable. His mention of 'Fruit a small reddish-brown drupe' clearly shows that he was referring to the tetraploid form, and he mentioned that the plant was 'widely cultivated in tropical and subtropical countries as an ornamental trailer'. Although his photograph is rather indistinct, it appears to show the seedless triploid form.

By the 1950s and 1960s creeping lantana had become widespread throughout coastal and subcoastal Queensland, with collections in the Queensland Herbarium from Gympie, Thangool, Biloela, Yeppoon, St Agnes and again from Ipswich. It is also present at Gatton and Toowoomba.

Creeping lantana is listed as a naturalized introduction in the northern and central coastal regions of New South Wales (Jacobs and Pickard 1981), and specimens of the tetraploid form exist in the herbarium of the Royal Botanic Gardens, Sydney, from Casino and Sydney.

The distribution of *Lantana montevidensis* as a weed in Australia is shown in Figure 2.

### Origins of the Australian weedy lantanas

The horticultural forms of *L. camara* grown in coastal Queensland and New South Wales are compact bushes which are thornless or almost so, which set few seeds, and which are of low weedy potential. The weedy forms in the same region are generally spreading or rambling thorny shrubs that set large numbers of seeds (Swarbrick, unpublished data). The horticultural forms probably correspond with those members of Loudon's (1830) *Inermes* which formed the bulk of the recorded horticultural

introductions into Australia in the 19th century. Thorny forms of *L. camara* are cultivated as ornamental shrubs in southern Australia, where they rarely escape to become weeds because the climate does not favour either seed production or the establishment and persistence of the plants.

The weedy lantanas of coastal Queensland and New South Wales probably descend both directly and indirectly from thorny lantanas introduced into this country during the 19th century for ornamental and perhaps hedging purposes. Although most of the introductions discussed above and grown in botanic gardens and commercial nurseries were apparently thornless, some thorny biotypes were also grown and distributed when lantana



Figure 2 Distribution of the tetraploid form of *Lantana montevidensis* in Australia. This form is not known to occur elsewhere on the mainland or on Norfolk or Lord Howe Islands.

was a fashionable garden ornamental during the latter half of last century. With little or no restraint on private plant introduction at the time, other thorny (and thornless) biotypes would have been introduced by immigrants and returning visitors from Europe and elsewhere, and such introductions would have gone unrecorded. Smith and Smith (1982) note the tradition that the Common Pink biotype of lantana was introduced into the Port Macquarie area by a Major Innes from South Africa, perhaps as an ornamental hedge, and that it grows there still. Such unsubstantiated stories abound.

The main area of settlement and settled garden horticulture in eastern Australia prior to 1900 was in the Sydney-Melbourne-Adelaide triangle, an area in which the thorny lantanas are still grown ornamentally but in which they are not weedy because the climate does not allow their prolific reproduction or growth. As settlement proceeded northwards along the coastal strip in the last decades of the 19th and the first decades of the 20th centuries, both thornless and thorny lantanas would have been carried north and planted in areas much more suitable for their reproduction and growth. The relatively seedless and slow-growing horticultural types would have remained as innocuous garden ornamentals. The free-seeding and fast-growing weedy types, however, were given ideal conditions for distribution, growth and diversification: long distance transport by man, establishment in gardens surrounded by disturbed bushland containing birds which spread the seeds, moist fertile soil and moist air, and a wide range of new and genetically challenging environments. The result was predictable.

The breeding system of *Lantana camara* still remains obscure and is in urgent need of further research. Khoshoo and Mahal (1967) consider that the plant is at least partly apomictic, but Spies and Stirton (1982a) failed to find firm evidence of apomixis. Both consider that sexual reproduction occurs. Whether partly apomictic or not, some cross-pollination and genetic recombination is bound to occur in such a genetically diverse, insect visited and free-seeding species, and Spies and Stirton (1982b) describe a hybrid swarm of *Lantana camara* biotypes in South Africa. Somatic mutations are not uncommon in the species and have been observed in D. S. Smith's collection of lantana biotypes at CSIRO, Indooroopilly (R. Kassulke, pers. comm., 1983). Considering the large areas of lantana in eastern coastal Aus-

tralia (Figure 1) such genetic recombinations and somatic mutations have probably occurred many times and is still occurring today. Apomixis and self-pollination would then have favoured the reproduction of those biotypes most fit for the local environment, allowing the rapid development and spread of apparently pure stands of biotypes. Such pure or almost pure stands are a feature of Australian and of South African populations of the weed today.

It is suggested that some of the Australian weedy biotypes are the direct descendants of plants introduced into Australia in the late 19th century, but that others (perhaps the majority) have originated in coastal Queensland and New South Wales. This view is partially supported by the observation of Spies and Stirton (1982b) that the South African and Indian biotypes are quite different in their chromosomal behaviour, leading these authors to consider either that different biotypes were introduced into the two countries or that post introduction evolution in each country has resulted in different cultivar assemblages. Both routes to genetic diversity may, of course, have occurred.

Creeping lantana (*L. montevidensis*) shows very little morphological variation in Australia other than the sterility and fertility associated with triploidy and tetraploidy. The triploids were obviously introduced as ornamentals, and because of their infertility have remained as innocuous garden ornamentals. A variegated form with lilac flowers is cultivated in the new Brisbane Botanic Gardens. The origin of the tetraploids is unknown, but may have been due to the direct introduction of such material as seed or vegetative plants from Montevideo or elsewhere within its native range.

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