

Eucalyptus in Asia: A Beekeeping Resource

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Eucalyptus species have probably been Australia's most successful export. Eucalypts have been planted in tropical, subtropical and temperate regions world-wide with estimates that plantations are likely to exceed 10 million hectares by the year 2000. Florence (1996) states that 'Eucalypts are mainly grown for pulpwood, fuelwood and charcoal, mining timber, fibreboard and essential oils'. What is often not stated in forestry-sourced references is the tremendous value eucalypts have to the beekeeping industry. Australia has average yields of 100–110 kg of honey per hive in many years. Of the 26,000 to 27,000 t produced on average per year by Australian beekeepers, about 70–80 per cent is derived from *Eucalyptus* species.

The diversity of *Eucalyptus* species accounts for the success of Australian beekeepers. Eucalypts are naturally occurring in a range of locations, extending from dry arid areas to cool alpine regions, from wet or dry temperate forests to warmer tropical regions. There are approximately 550 species of eucalypts that are endemic to Australia, of which 220 have been identified as valuable to honeybees (Lazarides and Hince, 1993).

Eucalyptus in Asia

It is estimated that 30–40 per cent of all trees planted in the tropics in recent years are of

Australian origin (Vercoe, 1993). These tree species are primarily eucalypts, acacias and casuarinas. Boland (pers. comm.) of the Division of Forestry, CSIRO, Australia suggests that in 1997 the primary species of eucalypts planted in Southeast Asia are *E. camaldulensis* and *E. tereticornis* in a ratio of approximately 60: 40. An estimate of the approximate area of Australian eucalypts in plantations in Asia is given by Vercoe (1993, revised in 1996 pers. comm.) (Table 1).

India

Eucalypts were brought to India by the British in about 1843 to provide a reliable fuel supply.

Table 1. Australian *Eucalyptus* spp. in Asia

Country	<i>Eucalyptus</i> plantation area (ha)
India	4,800,000
Indonesia	80,000
Malaysia	8,000
Myanmar	25,000
Nepal	5,000
Pakistan	28,500
Philippines	10,000
China	670,000
Sri Lanka	45,000
Taiwan	3,500
Thailand	62,000
Vietnam	245,000
Total	5,982,000

They were planted in the Nilgiri Hills where growth rates of 6–7.5 m from seed in only eight months were reported. It was reported in 1876 that large supplies of mainly *E. globulus* were imported. Apparently the introduction was not widely successful. The major species in India is *E. tereticornis*. *Eucalyptus resinifera*, *E. camaldulensis*, *E. citriodora*, *E. viminalis* and *E. robusta* have also been planted (Zacharin, 1978).

Sri Lanka

By 1873 the total area planted was about 8300 ha, chiefly with *E. camaldulensis*, *E. grandis*, *E. citriodora* and *E. microcarpa* (Zacharin, 1978). By 1993 this figure had risen to 45,000 ha (Vercoe, 1993). Punchihewa (1994) writes on beekeeping in Sri Lanka and refers to *Apis dorsata* colonies migrating on to *Eucalyptus* species mainly red gum from July until October each year. Punchihewa (1994) refers to management of bees pre- and post-eucalypt flows, but does not state the species. Red gum may refer to a number of species but is probably either *E. camaldulensis* or *E. tereticornis*. Fernando (1980) also refers to *Eucalyptus* species as a melliferous floral resource in Sri Lanka.

Nepal

Some limited plantings of eucalypts have been reported in and around Kathmandu, but in other parts of the country only odd trees occur. The main species that have been reported to do well include *E. camaldulensis*, *E. grandis* and *E. tereticornis* (Zacharin, 1978). There is potential to investigate eucalypt species that are more suited to alpine climates than those species thus far reported in Nepal. Examples include *E. regnans*, *E. delegatensis* and *E. pauciflora*.

Pakistan

Eucalypts were introduced in 1867 and a large number of species have been tried. However, only 1000 ha had been planted up to 1978. The main species being *E. camaldulensis*, *E. tereticornis*, *E. microtheca* and *E. citriodora* (Zacharin, 1978). The area of eucalypts in plantations had grown to 28,500 ha in 1993 (Vercoe, 1993).

China

Between 1894 and 1896 eucalypts were introduced to south China from Italy. The earliest species was *E. globulus* then came *E. camaldulensis*, *E. tereticornis*, *E. citriodora* and *E. robusta*. Eucalypts were noted by Zacharin (1978) to be well spread across the country, with plantings between agricultural crops and along railway lines. In the 1970s, experimental plantings of *E. regnans*, *E. delegatensis*, *E. melliodora*, *E. viminalis*, *E. amygdalina* and *E. obliqua* were instigated (Zacharin, 1978). Florence (1996) reported that some 600,000 ha of eucalypt plantations in south China have been based mainly on *E. exserta* and *E. citriodora*, with *E. globulus* in the 'cooler' subtropical areas. Many of these plantations were reported to be below optimum for wood production.

Hong Kong

Species such as *E. grandis*, *E. tereticornis*, *E. robusta* and *E. pilularis* are reported to grow well in the New Territories, although there are no large areas planted (Zacharin, 1978). There are no significant plantings of eucalypts in Hong Kong.

Japan

In 1954 the government of Japan officially adopted eucalypts for reforestation. *Eucalyptus globulus* is the most common species, although there are many other plantings of eucalypt species mainly as single trees (Zacharin, 1978). There are no significant plantations recorded.

Singapore

Only specimen trees of about 14 eucalypts have been planted in the botanic gardens (Zacharin, 1978). The size of Singapore does not permit substantial plantings of forest species.

Malaysia

Eucalyptus deglupta and *E. robusta* were regarded as the most common species planted in 1978, with some areas of *E. grandis* (Zacharin, 1978). *Eucalyptus deglupta* originates from Indonesia.

Table 2. Honey and pollen values of *Eucalyptus* spp. grown in Asia

<i>Eucalyptus</i> species	Value for honey	Average honey yields per hive (kg)	Value for pollen
<i>E. amygdalina</i>	-	-	-
<i>E. camaldulensis</i>	High	30-50	High
<i>E. citriodora</i>	Medium	20	Low
<i>E. decaisneana</i>	-	-	-
<i>E. deglupta</i>	-	-	-
<i>E. delegatensis</i>	Medium-High	20-30	High
<i>E. exserta</i>	Low	10-20	Medium
<i>E. globulus</i>	Medium	20	High
<i>E. grandis</i>	Low	10	Medium
<i>E. melliodora</i>	Medium-High	10-60	Nil
<i>E. microcarpa</i>	Low	10	Low
<i>E. microtheca</i>	Medium-High	10-30	High
<i>E. obliqua</i>	Low-Medium	10	Low-Medium
<i>E. paniculata</i>	High	30-160	Nil
<i>E. pilularis</i>	Medium	0-30	Medium
<i>E. regnans</i>	Low	-	High
<i>E. resinifera</i>	Low-Medium	10-30	Medium
<i>E. robusta</i>	Low-Medium	10-20	Medium
<i>E. saligna</i>	Medium-High	20-40	High
<i>E. tereticornis</i>	Low-Medium	20	Medium
<i>E. urophylla</i>	-	-	-
<i>E. viminalis</i>	Low-Medium	30	Medium-High

Note: - = no information available.

Indonesia

There are three native species of eucalypt. *Eucalyptus alba* occurs at lower altitudes in Timor and surrounding islands; *E. decaisneana* is distributed over the mountains of Timor and adjacent islands; *E. deglupta* occurs on both the lowlands and mountainous regions of Sulawesi and the Moluccans (Zacharin, 1978).

Honey and Pollen Values of *Eucalyptus* spp. Grown in Asia

Table 2 indicates the relative values for honey and pollen of eucalypts mentioned in this paper

to be growing in Asia as they relate to management of honeybees under Australian conditions. The average honey yield per hive is what beekeepers, under Australian conditions, may extract under reasonable conditions.

Of the two *Eucalyptus* species that dominate most plantings in Southeast Asia, *E. tereticornis* is regarded as a support species in most of its indigenous range. *Eucalyptus camaldulensis* has the widest distribution of any eucalypt in Australia. The value of this species to beekeeping varies across its distribution. Generally, honeybees do well working this species with both honey and good-quality pollen being gathered. Australian beekeepers prefer this species to be periodically flooded, particularly in spring with flowering occurring over the summer (Somerville and Thompson, 1995).

Eucalyptus paniculata and *E. melliodora* are important honey-producing species in Australia, but their pollen is not collected in any significant quantities by honeybees. Management considerations regarding nutritional requirements of the colony have to be implemented when contemplating working a honey-flow from these species.

Discussion

Beekeeping world-wide relies on a diverse range of honey- and pollen-yielding flora. Frequently knowledge of the available flora is limited. Eucalypts are often mentioned as being of value as a melliferous resource in many countries. Difficulties arise in utilising these flora when species are not specified. The necessity of authors of beekeeping literature to state the actual eucalypt species is important when relative values for honey and pollen production are considered. Eucalypt species have been largely selected for plantings based on their growth habits as they relate to timber production and their potential for beekeeping has often been overlooked. Given that it is possible for the value of beekeeping products, harvested from some eucalypt species, to exceed the value of timber

products it is worth suggesting that relative values for honey production should be a consideration by reforestation organisations and foresters when planting trees for other purposes.

In Australia it is possible that the value of the honey crop, derived from *E. paniculata* on the north coast forests of New South Wales, exceeds the value of timber in many locations (Somerville, 1998). This is also recognised in Queensland where *E. polyantheros* and *E. caleyi* are not harvested for timber owing to their major contribution to honey production in the region (Moncur and Kleinschmidt, 1992).

The box/ironbark and stringybark group of eucalypts is under-represented in plantings throughout Asia, whereas this group provides the majority of the honey crop in Australia (Somerville and Moncur, 1997): *E. melliodora*, *E. albens*, *E. paniculata*, *E. crebra*, *E. melanophloia*, *E. sideroxylon*, *E. microcarpa*, *E. fibrosa* and *E. caleyi*. Other important eucalypts to the Australian beekeeping industry are given in Table 3.

It should be noted that only two species in this table appear in the table of eucalypts growing in Asia. The time of year these trees flower varies according to individual species and location; also under Australian conditions flowerings may only occur every two to four years with many eucalypt species. It is normal practise for Australian beekeepers to move honeybees from one flowering eucalypt to the next, as one finishes flowering and another begins. A knowledge of the relative flowering periods is essential to plan the movement of colonies.

Not all *Eucalyptus* are the same in regard to honey and pollen production. Their main function could be as a build-up plant, i.e. providing sufficient pollen and nectar for the colony to breed and strengthen in numbers prior to a more reliable honey source flowering or hives being used for crop pollination.

The quantity and characteristics of honey obtained from eucalypt nectar also varies with species. Honey produced may vary from a light

Table 3. Honey and pollen values of some important *Eucalyptus* species in Australia

<i>Eucalyptus</i> species	Value for honey	Average honey yields per hive	Value for pollen
<i>E. albens</i>	High	30-50	Medium
<i>E. caleyi</i>	High	30-50	Nil
<i>E. calophylla</i>	High	30-80	High
<i>E. camaldulensis</i>	High	30-50	High
<i>E. crebra</i>	High	40-80	Medium
<i>E. diversicolor</i>	High	40-100	Low
<i>E. macrorhyncha</i>	High	40-60	Medium-High
<i>E. maculata</i>	High	30-80	High
<i>E. marginata</i>	High	20-60	High
<i>E. melanophloia</i>	High	50-70	Medium
<i>E. melliodora</i>	High	30-80	Nil
<i>E. microtheca</i>	High	30-50	High
<i>E. muelleriana</i>	High	20-60	High
<i>E. ochrophloia</i>	High	30-50	Low
<i>E. paniculata</i>	High	30-160	Nil
<i>E. pauciflora</i>	Medium-High	40-50	High
<i>E. redunca</i>	High	20-60	Medium
<i>E. sideroxylon</i>	High	30-80	Nil

P-fund reading of 5-10 mm to a darker colour of P-fund of 90-110 mm depending on the species. Eucalypt species also vary in their reliability regarding yields. In a recent study of the value of forested lands within New South Wales, average honey yields for the top-producing eucalypts varied from 10 kg per hive to 162 kg per hive (Somerville, 1998).

Some eucalypt species planted in other countries have performed better in relation to their honey-producing capacity than in their indigenous locations. An example of this is *E. grandis* that is not a highly regarded source of honey in Australia, but is a major source of honey in South Africa.

Given the wide diversity of *Eucalyptus*, it is possible to select from a range of species that benefit beekeeping activity and forestry objectives for all climatic areas of Asia. Gathering information on honey and pollen production of eucalypts currently growing throughout Asia would be important in determining suitable

species considered for reforestation projects. Honey and pollen values of species growing in their native Australian environment should be considered when selecting species that will not only meet the desired criteria for timber and other wood-related products, but also benefit local family beekeeping operations adjacent to such tree plantings throughout Asia.

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