

Some Observations on an Urban Mistletoe *Dendrophthoe pentandra* (L.) Miq. (Loranthaceae) in Thailand

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There is little published information on the hosts of Thai mistletoes (Loranthaceae or Viscaceae) although BARLOW (2002a, b) cited records of host genera gleaned from herbarium records. Between July and October 2008, again in 2009 and in February–March 2010, I recorded mistletoes and their hosts in various provinces of Central and Northern Thailand and incorporated small vouchers in field notebooks, sealed under 50 mm wide strips of transparent Scotch® Brand Tape (3M, St Paul, Minnesota). Similar specimens taken elsewhere have remained stable for more than 30 years. Some conventional specimens were deposited in the Herbarium at the Queen Sirikit Botanic Gardens (QBG), Chiang Mai, and specimens already in that collection were examined. Finally, notes were made of any animals seen probing flowers or ingesting seeds.

Although several species in the Loranthaceae occur in many rural and disturbed sites, often on exotic or cultivated hosts, one species, *Dendrophthoe pentandra* (L.) Miq. was common in urban parks and gardens and on street trees as well as roadside trees of semi-rural areas. The objective of this paper is to examine the status and possible reasons for the abundance of this mistletoe in these urban and semi-rural environments in and around the Thai cities of Bangkok and Chiang Mai.

Results: *Dendrophthoe pentandra* was recorded on cultivated hosts from 24 families, 40 genera and more than 40 species; unidentified host species occurred in *Lagerstroemia* (several) and *Syzygium*, (at least two). (Table 1).

Some trees were common hosts wherever they occurred (e.g. *Mangifera indica*, *Casuarina equisetifolia*, *Tectona grandis* and several species of *Lagerstroemia*). They usually supported robust mistletoes. Other trees, although widespread and common, hosted mistletoes less frequently but, when they did, the mistletoes were usually robust or moderately so and several adjacent trees might be infected, implying they were adequate hosts once an initial infection had occurred (e.g. *Eucalyptus camaldulensis*, *Pterocarpus indicus*, and *Terminalia catappa*). Occasionally, mistletoes were found in common shrubs or trees that were obviously poor hosts. Infections were rare, infected hosts supported few (often one) small, relatively weak plants and conspecific neighbours were often not infected (e.g. *Plumaria acuminata*, *Caesalpinia pulcherima* and *Phyllanthus acidus*).

Eighteen (45%) of the 40 host genera are represented in Northern or Central Thailand by indigenous species. However, ignoring *Lagerstroemia* and *Syzygium* (identified only

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Table 1. Summary of the cultivated hosts in which *Dendrophthoe pentandra* was recorded in urban and semi-rural areas around Bangkok (BK) and Chiang Mai (CM). The columns 'mistletoe status' and 'host record' indicate whether mistletoes on that host were robust or weak and the relative frequency of records from that host. The column 'host status' indicates whether the host is indigenous in the area in which it was recorded (either northern or central Thailand).

City	Host family	Host	Mistletoe status	Host records	Host status
BK, CM	Anacardiaceae	<i>Mangifera indica</i> L.	robust	common	exotic
CM	Anacardiaceae	<i>Spondias piñata</i> (L.f.) Kurz	moderate	rare	indigenous
CM	Annonaceae	<i>Annona squamosa</i> L.	moderate	moderate	exotic
BK	Annonaceae	<i>Artabotrys hexapetalus</i> (L.f.) Bhandari	moderate	rare	exotic
BK	Apocynaceae	<i>Plumaria acuminata</i> Aiton	weak	rare	exotic
BK	Apocynaceae	<i>Wrightia religiosa</i> (Teijsm. & Binn.) Hook.f.	robust	rare	exotic
BK	Bignoniaceae	<i>Millingtonia hortensis</i> L.f.	moderate	rare	indigenous
CM	Bignoniaceae	<i>Radermachera ignea</i> (Kurz.) van Steenis	moderate	rare	indigenous
CM	Bignoniaceae	<i>Stereospermum cylindricum</i> Pierre ex D. Pop.	robust	rare	indigenous
BK	Bignoniaceae	<i>Tabebuia chrysantha</i> (Jacq.) G. Nicholson	weak	rare	exotic
CM	Bombacaceae	<i>Bombax ceiba</i> L.	moderate	rare	indigenous
BK	Bombacaceae	<i>Sterculia foetida</i> L.	moderate	rare	indigenous
BK	Caesalpinaceae	<i>Albizia saman</i> (Jacq.) F. Muell.	robust	moderate	exotic
CM	Caesalpinaceae	<i>Caesalpinia pulcherrima</i> (L.) Sw.	weak	rare	exotic
CM	Caesalpinaceae	<i>Cassia bakeriana</i> Craib	moderate	rare	indigenous
BK, CM	Caesalpinaceae	<i>Cassia fistula</i> L.	moderate	common	exotic
BK, CM	Caesalpinaceae	<i>Peltophorum pterocarpum</i> (DC.) K. Heyne	moderate	moderate	indigenous
BK, CM	Caesalpinaceae	<i>Pterocarpus indicus</i> Willd.	robust	common	exotic
CM	Caesalpinaceae	<i>Senna spectabilis</i> (DC.) Irwin & Barnaby	moderate	rare	exotic
BK, CM	Casuarinaceae	<i>Casuarina equisetifolia</i> L.	robust	common	indigenous
BK, CM	Combretaceae	<i>Terminalia catappa</i> L.	robust	common	exotic
BK	Combretaceae	<i>Terminalia ivorensis</i> A. Cher.	robust	common	exotic
CM	Euphorbiaceae	<i>Phyllanthus acidus</i> (L.) Skeels	weak	rare	exotic

Table 1 (Continued)

City	Host family	Host	Mistletoe status	Host records	Host status
CM	Flacourtiaceae	<i>Flacourtia jangomas</i> (Lour.) Raeusch.	robust	rare	indigenous
BK, CM	Labiatae	<i>Tectona grandis</i> L.f.	robust	moderate	indigenous
CM	Lauraceae	<i>Persea americana</i> Mill.	weak	rare	exotic
BK	Lecythidaceae	<i>Careya sphaerica</i> Roxb.	robust	rare	indigenous
BK, CM	Lythraceae	<i>Lagerstroemia</i> sp.	robust	common	both
CM	Lythraceae	<i>Punica granatum</i> L.	weak	rare	exotic
BK	Magnoliaceae	<i>Michelia champaca</i> L.	moderate	rare	exotic
CM	Melastomaceae	<i>Melastoma malabathricum</i> L.	weak	rare	indigenous
CM	Meliaceae	<i>Azadirachta indica</i> A. Juss.	strong	rare	exotic
BK	Moraceae	<i>Artocarpus heterophyllus</i> Lam.	moderate	rare	exotic
BK	Moraceae	<i>Ficus altissima</i> Blume	robust	rare	indigenous
CM	Moraceae	<i>Ficus callosus</i> Willd.	moderate	rare	indigenous
BK	Myrtaceae	<i>Callistemon lanceolatus</i> DC	robust	moderate	exotic
CM	Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.	strong	rare	exotic
BK, CM	Myrtaceae	<i>Syzygium</i> sp.	moderate	moderate	both
CM	Papilionaceae	<i>Butea monosperma</i> (Lam.) Taub.	moderate	rare	indigenous
CM	Papilionaceae	<i>Sesbania grandiflora</i> (L.) Poir.	moderate	rare	exotic
CM	Rhamnaceae	<i>Ziziphus mauritania</i> Lam.	moderate	rare	exotic
CM	Rutaceae	<i>Citrus hystrix</i> DC.	weak	rare	exotic
BK	Sapotaceae	<i>Mimusops elengi</i> L.	robust	rare	exotic

to genus, both genera having exotic and indigenous representatives), 25 (61%) of 41 host species were exotic to their respective areas (CM or BK) and most of the remaining species are commonly planted for their ornamental or economic value and all records cited here were from cultivated or feral hosts.

Turning to potential pollinators and dispersers, Scarlet-backed Flowerpeckers (*Dicaeum cruentatum*, Dicaeidae) often visited *D. pentandra*, even in trees lining busy, city streets where no other flowerpecker species and few, if any, other indigenous passerines were seen. They were observed probing open flowers and extracting seed from ripe fruits. Sunbirds (Nectarinidae) sometimes probed the flowers. Although other birds perched and sometimes nested in urban mistletoes, none were observed probing flowers or extracting seeds.

Discussion: BARLOW (2002a) cited 20 host records for *Dendrophthoe pentandra* in Thailand (Table 2). Before comparing his list with this one, some precautionary notes are necessary. His data were obtained from labels of herbarium specimens collected throughout

Thailand (BARLOW, pers. comm.) and he only cited host genera. Thus, he did not distinguish exotic from indigenous host taxa (some genera include both in Thailand) or wild from cultivated host plants. Nevertheless, 19 (95%) of the 20 genera he listed contain species that are indigenous to Thai forests and few contain commonly cultivated species, suggesting that most were wild plants. The paucity of exotic genera in his list contrasts with this study and may reflect the understandable emphasis botanical collectors place on documenting indigenous plant communities. After all, apart from identifying potential weed species, there is little botanical merit in documenting the exotic communities of urban streets, parks and gardens or comprehensively representing them in herbarium collections.

Of the 53 genera on the combined lists, only three (*Ficus*, *Phyllanthus* and *Terminalia*) are common to both studies and all three of those genera contain both indigenous (Thai) and exotic species. Thus, Barlow's work suggests that *D. pentandra* utilises a wide range of indigenous forest hosts and this study has shown that its plasticity extends to many exotic genera and to exotic species of genera that have indigenous representatives. Urbanisation usually eliminates indigenous plants, replacing them with cultivated or weedy imports. By exploiting exotic hosts, this mistletoe is one indigenous species that has been able to spread from natural forests into expanding 'urban jungles'.

To spread, fresh seed has to be transported from a mistletoe in one host canopy to a receptive twig in another host canopy. Thus, success would not have been possible without effective pollinators and seed dispersers. Most South East Asian loranthaceous mistletoes are pollinated and dispersed by birds (BARLOW, 1997). The colours (yellow, orange or red), curved shape and corolla length in the open flower suggest that nectarivorous birds like sunbirds (Nectarinidae) with long curved bills pollinate most Thai *Dendrophthoe* species but the flowers of *D. pentandra* are notable for their relatively short, broad, almost campanulate corolla tubes (see illustration in QIU & GILBERT, 2003). (Table 3).

In other respects, *Dendrophthoe pentandra* shares the same general ornithophilous characteristics of its congeners. Although sunbirds probe *D. pentandra* flowers, in many instances they are unlikely to effect pollination because their long bills prevent their heads contacting the mistletoe's anthers and/or stigma and, in this instance, they may often be nectar robbers, not pollinators.

On the other hand, Scarlet-backed Flowerpeckers have shorter bills. They frequently probe the flowers and consume the seeds of *D. pentandra*. It has been known for some time that flowerpeckers can both pollinate and disperse some mistletoes (e.g. BARLOW, 1997; DAVIDAR, 1983 and references therein). Also see images of flowerpeckers on *D. pentandra* at www.besgroup.talfrynature.com). DAVIDAR (1983) commented on the similarity in colour of the flowers and fruits of species that are both pollinated and disperse by flowerpeckers in southern India (an observation that holds true for *D. pentandra* in Thailand) and suggested that the trait had evolved so that both flowers and fruits provide similar visual signals to the birds. Significantly, *D. pentandra* carries flowers and fruits throughout the year in this area (QBG records and personal observation), providing a continuous trophic resource for the flowerpeckers. This mutualistic relationship between mistletoes and the birds that pollinate and disperse them, together with the mistletoe's adaptability to so many exotic hosts, allows this mistletoe to thrive in anthropogenic environments, even city centres.

Finally, there are many gaps in these brief observations on the relationship between this mistletoe, its hosts and its pollinators/dispersers. I would welcome observations on other host records or other mistletoe/animal interactions. I would also plead with botanists collecting

Table 2. Host records for *Dendrophthoe pentandra* in Thailand cited by BARLOW (2002a). Host status refers to the occurrence of the host genus in Thailand. Genera with both exotic and indigenous species in Thailand are listed as Indigenous

Host family	Host genus	Host status
Anacardiaceae	<i>Buchanania</i>	Indigenous
Apocynaceae	<i>Willoughbeia</i>	Indigenous
Araliaceae	<i>Schefflera</i>	Indigenous
Betulaceae	<i>Carpinus</i>	Indigenous
Caesalpiniaceae	<i>Delonix</i>	Exotic
Combretaceae	<i>Terminalia</i>	Indigenous
Dipterocarpaceae	<i>Vatica</i>	Indigenous
Euphorbiaceae	<i>Chaetocarpus</i>	Indigenous
Euphorbiaceae	<i>Excoecaria</i>	Indigenous
Euphorbiaceae	<i>Phyllanthus</i>	Indigenous
Fabaceae	<i>Dalbergia</i>	Indigenous
Fagaceae	<i>Quercus</i>	Indigenous
Lauraceae	<i>Litsea</i>	Indigenous
Mimosaceae	<i>Acacia</i>	Indigenous
Moraceae	<i>Ficus</i>	Indigenous
Myrtaceae	<i>Melaleuca</i>	Indigenous
Rubiaceae	<i>Hymenodictyon</i>	Indigenous
Santalaceae	<i>Scleropyrum</i>	Indigenous
Rutaceae	<i>Atlantia</i>	Indigenous
Verbenaceae	<i>Congea</i>	Indigenous

Table 3. Characteristics of the open flowers of Thai species of *Dendrophthoe* (after BARLOW, 2002 but augmented by some unpublished personal observations).

Species	Length of corolla tube in open flowers	Width	Shape
<i>D. flocculosa</i>	16–19 mm	slender	Curved, more deeply split on one side
<i>D. incarnata</i>	40–85 mm	slender	Curved, more deeply split on one side
<i>D. kerrii</i>	12–20 mm	slender	Curved, more deeply split on one side
<i>D. lanosa</i>	15–30 mm	slender	Curved, more deeply split on one side
<i>D. longiflora</i>	ca. 30 mm	slender	Curved, more deeply split on one side
<i>D. pentandra</i>	(2–)6–12 mm	broad	Straight, campanulate

mistletoes to include a voucher for the host on the same herbarium sheet or, where a host is collected in its own right, to cross-reference the collection/accession numbers on both labels. At the very least, the host species should be noted on the mistletoe label. The shortcoming of the last option is that host identification becomes ambiguous if taxonomic revisions involve the host cited on the label.

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