

Parasitic plants

Parasitic plants derive some or all of their sustenance, both organic compounds and nutrients, from other plants. There are over 4000 parasitic plant species in the world and the parasitic habit has evolved multiple times. Parasitic plants are either obligate parasites, which means they cannot complete their lifecycles without a host, or facultative, where a host is not essential to the completion of the plant's lifecycle. Wholly parasitic plants, called holoparasites, do not produce chlorophyll and therefore cannot photosynthesise, depending entirely of the hosts resources. Other parasitic plants, called hemiparasites, do photosynthesise, but take water, nutrients and some organic material from the host or hosts..

Parasitic plants have modified roots, called haustoria, which invade the roots or stems of the host plant and connect to the xylem, phloem or both to absorb water, organic compounds and nutrients.

Mistletoes: aerial stem hemi-parasites

Mistletoes are stem/branch parasites, and you may be familiar with Eucalypts dripping with mistletoes in rural area or have spotted more cryptic species by looking for a cluster of leaves that have a form and shape a little different to the surrounding branches and leaves.

Because mistletoes grow on branches rather than in the ground, they have evolved unique methods of seed dispersal. Most Australian mistletoes rely on the mistletoebird, *Dicaeum hirundinaceum*, which eats the fruit produced by the mistletoes. Up to 90% of the mistletoe bird's diet is mistletoe berries! The seeds pass quickly through the birds, which digest the sweet fruit around it, leaving a sticky coat on the seed. When the birds poo, they wipe their bottoms on a branch, leaving the mistletoe seed stuck in a perfect spot to grow a new plant, high in the canopy! The Jointed Mistletoe, *Korthasella Rubra*, which grows in Royal National Park, have a different dispersal strategy, building up pressure in the fruit that eventually explode to propel its sticky seeds onto a bird or towards another branch.

The Sydney region is also home to an epiparasite. Golden Mistletoe, *Notothixos subaureus*, only grows on other mistletoes – a parasite on a parasite! Both the Jointed and Golden Mistletoes are in the VISCACEAE family while all other mistletoes in the area are in the LORANTHACEAE family.

Mimicry in mistletoes

Some mistletoe species are specialists, only growing on a single host species or genus. And in these species, there are many examples of mistletoe foliage with a strong resemblance to the leaves of its host. Two examples are on display here. Can you easily distinguish the *Muellerina eucalyptoides* from *Eucalyptus acmenoides*, and *Amyema cambagei* from *Casuarina cunninghamiana*?

There are several hypotheses about why mistletoes might have evolved to mimic the foliage of their host, including:

1. **Convergence of form in response to common environmental factors hypothesis:** Given both mistletoe and their host grow in the same environments, the leaves of both species have evolved similar traits.
2. **The bird search image hypothesis:** Foliage mimicry means that the mistletoe bird has to search among trees for mistletoe seeds to eat, thereby moving through un-parasitised trees and spreading the mistletoe to new trees.
3. **Palatability and vegetative concealment from herbivores hypothesis:** Many mistletoe species have more nutritious foliage than their hosts and foliage mimicry reduces detection by herbivores, therefore reducing herbivory. [Mistletoe species with higher N concentration than their host are more likely to mimic]

Which hypothesis do you favour or could it be a combination of all three?

References:

Mistletoes and their Biology. <http://www.anbg.gov.au/mistletoe/>

Ehrlinger et al. 1986. Mistletoes: a hypothesis concerning morphological and chemical avoidance of herbivory. *Oecologia*. 70:234-237

Robinson, Les. 2003. *Field Guide to the Native Plants of Sydney*. Kangaroo Press, Sydney, Australia.

Reid, N. 1991. Coevolution of mistletoes and frugivorous birds. *Australian Journal of Ecology*. 16: 457-469

Examples of mimicking mistletoes



***Amyema cambagei* left, in *Casuarina cunninghamiana* right.**

Source:

<http://www.anbg.gov.au/mistletoe/mimicry.html>



Eucalypt left, and mistletoe *Amyema sanguinea* right

Source:

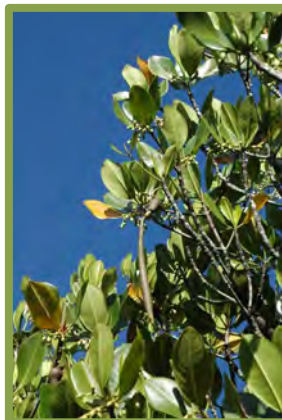
<http://www.anbg.gov.au/mistletoe/mimicry.html>



The mistletoe *Dendrophthoe homoplastica* left, and host *Eucalyptus shirleyi* right

Source:

<http://www.anbg.gov.au/mistletoe/mimicry.html>



The mistletoe *Lysiana maritime*, left, and its host *Rhizophora stylosa*, right.

Mistletoe Flowers

In contrast to the foliage, mistletoe flowers are very different to their host's flowers to attract a different suite of pollinators maximising pollination efficiency. Mistletoe flowers are very distinctive, particularly in the Loranthaceae family.

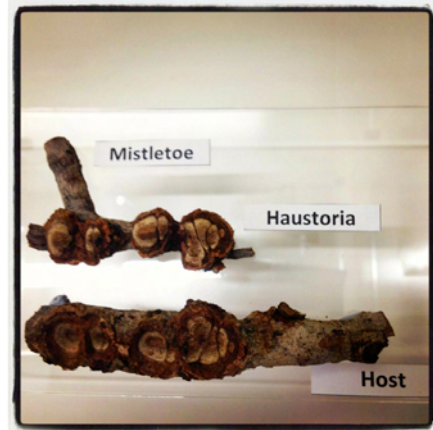


Examples of mistletoe flowers; multiple species with Eucalupt hosts.
Photos: Marina Scalon and Julia Cooke

This display was prepared by Julia Cooke and Marina Scalon. Marina's PhD research is on the ecophysiology of Australian and Brazilian mistletoes. Learn more about her research here: <http://marinascalon.webs.com>

Want to know more?

For examples of dissected haustoria, information about mistletoe birds, and the extraordinary relationships mistletoes and butterfly species, see the display in the cabinet opposite the entrance to the Red Lab in E8A, level 1.



Photos and specimen prep: Julia Cooke