

Botanical Briefs: Australian Stinging Tree (*Dendrocnide moroides*)

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PRACTICE POINTS

- *Dendrocnide moroides* is arguably the most brutal of stinging plants, even leading to death in dogs, horses, and humans in rare cases.
- Clinical observations after contact reveal immediate piloerection and local swelling, which may disappear after 1 hour or last as long as 24 hours, but subjective pain, pruritus, and burning can persist for months.
- The most successful method of removing plant hair is hair removal wax strips, which are considered an essential component of a first aid kit where *D moroides* is found.

Dendrocnide moroides (also known as gympie-gympie, mulberrylike stinging tree, or stinger) is arguably the most brutal of stinging plants, even leading to death in dogs, horses, and humans in rare cases. They can be recognized as shrubs with heart-shaped, serrated, dark green leaves that are covered in what appears to be soft downy fur with red to dark purple raspberries growing on long stems. After contact, there is immediate piloerection and local swelling, which may disappear after 1 hour or last as long as 24 hours, but the subjective pain, pruritus, and burning can persist for months. One can only treat conservatively with symptom management, and the most successful method of removing plant hair is hair removal wax strips, which are considered an essential component of a first aid kit where *D moroides* is found.

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Clinical Importance

Dendrocnide moroides is arguably the most brutal of stinging plants, even leading to death in dogs, horses, and humans in rare cases.¹⁻³ Commonly called *gympie-gympie* (based on its discovery by gold miners near the town of Gympie in Queensland, Australia), *D moroides* also has been referred to as the *mulberrylike stinging tree* or *stinger*.^{2,4-6}

Family and Nomenclature

The Australian stinging tree belongs to the family Urticaceae (known as the nettle family) within the order Rosales.^{1,2,3,5} Urticaceae is derived from the Latin term *urere* (to burn)—an apt description of the clinical experience of patients with *D moroides*-induced urticaria.

Urticaceae includes 54 genera, comprising herbs, shrubs, small trees, and vines found predominantly in tropical regions. *Dendrocnide* comprises approximately 40 species, all commonly known in Australia as stinging trees.^{2,7,8}

Distribution

Dendrocnide moroides is found in the rainforests of Australia and Southeast Asia.² Because the plant has a strong need for sunlight and wind protection, it typically is found in light-filled gaps within the rainforest, in moist ravines, along the edges of creeks, and on land bordering the rainforest.^{3,6}

Appearance

Although *D moroides* is referred to as a tree, it is an understory shrub that typically grows to 3 m, with heart-shaped, serrated, dark green leaves that are 50-cm wide (Figure 1).⁶ The leaves are produced consistently through the year, with variable growth depending on the season.⁹

The plant is covered in what appears to be soft downy fur made up of trichomes (or plant hairs).^{1,6} The density of the hairs on leaves decreases as they age.^{2,9} The fruit, which is actually edible (if one is careful to avoid hairs), appears similar to red to dark purple raspberries growing on long stems.^{5,6}

Cutaneous Manifestations

Symptoms of contact with the stems and leaves of *D moroides* range from slight irritation to serious neurologic disorders, including neuropathy. The severity of the reaction depends on the person, how much skin was contacted, and how one came into contact with the plant.^{1,5} Upon touch, there is an immediate reaction, with

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burning, urticaria, and edema. Pain increases, peaking 30 minutes later; then the pain slowly subsides.¹ Tachycardia and throbbing regional lymphadenopathy can occur for 1 to 4 hours.^{1,6}

Cutaneous Findings—Examination reveals immediate piloerection, erythema due to arteriolar dilation, and local swelling.² These findings may disappear after 1 hour or last as long as 24 hours.¹ Although objective signs may fade, subjective pain, pruritus, and burning can persist for months.³

Dermatitis-Inducing Plant Parts

After contact with the stems or leaves, the sharp trichomes become embedded in the skin, making them difficult to remove.¹ The toxins are contained in siliceous hairs that the human body cannot break down.³ Symptoms can be experienced for as long as 1 year after contact, especially when the skin is pressed firmly or washed with hot or cold water.^{3,6} Because the plant's hairs are shed continuously, being in close proximity to *D moroides* for longer than 20 minutes can lead to extreme sneezing, nosebleeds, and major respiratory damage from inhaling hairs.^{1,6,9}

The stinging hairs of *D moroides* differ from irritant hairs on other plants because they contain physiologically active substances. Stinging hairs are classified as either a hypodermic syringe, which expels liquid only, or as a tragia-type syringe, in which liquid and sharp crystals are injected.

The Australian stinging tree falls into the first of these 2 groups (Figure 2)¹; the sharp tip of the hair breaks on contact, leading to expulsion of the toxin into skin.^{1,4} The hairs function as a defense against mammalian herbivores but typically have no impact on pests.¹ Nocturnal beetles and on occasion possums and red-legged pademelons dare to eat *D moroides*.^{3,6}



FIGURE 1. Leaf and fruit of *Dendrocnide moroides*. Reprinted with permission from Hurley.⁶

The Irritant

Initially, formic acid was proposed as the irritant chemical in *D moroides*¹; other candidates have included neurotransmitters, such as histamine, acetylcholine, and serotonin, as well as inorganic ions, such as potassium. These compounds may play a role but none explain the persistent sensory effects and years-long stable nature of the toxin.^{1,4}

The most likely culprit irritant is a member of a newly discovered family of neurotoxins, the gympietides. These knot-shaped chemicals, found in *D moroides* and some spider venoms, have the ability to activate voltage-gated sodium channels of cutaneous neurons and cause local cutaneous vasodilation by stimulating neurotransmitter release.⁴ These neurotoxins not only generate pain but also suppress the mechanism used to interrupt those pain signals.¹⁰ Synthesized gympietides can replicate the effects of natural contact, indicating that they are the primary active toxins. These toxins are ultrastable, thus producing lasting effects.¹

Although much is understood about the evolution and distribution of *D moroides* and the ecological role that it plays, there is still more to learn about the plant's toxicology.

Prevention and Treatment

Prevention—*Dendrocnide moroides* dermatitis is best prevented by avoiding contact with the plant and related species, as well as wearing upper body clothing with long sleeves, pants, and boots, though plant hairs can still penetrate garments and sting.^{2,3}

Therapy—There is no reversal therapy of *D moroides* dermatitis but symptoms can be managed.⁴ For pain, analgesics, such as opioids, have been used; on occasion, however, pain is so intense that even morphine does not help.^{4,10}

Systemic or topical corticosteroids are the main therapy for many forms of plant-induced dermatitis because they are able to decrease cytokine production and stop



FIGURE 2. Stinging hairs resembling hypodermic syringes of *Dendrocnide moroides*. Republished under the Creative Commons Attribution (CC-BY 4.0).¹

lymphocyte production. Adding an oral antihistamine can alleviate histamine-mediated pruritus but not pruritus that is mediated by other chemicals.¹¹

Other methods of relieving symptoms of *D moroides* dermatitis have been proposed or reported anecdotally. Diluted hydrochloric acid can be applied to the skin to denature remaining toxin.⁴ The sap of *Alocasia brisbanensis* (the cunjevoi plant) can be rubbed on affected areas to provide a cooling effect, but do not allow *A brisbanensis* sap to enter the mouth, as it contains calcium oxalate, a toxic irritant found in dumb cane (*Dieffenbachia* species). The roots of the Australian stinging tree also can be ground and made into a paste, which is applied to the skin.³ However, given the stability of the toxin, we do not recommend these remedies.

Instead, heavy-duty masking tape or hot wax can be applied to remove plant hairs from the skin. The most successful method of removing plant hair is hair removal wax strips, which are considered an essential component of a first aid kit where *D moroides* is found.³

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