



Rust of Tree Heliotrope

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The tree heliotrope (*Tournefortia argentea* L. fil.) is native to tropical Asia, Madagascar, tropical Australia, and Polynesia (Wagner et al. 1999). This small coastal tree, naturalized in Hawai'i, has value to traditional Pacific Island cultures and to contemporary societies. A member of the borage family, *T. argentea* is a source of food, fuel, animal fodder, handicraft material, tools, traditional medicines, and wood for canoe building for atoll-island cultures (Manner and Elevitch 2006). This especially salt-tolerant tree helps keep beaches from eroding, acts as a windbreak to block salt spray, and flourishes as an attractive tropical plant in coastal landscapes and at tourist resorts.

Tournefortia argentea grows as a shrub (1–5 m tall) or small tree (6–12 m tall) in coastal strand environments. In Hawai'i, it is often found with naupaka (*Scaevola taccada*), hau (*Hibiscus tiliaceus*, beach hibiscus), milo (*Thespesia populnea*, Portia tree), pōhuehue (*Ipomoea pes-caprae*, beach morning glory), nanea (*Vigna marina*, beach pea), and other Hawaiian beach plants. These strand plants thrive in the thin, shallow, well-drained, and infertile soils of coral-sand beaches and the rocky coral-limestone outcroppings of the Pacific Islands. The resilient *T. argentea* withstands intense sunlight, strong winds, salt spray, and submersion of roots in salt-water tides. The trees' arching, spreading canopies cast valuable shade upon the beaches and coastlines of all



***Tournefortia argentea* is the only reported host for *Uredo wakensis*, the cause of this conspicuous foliar rust disease.**

the main Hawaiian Islands except Kaho'olawe.

Although the tree heliotrope is relatively free from parasitic insects and plant pathogens, the symptoms of a rust disease first reported in Hawai'i in 1998 (Gardner and Flynn 1998) are conspicuous and damaging to its leaves. In infected plants the rust reduces the food value for humans, can kill leaves and cause defoliation, and reduces the plants' aesthetic value and overall health. Here we discuss rust of tree heliotrope and the pathogenic fungus that causes it, and we suggest integrated practices for managing the disease.

Disease Symptoms and Signs

The symptoms and signs of rust on *T. argentea* vary in severity and incidence among environments and locations. They include the following:

- Small leaf spots with powdery cinnamon- to dark chocolate-brown erumpent uredinia 1–3 mm in diameter. The uredinia, or pustules, are scattered on both the adaxial (upper) and abaxial (lower) leaf surfaces. They release powdery masses of infective urediniospores. These spores are brown, pyriform, globose or subglobose, moderately thick-walled, prominently echinulate (spiny), and measure 19–27 μm \times 24–27 μm (Gardner and Flynn 1998).
- Brown, necrotic leaf spots
- Leaf curling and yellowing
- Leaf death



Left: Powdery cinnamon- to dark chocolate-brown erumpent uredinia scattered on top and bottom of leaf surfaces. **Middle:** Rust pustules surrounded by yellowing leaf tissue. **Right:** Touching the pustules will leave a powdery brown residue on the skin.

- Premature defoliation
- Unthrifty plant growth; tree decline.

Pathogen

The pathogen is a basidiomycete fungus named *Uredo wakensis* Cummins, 1940 (= *Uromycestairae* Hiratsuka, f., 1940). *Uredo wakensis* was originally described infecting *T. argentea* on Wake Island and is also reported from other Pacific islands on that host. *Uredo wakensis* is the anamorphic (uredinal) state of *U. tairae*, which was described originally from Okinawa (Hiratsuka 1940). Only this asexual, uredinial state is known in Hawai'i.

Host Range

Aside from *T. argentea*, the host range of *U. wakensis* is unknown.

Distribution

Currently, the disease is uncommon in Hawai'i. Though widely distributed, it only infects *T. argentea* at a few locations on each island. This may be due to the narrow environmental requirements of the pathogen or those needed for infection. It could also be a lack of spore dispersal among plants or variations in susceptibility to *U. wakensis* among populations of *T. argentea*.

The first report of rust on *T. argentea* in Hawai'i came from Kaua'i in 1996 by Gardner and Flynn (1998), who subsequently found it on O'ahu. The most severely affected areas in Hawai'i are along the North Kona coast of the Big Island at the Old Kona Airport Park and the Four Seasons/Hualalai resort, at Kailua beach on O'ahu, at Kanahā beach on Maui (Forest Starr, personal communication), and at some coastal areas of Kaua'i (Gardner and Flynn 1998).

Disease Management

- Practice sanitation; pick up fallen leaves and prune severely diseased leaves from plants.
- Improve aeration of the tree canopies in areas with high humidity by controlling weeds and removing unwanted windbreaks, and by pruning *T. argentea*.
- Do not plant *T. argentea* side by side. Interplant with other species to reduce spread of the disease.
- Avoid transplanting rust-infected seedlings.
- Do not introduce infected plant material into a rust-free area.
- Fungicides are not registered for tree heliotrope in Hawai'i. Their effectiveness would probably be short lived in any case, as rust fungi develop resistance to many fungicides through mutation. Further, spraying



Left: Infected leaves turn yellow and brown, curl, and fall from the tree prematurely. Middle: Severely diseased plants have fewer viable leaves. About half of the leaves on this branch are heavily infected. Right: Urediniospores of *U. wakensis* (Photograph: Donald E. Gardner, from the Hawaiian Ecosystems at Risk [HEAR] project Web site [www.hear.org/pph]).

pesticides in beach or coastal strand environments could pose risks to those ecosystems.

- No host resistance is reported within *T. argentea*, although disease-free trees may be found. The plant is unimproved; no plant breeding or human selection for agronomic traits has occurred in Hawai'i for tree heliotrope.
- Plants at sites with lower relative humidity and less total rainfall are not as likely to develop severe rust symptoms.

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References

- Gardner, DE, and Flynn, TW. 1998. *Uredo maua*, sp. nov., and *Uromyces tairae*: Additions to the rust flora of Hawai'i. *Mycoscience* 343–346.
- Hiratsuku, V. 1940. Materials for a rust-flora of Riukiu Islands. II. *Bot. Mag.* 54:374.
- Manner, HI, and Elevitch, CR. 2006. *Tournefortia argentea* (tree heliotrope). In: Species Profiles for

Pacific Island Agroforestry, Craig Elevitch, (ed.) Permanent Agriculture Resources, Hōlualoa, HI. 12 pp. <http://agroforestry.net/tti/Tournefortia-treeheliotr.pdf> (accessed 4 June 2012).

Wagner, WL, Herbst, DR, and Sohmer, SH. 1999. Manual of the Flowering Plants of Hawaii (Revised Edition), vols. 1, 2. University of Hawai'i, Bishop Museum Press, Honolulu.