



Mamaki Rust

Pucciniastrum boehmeriae (Dietel) Syd. & P. Syd
(Pucciniastraceae)



Figure 1. Top view of akolea leaf infected with *Pucciniastrum boehmeriae*; inset: close-up.

Background

In August 2013, a diagnostician at the University of Hawaii (UH) Agricultural Diagnostic Service Center, Komohana Research Station incidentally detected an unfamiliar rust on a mamaki (*Pipturus albidus*) leaf sample from a Hawaiian Acres, Kurtistown residential grower on the Big Island. Consequently, the rust sample was sent to the United States Department of Agriculture, Agricultural Research Service, Systematic Mycology and Microbiology Laboratory (SMML), where it was promptly identified via morphological and molecular means as *Pucciniastrum boehmeriae* (Dietel) Syd. & P. Syd., a new record in both Hawaii and the U.S.

A subsequent visit by the UH diagnostician and Hawaii Department of Agriculture (HDOA) staff to the initial detection site yielded only two more slightly rust infected leaves. Additional surveys at mostly nurseries and botanical gardens throughout the main Hawaiian Islands failed to detect the *P. boehmeriae* rust. In November 2015, leaf lesions were spotted on wild *Boehmeria grandis* (akolea) plants in the Southern Koolau Mountains on Oahu by HDOA staff. SMML confirmed the presence of *P. boehmeriae* on the Oahu akolea leaf samples in February 2016, thus increasing both the known local distribution and susceptible endemic host plant species in the Urticaceae plant family.

Importance of the Urticaceae in Hawaii

Mamaki, akolea, and other related Hawaiian species in the Urticaceae (nettle) family have long been important food sources for various native species of Hawaiian fauna. One of these species is the alala (Hawaiian crow- *Corvus hawaiiensis*). While this species is currently extinct in the wild, it is expected to be reintroduced on Hawaii Island in the near future as part of a captive breeding and reintroduction program. According to the Committee on the Scientific Bases for the Preservation of the Hawaiian Crow (1992), between one third and one half of an adult alala's diet consists of fruit from a handful of native understory plants and climbing vines, including mamaki. Hawaii's official State Insect, the Kamehameha butterfly (*Vanessa tameamea*), also depends on *P. albidus* as its preferred host plant, part of a diet highly specific to native Urticaceae, including *Boehmeria*, *Neraudia*, *Touchardia*, and *Urera* (Swezey 1924). According to more recent studies, populations of *V. tameamea* appear to be declining, and can no longer be found in areas where they were once historically common (Tabashnik et al. 1992). While this could be the effect of multiple factors, additional host plant loss due to this rust could negatively affect populations further. Olona (*Touchardia latifolia*) were very important ethnobotanical plants for native Hawaiians. Their sap, stems, fruit, and leaves were used in medicine, kapa, and for prized cordage. In modern times, Urticaceae like mamaki are farmed for tea and grown for conservation and native plant landscaping.



Figure 2. Bottom view of view of akolea leaf infected with *Pucciniastrum boehmeriae*; inset: close-up.



Symptoms and Means of Spread

Tree: Unthrifty appearance with thinning canopy, due to premature defoliation because of the rust infection.

Leaves: Vein-delimited dark/chlorotic spots or lesions on the upper side of leaf surface (Fig. 1) and yellow to orange pustules or uredinia on the lower side of leaf surface (Fig. 2). Uredinia are scattered, minute, and dome-shaped with a central pore (Fig. 3) (Demers *et al.* 2014).

Powdery urediniospores (Figs. 3 & 4) spread by wind or splashing rain to other susceptible plants. However, since no teliospores have been observed, the exact life cycle, and whether or not the rust needs an alternate host is unclear. In general, rust diseases are most damaging under cool conditions with long periods of wetness or humidity.

Host Range and Distribution

According to the SMML database (Farr *et al.* 2016), this pathogen is known from *Abies*, *Begonia*, *Boehmeria*, and *Cypholophus* and occurs in China, Japan, Indonesia, New Caledonia, Nepal, Papua New Guinea, the Philippines, Taiwan, and Thailand. In the State of Hawaii, *P. boehmeriae* was detected on *Pipturus albidis* (mamaki) and *Boehmeria grandis* (akolea) on the Hawaii and Oahu islands, respectively. The infestation on the former does not seem to be widespread, while its distribution on the latter is still unknown and is being investigated.

Management

At present, there is no approved specific fungicide to control the disease. Some licensed broad-spectrum fungicides can be used; however, consult your local county Extension Agent for the proper ones and always read the label before buying and using pesticides. For home gardeners, botanical garden keepers and commercial growers, the Department recommends good sanitation practices, such as removing and bagging or destroying infected leaves, fruits, or other plant parts (as they may harbor the infectious mycelium or urediniospores) as soon as symptoms appear. Improve air circulation and removal of weeds (as they maybe potential or alternate hosts) in the tree hedgerow or growing areas are helpful in mitigating the spread and development of the disease. Sanitizing tools before and after use and keeping the foliage dry when irrigating will help lower the disease incidence and severity. These measures may not be feasible in large natural and conservation areas, but report any suspected sightings to HDOA indicated below. Since occurrence of the rust on other islands other than the Big Island or Oahu is unknown, do not move mamaki, akolea or related plant species, including their fruits from the infested areas.

If you think you have seen mamaki rust, please report it to the Hawaii Department Of Agriculture's Plant Pathology Laboratory at [808-973-9546](tel:808-973-9546).

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Figure 3 Dome-shaped uredinia (red arrows) with a central pore filled with urediniospores.



Figure 4 Echinulate, ellipsoid to pyriform shaped urediniospores.

References

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