



## Rust of Ko'oloa 'Ula (*Abutilon menziesii*)

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Plants in the Malvaceae family are herbs, shrubs, or trees numbering about 1500 species in about 75 genera. Several species endemic to Hawaii are hosts of *Puccinia heterospora*, a nonnative rust fungus causing leaf spotting, curling, blight, and defoliation. *P. heterospora* was probably brought into Hawaii on weedy malvaceous host plants.

The rust disease caused by this plant-pathogenic fungus has become established on the native Hawaiian Malvaceae species *Abutilon grandifolium* (hairy abutilon, ma'o), *A. incanum* (ma'o), and *A. menziesii* (ko'oloa 'ula).

### Symptoms

Raised brown leaf spots appear on leaf surfaces with fuzzy looking masses of fungal spores. On the upper leaf surface the spots appear as sharply defined, circu-

lar, sunken, yellow, spot-like depressions. Leaves often curl and fall off prematurely.

The fungus *Puccinia heterospora* produces these conspicuous, sometimes large ( $\frac{3}{8}$  inch [1 cm]) blotch-like dark lesions on both leaf surfaces but they are often more prevalent on the undersides. The lesions appear powdery in texture owing to the masses of rust teliospores.

Symptoms caused by infection with *P. heterospora* may resemble those caused by *P. malvacearum* on hosts such as 'ilima, which may be infected with either rust. The rust species on malvaceous hosts are best distinguished from one another by microscopic characteristics.

### Cause

The disease is caused by the fungus *Puccinia heterospora* which, like the related *P. malvacearum*, is found on many



Symptoms of leaf rust of *Abutilon menziesii* caused by *Puccinia heterospora*. Left: severely diseased, curling leaf with abundant, dark brown telia on a lower leaf surface. Right: Yellow spots on leaf undersides, some with spores forming during latter stages of symptom development.

plants of the Malvaceae family in Hawai'i, including 'ilima and species of *Abutilon*.

### **Epidemiology**

Wind and splashing water disperse rust spores from lesions of infected plants. Spores landing on leaves can infect and cause leaf spots shortly thereafter. Millions of spores can be produced to cause rapid infection of many leaves on a plant, leading to extensive defoliation and weakening of the plant. Many cycles of disease can occur yearly, because new infections produce spore bearing lesions within 2–3 weeks.

### **Disease management**

#### **Cultural control**

Planting material—Use disease-free plants.

Site—Grow plants in an uncrowded, dry, sunny location. Improve air circulation in the plant canopy.

Horticulture—Maintain good plant nutrition and vigor through appropriate fertilizer and irrigation practices.

Sanitation—Periodically remove and destroy severely diseased leaves from the plant and ground surface. Pick off the first infected leaves, if possible.

Other hosts—Destroy common malvaceous weeds in the vicinity, because they may possibly host the disease.

#### **Chemical control**

Fungicides may be needed to control or eradicate the disease symptoms (check the label for appropriate use permission).

Nonsystemic (protectant)—ferbam, mancozeb (Dithane M-45<sup>®</sup>, Fore<sup>®</sup>, Manzate 200<sup>®</sup>); sulfur; zineb; copper fungicides

Systemic (eradicant)—Bayleton<sup>®</sup>

Apply fungicides with a focus on lower leaf surfaces. With nonsystemic fungicides, apply at 10-day intervals until disease is controlled (unless the label specifies otherwise). With systemic fungicides, follow label direction; fewer applications will be required, compared with nonsystemic fungicides.

#### **References**

- Carr, Gerald. Malvaceae. <http://www.botany.hawaii.edu/faculty/carr/malv.htm>
- Gardner, D.E., and C.S. Hodges, Jr. 1989. The rust fungi (Uredinales) of Hawaii. *Pacific Science* 43:41–55.
- Heimann, M.F., and G.L. Worf. 1997. Hollyhock disorder: Rust. Cooperative Extension Publications, University of Wisconsin, Extension (Publication A2613), <http://cecommerce.uwex.edu/pdfs/A2613.PDF>

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