College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Plant Disease
July 2013
PD-96

Rust of Canna Lily

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Canna lily (*Canna indica* L., Indian shot, *ali'ipole*, *li'ipole*, *poloke*) is a popular landscape ornamental in Hawai'i that grows wild in disturbed sites and along roadsides. Native to tropical South America, *C. indica* also appears near waterways and wetlands. It can be found along the banks of lakes, ponds, streams, and swamps. In addition to traditional garden culture, selections derived from *Canna glauca* are grown in pots in shallow water gardens. Canna lily, an herbaceous perennial, is a monocot in the family Cannaceae. It bears a morphological similarity to the hundreds of hybridized varieties of garden canna classified as *Canna* × *generalis*.

Rusted canna lilies infected by *Puccinia thaliae*.

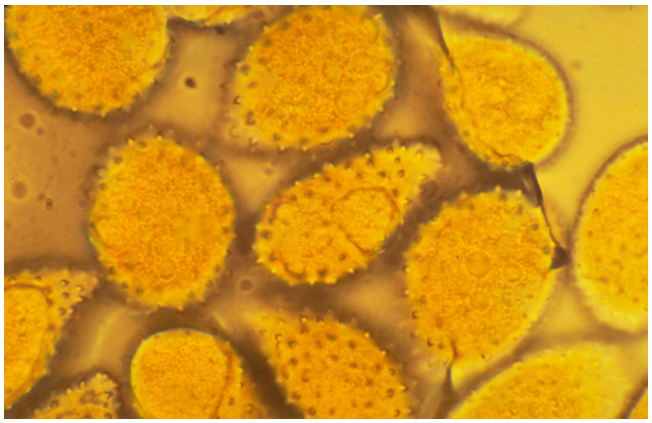
The approximately one dozen groups of hybrids vary widely in the color of their stems, leaves, and flowers (Kessler 2007). Foliage colors range from light green through dark red, with several cultivars bearing leaves striped with reds, yellows, green, and white. Because canna are grown for their bold foliage as much as for their colorful flowers, foliar pests can cause great impact on the plants.

A rust disease caused by *Puccinia thaliae* Dietel. is conspicuous and commonly occurs in Hawai'i. It afflicts canna lily and several other plant genera. The disease damages canna leaves severely, causing them to develop rusty spots, turn brown, senesce prematurely, or collapse and fall. Here we describe the pathogen and the disease symptoms it causes and suggest integrated practices for the effective management of rust of canna lily.

Pathogen

The pathogen is the fungus, *P. thaliae* (= *P. cannae*). Golden urediniospores form in the uredinia. These small eruptions can occur on both sides of a leaf but mostly develop on the undersides. The erumpent uredinia, covered initially by the epidermis, later push through it to expose their powdery golden spores. The urediniospores have bristly walls, may vary from egg- to pear-shaped, measure 28–40 × 20–25 μm, and range in color from golden to pale yellow–orange. Sparse, minute, round reproductive cells called telia also form in the uredinia and are covered by the epidermis. The cylindrical to club-shaped teliospores (reported from Hawai'i by Gardner and Martinez 1985) measure 50–83 × 14–21 μm, have acute or truncate apices that gradually thicken, and have short pedicels (Saccardo 1902). Pycnia and aecia, two other spore stages of a rust fungus, have not been reported for *P. thaliae* (Gardner and Martinez 1985).

Published by the College of Tropical Agriculture and Human Resources (CTAHR) and issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, under the Director/Dean, Cooperative Extension Service/CTAHR, University of Hawai'i at Mānoa, Honolulu, Hawai'i 96822.



Left: Urediniospores of *Puccinia thaliae* are round to ovoid, yellow–orange, and echinulate; they measure 25–35 × 15–20 µm (photograph by Donald Gardner). Right: As the disease progresses, necrosis develops.

Older, lower leaves may be severely diseased and covered with coalesced, yellow uredinia that cause chlorosis, brown necrosis, premature defoliation, and plant decline.

Left: On some canna varieties, rust lesions are vein limited and angular and surrounded by yellow, chlorotic halos. Right: On the underside of leaves the uredinia may form linear arrays within the lesions.



Left: The inch-long, erect seed cases of canna lily contain li'iope ("tiny globes"). These black seeds are worn in lei or placed in shells of the la'amia, the fruit of the calabash tree (*Crescentia cujete*), for hula rattles (Neal 1991). Middle and right: Small, discrete, spore-bearing uredinia may appear on both surfaces of mildly infected upper leaves and leaf sheaths, with corresponding brown, necrotic spots forming on the opposite sides of leaves.

Host Range

The host range of *P. thaliae* includes *Canna indica* (syn. *C. edulis*) and some hybrids of *C.* × *generalis* in the order Zingiberales, family Cannaceae, as well as *Maranta arundinaceae*, *Stromanthe tonckat*, *Thalia dealbata*, and *T. geniculate*, *Calathea* sp., *Ctenanthe* sp., and *Ischnosiphon* sp. in the family Marantaceae (Zingiberales) (Bhasabutra et al. 2011; Jeeva et al. 2004; Kaur 2011; Padamsee and McKenzie 2012).

Symptoms

Symptoms of canna rust have been reported throughout Hawai'i since the early 1970s (Gardner and Martinez 1985). The disease produces numerous small, yellow, irregularly shaped, powdery rust pustules on leaves, petioles, and flowers. These pustules are found primarily on the lower surface of leaves, with corresponding 1–2 mm-diameter chlorotic lesions on the upper surface (Kessler 2007). In advanced stages of the disease, spots on the upper leaf surface coalesce and turn dark brown. Heavily diseased leaves eventually desiccate, collapse, and fall.

Epidemiology

Infection and disease development are favored by high relative humidity and extended periods of leaf wetness. Factors that create high relative humidity include high soil moisture, tall weeds, poor air circulation, and dense or shaded plantings of canna lilies.

Disease Management

Integrate the following practices for best management of rust of canna lily.

- Grow canna cultivars resistant to this disease. Broschat et al. (1983) evaluated 38 cultivars of *Canna* for susceptibility to canna rust. The cultivars 'Halloween' and 'Yellow King Humbert' were highly susceptible, and even the most resistant cultivars, 'Louis Cayeaux' and 'La Boheme', were still moderately susceptible. However, some hybridized varieties may show a high level of resistance to the rust in Hawai'i. Growers should observe the varieties growing in their area and select only those with few or no symptoms of rust.
- Plant canna lilies in in well-drained, fertile soils in well-ventilated areas that receive full sunlight. Apply a layer of compost or mulch several inches thick around plants. Avoid planting cannas in shady or poorly drained locations with high relative humidity.
- Apply a moderate amount of fertilizer (e.g., 5-10-5) monthly to ensure rapid plant growth.

- Prune cannas periodically to reduce crowding and relative humidity in the canopy. Practice "deadheading" by cutting old or spent flowers from the plant. When plant shoots finish flowering, remove the entire stem and leaves to ground level, because no more flowers will develop on these stems. This practice reduces the leafy appearance of the plant, increases aeration in the canopy, and permits more light and fungicide spray to reach the plant.
- Avoid wetting the plant leaves. Do not use sprinkler irrigation.
- Remove and destroy infected foliage. Do not compost symptomatic leaves.
- Destroy all unwanted "volunteer" canna plants.
- Copper fungicides may provide some control of the rust. However, thorough coverage of both upper and lower leaf surfaces and frequent applications (every 2 to 3 weeks) may be required to adequately control the disease. Note that fungicide sprays for rust of canna lily may be relatively costly in labor, equipment, and fungicide product. Although other, more effective or systemic fungicides having modes of action with higher specificity may be available, we do not recommend their use due to the higher probability of the development of fungicide resistance in populations of *P. thaliae*.

Acknowledgements

The author thanks Fred Brooks and Richard Criley of UH-CTAHR for their thoughtful reviews of this manuscript.

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