

Foliar Pathogens in Guam: *Puccinia* and *Uromyces*

Disease: Rust

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Figure 1. Uredospores within uredium of *Puccinia* sp. on wheat
Source: <https://istudy.pk/puccinia/>

Introduction

RUST diseases— best known world-wide for devastating cereal crops— affect a wide range of host plants, including cereals, turfgrass, ornamental grasses, and a few selected non-grass plants. Rust refers to the appearance of infected plants. Numerous small, red to orange lesions can be seen on infested leaf and stem tissue. The coloration of the lesions is due to the masses of pigmented spores produced within the lesions. The two rust genera with the largest number of species are *Puccinia* and *Uromyces* in the family Pucciniaceae. The only morphological difference between the two genera is the number of teliospore (sexual) cells, typically unicellular in *Uromyces* and two-celled (uniseptate teliospores) in *Puccinia*. Other recognized genera causing rust include *Uredo*, *Cerotelium*, *Goplana*, and *Colesporium*.

Hosts

The genus *Puccinia* was mentioned causing rust on 6 hosts in the Index of Plant Diseases on Guam, including canna lily, corn, two grasses, peanut, and onion. Other rust species were also listed, including *Cerotelium* on fig, *Uromyces* on bean and beggarticks, *Uredo* on glorybower, and *Goplana* on yam. *Coleosporium plumeriae* was not listed but is an important rust fungus on Guam, causing rust on the

ornamental plumeria tree. In the Diseases of Cultivated Crops in Pacific Island Countries, rust disease was listed on corn, peanut, French bean, yard-long bean, yam, coffee, wattle, kauri, lucerne, banana, peach, plumeria, canna lily, geranium, split leaf philodendron, and chrysanthemum.

Morphology of *Coleosporium plumeriae*

The life cycle of rust is variable and complex, producing as many as five different types of spores; however, one of the things they have in common is a life cycle stage in which rust colored spores that can be easily wiped off with your fingers are produced. In the case of *C. plumeriae*, only uredospores, teliospores, and basidiospores have been described. Uredospores are the repeating stage of the fungus and are most often observed on heavily infected plants. Lesions start as a small blister (0.5-1 mm diameter), containing the uredia (fruiting body). The uredia are formed on transversing mycelium, later rupturing through the host epidermis and revealing a powdery mass of yellow-orange spores (uredospores) (Fig. 1, 3, & 4). Uredospores (16-26.5 x 21.5-30 µm) are produced within the uredia in chains, are orange-red, circular to ovoid, and 1-celled (Fig. 2a). Two-celled, clavate, reddish teliospores (23-32 x 45-85 µm) are sometimes present (Fig. 2b). Telia begin the sexual stage of the life cycle, forming later on diseased leaves.

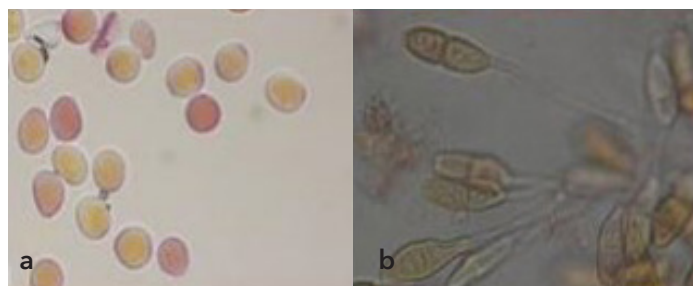


Figure 2. Examples of [a] uredospores, and [b] teliospores
Photos: J. Williams-Woodward



Figure 3. Uredia of *C. plumeriae* on plumeria leaf, as viewed through a hand lens

Source: <http://blogs.ifas.ufl.edu/monroeco/2008/12/02/frangipani-rust/>

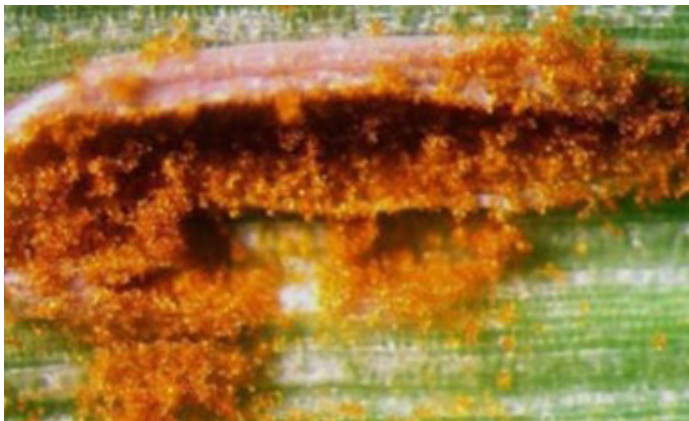


Figure 4. Mass of uredospores rupturing from uredia on surface of plumeria leaf; *C. plumeriae*, as viewed through a dissecting microscope

Source: https://www.researchgate.net/figure/Wheat-stem-rust-caused-by-Puccinia-graminis-f-sp-tritici-a-Severely-infected-leaves_fig1_257789219

Visibility of *Coleosporium plumeriae*

- **With the unaided eye:** small, roughly circular, yellow-orange uredia can be seen (Fig 5a).
- **With a 14X coddington hand lens:** uredia can be clearly seen on host tissue (Fig. 3).
- **With a dissecting microscope:** masses of uredospores are more visible (Fig. 4).
- **With a compound microscope:** uredospores and teliospores are seen in detail (Fig. 2a, 2b).

Disease Development on Guam

Plumeria rust is common throughout the Pacific region. In Guam, it is present year-round, but level of infections appears to vary over the course of the year. Host susceptibility varies with variety, age of plant, and site conditions. *Puccinia* is spread by windborne uredospores, which under wet conditions will stick to leaf surfaces. Free water is required for spore germination and leaf infection, which can occur within 3 hrs. The pathogen survives on infected leaves and leaf debris.

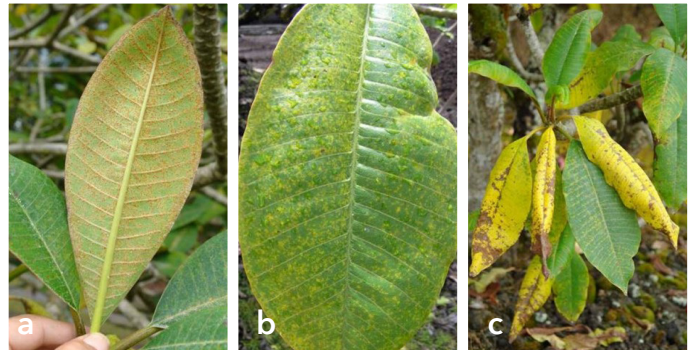


Figure 5. Foliar symptoms of *C. plumeriae* on Plumeria. [a] Uredia on underside of leaf, [b] Infection on upper leaf surface, [c] Older, developed infection

Source: <https://www.ctahr.hawaii.edu/oc/freepubs/pdf/pd-61.pdf>

Foliar Symptoms

The undersides of infected leaves show numerous tiny, raised, yellow/orange to dark orange/brown, powdery rust pustules (uredia) (Fig. 5a). The pustules may emerge sparsely on the upper surface of heavily diseased leaves. Yellow or brown (dependent on host) spots are visible on the upper leaf surface, opposite to the infected sites on the lower surface (Fig. 5b). As lesions age, enlarge and coalesce, these areas develop into sunken, angular and grayish to brown spots (Fig. 5c). When leaves are severely diseased, they may turn yellow, dry, curl, become distorted, and fall. Premature defoliation can approach 100 percent.

For further information

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Acknowledgments

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