Rust on *Commelina diffusa* in Hawaii

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**ABSTRACT**


The uredinial state of a rust disease pathogen is widespread on *Commelina diffusa*, a common ground cover in Hawaii, and sometimes causes death of aboveground portions of the host. No telia have been observed. Although this rust on *Commelina* in Hawaii has been attributed to *Uromyces commelinae*, the rust fungus reported here is *Phakopsora tecta* or *Physopella tecta*. *Sphaerellapis fulm* produced prominent pycnidia in many uredinia. Voucher specimens were deposited in the USDA National Fungal Collection Herbarium in Beltsville, MD.

Additional key words: *Phakopsora commelinae*

*Commelina diffusa* Burm. f. (day flower or honohono "grass") is one of the most common ground covers in the wet regions of Hawaii. In this study on the islands of Hawaii, Maui, and Oahu, this species was almost universally infected, at least to some degree, with a rust fungus. Based on the frequency of these observations, the rust will probably be found on *C. diffusa* wherever this host occurs in Hawaii.

Lighter infections were evident as isolated or converging, reddish brown flecked, pale green to chlorotic areas on the upper leaf surfaces. Masses of colorless urediniospores were visible on the lower leaf surfaces. Heavy infections resulted in death of leaves and decline of all aboveground plant portions, although such extreme effects were rare.

Rust collections on *C. diffusa* from various localities throughout the state have been referred to as *Uromyces commelinae* (Speg.) Cke. (unpublished records of the University of Hawaii Plant Disease Clinic), but no voucher specimens are known to confirm these identifications. *U. commelinae* occurs in many countries and is common in warm regions of the world (1,2), but the characteristics of the uredinia easily distinguish the rust species reported here from *U. commelinae*.

Materials and Methods

Rust-infected leaf tissue for scanning electron microscope (SEM) observation was fixed in 2% glutaraldehyde, dehydrated in a graded acetone series, critical point dried, and mounted with conductive cement and coated with gold-palladium alloy.

Some urediniospores were observed directly by suspending the spores in absolute alcohol and spreading droplets of the suspension on glass coverslips mounted on specimen mounts with conductive cement. The alcohol was subsequently allowed to evaporate. This rapid preparation method was adequate for examination of surface features of urediniospores, although some collapse of the spores resulted.

Specimens were observed and SEM-micrographs taken with a Cambridge Stereoscan S410 SEM using Polaroid type 55 positive/negative film.

Uredinial sori cross sections 10 μm thick were prepared for light microscopic observation by a standard paraffin method (6) for producing permanent, stained slides. Freehand sections of fresh tissue were also prepared. Urediniospores

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**Fig. 1.** Urediniospores of *Phakopsora tecta* or *Physopella tecta* (30 mm = 27 μm).

**Fig. 2.** Uredinial sori of *Phakopsora tecta* or *Physopella tecta* on *Commelina diffusa* showing the (large arrow) prominent epidermal covering with a central pore and (small arrows) characteristic paraphyses (30 mm = 76 μm).
were selected for measurement at random from various sources of fresh infected leaves.

RESULTS AND DISCUSSION

The urediniospores were irregularly ellipsoid, (12)17–21(35) × (19)25–29(40) μm. The average of 100 spores was 19×28 μm. The spore wall was hyaline, rather thin (uniformly about 1.3 μm), and finely echinulate (Fig. 1). Germ pores were not seen despite attempts to locate them.

Urediniosori were hypophyllous and subepidermal in origin and were characterized by prominent epidermal covering with a central pore through which mature spores were expelled (Fig. 2). Numerous large, capitulate or clavate paraphyses occurred around the pore periphery (Figs. 2 and 3). The paraphyses had a prominent apical thickening and were as wide as 11 μm at the apex. Voucher specimens of infected leaves have been deposited in the USDA National Fungal Collection Herbarium, Beltsville, MD.

Uredinia on many leaves were heavily infected with a Sphaerellopsis (= Darluca) species, presumably S. filum (Biv.-Bern. ex Fr.) Sutton; under SEM, their large, shiny black, prominently ostiolate pycnidia appeared to completely dominate infected sori (Fig. 3). Most S. filum conidia were 3–4.5 × 14–16 μm. Each conidium had a prominent central septum and the tuftlike appendage at each end that is usually associated with S. filum.

The prevalence and apparent widespread distribution of the rust suggest that this is the rust of Commelina sp. of previous unpublished reports and observations and probably should be referred to Phakopsora tecta H. S. Jacks. & Holw. (5) or Physopella tecta (H. S. Jacks. & Holw.) Azb. (3) rather than U. commelinae. The relatively recent transfer of Phakopsora tectata Physopella tecta by Azukina (3), whose work was based largely on Jackson's description of the arrangement of the chains of teliospores of Phakopsora tecta (5), illustrates the unresolved lack of consensus in distinguishing between these genera.

U. commelinae is characterized by amphigenous and caulicolous, pulverulent and sometimes circinate uredinia. The uredinia are a paraphysate. The urediniospores are 20–26×26–35 μm. They have a rather thick (2–2.5 μm) dark cinnamon or chestnut brown wall with two equatorial germ pores. The wall is finely echinulate (1,2). This is clearly not the species considered here.

Phakopsora tecta or Physopella tecta may be distinguished from Phakopsora commelinae Gäum. nomen nudum (no other name is available), a rust reported on C. nudiflora L. in Guam and Indonesia (4,7), by the urediniospore and paraphysis dimensions and shape. Jackson (5) described Phakopsora tecta urediniospores as somewhat irregularly ellipsoid, 18–22 × 24–32 μm and the paraphyses as 8–12 μm broad, but P. commelinae urediniospores are reportedly pyriform to oval, (13)14–15(19) × (21)24–25(30) μm and the paraphyses are 12–14 μm broad (4).

No members of the genera Phakopsora or Physopella have previously been reported from Hawaii. The telial state has been encountered only infrequently in tropical regions for U. commelinae or Phakopsora tecta, and telia were not observed in this study.

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LITERATURE CITED