

Rust on *Commelina diffusa* in Hawaii

D. E. GARDNER, Research Plant Pathologist, National Park Service Cooperative Park Studies Unit, University of Hawaii, Honolulu 96822

ABSTRACT

Gardner, D. E. 1981. Rust on *Commelina diffusa* in Hawaii. Plant Disease 65:690-691.

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*. *Sphaerellopsis filum* 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 (unpublished records of the University of Hawaii Plant Disease Clinic), but no voucher specimens are known to confirm these identifications.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 sorus cross sections 10 μ m 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

Accepted for publication 19 May 1981.

The publication costs of this article were defrayed in part by page charge payment. This article must therefore be hereby marked "advertisement" in accordance with 18 U.S.C. § 1734 solely to indicate this fact.

This article is in the public domain and not copyrightable. It may be freely reprinted with customary crediting of the source. The American Phytopathological Society, 1981.

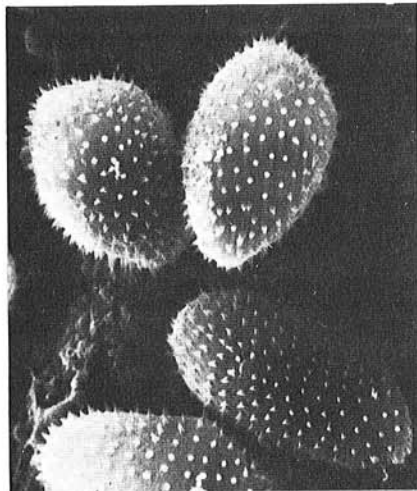


Fig. 1. Urediniospores of *Phakopsora tecta* or *Physopella tecta* (30 mm = 27 μ m).

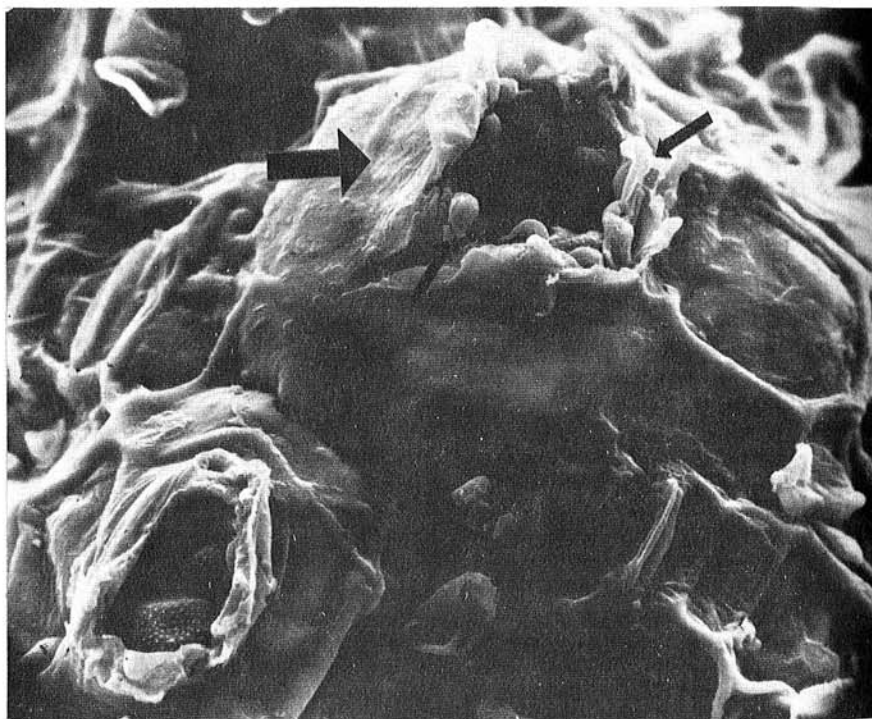


Fig. 2. Uredinial sori of *Phakopsora tecta* or *Physopella tecta* on *Commelina diffusa* showing the (large arrow) prominent epidermal covering with a central pore and (small arrows) characteristic paraphyses (30 mm = 76 μ m).

were selected for measurement at random from various sources of fresh infected leaves.

RESULTS AND DISCUSSION

The urediniospores were irregularly ellipsoid, $(12)17-21(35) \times (19)26-29(40) \mu\text{m}$. The average of 100 spores was $19 \times 28 \mu\text{m}$. The spore wall was hyaline, rather thin (uniformly about $1.3 \mu\text{m}$), 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 a prominent epidermal covering with a central pore through which mature spores were expelled (Fig. 2). Numerous large, capitate or clavate paraphyses occurred around the pore periphery (Figs. 2 and 3). The paraphyses had a prominent apical thickening and were as wide as $11 \mu\text{m}$ 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 $3-4.5 \times 14-16 \mu\text{m}$. 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 tecta* to *Physopella tecta* by Azbukina (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 aparaphysate. The uredinio-



Fig. 3. Pycnidium of *Sphaerellopsis filum* protruding through the pore and rupturing the (large arrow) epidermal covering of a *Phakopsora tecta* or *Physopella tecta* uredinium. The pore is surrounded by (small arrows) paraphyses ($30 \text{ mm} = 27 \mu\text{m}$).

spores are $20-26 \times 26-35 \mu\text{m}$. They have a rather thick ($2-2.5 \mu\text{m}$) 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, $18-22 \times 24-32 \mu\text{m}$ and the paraphyses as $8-12 \mu\text{m}$ broad, but *P. commelinae* urediniospores are reportedly pyriform to oval, $(13)14-15(19) \times (21)24-25(30) \mu\text{m}$ and the paraphyses are $12-14 \mu\text{m}$ 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.

ACKNOWLEDGMENTS

The technical assistance of Dina Kageler and Susan Look is gratefully acknowledged.

LITERATURE CITED

1. Arthur, J. C. 1912. Aecidiaceae. North Am. Flora. 7:237.
2. Arthur, J. C. 1934. Manual of the Rusts in United States and Canada. Purdue Research Foundation, Lafayette. 438 pp.
3. Azbukina, Z. M. 1970. De positione systematica et affinitate generum tribus Phakopsoreae Arth. emend. Azb. Akad. Nauka. SSR Bot. Inst. Nov. Sist. Nizh. Rast. Leningrad 7:208-232.
4. Gäumann, E. 1922. Mykologische Mitteilungen II. Bull. Jard. Bot. Buitenzorg, Série III, Vol. V. Livr. 1. 106 pp.
5. Jackson, H. S. 1926. The rusts of South America based on the Holway collections. I. Mycologia 18:139-162.
6. Sacc, J. E. 1958. Botanical Microtechnique, 3rd ed. Iowa State Univ. Press, Ames. 228 pp.
7. U.S. Department of Agriculture. 1960. Index of Plant Diseases in the United States. Agric. Handb. 165. 531 pp.