

# Plant Parasitic Algae

## Pests and Diseases of American Samoa

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Many people living in tropical and subtropical climates have observed orange growths on plant leaves, stems, even cement block walls. These growths are often identified as filamentous algae in the order Trentepohliales. Their life styles vary from free-living forms found on many surfaces in wet, humid areas, to damaging plant parasites. Though they belong to the division of aquatic green algae (Chlorophyta), the Trentepohliales are aerial, needing free water only to germinate. Their color varies from yellow-green to bright orange, depending on the amount of carotenoid pigment produced. All are autotrophic.

At present there are six recognized genera in the Trentepohliales: *Cephaleuros* Kunze in Fries, *Stomatochroon* Palm, *Phycopeltis* Millardet, *Physolinum* Printz, *Trentepohlia* Maritius, and *Printzina* Thompson and Wujek. *Cephaleuros* is a plant parasite, living under the leaf cuticle of its host (Figure 1a). *Stomatochroon* is only present in the substomatal chambers of leaves (Figure 1b). *Phycopeltis* (Figure 1c) and *Physolinum* usually live on leaves but may be found on other surfaces in humid environments. *Trentepohlia* (Figure 1d) and *Printzina* grow on living and non-living substrates.



Figure 1. (a) sporangiophores and setae of *Cephaleuros* bursting through a leaf cuticle; (b) sporangiophores and sporangia of *Stomatochroon*; (c) *Phycopeltis* on a leaf surface; (d) *Trentepohlia* on a coconut palm.

*Cephaleuros* is the best known genus in the order, with early reports of severe damage to tea and coffee plantations in 19th-

century India. Recently, over 400 host plants of *Cephaleuros* spp. were listed for Brazil, with more than 200 identified in Louisiana, and 150 in Florida.

Species of *Cephaleuros* are occasionally mistaken for fungi. Fuzzy, bright orange spots on leaves and stems look very much like rust fungi. In fact, *Cephaleuros virescens* has the misleading common name, "red rust" (Figure 2).



Figure 2. Rust-like *C. virescens* usually grows on upper leaf surfaces.

Other species of *Cephaleuros* have fungus-like filaments (Figure 3a), sterile hairs (Figure 3b), or produce sporangiophores and zoosporangia that resemble downy mildew fungi (Figure 3c, 3d).

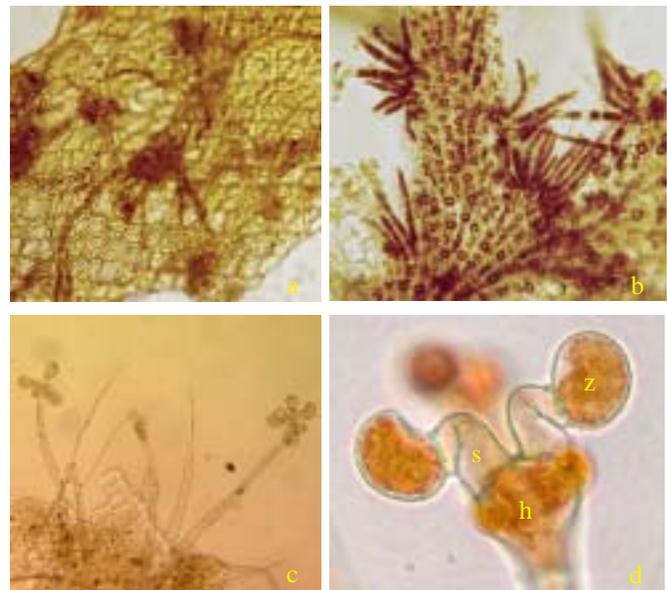


Figure 3. (a) filaments of *C. parasiticus* growing beneath a host's upper epidermis; (b) sterile hairs (setae) of *C. expansa*; (c) sporangiophores and zoosporangia of *C. virescens*; (d) close-up of head cell (h), suffultory cells (s), and zoosporangia (z) of *C. virescens*.

## Survey of Trentepohliales

Loss of tropical species due to habitat destruction is a worldwide concern. The population of American Samoa almost doubled between 1980 and 2000, resulting in a loss of forests and agricultural land (Figure 4). A survey was conducted from June 2000 to May 2002 on Tutuila, the main island of American Samoa. Its purpose was to record existing algae in the Trentepohliales, their host range, and plant damage caused by the parasitic species, *Cephaleuros*.



Figure 4. Lowland rain forest cleared for agricultural production.

## Survey Results

*Cephaleuros*, *Stomatochroon*, *Phycopeltis*, and *Trentepohlia* were collected on Tutuila during this survey: *Printzina* and *Physolinum* were not found. These algae were identified on 145 plant species and cultivars in 100 genera and 48 families. Among these hosts were hibiscus, orchids, euphorbias, palms, kava, citrus, and native forest trees; 90% of the hosts were dicots.

Six of the known thirteen species of *Cephaleuros* are present in American Samoa:

<i>C. expansa</i>	<i>C. minimus</i>
<i>C. henningsii</i>	<i>C. parasiticus</i>
<i>C. karstenii</i>	<i>C. virescens</i>

*C. parasiticus* and *C. minimus* enter plants through the upper leaf surface, grow between cells, and produce sporangio-phores from the lower leaf surface (Figure 5). *Cephaleuros parasiticus* is the most commonly reported of these intercellular fungi and usually causes the greatest damage.

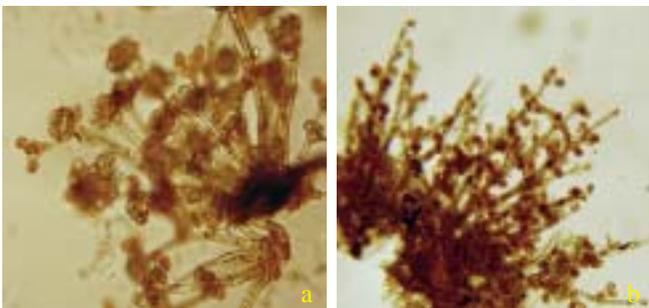


Figure 5. Sporangio-phores of (a) *C. parasiticus* and (b) *C. minimus*.

More than 75% of all *Cephaleuros* species collected during this survey were *C. virescens*. Of the 93 plant hosts infected by this alga, partial or full-thickness leaf necrosis occurred on 49% of the hosts (Figure 6a). Death limited to epidermal cells was observed on 42% of host leaves (Figure 6b) and 9% appeared undamaged.



Figure 6. (a) full-thickness leaf lesion with *C. virescens* still actively growing in its center; (b) necrotic, hypertrophied epidermal cells beneath a superficial *C. virescens* infection.

Fungi parasitized *Cephaleuros*, *Phycopeltis*, and *Trentepohlia*, to form lichens. The lichenized state of *C. virescens* was identified as *Strigula elegans* (Fee) Mull. Arg. (Figure 7). Early literature suggested the fungus portion of *Strigula* was responsible for plant damage. More recent findings, including this study, show the fungus parasitizes the alga, not the plant. Plant injury is caused by the alga before a fungus colonizes it.

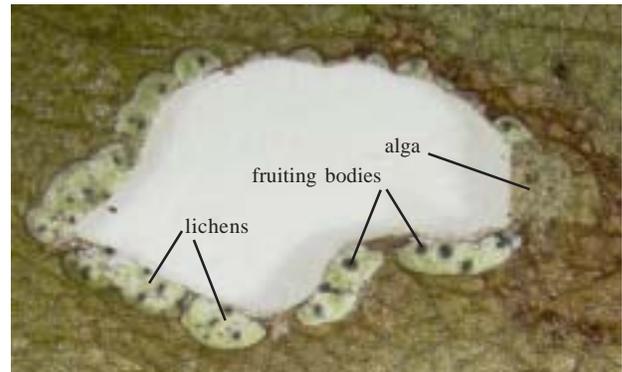


Figure 7. The lichen, *Strigula elegans*, surrounding leaf damage caused by its algal component, *C. virescens* (non-lichenized alga at right).

Severe damage caused by *Cephaleuros* spp. usually occurred on older leaves with less damage to healthy, fast-growing plants. In crowded or poorly maintained fruit orchards or landscape plantings, however, control measures may be desirable. Management of algal infections includes: plant spacing and pruning to increase air circulation and light, sanitation, and appropriate fertilization and irrigation to promote plant health.

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