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STRIGULA FRIES, THE PLANT PARASITIC LICHEN

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Associations between algae and fungi are commonplace and vary widely in their degree of intimacy. The most complex of these associations is a lichen, which can be defined as a long-lived, morphologically distinct thallus composed of an alga and a fungus, within which there is physical and physiological integration, by strictest definition, of benefit to both organisms (4). Ever since the dual nature of lichens was established in 1867 by Schwendener (12), there have been disagreements as to whether the association is truly a mutualistic symbiosis or rather a case of mild parasitism of an alga by a fungus. Though these arguments may be semantic, most lichenologists attribute the following benefits to the symbionts: for the alga, a) protection from adverse environmental conditions such as excess light, desiccation, and mechanical injury; and b) minerals and other inorganic substances for growth; for the fungus, a) vitamins; and b) organic substances derived from algal photosynthesis (1).

Fig. 1 Strigula on Magnolia grandiflora:

A) upper leaf surface showing gray-white spots;

B) typical hand lens view showing black fungal fruiting structures within some of the leaf spots.

Photos 702292-1 & 3 by Jane Windsor

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Lichens are capable of growing on practically any surface that endures long enough for the slow growing thallus to become established and where competition from other plants is minimal. Rocks, tree trunks, and branches are favorite habitats. Observation of lichens on plant hosts has often spawned concern for the health of the host plant. The only possible damage resulting from the vast majority of lichen growths on plant parts is interference with gas exchange of host tissues covered by the epiphyte (2). Within the past year, several plant specimens have been submitted to the Bureau of Plant Pathology bearing thalli of the only known plant parasitic lichen, Strigula Fries.

TAXONOMY OF STRIGULA. The genus Strigula contains a number of species of plant parasitic lichens which occur on leaves and very rarely on stems. The algal component of Strigula is the well-known causal agent of algal leaf spot or green scurf, Cephaleuros virescens Kunze. The parasitic capability of the lichen itself is attributable mainly to C. virescens. Fungal associates of Strigula are known from several genera of fungi; the ascomycetes Massaria and Microthyriella are most commonly reported. Taxonomic classification in the lichens currently is based primarily on the fungal component of the lichen (6), therefore upon taxonomic revision, the taxon Strigula may in the future be separated into several new genera to accomodate each of the fungal components.

IS STRIGULA A PARASITE? Review of the limited literature available on Strigula reveals conflicting information concerning this lichen's parasitic capabilities (3,5,7,11,13,14). This disagreement is understandable since the degree of parasitism by Cephaleuros varies widely, depending largely on the host plant and the environment (7,9,10). Recent ultrastructural studies of Strigula elegans (Fee) Mull. Arg., a common species of Strigula, have verified the parasitic capabilities of the lichen on Magnolia grandiflora L., as evidenced by dead epidermal and parenchyma cells in the leaf tissues beneath the lichen (3). Strigula's status as a true lichen might also be questioned, as Cephaleuros can thrive independently in nature, quite apart from the mutual benefits afforded by lichenization. Again, this may be a matter of semantics, or a function of environment, identity of the fungal associates, and perhaps the vigor of the host plant (8).

SYMPTOMS, LIFE CYCLE OF STRIGULA. The life cycle of the lichen usually commences with an existing algal thallus becoming lichenized via colonization by a compatible fungus. On most of the specimens submitted to the Bureau of Plant Pathology, both Strigula and typical, non-lichenized thalli of Cephaleuros can be observed. The lichens are subcuticular gray-white crusts, 1-10 mm in diameter on the upper leaf surface (fig. 1A), supporting black fungal fruiting structures (fig. 1B). Often, necrosis is present beneath the lichen, but the necrosis seldom penetrates the leaf. Unlike most lichens, Strigula does not produce soredia, (vegetative propagules containing both viable fungal and algal cells). Reproduction of Strigula evidently depends upon chance encounters of the separate organisms which reproduce normally, Cephaleuros by zoospores from sporangia, and the fungus by conidia or ascospores from pycnidia or perithecia, respectively.

HOST RANGE OF STRIGULA. Presumably, the host range of Cephaleuros determines the host range of Strigula. The host range of Cephaleuros in Florida has been updated recently (9), and all hosts listed could be considered potential hosts for Strigula. Host plants have more or less coriaceous, persistent leaves. The literature records the following hosts in the Gulf States: Camellia japonica L., Cinnamomum camphora (L.) Nees & Eberm., Eugenia sp., Illicium floridanum Ellis, Ligustrum sp., Magnolia grandiflora L., Michelia figo (Lour.) K. Spreng., Osmanthus fragrans Lour., Quercus falcata Michx. var. pagodifolia Elliott, and Sabal minor Jacq. (15). From the Division of Plant Industry files, the following hosts can be added: Brassaia actinophylla Endl., Citrus aurantium L., Ilex cassine L., Parmentiera edulis DC., Psidium cattleianum Sabine, Psidium guajava L., Syzygium jambos Alston.

CONTROL. Chemical controls effective against Cephaleuros should perform well on the lichen, Strigula. Fixed or neutral copper sprays at the rate of 1 lb Cu/100 gal water will control the alga (8), but such sprays are not registered for control of either algal leaf spot or Strigula. Cultural control measures directed at improving host plant vigor are effective in controlling Cephaleuros, and hence Strigula. Removal or correction of the limiting factors of plant development should be given first consideration when disease control is deemed necessary.

SURVEY AND DETECTION. Look for small (1-10 mm) gray-white spots on the upper leaf surfaces of plants which have leathery and persistent leaves. Hand lens viewing may reveal black fungal fruiting structures within the leaf spots.

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