

HELICONIA ROOT ROT AND FOLIAR BLIGHT CAUSED BY *CYLINDROCLADIUM*

J. Y. Uchida, M. Aragaki, and P. S. Yahata*

Introduction

The tropical cut flower market has increased markedly in the past few years. Novel heliconia cultivars have delighted North American and European floral designers, and these appealing exotic flowers have been well received by consumers. While demand for new plants and cut flowers continues to increase, growers have noticed a major problem in some of their plantings. Diseased plants in these fields or sections of fields showed excessive leaf loss and general plant decline. The cause of heliconia decline appeared to be parasitic, and a study was undertaken to determine the pathogens involved.

Disease and Symptoms

Diseased plants had dry, papery leaf spots, "firing" or drying of leaf margins, sheath and petiole blights, varying amounts of leaf yellowing, and severe root rot. Leaf scorch and firing of leaf edges are symptoms of water stress, which resulted from sheath and petiole blights, and severe root rot. This was followed by premature loss of leaves, which led to weak and stunted plants. Floral quality and quantity were reduced as a consequence of this decreased photosynthetic capacity of diseased plants.

Rhizomes were generally healthy internally, although there was blackening of the vascular bundles traceable to infected roots.

Cause and Spread

Early isolations made from diseased petioles and dry sheath tissue yielded *Cylindrocladium*, but only saprophytes were recovered from scorched leaf blades. *Cylindrocladium*, a known fungal pathogen of spathiphyllum, fern, palm, alfalfa, papaya, ohia, and many woody plants, was subsequently isolated from rotted heliconia roots as well as from spots on leaf blades, leaf sheaths, and petioles. A survey of several commercial heliconia fields, in which the same species of *Cylindrocladium* was found associated with poorly growing plants, demonstrated the widespread nature of this problem. The fungus was isolated from root rots of the following heliconia cultivars: 'Parakeet', 'Parrot', 'Christmas Red', 'Firebird', 'Wagnerana Rainbow', 'Red Caribea', and 'Kamehameha'. Since heliconia is vegetatively propagated, it is not surprising that the disease was found in so many varieties and locations.

In controlled greenhouse studies, the pathogenicity of the *Cylindrocladium* from heliconia was confirmed on heliconia 'Red Caribea'. Spores of the fungus produced in pure culture were applied to healthy plants, and symptoms of the disease, such as leaf spots, petiole and sheath blights

(Figures 1, 2), and severe root rot (Figure 3), developed. The sheath and roots were especially susceptible.

Morphologically, the *Cylindrocladium* species from heliconia closely resembles *Cylindrocladium spathiphylli*, a very destructive pathogen on commercial spathiphyllum. Two isolates of *Cylindrocladium* from diseased heliconia were not pathogenic to healthy spathiphyllum plants, however. Similarly, isolates of *Cylindrocladium spathiphylli* obtained from spathiphyllum were not pathogenic to heliconia (Figure 3). On the basis of morphological and physiological similarities and host specificity, the fungus from heliconia is tentatively named *Cylindrocladium spathiphylli* f. sp. *heliconiae*.

Cylindrocladium produces large numbers of spores, which are spread by splashing water. Movement of the fungus is relatively slow, because its dispersal depends upon water or soil movement. On the other hand, contamination of clean areas can take place rapidly if contaminated plants, diseased plant parts, and infested tools, soil, and equipment are not properly disposed of or treated. When infested areas of the field are cleaned by removing dead leaves, rhizomes, and roots, this debris should be destroyed, not composted nor dumped in a waste pile.

The fungus also produces microsclerotia, which serve as resistant survival structures; these persist for extended periods in decomposing diseased leaves, roots, or corms. Replanting in an area previously cropped with badly diseased heliconia should be avoided, since infections of healthy plants would likely occur again. *Cylindrocladium crotalariae*, a close relative that also produces microsclerotia, has been reported to survive in fallowed fields for two years.

Control

Although therapy or curing of diseased plants is usually uneconomical, rare, valuable heliconia plants that become diseased can be rescued by careful trimming and peeling of the corms and removal of all dark areas. These trimmed corms should be soaked in a freshly prepared 10-percent liquid household bleach solution for five minutes and then planted in clean vermiculite or commercial potting mix. After these are rooted and growing vigorously, they should be transplanted into clean fields. Any plant that appears weak or is suspect should not be planted out in the field. Every effort should be taken to avoid field introduction of heliconias that may be diseased, as eradication of the pathogen from the field is virtually impossible.

Because of a lack of information on this disease, more work is needed to develop basic control procedures. In the

The authors thank the Governor's Agricultural Coordinating Committee for financial assistance making this research possible.

* Assistant Professor of Plant Pathology, Professor of Plant Pathology, and Research Associate in Plant Pathology, respectively.

meantime, it is crucial for growers who are establishing new fields to use only disease-free planting material. When growers are not certain if the planting material is healthy, rhizomes should be washed, peeled completely, dipped in a surface disinfectant (as mentioned above), and planted in fresh commercial potting mix or sterilized media in individual containers. Plants that grow vigorously with no evidence of poor growth associated with root rot can then serve as stock for new healthy plantings.

Fungicides have not been successful in controlling root rot of *spathiphyllum* caused by *Cylindrocladium*

spathiphylli. This indicates that a successful heliconia root rot control program must be based on careful introduction of disease-free stock plants. Species of *Cylindrocladium* are inhibited by benomyl, and disease prevention of leaf spots and petiole blight may be obtained with this chemical.

The burrowing nematode (*Radopholus similis*) and three root-rotting fungi, *Pythium splendens*, *P. aphanidermatum*, and *P. myriotylum*, have been found in association with heliconia root rot. Their roles in heliconia diseases need investigation.



Figure 1. Young lesions on leaf and sheath of heliconia inoculated with *Cylindrocladium spathiphylli* f. sp. *heliconiae*.



Figure 2. Blighting of sheath and leaves after foliar inoculation. New leaves produced after the inoculation are unaffected.

Figure 3. Root rot caused by *Cylindrocladium spathiphylli* f. sp. *heliconiae*. From left: uninoculated control; plant inoculated with *Cylindrocladium* from *spathiphyllum*; two plants inoculated with *Cylindrocladium* from heliconia.

