

## Foliar Pathogens in Guam: *Cercospora*

Diseases: Leaf Spot, *Cercospora* Leaf Spot, Frog-eye, Leaf Streak

Robert L. Schlub, Ph.D., Julia Hudson, and Elizabeth Hahn  
Cooperative Extension & Outreach, College of Natural & Applied Sciences,  
University of Guam

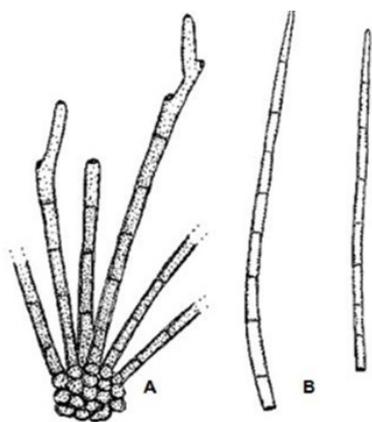


Figure 1. [A] Conidiophore fascicle, [B] Conidia of *Cercospora* sp.  
Source: <https://imafun-gus.biomedcentral.com/articles/10.5598/imafun-gus.2013.04.02.12>

### Introduction

The genus *Cercospora* and its nearly identical taxonomic relative *Pseudocercospora* consist of nearly 2000 spp. Most have no known sexual stage. These fungi are responsible for **LEAF SPOTS** on vegetables, field and forage crops, and woody and herbaceous ornamentals. The region's most severe banana diseases, black Sigatoka or black leaf streak and yellow Sigatoka are caused by *Mycosphaerella*. It has asexual structures like its close relative, *Cercospora*, but with a sexual stage as well.

### Hosts

*Cercospora*, *Pseudocercospora*, and *Mycosphaerella* were mentioned on 39 hosts in the Index of Plant Diseases in Guam, all of which exhibited foliar symptoms. Some common hosts include *Dracaena*, Guam daisy, beach morning glory, giant taro, banana, wax gourd, cucumber, watermelon, eggplant, and pepper. In the Diseases of Cultivated Crops in Pacific Island Countries these pathogens were listed on banana, giant taro, peanut, sweet pepper, coffee, water spinach, lettuce, mango, cassava, and arrowroot.

### Morphology of *Cercospora echinocystis*

Characteristics of the genus *Cercospora* include lack of a fruiting body, zig-zag growth of conidiophores (spore-bearing hypha), and attachment scars on conidiophores with corresponding thickening on the conidia (asexual spore) at point of attachment (hilum). In contrast, the genus *Pseudocercospora* have conidial scars which are inconspicuous, unthickened, and not darkened. In addition, the conidia have a rounded apex instead of pointed and the hilum is neither thickened nor darkened.

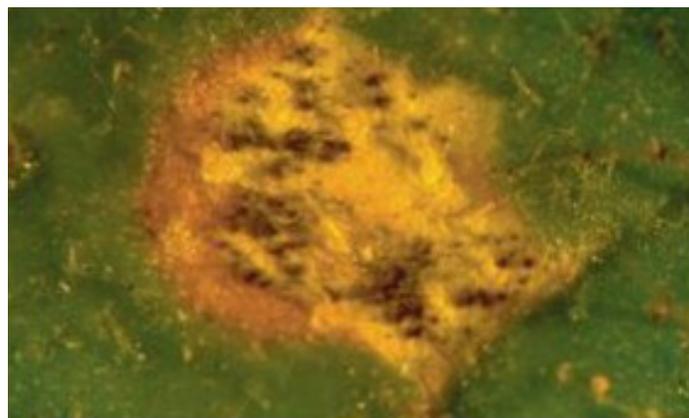


Figure 2. *Cercospora* leaf spot on wax gourd showing pseudostromata, viewed with 14X hand lens  
Photo: R.L. Schlub

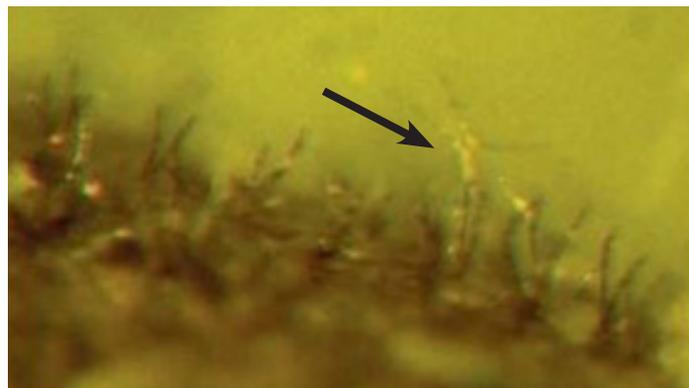


Figure 3. *C. echinocystis* on wax gourd showing hyaline conidia (arrow) on dark conidiophores  
Photo: R.L. Schlub

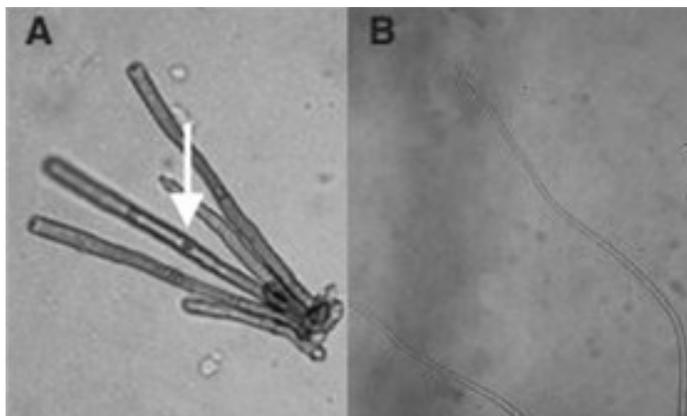


Figure 4. *C. echinocystis* on wax gourd: [A] clump of conidiophores with visible conidia attachment scars (arrow), [B] long conidia  
Photo: R.L. Schlub

*Cercospora echinocystis* is the most commonly reported *Cercospora* species on wax gourd. Conidiophores of *C. echinocystis* (mostly 4-5.5 X 50-300  $\mu\text{m}$ ) are pale brown, straight, or slightly bent, slight and sparingly branched, with septa (cross walls) and are formed in pseudostromata (hyphae matrix) on which 3-10 tightly packed conidiophores are formed (Fig. 1A, 3, & 4A). Conidiophores emerge from the host tissue either through the stomata or by rupturing the epidermis. Conidiophores bear conidia successively on new growing tips. The conidia appear to emerge laterally because of the development of a lateral branch just below the point of attachment, which pushes the terminal point of the conidiophore to the side, while the conidium is still attached. This results in a conidiophore with a slight zig-zag appearance. A scar is formed at the point of the conidial attachment (Fig. 4A). Conidia are solitary, colorless to lightly pigmented, straight to slightly curved, multicellular (having 5-10+ septations per spore), long and slender (50-220  $\mu\text{m}$ ), and with a narrow-pointed tip (1-2  $\mu\text{m}$ ) and a wider base (3.5-5  $\mu\text{m}$ ) (Fig. 1B, Fig. 4B).

### Visibility of *Cercospora echinocystis*

- **With the unaided eye:** leaf spots appear as brown to black circular spots, often associated with a yellow halo (Fig. 5, 6, 7, & 8).
- **With a 14X coddington hand lens:** the fungus appears as hairy black clumps (pseudostromata) with barely visible white silvery threads (conidia) (Fig 2).
- **With a dissecting microscope:** dark conidiophores appear as small bundles of black sticks, many of which have attached conidia (Fig. 1A, Fig. 3).
- **With a compound microscope:** conidia and conidiophores can be seen in detail (Fig. 1, Fig. 4)

### Disease Development on Guam

Favorable conditions for *Cercospora* are 77° to 95° F with night temperatures above 61° F, and a relative humidity of 90-95%. Guam has a year-round temperature of 86-90°F during the day and 75-77°F at night accompanied by a high relative humidity, making Guam the perfect location for this disease. When moisture is sufficient, new spores are formed and spread via rain-splash or wind to new leaves or plants. Infection and lesion formation initially occurs on older leaves before progressing to newer ones.



Figure 5. Leaf spots on eggplant caused by *C. melongenae*  
Source: [https://en.wikipedia.org/wiki/Cercospora\\_melonigenae](https://en.wikipedia.org/wiki/Cercospora_melonigenae)



Figure 6. Enlarged spots and defoliation on eggplant caused by *C. melongenae*  
Source: [https://en.wikipedia.org/wiki/Cercospora\\_melonigenae](https://en.wikipedia.org/wiki/Cercospora_melonigenae)

### Foliar Symptoms

Leaf spot symptoms vary with host. The spots where the central portion is lighter than its margin are referred to as “frogeyes.” Leaf lesions often appear as brown to black circular spots with darker borders and often with a yellow halo (Fig. 5, 7, & 8). As small spots mature, they become larger. Restriction by veins gives them an angular appearance. Coalescing of spots may lead to large irregular-



Figure 7. Leaf spots on watermelon caused by *C. citrullina*  
 Source: <https://extension.okstate.edu/fact-sheets/watermelon-diseases.html>

shaped necrotic areas followed by defoliation. On most hosts, spots are more prevalent at the leaf margin but on others hosts like the ornamental beach morning glory, spots may be numerous and scattered. Black Sigatoka and yellow Sigatoka start out as small spots running parallel to the veins of leaves. Over time, spots enlarge into streaks that turn brown, and coalesce into large areas. Black Sigatoka spots and streaks are black in color (Fig 8) and lack the distinct yellow halo that is present in young streaks of yellow Sigatoka.



Figure 8. Leaf spots on cucumber caused by *C. citrullina*  
 Source: <https://www.insectimages.org/browse/detail.cfm?imgnum=5586132#>

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