



## Foliar Pathogens in Guam: *Phyllosticta* (*Guignardia*)

Diseases: Leaf Spot, Freckle

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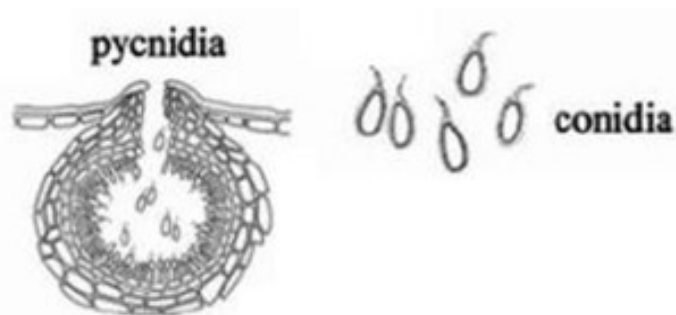


Figure 1. Pycnidia and conidia of a *Phyllosticta* fungi  
Source: [https://www.researchgate.net/figure/Schematic-representation-of-the-life-cycle-of-Phyllosticta-and-its-teleomorph-redrawn\\_fig2\\_257799862](https://www.researchgate.net/figure/Schematic-representation-of-the-life-cycle-of-Phyllosticta-and-its-teleomorph-redrawn_fig2_257799862)

### Introduction

*Phyllosticta* and its nearly identical taxonomic relative *Phoma* are members of the fungal group Sphaeropsidales, which produce small, black fruiting bodies (pycnidia) that contain asexual spores on the surface of infected tissue. The asexual spores (conidia) are released when moisture is present. After formation of the pycnidia, perithecia may form. Perithecia (sexual fruiting bodies) occur less commonly but appear identical to pycnidia. They are the sexual fruiting bodies of these fungi, in which form sexual spores (ascospores). Perithecia appear identical to pycnidia but are less common. Historically the sexual name, *Guignardia*, was given to the majority of the *Phyllosticta*, *Didymella* and *Phoma* spp. When these fungi infect foliage, they often cause **LEAF SPOTS** which are oval to irregular in shape and tannish gray with dark borders. Pycnidia are produced within the leaf spot, often in a ring pattern.

### Hosts

The genus *Phyllosticta* was mentioned causing foliar symptoms on 15 hosts in the Index of Plant Diseases in Guam, most frequently reported on banana and taro. Other hosts include achiote, potato, jack bean, watermelon, guava, bell pepper, sweet pepper, croton, orchids, dumb cane, and confederate rose (*Hibiscus mutabilis*). *Phyllosticta* sp. has

also been known to infect prostrate spurge (*Chamaesyce prostrate*), a common weed found on Guam. In the Diseases of Cultivated Crops in Pacific Island Countries, *Phyllosticta* was listed as a foliar pathogen on yams and banana, and *Phoma* on taro. *Phyllosticta* leaf spots and blights are one of the most serious problems in Hawaii's commercial orchid industry. Leaf freckle of banana is most often caused by *Phyllosticta cavendishii*.

### Morphology of *Phyllosticta cavendishii*

Both *Phyllosticta* and *Phoma* produce small, 1-celled conidia (spores) on short conidiophores (spore-bearing hypha) within a dark, globose pycnidia (closed fruiting structure). *P. cavendishii* pycnidia are light to dark brown in color, spherical to globose, 78-137  $\mu\text{m}$  in diameter, and partially embedded within plant tissue (Fig. 1, 2, & 3). Pycnidia contain short, simple conidiophores (4-5 x 8-12  $\mu\text{m}$ ) that produce the fungal spores. Once produced, spores (conidia) are extruded through the opening (ostiole) at the top of the pycnidium (Fig. 1, 3, & 4b). Conidia are very small (8-9 x 13-16  $\mu\text{m}$ ), colorless (hyaline), rounded or elliptical, and single celled (Fig. 4a, 4b). Often spores form a "tendrils" (11-16  $\mu\text{m}$  long) as they are compressed and extruded through the ostiole of the pycnidium (Fig. 3).

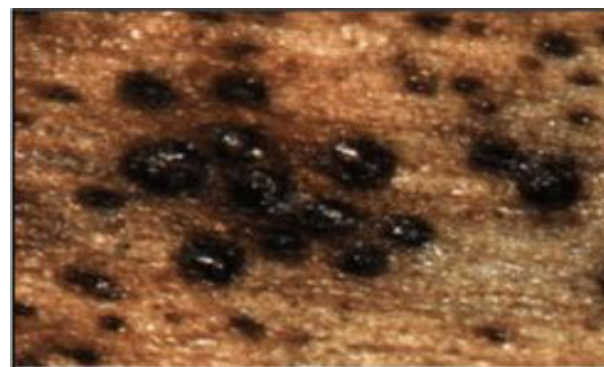


Figure 2. Pycnidia of *P. cavendishii* on banana leaf  
Source: [https://www.researchgate.net/publication/257799883\\_Phyllosticta\\_species\\_associated\\_with\\_freckle\\_disease\\_of\\_banana](https://www.researchgate.net/publication/257799883_Phyllosticta_species_associated_with_freckle_disease_of_banana)



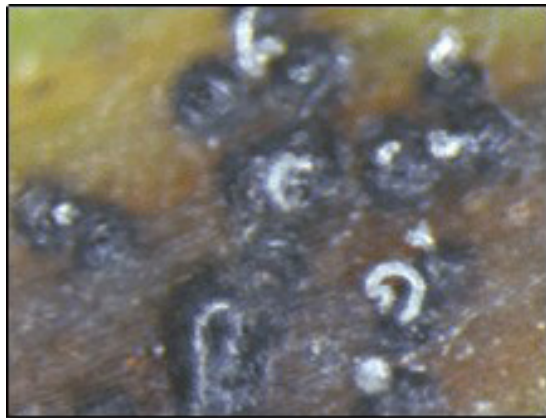


Figure 3. Pycnidia of *P. cavendishii* on banana leaf with spore masses extruding through their ostioles  
 Source: [https://www.researchgate.net/figure/Freckle-disease-Phyllosticta-cavendishii-on-Cavendish-banana-cultivar-a-Symptoms-on\\_fig1\\_336655866](https://www.researchgate.net/figure/Freckle-disease-Phyllosticta-cavendishii-on-Cavendish-banana-cultivar-a-Symptoms-on_fig1_336655866)

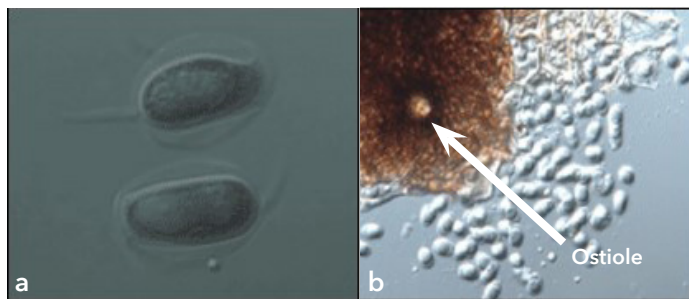


Figure 4. [a] Conidigenous cells of *P. cavendishii* on banana, [b] Pycnidia with ostiole (pore through which spores are discharged) and conidia  
 Source: [https://www.researchgate.net/figure/Freckle-disease-Phyllosticta-cavendishii-on-Cavendish-banana-cultivar-a-Symptoms-on\\_fig1\\_336655866](https://www.researchgate.net/figure/Freckle-disease-Phyllosticta-cavendishii-on-Cavendish-banana-cultivar-a-Symptoms-on_fig1_336655866)

### Visibility of *Phyllosticta cavendishii*

- **With the unaided eye:** larger pycnidia can be seen within leaf spots (Fig. 6).
- **With a 14X coddington hand lens:** pycnidia are clearly seen (Fig. 2).
- **With a dissecting microscope:** pycnidia appear roughly spherical in shape with an opening at the top. Masses of spores can sometimes be seen exiting the ostiole (exit pore through which spores are discharged) (Fig. 3).
- **With a compound microscope:** conidia can be seen emerging from ostiole (Fig. 4b) and tendrils of conidia can be seen in detail (Fig. 4a).

### Disease Development on Guam

Disease development is favored by temperatures of 25-30°C (77-86°F) and 2-3 weeks of cloudy and rainy weather. Due to Guam's year-round temperature range of 76-88°F, a disease outbreak may occur at any time. However, the likelihood is greatest during Guam's rainy season (July-November). Free water is required for spores of *Phyllosticta* to be released and germinated. Sporulation is greatest on older leaves, from there spores are splashed to healthy young leaves. The ability of *Phyllosticta* to continue growing and producing spores after infected tissue dies, enables disease to spread with the movement of dead plant material.

### Foliar Symptoms

*Phyllosticta* leaf spots are typically small (8- 25 mm) and oval to irregular in shape. Young spots are generally reddish brown, developing into tannish-gray leaf spots with dark brown to purple borders which are often accompanied by a chlorotic region surrounding the spot (yellow halo). Leaf spots are usually small and separate, but sometimes spots can cover large areas of the leaf. The centers of spots frequently rot out to produce a "shot-hole" appearance (Fig. 5). Pycnidia (fungal fruiting structures) can often be seen within the leaf spot (Fig. 6).

Similar to characteristics on other hosts but distinctive to banana, *Phyllosticta* causes leaf "freckling" — where individual reddish-brown spots will occur, later turning dark brown to black, usually on the upper surface of leaves (Fig. 7). They occasionally form dense groups. If there are large numbers of spots, the leaves turn yellow and die early.



Figure 5. "Shot-hole" appearance caused by *Phoma* sp. on taro, similar to symptoms of *Phyllosticta* sp  
 Source: [https://www.pestnet.org/fact\\_sheets/taro\\_minor\\_leaf\\_spots\\_094.htm](https://www.pestnet.org/fact_sheets/taro_minor_leaf_spots_094.htm)





Figure 6. Example of pycnidia formed by *Phyllosticta* sp., seen within leaf spots of jackfruit  
 Source: [https://www.researchgate.net/publication/257799862\\_Phyllosticta\\_-\\_An\\_overview\\_of\\_current\\_status\\_of\\_species\\_recognition](https://www.researchgate.net/publication/257799862_Phyllosticta_-_An_overview_of_current_status_of_species_recognition)



Figure 7. *Phyllosticta* sp. causing leaf freckle on banana  
 Source: [https://www.pestnet.org/fact\\_sheets/banana\\_freckle\\_124.htm](https://www.pestnet.org/fact_sheets/banana_freckle_124.htm)

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