

Foliar Pathogens in Guam: *Helminthosporium*

Diseases: Southern Leaf Blight, Leaf Spot

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

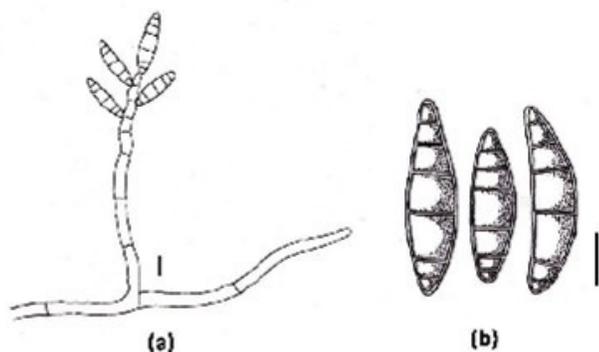


Figure 1. Conidiophore (a) and conidia (a,b) of *Bipolaris* sp., bar = 20µm
 Source: <https://www.researchgate.net/figure/Conidiophore-and-conidia>

Introduction

The genus *Helminthosporium* belongs to the Moniliales order of fungi. *Helminthosporium* spp. have been reclassified as genera of *Bipolaris*, *Dreschlera*, *Exserohilum*, and *Helminthosporium*. Related fungi include *Curvularia*, *Cercosporidium*, and *Cochliobolus*. These fungi are characterized by dark-pigmented structures, production of a stromata, and bipolar germination of their conidia (asexual spore). Besides being a pathogen, these fungi can grow as a saprophyte; therefore, sporulation on dead or dying tissue should not be considered indicative of a disease. These genera of fungi commonly cause **LEAF SPOTS**, **LEAF BLIGHT**, melting out, root rot, and fruit rot symptoms. Infections are most problematic in high value field crops in the grass family *Poaceae*, such as rice, maize, wheat, and sorghum. Historically this pathogen has been responsible for notable epiphytotic and starvation of large human populations in several regions throughout the world. In Bengal, India in 1942, between 50-90% of the rice crop was lost to brown spot. In 1970, 85% of the United States corn crop was threatened by southern corn leaf blight which caused losses in some areas of between 50-100%.

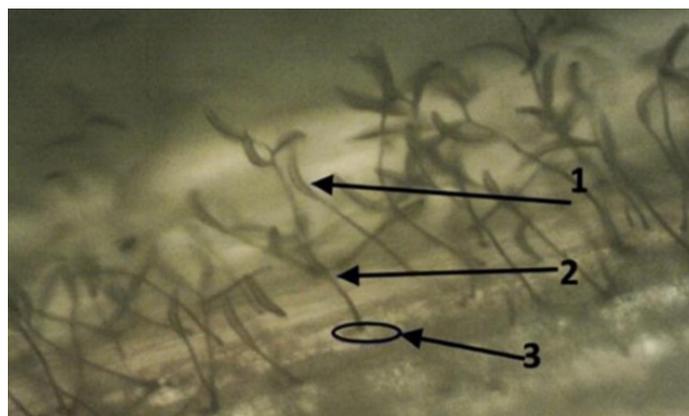


Figure 2. Photomicrograph of infected maize leaf with *B. maydis* conidia: (1) conidium, (2) conidiophore bearing the conidium at the tip, (3) conidiophore having emerged from the stomata
 Source: <https://link.springer.com/article/10.1007/s10658-019-01870-4#Fig1>



Figure 3. Conidia of *Bipolaris maydis* on corn, as seen through a compound microscope
 Photo: B. Deloso



Figure 4. Southern leaf blight on corn, caused by *Bipolaris maydis*
Photo: J. Hudson



Figure 5. Black "hairs" are a sign of southern corn leaf blight caused by *B. maydis*
Source: https://wiki.bugwood.org/Bipolaris_maydis

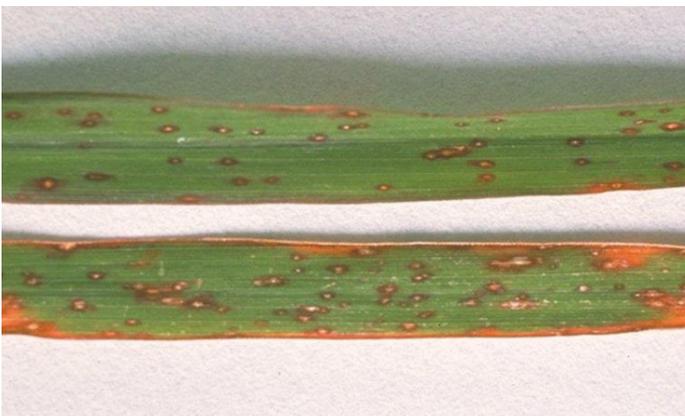


Figure 6. Example of "eye spots" caused by *Helminthosporium* species on grasses: *Curvularia ischaemi* on batiki blue grass
Source: https://apps.lucidcentral.org/pppw_v10/text/web_full/entities/

Hosts

In the Index of Plant Diseases on Guam, either *Helminthosporium*, *Bipolaris*, *Drechslera*, or *Exserohilum* were mentioned on 7 hosts causing leaf spots and leaf blight, most notably causing southern leaf blight on corn.

Molecular testing has identified the species found on Guam as *Bipolaris maydis* (basionym: *Helminthosporium maydis*). Less common hosts on Guam include papaya, yardlong bean, sorghum, hot pepper, and ryegrass. In the Diseases of Cultivated Crops in Pacific Island Countries, *Helminthosporium* was not listed; however, *Bipolaris* was listed on corn and coconut (affecting seedlings only), *Exserohilum* was listed on corn, *Drechslera* was listed on barley, and *Curvularia* was listed on batiki blue grass.

Morphology of *Bipolaris maydis*

Conidiophores of the fungus are simple, tall (5-7 μm wide x 105-470 μm tall), erect, and brown or darkly pigmented. Conidia develop laterally through pores located beneath the septa while the apex of the conidiophore is still growing, forming conidia on each successive new tip (Fig. 1a, Fig. 2). Growth of the conidiophore ceases with the formation of terminal conidia. Conidia are large (14-18 x 66-102 μm), darkly to lightly pigmented, septate, multi-celled, cylindrical to extended ovals, and most accurately described as fusiform (spindle shaped) and typically bent. Center cells tend to be wider than cells at the ends (Fig. 1b, Fig. 3). They germinate principally from one or both end cells.

Visibility of *Bipolaris maydis*

- **With the unaided eye:** long, elliptical to rectangular light brown spots are visible on the leaf surface (Fig. 4, Fig. 6).
- **With a 14X coddington hand lens:** conidia and conidiophores are barely visible as thin black "hairs" (Fig. 5).
- **With a dissecting microscope:** conidia and conidiophores can be seen in more detail (Fig. 2).
- **With a compound microscope:** all features of conidia and conidiophores are clearly visible (Fig. 3).

Disease Development on Guam

The fungus *Bipolaris maydis* survives on corn debris as spores and mycelium. Primary spread of the disease is by movement of spores by wind or splashing water. Severity of disease increases with high humidity and temperature, thus making Guam a highly susceptible environment. Favorable temperatures range from 20-32°C (68-90°F). Under favorable weather conditions, primary leaf infections give rise to spores which result in secondary infections on the same plant. In severe cases this cycle can be repeated; thereby, resulting in nearly all leaves with lesions.

Foliar Symptoms

This group of fungi causes a variety of symptoms depending on the disease and host. On corn, leaf spots begin as long, grayish green or tan spots which are at first elliptical, and later become rectangular, up to 25 mm long and 2-6 mm wide (Fig. 4). The spots are at first separated by the leaf veins, but later may merge. In severe cases all above ground parts of a plant may develop spots with yellow haloes and dark red/brown borders. Leaves will eventually dry out and die prematurely. A closer look within the spots will reveal thin black “hairs,” which are the fungus’ spores and spore-bearing structures (Fig. 5). On grasses, leaf spots have a reddish border and a grey center as they enlarge (Fig. 6). Leaf spots may lead to death of the leaf blade and its crown. Under severe disease pressure, it may cause “melting-out” which are non-distinct patches or patterns of turf that is thinning, turning tan, and dying.

For further information

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Acknowledgments

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