

Foliar Pathogens in Guam: *Alternaria* and *Stemphylium*

Diseases: Early Blight, Bull's Eye, Leaf Blight, Gray Leaf Spot

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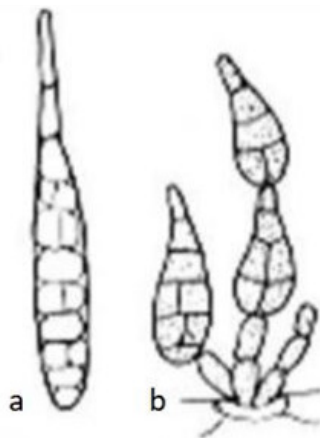


Figure 1. *Alternaria solani*, [a] conidia. [b] chains of conidia arising from short conidiophores
 Photo: Rubert Streets, 1972

Introduction

Alternaria and *Stemphylium* are members of the Pleosporaceae family of fungi. In addition to being plant pathogens, *Alternaria* and *Stemphylium* are considered some of the most important mold allergens (human pathogens) in the USA. They infect foliage as well as other plant tissues. Fortunately, neither species causes major losses on Guam. Conidia of these fungi are distinctive in that they are muriform—having both longitudinal and transverse cross-walls (Fig. 1, 2, & 3b). The cosmopolitan fungal genus *Alternaria* consists of multiple saprophytic and pathogenic species. There are over 60 host-specific *Alternaria* species causing foliar disease in over 100 host species of plants, of which *Alternaria solani* is one of the primary pathogens reported. On Guam, *A. solani* is responsible for **EARLY BLIGHT** of tomato. There are several pathogenic species of *Stemphylium*. *S. solani* is of greatest concern, infecting over 20 species of plants including tomatoes, potatoes, peppers, garlic, and onions. *Stemphylium* grey leaf spot of tomato is distributed worldwide, particularly in humid tropical and subtropical regions.

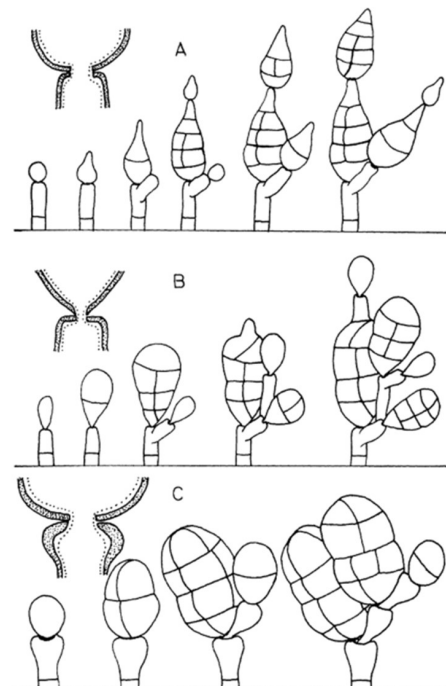


Figure 2. A. *Alternaria*, B. *Ulocladium*, and C. *Stemphylium*: diagrams of conidiophore growth and successive conidia production, with enlargements of the site of contact between conidiophore apex and conidium base

Hosts

In the Index of Plant Diseases on Guam, the genus *Alternaria* was mentioned on 5 hosts and the genus *Stemphylium* was mentioned on 13 hosts. All hosts listed exhibited foliar symptoms. Hosts listed include cabbage, tomato, bean, bok choy, radish, peanut, squash, parsley, sunn hemp, pumpkin, carrot, pepper, onion, and mango. In the Diseases of Cultivated Crops in Pacific Island Countries, *Alternaria* was listed on cabbage, carrot, granadilla, leek, passionfruit, potato, and tomato, and *Stemphylium* was listed on carrot.

Morphology of *Alternaria solani*

The hyphae of *A. solani* are septate and branched, becoming dark with age. Conidia form on simple conidiophores which are darkly pigmented and short (50-90 µm) (Fig. 1b,

Fig. 3a). Conidia are typically formed singly at the apex of conidiophores (Fig. 1b, Fig. 2). Conidia (12-20 x 120-296 μm) are distinctive—darkly pigmented, multicellular, and with both horizontal and vertical cross-walls (septa) (Fig. 1a, Fig. 3b). Isolates having elongated terminal cells (“beaks” or “tails” - Fig. 3) are generally considered pathogenic whereas those without are considered saprophytic. To distinguish among three common foliar fungi that have muriform conidia (*Alternaria*, *Stemphylium*, and *Ulocladium*) it is necessary to examine their conidia and conidiophore development (Fig. 2).



Figure 3. [a] Conidiophores with singular or chains of conidia, typical of *A. solani*. Source: [https://wiki.bugwood.org/Alternaria_solani_\(Early_blight_of_tomato\)](https://wiki.bugwood.org/Alternaria_solani_(Early_blight_of_tomato)). [b] Conidia of *Alternaria solani* Source: <https://www.apsnet.org/edcenter/disandpath/fungalasco/pdlessons/Pages/PotatoTomato.aspx>

Visibility of *Alternaria solani*

- **With the unaided eye:** brown leaf spots appear on leaves. Concentric rings are sometimes visible within spots (Fig. 5).
- **With a 14X coddington hand lens:** concentric rings (or “bull’s eyes”) are clearly visible. Thin strings of conidiophores with conidial chains are barely visible.
- **With a dissecting microscope:** conidiophores with single or chained conidia are clearly visible (Fig. 3a).
- **With a compound microscope:** conidia crosswalls and individual cells are visible (Fig. 1a, Fig. 3b).

Disease Development on Guam

Due to Guam’s year-round growing season and *Alternaria*’s saprophytic and pathogenic capabilities, the fungus is able to survive from crop to crop in plant debris, in volunteer solanaceous crops (tomatoes, peppers, eggplant), and in various solanaceous weeds. Its spores are spread by wind—

germinating and infecting plants within 35 to 120 minutes after landing, depending on conditions. Lower, older leaves are usually attacked first with the disease progressing upward. Favorable conditions for the disease are warm, humid weather with heavy dew or rain. Plants become more susceptible with age, fruit load, and nutrient stress.



Figure 5. Spots of *Alternaria solani* on tomato leaf, showing characteristic yellow halos and bull’s eye
Source: <https://www.apsnet.org/edcenter/disandpath/fungalasco/pdlessons/Pages/PotatoTomato.aspx>



Figure 6. Spots of *Alternaria solani* on potato leaves leading to collapse and death as they coalesce.
Source: https://www.pestnet.org/fact_sheets/tomato_early_blight_211.htm

Foliar Symptoms

First symptoms of early blight on tomato appear as small, pinpoint to 6 mm, circular to angular brownish-black spots, surrounded by yellow halos. As the spot enlarges, concentric rings of dark tissue develop in the spots, creating the characteristic “bull’s eye” (Fig. 5). Spots are often numerous and quickly enlarge to cause leaf blight (Fig. 6). Severe infection on tomatoes may cause leaf drop, thereby exposing fruit to possible sun damage (sunscald), which predisposes the fruit to infection by *A. solani*. Since many species of *Alternaria* can grow on dead tissue,

diagnosis should be based on the formation of spores at the margins of healthy and diseased tissue and not on their mere appearance on dead tissue or fallen leaves.

For further information

Contact the College of Natural & Applied Sciences, Extension and Outreach at 735-2080 for help or more information. Additional publications can be found on our website at: uog.edu/extension/publications.

Acknowledgments

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