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Foliar Pathogens in Guam: *Erysiphe (Oidium)*

Disease: Powdery Mildew

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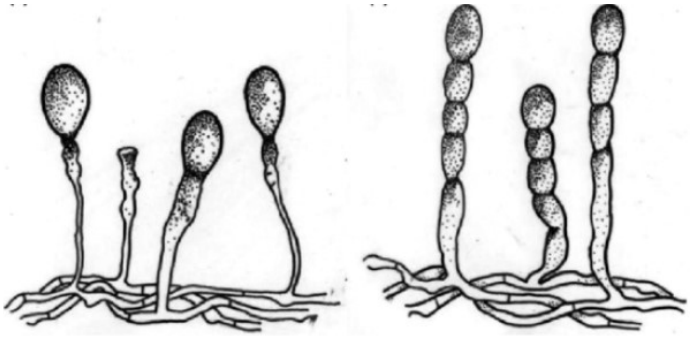

Figure 1. Conidiophores and conidia of powdery mildew
Source: https://www.researchgate.net/figure/Left-a-Non-catenate-conidia-forming-powdery-mildew-sample-taken-from-a-rubber-tree_fig2_298788544

Introduction

POWDERY MILDEW is the name of a disease or the group of Ascomycete fungi that produces a superficial, whitish, talcum-like growth on the surface of leaves and other plant tissue. The powdery mildew fungi include ***Erysiphe,*** *Sphaerotheca, Unicinula, Phyllactinia, Microsphaera, Leveillula,* and *Blumeria*. These fungi produce sexual spores (ascospores) in sac-like structures called asci, which form within a chasmothecia (fruiting body formally referred to as cleistothecia). These fungi are often cited as "oidium", a name derived from the fact that they produce their asexual spores (conidia) in chains.

Hosts

In the Index of Plant Diseases in Guam, powdery mildew, *Oidium*, or *Erysiphe* were cross listed with 28 hosts. Guam hosts include cucumber, bitter melon, bottle gourd, chayote, lettuce, okra, bean, papaya, mango, and watermelon. In the Diseases of Cultivated Crops in the Pacific Island Countries, powdery mildew was listed on papaya, cucumber, strawberry, tomato, mango, and yard-long bean.

Morphology of *Erysiphe cichoracearum*

After a spore lands on a leaf surface, it germinates and produces thin thread-like branching filaments called hyphae. En masse they form the mycelium, which comprise the vegetative (non-sporulating) body of the fungus. Some of the hyphae will develop into specialized cells called conidiophores (8-15 µm wide x 40-132 µm long) (Fig. 1, 3, &4). It is from these upright, simple conidiophores that chains of conidia (asexual spores) are produced (Fig. 1, Fig. 3). A single chain may consist of 3-5 spores. Conidia are large (16-29 µm wide x 32-46 µm long), ovoid, single-celled, and clear (Fig. 4). Mycelium and conidiophores are produced mainly on the upper leaf surface, where en masse they can be easily seen as various sized patches of white powder. Over time these patches turn grayish and may become dotted with fruiting structures 80-150 µm in diameter. Chasmothecia are small, pinhead-sized, spherical structures that are initially white and later turn black with age (Fig. 2).

Figure 2. Example of what chasmothecia of a powdery mildew fungus look like under a 14X hand lens
Source: https://en.wikipedia.org/wiki/Powdery_mildew#/media/File:Uncinula_tulasnei_-_powdery_mildew_-_Echter_Mehltau_07.jpg

Visibility of *Erysiphe cichoracearum*

- **With the unaided eye:** en masse, mycelium and conidial chains appear as whitish, talcum-like growth (Fig. 5 & 6); chasmothecia are barely visible as small dots.
- **With a 14X coddington hand lens:** chasmothecia with appendages are visible as spherical dots (Fig. 2); conidiophores with long conidial chains are barely visible.
- **With a dissecting microscope:** hyphal strands, conidiophores with conidial chains (Fig. 3), chasmothecia, and chasmothecia appendages are visible.
- **With a compound scope:** all conidial structures are clearly visible (Fig. 4) as well as chasmothecia appendages and asci.

Figure 3. Conidiophores of a powdery mildew fungus with conidial chains
Source: https://www.apsnet.org/edcenter/disandpath/

Figure 4. Conidia and conidiophores of a powdery mildew fungus
Photo: R.L. Schlub

Disease Development on Guam

Guam's high temperature and year-round high humidity is ideal for disease development. Unlike most asexual spores of foliar fungi, powdery mildew conidia do not require a wet leaf surface to germinate and infect. Outbreaks of powdery mildew are more likely to be seen during Guam's dry season (January-April) because dry conditions favor the production and dispersal of conidia. Shady conditions generally are more favorable for disease development. Though powdery mildew is a common occurrence on Guam, it is generally not considered a disease of major importance. However, severely infected plants will have reduced yields, shortened production times, and poor fruit flavor.

Foliar Symptoms

Regardless which fungus is causing powdery mildew on a particular host, the symptoms are almost always the same. First to be seen are superficial, sparse, white to gray powdery patches, mainly on upper leaf surfaces (Fig. 5). These patches increase in size and may eventually cover the entire upper leaf surface; simultaneously the color of the underlying tissue changes— most often to a pale yellow-green. In severe infections of Guam's vine crops like cucumber, leaves will develop rapidly spreading yellowish blotches, which eventually causes the leaf to wither and die. Contradicting the norm, powdery mildew on papaya is typically seen on the underside of leaves, with corresponding yellowish-green spots on the upper leaf surface (Fig. 6). In some cases mycelium will also grow on the upper leaf surface.

Figure 5. Powdery mildew on the upper surface of cucumber leaves
Source: https://thisismygarden.com/2019/05/powdery-mildew-2/

Figure 6. Powdery mildew on the lower and upper surfaces of papaya leaves
Source: https:/www.flickr.com/photos/scotnelson/32408459985/in/photostream/

For further information

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