

## Basil Downy Mildew

*Peronospora belbahrii*

**O**n Friday, Jan. 28, the pathogen Basil Downy Mildew was identified as infecting basil at several farms in Wai'anae. It has not yet been found anywhere else in Hawai'i. Basil is a \$6.8M crop in Hawai'i, sold within the Islands and exported to the Mainland and Canada. Leaves infected with downy mildew cannot be sold, and in some areas of the Mainland, growers have lost their entire crop to this disease and fast-spreading pathogen. It is important to first identify this downy mildew and then work quickly to eradicate or greatly reduce it to save present crops and prevent it from spreading.

### What Is It?

According to Cornell University's Plant Pathology department, Basil Downy Mildew, caused by *Peronospora belbahrii*, is a destructive pathogen characterized by clear to black sporulation, yellow leaf discoloration, and die-off of basil leaves. Since 2001, it has been found throughout Europe, Israel, New Zealand, Argentina, and some parts of Africa. It reached the mainland US and Canada in 2007 and greatly expanded the areas infested in 2008. In 2009, it was reported in California. This is the first instance of basil downy mildew identified in Hawai'i.

### What Causes It?

Downy mildews are spread by seeds that have been penetrated and infected by the pathogen and by spores on leaves, seeds, and other items. The numerous spores can also be dispersed great distances by the wind, making it especially contagious. Temperatures in Hawai'i are usually high enough that downy mildews are not a problem, but the recent cool weather and unusual



*Clockwise from top left: yellowing of infected basil leaves; sporulation on undersides of leaves; sporulation as seen from top of leaves; black discoloration of dying leaves. Photographs are from the Cornell Vegetable MD Online, Dept of Plant Pathology, Ithaca, NY.*

rains in Wai'anae have created a favorable environment for this mildew. It may not be an ongoing problem in Wai'anae and other dry areas, but as long as the temperature remains low in the morning hours and there is high humidity or rain, the environment will continue to be ideal for this pathogen. If the pathogen spreads to wetter sites like Kahuku and Waialua on O'ahu or to sites on the neighbor islands, it may become an even greater problem.

### How Do I Know Whether My Plants Have It?

Plants infected with downy mildew have black lesions on the lower leaves and black or purple-gray mildew growing on the underside of the leaves. The leaves then turn yellow, particularly on the upper surface, and eventually become splotched with black or brown and

die. The black spots on dying leaves may be mistaken for sunburn, but sunburned leaves do not have the spores seen with downy mildew. If you are not sure, you can contact your local county agent, the Agricultural Diagnostic Service Center, or Plant Pathologist Dr. Janice Uchida (see Contacts, below).

### What Can Be Done About It?

- Growers should monitor their fields. If downy mildew is confirmed, remove all infected leaves, including those that have fallen to the ground, and burn them or bury them to a depth of at least a foot. Leaves should not be uncovered until they have completely decomposed—about two to three weeks, depending on how moist the soil is.
- After removing infected leaves, apply a fungicide to the remaining stems and later to the new growth. Fungicides approved for basil downy mildew include Fungiphite®, Fosphite®, and Actinovate® AG. These products are licensed for sale in Hawai‘i. The two products listed in the Cornell publication (see Web site, below), ProPhyt® and K-Phite®, are not licensed for sale in Hawai‘i, but they have the same active ingredient as Fungiphite and Fosphite. These products are for commercial growers and not homeowners; an appropriate product for homeowners is still under study. OxiDate®, also listed in the Cornell publication, does not have basil listed on its label and therefore should not be used. Quadris®, a systemic fungicide, is approved for use in Hawai‘i and can also be applied to basil. Kaligreen® may be useful as well, but more study is needed.
- Soil, tools, and equipment, including boxes, trucks, gloves, work clothes, benches, and anything else that could be infested, should be sanitized. Plastics, clothing, and gloves can be soaked in 15% freshly prepared bleach solution (15 parts bleach mixed with 85 parts of water) with a little detergent or soap added for better contact. For wooden benches, spray well with a 30% bleach solution (30 parts bleach and 70 parts water); try to spray the undersides of the benches also, as well as the legs. The ground under the benches can be sprayed with a 20% bleach solution (20 parts bleach and 80 parts water). Used boxes should be discarded, as it is unknown how long the spores will survive on boxes. The upper surface of the soil may have host tissue (leaves with spores) or spores and should be cleaned and allowed to dry. It can be sprayed with fungicide around the plant. Pathogen spores are fragile and will

not last in soil for more than a few days to a week.

- Other types of sterilizing agent include the quaternary ammonium chloride compounds such as Physan 20™. Follow directions for use. These are not toxic to humans if used properly.
- Cornell University advises that certain species of basil are more susceptible to basil downy mildew than others: sweet basil (*Ocimum basilicum*) is the most susceptible, while Thai basil is slightly less susceptible and lemon basil cultivars are even less so. No symptoms were found in New Jersey on ‘Spice,’ ‘Blue Spice,’ and ‘Blue Spice Fil.’
- Growing basil in environments that reduce leaf wetness and humidity will discourage disease. There should be enough space between the plants to allow air to circulate freely among them. For new fields, design a pattern with rows parallel to the prevailing wind direction and use drip irrigation. In fields that are densely planted, removal of some of the plants is recommended to increase air movement and canopy drying. If plants are grown in greenhouses, fans should be used to circulate the air, and plants should be spaced at greater distances.

### More Information

Cornell University’s Extension Service has put out a useful fact sheet about basil downy mildew: <http://vegetablemendonline.ppath.cornell.edu/NewsArticles/Basil-Downy.html#Report>

More pictures of infected plants can be seen here: [http://www.longislandhort.cornell.edu/vegpath/photos/downymildew\\_basil.htm](http://www.longislandhort.cornell.edu/vegpath/photos/downymildew_basil.htm)

#### Local contacts:

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