

FOLIAR BLIGHT OF LEEA CAUSED BY A *PHYTOPHTHORA* SPECIES

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Introduction

Leea coccinea, known as West Indian holly, is commonly used for landscaping in the tropics. Outside the tropics and especially in the temperate regions of the United States, it is a popular potted plant. Red leea, also known as Rubra, is especially prized for landscaping and is an easy, rapidly growing plant with striking color accents. In Hawaii, leea has been relatively disease-free, except for a root and collar rot caused by *Calonectria* and reported in 1981. Recently, a new leaf spot and blight causing significant crop losses was discovered on green and red leea at two commercial nurseries on Oahu.

The first disease specimens were from large potted red leea plants received in 1987. A few months later, young red leea seedlings, approximately 2–3 inches (about 5–7 cm) tall, were observed with similar symptoms at another nursery. In early 1990, an outbreak of this disease occurred on young potted green leea, approximately 8 inches tall, resulting in the loss of hundreds of plants in a commercial nursery. A study of this serious new disease was begun in 1988 and is continuing in our laboratory.

Disease and Symptoms

On mature red leea, leaf spots were irregular in shape, slightly lighter in color than the normal reddish-purple leaves, and difficult to see unless plants were inspected closely (Fig. 1). From a distance, severely infected plants could be recognized by randomly wilting leaflets and leaves, especially at the top half of the plant (Fig. 2). Leaf blights and spots had irregular, dark greenish-purple, water-soaked borders, especially noticeable on the lower leaf surfaces. Lesions dried into wrinkled, brittle, brown to gray-black tissue. Older leaf spots and blights were purplish olive-green to brown, appeared scalded, and were accompanied by considerable defoliation after lesion expansion. The fungus also spread into

petioles and stems, formed dark purple-brown to black lesions, and killed young branches.

On green leea, leaf spots and blights were more distinct. Young lesions and actively expanding blights were grayish green to slightly brownish green. As spots matured and dried, the older areas turned dark brown, then black (Fig. 3). Young plants were severely blighted, wilted, or killed, which resulted in a loss of more than 70 percent of the crop at one nursery.

Causal Organism and Spread

A *Phytophthora* species, apparently new to Hawaii, was recovered from diseased leea. Several collections were made from each nursery where the disease occurred, and *Phytophthora* isolates were cultured. The *Phytophthora* sp. isolated from diseased tissue was similar to *P. meadii*, a known pathogen of rubber and breadfruit in other parts of the world, and *P. megakarya*, a pathogen of cacao.

Pathogenicity of the *Phytophthora* sp. isolated from leea was confirmed by inoculations of red leea plants, using a zoospore suspension prepared from pure cultures. Typical disease symptoms, ranging from leaf spots (Fig. 4) and leaf wilt (Fig. 4, 5) to plant death, were reproduced and the fungus was re-isolated.

Fungal spores, or sporangia, are dislodged and spread primarily by water droplets (e.g., rain or overhead irrigation) and air movement. These spores land on healthy tissue, germinate with moisture, and produce infectious hyphal threads that penetrate the host and proliferate within the plant. Initial symptoms of the disease appear as small spots two to three days after infection. These small spots eventually expand into blights and kill various parts of the plant. The rates of spot expansion and blight development depend on moisture and temperature. Free moisture and temperatures in the 68–86°F (20–30°C) range favor lesion expansion. New spores produced externally on diseased tissue begin the cycle over again. On rare



Fig. 1. Diffuse pale leaf spots on *L. coccinea* caused by *Phytophthora* sp. (see arrows).



Fig. 2. Healthy *L. coccinea* on the left and infected plant with diseased drooping leaves on the right.



Fig. 3. Irregular black leaf spots on green *L. coccinea* caused by *Phytophthora* sp.

Fig. 4. Gray-black active blights caused by *Phytophthora* on green *L. coccinea*.



Fig. 5. Healthy *L. coccinea* on the left; inoculated blighted, defoliating plant on the right.



occasions, large masses of sporangia are sometimes visible as white to creamy, crusty areas on the diseased plant. More commonly, however, these small sporangia are too few to be observed by growers.

Long periods of free moisture from rain or overhead watering favor the pathogen and encourage its spread. Water is needed for fungal germination, penetration of the host, and rapid disease development.

Control

The *Phytophthora* sp. attacking leea appears to be very persistent and continues to grow within the host even when the environment is dry. Disease control should emphasize prevention rather than treatment of plants after the disease has occurred.

Effective disease control after the crop has been contaminated is possible only with a serious commitment to reduce disease levels by removing and destroying all badly diseased plants and infested debris. Diseased plants should be removed from the nursery or incinerated. At low to moderate disease levels, all infected and suspect leaves, twigs, and stems should be removed and destroyed. Crops need to be checked daily, and any new lesions must be excised immediately before new spores are formed. Plants with obvious root rots should be discarded. Nursery clean-up should be assigned to a specific individual who will not fertilize, transplant, or handle healthy plants in the same day. Handling badly diseased plants contaminates hands, clothing, and tools with fungal spores.

The growing environment should be kept as dry as possible. Good air circulation should be encouraged by fans, greater interplant spacing, bench design, and crop position within the greenhouse. Without solid-covered greenhouses, disease control in contaminated crops is nearly impossible during prolonged wet periods.

The economics of attempting to salvage heavily diseased crops is questionable. If it is attempted, all dying or severely diseased plants

should be destroyed, and remaining plants should be cleaned thoroughly by removing all signs of infection. It is important to recognize that plants still harbor the pathogen, even after clean-up and effective fungicidal treatment; using these plants in landscaping will contaminate many areas in the state with this new *Phytophthora*.

Preliminary fungicide trials compared chloroneb (Demosan) at 15 lb/100 gal, phosethyl-Al (Aliette) at 5 lb/100 gal, ethazole (Truban) at 12 oz/100 gal, and metalaxyl (Subdue) at 10 fl oz/100 gal on green leea plants approximately 1½ to 2 feet tall. Treated plants were drenched with the fungicides, maintained in the greenhouse, and inoculated a week later with a suspension of *Phytophthora* zoospores. Disease development was monitored in the greenhouse over a period of three weeks. Best results were obtained with metalaxyl, although some leaf spotting still occurred. Plants receiving no fungicide were severely blighted and defoliated within a week.

Foliar applications of mancozeb (Manzate 200) will kill spores and prevent infection and subsequent establishment of the pathogen if inoculum or spore levels are low. A contact fungicide such as mancozeb is known to destroy only a percentage of pathogenic spores; it does not eradicate all spores. Good nursery sanitation will keep spore levels low and greatly enhance the effectiveness of this fungicide. Very high disease levels make mancozeb virtually useless against this aggressive pathogen.

Since treatment of diseased plants provides only limited benefits, effective control must be provided by preventive measures. This includes identification of clean seed and seedling sources, nursery sanitation, close crop monitoring, and probably one or two fungicidal applications to prevent infections, especially in nurseries exposed to this new *Phytophthora*.

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