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ENTOMOSPORIUM LEAF SPOT

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OVERVIEW

The Entomosporium leaf spot is a widespread disease affecting landscape ornamentals, caused by the fungus *Diplocarpon mespili* (formerly *Entomosporium mespili*). The name Entomosporium means "insect-like" because the spores of the fungus look like microscopic insects (Figure 1). Although this plant pathogen can infect all members of the rose family in nurseries and landscapes, including photinia, hawthorn and flowering pear, the disease is particularly destructive on photinia plants. Red-tip photinia (*Photinia x fraseri*) cultivar is the hybrid species that is most susceptible to this disease. The fungus overwinters on infected twigs and leaves that were produced during the previous year. New growth on the lowest branches of a tree or shrub are generally infected first, after which, the disease symptoms progress upwards. The disease progresses rapidly in mild temperatures (60 to 80 degrees F) and prolonged leaf wetness during spring rains, or in response to persistent moisture from overhead irrigation with limited airflow. Symptoms typically appear as small, slightly raised spots on either surface of the leaf, which then develop into a depressed brown center with dark red margins (Figure 2-4). Cultural practices, including sanitation, pruning, maintaining proper spacing between plants and ensuring good airflow, can help manage the disease. Additionally, fungicides are available to control this pathogen in severe cases of infection.

DISTRIBUTION, DISEASE SEVERITY AND SUSCEPTIBLE HOST PLANTS

Entomosporium leaf spots have been reported across North America and in other parts of the world where photinia is grown. Although all members of the rose family are susceptible to diseases, the most susceptible hosts are photinia (*Photinia* spp.) and cultivars, Indian hawthorn (*Rhaphiolepis indica*) and cultivars, and flowering pear (*Pyrus* spp.).

In Tennessee landscapes, this leaf spot disease is a most common problem on red-tip photinia (*Photinia x fraseri*). Other landscape plants that serve as hosts are hawthorn (*Crataegus* spp.), serviceberry (*Amelanchier* spp.), quince (*Cydonia* spp.), loquat (*Eriobotrya* spp.), crabapple and apple (*Malus* spp.), and flowering and fruiting pear (*Pyrus* spp.) [1,2]. Disease severity varies among species and even cultivars of the same species [3].

THE FUNGAL PLANT PATHOGEN

The fungus *Diplocarpon mespili* has several synonyms, including *Entomosporium mespili*, *Entomosporium maculatum*, *Diplocarpon maculatum*, *Diplocarpon soraueri*, *Entomopeziza mespili*, *Entomopeziza soraueri* and *Fabraea maculata*. It produces conidia (asexual spores) in fruiting bodies called acervuli. These conidia are multicellular (4-5 celled) and have a slender bristle-like appendage, giving them the appearance of microscopic insects (Figure 1). Hence, the common name of the disease reflects the previous generic name, which was Entomosporium, meaning "insect-like." Additionally, the fungus produces two-celled sexual spores called ascospores from the fruiting bodies called apothecia.

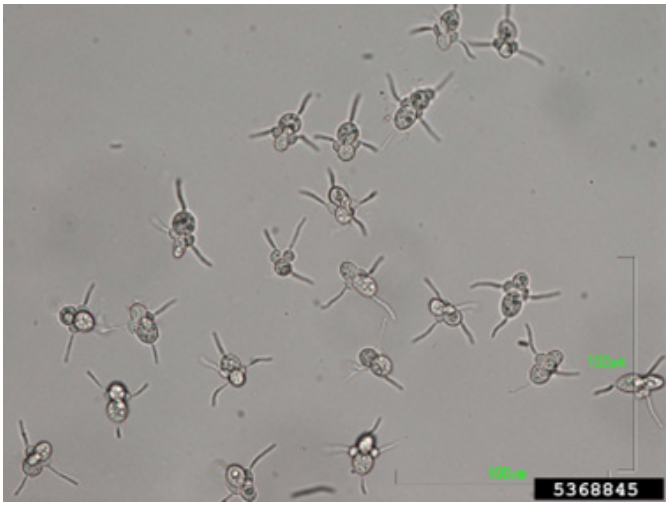

Figure 1: *"Insect-like" Asexual spores (conidia) of the Entomosporium leaf spot fungus (*Diplocarpon mespili*). (Image: Paul Bachi, University of Kentucky Research and Education center, Bugwood.org)*

DISEASE IDENTIFICATION

The symptoms of the leaf spot on photinia initially appear as small, slightly raised spots with a darker red color on either side of the leaf (Figure 2A), which later develop into spots with a depressed brown center with dark red margins.

These spots have grayish centers of necrotic tissues with a distinctive dark red to marron halo or margin (Figure 2B). The disease primarily affects only the leaf blades but may occasionally infect petioles and tender twigs. Minute black specks are developed on centers of each spot, which are the fruiting bodies of the fungus known as acervuli. Initially, leaf spots are randomly scattered, however during heavy infections, large irregular purple to maroon blotches may appear (Figure 3A). Individual lesion may coalesce to form brown areas of dead tissue. Infection leads to premature defoliation (Figure 3B). In red-tip photinia, severe infections lead to complete defoliation, weakening of plants and, in many cases, branch die back and death of the entire plants in landscape have been reported (Figure 3B) [4].

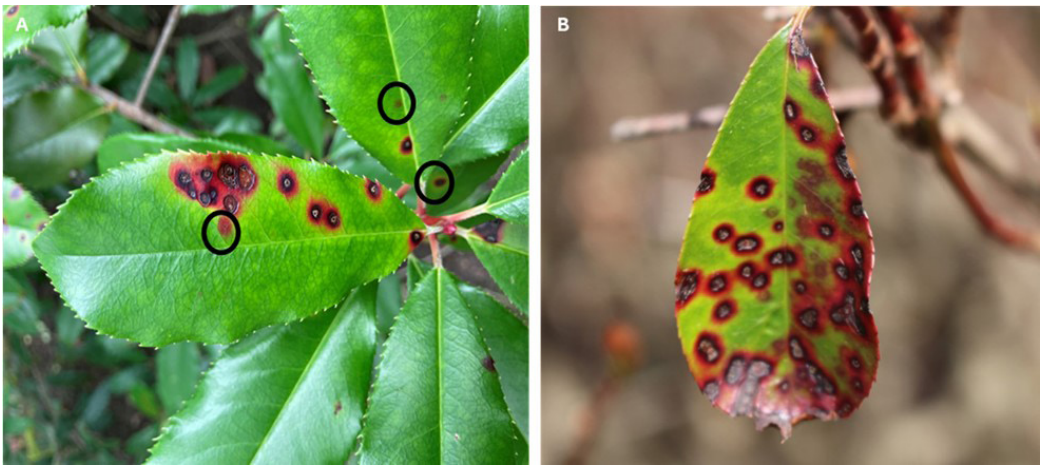

Figure 2: *Entomosporium leaf spot on photinia (*Photinia x fraseri*).* ***A.*** *Appearance of early leaf spot symptoms (reddened tissues; circled in black). B. Late-stage leaf spots present a depressed gray-brown center disk with dark red margins. (Image: Alan Windham, Professor Emeritus, University of Tennessee)*

Figure 3: *Entomosporium leaf spot on photinia (*Photinia x fraseri*).* ***A.*** *A severe infection on photinia leaves with leaf spot areas increasing in size with premature leaf color change that forms large regions of damaged leaves.* ***B****. Defoliation and dieback resulting from a severe leaf spot infection on a hedge of photinia. (Image by Alan Windham, Professor Emeritus, University of Tennessee)*

The symptoms of Entomosporium leaf spots in Indian hawthorn include reddish-purple margins with light gray to dark gray centers, and part of the entire leaf may then turn dark orange or red (Figure 4A) leading to defoliation (Figure 4B).

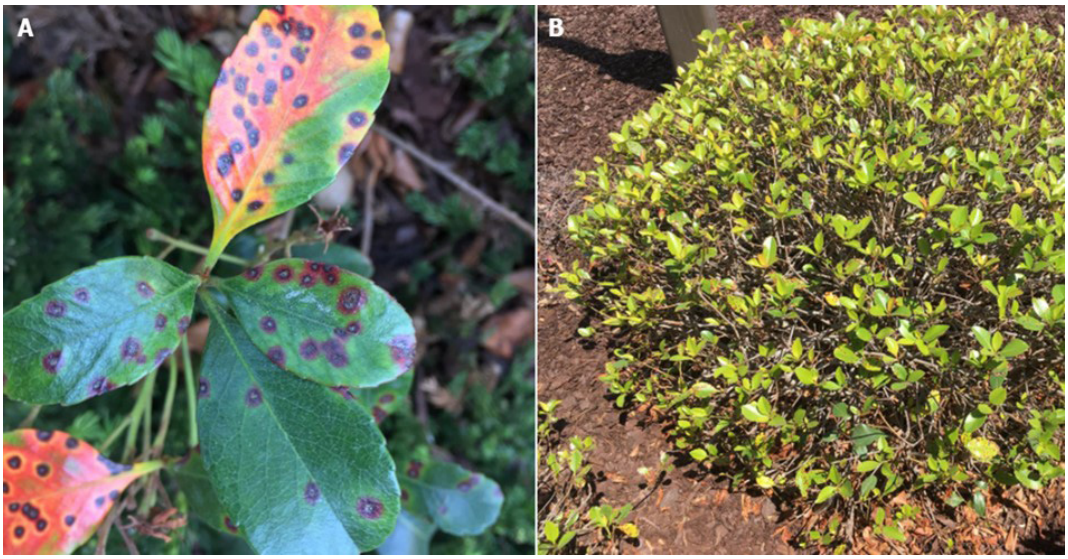

Figure 4: *Entomosporium leaf spot on Indian hawthorn (*Rhaphiolepis indica*). **A**. Early (spot on green leaves) and late-stage symptoms (leaf color change to orange) on Indian hawthorn foliage.* **B.** *Defoliation on Indian hawthorn as a consequence of Entomosporium leaf spot infection. (Image by Alan Windham, Professor Emeritus, University of Tennessee)*

DISEASE CYCLE:

The fungus overwinters mainly as mycelia on infected fallen leaves and twigs from the previous year and on infected leaves that remain on the plant. During periods of mild temperature (60 to 80 degrees F) and humid weather, larger numbers of spores (conidia) are produced from fruiting bodies on the lesion surface. New infections start in late winter or early spring and continue throughout the growing season with mild weather conditions (Figure 5). The spores are spread by splashing water or wind to healthy tissue. Therefore, rainy springs and overhead irrigation promote disease infection. Infections commonly appear first on the new growths of lower branches and spread gradually upward. High humidity, crowded conditions and extended periods of leaf wetness favor disease development. Extended periods of dry weather and high temperatures may slow the spread of the disease. In container nurseries, close plant spacing and overhead irrigation make favorable conditions for diseases development.

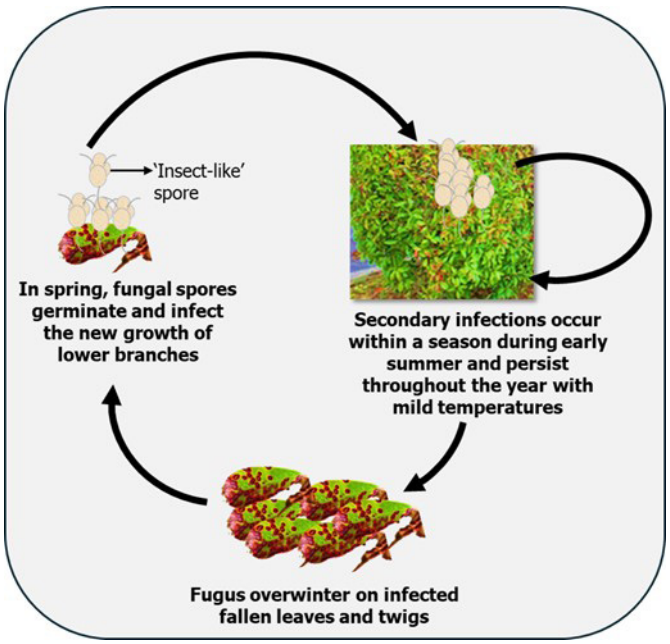

Figure 5: *The disease cycle (asexual) of Entomosporium leaf spot.*

INTEGRATED PEST MANAGEMENT STRATEGIES:

Prevention is the best practice to manage this disease. Cultural practices play an important role for the successful management of this leaf spot. Practices that reduce the inoculum and create unfavorable conditions for the disease, along with using resistant cultivars (if available), are the effective measures for managing it. Currently, there are no resistant cultivars of red tip photinia available in the market, however *Photinia sertifolia* is reported least sensitive and 'Cracklin' red tip photinia is partially resistant to this disease [5].

Cultivars of Indian hawthorn including 'Indian Princess', 'Gulf Gueen', 'Olivia', and 'Snow White' have shown resistance with low level of leaf spotting and premature leaf shedding [6]. Additionally, in resistance screening experiments, hawthorn cultivars such as 'Minor', 'Georgia Petite', and 'Olivia,' have demonstrated resistance to this leaf spot, with low leaf spot and defoliation rating [7].

Cultural methods:

The following cultural practices help to manage the disease:

- Remove spotted fallen leaves from susceptible or infected host plants, particularly in the winter prior to the emergence of new growth.
- Prune severely infected branches and burn them.
- Use clean plant material collected from disease-free stock materials for cuttings and propagation stock. If commercial nurseries purchase the plant liners, where and when possible, newly purchased plant material can be held "in quarantine" away from other susceptible plant species and observed for appearance of any Entomosporium leaf spot symptoms.
- Maintain proper spacing between plants in both landscapes (4-5 feet apart) and nurseries (2-3 feet apart) to ensure good air movement and rapid foliage drying, as well as creating low humid conditions.
- Avoid overhead irrigation; it is preferable to use drip irrigation that is directed onto substrate surfaces. If overhead irrigation is the only option available, scheduling irrigation for the early morning will limit the period of leaf wetness by exposing the leaves to sunlight and wind, which helps dry leaf tissues.

Chemical control methods:

Fungicides can be used to control Entomosporium leaf spot (Table 1). Preventive fungicides can be applied to ensure the production of disease-free plants before the disease incidence, especially for commercial nursery production. On photinia, the application of preventive fungicides is recommended at 10 to 14 day re-treatment intervals, between bud break in early spring and until all new foliage has matured. In home and landscape settings, fungicides can be applied to healthy plants upon appearance of Entomosporium leaf spot symptoms on nearby plants. Curative fungicides can be used to control defoliated plants. Read the label of the specific fungicides to determine whether it has preventive or curative actions. Some fungicides can provide both curative and preventive action. To minimize the risk of fungicide resistance, choose multicide fungicides (indicated with letter 'M') or combinations of single-site and multisite fungicide, and/or rotate fungicides with different modes of action (FRAC CODE) rather than just the different names (as different brand names may have same mode of action).

Table 1. Fungicide products and active ingredients recommended for (P) prevention, (C) curative management or (P/C) both protection against Entomosporium Leaf spot on Photinia and Indian hawthorn.

Name of Fungicides	FRAC CODE	Active ingredients	Homeowner rate (per gal)	Commercial rate (per 100 gal)	Application Interval (days)	Action
Spectro 90^{WDG}	1+M5	Chlorothalonil + Thiophanate-methyl	-	1-2lbs	7-14	P/C
Banner Maxx II	3	Propiconazole	-	5-8 fl oz	14-21	P
Daconil Weatherstik	M5	Chlorothalonil	1 ½ - 3 tsp	1.4 pt	7-14	P/C
Daconil Ultrex	M5	Chlorothalonil		1.4lb	14-21	P/C
Fung-onil concentrate	M5	Chlorothalonil	2 ¼ tsp	-	7-14	P/C
Eagle 40WP	3	Myclobutanil		3-6 oz	10-14	P/C
Zysban WSB	1 +M3	Thiophanate-methyl + Mancozeb		24 oz	7-10	P/C
Bayleton FLO	3	Triadimefon		4-8 fl oz	14-21	P/C

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PRECAUTIONARY STATEMENT

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

DISCLAIMER

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), the University of Tennessee Institute of Agriculture and University of Tennessee Extension assume no liability resulting from the use of these recommendations.

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