Proc. Fla. State Hort. Soc. 121:353–355. 2008.

Cercospora Leaf Spot Caused by *Cercospora dendrobii* on *Dendrobium antennatoum* Lindl. and Its Control

Robert T. McMillan, Jr.[1]*, Aaron J. Palmateer[2], and Wagner A. Vendrame[2]

[1]*Kerry's Nursery, Inc., 21840 S.W. 258th Street, Homestead, FL 33031*

[2]*University of Florida, IFAS, Tropical Research and Education Center, 18905 S.W. 280th Street, Homestead, FL 33031*

Additional index words. dendrobiums, disease control, evergreen, fungicides, fungicide source, leaf spots

Cercospora leaf spot disease of *Dendrobium* spp. has been reported in Florida, Thailand, and most of the tropical areas of the world where dendrobiums are grown. It most commonly occurs in southern Florida and has been significant in dendrobium production. Other species of cercospora leaf spot pathogens are occasionally found on other genera of orchids, including *Angraceum*, *Cattleya*, *Odontoglossum*, *Brasavola*, *Broughtonia*, *Epidendrum*, and *Schomburgkia*. Leaf lesions on the *Dendrobium* are at first noted on the undersurface of the leaf as pale yellow sunken spots, 1 to 3 mm in diameter. With time, the spots continue to enlarge in a circular or irregular pattern and eventually may cover the whole underside of the leaf. Later the spots become slightly sunken and purple-black with the developing margin remaining yellow. Following the appearance of the spots on the lower leaf surface, a corresponding yellow–pale green area can be seen on the upper leaf surface. Eventually the spots turn purplish-black or black. Heavily infected leaves abscise. Prolonged periods of leaf wetness should be avoided. Chlorothalonil and thiophanate-methyl are labeled for control of cercospora leaf spot on orchid in the United States. Results from cercospora fungicide trials conducted in 2005 showed that the BASF 516 04 F (pycadostrobin + boscalid) 38%WG at 340.2 g per 379 L of water and pyraclostrobin 20%WG at 226.8 g per 379 L of water were significantly effective.

The *Dendrobium* genus contains about 1200 tropical species. The genus occurs in diverse habitats throughout much of southern, eastern, and Southeast Asia, including the Philippines, Borneo, Australia, New Guinea, and New Zealand. The orchids grow quickly throughout summer, but take a long rest during winter. In the spring, new shoots are formed and it is at this time of the year that the dendrobiums are most susceptible since the climatic conditions are favorable to the *Cercospora* pathogens. Some species are in great demand by orchid lovers and this has resulted in the breeding of numerous varieties and hybrids. Burnett (1974) reported six species of *Cercospora*—*Cercospora epipactidis* C. Mass., *C. peristeriae* Burnett, *C. dendrobii* Burnett, *C. angraeci* Feuilleaubois and Roumeguere, *C. odontoglossi* Prillieux and Delacrois, and *C. cypripedii* Ellis and Dearness—that infect orchid species. He also reported four undescribed *Cercospora* spp. infecting orchids. Burnett, (1974) found all of the undescribed *Cercospora* spp. caused some type of injury to orchids. *Cercospora* diseases are almost manifested as leaf spots that either stay relatively small and separate, or may enlarge and coalesce, resulting in leaf blights. The diseases are found in cereals and grasses, field crops, vegetables, ornamentals, and trees (Agrios, 1997). *Cercospora* spp. are more prevalent in the tropical/subtropical world, with fewer found in the temperate environs (Agrios, 1997; Burnett, 1974; Chupp, 1953; Dodge and Ricket, 1943). *Cercospora dendrobii* was first discovered causing a leaf spot on dendrobiums in West Palm Beach, FL in Oct. 1961 (Burnett, 1974). It was later found throughout the state of Florida on many dendrobiums, both evergreen and deciduous cultivars and species, and has since become established wherever infected dendrobiums have been imported (Burnett, 1974).

The fungus attacks some 100 different types of plants, including both cultivated ones and weeds (Alfieri et al., 1991; Farr et al., 1989; Pirone, 1970). The disease occurred as a severe blight affecting more than 90% of 500 dendrobium potted nursery stock during Spring 2005. Grade and standard qualities were severely reduced due to severe foliage blight (Fig. 1). The purpose of this research was to determine effective methods of control.

Fig. 1. Potted dendrobium plants showing all stages of cercospora disease development, yellow lesions on leaf surfaces, chlorotic, and necrosis.

*Corresponding author; email: rmcmillan@kerrys.com; phone: (305) 242-4591

Table 1. Fungicides applied to dendrobiums to manage *Cercospora*.

Active ingredient	Trade name	Formulation	Rate of product/379 L[z]	Company, city, state
Control				
BAS 516 04 F		38%WG	170.10 g (6.0 oz)	BASF Corp.,Triangle Park, NC
BAS 516 04 F		38%WG	340.19 g (12.0 oz)	BASF,Corp.,Triangle Park, NC
Thiophanate methyl	Cleary's 3336	4F	177.39 mL (6.0 fl oz)	Cleary's Chemical Corp., Dayton NJ
Azoxystrobin	Heritage	50WG	113.40 g (4.0 oz)	Syngenta Professional Products, Greensboro, NC
Pyraclostrobin	Insignia	20%WG	113.40 g (4.0 oz)	BASF Corp.,Triangle Park, NC
Pyraclostrobin	Insignia	20%WG	226.80 g (8.0 oz)	BASF Corp.,Triangle Park, NC
Mancozeb	Pentathlon	LF	946.07 mL (32.0 fl oz)	SePro Corp.,Carmel, IN

[z]Application rate recommended on the product label per 379 L (100 gal).

Materials and Methods

Dendrobium clones, *D. antennatoum,* were potted in hard coco on 10 Sept. Plants were fertilized weekly with 150 ppm Peters Professional 20–20–20 water-soluble fertilizer (The Scotts Company, Marysville, OH). The experimental area consisted of 10 potted *D. antennatoum* plants infected with *C. dendrobii* placed on each side of the 10 potted *D. antennatoum* treatment plants. Ten plants per treatment were arranged in a completely randomized design with four replications. Each treatment row of *D. antennatoum* was bordered by two *C. dendrobii* infected rows.

Five fungicides were evaluated for disease control in a commercial nursery. Treatments and rates, except mancozeb, were applied every 21 d, with first fungicide application on 10 Mar., ending on 10 May, for a total three applications with a CO_2-driven backpack sprayer equipped with a single, flat fan nozzle (Table 1). Mancozeb was applied every 7 d for a total of nine applications. Treatments were applied until point of runoff in a spray volume of 100 gal/acre.

Cercospora dendrobii lesions were counted on 17 May. Plants were rated on a scale of 1 to 10, where 0 = no disease, 2 = very few lesions on the lower canopy, 3 = very few lesions in upper canopy, 4 = some lesions with slight defoliation, 5 = lesions noticeable in upper canopy with some defoliation, 6 = lesions numerous with significant defoliation, 7 = lesions numerous with heavy defoliation, 8 = very numerous lesions on few remaining leaves, 9 = very few remaining leaves covered with lesions, and 10 = plant completely defoliated.

Results and Discussion

Cercospora dendrobii lesions on plants in treatment rows infected from the diseased border-row dendrobiums were identical in all respects to the lesions resulting from natural infection.

Disease lesions were first noted on the leaves 6 to 10 d after infection and began as a light yellow area on the lower surface. Some of the lesions coalesced, resulting in large yellow areas. As these aged they became sunken and turned purple-black with a chlorotic halo surrounding them. On the upper leaf surface there was a corresponding yellow-green spot. As these leaf spots aged, they turned purplish-black or black. The heavily infected leaves eventually turned chlorotic and abscised. These lesions matched those described by Burnett in 1974.

All of the fungicides applied as a protective spray resulted in declined infecton when compared to controls (Table 2). Plants treated with BAS 516 of F (pycadostrobin + boscalid), thiophanate methyl, azoxystrobin, pyraclostrobin, and mancozeb looked significantly better than the unsprayed control. The treatments of BASF 516 04 (pycadostrobin + boscalid) F 38%WG at 340.2 g per 379 L (0.75 lb per 100 gal) of water and pyraclostrobin 20%WG at 226.8 g per 379 L (0.50 lb per 100 gal) of water were significantly more effective than the other treatments as compared to the untreated control (Table 2). Fungicides, such as azoxystrobin and pyraclostrobin, and thiophanate methyl especially at the higher rate are effective if applied prior to the first appearance of *Cercospora* in the spring in the polyhouse and/or the shadehouse crop (Fig. 2).

Cercospora on dendrobiums has always been a problem for orchid growers both commercial as well as collectors. Where humidity has been controlled it has not been necessary to apply fungicides that are touted to be effective in controlling *Cercospora* (personal observation). However, in the past 6 to 8 years, several

Table 2. Disease rating of *Dendrobium antennatoum* Lindl. leaves that were not treated (control) or were treated with fungicides before they were exposed to *Cercospora dendrobii* Burnett conidia from disease border rows.

Treatment[x]	Rate per 379 L	Disease rating[yz]
Control (water)	Untreated	4.50a
Pycadostrobin + boscalid	171.0 g	1.45 d
Pycadostrobin + boscalid	340.2 g	0.43 e
Thiophanate methyl	177.0 mL	2.38 c
Azoxystrobin	113.4 g	2.45 c
Pyraclostrobin	113.4 g	2.33 c
Pyraclostrobin	226.8 g	0.44 e
Mancozeb	907.2 g	2.95 b

[z]Final cercospora leaf spot incidence after plants were exposed to the border rows infected with *Cercospora*, means of four replications having 320 plants each, values followed by same letters in a column do not differ significantly according to Duncan's multiple range test (P=0.05).

[y]Plants were rated on a scale of 1 to 10, where 0 = no disease, 2 = very few lesions on the lower canopy, 3 = very few lesions in upper canopy, 4 = some lesions with slight defoliation, 5 = lesions noticeable in upper canopy with some defoliation, 6 = lesions numerous with significant defoliation, 7 = lesions numerous with heavy defoliation, 8 = very numerous lesions on few remaining leaves, 9 = very few remaining leaves covered with lesions, and 10 = plant completely defoliated.

[x]Five fungicides were evaluated for disease control in a commercial nursery. Treatments and rates, except mancozeb, were applied every 21 d, with first fungicide application on 10 Mar., ending on 10 May for a total three applications, with a CO_2-driven backpack sprayer equipped with a single, flat fan nozzle (Table 1). Mancozeb was applied every 7 d for a total of nine applications. Treatments were applied until point of runoff in a spray volume of 100 gal per acre.

Fig. 2. The importance of fungicides that control leaf spot, causing fungi such as *Cercospora* is extremely important for mass production of dendrobium orchids.

evergreen dendrobiums have shown extensive damage by what appears to be *C. dendrobii* based on the symptoms described by Burnett (1974). The questions are, has a new *Cercospora* strain eviolved, or are some of the new evergreen *Dendrobium* more susceptible to *Cercospora*? Since many of the new cultivars are developed and shipped in from Thailand as liner plants, they may arrive infected with *Cercospora*. Visual inspections of these liner dendrobiums from Thailand have not detected *Cercospora* or other leaf spot causing fungi.

Additional research studies are needed to answer these questions regarding the *Dendrobium–Cercospora* relationship since fungicides are helpful, but genetically resistant dendrobiums are much more desirable. The ultimate goal of the orchid industry is to provide the best finished product.

Literature Cited

Agrios, G.N. 1997. Plant pathology. 4th ed. Academic Press, New York.

Alfieri, S.A., Jr., K.R. Langdon, J.W. Kimbrough, N.E. El-Gholl, and C. Wehlburg. 1991. Disease and disorders and plants in Florida. Bul. No. 14. Fla. Dept. Agr. and Consumer Serv., Div. of Plant Industry. Index of plant diseases in Florida. Fla. Dept. Agr. and Consumer Serv., Div. of Plant Industry. Bul. No. 11.

Burnett, H.C. 1974. Orchid diseases. Fla. Dept. Agr. and Consumer Serv., Div. of Plant Industry. Bul. No. 10.

Chupp, C. 1953. A monograph of the genus *Cercospora*. Cornell University Press, Ithaca, NY.

Dodge, O.B. and H.W. Ricket. 1943. Orchidaceae (orchids), p. 443. In: Diseases and pests of ornamental plants. Jacques Cattell Press.

Farr, D., G. Bills, G. Chamuris, and A. Rossman. 1989. Fungi on plants and plant products in the United States. Amer. Phytopathol. Soc., St. Paul, MN.

Pirone, P.P. 1970. Diseases and pests of ornamental plants. Ronald Press, New York.