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PP268

Black Spot of Rose[1]

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Introduction

Black spot is, a fungal disease that affects nearly all rose cultivars worldwide. It is a frequent problem for roses grown outdoors and reduces the quality and life span of the plants. However, the poor performance of roses in Florida can also be associated with various factors such as inadequate fertilization and water deficiency during the warm season, as well as the use of root stocks and scions not well-adapted to Florida's conditions.

Causal Agent and Geographical Distribution

The black spot pathogen, *Marssonina rosae* (*Diplocarpon rosae*, sexual stage), is a parasite specific to roses and is considered the most serious disease of roses in Florida. The disease was first reported in Sweden in 1815 and in the United States in 1830. Since then, it has been reported in South America, Canada, Australia, and China, among other countries.

Different genotypes or races of *M. rosae*, i.e., isolates that infect a specific cultivar or group of cultivars, have been identified. Certain species of roses and cultivars of old garden roses are considered more resistant to the disease than modern cultivars. Modern roses and especially the popular hybrid teas are not only more susceptible to the disease, but also considered high maintenance roses in Florida requiring more attention to disease control, fertilization, and irrigation.

Symptoms

M. rosae produces black spots of about two to 12 mm in diameter usually in the upper surface of the leaves (Fig. 1a). Often, those spots may have irregular, radiate, feathery borders (Fig. 1b). In older lesions, black spore-bearing structures, called acervuli, can be observed as well as white, slimy masses of conidia (Fig. 2a). Yellowing around the lesions on infected leaves can occur and severe defoliation occurs in the most susceptible cultivars. While leaves are the most susceptible part of the plant, stipules and pedicels can also be infected. Spots can also be found also in peduncles, fruits, and sepals. Symptoms of black spot are usually confused with those of Cercospora leaf spot (See EDIS publication *Cercospora Leaf Spot of Rose* at http://edis.ifas.ufl.edu/PP267).

The infection cycle starts when spores are spread by rain or overhead irrigation from leaves or canes infected from the previous season. The conidia must be wet for several hours to infect plant tissues. Symptoms begin to appear in three to 16 days after infection. Mature conidia can be produced 10 to 18 days after infection and initiate a new cycle. Conidia are colorless and two-celled (Fig. 2b). A temperature of

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Figure 1a. Leaves of 'Old Blush' rose infected with *Marsonina rosae*.
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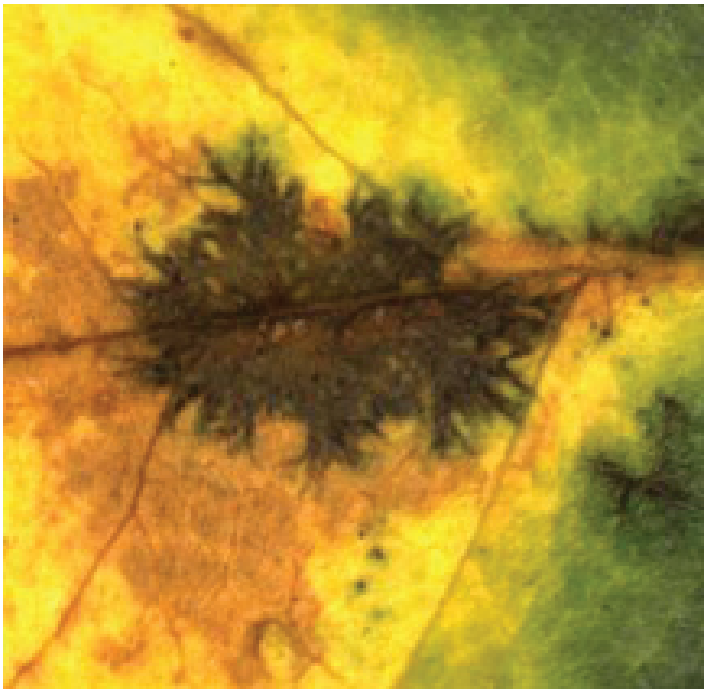

Figure 1b. Typical lesion of black spot on a rose leaf.
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64°F is optimal for black spot development, but conidia germination still occurs from 59 to 81°F. This wide temperature range allows the disease to continue to develop as long as the moisture is adequate during the season.

Control

Black spot can be controlled by planting cultivars with resistance to the disease such as WEKcisbako (HomeRun®) or RADrazz (Knock Out®). These cultivars are, however,

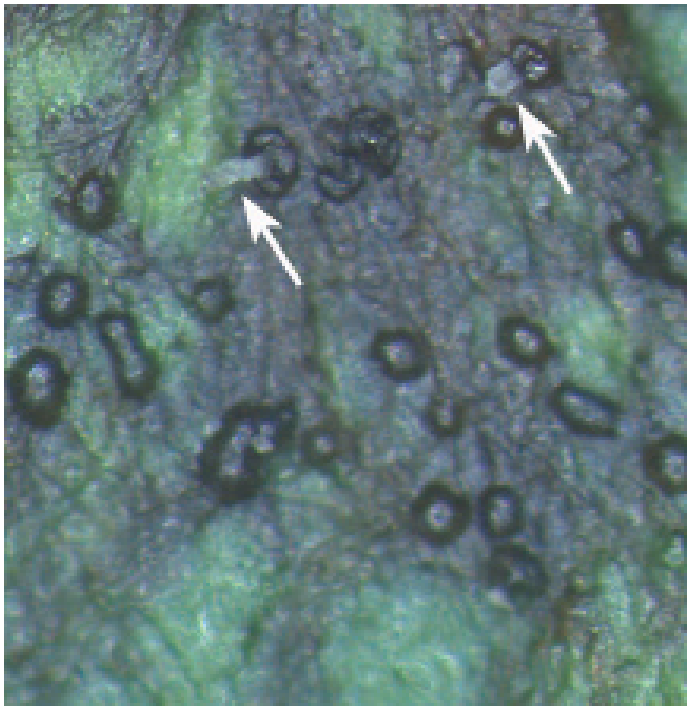

Figure 2a. Black acervuli on a lesion caused by *Marsonina rosae*. Note the white masses of conidia (arrows), 50x.
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Figure 2b. Microscopic view of two-celled conidia of *Marsonina rosae*, 400x.
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susceptible to Cercospora leaf spot. Old garden roses 'Mrs. B.R. Cant' and 'Spice' have shown good levels of resistance to both diseases in our trials. Sanitation practices, such as removal and burning of fallen leaves and pruning of canes late in the winter before new shoots are produced, help reduce the amount of inoculum. Plants should not be allowed to remain wet for long periods of time and overhead

irrigation should be avoided or minimized. If this is not possible, plants should be irrigated early in the morning to allow leaves to dry.

For chemical control, an initial application of a protectant fungicide should be made at bud break, followed by bimonthly applications until leaves are completely expanded. During the summer, applications every 7-14 days may be necessary to successfully manage the disease.

Fungicides labeled for the control of black spot of roses in Florida are listed in Tables 1 and 2. For managing fungicide resistance, the best strategy is to rotate among products with different modes of action. All fungicides within the same group (with the same number or letter) have the same active ingredient or a similar mode of action. Fungicide resistance is usually low with multi-site inhibitor fungicides group (M).

Table 1. Fungicide products marketed for use by professional pesticide applicators for control of black spot on roses

Active ingredient	Fungicide group	Trade name
Copper ammonium compex	M1	Copper-Count®- N
Copper hydroxide	M1	Champ® Dry Prill, Champ® Formula 2, Kentan® DF
Copper hydroxide + Copper oxychloride	M1	Badge® SC, Badge® X2
Copper oxychloride	M1	Agri Star® COC DF, Agri Star® COC WP
Copper oxychloride + Copper sulfate	M1	C-O-C-S® WDG
Sulfur	M2	Arysta Sulfur 6L, Cosavet-DF®, Kumulus® DF, Stoller® THAT® flowable sulfur, Thiolux Jet, Wettable sulphur, Micro Sulf®, Microthiol® Disperss®
Mancozeb	M3	Dithane® 75DF Rainshield®, Fore™ 80WP Rainshield®, Koverall™, Penncozeb™ 75DF
Maneb	M3	Maneb 75DF, Maneb 80WP
Ziram	M3	Ziram 76DF
Captan	M4	Captan 50WP, Captan 50W, Captec 4L®
Chlorothalonil	M5	Daconil Ultrex® Turf Care®, Daconil Weatherstik®, Echo® 720 T&O, Echo® Zn T&O, Ensign™ 720, Ensign® 82.5% T&O, Initiate® 720, Prokoz Mainsail™ 6.0 F, Prokoz Mainsail™ WDG
Chlorotalonil + thiophanate-methyl	M5+1	Spectro™ 90WDG T&O
Thiophanate-methyl	1	3336® F, Nufarm T-Methyl SPC 4.5 F, Nufarm T-Methyl SPC 50 WSB, Quali-Pro® TM 85 WDG
Myclobutanil	3	Eagle® 20EW, Prokoz, Quali-Pro® Myclobutanil 20 EW T&O
Propiconazole	3	AmTide Propiconazole 41.8% EC, Banner Maxx®, Banner Maxx® II, Fitness™, Nufarm Propiconazole SPC 14.3 MEC, Procon-Z™, Prokoz® Hoist™, Propensity® 1.3ME T&O, Quali-Pro® Propiconazole 14.3
Tebuconazole	3	Clearscape T&O, Quali-Pro® Tebuconazole 3.6F, Monsoon® Turf, Offset™ 3.6F, Torque™
Azoxystrobin	11	Heritage®
Trifloxystrobin	11	Compass® Fungicide, Compass® O 50WDG
Thiophanate-methyl + Iprodine	1 + 2	Nufarm TM+IP SPC
Bacillus subtilis	NC	Cease®
Clove oil+ Rosemary Oil+ Thyme oil	NC	Sporan™, Sporatec®
Mineral Oil	NC	Tritek™
Parafinic Oil	NC	JMS Stylet-oil®
Petroleum Oil	NC	Saf-T-Side®
Potassium bicarbonate	NC	Milstop®
Reynoutria sachalinensis	NC	Regalia®
Neem Oil	NC	Trilogy®

Fungicide Group (FRAC Code): Numbers (1-37) and letters (M) are used to distinguish the fungicidal mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered in making decisions about how to manage fungicide resistance. M=Multi-site inhibitors, fungicide resistance is low; NC= not classified. Source: http://www.frac.info/ (Fungicide Resistance Action Committee, FRAC).

Always read a current product label before applying any chemicals.

Table 2. Fungicide products marketed toward homeowners for control of black spot on roses

Active ingredient	Fungicide group	Trade name
Copper hydroxide	M1	Hi-Yield® Copper
Copper Sulfate	M1	Bonide® Copper Dust
Copper Octanoate	M1	Bonide® Liquid Copper, Natural Guard Copper Soap, Ortho® Disease B Gon® Copper Fungicide
Sulfur	M2	Bonide® Sulfur Dust, Ferti-lome® Dusting Sulfur, Green Light, Hi-Yield® Dusting Wettable Sulphur, Ortho® Bug-B-Gon® Rose & Flower Care
Mancozeb	M3	Bonide® Mancozeb
Captan	M4	Bonide® Captan 50WP, Hi-Yield® Captan 50W Fungicide
Chlorothalonil	M5	Bonide® Fungonil, Ferti-lome® Broad Spectrum, Hi-Yield® Vegetable, Flower, Fruit and Ornamental Fungicide, Monterey, Ortho® Disease B Gon™ Garden Fungicide, Monterey Fruit Tree, Vegetable & Ornamental Fungicide
Myclobutanil	3	Spectracide Immunox® Multi-Purpose Fungicide
Propiconazole	3	Ferti-lome® Liquid Systemic Fungicide, Monterey Fungi-Fighter
Tebuconazole	3	Bayer Advanced™ Disease Control for Roses, Flowers & Shrubs
Tebuconazole + Imidacloprid	3 +	Bonide® Rose RX Systemic Drench, Ferti-lome® 2-N-1 Systemic
Triforine	3	Ortho® RosePride® Disease Control
Calcium Polysulfide	NC	Hi-Yield® Lime Sulfur Spray
Neem Oil	NC	Bonide® RX 3 in 1, Green Light® Neem Concentrate, Green Light® Rose Defense®, Monterey
Acetamiprid + Triticonazole	NC + 3	Ortho® Bug B Gon® Insect & Disease Control
Acephate + Resmethrin + Triforine	NC + NC + 3	Ortho® RosePride® Insect, Disease & Mite Control

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