Evaluation of New Fungicides for Control of Rose Blackspot[1]

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Abstract

Daconil 2787, Spotless, Systhane, Maag RO15-1279, and Funginex were evaluated for blackspot control on field-grown roses. Weekly applications of Systhane at 0.16–0.20 g ai/l (0.021–0.027) oz ai/gal) and Maag RO15-1279 at 0.10 g ai/l (0.013 oz ai/gal) provided season-long blackspot protection equal to Daconil 2787. Lower rates of both Maag RO15-1279 and Systhane were less effective than the recommended rates of both fungicides. Spotless retarded shoot elongation, while Systhane and Maag RO15-1279 did not.

Index words: *Diplocarpon rosae*, fungicide, chlorothalonil, triforine, pyrifenox, diniconazole, myclobutanil, disease control

Introduction

Blackspot caused by *Diplocarpon rosae* Wolf (anamorph *Marssonina rosae* (Lib.) Lind) is a common and often destructive disease of cultivated roses. The protectant fungicides Daconil 2787 and Phaltan (Folpet) provided good protection from blackspot when used according to label directions (3, 4, 7, 9). A rapidly expanding group of new systemic fungicides, known as sterol-biosynthesis inhibiting (SBI) fungicides, may provide superior blackspot control than available protectant fungicides. Morrison and Russell (9) showed that triforine, among the first SBI fungicides, for blackspot control was similarly efficacious to that of Daconil 2787. Subsequently registered under the trade names Funginex and Triforine, it is widely recognized as an effective treatment for blackspot as well as powdery mildew and rust on rose (5, 6, 8). Though the efficacy of some SBI fungicides for powdery mildew control on rose is excellent (1, 2, 10), effectiveness of many of these fungicides for blackspot control has not been well documented. Meeus (8) reported that Funginex gave better blackspot control than several SBI fungicides, including Rubigan (fenarimol), Nimrod (bipirimate), and Bayleton (triadimefon). Research evaluating other recently developed SBI fungicides for blackspot control is limited. Our objectives were to evaluate the efficacy of the SBI fungicides Maag RO15-1279, Spotless, and Systhane for the control of blackspot of rose and compare their activity with that of Daconil 2787 and Funginex.

Material and Methods

In August 1983, *Rosa* sp. cv. Queen Elizabeth plants in 3.8-1 (#1) containers were planted in a sandy loam soil amended with peat moss (1:1 by vol.). Bimonthly, 227 g (8 oz) of 8N-3.2P-6.6K (8-8-8) fertilizer was applied from March to August 1984 around the base of each plant. Water was applied as needed with overhead sprinklers. Each plant was pruned regularly to remove spent blooms and suckers. Fungicides were applied until run-off with a hand-pump compressed air sprayer. The spreader-sticker CS-7 (1/2% by vol.) was included with the wettable fungicides. The experimental design was a randomized complete block of 4 replications with 2 plants per replicate.

In 1984, Maag RO15-1279 (pyrifenox) 4E at 0.05 and 0.10 g ai/l (0.006 to 0.13 oz ai/gal), Spotless (diniconazole) 25W at 0.06, 0.13, and 0.26 g ai/l (0.008, 0.016, and 0.031 oz ai/gal), Systhane 2E at 0.04, 0.08, and 0.16 g ai/l (0.005, 0.011, and 0.021 oz ai/gal), Daconil 2787 (chlorothalonil) 4.17F at 1.35 g ai/l (0.18 oz ai/gal), and Funginex (triforine) 1.6E at 0.18 g ai/l (0.024 oz ai/l) were evaluated for blackspot control. Weekly foliar applications were made from March 22 to August 17. Visual ratings of disease severity were made using a scale of 1 = no disease to 5 = severe defoliation on May 29, June 21, August 9, and August 21, 1984.

Trials were repeated in 1985 with Maag RO15-1279 (pyrifenox) 4E at 0.05 and 0.10 g ai/l (0.006 and 0.013 oz ai/gal), Systhane (myclobutanil) 40W at 0.08 and 0.16 g ai/l (0.011 and 0.021 oz ai/gal), Daconil 2787 (chlorothalonil) 4.17F at 1.35 g ai/l (0.18 oz ai/gal), and Funginex (triforine) 1.6E at 0.18 g ai/l (0.024 oz ai/gal) applied at one-week intervals from April 11 to October 11. Cultural practices were similar to those employed in 1984. Disease ratings using the previously mentioned scale were made on August 30, September 27, and October 25.

The significance of treatment effects for each trial was tested by two way analysis of varience and Fisher's Least Significant Difference Test.

Results and Discussion

In 1984, all fungicides reduced blackspot severity compared to the nonsprayed plants (Table 1). Maag RO15-1279 and Systhane maintained the best disease control through June at all rates tested as well as Funginex and Daconil 2787. Effectiveness of the 0.05 g ai/l rate of Maag RO15-1279 compared to the 0.10 g ai/l rate declined significantly ($R^2 = 0.71^{**}$) under heavy mid-summer blackspot pressure. A significant linear drop in disease severity ($R^2 = 0.48^{*}$) was noted as the application rate of Systhane increased from 0.04 to 0.16 g ai/l. Maag RO15-1279 at 0.10 g ai/l and the two higher rates of Systhane maintained blackspot control

[1]Received for publication November 30, 1987; in revised form March 9, 1988. Journal Article No. 18-871426P of the Alabama Agricultural Experiment Station.
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Table 1. Efficacy of selected fungicides for control of blackspot on rose cv. 'Queen Elizabeth', 1984.

Fungicide	Rate		Disease Ratings[z]		
	g ai/l	oz ai/gal	May 29	Jun 21	Aug 23
Daconil 2787 40.4F	1.35	0.18	1.6	1.0	1.1
Funginex 1.6E	0.18	0.024	1.6	1.1	1.5
Maag RO 15-1279 4E	0.05	0.006	1.1	1.4	2.5
Maag RO 15-1279 4E	0.10	0.013	1.1	1.1	1.3
Spotless 25W	0.06	0.008	2.3	2.6	3.4
Spotless 25W	0.13	0.016	2.1	2.0	2.8
Spotless 25W	0.26	0.031	2.1	1.6	2.3
Systhane 2E	0.04	0.005	1.6	1.1	1.9
Systhane 2E	0.08	0.011	1.3	1.0	1.5
Systhane 2E	0.16	0.021	1.5	1.0	1.3
nonsprayed control	—	—	3.4	3.9	4.3
LSD (P = 0.05)			0.6	0.5	0.6

[z]Disease severity assessed on a scale of 1 = no disease to 5 = severe defoliation.

equal to Funginex and Daconil 2787 through the summer.

Spotless generally did not control blackspot as well as the other fungicides but did reduce blackspot severity compared to the nonsprayed plants. Treated plants had significantly less disease ($R^2 = 0.60^{**}$) as the application rate increased from 0.06 to 0.26 g ai/l, however blackspot severity increased on plants treated with all rates of Spotless after May 29. By late August, however, Spotless provided poor disease control at all rates compared to Funginex and Daconil 2787.

Phytotoxicity was noted only on the Spotless-treated plants. Symptoms observed were expressed as reduced shoot growth and compact growth habit. Large, fast growing suckers noted on the other treatments did not develop on the Spotless-treated plants. Stunting was most apparent at the higher application rates of Spotless consequently this fungicide was deleted from subsequent field trials.

Results of the 1985 test were similar to those obtained in 1984. Maag RO15-1279 at 0.05 and 0.10 g ai/l and Systhane at 0.08 and 0.16 g ai/l were equally effective in controlling blackspot through late September as Daconil 2787 or Funginex (Table 2). In late October, disease severity on plants treated with the low rate of Maag RO15-1279 or Systhane was higher than on the Daconil 2787-treated plants. Differences in disease severity between the low and high rates of Maag RO15-1279 ($R^2 = 0.90^{**}$) and Systhane ($R^2 = 0.69^{**}$) were significant. Both Maag RO15-1279 at 0.10 g ai/l and Systhane at 0.16 g ai/l provided the same level of disease control as Daconil 2787. No phytotoxicity was noted on any of the treatments.

In summary, Maag RO15-1279 and Systhane provided excellent protection from blackspot on rose. Through midsummer, all rates of both fungicides maintained effective disease control. However, 0.10 g ai/l of Maag RO15-1279 and 0.16 to 0.20 g ai/l of Systhane were needed for season-long blackspot control. Efficacy of both fungicides for the control of blackspot was similar to that obtained with Daconil 2787 and Funginex at recommended rates. Neither fungicide was phytotoxic to rose foliage or blooms at the rates evaluated.

Spotless did not adequately control blackspot on rose. Though disease severity was reduced by all rates of Spotless compared with the nonsprayed control, Daconil 2787 and Funginex gave better disease control. Plant growth regulator effects of Spotless on shoot elongation were also quite severe, particularly at the higher application rates.

Significance to the Nursery Industry

Blackspot is an annual threat to the health and value of most cultivated rose hybrids in landscape and nursery plantings. Repeated fungicide applications are needed from spring bud break through the first fall frost to protect roses from this debilitating disease. Systhane and Maag RO15-1279 have been proven to be as effective in controlling blackspot over an extended time period as currently available fungicides without injury to rose foliage or blooms. Further development of both fungicides is possible if their efficacy against powdery mildew and rust on roses can be demonstrated.

Table 2. Comparison of Maag RO15-1279 and Systhane with Funginex and Daconil for control of blackspot of rose cv. Queen Elizabeth, 1985.

Fungicide	Rate		Disease Ratings[z]		
	g ai/l	oz ai/gal	Aug 30	Sep 27	Oct 25
Daconil 2787 40.4F	1.35	0.18	1.0	1.1	1.3
Funginex 1.6E	0.18	0.024	1.1	1.1	1.5
Maag RO 15-1279 4E	0.05	0.006	1.8	1.5	2.3
Maag RO 15-1279 4E	0.10	0.013	1.4	1.3	1.5
Systhane 40W	0.08	0.011	1.4	1.8	2.1
Systhane 40W	0.16	0.021	1.4	1.4	1.4
nonsprayed control	—	—	3.3	3.9	4.1
LSD (P = 0.05)			0.9	0.7	0.7

[z]Disease rating assessed on a scale of 1 = no disease to 5 = severe defoliation.

(*Ed. note:* This paper reports the results of research only, and does not imply registration of a pesticide under amended FIFRA. Before using any of the products mentioned in this research paper, be certain of their registration by appropriate state and/or federal authorities.)

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Comparison of Rootability of Stem Cuttings from Seedlings of *Aesculus* sp. and Mature *Aesculus* × *arnoldiana* 'Autumn Splendor'[1]

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Abstract

Rootability was evaluated for stem cuttings taken at varying positions and developmental stages from seedlings of *Aesculus* and from the mature trees of *Aesculus* × *arnoldiana* 'Autumn Splendor'. Rooting was 100% for cuttings taken from 2-week-old seedlings and 0% for those obtained from the crown of the mature tree 2 months after commencement of spring growth flush. Intermediate rootability was found for cuttings taken from 1-month-old seedlings and from the 2 week-old growth of suckers at the base of the mature tree. Rooting of cuttings with intermediate rooting potential was increased by a quick dip treatment with 2500 ppm indole-3-butyric acid (IBA) or by using apical rather than basal stem segments. Commercially acceptable rooting was not achieved using cuttings from root suckers or the crown of *Aesculus* 'Augumn Splendor'.

Index words: phase change, juvenility, maturation, rooting, IBA, buckeye

Introduction

Rooting ability of shoot cuttings from woody plant species depends on many factors. High rooting potential is generally considered to be a juvenile characteristic which is often lost during maturation (4, 5, 6, 7, 9). Evidence indicates that both physiologic and ontogenetic development over time contribute to decreased rootability as a plant gets older (2). Rooting potential is influenced by the position on the parent tree from which cuttings are taken and by the stage of shoot development at the time of taking cuttings (1, 6, 8, 10). The stage for achieving successful rooting can be quite limited. In some cases shoots arising from roots have a greater propensity to root than do cuttings from any other location on the plant (3, 7).

Attempts to propagate the selection *Aesculus* × *arnoldiana* 'Autumn Splendor' via traditional vegetative means, including bench grafting. T-budding, and rooting of stem cuttings, have met with limited success or was economically impractical. In order to characterize rooting potential in a tree-type *Aesculus* species such as the selection 'Autumn Splendor' and develop a system for clonal propagation, this study was designed to compare the influence of maturation state, developmental stage, cutting position, and indole-3-butyric acid (IBA) treatment on the rooting of stem cuttings.

Materials and Methods

Cuttings were taken from seedlings and a mature 30-year-old tree of *Aesculus* × *arnoldiana* 'Autumn Splendor' tree. Seeds collected from 'Autumn Splendor' were germinated in 100% sharp river sand in a greenhouse maintained at a temperature of 18/24°C (64/75°F) day/night. Seedlings were fertilized periodically with 20N-6.6P-16.6K (20-16-20).

[1]Received for publication November 5, 1987; in revised form March 21, 1988.

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