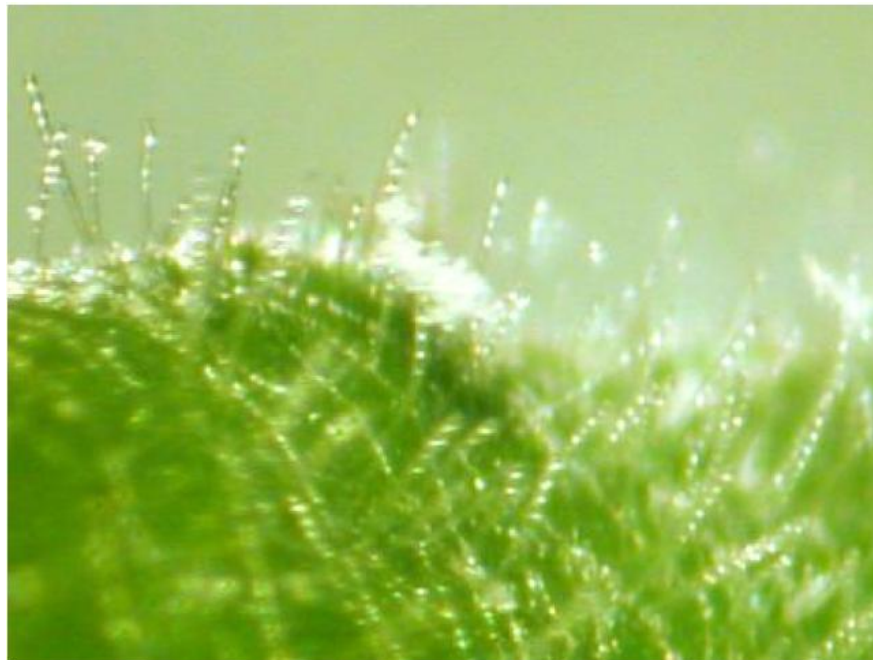


PERFORMANCE PROFILE

Evaluations of PureCrop1 against powdery mildew, *Sphaerotheca pannosa* on roses



Laboratory trials were conducted in Davis, CA.

by
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Summary

Evaluations were conducted to test the performance of PureCrop1 for controlling powdery mildew infections on rose. Laboratory bioassays were used to evaluate the ability of PureCrop1 to eradicate existing powdery mildew infections and evaluate any residual action of PureCrop1 against reoccurring infections at two concentrations. Two small plot trials using potted roses were also conducted in a non-producing commercial greenhouse to confirm laboratory results.

The laboratory bioassays revealed that PureCrop1 at dilutions of 150 and 300:1 (6,666 and 3,333ppm) resulted in virtually 100 percent elimination of powdery mildew infections on potted rose plants relative to the water only control plants. The residual control tests showed that reoccurrence of powdery mildew was suppressed for the 300:1 treatment from 4 to 7 days under high disease pressure. The 150:1 treatment suppressed powdery mildew a little longer from 5 to 9 days.

The small plot trials showed similar results as the laboratory trials. An initial small plot trial demonstrated the 300:1 treatment effectively eradicated mildew infections on potted rose and suppressed their reoccurrence for at least a five-day period under field conditions. A second replicated block trial also showed eradication and suppression from a 4 to 7 day period at 300:1, while the 150:1 treatment gave slightly longer suppression up to 9 days. Both treatments of PureCrop1 were found to perform as well, or better, than [REDACTED], a standard fungicide used for mildew control in commercial roses.

From these initial trials it has been shown that PureCrop1 can operate as an effective fungicide for *Sphaerotheca pannosa* control on roses and may have application against this and possibly other species of powdery mildew in commercial agriculture.

Cover photo: Sporulating powdery mildew colony on young rose leaf at 80X magnification.

Procedures

I. Laboratory Bioassays

PureCrop1 Treatments:

- 1) 0.333% PureCrop1(3,333 ppm or 300:1 dilution)
- 2) 0.666% PureCrop1(6,660 ppm or 150:1 dilution)
- 3) Water only control.

Laboratory trials were conducted in Davis, CA. Six potted mini-rose plants were incubated in plastic covered cold frames between 78-84°F and approximately 100% RH for four hours each evening and 80-86°F and 26 –53% RH during the day until powdery mildew infections were apparent on new foliage (usually in 48 to 96 hours, **Figure 1**). The number of leaves showing mildew infections were then recorded (pre-count) and each of the potted roses were randomly assigned to one of the three treatments listed above. Treatment effects were verified by examining individual leaves under the dissection microscope for evidence of active powdery mildew colonies on leaf surfaces. Treated plants were returned to the cold frames and subjected to the same temperature and relative humidity regimes through the course of the residual control trials. Plants were inspected daily and the number of leaves showing infection was recorded. The first eradication and residual control trial was begun on 19 April and the second began on 21 May.

II. Small plot evaluations

PureCrop1 Treatments:

- 1) XXXXXXXXXX label rate – positive control
- 2) 0.333% PureCrop1 (3,330 ppm or 300:1 dilution)
- 3) 0.666% PureCrop1 (6,660 ppm or 150:1 dilution)
- 4) Water only control.

Evaluations were conducted in an experimental glasshouse in Sacramento County, CA. An initial small plot trial was conducted to test the field efficacy of PureCrop1 for mildew control on potted commercial roses. Eight plots consisting of at least 6 potted rose plants were established and randomly assigned either the PureCrop1 (300:1) treatment or a water only treatment. Applications were made on 19 April and the degree of powdery mildew suppression was monitored for 10 days post application. The second powdery mildew study compared all the treatments listed above within a randomized complete block design. The two blocks of potted commercial roses were established in different locations within the greenhouse. Each block was separated into 8 plots consisting of at least 6 potted rose plants each. Plots were randomly assigned to one of the four treatments listed above, such that, each treatment was represented twice in each block (four observations per treatment, **Table 1**). The first applications were made on 19 May and the second time occurred on 28 May. Plots were monitored until 10 June when climatic conditions were too unfavorable for powdery mildew development. Plots were monitored visually every 48 hours for signs of fungal growth or conidia (powdery appearance). Plots were scored as having powdery mildew when the first signs of infection become apparent to observers. The trial was begun when climatic conditions favored powdery mildew growth.

Results

I. Laboratory Bioassays

Both of the laboratory bioassays revealed that PureCrop1 at dilutions of 150 and 300:1 (6,666 and 3,333ppm) consistently eliminated 100 percent of powdery mildew infections on potted rose plants relative to the water only control plants (**Table 2**). Within 48 hours of the PureCrop1 applications, all mildew infections stopped showing signs of active mycelia growth on any of the plants or leaves examined. None of the treated powdery mildew colonies were observed to resume growth after the PureCrop1 treatments for at least 72 hours.

The residual control tests revealed that reoccurrence of powdery mildew infection was prevented in the 300:1 treatment from 4 to 7 days under high disease pressure relative to the water only controls. The 150:1 treatment tended to suppress powdery mildew for a slightly longer period, from 5 to 9 days (**Tables 3 & 4**). In both trials, none of the previously healthy colonies showed resumed activity, rather, after exposure to optimal disease conditions, new infections eventually arose, presumably from newly germinating spores once the PureCrop1 residuals became ineffective.

II. Small plot evaluations

The replicated small plot trials demonstrated similar results as in the laboratory trials. The first small plot trial conducted on 19 April demonstrated the 300:1 treatment effectively eradicated active mildew infections on potted rose relative to the water only controls. All the PureCrop1 treated rose plots showed consistent performance. Furthermore, the PureCrop1 treated plots were also shown to suppress reoccurrence of infections for at least a five-day period under glasshouse conditions that favor mildew infection. The water only control plots on the other hand, showed renewed mildew infections within 48 hours of treatment. A second much larger replicated complete block trial was established to compare powdery mildew control at two different PureCrop1 concentrations with a standard commercial fungicide [REDACTED]. Results of the three-week trial again confirmed previous results showing eradication and suppression of mildew infections from 4 to 7 days for the 300:1, while the 150:1 treatment again gave slightly longer suppression from 5 to 9 days (**Table 1**). The [REDACTED] treated plots also showed excellent eradication of active mildew colonies. Residual performance of [REDACTED] ranged from 5 to 7 days at the label rate treatment. As in previous trials, the water only control plots showed active sporulating colonies within 48 hours of treatment application. This results indicated that PureCrop1 at 300:1 gave control similar to the label rate of [REDACTED]. The 150:1 tended to give the longest period of powdery mildew suppression, however, variability in the results suggest the differences in residual control between concentrations needs to be retested.

Over the three-week trial, some variability in powdery mildew control and suppression was noted among plots within a block and between the two blocks depending on treatment, disease pressure, rose varieties etc. However, the results of the trial clearly demonstrated that PureCrop1 could be used as an effective fungicide for *Sphaerotheca pannosa* control on roses and can perform as well or better than a leading commercial fungicide. No phytotoxicity symptoms were noted for either PureCrop1 treatment on any of the rose varieties tested. [REDACTED] showed some minor leaf distortions on one rose variety.

Conclusions

Both treatments of PureCrop1 were found to perform as well, or better, than [REDACTED], a standard fungicide used for mildew control in commercial roses. The level of residual control was somewhat variable for both PureCrop1 treatments as well as the [REDACTED] treatments. The reason for the performance variability isn't known. What we can conclude from the laboratory and small plot trials is that use of PureCrop1 between 300:1 and 150:1 dilutions appears to show very consistent eradication and generally at least a 5 to 7 day suppression period of powdery mildew on commercial rose varieties. Several additional informal trials were performed that also showed normal growth and flowering of roses using weekly PureCrop1 applications for an eight week period. Overall, the trials thus far support the notion that PureCrop1 may be a viable commercial fungicide and may have application against this and possibly other species of powdery mildew in commercial agriculture.

Table 1. Eradication of powdery mildew tests on potted rose plants showing the combined results from two laboratory trials 48 hours after treatment application.

Treatment	Trial	Pre-# inf. Leaves	Post-# inf. Leaves
WOC	1	1	6
WOC	1	3	9
WOC	2	2	7
WOC	2	2	3
PureCrop1, 300:1	1	6	0
PureCrop1, 300:1	1	2	0
PureCrop1, 300:1	2	5	0
PureCrop1, 300:1	2	4	0
PureCrop1, 150:1	1	4	0
PureCrop1, 150:1	1	1	0
PureCrop1, 150:1	2	3	0
PureCrop1, 150:1	2	2	0

* number of infected leaves per potted rose plant

Table 2. Results of laboratory trials evaluating the residual control of PureCrop1 against powdery mildew under conditions of high infection pressure.

Treatment	72 hrs	5 Days	7 Days
WOC	3	9	11
WOC	5	14	19
PureCrop1, 300:1	0	1	3
PureCrop1, 300:1	0	0	1
PureCrop1, 150:1	0	0	0
PureCrop1, 150:1	0	0	1

* number of infected leaves per potted rose plant.

Table 3. Results of the second set of laboratory trials evaluating the residual control of PureCrop1 against powdery mildew under conditions of high infection pressure.

Treatment	72 Hrs	5 Days	7 Days
WOC	7	18	21
WOC	7	14	17
PureCrop1, 300:1	0	2	3
PureCrop1, 300:1	0	3	3
PureCrop1, 150:1	0	0	0
PureCrop1, 150:1	0	1	2

* number of infected leaves per potted rose plant.

Table 4. Small plot replicated trial comparing two Agri-50 concentrations with ██████ (commercial standard) and a water only control on potted roses in a non-producing greenhouse.

	22 May	28 May	09 June
Trtmt. BLK I			
WOC	*	*	*
██████	NI	*	NI
PureCrop1, 300:1	NI	*	NI
PureCrop1, 150:1	NI	NI	NI
Trtmt. BLK II			
WOC	*	*	*
██████	NI	NI	NI
PureCrop1, 300:1	NI	NI	NI
PureCrop1, 150:1	NI	NI	NI
Trtmt. BLK III			
WOC	*	*	*
██████	NI	*	NI
PureCrop1, 300:1	NI	*	NI
PureCro1, 150:1	NI	NI	NI

NI = non-infected, * = infection present,
 * infections in WOC inactive due to unfavorable conditions by this date



Figure 1. Potted roses were incubated in cold frames until the first signs of conidia (powdery appearance) occurred on young foliage before treatment applications.

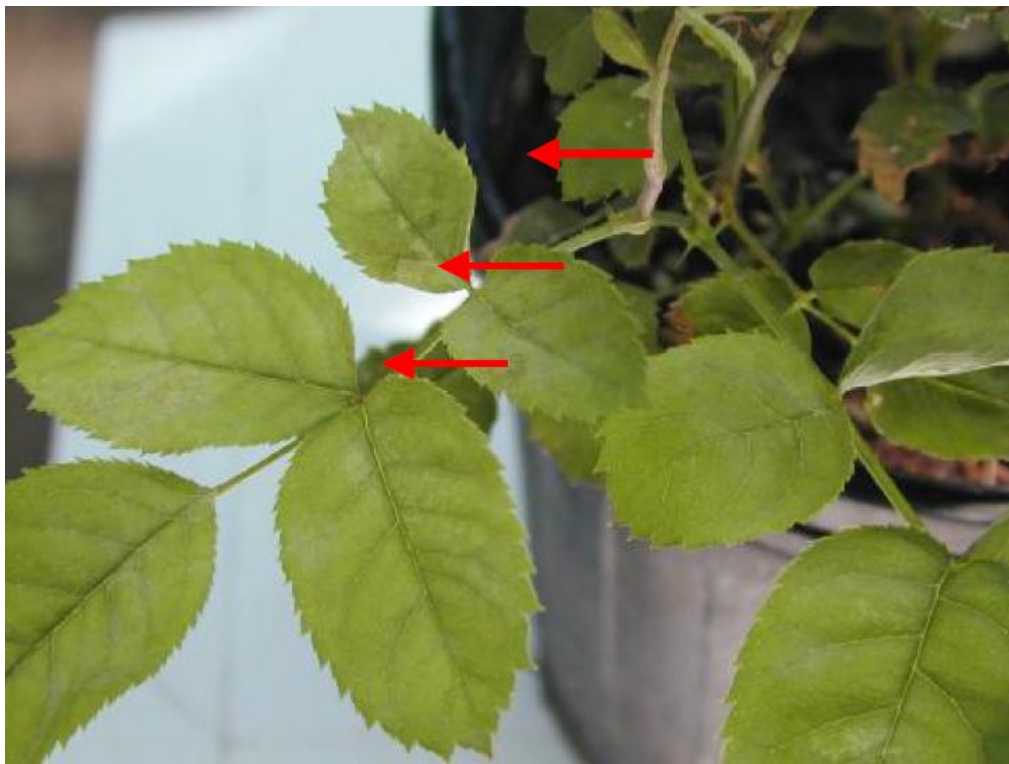
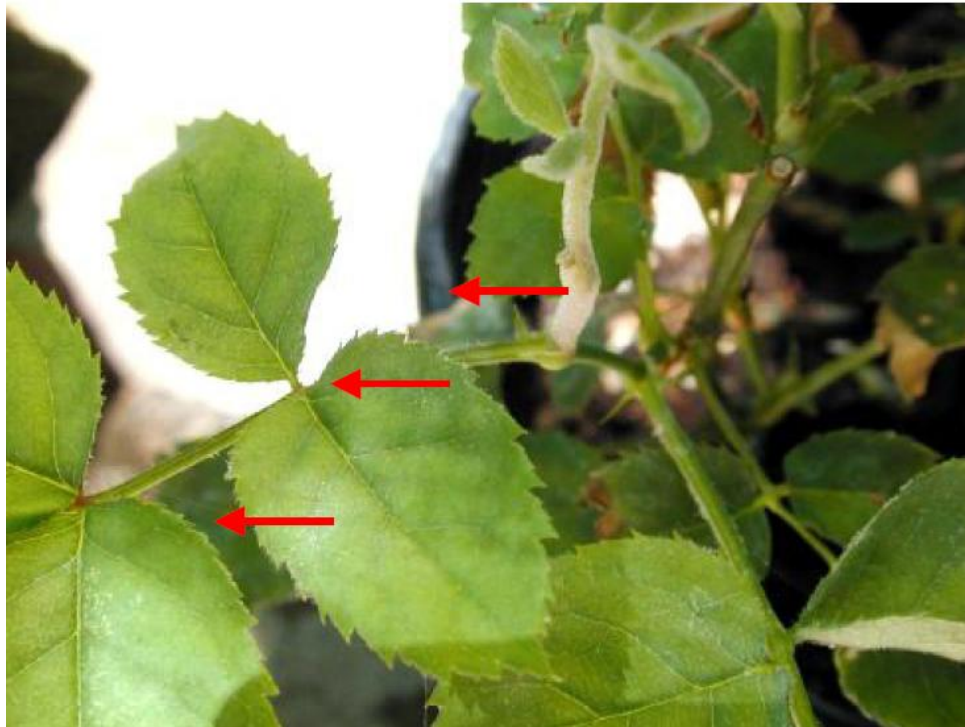


Figure 2. A potted rose plants showing conidia on stems and fungal growth on leaves and stems (Top). Forty-eight hours after an PureCrop1 application (150:1) all fugal growth had been eliminated and much of the new growth recovered from the powdery mildew infections (bottom).



Figure 3. Comparison of water only control treated rose foliage (above) with PureCrop1 (150:1) treated infection (below) 72 hours after treatment application.