



## COLORADO FLOWER GROWERS ASSOCIATION

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# ROSE POWDERY MILDEW CONTROL — EFFECT OF pH AND WATER QUALITY ON BENLATE EFFECTIVENESS

Mary Jobson and Joe J. Hanan<sup>1</sup>

Studies on effectiveness of Benlate™ in controlling powdery mildew of roses indicate that for borderline situations, high quality water and reducing pH of the water to 6.0 will enhance control. However, if massive powdery mildew infection is present, depending upon season, Benlate™, regardless of what is done to the water, is not a good material for mildew control.

Benlate™ does not eradicate mildew. The material acts mostly to prevent germination and penetration of the fungal conidia. It is not a mildicide. As it is almost impossible to obtain complete spray coverage on a dense rose crop, heavy infection, combined with suitable environment for mildew build-up means that very poor results are likely to be obtained. On the other hand, if proper attention is given to controlling the environment as outlined in CFGA Bulletin 325, and timely spray applications are made prior to heavy infection; then Benlate™ will help keep mildew under control. In that situation, good water and low pH are aids. The same thing can probably be said about other pesticides applied in water.

### Materials and Methods

'Forever Yours' roses, in 5 gallon containers filled with gravel, were placed in a carnation house maintained at 52-54°F night and 60-62°F day. Previous experience in these conditions had shown that mildew infection was enhanced, particularly as there was no sulfur vaporization. The bench was divided into ten plots, 6 plants per plot, and the

treatments applied with a two-gallon hand sprayer to "run-off". There were three series of treatments, Sept. 1, 1977, to Oct. 11; Dec. 8, 1977, to Feb. 2, 1978; and Mar. 20, 1978, to May 3. Before each series, the plants were cut back and rearranged in random order.

In each of the three series, five treatments were applied to two plots:

1. Fort Collins water, pH 7.0, 56 micromhos/cm electrical conductivity.
2. Fort Collins water acidified to pH 6.0 with sulfuric acid.
3. Hard water, pH 8.5, containing 4 meq/l (336 ppm) sodium bicarbonate, 3 meq/l (370 ppm) magnesium sulfate and 2 meq/l (100 ppm) calcium carbonate.
4. Hard water containing the salts listed in No. 3 and acidified to pH 6.0 with sulfuric acid.

To these treatments, Benlate™ was mixed at the rate of 0.5 lb. per 100 gallons with Multifilm spreader added at the rate of 10.2 fluid ounces per 100 gallons.

5. Control, Fort Collins water in Series 1 and 2, without Benlate™.
6. Fort Collins water with Banlate™, acidified to pH 5.0 in Series 3.

Spray effectiveness was determined by counting the number of shoots infected with mildew. In each plot, 25 shoots were randomly selected for the count, with counts usually being made on a weekly basis, although this varied on occasion to as few as 3 days. Spray applications were usually once every two weeks for first and third series, and weekly during the second series.

<sup>1</sup>Rose Committee scholar and Professor respectively.

## Results

The results of the first series were highly significant (Fig. 1 - upper). Mildew infection was also minimum. Reducing pH

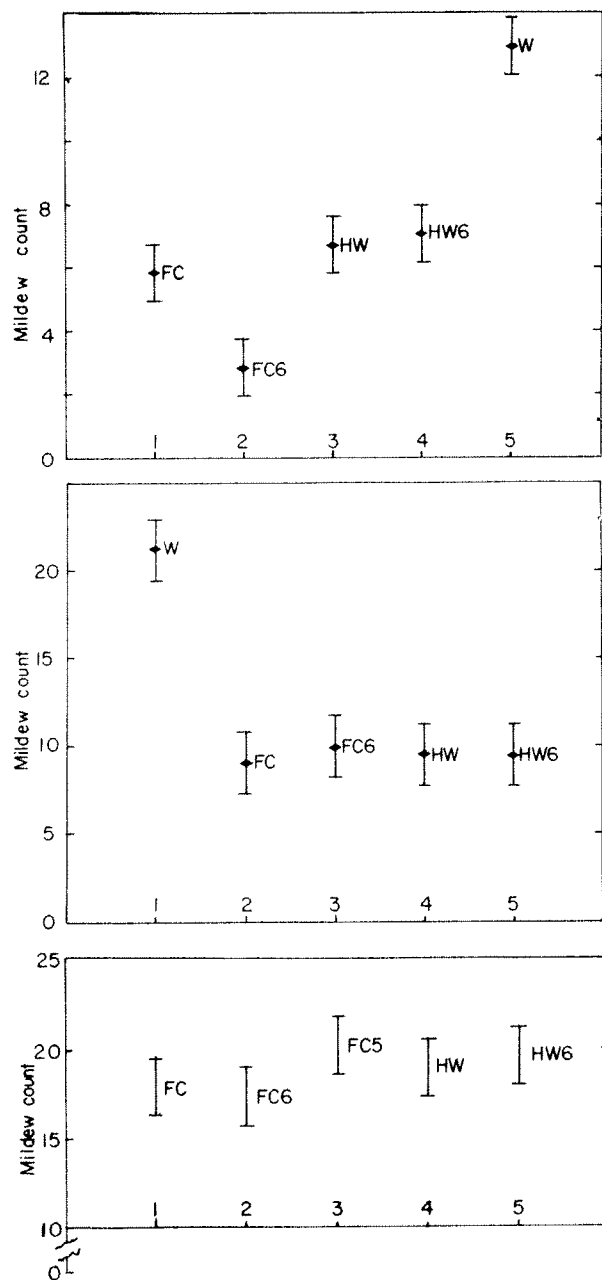


Fig. 1: Benlate™ effectiveness for controlling rose powdery mildew as influenced by pH and water quality.

**Upper:** Series 1, Sept. 1, 1977, to Oct. 11, 1977, 9 spray applications.

**Middle:** Series 2, Dec. 8, 1977, to Feb. 2, 1978, 7 spray applications.

**Lower:** Series 3, Mar. 2, 1978, to May 3, 1978, 10 spray applications.

**Key:**  
 W — Ft. Collins water without Benlate™  
 FC — Fort Collins water with Benlate™  
 FC6 — Fort Collins water reduced to pH 6.0 with Benlate™  
 FC5 — Fort Collins water reduced to pH 5.0 with Benlate™  
 HW — Hard water with Benlate™  
 HW6 — Hard water reduced to pH 6.0 with Benlate™

to 6.0 in hard water, however, did not appear as effective as doing the same thing in good water. There were differences as to time from initiation of the spraying schedule; mildew infection gradually decreasing as the roses grew and protection was maintained (Fig. 2). Individual treatments, such as No. 2 (Ft. Collins water, pH 6.0) reduced mildew count to 1.0 by the 5th application, and consistently maintained it at that level for the remainder of the experiment. There was a slight enhancement of Treatment 4 over Treatment 3 (Hard water reduced to pH 6.0) by the 6th application. By the end of Series 1, No. 3 had a mildew count of 9.0 as contrasted to 7.0 for No. 4. This was not significantly different.

It will be noted in Figures 1 and 2, that mildew infection was much greater in the 2nd and 3rd series. By the start of the 3rd series, all shoots were infected with mildew. The effect of individual treatments disappeared. Interaction between time and treatment was not significantly different in Series 2 and 3. No consistent benefit of reducing pH to 6.0 in either good or hard water could be observed. However, water with no salts present gradually gave better results. Reducing pH to 5.0 damaged the foliage and tended to reduce protection to mildew.

In general, we feel we can make these observations on effectiveness of Benlate™ for controlling powdery mildew of roses:

1. Benlate™ is a protectant, and benefits will not be observed until sufficient time elapses for new foliage production which has been sprayed.
2. Benlate™ effectiveness will vary, depending upon the degree of infection, with benefits reduced at high infection rates.
3. Water with no salts, deionized or distilled, is best, particularly under critical conditions of environment and low infection rates.
4. Reducing pH to 6.0 will help if the same conditions as outlined in No. 3 prevail.
5. It is our observation, based upon previous experience with powdery mildew and what is in the literature, that no single treatment will eradicate rose powdery mildew. Proper environmental control combined with sulfur volatilization are the two most effective methods, followed with chemical control as required.

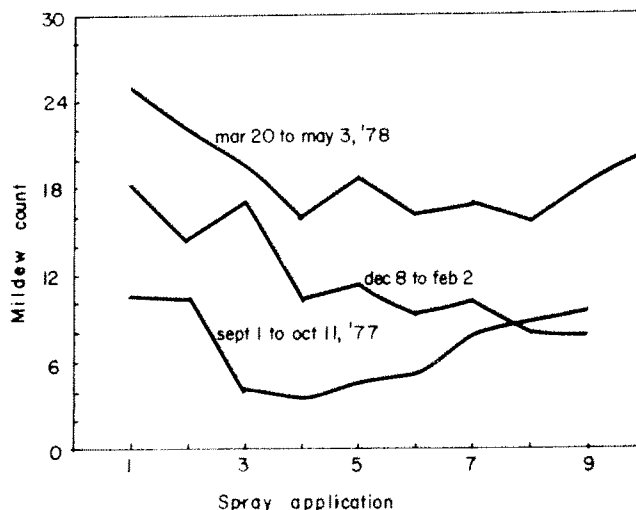


Fig. 2: Effectiveness of Benlate™ in reducing rose powdery mildew, all treatments combined for three different times of the year. Roses grown under conditions suitable for maximum mildew infection.