

# Fungicides for powdery mildew and rust in roses

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**P**owdery mildew is undoubtedly the most widespread disease of roses. The casual fungus, *Sphaerotheca pannosa* var. *rosae*, appears as a white or gray powdery or mealy coating on the leaves, tender stems, and flowerbuds. It distorts and discolors those areas, causes defoliation, and reduces plant vigor.

Rust, caused by the fungus *Phragmidium mucronatum*, is identified by pustules of orange spores that form on the undersides of the leaves and on other green parts. Yellow or brown spots appear on the upper leaf surfaces. Because of frequent rains, rust became a serious disease in the experimental area at the University of California South Coast Field Station, near Santa Ana, in the winter and spring of 1980 and 1981. The disease had been present before then but had not caused economic damage.

## Five-year study

We evaluated several new fungicides for the control of powdery mildew and rust during a five-year study at the field station (see table). In all trials, we used the cultivar 'Mary DeVore' in four replicates of each treatment with three rose plants per replicate.

In the 1978 trial, a light powdery mildew infection was present in the experimental area at the time of the first spray. Vanguard (etaconazole) and Sisthane (phenapronil) provided excellent control of rose powdery mildew. Bayleton (triadimefon), a new unregistered fungicide, was next in effectiveness. Cit-Cop (copper salts of fatty and rosin acids) provided some control and was significantly better than no treatment. Vanguard caused a darkening of the foliage.

Powdery mildew was not present in the plot in 1979 before application of the first spray. Triforine ED (triforine) is an 18.2 percent formulation sold to commercial rose growers; triforine is sold to gardeners as Funginex, a 6.5 percent formulation.

Vanguard at 7 or 11 ounces, Sisthane, and Triforine 18.2 percent all provided excellent control of rose powdery mildew and were significantly better than no treatment.

In 1980, a few rust pustules and powdery mildew lesions were found in the plot before application of the first spray. BayCor (bitertanol), a new material, and Daconil 2787 (chlorothalonil) were included because of reports that they have

been effective in other parts of the U.S.

Triforine and Plantvax (oxycarboxin) were significantly better than the other materials tested for rust control, but only Triforine was significantly better for control of powdery mildew. BayCor and Daconil 2787 gave intermediate control of both rust and powdery mildew but were significantly better than no treatment.

In 1981, we added a new fungicide, Ciba Geigy 71818, to those previously tested. Both powdery mildew and rust had developed on the plants, so it was possible to obtain information on control of both diseases.

Triforine, Vanguard, and Bayleton were significantly better than all other fungicides tested for the control of powdery mildew. Triforine, Vanguard and Plantvax were equally effective for rust control. Ciba Geigy 71818 was intermediate in control of both rust and powdery mildew.

Light infections of powdery mildew and rust fungi were present in the plot before application of the first spray in 1982. We obtained a new formulation of Ciba Geigy 71818, since this material had not performed well in the 1981 experiment. DuPont L6177, a new material, was included because experimental evidence suggested it was effective for the control of powdery mildew of rose. El 222 (fenarimol) is an old unregistered fungicide, which was effective in earlier trials, and which might be registered in the near future.

Triforine, DuPont L6177 at 6.6 fluid ounces, and Ciba Geigy 71818 were significantly better than all other fungicides tested for the control of powdery mildew. Triforine and DuPont L6177 6.6 fluid ounces were effective for the control of rust on the rose leaves and stem.

## Summary

Triforine, also sold under the name of Funginex, proved to be consistently effective for control of powdery mildew and rust diseases of rose in the five years of trials. Plantvax was effective only for rust. Of the **unregistered** fungicides, Vanguard, Bayleton, DuPont L6177, Ciba Geigy 71818, El 222, and Sisthane were effective for powdery mildew control. Vanguard and DuPont L6177 appeared to provide control of rust. Sisthane will not be marketed in the United States.



Powdery mildew distorts and discolors stems, leaves, and buds of roses. Rust forms pustules on leaves (below).

Comparison of fungicides for rose disease control — cultivar 'Mary DeVore', Santa Ana, California

Fungicide and rate*	Disease rating†	
	Powdery mildew	Rust
<b>1978 trial (applied Mar 25; Apr 4, 14, 25)</b>		
Vanguard 10W, 9 oz.	0.7 a	...
Sisthane EC (2 lb.), 1.5 pt.	1.0 ab	...
Bayleton 25W, 8 oz.	1.2 b	...
Cit-Cop 4E, 2 qt.	1.8 c	...
Untreated control	3.3 d	...
<b>1979 trial (applied Mar 14; Apr 4, 18; May 3, 16)</b>		
Vanguard 10W, 7 oz.	0.3 a	...
Vanguard 10W, 11 oz.	0.5 a	...
Triforine EC 18.2%, 12 fl. oz.	0.6 a	...
Sisthane EC (2 lb.), 1 qt.	0.7 a	...
Untreated control	2.6 b	...
<b>1980 trial (applied Mar 7, 20; Apr 4)</b>		
Triforine EC 18.2%, 12 fl. oz.	1.4 a	0.8 a
Plantvax 75W, 1.3 lb.	4.8 c	1.2 a
BayCor 25W, 8 oz.	2.4 b	3.2 b
Daconil 2787 75W, 2.5 lb.	3.2 b	3.2 b
Untreated control	6.0 c	4.4 c
<b>1981 trial (applied Mar 12, 26; Apr 8, 22)</b>		
Triforine EC 18.2%, 12 fl. oz.	1.2 a	0.2 a
Vanguard 10W, 12 oz.	1.4 a	0.2 a
Bayleton 25W, 8 oz.	1.6 a	2.0 b
BayCor 25W, 16 oz.	3.5 b	1.6 b
Ciba Geigy 71818 10W, 10 oz.	5.2 bc	3.8 c
Plantvax 75W, 1.3 lb.	5.6 bc	0.1 a
Untreated control	9.0 d	7.0 d
<b>1982 trial (applied Mar 4, 15; Apr 5, 15)</b>		
Triforine EC, 12 fl. oz.	0.3 a	1.2 a
Ciba Geigy 71818 10W, 10 oz.	0.4 a	3.8 c
DuPont L6177 30%, 6.6 fl. oz.	0.3 a	1.5 a
EI 222 12.5%, 5 fl. oz.	1.0 b	2.8 bc
DuPont L6177 30%, 3.3 fl. oz.	1.6 c	2.6 b
No treatment	5.1 d	6.6 d

\*Rates of materials per 100 gallons of water, 4 fluid ounces of Rohm and Haas Triton B-1956 spreader-sticker per 100 gallons water added to all fungicide suspensions. Sprays applied to runoff with a 2-gallon CO<sub>2</sub> pressurized Hudson sprayer at 30 psi.

† Significant at 5 percent level. Within each trial year, treatments with same letter are not significantly different from each other.

‡ Rated on a scale of 0 to 4: 0 = no disease; 4 = mildew completely covering both sides of leaves and numerous mildew colonies on petioles and stems.

§ Rated on a scale of 0 to 10: 0 = no disease; 10 = severe powdery mildew and rust development.

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A limited-resource producer cooperative is formed when several persons or families with low income join together to farm land that is either owned or rented by the group. These organizations contrast sharply with agricultural cooperatives organized to improve member access to product markets or to supplies. First, in pooling resources to form a cooperative, there is often not much to pool other than the labor each member-family can contribute. Second, the low-income producer cooperative movement in California is composed largely of former sharecroppers and farmworkers of Mexican descent. Their motivation is that they are likely to have more income and independence as owner-members than as hired laborers. Third, although limited-resource cooperatives are organized for economic purposes, most tend to have social goals as well, such as the improved health, education, and general well-being of their member-families.

## California production cooperatives

There is a high turnover rate among low-income producer cooperatives and no official records document their numbers, but there may be as many as 20 or 30 in the state and at least as many "spin-off" farming partnerships and joint ventures. Through reports of field research, on-site visits, and correspondence, we have studied several cooperatives, representing a cross-section of types, to identify their origins, sources of support, economic status, and role in California agriculture. A summary is presented here.

# California's low-income producer cooperatives

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## They're suited for some labor-intensive crops

**Cooperativa Campesina, Watsonville, Santa Cruz County.** The origins of the oldest known limited-resource producer cooperative, Cooperativa Campesina, can be traced to a 1969 adult education class sponsored by Trabajadores Adelante (TA), a training and economic development agency funded by the U.S. Office of Economic Opportunity (OEO). A core group of six farmworkers organized themselves, raised \$3,000, and appealed for assistance to the Central Coast Counties Development Corporation (CCCDC). They were able to rent six acres of county land and obtain technical assistance. New members were selected from a CCCDC recruiting drive, bringing the total to 30 in the second year of operation. With further help from CCCDC, the Wells Fargo Bank, and OEO, Cooperativa Campesina became a million-dollar-plus strawberry operation by 1974.

Nine years and four farm sites later, a CCCDC offer of help to purchase and develop another farm, which was only of marginal quality, coincided with serious cash flow problems for the cooperative. CCCDC was not able to deliver the promised financing and subsequently closed its doors (in 1980). Cooperative members made plans to liquidate their operation and pay all debts by Decem-

ber 1981, but their voluntary plan was not adequate to satisfy creditors.

In 1982, Cooperativa Campesina was legally winding up its affairs under court supervision. Member families are now farming in smaller groups, as joint ventures or partnerships, continuing the land- and equipment-sharing methods of the cooperative. After more than 10 years of operation, the cooperative has "failed," but virtually every member family has succeeded in becoming a self-employed strawberry grower.

**Cooperativa Central, Salinas, Monterey County.** Like Cooperativa Campesina, Cooperativa Central was stimulated by TA. In 1972, 12 farmworker-organizers obtained an interest-free loan from OEO and one from the Bank of America with which they purchased farming assets from Stevall, Incorporated, a successful strawberry operation. The original 12 members contacted Stevall's 61 sharecroppers who had been receiving 50 percent of the returns per unit of output, offered them 55 percent, and organized them into the cooperative. The former owner remained with the group through the first year of operation in compliance with a stipulation of the bank loan; the bank gave careful financial guidance to the cooperative.

In 1977, Central purchased 700 acres