

**Linda Chalker-Scott, Ph.D., Extension Urban Horticulturist and Associate Professor,
Puyallup Research and Extension Center, Washington State University**

**The Myth of Milk and Roses:
*"Milk sprayed onto rose leaves will prevent fungal and bacterial diseases"***

The Myth

In the last few years, the Internet has been abuzz with the news that spraying milk on rose leaves can control foliar diseases. The web stories most often cite a Brazilian study published in 1999 focusing on powdery mildew control on zucchini. This new alternative to conventional fungicides has been augmented with anecdotal reports of successful powdery mildew control on a variety of plants, including roses. Moreover, the treatment is also touted as preventing leaf black spot, thus giving hope to rose aficionados everywhere of a safe, effective method of growing disease-free specimens.

The Reality

Milk has been part of the horticultural toolbox for many decades; for instance, it has been used with varying effectiveness as a spreader or sticker in pesticide applications. Perhaps the best-documented use of milk has been in reducing the transmission of leaf viruses, especially tobacco mosaic and other mosaic viruses. Studies over the last half of the 20th century document the effectiveness of milk used for this purpose (Table 1):

Table 1: Effectiveness of milk products in protecting leaves from viruses:

Location	Year	Crop	Milk product	Conditions	Effective?
Australia	1967	Sugarcane	Evaporated	Field	Somewhat
Brazil	2001	Zucchini	Raw + leaf extract	Field	Yes
Brit. Col.	1964	Tomato	Unknown	Unknown	Yes
Florida	2004	Hibiscus	Non-fat dry	Field	Yes
Germany	1971	Spinach	Full cream	Greenhouse	Yes
		Beans	Full cream	Greenhouse	Yes
		Beets	Full cream	Greenhouse	Yes
		Celery	Full cream	Greenhouse	Yes
		Pea	Full cream	Greenhouse	Yes
		Potato	Full cream	Greenhouse	No
Hawaii	1994	Orchid	Nonfat	Laboratory	No
India	2003	Sunflower	Nonfat	Field	Somewhat
Manitoba	1959	Barley	Nonfat	Field	Yes
New Zealand	1943	Tobacco	Unknown	Field	Yes
Quebec	1968	Tomato	Unknown	Unknown	Yes
Russia	1961	Tobacco	Whey	Laboratory	Somewhat
Taiwan	1991	Pepper	Nonfat	Field	No

The effectiveness of milk sprays in reducing virus transmission probably improves with the concentration of the milk product used; milk concentrations of 20% nonfat dry or 30% fresh were reported as effective in the Florida and Brazil studies, respectively. Milk is routinely recommended as an organic hand sanitizer when handling virus-susceptible seedlings for transplant.

How milk functions as an antiviral agent is not clear but there are a few attractive hypotheses. First, milk may deactivate viruses chemically or isolate them physically; hence the success of milk as a sterilizing treatment. Second, milk may prevent aphid attack, and thus transmission, of aphid-borne viruses. Aphids may be deterred by the milk film on the leaf or attacked by aphid pathogens whose growth is enhanced by milk sprays; a 2003 study identified just such a fungal agent on treated pepper leaves.

Recently, milk has made an appearance as an antifungal agent, specifically in powdery mildew prevention (Table 2). [Note that there have been no published scientific studies investigating roses or any other ornamental plant species.]

Table 2: Effectiveness of milk products in protecting leaves from powdery mildew:

Location	Year	Crop	Milk	Conditions	Effective?
Australia	2000	Melon	Full & half	Field	Somewhat
Brazil	2005	Pumpkin	Raw	Field	Yes
		Pumpkin	Pasteurized	Field	Yes
Brazil	1999	Zucchini	Fresh	Greenhouse	Yes
Italy	2003	Cucurbits	Unknown	Field	Inconclusive
Italy	2002	Cucurbits	Fresh	Greenhouse	Yes
		Cucurbits	Dried	Greenhouse	Yes
		Cucurbits	Fresh	Field	Yes/No
		Cucurbits	Dried	Field	Yes/No
UK	2003	Wheat	Pasteurized	Greenhouse	Yes

The results of these studies suggest that milk treatment under controlled (greenhouse) conditions is more successful than in the field. None of these studies utilized nonfat milk, so it's unclear whether it would show any efficacy. In general, it appears that milk applied before fungal inoculation is more effective than milk applied after infection is present. Stems and lower leaf surfaces may be less protected, especially under high disease incidence.

This last point is important when considering the value of anecdotal claims of the effectiveness of milk or any other pesticidal treatment. *Unless plant material is actually challenged (exposed to) the disease or pest of interest, it is impossible to attribute the subsequent lack of disease or pests to that treatment.* Statements such as "Last year I had horrible black spot problems, but this year I used milk spray and my roses are disease-free" display faulty logic in the assumption of cause and effect where none may actually exist.

There are a few potential drawbacks to using milk as a foliar spray:

- Milk-fat can produce unpleasant odors as it breaks down.
- The benign fungal organisms that colonize leaves and break down milk can be aesthetically unattractive.
- Dried skim milk has been reported to induce black rot, soft rot, and *Alternaria* leaf spot on treated cruciferous crops.

Is it worth trying milk as a treatment for viruses, powdery mildew, or any other disease? Absolutely! There is substantial evidence that milk treatments can be effective in the protection of some crops, and organic farmers especially might benefit from this method. But on which plant species will milk treatment prevent disease? What pathogens are actually inhibited by milk products, and which milk

products are the most effective? Until these questions have been answered, it will be impossible to devise a reliable application protocol.

The Bottom Line

- There is no evidence that milk sprays are effective in controlling black spot on roses or any other ornamental plant species.
- Milk sprayed onto leaves may act as a nutrient source for benign microorganisms, decreasing the leaf area available for powdery mildew to infect.
- Leaves coated with a milk spray may be less vulnerable to aphid attack, thereby reducing the transmission of aphid-borne viruses.
- Milk sprays can encourage the growth of other microorganisms, whose presence may be aesthetically unappealing.
- Milk sprays may be a viable alternative to conventional pesticides, especially for organic farmers.

For more information, please visit Dr. Chalker-Scott's web page at <http://www.theinformedgardener.com>.