

Wetting Agents and Fungicide Efficacy



/ on geranium. (All photos courtesy of Chase Research Gardens Inc.)

By A. R. Chase

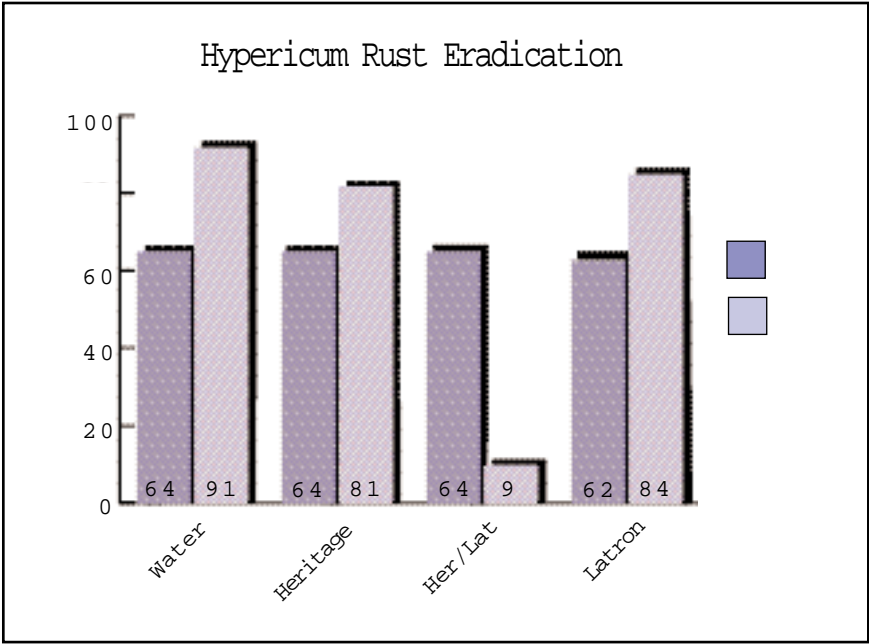
Depending on the disease present and the chemical used, mixing a wetting agent into your fungicide treatment is not always necessary. The trick is knowing what to

Disease control is one of the most complicated issues facing the ornamental industry today. One of the approaches to disease is for the grower to attempt a diagnosis of symptoms and choose the appropriate fungicide for control. Due to the difficulty of diagnosing problems by eye alone, many growers simply choose to apply products preventively. Both methods are widely used and can be effective ways to reduce losses from disease. Whether using preventive or therapeutic methods, it helps to know whether or not additions

of adjuvants for distribution of a fungicide are potentially beneficial. One of the first things to consider is what the product label instructs regarding the use of an adjuvant. Some product labels such as that for Daconil Ultrex say, “DO NOT combine DAPONIL ULTREX Turf and Ornamental Fungicide in the spray tank with pesticides, surfactants or fertilizers, unless your prior use has shown the combination to be physically compatible, effective and non-injurious under your conditions of use.” In

important to be familiar with the labels of all products you are using. A generalization will simply get you into trouble. Once you have determined whether or not you can use an adjuvant in a tank mix and which type to choose, it is critical that you know whether or not the addition will be beneficial or harmful. Generally, adjuvants are added to foliar sprays to improve uniformity of coverage, wetting, redistribution of the product and longevity on the leaf surface. These recommendations originated in leaf disease control on vegetables, with products that were classic protectants such as mancozeb. Some of our newer products have some degree of systemic action and are not purely protectants. In some cases, current formulations are sophisticated combinations of active ingredients and inerts designed to be used without additional adjuvants.

Figure 1. Hypericum rust eradication with Heritage (1 oz./100 gal.) and Latron B-1956 (0.25% v/v).



contrast, the Heritage label states, “The addition of a non-silicon based wetter/sticker at 0.06 percent v/v (8 oz/100 gal) is recommended for best results.” It is therefore

Table 1. Products used in Chase Research Gardens trials (1998-2000).

Product	Description	Manufacturer
Break-thru	Nonionic wetter/spreader/penetrant/surfactant (silicon)	Goldschmidt Chemical Corp.
Latron B-1956	Spreader-sticker	
Rohm and Haas Company		
PsiMetric	Blended nonionic media	Aquatrols
	surfactant	

So when is an adjuvant a good idea? Over the past three years, we have been working with a number of wetting agents, including those used for foliar and soil fungicide applications. The specific products, their description and manufacturers are listed in Table 1. These products are a very small representation of the many that are available for use in the horticultural industry, and their inclusion in our studies is not meant as an endorsement over similar products not mentioned in this article.


FOLIAR DISEASE CONTROL

Let’s start with foliar diseases since they are easier to detect and monitor. We performed tests on *botrytis*, downy mildew, powdery mildew and rust. Sometimes, addition of an adjuvant improved disease control, sometimes no effect was noted and sometimes disease control was reduced. Table 2 lists the results of specific trials.

Generally, control of rust and powdery mildew is improved when using a wetting agent such as those tested here. Sometimes the improvement is slight, but at other times, it is dramatic. Figure 1 shows the results of a test in eradication of hypericum rust with Heritage. Without the addition of Latron B-1956, there was no control of the rust, compared to 95 percent eradication when Latron was added to the same rate of Heritage. In two trials with experimental compounds from Aventis, we found excellent improvement in control of powdery mildew on miniature roses and crape myrtle when an adjuvant was

Table 2. Results of foliar disese trials with and without adjuvants.

Disease	Products (rate/100 gal.)	Effect on control
Botrytis blight on geranium	Decree (12 oz.)	None
	Latron (8 oz.)	
Downy mildew on snapdragon	Protect T&O (16 oz.)	Worse disease
	Latron (32 oz.)	Better control
	Protect T&O (16 oz.)	
	Break-thru (4 oz.)	
	Daconil Ultrex (1.4 lb.)	Worse disease
	Break-thru (4 oz.)	None
	Dithane NF (24 oz.)	
	Break-thru (4 oz.)	
	Heritage (1 oz.)	None
	Latron (32 oz.)	
	Compass (4 oz.)	Better control
	Latron (32 oz.)	
Downy mildew on stock	Heritage (1 oz.)	None
	Latron (32 oz.)	
Powdery mildew on crape myrtle	Experimental products	Better control
Powdery mildew on roses	Experimental products	Better control
Powdery mildew on hydrangea	Compass (1 oz.)	Better control
	Latron (8 oz.)	
	Heritage (1 oz.)	Better control
	Latron (8 oz.)	
Rust on hypericum	Heritage (1 oz.)	Better control
	Latron (32 oz.)	
Rust on snapdragon	Decree (24 oz.)	Better control
	Silwet (2 oz.)	




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added (Figure 2). Apparently, the hydrophobic nature of both rust pustules and powdery mildew makes it difficult for many products to penetrate the fungal mass. Even systemic products, such as Heritage, benefited from additions of a wetting agent for these diseases.

In contrast, control of *botrytis* blight with Decree was not improved when Latron B-1956 was added. Additional tests with *botrytis* and other fungicides are necessary to determine if this is due to the nature of the disease or a characteristic of Decree. Additions of Latron B-1956 or Break-thru showed mixed results. When Heritage was used, it was generally not beneficial to add a surfactant (Figure 3). However, when Compass or a mancozeb product was used, control was sometimes improved. In contrast to rusts and powdery mildew, downy mildew and *botrytis* do not produce an extremely water repellant mass of fungal growth or spores. Thus, some products can penetrate the mass, while others cannot.

Heritage and Compass are similar fungicides with the exception that Heritage is systemic from the bottom up, while Compass is locally systemic

Figure 2. Preventive control of powdery mildew on miniature roses using experimental products from Aventis. Rates are given for 100 gal.

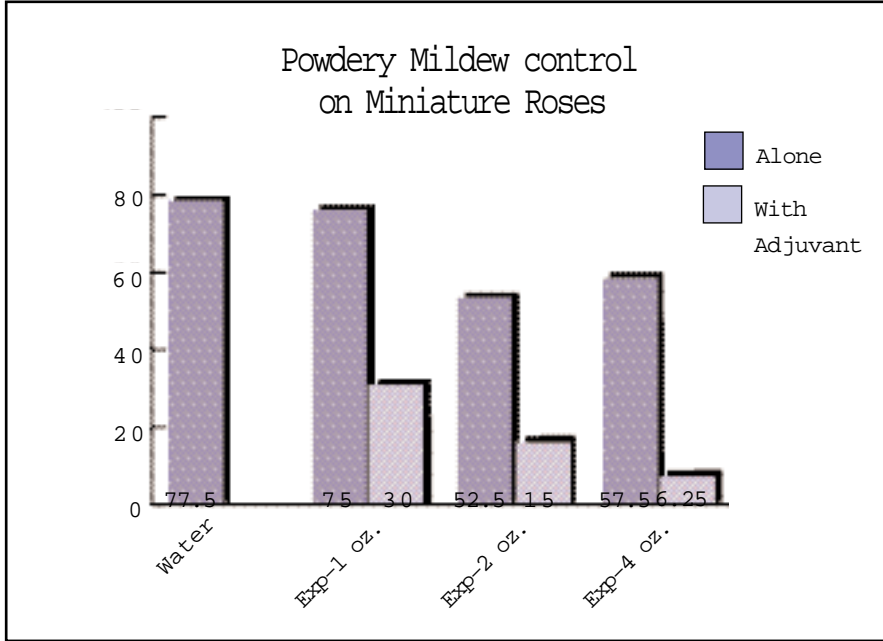
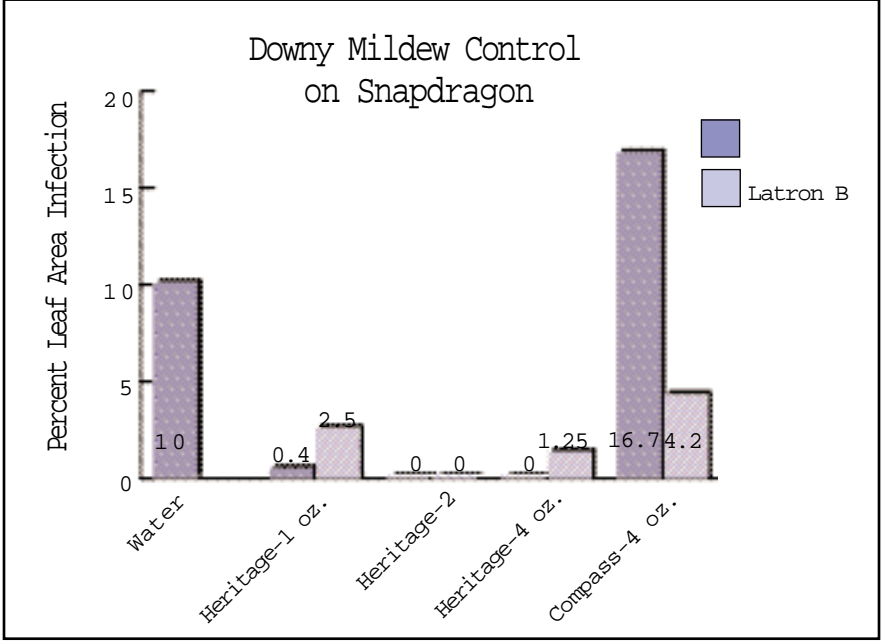


Figure 3. Preventive control of downy mildew on snapdragons with Heritage (1, 2 or 4 oz./100 gal.) and Compass (4 oz./100 gal.) with or without Latron B-1956.



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Left to right: Powdery Mildew on rose; powdery mildew on stock (sporulation).



(mesostemic). In downy mildew control, Heritage did not benefit from addition of a wetting agent, while Compass did benefit. This is probably due to the differences in their systemic abilities. Protectant products, such as the mancozeb, sometimes benefited from addition of a wetting agent for downy mildew control.

It is not obvious at this point whether silicon-based products, such as Silwet L-77 and Break-thru, would be more

beneficial compared to a nonionic product such as Latron B-1956. With the silicon-based adjuvants, phytotoxicity appears to be a concern. The high level of activity of these products sometimes results in too much active ingredient of the fungicide being available and, therefore, development of phytotoxicity. Observations suggest that use of a slightly lower rate of the fungicide could reduce the phytotoxic response.

SOIL-BORNE DISEASE CONTROL

A long series of tests were completed over the past three years with PsiMatric and fungicides meant for soil-borne disease control (Table 3). Some of the tests were performed multiple times. PsiMatric was used as an 8-ounce/100-gallon drench either in the tank-mix or applied the day before the fungicide was applied.

The chart may be interpreted as follows: The words in each box refer to my experience with the fungicide product over the past 21 years for control of the specific disease listed. Usually, the products give a range of control, depending on the disease pressure. The color of the box indicates whether or not addition of PsiMatric was beneficial, harmful or ineffective. Blue boxes indicate that fungicide efficacy is higher with PsiMatric than alone, and red boxes indicate that addition resulted in a reduction of efficacy of that fungicide. Yellow boxes were combinations where no obvious effect was noted, and white boxes have not been tested to date. One can expect products with the same active ingredients to

Product	Liverwort	Cylinrocladium	Fusarium	Pythium	Rhizoctonia	
Thielaviopsis						
3336		Good-vgood	Good		Vgood-exc	Vgood
Cinnamite	Vgood-exc					
Heritage		Fair-vgood	Vgood	Good	Vgood-exc	None
Medallion		Vgood-exc	Vgood		Excellent	Good
Phyton 27		Poor-good	Good	Some	Some	Fair
PlantShield		Good		Good	Good	Fair
Subdue				Excellent		
Maxx						
Terraclor					Excellent	

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Downy mildew sporulation (left) and systemic infection (right) on Snapdragon.

act similarly, but formulation might come into play. Growers should make their own evaluations.

As with foliar disease, observations can sometimes reveal the type of disease present, as well as the type of fungicide needed. Products that are very mobile in the potting media, such as Subdue Maxx, were not improved by addition of a media surfactant. Other products, like Medallion, are tied up in the upper portions of the potting medium, and movement through the pot can improve their control of some diseases, such as *fusarium* and *cylindrocladium*. In contrast, *rhizoctonia* diseases are generally most active near the potting medium surface, and moving a fungicide such as Medallion a little did not affect control, while moving a fungicide like 3336 resulted in decreased control. This is probably due to the fact that 3336 is more mobile in the potting media than Medallion. Thus moving the product away from its target is not beneficial.

It has been generally harmful to use PsiMatric with PlantShield (RootShield). This may be due to the direct action of PsiMatric on the biological control agent. We have successfully shown control of *pythium* diseases with PsiMatric alone. Although *pythium* and *trichoderma* (active fungus in PlantShield) are only distantly related, tests should be performed to determine whether or not PsiMatric harms this fungus directly.

CONCLUSIONS

It seems obvious from this work that additions of adjuvants, such as wetting agents, to fungicides used to control both foliar and soil-borne disease can sometimes improve their efficacy and at other times reduce it. If one can determine the nature of the disease and the action of the fungicide, one can predict whether or not addition of a wetting agent will be beneficial. In the absence of that knowledge, growers can use this paper as a guideline and perform tests with products of their choice under their conditions. Just remember to follow the label before you start experimenting.

A.R. Chase is a plant pathologist and president of Chase Research Gardens Inc., Mt. Aukum, Calif. Further information on disease control is available at www.chaseresearchgardens.com.

Editor's Note: The use of specific trade names in this publication does not constitute endorsement of these products in preference to others containing the same active ingredients. The use of trade names is solely for the purpose of providing specific information and does not signify that they are approved to the exclusion of others. Mention of a product does not constitute a guarantee or warranty of the product by the author or magazine.