

**Project Title:** Fighting Foliar Diseases Using Tools: Forecasters and Environmentally-Friendly Fungicides

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**Industry Needs Addressed:**

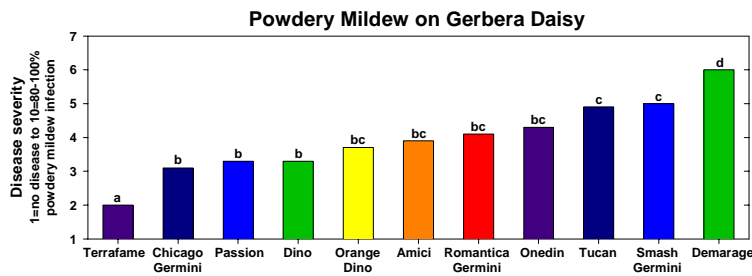
Uncontrolled epidemics of foliar diseases can decimate floriculture crops. Fungicides that help control diseases are at risk due to review and pending regulatory action of the Food Quality Protection Act, and to pathogens developing fungicide resistance. Growers need to know the conditions that trigger disease development and have access to effective fungicides to stop epidemics and produce quality floriculture crops.

**Research Conducted:**

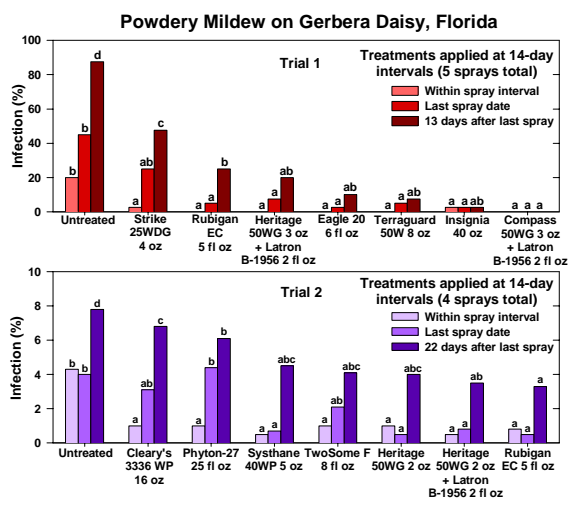
**Epidemiology and management of powdery mildew.**

Poinsettia: Effects of temperature and relative humidity on the conidial germination and infection processes of powdery mildew were quantified on poinsettia foliage. The lowest temperature (15°C) was generally less conducive to infection processes (conidia germination, appressorium and haustorium development, primary and secondary germ tube formation and germ tube elongation) than the higher temperatures of 20 and 25°C. Formation of appressoria and primary germ tubes were favored by 20°C. Conidial germination was favored by warm temperatures (20°C) and high RH (80%). Sporulation was initiated 9 days after inoculation regardless of temperature, but temperature significantly affected the number of conidia produced per conidiophore. Haustorium development appeared to be severely limited at 15°C. Germ tubes of *Oidium* sp. elongated regardless of RH. Incorporating temperature manipulation with scouting and fungicide applications may enhance powdery mildew management.

In a fungicide trial conducted on Long Island, the first symptoms of powdery mildew colonies on leaves were observed 12 days after inoculum was introduced. The number of colonies per bract climbed from 7.3 to nearly 38/bract at the final rating. Leaf infections were reduced by all treatments: the number of colonies rose from 15/leaf to 43/leaf on the untreated control plants, whereas the number of colonies on marked leaves of the treated plants was sharply reduced. Residue varied greatly in the different treatments. Although Decree and BAS 500 treatments gave excellent powdery mildew control, the residue for both was quite high when rated on bracts. Compass, in contrast, gave excellent control without excessive residue at the rate tested. All of the treatments, (fungicides, biocontrols, biorationals and fungicide-biocontrol alternations) worked very well at reducing disease on the poinsettia bracts.



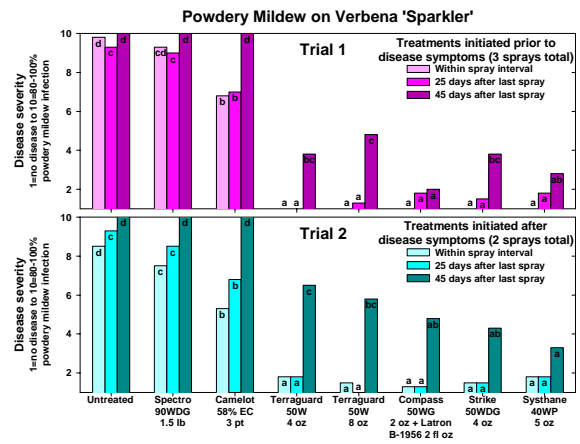
**Gerbera:** A cultivar trial showed 'Terrafame' to be most resistant to powdery mildew; this cultivar had significantly less disease than all other cultivars (trace to 10% infected foliage). Five cultivars had 20% infection: 'Chicago Gemini,' 'Passion,' 'Dino,' 'Orange Dino,' and 'Amici.' 'Demarage'



was the most susceptible cultivar with 40-50% infection. Two fungicide trials were conducted in Florida and included 11 products. In the first trial, all fungicides controlled powdery mildew compared to the untreated control that was heavily diseased. However, Compass 50WG was a stand-out product and kept plants disease-free even 13 days after the last spray. In the second trial, all products with the exception of TwoSome F, Cleary's 3336 WP and Phyton-27 kept disease limited as long as the spray interval was not exceeded. After the spray interval was exceeded, disease increased significantly. Although all treatments were better than the untreated control, the level of disease was not commercially acceptable.

**Verbena:** Although powdery mildew can offer a real challenge to growers of susceptible crops such as verbena, there are many new tools that offer excellent control. According to MSU results, Compass 50WG, Terraguard 50W, Strike 50WDG, and Sythane 40WP are highly effective in controlling powdery mildew even when used at two to three week intervals. While all of these

label,  
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fungicides list powdery mildew on their verbena is specifically listed only on the Compass 50WG label. Powdery mildew is known for its ability to adapt and develop resistance to fungicides and it is important rotate among fungicides with different of action. Using as few sprays as possible helps to delay the development of resistance. Our study also suggests that powdery mildew is best controlled when fungicides are begun prior to the appearance of the disease. Since verbena susceptible to powdery mildew, it would be of benefit to begin a spray program prior

to disease development and apply fungicides (alternate products) effective against powdery mildew at two to three weeks intervals to maintain a healthy crop. Similarly, in research conducted on Long Island, powdery mildew on the upper leaf surface was sharply reduced by all treatments (see table). Observations made on leaf undersurfaces (qualitative

**Powdery Mildew on Verbena**

Treatment and rate/100 gal	Interval	Powdery mildew coverage (%)	
Not treated, inoculated.....	--	21.1	c
Decree 50WDG 24 oz.....	7 day	5.6	b
Decree 500SC 24 fl oz.....	7 day	2.9	ab
BAS 500 02F 8 fl oz.....	7 day	0.1	a

BAS 500 02F 16 fl oz .....	7 day	0.5	a
Phyton-27 21.4%EC 25 fl oz .....	7 day	0.0	a
QRD 713 AS 3 gal .....	7 day	0.4	a
Terraguard 50WP 8 oz .....	14 day	0.0	a

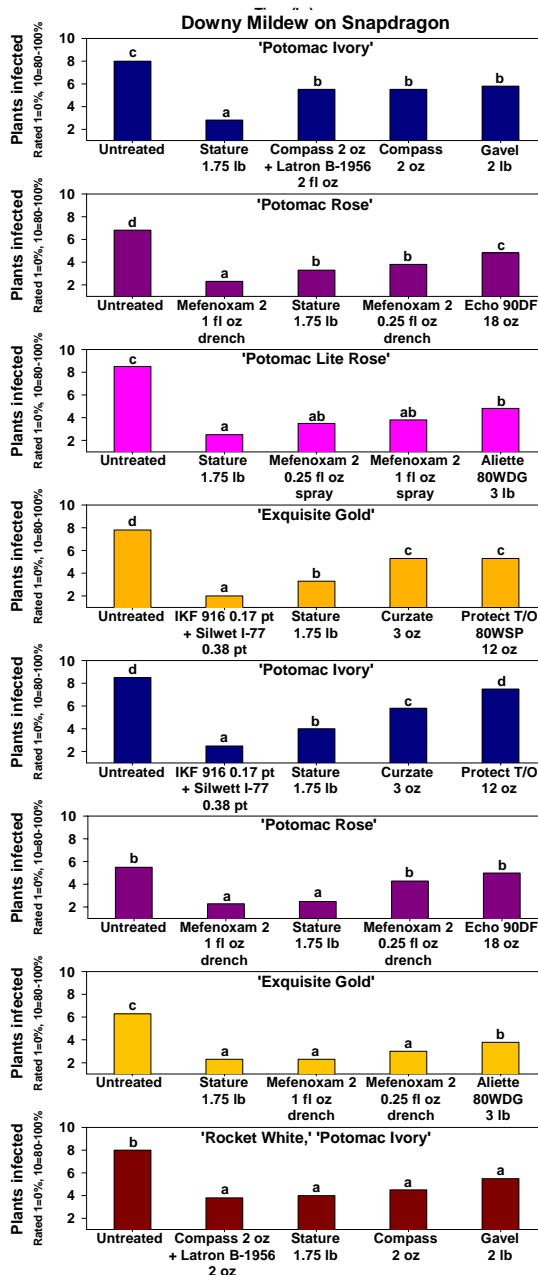
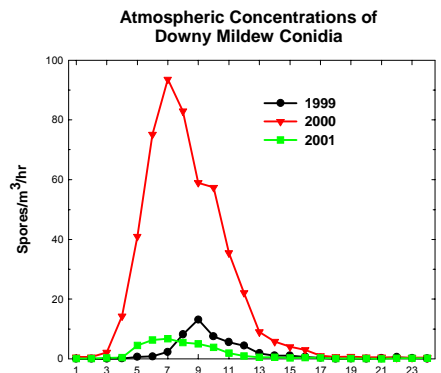
Values in a column followed by the same letter are not significantly different (Fisher's Protected LSD, P=0.05).

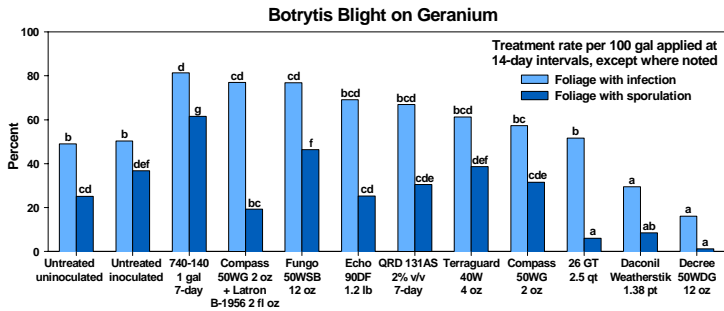
data only) indicated that Terraguard, the biocontrol product QRD 713 AS, and BAS 500 were better than the other treatments at suppressing powdery mildew. A white residue was noted in treatments with both Decree formulations. None of the products showed any phytotoxicity at the rates tested. All would be of value for verbena powdery mildew management.

**Epidemiology and management of downy mildew.** Over the three years of a downy mildew snapdragon study in Florida, atmospheric conidial concentrations were greatest during 500 to 1200 hours. Peak conidial concentrations occurred between 0700 and 0900 hours. Minimum daily temperatures <10.0°C appeared to have a moderate limiting effect on atmospheric conidia concentrations, while temperatures <6.0°C had more severe limiting effects. Maximum daily temperatures >30.0°C limited concentrations of atmospheric conidia. Long dew periods (6 hours) were associated with relatively large conidia releases.

Fungicide trials were conducted in Florida on five snapdragon cultivars. The newly registered fungicide Stature consistently limited downy mildew compared with the untreated plants. Other products that were effective included Mefenoxam 2, Curzate, Compass, Gavel, Aliette, and IKF 916. Protect T/O and Echo 90DF provided inconsistent results. With the successful completion of the fungicide trials we can share this information with the chemical producers and encourage the expansion of labels to include snapdragons.

**Epidemiology and management of Botrytis.** Several fungicides were tested against Botrytis including those considered by EPA to be reduced risk (see graph next page). Both Daconil Weatherstik and the newly registered Decree 50WDG were especially effective in reducing the amount of foliar infection and sporulation. The newly formulated Chipco 26GT was also highly effective in limiting sporulation. The new reduced risk fungicide Compass effectively limited sporulation when combined with Latron B-1956.





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