

# Special Research Report # 126: Disease Management

## Integrated Management of *Fusarium* in Florists' Crops

### Management of *Fusarium* wilt of Hiemalis Begonias

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## BACKGROUND

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Prior to 2003, there were no reports of *Fusarium* causing disease on begonias in North America. In Europe, a new *Fusarium* disease was reported on Hiemalis begonia (*Begonia x hiemalis* Fotsch) that subsequently spread into the U.S. The fungus was initially described as *Fusarium oxysporum* but closer observations and molecular analysis found it was a different species and was called *F. foetens* (Fig. 1).



**Fig. 1**  
Spores and conidiophores of *Fusarium foetens*.

The objectives of this study were to determine: (1) if this new species posed a threat to other begonia cultivars commonly grown, (2) if fungus gnats could spread the pathogen, and (3) the efficacy of different sanitizing agents.



**Fig. 2 - Symptoms of *Fusarium* wilt of Hiemalis begonia.**



**Fig. 3 - Vascular discoloration of Hiemalis begonia infected with *Fusarium* wilt.**

## MATERIALS AND METHODS

### Susceptibility of begonia species:

A series of greenhouse trials examined the susceptibility of seven cultivars of Hiemalis

begonias, 12 cultivars of Rex begonias (*Begonia rex*) along with a tuberous begonia (*Begonia x tuberhybrida*), an angel wing begonia (*Begonia cocchineae*), and seedling begonias (*Begonia x semperfloren-cultorum*) to the new *Fusarium* pathogen. Over a dozen plants were inoculated and compared to a dozen plants that were not inoculated (See Figs. 2 & 3).

### Transmission by fungus gnats:

Six begonias of the cv. Emma were put into pots infested with the pathogen and then placed into open cages that had been enclosed in nylon mesh. Six healthy seedlings of 'Emma' were transplanted into a noninfested potting mix and placed in each cage, but kept at least one foot away from plants in infested soil. All plants were kept in saucers to prevent water from contaminating healthy plants. Two cages were infested with 75 adult fungus gnats (*Bradysia* spp.)/cage. In another set of cages, no fungus gnats were released, and all plants were treated with 1.5 g of Marathon 1% G to inhibit any resident larvae in the potting mix and to

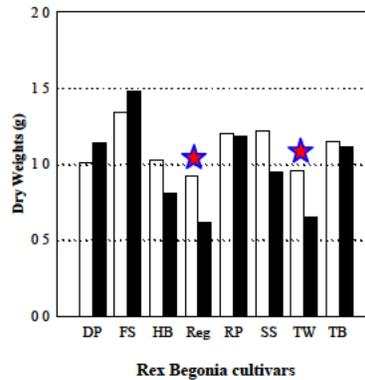
serve as the control. Plants were grown with the cages for 8 weeks whereupon the study was terminated, and plants were destructively harvested and rated for disease.

**Efficacy of sanitizing agents on *F. foetens*:** Varying concentrations of four sanitizing agents were examined for their ability to kill conidia of *F. foetens* in irrigation water. The agents were: household bleach (5.25% sodium hypochlorite), Green Shield® CA (quaternary ammonium compounds), ZeroTol® (peroxyacetic acid and hydrogen peroxide), and Sanitate® (peroxyacetic acid and hydrogen peroxide). Conidia were exposed to each concentration for 15 min and then placed onto a nutrient agar to determine germinability.

## CONCLUSIONS

**Cultivars:** All *Begonia x Hiemalis* cultivars were susceptible to *Fusarium* wilt. Although we did not see any visible symptoms on Rex begonias, we did see a significant stunting of the cultivars Reggae and Trade Winds suggesting that these cultivars may have some susceptibility to the disease (see Fig. 4). The tuberous begonias, angel wing begonias, and seedling begonias exhibited no symptoms or stunting when compared to the control.

**Fungus gnat transmission:** All healthy plants engaged with fungus gnats eventually showed symptoms of *Fusarium* wilt: whereas plants engaged without fungus gnats and treated with insecticide remained healthy (see Fig. 5).



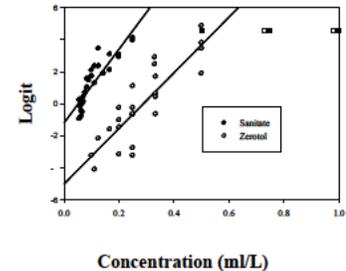
**Fig. 4**  
Effect of *Fusarium foetens* on dry weights of Rex begonias (DP = Devils Paradise, FS = Flamingo Shoals, HB = Hurricane Bay, Reg = Reggae, RP = Rum Painkiller, SS = Silver Sands, TW = Trade Winds, TB = Tropical Breeze); = significantly different from the control.



**Fig. 5**  
Fungus gnat studies. Healthy plants engaged without fungus gnats (left) and healthy plants that became diseased when engaged with fungus gnats (right).

**Effect of disinfectants:** Both household bleach and Green Shield® killed all spores at 0.01% so its LD<sub>50</sub> could not be determined by

these trials. ZeroTol and Sanitate had less activity (Fig. 6). Their LD<sub>50</sub>'s were ZeroTol = 0.3 ml/L and Sanitate = 0.1 ml/L. However, at recommended rates, these products also killed the spores and may be able to be used in irrigation water.



**Fig. 6** - Logit plot of the effect of Zeritol® and Sanitate® on spores of *Fusarium foetens*

## IMPACT TO THE INDUSTRY

Although the incidence of *Fusarium* wilt of begonia is limited, growers must be vigilant and scout for symptoms. If the pathogen becomes established in a greenhouse, strict fungus gnat control will be necessary to minimize spread. In addition, these findings suggest that certain cultivars of Rex begonias may show damage if the pathogen were present in higher inoculum densities.

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