

Special Research Report #110: Disease Management Biology, Epidemiology, and Integrated Management of Fusarium Tuber Rot of Caladiums

Robert J. McGovern¹, Wade H. Elmer², David C. Geiser¹, and Brent K. Harbaugh¹
¹Univ. of Florida-IFAS; ²Connecticut Agricultural Exper. Station; ³Pennsylvania State Univ.



FUNDING INDUSTRY SOLUTIONS
TODAY & TOMORROW

Phone: 618/692-0045

Fax: 618/692-4045

E-mail: afe@endowment.org

Website: www.endowment.org

BACKGROUND

The world's caladium production is centered in and around Lake Placid, Florida. Over the past decade production has declined across all cultivars. One of the primary causes is tuber rot caused by the fungus *Fusarium solani*.



A survey of seed tubers of six important caladium cultivars conducted in 1997 detected an 80-100% incidence of *Fusarium* species. *F. solani* was consistently recovered, but *F. oxysporum* was also occasionally detected. *Fusarium* tuber rot has eliminated many important commercial cultivars.

METHODOLOGY & RESULTS

Biology/epidemiology.

Tissue-cultured caladium tubers were inoculated with *F. solani* and maintained in incubators to examine the infection process. We identified environmental conditions (high relative humidity, ~82° F) and inoculum density ($\geq 10^5$ conidia of *F. solani*/ml) that were optimal for *Fusarium* tuber rot.



We screened 40 isolates of *F. solani* from caladiums for their ability to cause tuber rot and found that these isolates ranged from non-pathogens to highly virulent. Similar experiments conducted with *F. oxysporum* isolates failed to produce tuber rot. *In vitro* assays of 70 *F. solani* isolates indicated that 47 were sensitive, 10 were moderately resistant, and 2 were highly resistant to thiophanate methyl (3336 50 WP, Fungo Flo,

etc.) This is the most commonly used fungicide for tuber rot control in caladium. We generated DNA sequences from four gene regions: elongation factor, internally transcribed spacer (ITS), nuclear large rRNA, and beta-tubulin in 65 isolates of *F. solani*. The results suggest that there are at least two distinct groups of *F. solani* isolates associated with outbreaks of this disease in Florida. Neither of these lineages was previously identified.

Integrated management.

Eleven laboratory experiments evaluated the effect of soaking tubers in hot water (120° F/30 min) amended with fungicides in reduction of infection by *F. solani*. Infection severity and incidence were measured using a *Fusarium*-selective medium and a 0-4 rating scale (see figure 1). Daconil Ultrex 82.5 WDG (chlorothalonil) alone and in combination with 3336 50 WP, Heritage 50 WG (Azoxystrobin), and Medallion 50 WP (Fludioxonil) significantly reduced the incidence and

severity of infection by *Fusarium* spp., while 3336 50 WP alone was generally ineffective. Two field trials evaluated fungicide efficacy in combination with hot water. In an experiment on muck soil, Spectro 90 WDG (chlorothalonil + thiophanate methyl) applied as a tuber soak in hot water increased plant emergence and number of jumbo tubers compared to 3336 alone. Spectro also significantly increased emergence and tuber number in raised, mulched beds on sand. Medallion plus Subdue Maxx 2E applied at planting also significantly increased plant emergence at the same site. (See Figure 2)

CONCLUSIONS

Decline in caladium tuber production in recent years is directly related to a high

incidence of *F. solani* in seed tubers. Resistance to thiophanate methyl exists in *F. solani* which may explain the increase of tuber rot. We found that chlorothalonil alone and in combination with other fungicides reduced infection by *Fusarium* and increased yield. Caladium isolates may be genetically distinct from other groups of *F. solani*. This characteristic may be useful in developing specific detection techniques. Management of *Fusarium* tuber rot in caladium must rely on:

- Selection of highly vigorous seed tubers.
- Preplant use of effective, labeled fungicides in combination with hot water.

- Use of *Fusarium*-resistant/tolerant caladium cvs., when identified or developed.

INDUSTRY IMPACT

Where adopted our recommendations for management of *Fusarium* tuber rot have halted the downward trend of caladium tuber production. Caladium cvs. that are highly susceptible to *Fusarium* tuber rot such as 'Frieda Hemple' and 'Florida Cardinal' have been significantly and positively impacted.

For additional information contact Robert McGovern at rjm@mail.ifas.ufl.edu.

June 2003 © Copyright The American Floral Endowment. All Rights Reserved

Figure 1. *Fusarium solani* Infection Severity Rating Scheme



Figure 2. Fungicide Effects on Emergence & Yield in Caladium 'Pink Beauty'

