

Susceptibility of Trailing Petunia (*Calibrachoa x hybrida*) to Infections by Foliar and Root Fungal Pathogens



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Introduction

Calibrachoa, *Calibrachoa x hybrida*, is a relatively new herbaceous annual crop introduced in 1998 by the greenhouse industry. Little is known about its susceptibility to various pathogens, but since it is closely related to petunia, speculation would implicate a number of potential diseases. Most of the work that involved *Calibrachoa* was done in relation to fungicide testing (1, 2). The objective of this study was to evaluate susceptibility of *Calibrachoa* cuttings to infection by pathogens commonly associated with greenhouse production. Rooted plugs of cv. Colorburst Violet were transplanted into 10 cm pots containing a peat-perlite mix. After four weeks, plants were removed from the growing medium to examine the roots. All isolates tested were pathogenic with varying degrees of symptom expression which included inter-veinal chlorosis of young leaves. Non-inoculated plants had healthy root systems with an abundance of primary, secondary and tertiary roots. Challenged plants showed necrotic root tips with fewer secondary and tertiary roots. We observed a 12-90% decrease in root fresh weight in challenged plants compared to non-challenged plants. All isolates from infected plants were recovered and identities confirmed.

Materials and Methods



Host: *Calibrachoa* cuttings were rooted in oasis before being transferred to 10 cm pots containing a peat:perlite mix (70:30 v/v). For all treatments, plants were maintained, watered, fertilized, and insect control was applied as needed.

Pathogens tested:

- *Two *Pythium* species: *P. aphanidermatum* (29), *P. ultimum* (211)
- *Three *Phytophthora* species: *P. cactorum* (814), *P. cinnamomi* (544), and *P. citrophthora* (889)
- **Rhizoctonia solani* (122) AG2
- **Verticillium dahliae* (CB68-4) VCG 4A
- **Botrytis cinerea*
- *Powdery mildew (Poinsettia isolate)

Inoculation Procedures:

- ✿ *Phytophthora* and *Pythium* spp. Four to five 1 cm plugs from the edge of the culture were placed at the crown of each plant in the 10 cm pot and covered lightly with soil to avoid desiccation. Pots were placed in plastic trays with about 1 inch of water for 48 hours to create flooding conditions that allow the release of zoospores and sporangia. After 48 hours, plants were removed from the trays and returned to greenhouse benches.
- ✿ *Rhizoctonia solani*: Soil inoculum was mixed with greenhouse potting mix.
- ✿ *Verticillium dahliae*: Microsclerotia of *V. dahliae* were added to the potting mix at the concentration of 105/g soil.
- ✿ *Botrytis cinerea*: Conidia was harvested from inoculum grown on PDA and adjusted to 10⁴ conidia/ml. Plants were sprayed to runoff with the spore suspension and placed in a mist chamber with low light and high humidity for the duration of the experiment.
- ✿ Powdery Mildew: Conidia were harvested with a paint brush from an unidentified powdery mildew pathogen on naturally infected Poinsettia plants and transferred to *Calibrachoa* leaves with a paintbrush. Inoculated plants were placed in a mist chamber with conditions conducive to disease development.

Disease Evaluation:

- ✿ Plants were visually inspected and disease severity was rated on a scale of 1 to 6.
- ✿ Roots were examined for disease symptoms and weighed to determine response to infection.
- ✿ Above ground vigor was assessed by determining the shoot fresh weight.

Experimental Design and Statistical Analysis:

Plants were challenged with soil pathogens and placed in the greenhouse/mist chamber in a randomized complete block design with 3 blocks and 7 replications per block. Analysis of variance (ANOVA) was implemented using the GLM procedure of SAS.

Results

Response of Calibrachoa plants to pathogen challenge fell into distinctive categories (Fig. 1):

- No or very little symptom development as indicated by low disease rating values. These were plants that were challenged with the two *Pythium* species and *Rhizoctonia*.
- Plants that responded moderately to the presence of the pathogen at the early stages of growth showing stunted growth and necrotic roots (*P. cactorum*), or white powdery deposits on younger leaves (Powdery mildew). However these plants soon recovered and maintained vigorous growth.
- Plants that scored high disease rating values, and exhibited stunted growth, and poor root development. Plants in this category died 3-4 weeks after infection (*P. citrophthora*) or soon thereafter (*P. cinnamomi*, and *V. dahliae*). Within this category were the plants that were challenged with *B. cinerea*. Under conditions of optimum light and moisture content, *B. cinerea* (Plate 2) seems as aggressive on Calibrachoa as *P. citrophthora*.
- Powdery mildew is a very specialized pathogen. In this study the isolate tested was obtained from naturally infected poinsettia plant and seemed to have little effect on Calibrachoa and is probably not pathogenic to Calibrachoa.
- The response of Calibrachoa to the pathogens tested was also manifested on plant growth and root development (Plate 1). Plants challenged with *P. citrophthora* and *P. cinnamomi* had significantly lower root weight compared to the control and other *Pythium* and *Phytophthora* inoculated plants.

Fig. 1: Response of Calibrachoa to infection by various greenhouse pathogens.

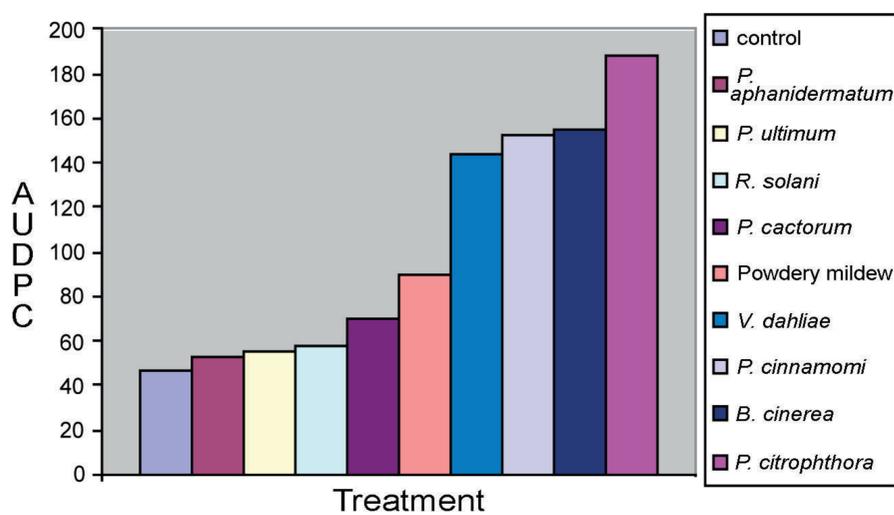


Plate 2: Foliar symptoms:

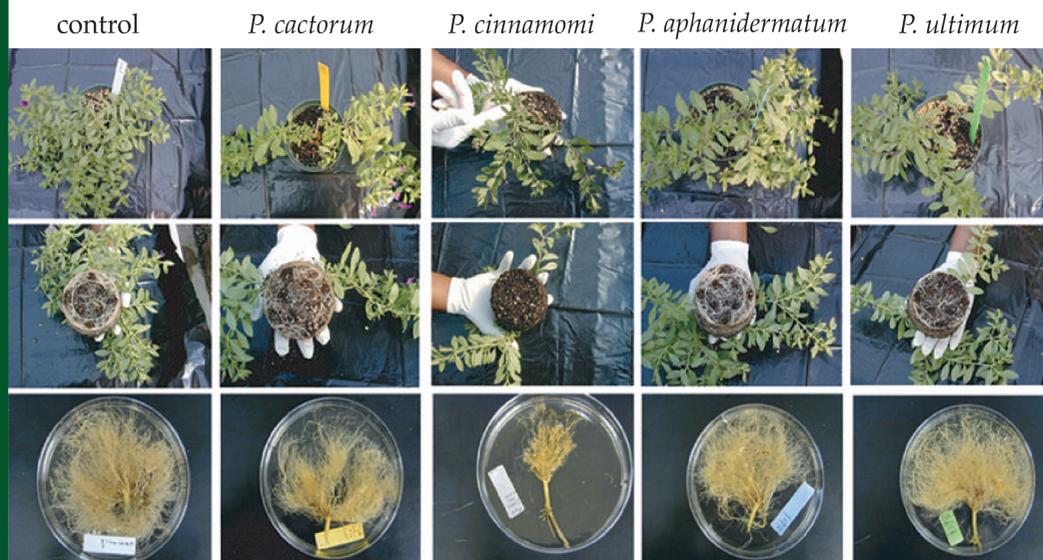
A) Wilting caused by *V. dahliae*.

B) *B. cinerea* growing on foliage.

C) Chlorotic foliage induced by *P. cinnamomi*.



Plate 1: Response of Calibrachoa to pathogens 6 weeks after inoculation.



Conclusions

- The pathogens tested in this study are prevalent in greenhouse settings and can be easily introduced through the use of infested soil or contaminated tools and can be aggravated by excess watering.
- *P. cinnamomi* & *P. citrophthora* killed the plants in 2-5 weeks.
- The two *Pythium* pathogens (*P. aphanidermatum* & *P. ultimum*) had little effect on the plants, which could be due to the semi woody nature of Calibrachoa roots. However, annuals with non-woody root system might be prone to infection by *Pythium* and other weak pathogens.
- *Verticillium* seemed to be aggressive on Calibrachoa, causing leaves to wilt 4-5 weeks after inoculation.
- Though the *Rhizoctonia* isolate tested in this study was not as aggressive as other pathogens, its effect on the plant appeared 7-8 weeks after inoculation. A plant that remained in the pot for 3-4 months could potentially show damage.

Literature Citation

1. M. K. Hausbeck, J. A. Woodworth, and B. R. Harlan. 2003. Evaluation of a biopesticide and fungicides for managing *Phytophthora* crown rot of Calibrachoa, 2003. Fungicide and Nematicide Tests. Vol.60. APS Press.
2. S. L. Slinski, R. L. Wick, and M. B. Dicklow. Evaluation of fungicides for rescue management of *Phytophthora dreschleri* crown rot of million bells, 2003. Fungicide and Nematicide Tests. Vol.60. APS Press.