

Plant Selections for Vegetative Channels: Evaluation of Seven Aquatic Plant Species for Susceptibility to Five Species of *Phytophthora*

Natasha L. Bell^{1*}, Daniel R. Hitchcock², Sarah A. White³



SCRI - CLEAN WATER³
REDUCE, REMEDIATE, RECYCLE

1- Environmental Engineering and Earth Sciences, Clemson University; 2- Baruch Institute of Coastal Ecology and Forest Science, Clemson University; 3 - Plant and Environmental Sciences, Clemson University

Introduction

- Growers have incentives to **develop onsite water treatment to enable water reuse**, including:
 - Increased competition for freshwater resources
 - Negative environmental impacts associated with non-treated agricultural and horticultural production runoff
 - Regulations concerning water use, quality, and disposal
- Effective and low-cost water remediation technologies are needed to ensure irrigation wastewater contaminants don't escape production areas
- Use of **aquatic plant species to remove contaminants in onsite vegetative channels**^{1,2} is an emerging research area

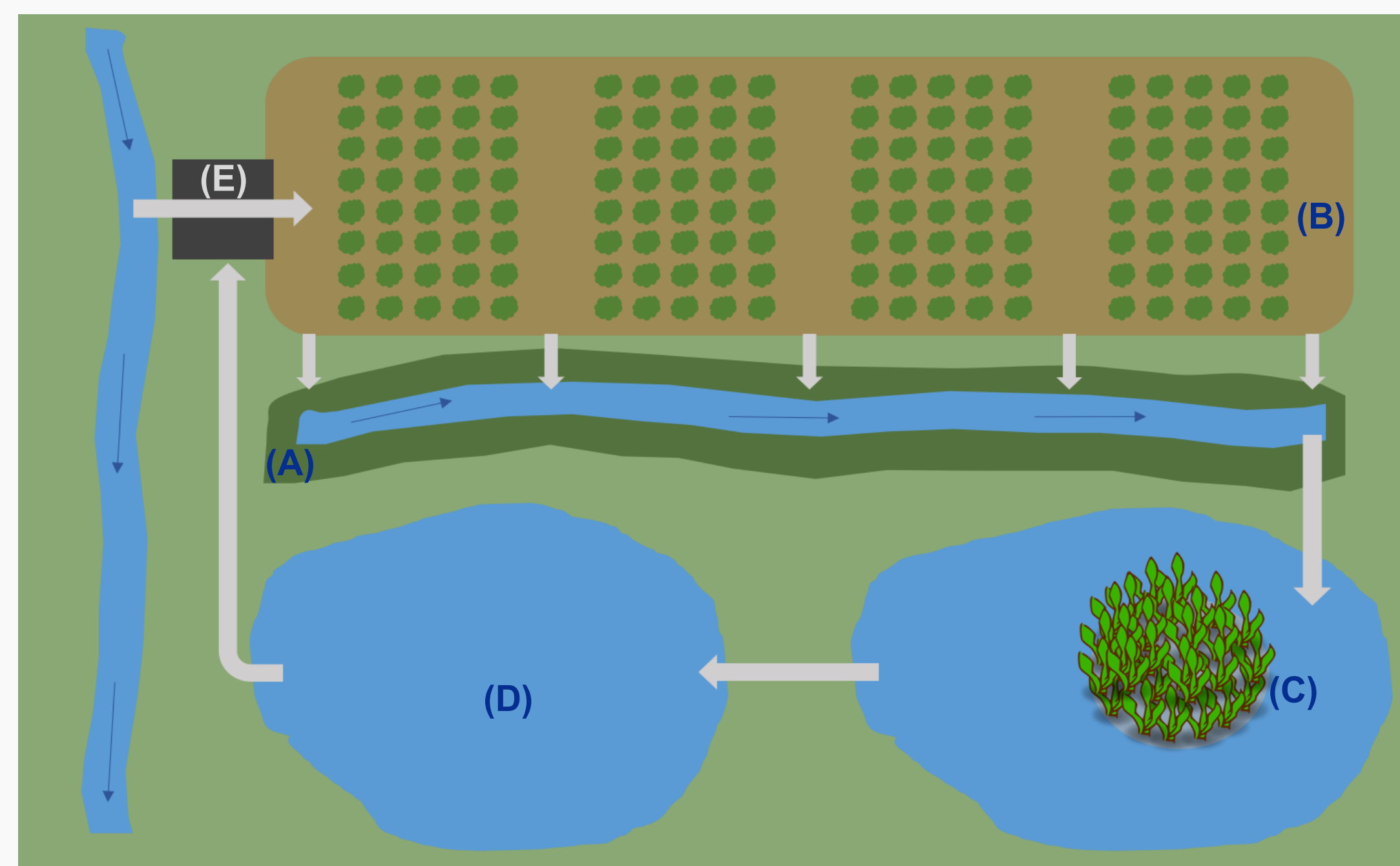


Figure 1. Schematic of a nursery that recycles runoff water and employs treatment systems, including a vegetative channel (A) that diverts water from growing area (B) to a series of floating treatment wetlands (C). Remediated irrigation wastewater flows into a second pond (D), and then may then be pumped (E) to be reused for irrigation.

*Phytophthora*³:

- Root, crown, and fruit rot, and foliage blight
- Millions of dollars in crop losses each year in the US
- Classified as Oomycetes, along with Pythium and Downy Mildews
- Cell walls made of cellulose - more closely related to plants and protozoa (rather than fungi with cell walls made of chitin)
- Chemotactic – attracted to and move toward host tissue

Objectives

The objective of this **greenhouse experiment** was to measure **potential susceptibility** of seven wetland plant species to infection by five species of *Phytophthora* commonly found at plant nurseries in the southeastern US

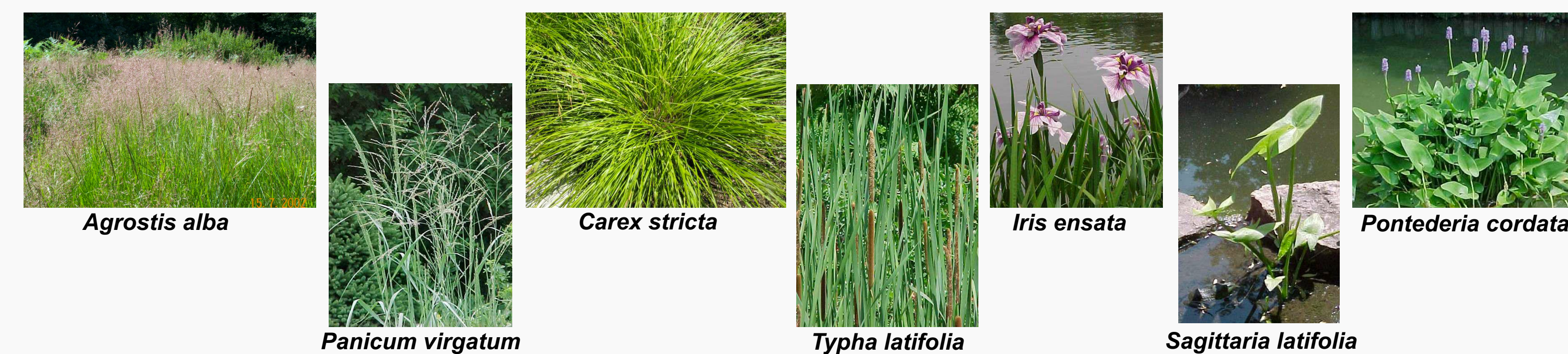
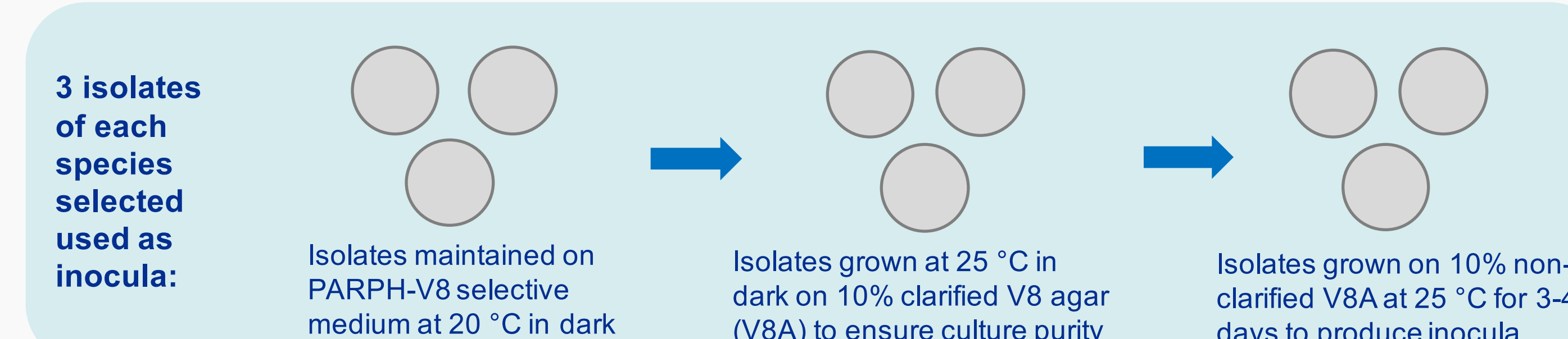


Figure 2. Wetland plant species used in this experiment (photographs from missouribotanicalgarden.org, except for *Agrostis alba* photograph - calphotos.berkeley.edu).

Methods⁴

Inocula Production:
P. cinnamomi
P. citrophthora
P. cryptogea
P. nicotianae
P. palmivora

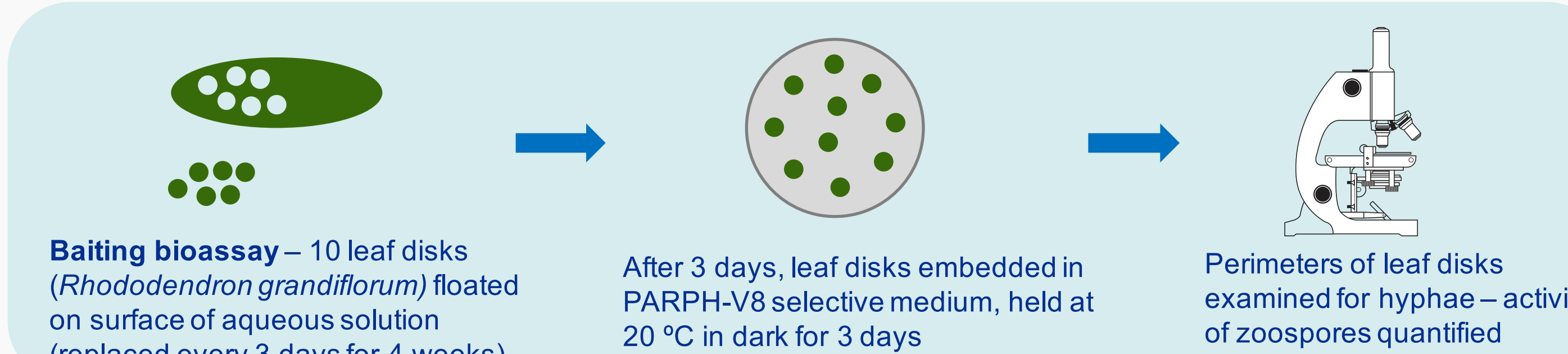


Aquatic plant species establishment & inoculation:

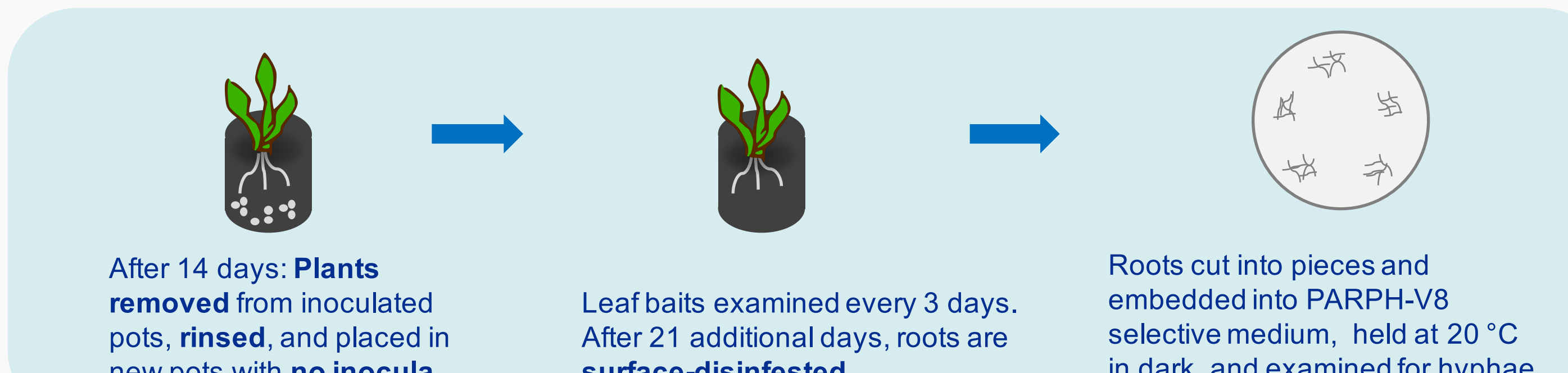


Monitoring:

- Leaf baits
- Plant growth rate
- Symptom development
- Ambient air & water temperature



Determine if plant serves as source of inoculum after 14 days constant exposure to inoculum:



Preliminary Results

- Colonization of floating leaf baits **confirmed zoospore presence and activity** (Figure 3)

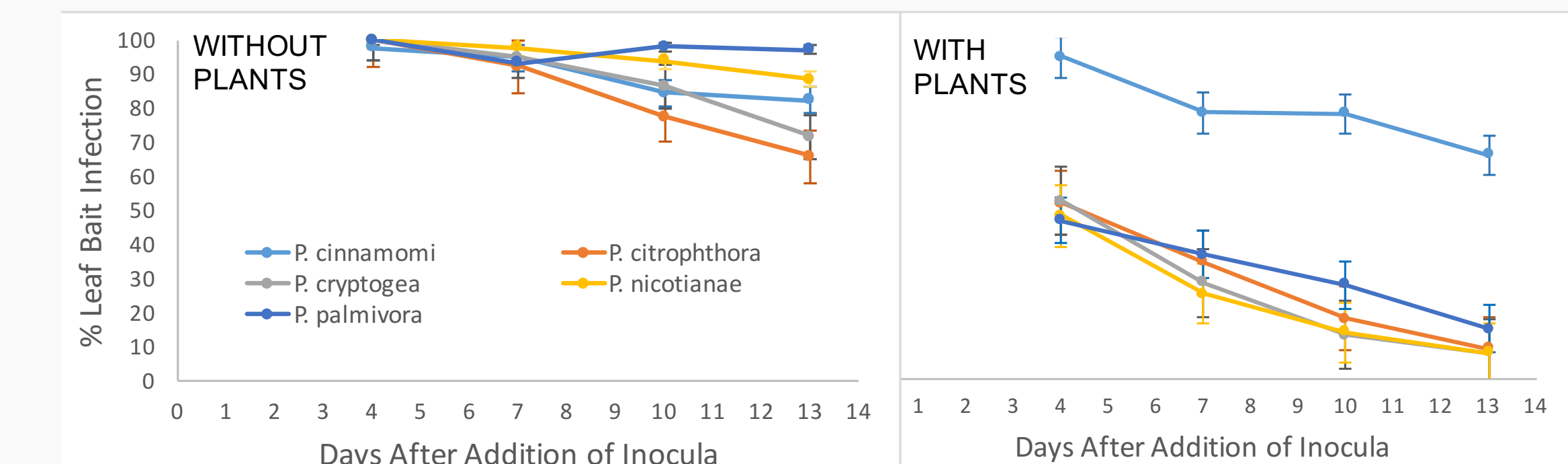


Figure 3. Percentage of leaf baits infected in the 'Phytophthora only' treatment (left) and the 'Phytophthora+Plant' treatment (right) during inoculation period (first 13 days of experiment).

- Percent leaf bait infection significantly differed ($p < 0.0001$) between the **'Phytophthora only' (90% infected)** and **'Phytophthora+Plant' (36% infected)** treatment groups
- Plants inoculated with *P. cinnamomi* had significantly greater percentages of infected leaf baits as compared to other *Phytophthora* species during inoculation period (Table 1)

Table 1. Comparison of the means of the percentages of leaf baits infected for experimental units containing plants during inoculation period. Means were compared using Tukey's LSD ($\alpha=0.05$). Means that do not share the same letter are significantly different.

<i>Phytophthora</i> Species	Plant Only	% Leaf Bait Infection
<i>P. cinnamomi</i>	A	78.7
<i>P. citrophthora</i>	B	27.1
<i>P. cryptogea</i>	B	24.2
<i>P. nicotianae</i>	B	22.6
<i>P. palmivora</i>	B	30.6

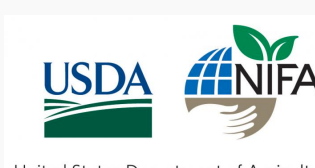
- No surface-disinfested root pieces were found to be infected – that is, these 7 plant species do not appear to be susceptible to these 5 common species of *Phytophthora***

Discussion & Future Work

- These 7 plant species do not appear to serve as hosts to 5 common species of *Phytophthora* found in the SE United States**
- Experiments will be **repeated during the Winter months** to determine **temperature effects** on *Phytophthora* pathogenicity
- Experimental vegetative channels will be constructed to **determine effects** of the following on *Phytophthora* removal:
 - Hydraulic retention time
 - Nutrient concentration
 - Inoculum loading
 - Planting density

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