Relating Seedling Quality and Survival to Cold Storage of Southern Pine Seedlings in the Presence of *Pythium*

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SFNMC Contact Meeting
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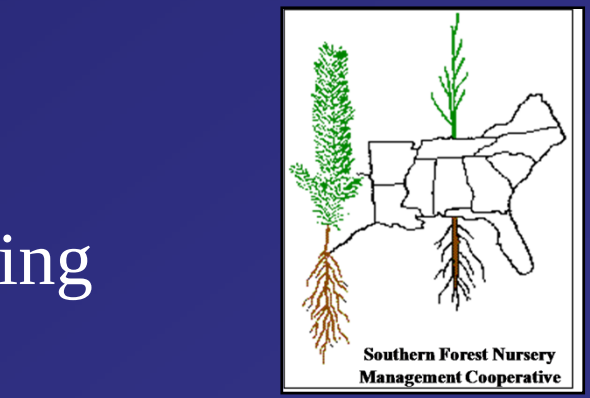

Container vs Bareroot Seedlings

Container

- More expensive
- Intact root plug after lifting
- Higher survival
- Extended planting season
- Storable throughout fall and winter

WHY?

Bareroot

- Cheaper
- Exposed root system
- Lower survival
- Defined planting season, especially if stored
- Poor storability before mid-December

The Million $ Question

Why do container seedlings store better than bareroot seedlings?

- At lifting, bareroot seedling root systems can be torn, especially if soil conditions are saturated or frozen
- There is speculation that *Pythium dimorphum* uses the injured roots as pathways for infection
- Seedlings are then placed in storage where the fungus may thrive in the moist, cool conditions


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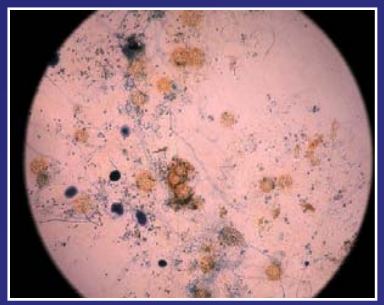
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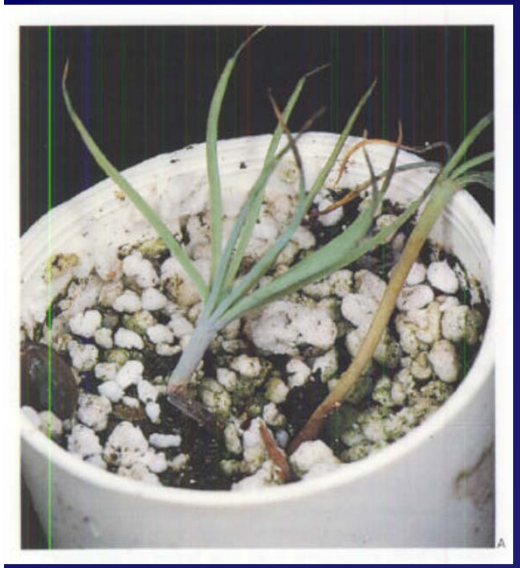
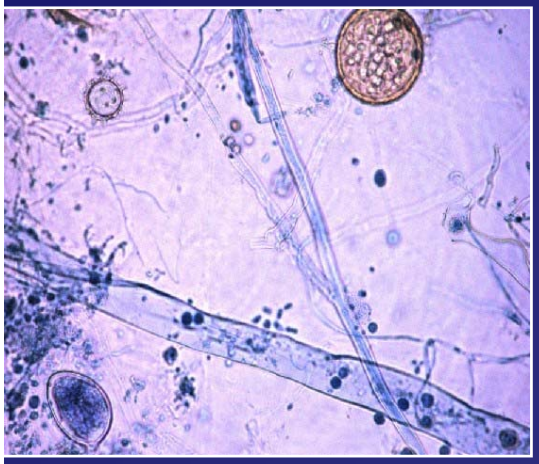
Pythium diseases



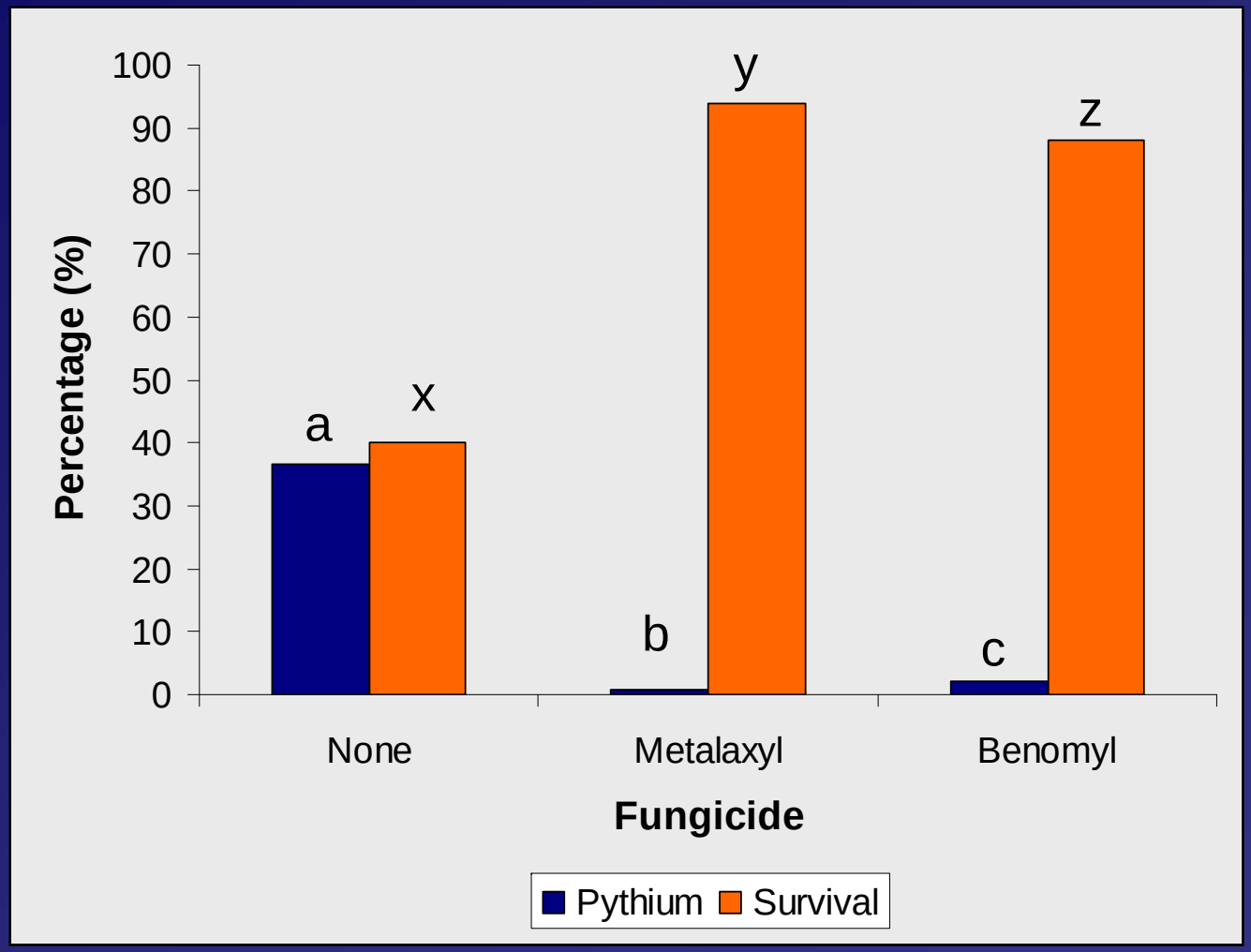
- Post-emergence damping off is evident when the seedling buckles at the hypocotyl area and falls over
- The absence of fine, lateral roots is an indicator of *Pythium* root rot
- These diseases spread more rapidly in bareroot nurseries

Pythium dimorphum



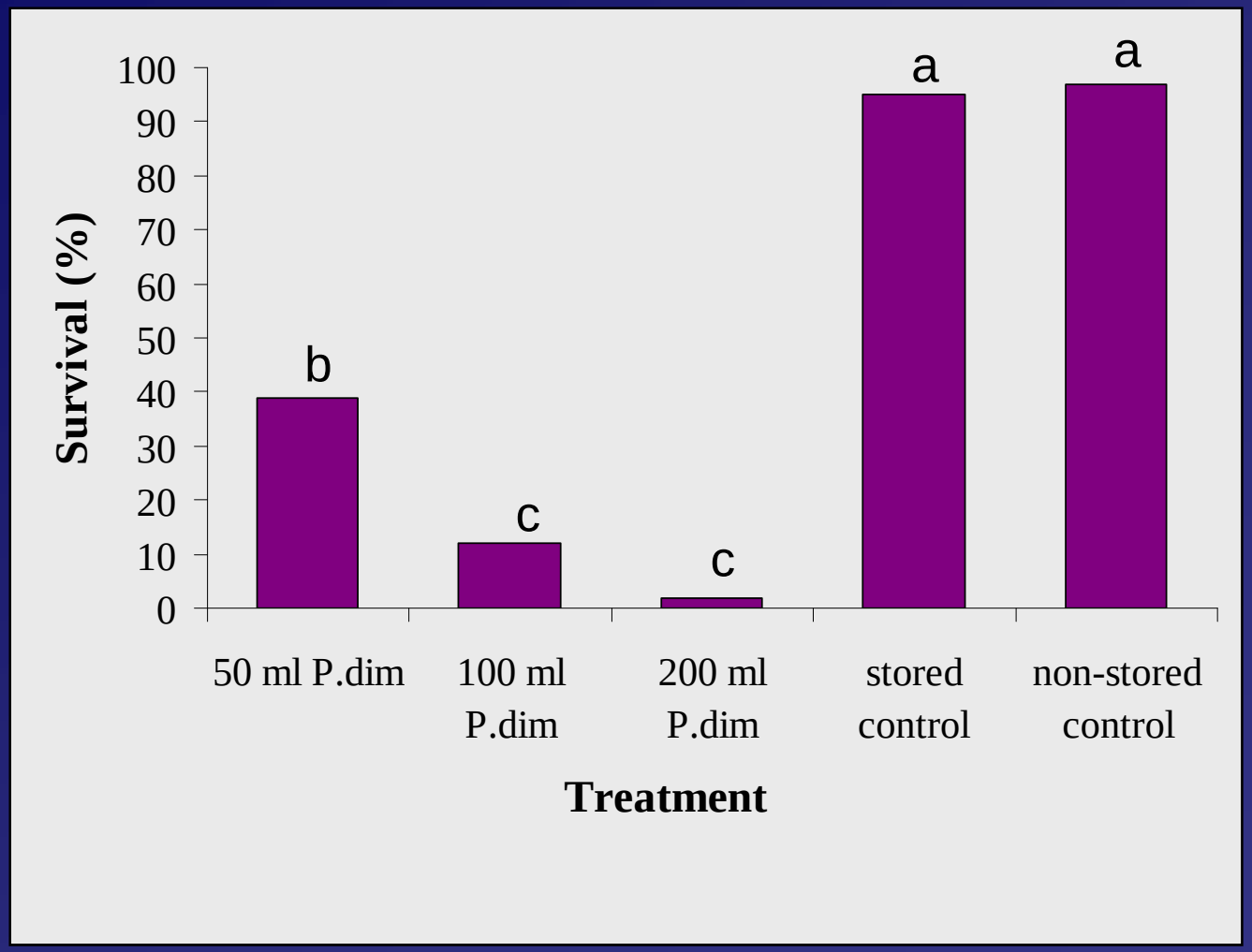
- This species was discovered on feeder roots of loblolly pine (*Pinus taeda*) in Louisiana
- It can lay dormant in the soil for years
- Moist, poorly drained soils allow zoospores to move throughout nursery beds, especially after irrigation or rainfall

Isolation and survival percentages from longleaf pine roots treated with fungicides and cold stored for four weeks



Jones et al. 1992

*Seedling survival from bareroot longleaf pine roots inoculated with *Pythium dimorphum* after 4 weeks of storage at 3-5°C in a 1994 supplementary field trial*



Sun 1996

Longleaf Pine Seedling Storability Experiment

Bareroot Longleaf

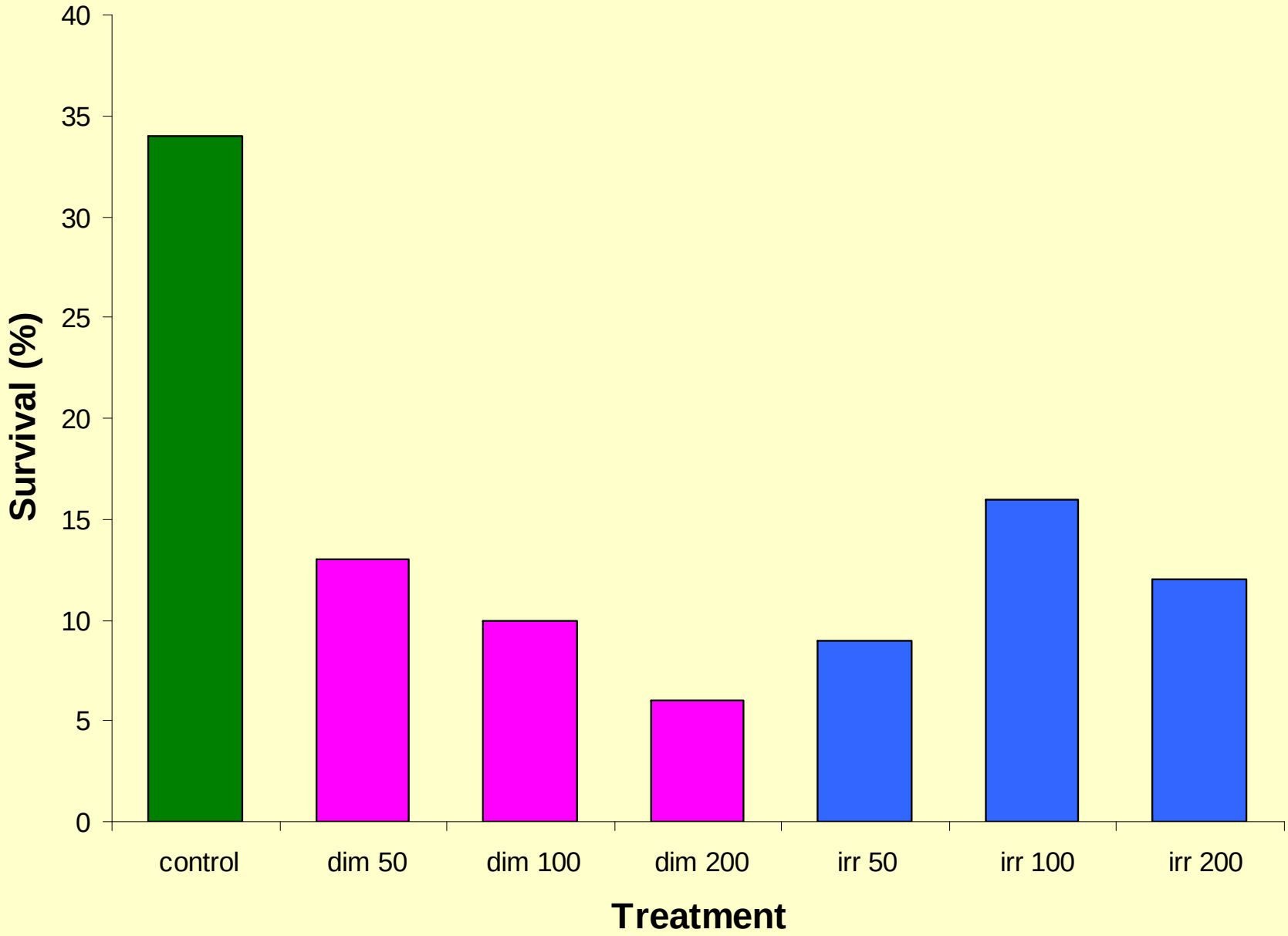
- Inoculated with *P. dimorphum* and *P. irregulare*
- Three levels: 50, 100, & 200 g

Container Longleaf

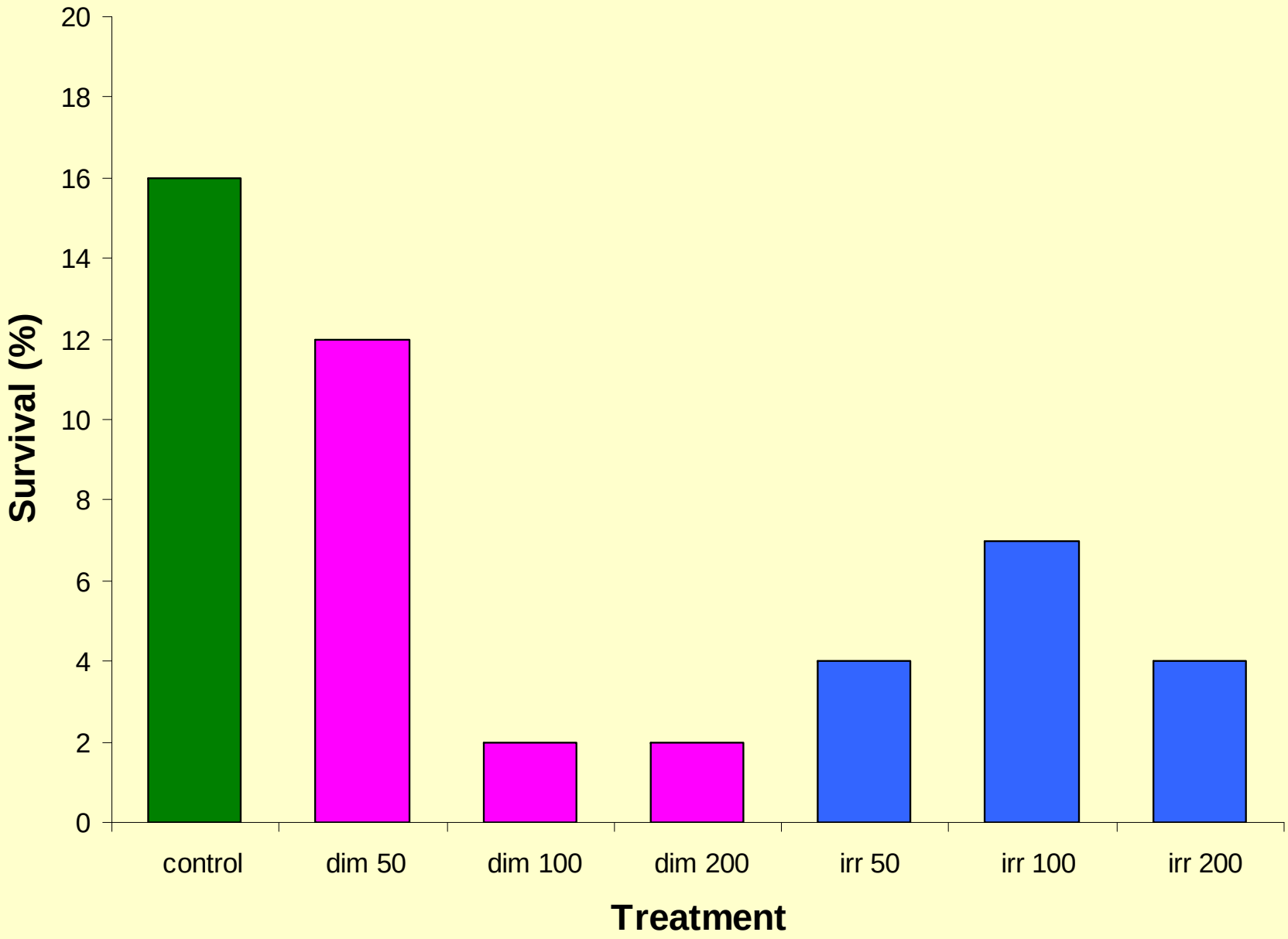
- Inoculated with *P. dimorphum* and *P. irregulare*
- One level: 200 g
- Root plug wounded or not wounded

- Storage Periods: three, six, and twelve weeks in plastic bags at 4-5°C (3 reps of 30 seedlings/treatment)
- Survival: seedlings outplanted after each storage period and monitored for six months

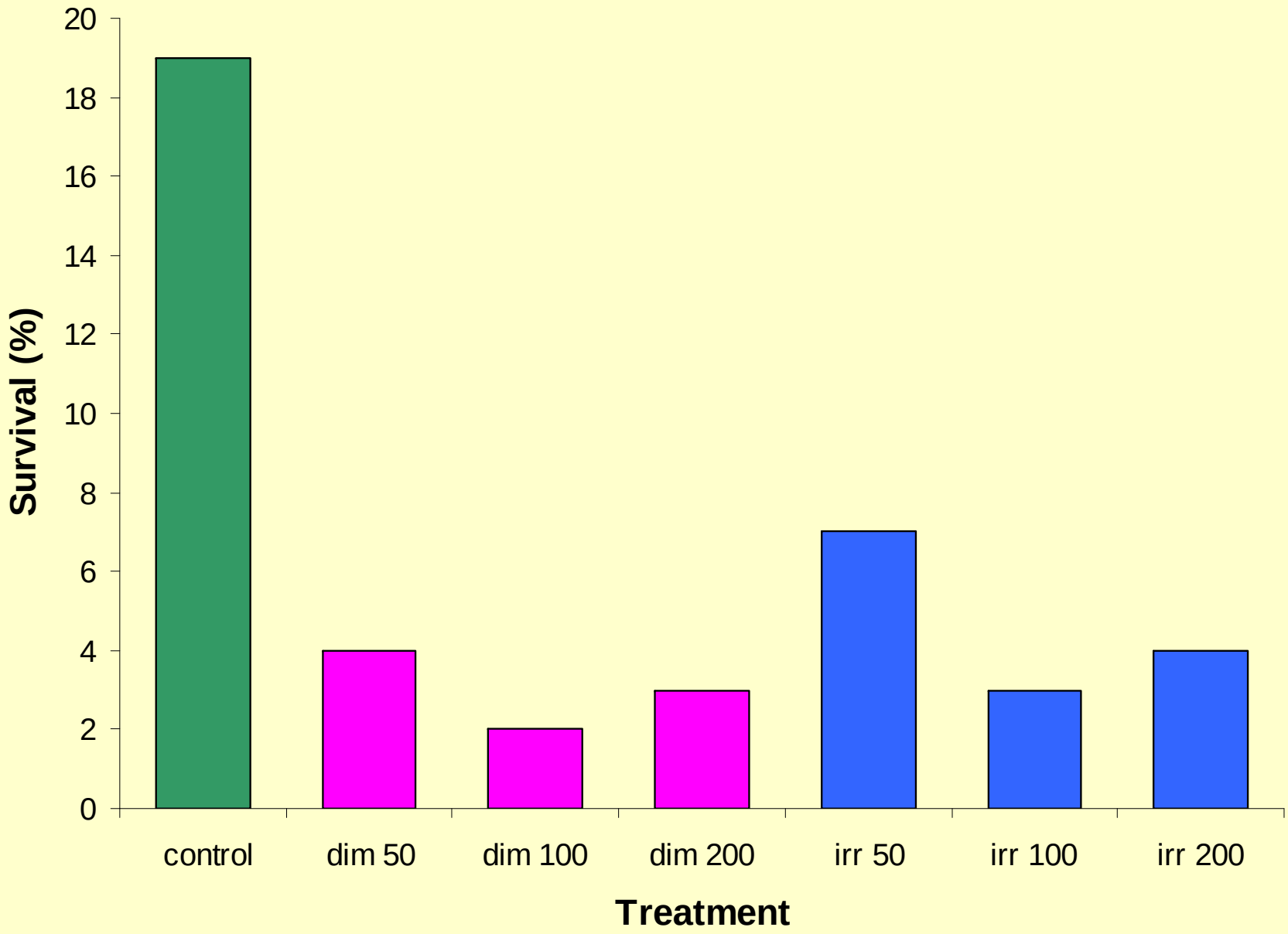
Bareroot Longleaf Survival: Stored 3 Weeks-Outplanted 24 Weeks



Bareroot Longleaf: Stored 6 Weeks-Outplanted 21 Weeks



Bareroot Longleaf: Stored 12 Weeks-Outplanted 18 Weeks

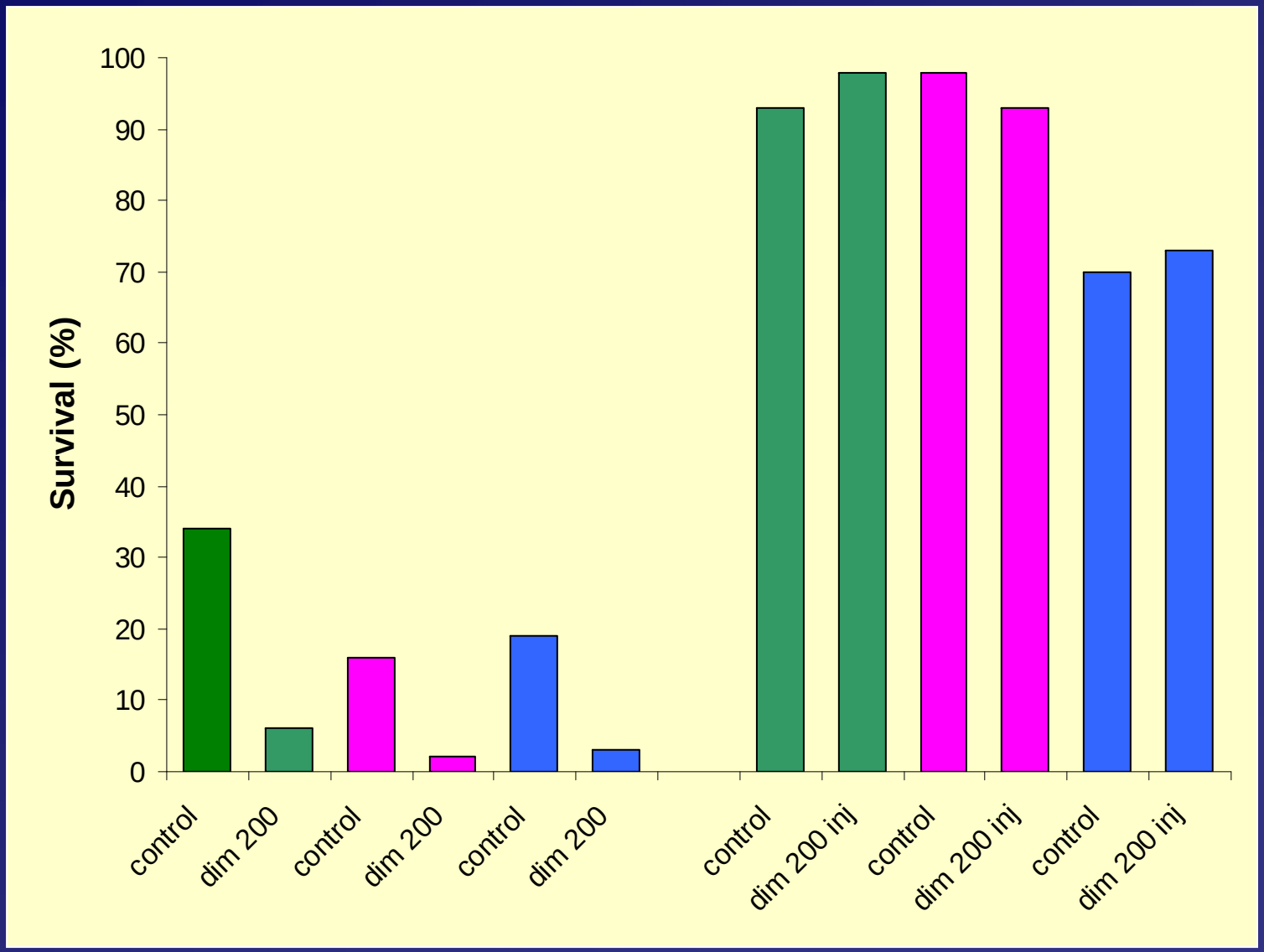


Survival: Bareroot vs Container Seedlings

= 3 wks stored/24 out

= 6 stored/21 out

= 12 stored/18 out



Bareroot

Container

Bareroot Longleaf Pine Root Growth Potential After Storage

Treatments:

- Inoculated with *P. dimorphum* and *P. irregulare*
- Two levels: 50 and 200 g
- Cold stored for three weeks in plastic bags at 4-5°C
- Placed in aerated aquariums (hydroponics)

(3 reps of 30 seedlings/treatment)

Measurements:

- RCD measured before going into the aquariums and after 60 days
- New roots > 0.5 cm were counted

RGP Experiment: Results

Treatment	New Roots > 0.5 cm	RCD 1 (mm)	RCD 2 (mm)	RCD Difference	Survival (%)
Control	20	9.94	10.12	0.19	82
P. Dim 50	13	9.28	9.11	-0.17	73
P. Dim 200	14	9.74	9.45	-0.29	84
P. Irr 50	30	8.30	8.29	-0.01	93
P. Irr 200	19	8.85	8.60	-0.25	86

Storability Research Happening Now

Shortleaf

Loblolly

- Maybe there is something in peat that suppresses *Pythium*, allowing container seedlings to store better?
- We are growing container loblolly, longleaf (*Pinus palustris*), shortleaf (*Pinus echinata*), and slash (*Pinus elliottii*) using 100% perlite or 100% peat/perlite media
- Treatments are: inoculations with *P. dimorphum*, *P. irregulare*, or none; roots wounded or not wounded; cold storage for 0, 6, or 12 weeks
- Survival will be monitored after storage in a greenhouse for four months

Storability Research Summary

- *Pythium* reduced survival of bareroot longleaf pine seedlings to < 15%
- Survival is worse with longer periods of cold storage
- *Pythium* is not affecting container longleaf pine seedling survival
- *Pythium* did not affect the root growth potential of bareroot longleaf pine seedlings
- Bareroot longleaf seedling RCD's shrunk during the RGP test with increasing levels of *Pythium*

Future Research

- *P. dimorphum* and *P. irregulare* pathogenicity (happening now)
- Container loblolly, longleaf, shortleaf, and slash seedling survival following several fall/winter lift dates, inoculations with *Pythium*, and cold storage (fall 08)
- Forest tree nursery soil surveys (fall & winter 08-09)
- Bareroot and container loblolly, shortleaf, and slash seedling survival following inoculations with *Pythium*, root wounding, and cold storage (winter 08-09/spring & summer 09)
- Root growth potential of bareroot loblolly, shortleaf, and slash seedlings following *Pythium* inoculations and cold storage (spring 09)
- *Pythium* growth rate on peat-amended agar (summer 09)

Thank You!

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- Forest Health Dynamics Laboratory-SFWS

Questions?