

Pine Decline in the Southern US – Nursery Issue?

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What is decline?

“...an interaction of interchangeable specifically ordered abiotic and biotic factors to produce a gradual general deterioration often ending in the death of the tree.” Paul Manion

History & Importance



Courtesy of M.J. Wingfield

Symptoms

- Short chlorotic needles.
- Sparse crowns.
- Reduced radial growth.
- Deterioration of fine roots.
- Mortality occurring in age class \geq ?? years

Symptoms - Crown



Pinus taeda

Symptoms - Crown



Pinus echinata

Symptoms - Crown



Fort Jackson Army Base, SC



Fort Benning Army Base, GA



Fort Benning Army Base, GA



Pinus pulustris

Symptoms - Roots

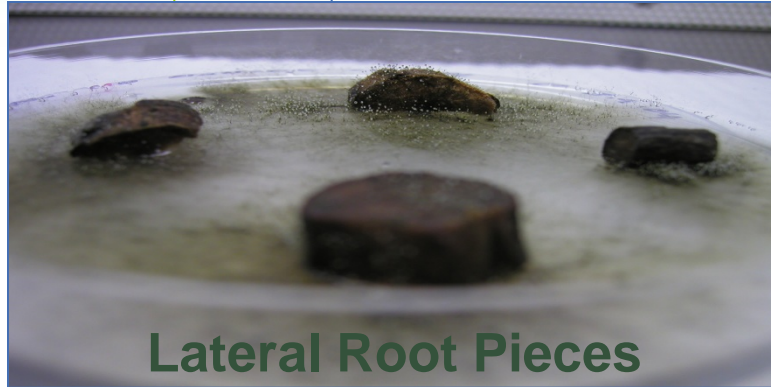
Loblolly Pine Root Ball Comparison



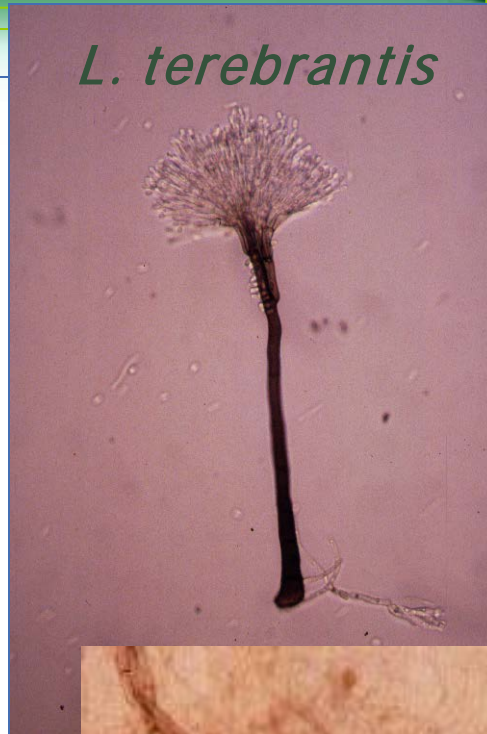
Healthy

Unhealthy

Leptoglyphium & *Ophiostoma* species



L. terebrantis



L. alacris



L. procerum



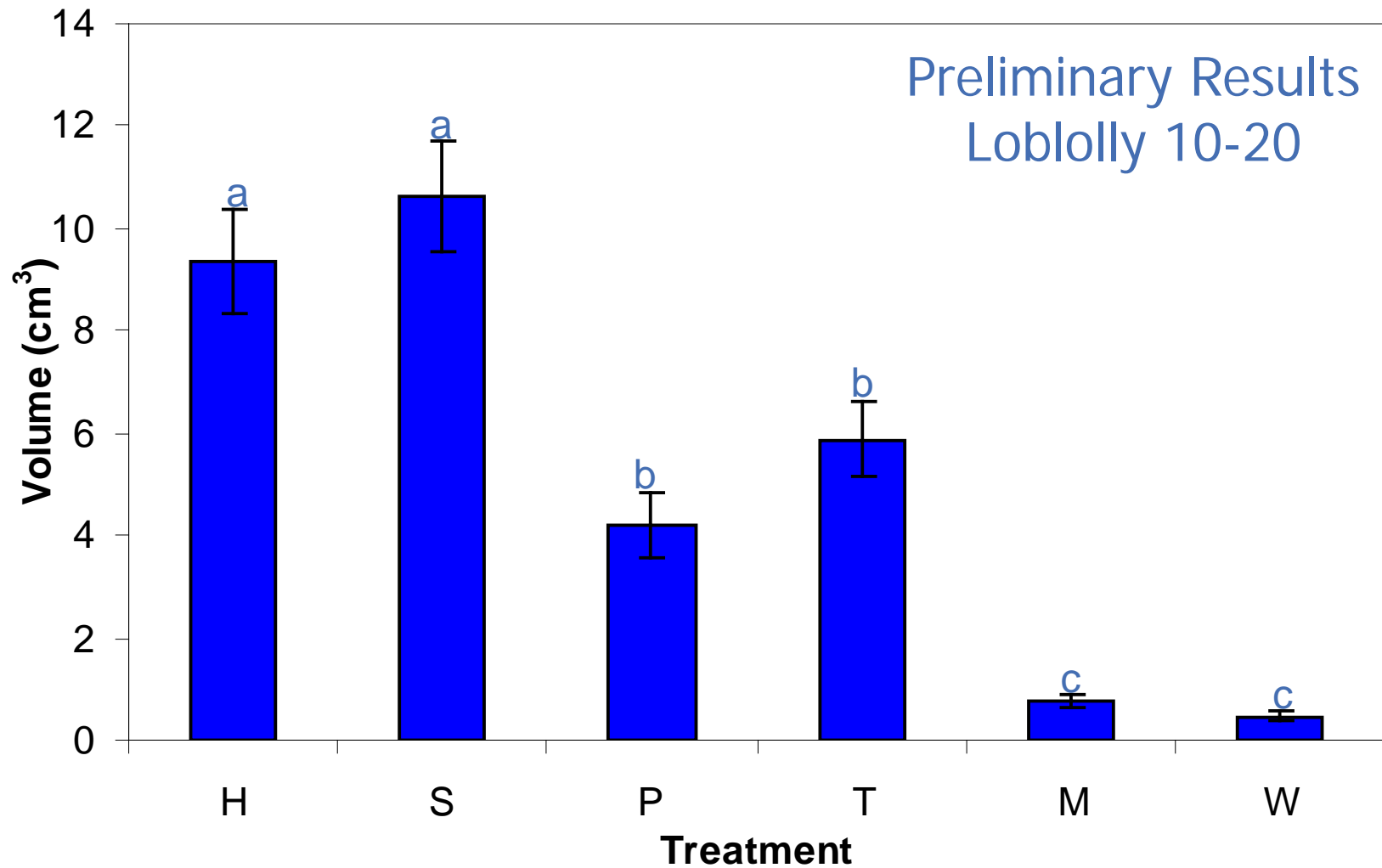
Ophiostoma spp.



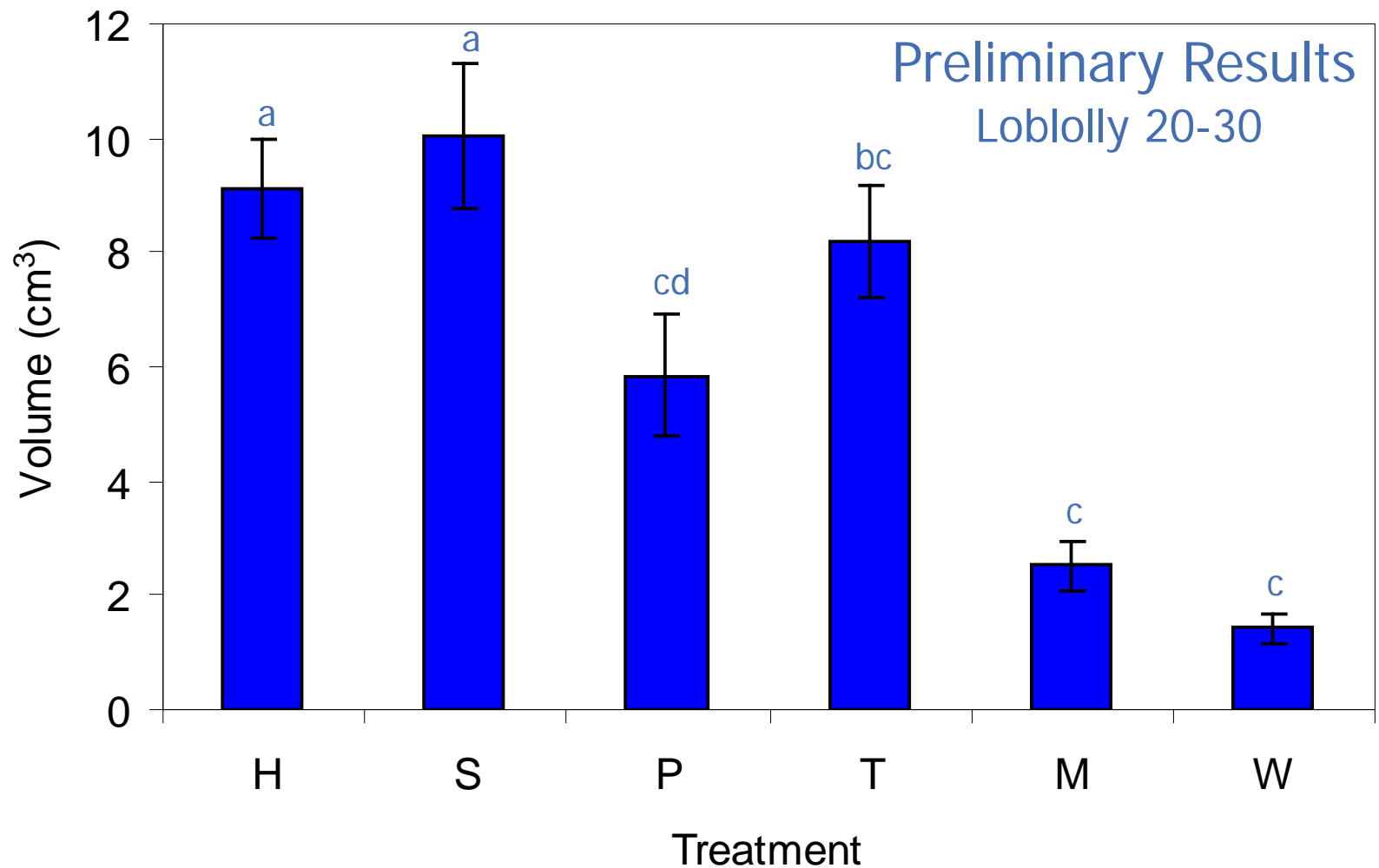
Pathogenesis

- Southern Yellow Pine
 - *Pinus taeda*
 - *Pinus palustris*
 - *Pinus echinata*
- *Leptographium* & *Grossmania*
 - *L. terebrantis*
 - *L. procerum*
 - *L. alacris* (Formerly *L. serpens*)
 - *L. truncatum*
 - *G. huntii*
 - Several undescribed species

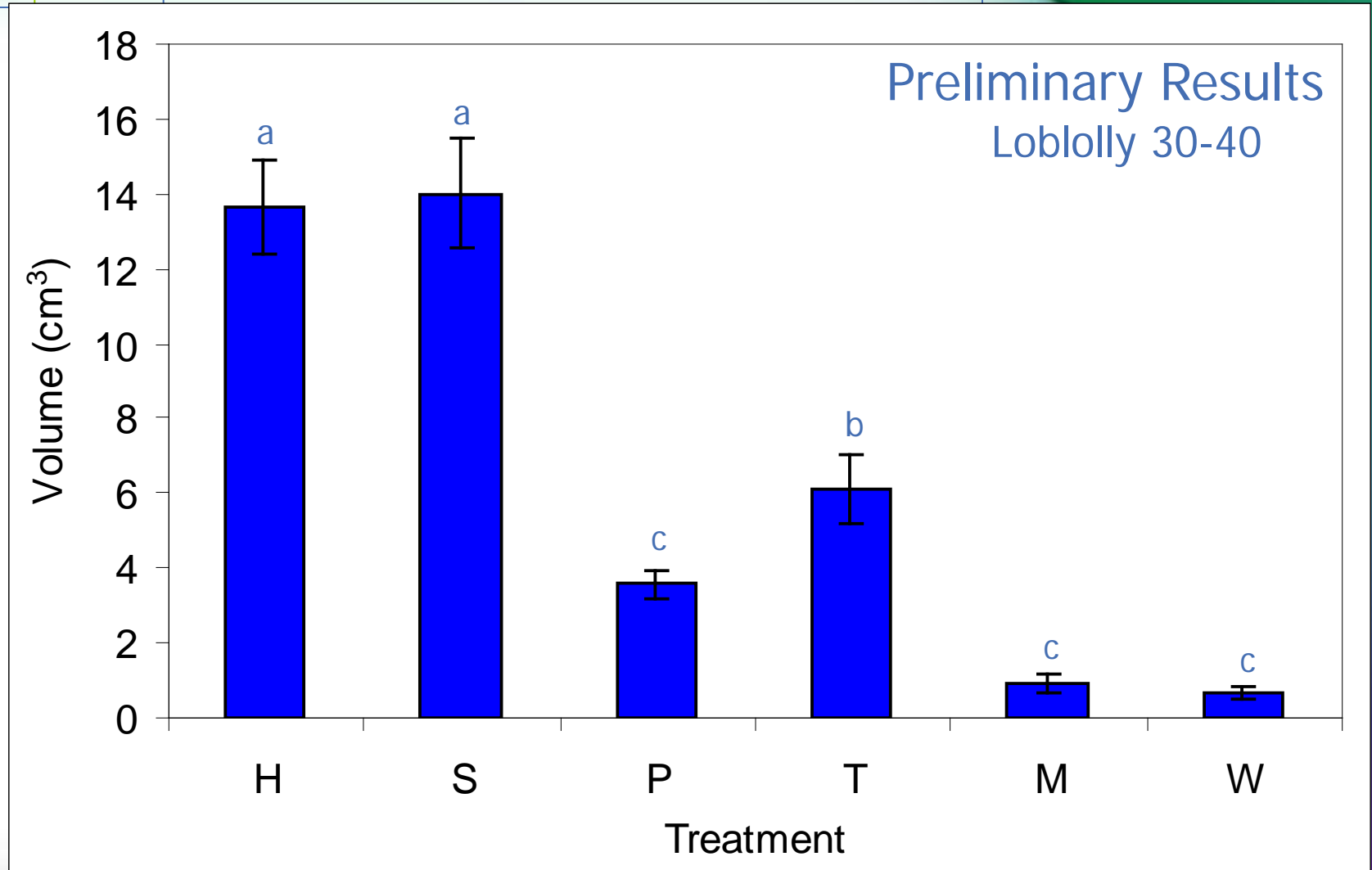
Pathogenesis - Mature Root Inoculations



Pathogenesis – Mature Root Inoculations

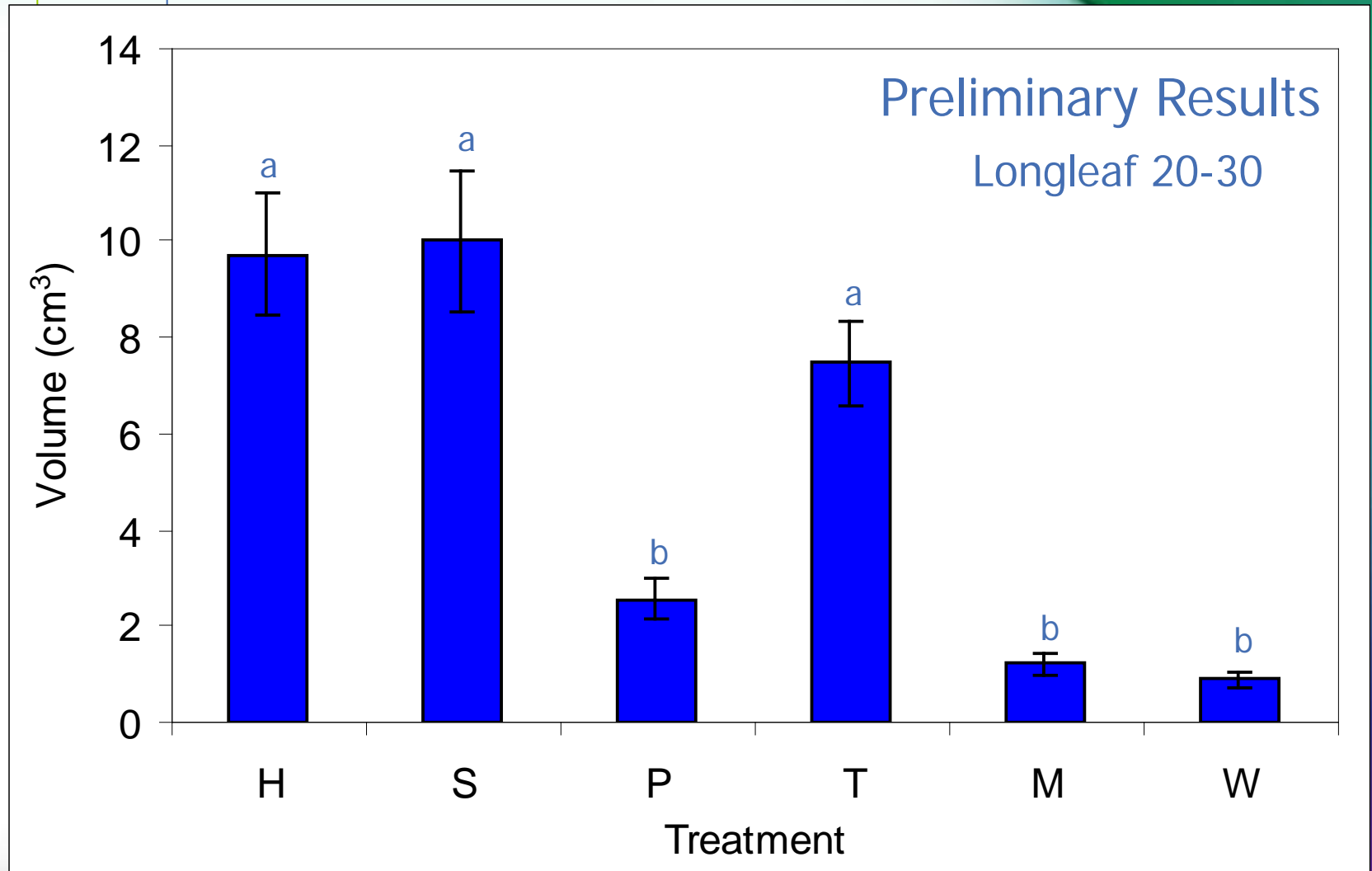


Pathogenesis – Mature Root Inoculations



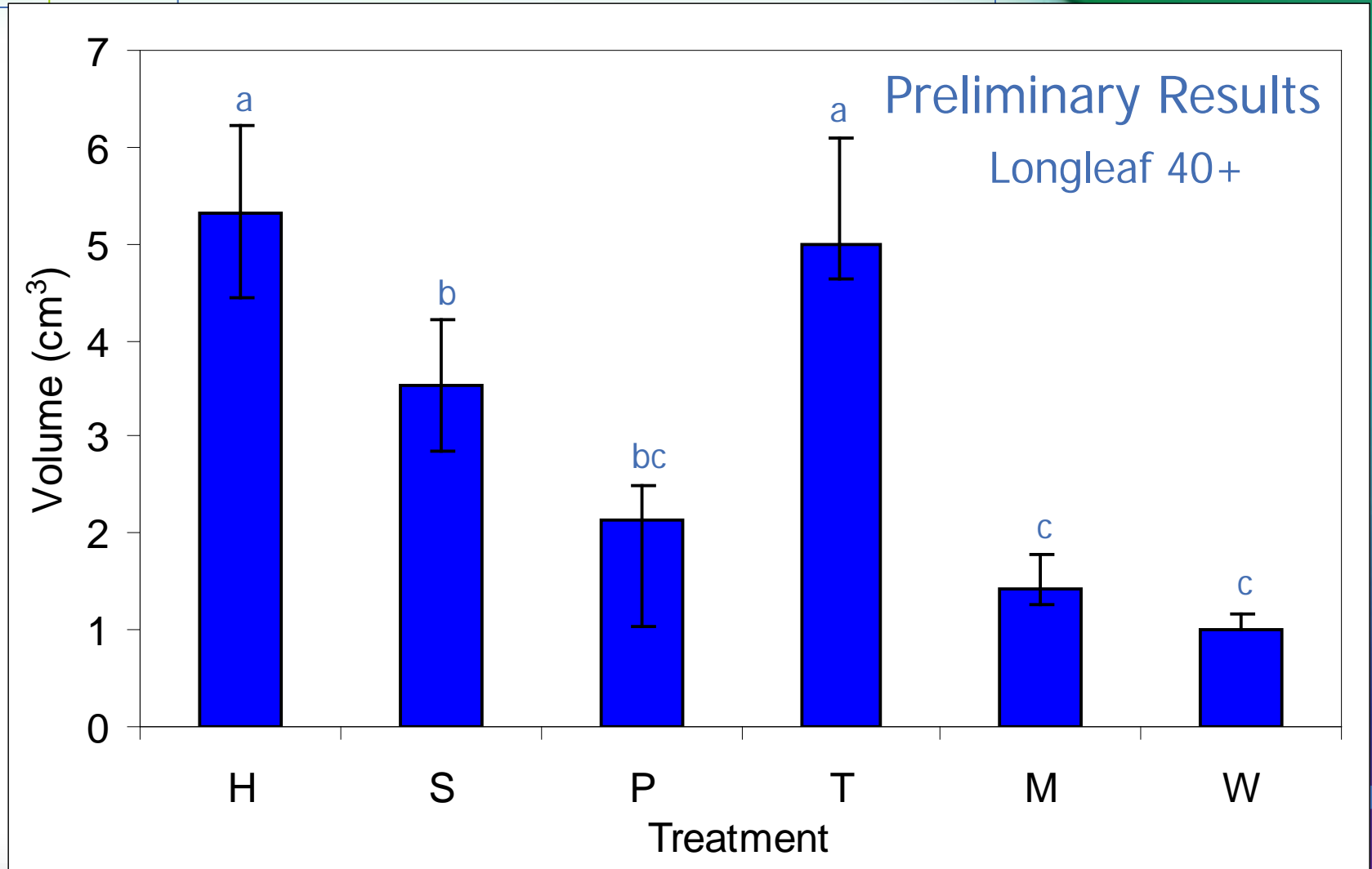
treatments

Pathogenesis – Mature Root Inoculations



treatments

Pathogenesis – Mature Root Inoculations



Fungus-Insect Interactions



Hylastes salebrosus



Hylastes tenuis

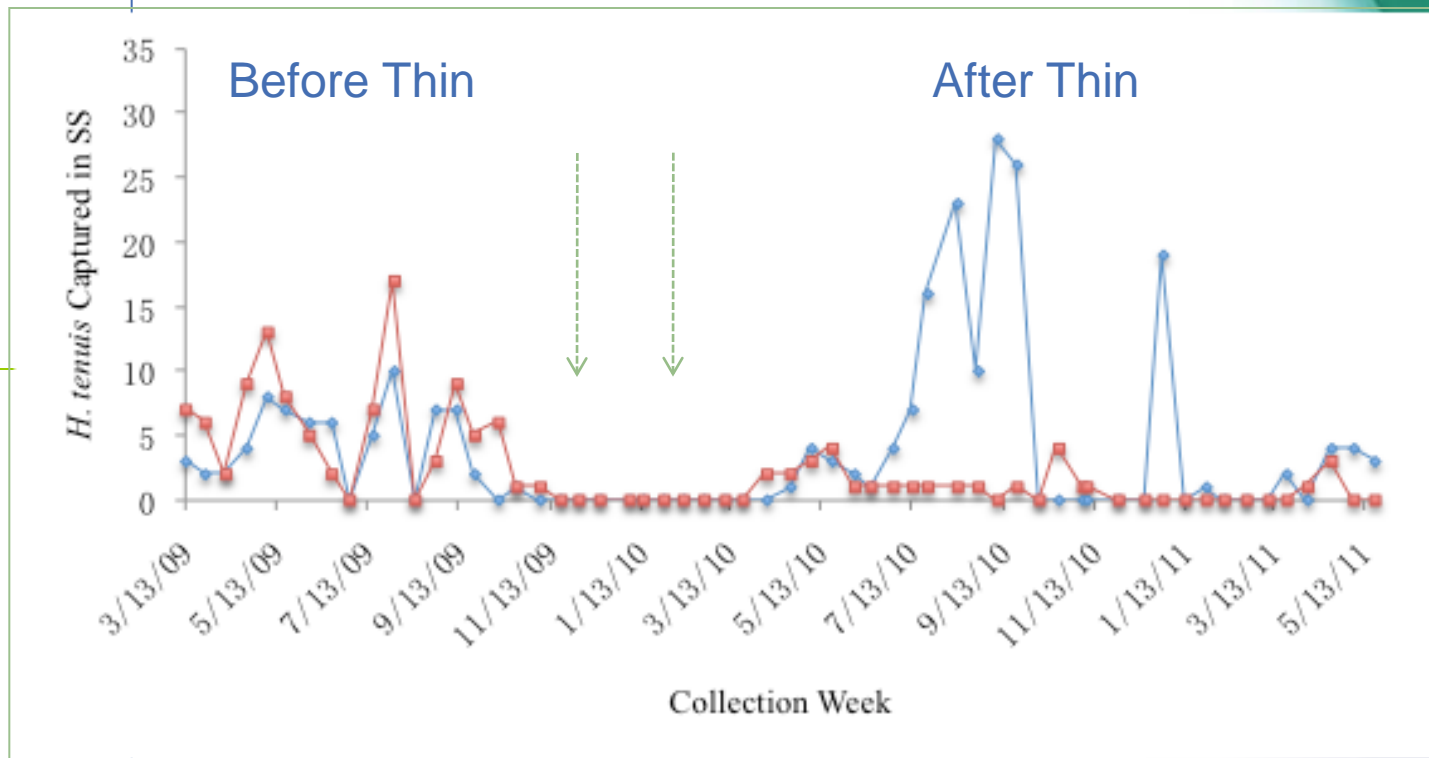


Hylobius pales



Dendroctonus terebrans

Hylastes Population Trend

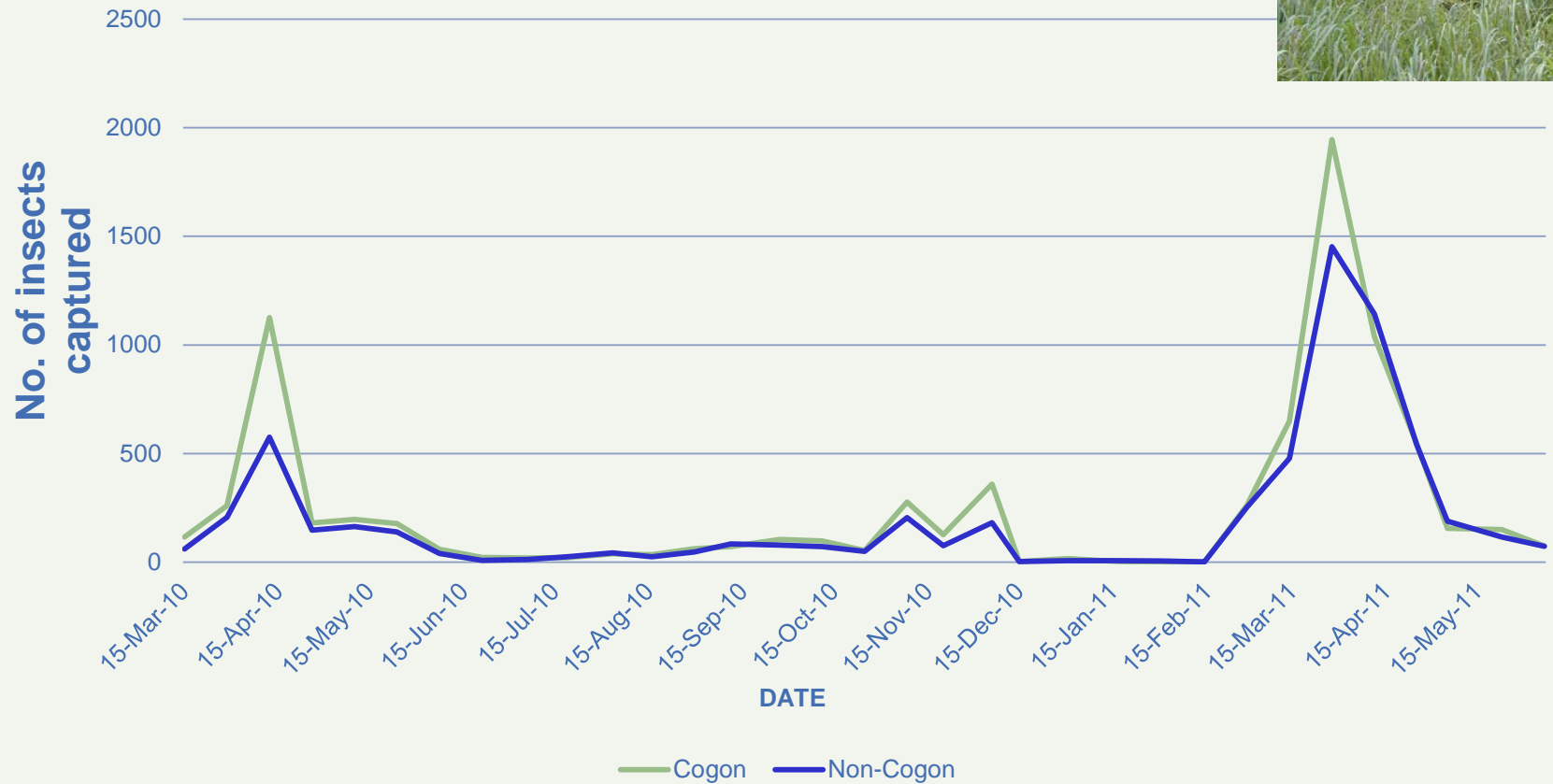


$$p_{(control)}=0.0363, \quad p_{(thinning)}=0.0447 \quad \alpha=0.05$$

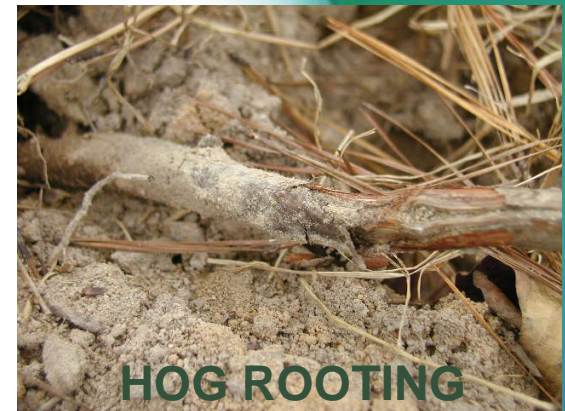
Hylastes Population Trends



H. salebrosus captured



Predisposition to Bark Beetles



Ecology-Epidemiology

Abiotic Stressors

Topographic position
Fire
Edaphic
Weather

Monoterpenes released

Insects respond

Insects Attack

Biotic Stressors

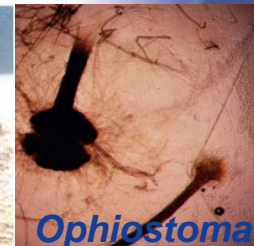
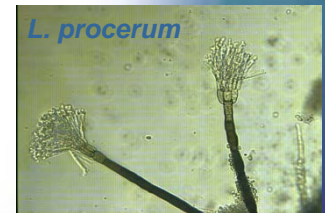
Fungi Colonize

Mutualistic

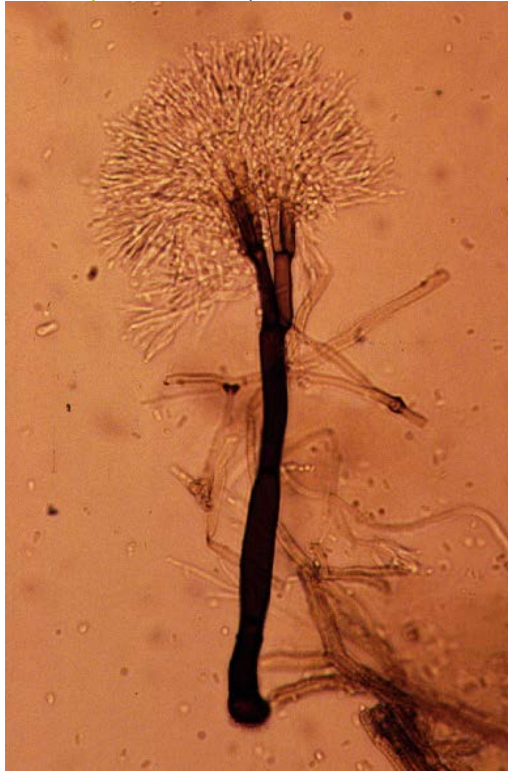
Death

Decline

SPB Attack



Any Questions?



Leptoglyphium



Gnathotrichous materiorius



Ophiostoma