Physiological response of loblolly pine saplings to *L. terebrantis* in naturally regenerated habitat

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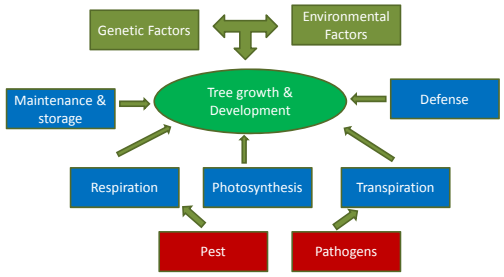
Background



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Background

- Pathogen infection
  - Causes tissue occlusions and lesions
  - Clogs tracheids and vessel element
  - Interferes with water transport

- How does saplings of loblolly pine responds to *L. terebrantis* infection?

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Objectives

- Monitor physiological response of loblolly pine saplings to *L. terebrantis* inoculation intensity throughout the 24 week period after inoculation.
- Determine relationships between pathogen-induced sapwood occlusion, stem hydraulic conductivity, inoculation intensity, and duration after inoculation were established.

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Hypotheses

- A positive, linear relationships would be found between *L. terebrantis* inoculation intensity and both sapwood occlusion and loss of stem hydraulic conductivity.
- Loss of stem hydraulic conductivity would yield a decrease in fascicle-level stomatal conductivity and more negative fascicle predawn water potentials

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Approach

- Study Area - Solon Dixon Forestry Education Center - Andalusia, AL
- Naturally regenerating pine stand – Loblolly, Slash, long leaf
- Treatments and inoculation procedures similar to the earlier study
- Post inoculation assessment up to 24weeks

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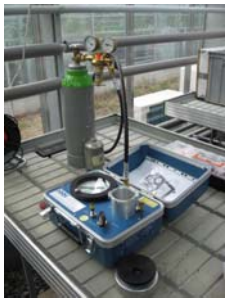
Predawn Water Potential

- Five trees per treatment were randomly selected and flagged
- Three fascicles per tree
- Excised fascicle is partly sealed in a pressure chamber
- The chamber is pressurized until fluid exudes from the cut surface



Pressure Chamber

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Mid-day Stomatal conductance

- Porometer is calibrated and the needles are clamped in the sensor head
- 2-3 readings per tree
- 5 trees per treatment

Porometer

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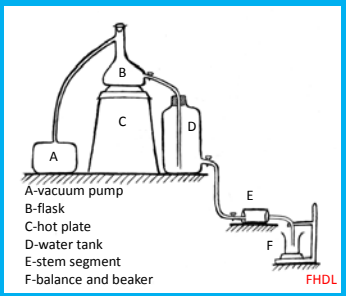
Set-up for Measuring Hydraulic Conductance



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Hydraulic Conductance

- 10cm stem was extracted
- Connected to the set-up
- Flow rate stabilized:
  5- 30minutes
- Flow rate per 5minute
- 3 readings per segment
- $K_s = QL/(\Delta PA_{sw})$

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Results – Precipitation & Temperature

Month	Precipitation (In)	Temperature (°F)
April	5.33	67.03
May	4.15	73.11
June	4.46	79.97
July	8.65	80.91
Aug	4.98	80.58
Sep	3.66	78.43
Oct	0	69.81

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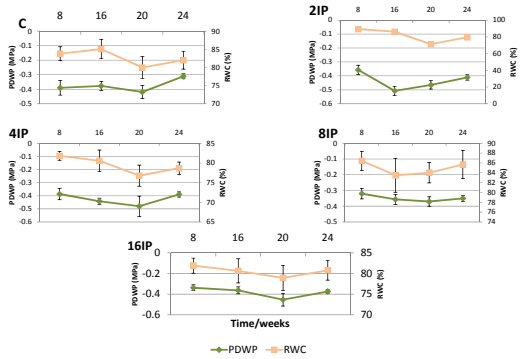
PDWP & RWC



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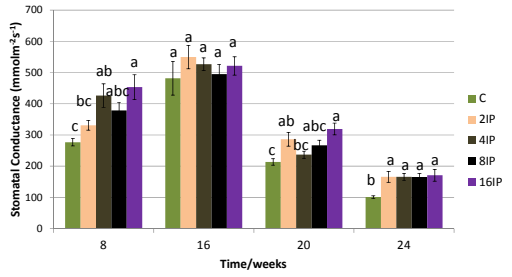
Stomatal Conductance



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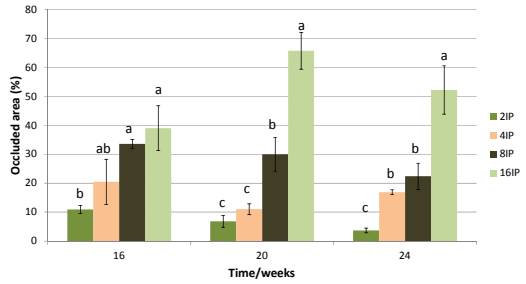
Tissue occlusion



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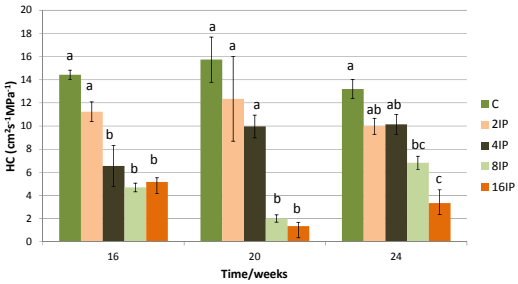
Hydraulic Conductance



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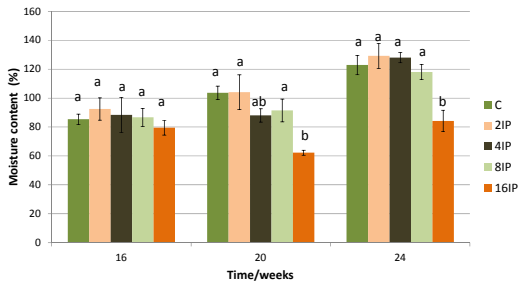
Moisture Content



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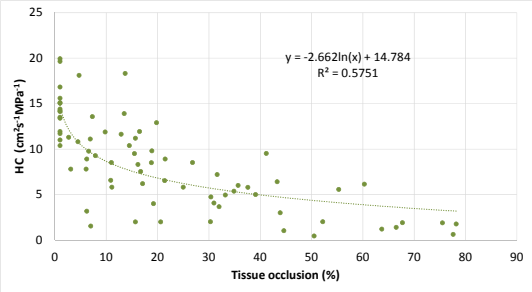
Hydraulic Conductance and Tissue Occlusion



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Conclusion

- Tissue occlusions of *L. terebrantis* caused a significant reduction in hydraulic conductivity through the stem of loblolly pine sapling
- Hydraulic conductivity decreased with increasing inoculum density
- Reduction of stem hydraulic conductivity did not yield a decrease in stomatal conductivity and more negative fascicle PDWP
- Fungal inoculum did not cause moisture stress within the study period

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Forest Health Cooperative

Rayonier