Forest Health Cooperative Annual Meeting - FY2021

Pine Needle Study Update

Presented By

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Committee Members

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Lecanosticta acicola impacts Nutrient Content and Total Phenolics in *Pinus taeda* Needles

Introduction

Nutrient availability

- Tree growth and productivity
- Host-pathogen interactions
- Manipulate management decision

Brown spot needle blight (BSNB)

- Geographical settings, climate and other plantation attributes
- Little known about BSNB and interaction of nutrients

Conifers including loblolly pine

- Constitutive and inducible defenses to prevent attack from pathogens
- Defensive chemicals and resistance

Objectives

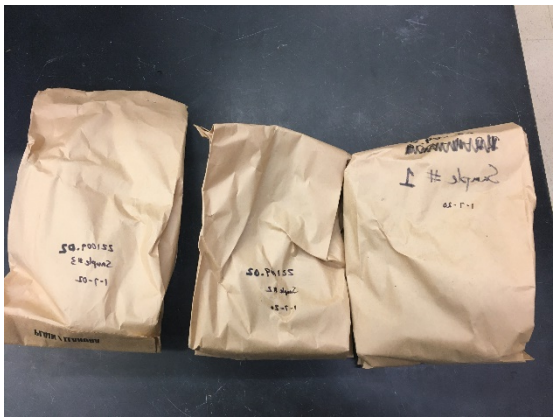
To determine the relationship between foliar nutrients and infection level to see how nutrients interact with *Lecanosticta acicola* severity

To evaluate the interactions between *L. acicola* severity and defensive chemical total phenolics in loblolly pine needles

Materials & Methods

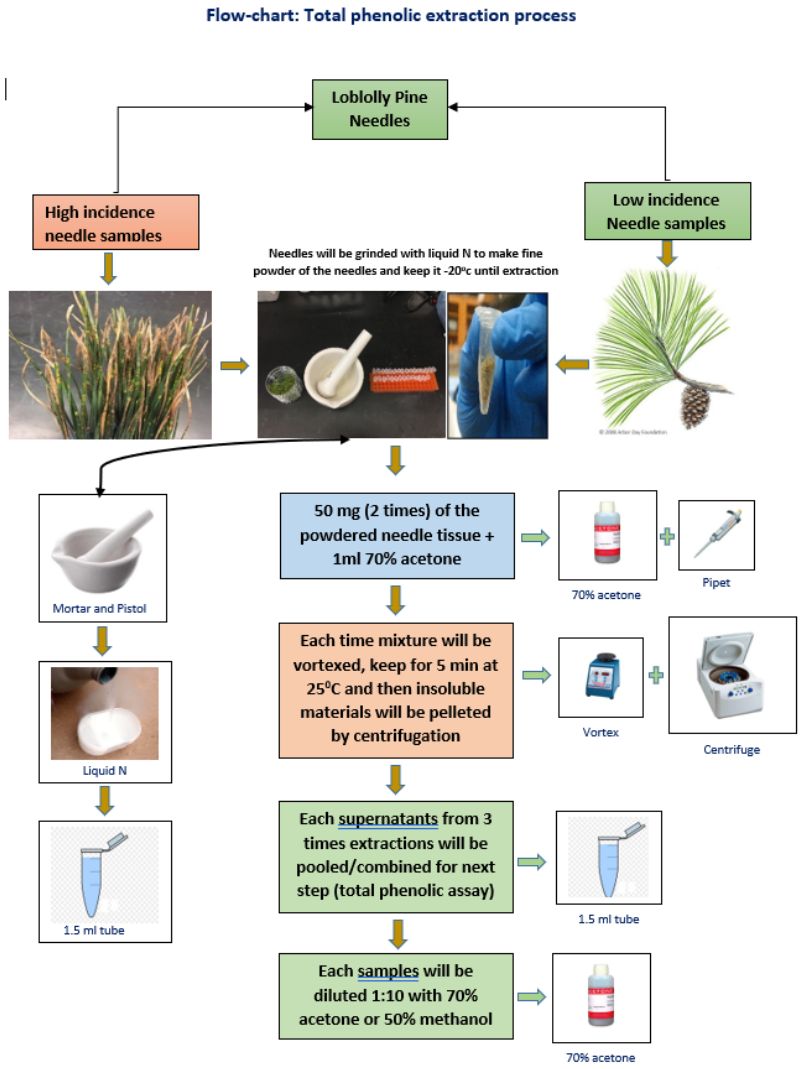
Foliar Nutrient Content Analyses:

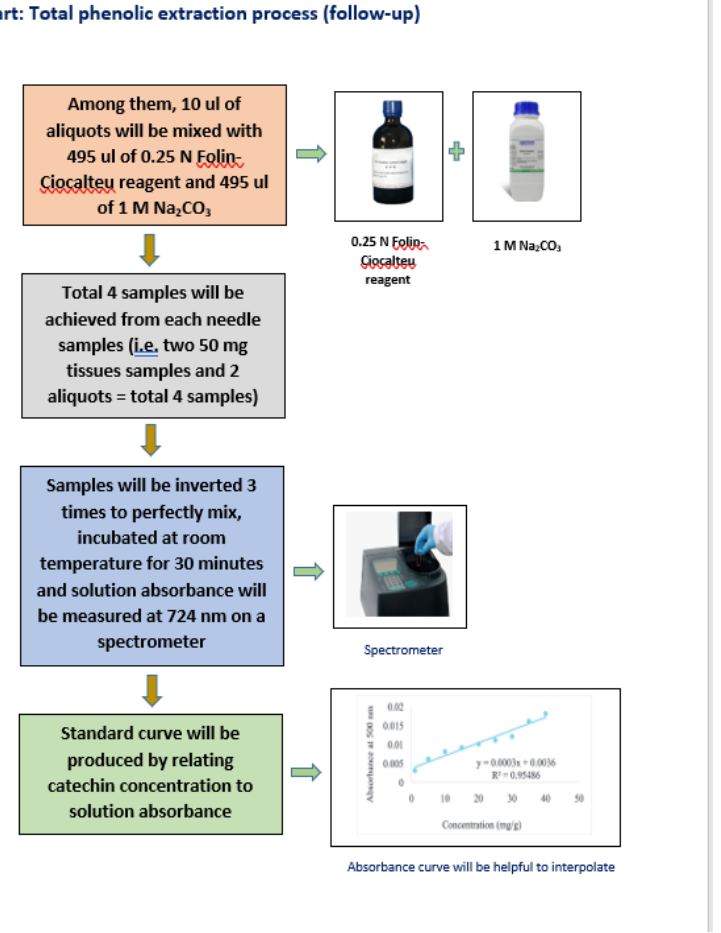
- Seven experimental plots
- Destructive sampling of foliage
- A 0.22 mag caliber rifle
- Fifty trees sampled
- Fifty fascicles per tree
- Oven-dried at 70°C
- 0.5 mm mesh screen
- Waypoint Analytical Laboratory



Materials & Methods

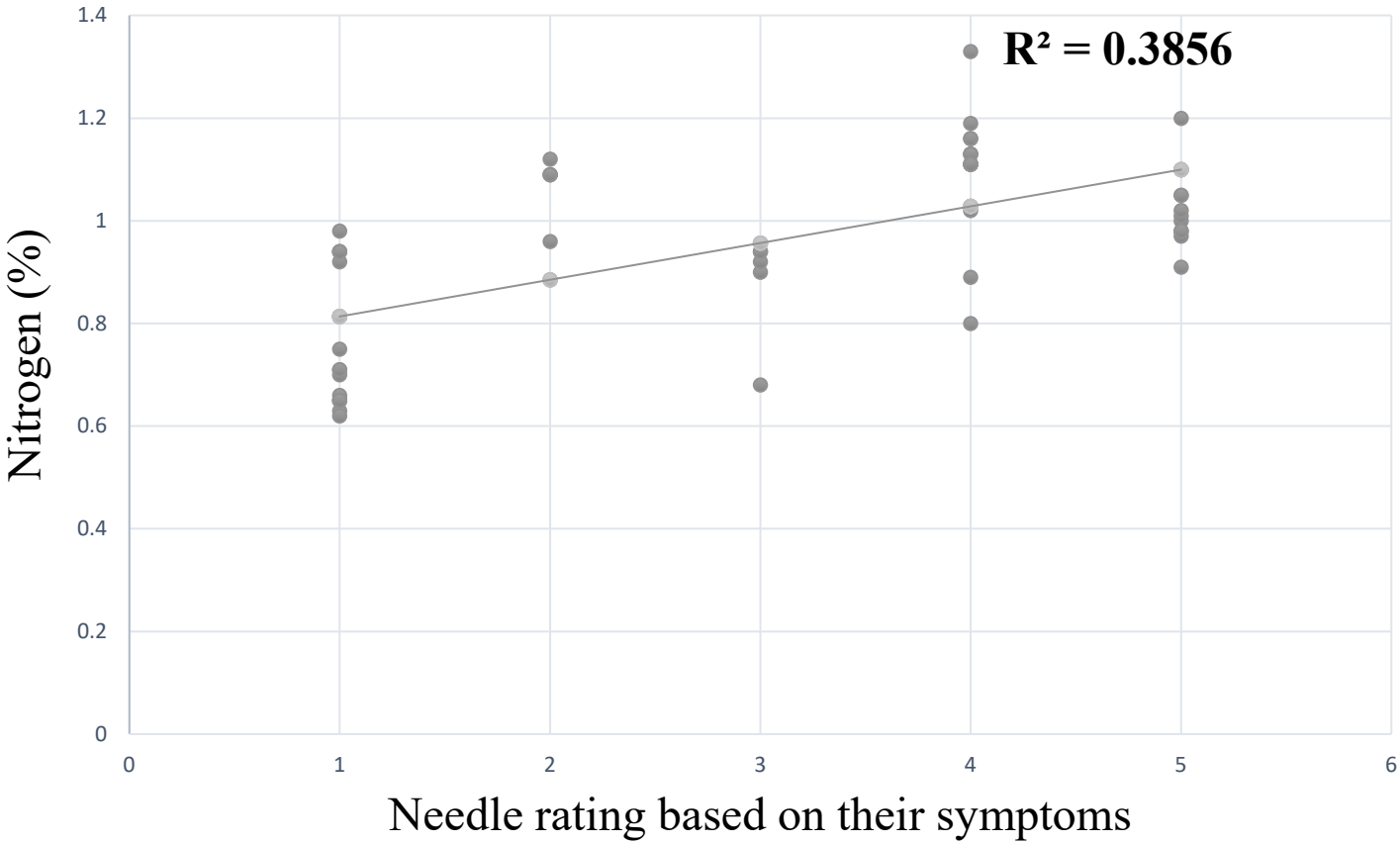
Total Phenolics Analyses: (collected from low and high incidence plots)





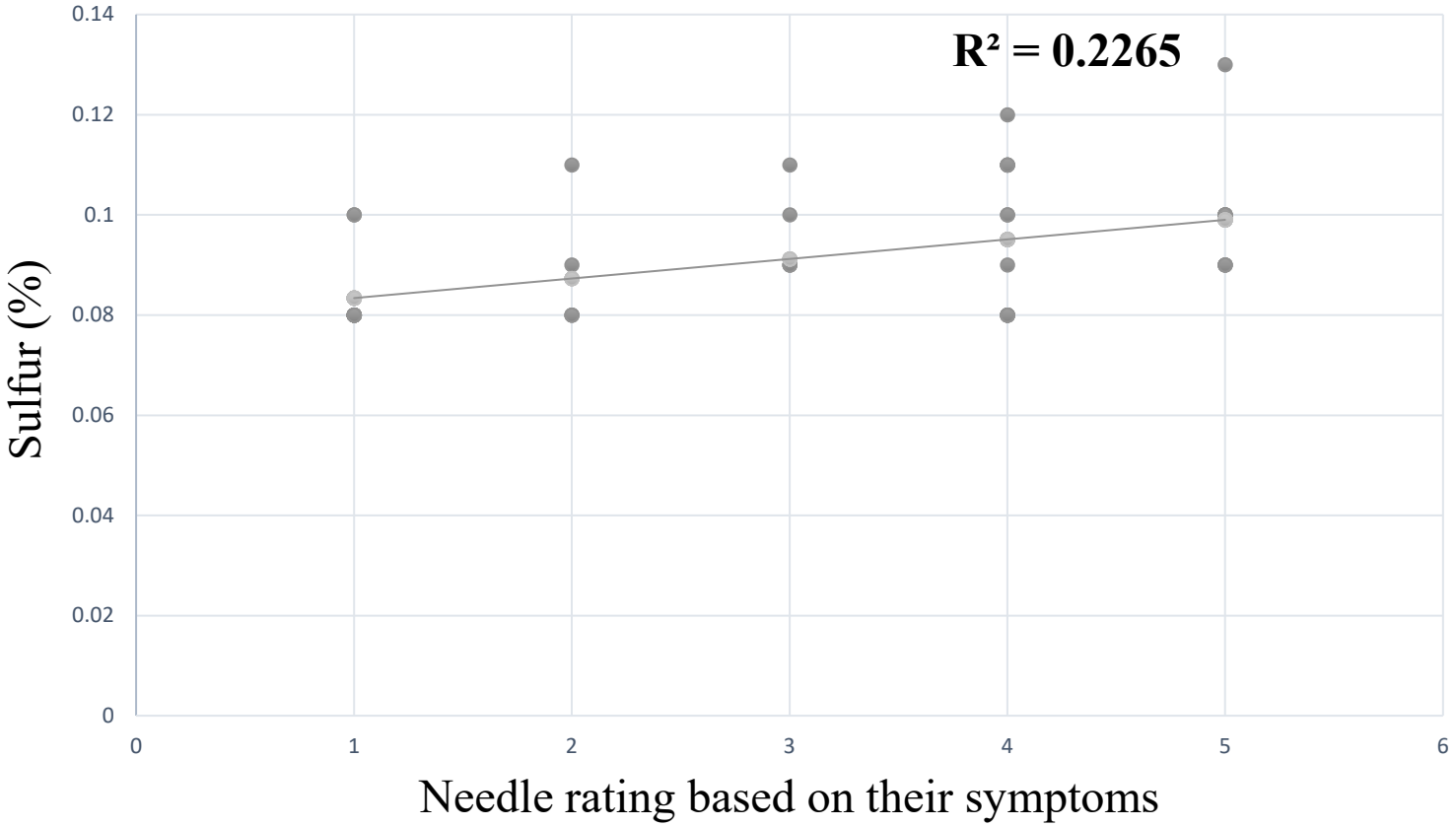
Statistical analyses were performed in R version 4.0.3 software

Results



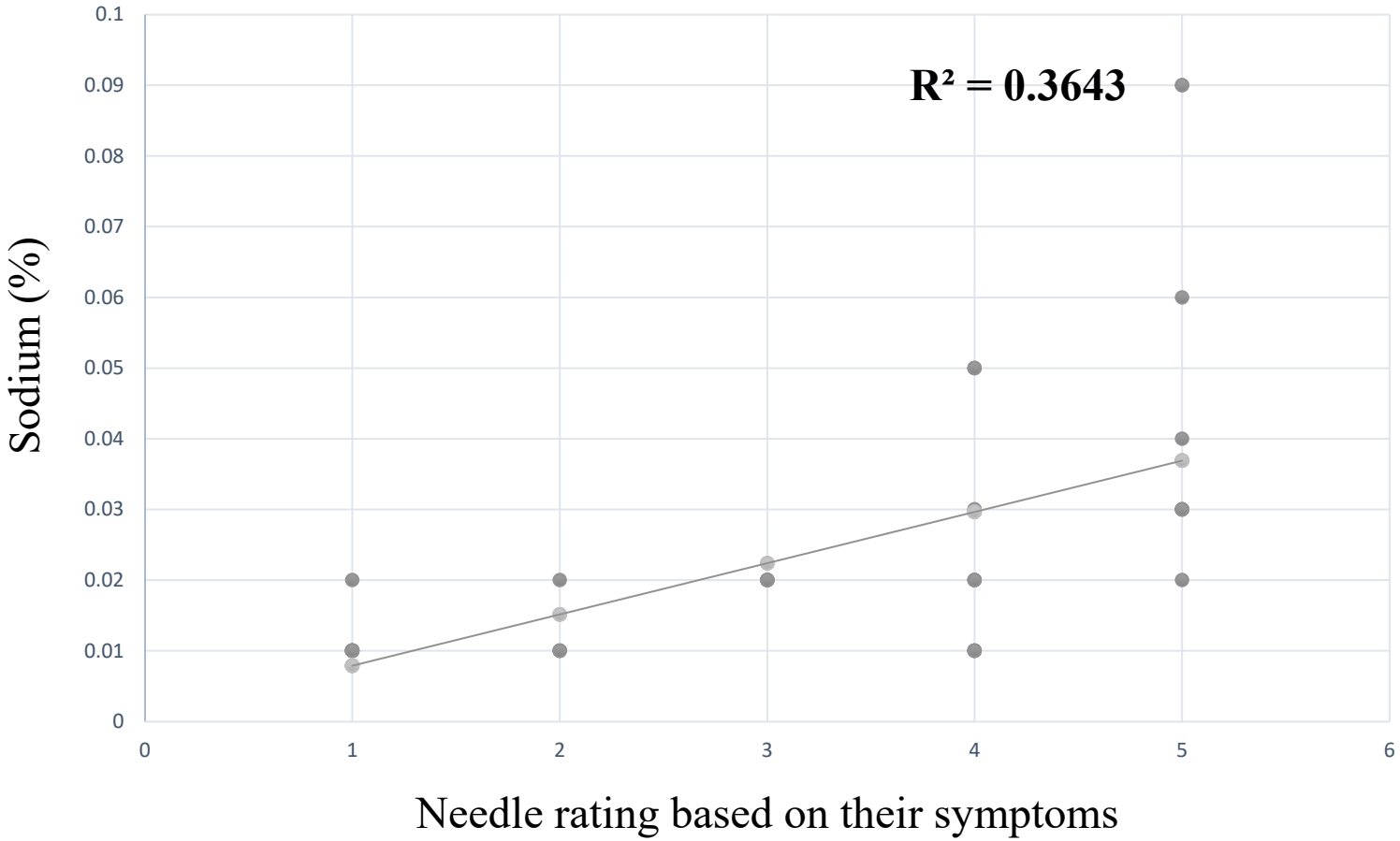
Relationships of Nitrogen with BSNB severity

Results



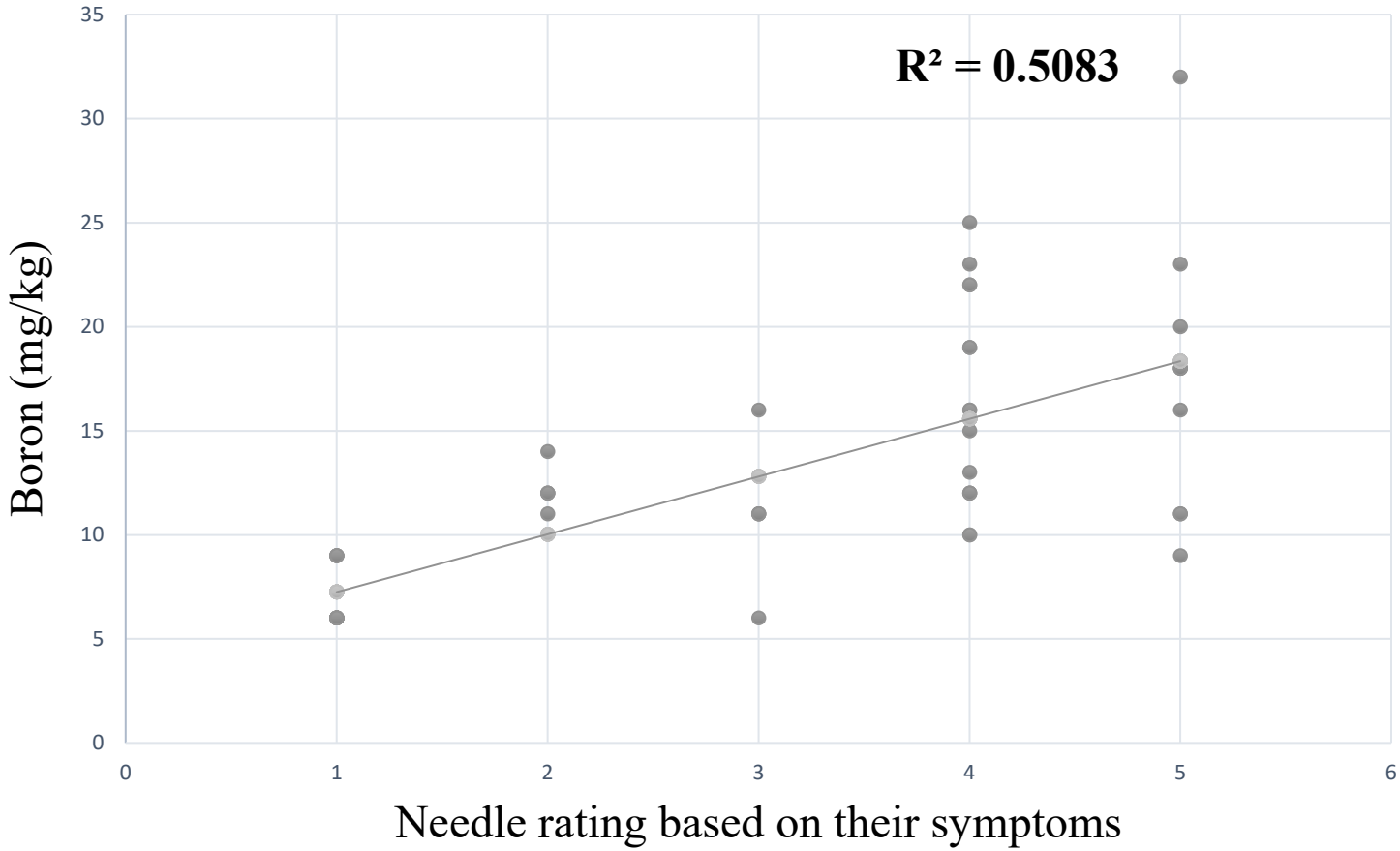
Relationships of Sulfur with BSNB severity

Results



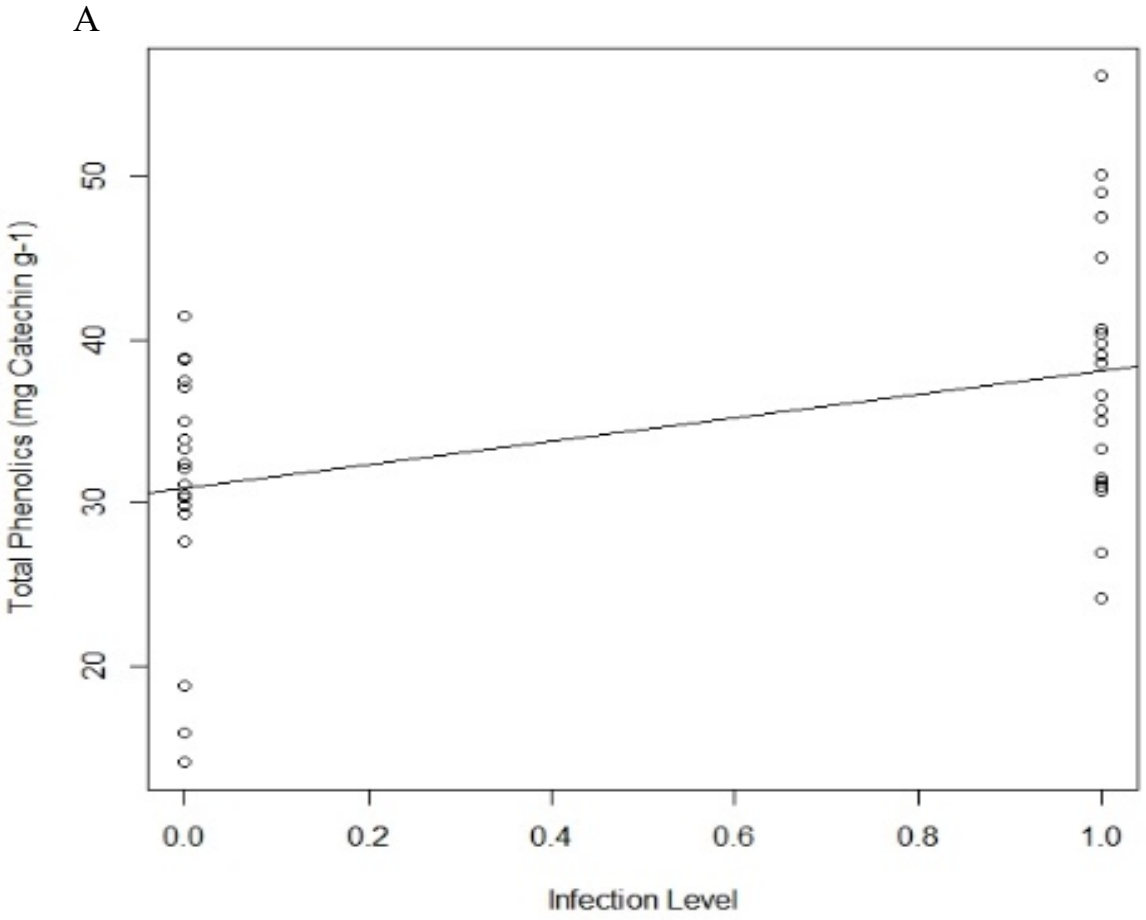
Relationships of Sodium with BSNB severity

Results



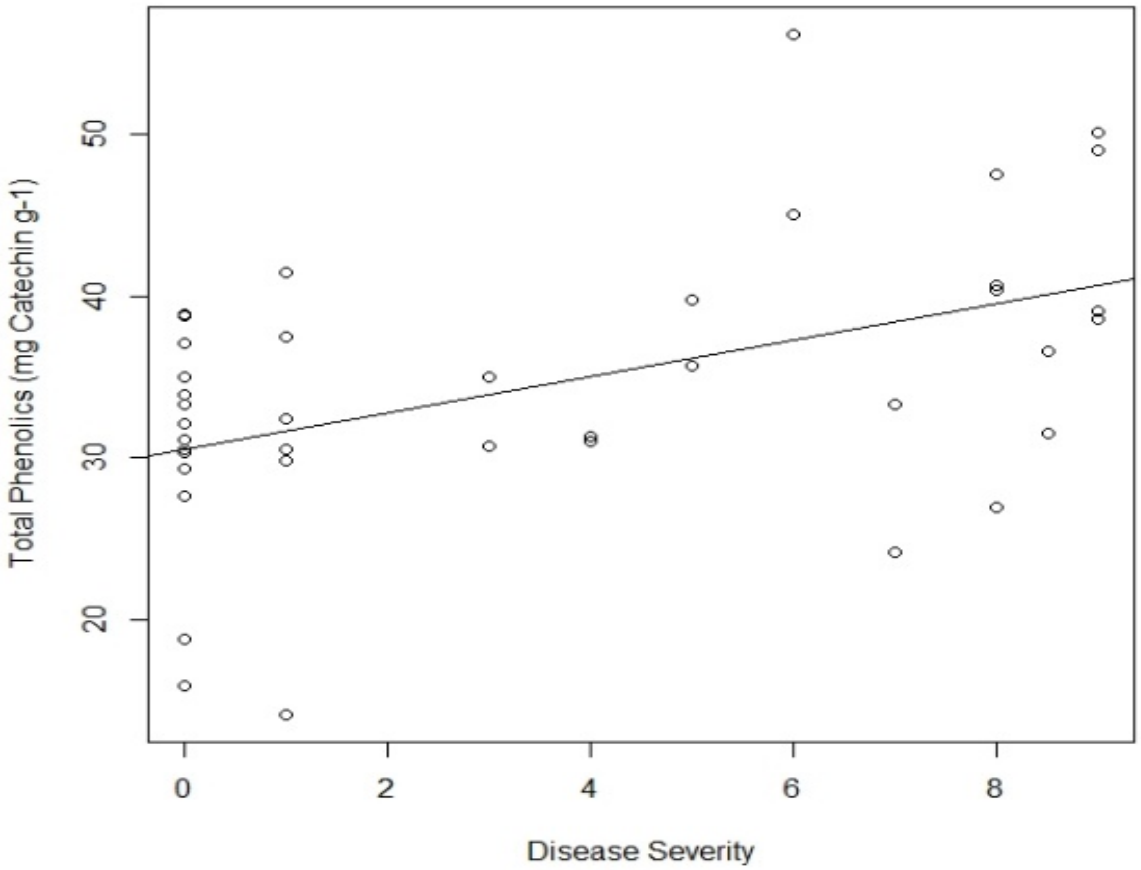
Relationships of Boron with BSNB severity

Results



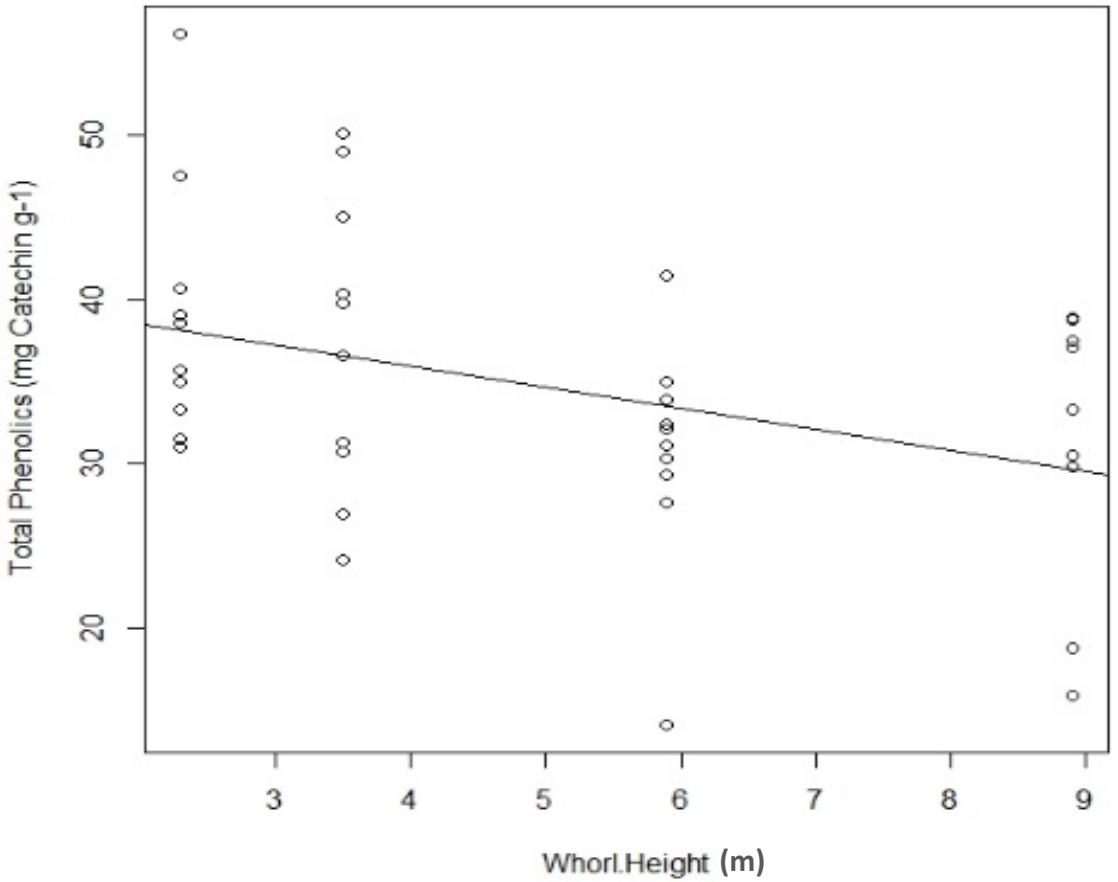
Relationships between total phenolics concentration and infection level

Results



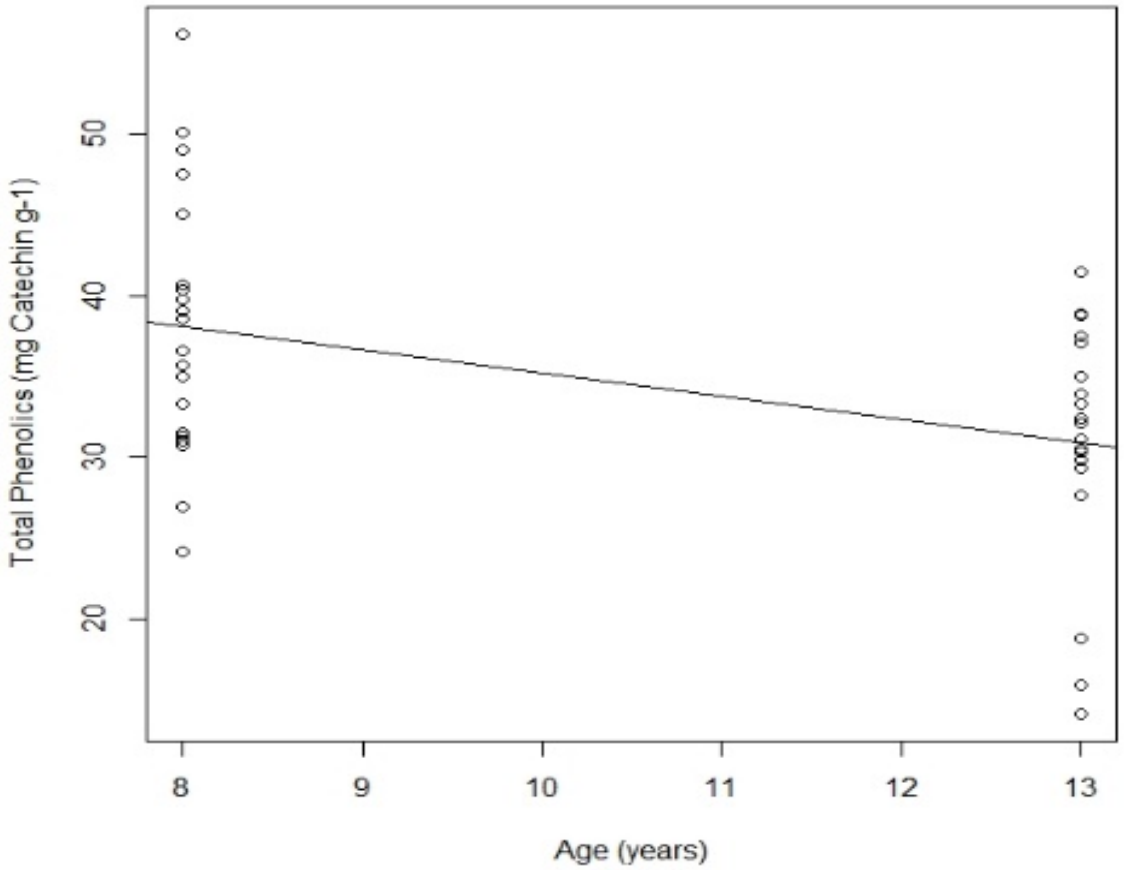
Relationships between total phenolics concentration and disease severity

Results



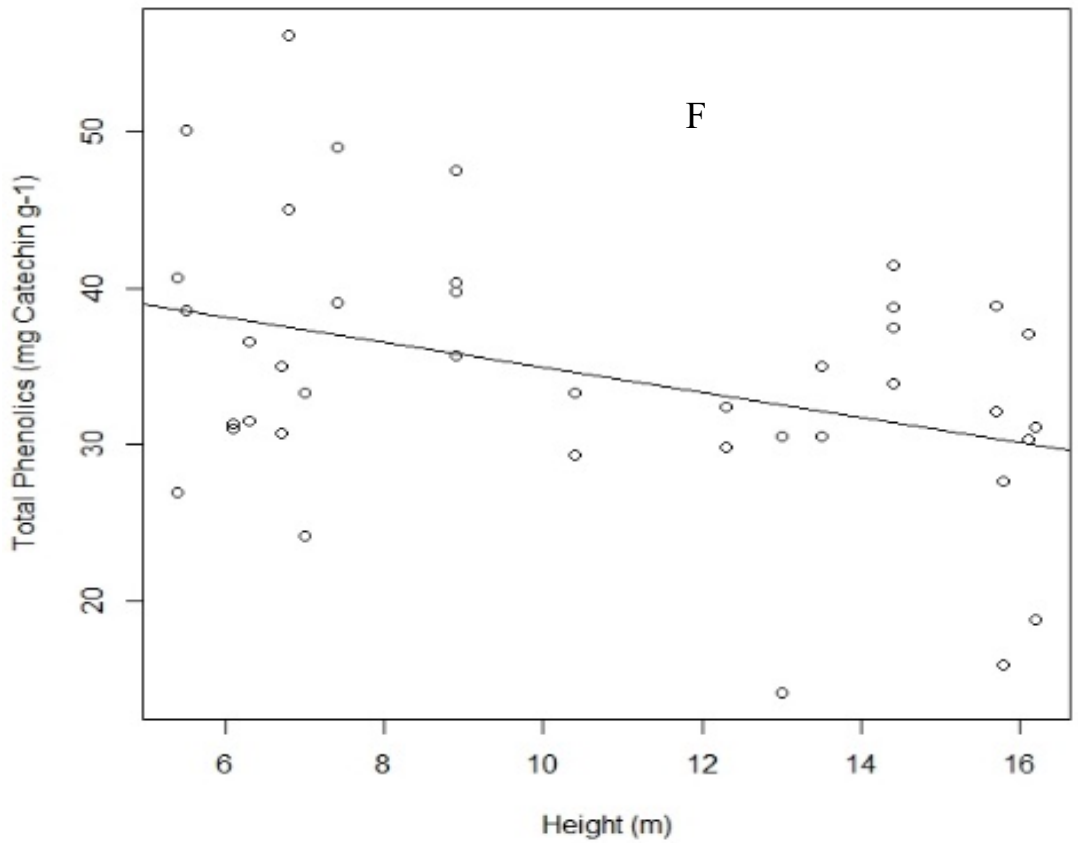
Relationships between total phenolics concentration and whorl height

Results



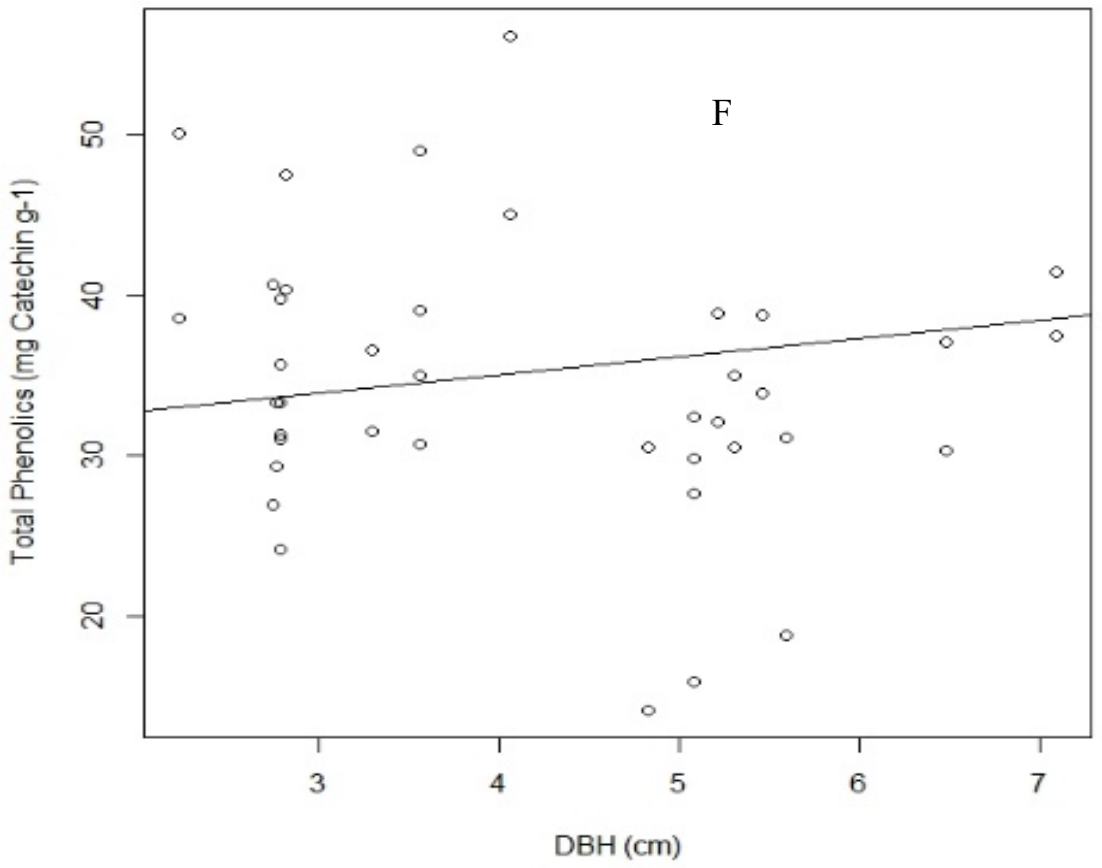
Relationships between total phenolics concentration and age

Results



Relationships between total phenolics concentration and Height

Results



Relationships between total phenolics concentration and DBH

Results

Loblolly pine foliage and foliar chemistry

- Nitrogen (N), Sodium (Na), Boron (B) and Sulfur (S) positively correlated
- No correlation of other nutrient contents
- High variations in the needles
- Total phenolics increased
- pH is different

Discussion

Lecanosticta acicola infection

- Loss of leaf area and carbon supply

- N and P is mobile

- Ca, B and Mn are immobile

- Loss of membrane integrity

Conclusions

Lecanosticta acicola impacts

- Loblolly pine foliage and foliar chemistry

- Total phenolics production as a normal defense system

- High concentration of nutrient contents

Further consideration

Could be foliar fungi influenced by foliar nutrients?

Could fertilization (N, Na, B and S) increase disease severity?

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Forest Health Dynamics Lab
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Forest Products Lab

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