Fine root dynamics in response to inoculation of *Leptographium terebrantis* in loblolly pine stand

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Background

- *Leptographium terebrantis* has potentiality to stain vascular bundles of declining trees and has higher ability to infect and kill the root system (Eckhardt et al. 2004)
- Root mortality is one of the factors affected by decline (Hess et al. 2002)
- Belowground assessment of roots often demands destructive techniques
- Minirhizotron method of fine root study is less destructive and demands less time and labor

Objectives

- To determine the change in fine root dynamics in the trees inoculated with different densities of *Leptographium terebrantis*
- To determine the changes in fine root dynamics during different sampling seasons

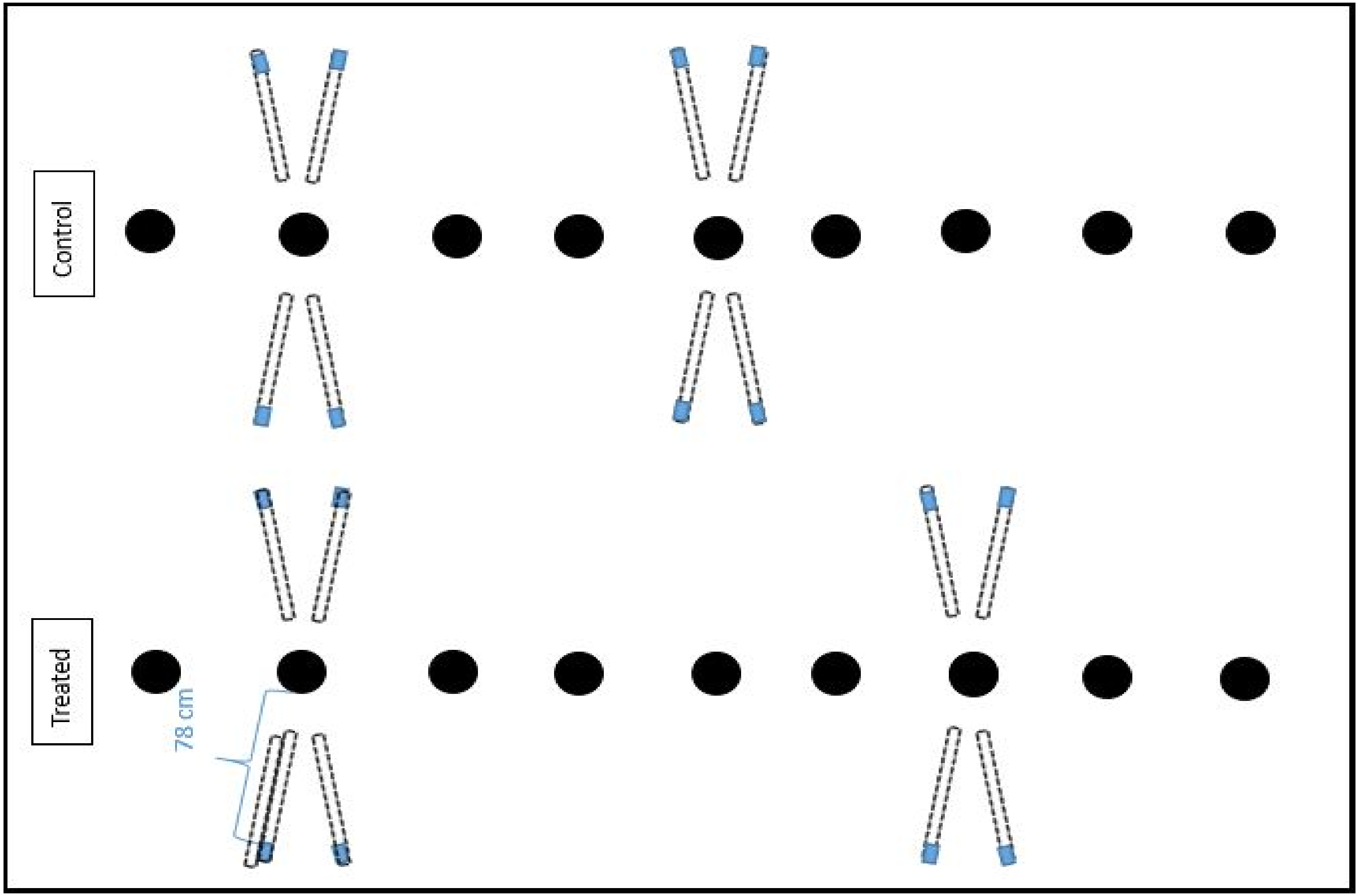
Hypotheses

- Pathogen action reduces water translocation to the crown causing reduced rates of carbon fixation and the loss of leaf area which in turn, lowers carbohydrate allocation to root system

- Different inoculum densities will have different impact on fine root dynamics

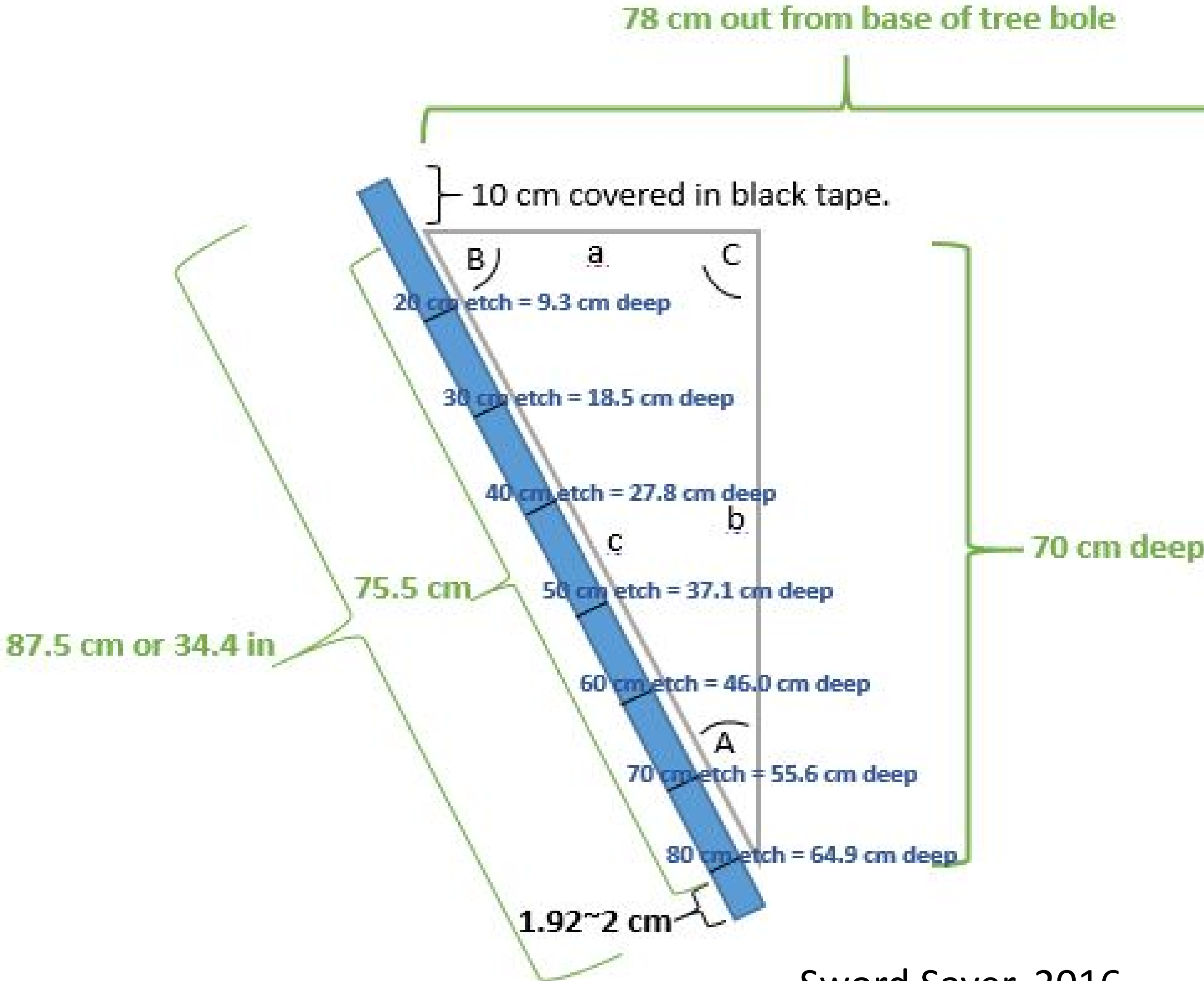
- Fine root density will be affected by sampling season and depth

Materials and Methods (Tube installation)



Sword Sayer, 2016

Materials and Methods (Tube installation)



Since $a^2 + b^2 = c^2$,

$c = \text{SQRT}(a^2 + b^2)$

c = SQRT (800.89 + 4,900.00)

c = 75.5 cm

Existing tubes already have an extra 10.0 cm and 1.92 or 2 cm on either end.

So, tube should be 75.5 + 10.0 + 1.92 cm = 87.5 cm long

Sword Sayer, 2016

Materials and Methods (Tube installation)

Materials and Methods (Data collection)

RLD (Root length density)=R/A

Newman's equation: R= (π×N×A)/ (2×H)

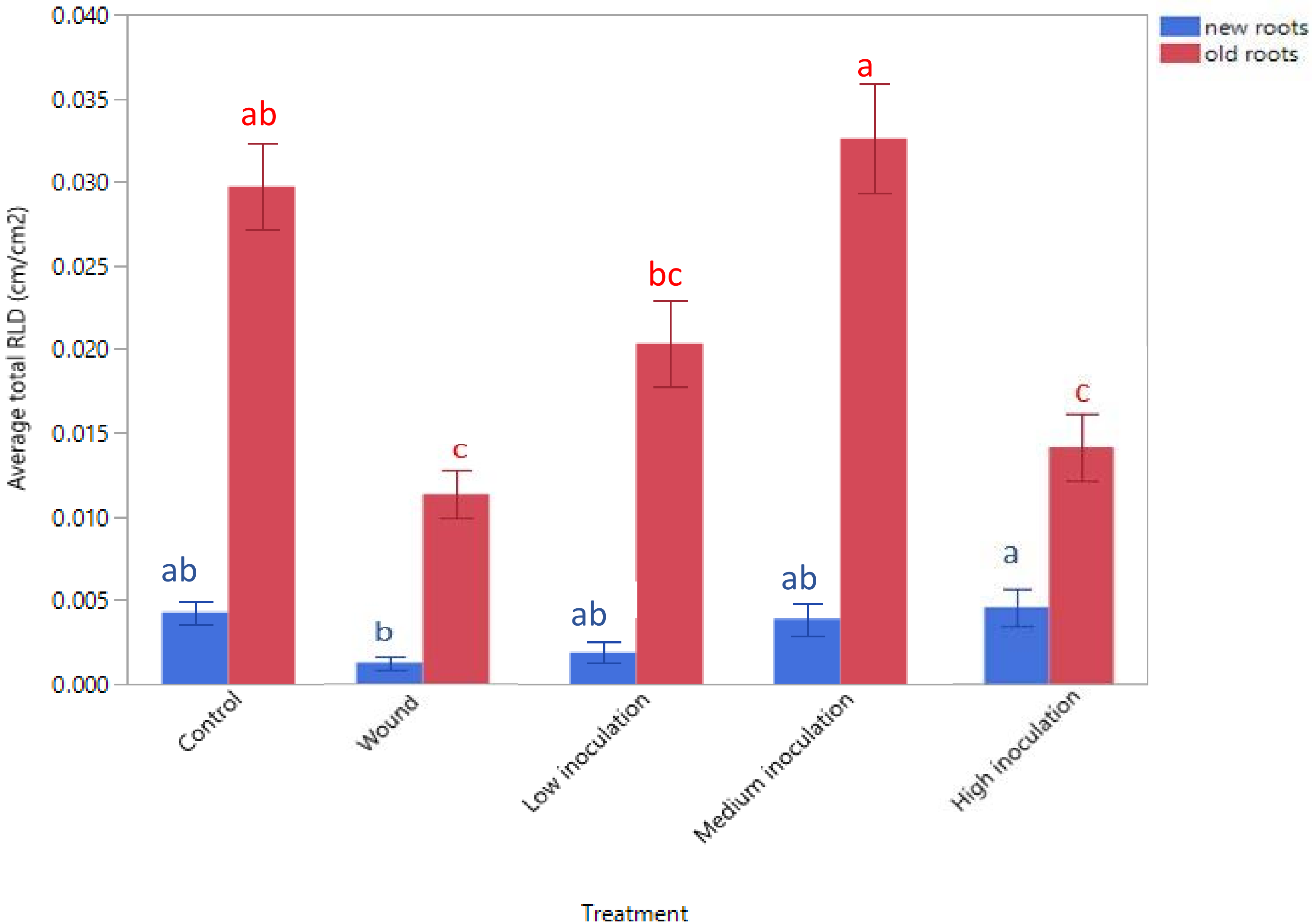
R =root length (cm)

N=No. of root intersections with etched lines

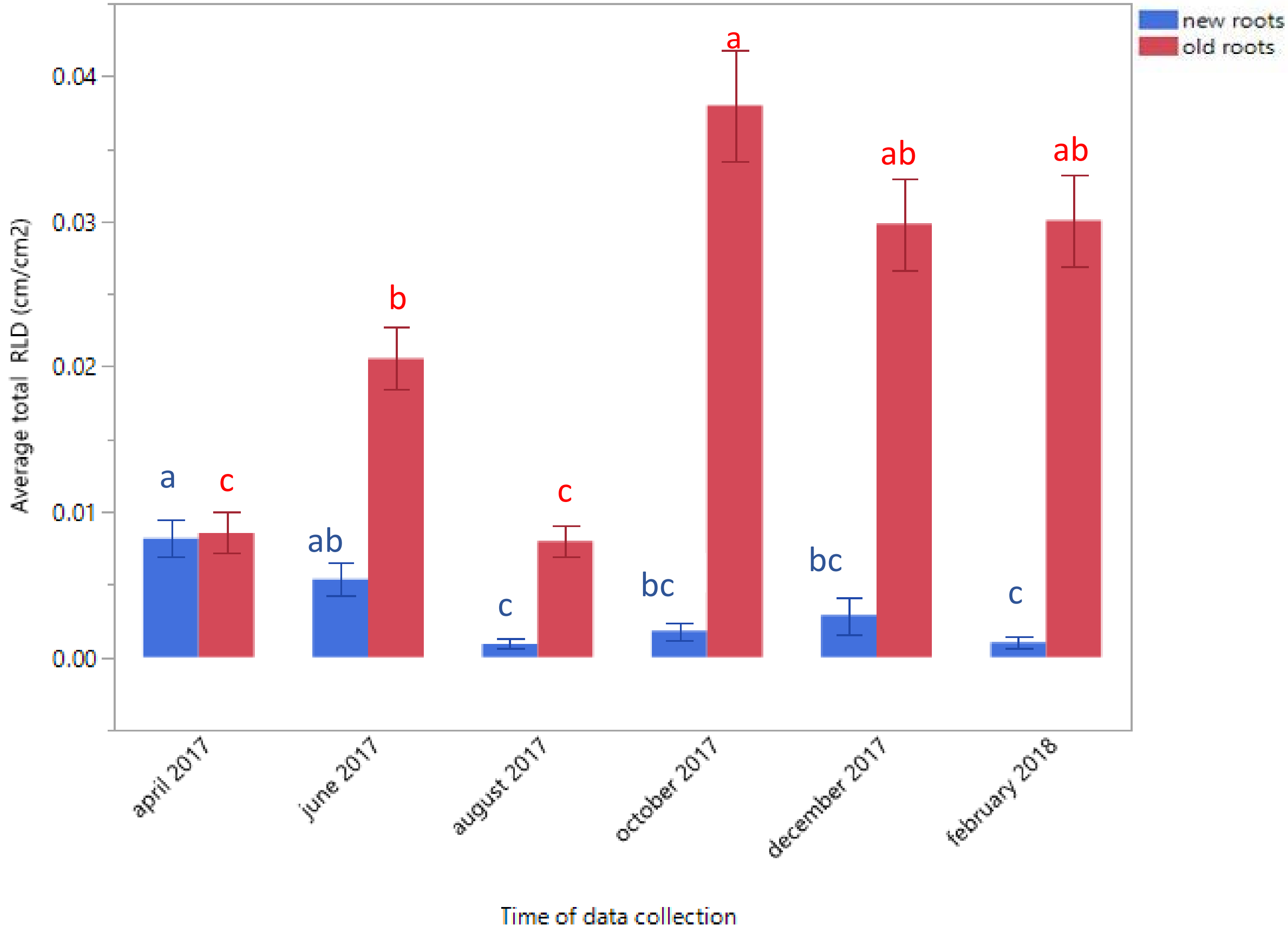
A=area of tube being accessed

H=length of the etched line which is the tube circumference

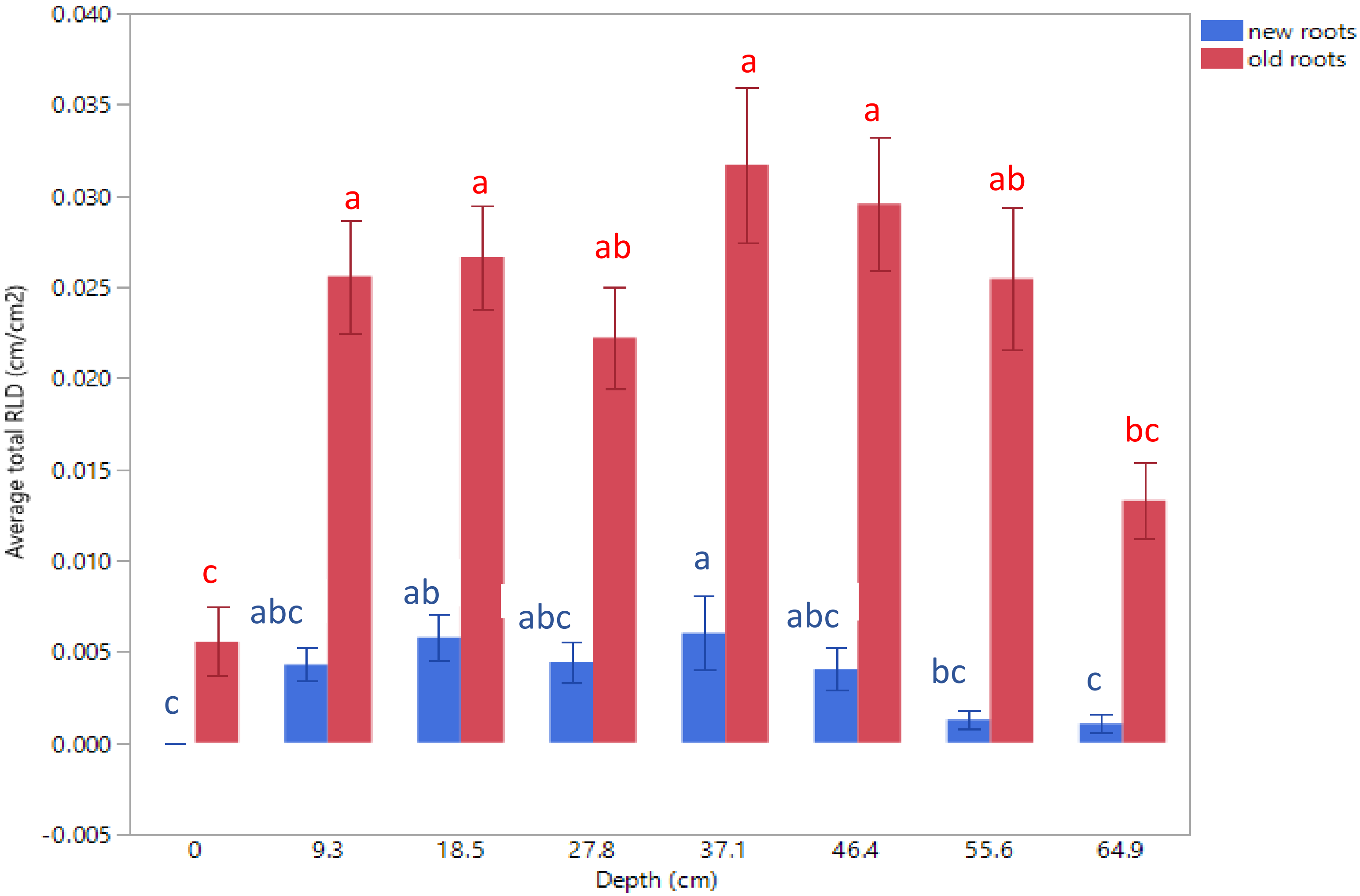
Results


0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Average total RLD (cm/cm2)
new roots
old roots
ab
ab
b
c
ab
bc
ab
a
a
c
Control
Wound
Low inoculation
Medium inoculation
High inoculation
Treatment

Results


new roots
old roots
0.04
0.03
0.02
0.01
0.00
Average total RLD (cm/cm2)
a
c
ab
b
c
c
bc
a
bc
ab
c
ab
april 2017
june 2017
august 2017
october 2017
december 2017
february 2018
Time of data collection

Results


0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.005
Average total RLD (cm/cm2)
new roots
old roots
c
c
abc
a
ab
a
abc
ab
a
a
abc
a
bc
ab
c
bc
0
9.3
18.5
27.8
37.1
46.4
55.6
64.9
Depth (cm)

Summary

- Fine roots were observed at ground surface in very few cases
- New ARLD was significantly affected by treatment, depth, time of data collection and the interaction of treatment and time of data collection
- Old RLD was significantly affected by treatment, depth, time of data collection and the interaction of treatment and depth

Summary

- Both new and old ARLD increased gradually from 0 to 18.5 cm, decreased slightly at 27. 8 cm, was highest at 37.1 cm and gradually decreased up to 64.9 cm
- Within the data collection time, and at same depth, no significant difference in ARLD (both new and old) was observed in between the treatment trees
- No significant differences in ARLD at same depth was observed between the treated and untreated trees within the treatment plots

Recommendations

- Frequently monitor for the presence of dead trees
- Timely fertilization
- Control soil and root compaction by decreasing the entry of heavy mechanical equipment

Acknowledgements

- Dalton Smith
- Andrea Wahl
- Sarah Pedan
- John Mensah
- Jessica Ahl
- Luis Mendez
- Undergraduate student

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