Management of citrus establishment with white and red-dyed kaolin

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Horticulture - Particle films

- Properties
  - Reflection
  - Shading
  - Redistribution of light within the canopy
- Reduce sunburn
- Increase whole canopy photosynthesis
- Increase leaf level water use efficiency
- Kaolin

Kaolin effects on ACP

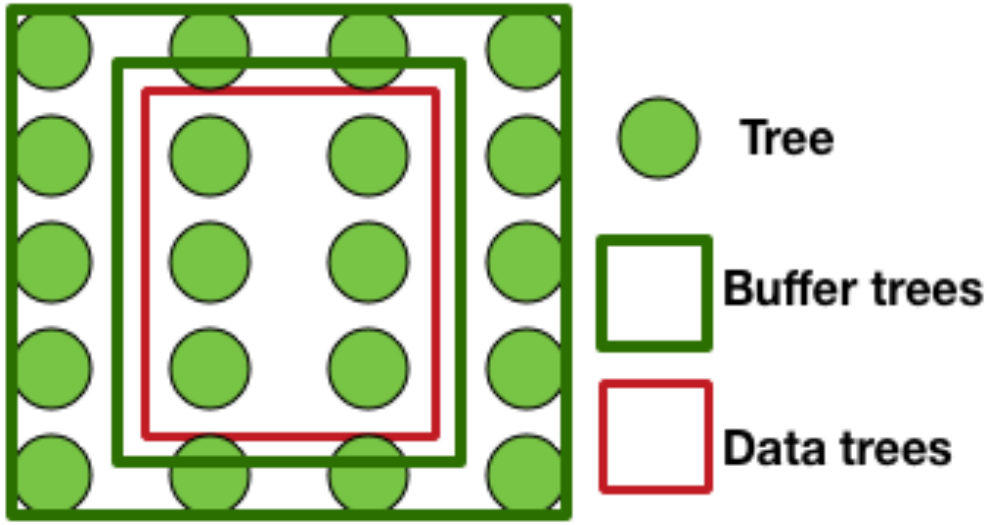
- Physical deterrence
- Optical “repellant”
- Some colors more effective than natural white

Objectives

- Compare red-dyed kaolin, undyed kaolin and foliar insecticides for:
  - Effects on ACP
  - Effects on infection rate
  - Effects on growth, photosynthesis, and horticultural characteristics
  - Subsequently interactions with disease.

Study design

- New planting from day 1
- Randomized complete block
  - 6 blocks
  - Location
- Plots
  - 20 treated trees
  - 6 data trees
- Treatments
  - White kaolin – Surround applied “as needed” + ”sticker” adjuvant (SKH)
  - Red kaolin – dye added with binding agent + ”sticker” adjuvant
  - Foliar insecticide – Calendar and psyllid pressure basis
  - Untreated control – systemic insecticides for leaf miner control

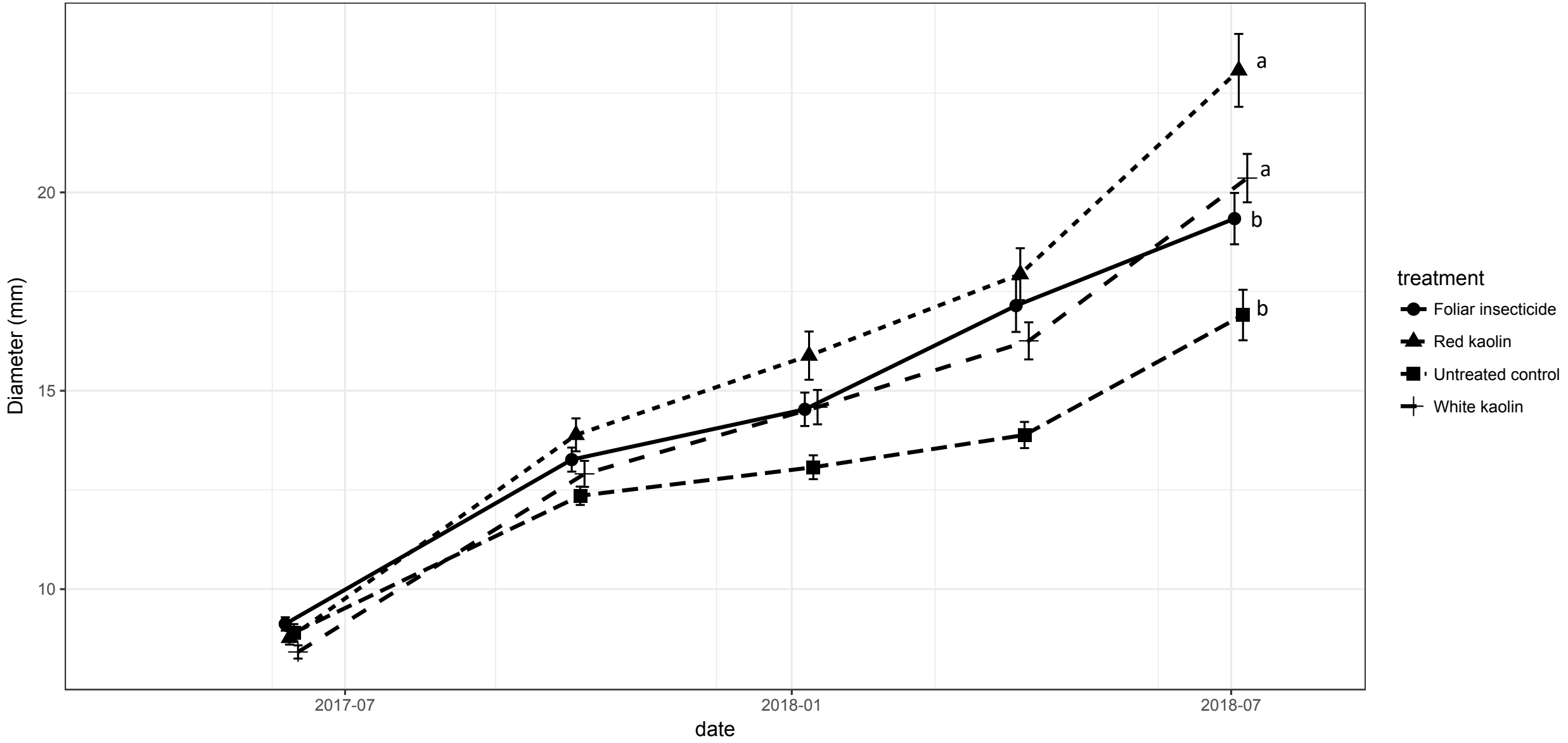


1 Plot (1 Replication of 1 Treatment)

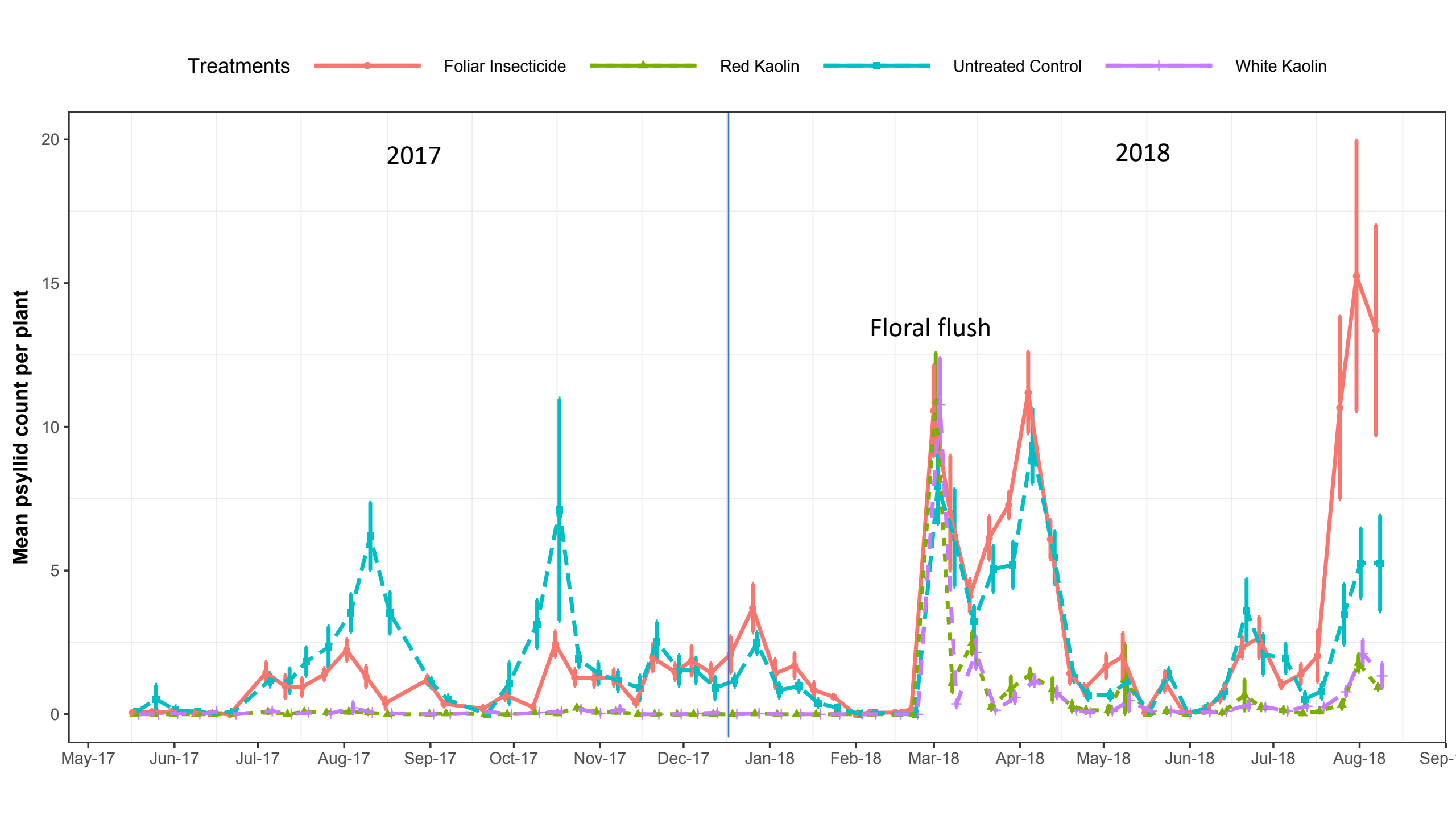
- Variables
  - Reflectance
  - ACP counts weekly
    - All ACP on each tree
  - PCR CLas detection quarterly
  - Stem caliper
  - Flowering
  - Gas exchange
    - Photosynthesis, stomatal conductance, transpiration
    - A_{max} : with PPFD 1,000 µmols m^{-2} s^{-1} , VPD -1.6 kPa, 400 ppm CO_2

LOWE'S

Results – Stem Diameter



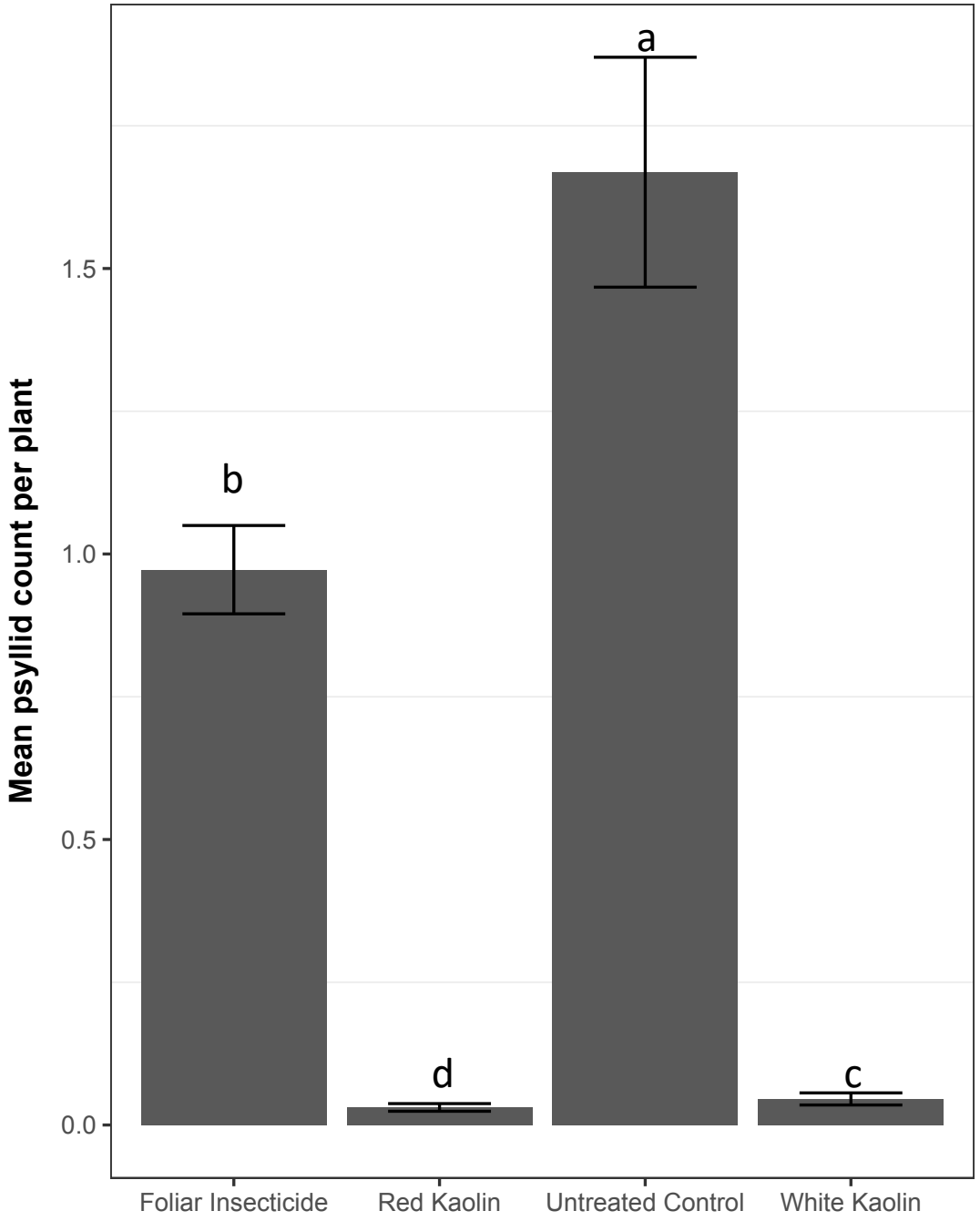
Results - Photosynthesis


Treatments
Foliar Insecticide
Red Kaolin
Untreated Control
White Kaolin
2017
2018
Floral flush
Mean psyllid count per plant
0
5
10
15
20
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18

Results – ACP – Dec 2017

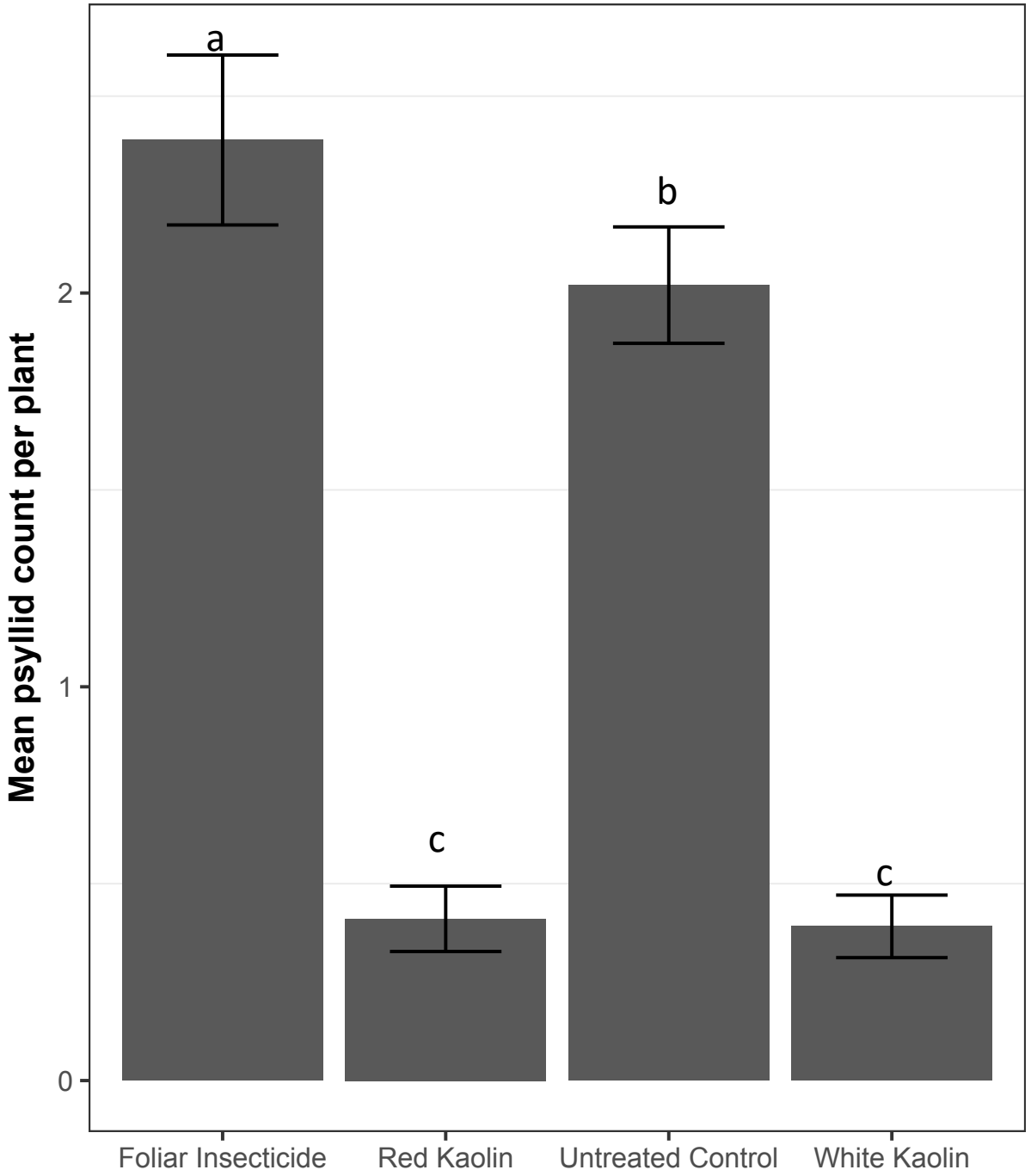
Percent control of ACP in kaolin treatments vs. chemical or untreated controls

	Insectide Control	Untreated Control
White Kaolin	95	97
Red Kaolin	97	98

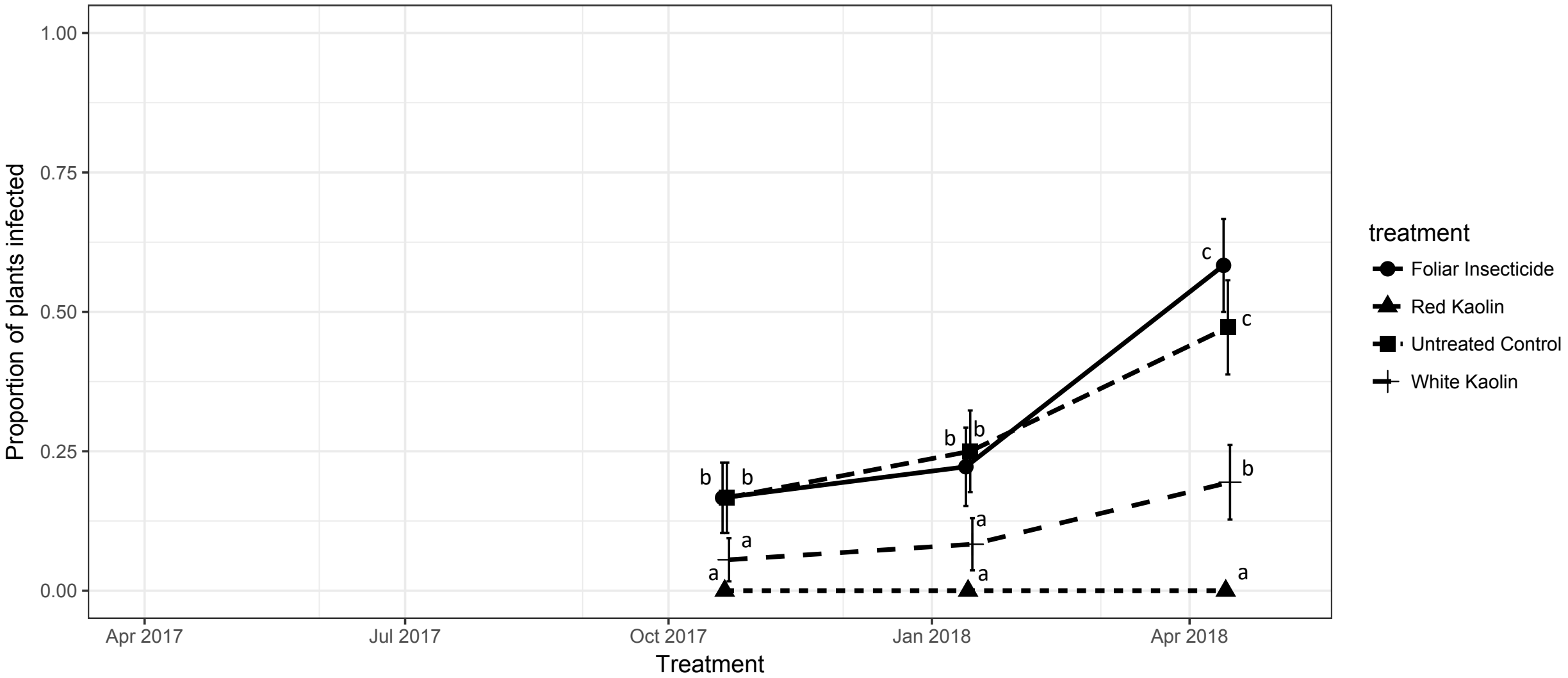


Results – ACP - as of August 2018

80% percent control of ACP in kaolin treatments vs. untreated control



Results – CLas infection



Preliminary conclusions

- Kaolin particle films improve ACP management and reduce disease pressure
  - Red-dyed kaolin superior to date
- Both red and undyed kaolin films increase growth
  - Photosynthetic increase lesser in red
  - No difference in overall growth

Future Questions, Next Steps

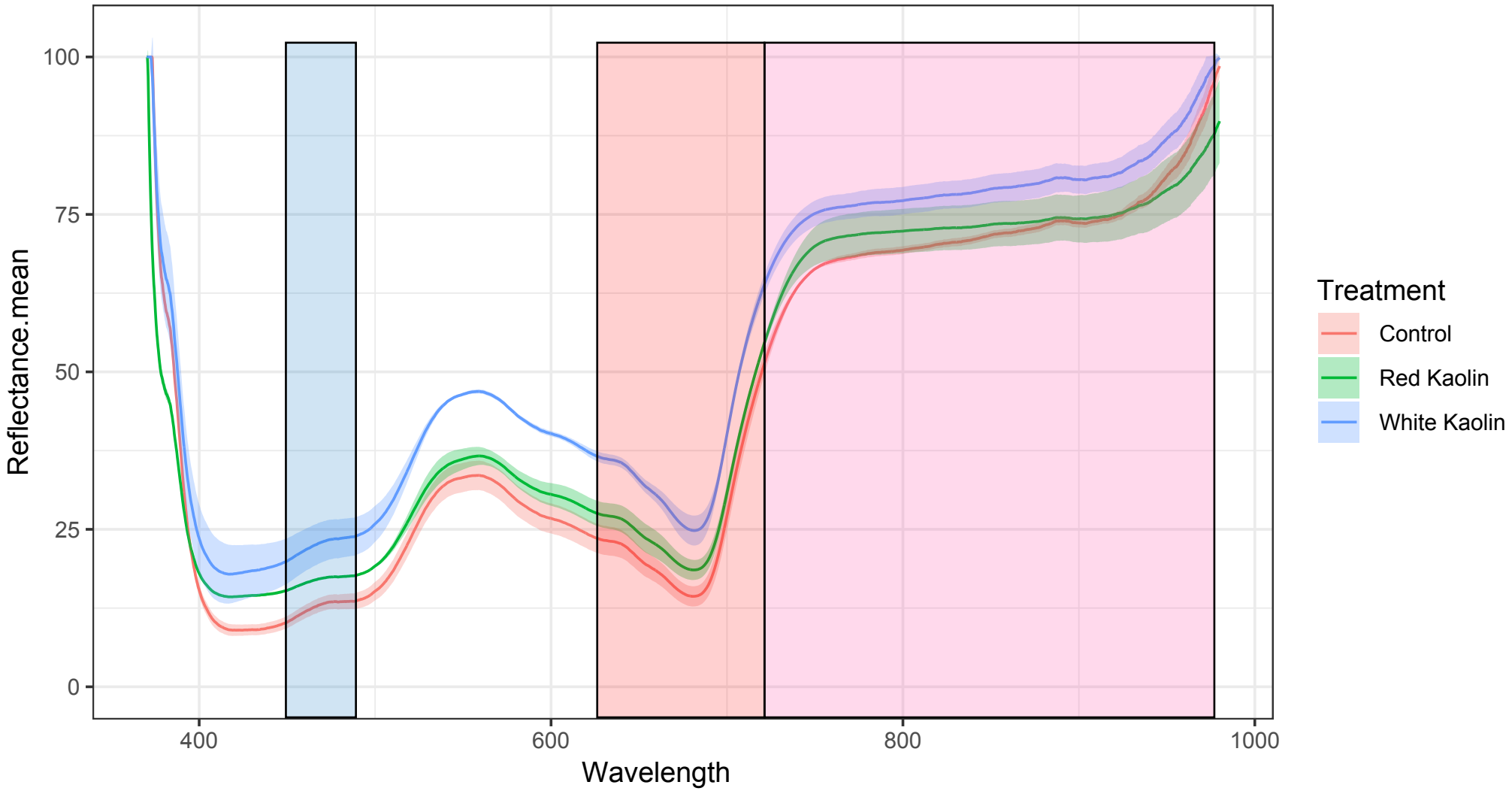
- Kaolin
  - Continued long-term field evaluation
  - Different light qualities (dye colors)
  - Effects on HLB symptoms vs. *C*Las transmission
    - Effects of color treatments on
      acclimative photochemistry*infection
    - Whole canopy vs. leaf-level water relations
  - Stickers/rainfastness
- Tree architecture
- Flush phenology

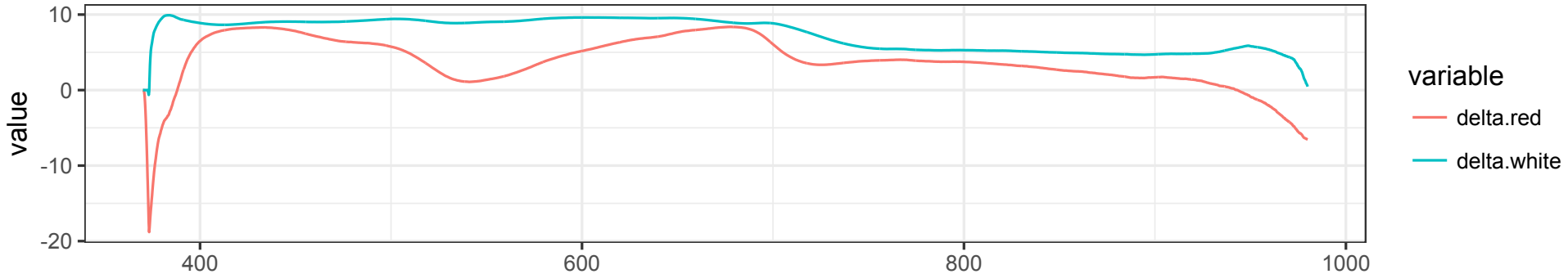
Thank you!

Questions?

CRDF Citrus Research and Development Foundation, Inc.

UF IFAS UNIVERSITY of FLORIDA


Reflectance.mean
100
75
50
25
0
400
600
800
1000
Wavelength
Treatment
Control
Red Kaolin
White Kaolin


value
10
0
-10
-20
400
600
800
1000
variable
delta.red
delta.white