Exploring liquid fungicides and seed potato management for optimum stand and yield

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Plant Pathology
UNIVERSITY OF WISCONSIN–MADISON
EXTENSION

2023 Maine Potato Summit

Tuesday, January 10, 2023

Smith Wellness Center – Northern Maine Community College

MAINE POTATOES

Vegetative Propagation of Potato

Benefits:
Shorter growing season
Relative genetic uniformity uniform product

Drawbacks:
Logistics of storing and transporting seed tubers
Disease pressure

Stark, J. C., et al. (2003). Potato Production Systems
edited by Dennis, A. J. (2008). Potato Health Managment, Second Edition.

Typical Seed Potato Protocol: Cut

- Cut tuber to 2-2.5 oz seed piece

Stark, J. C., et al. (2003). Potato Production Systems

Typical Seed Potato Protocol: Treat

- Cut tuber to 2-2.5 oz seed piece

- Treat with fungicide/ moisture absorber
  - Traditionally dry mancozeb and fir bark

http://www.milestone-equipment.com/treater-models

Stark, J. C., et al. (2003). Potato Production Systems

Typical Seed Potato Protocol: Suberize

- Cut tuber to 2-2.5 oz seed piece
- Treat with fungicide/ moisture absorber
  - Traditionally dry mancozeb and fir bark
- Store and let suberize and heal for one week
  - Good airflow
  - 50°-55° F
  - >95% relative humidity

Stark, J. C., et al. (2003). Potato Production Systems

Typical Seed Potato Protocol: Plant

- Cut tuber to 2-2.5 oz seed piece
- Treat with fungicide/ moisture absorber
  - Traditionally dry mancozeb and fir bark
- Store and let suberize and heal for one week
  - Good airflow
  - 50°-55° F
  - >95% relative humidity
- Plant

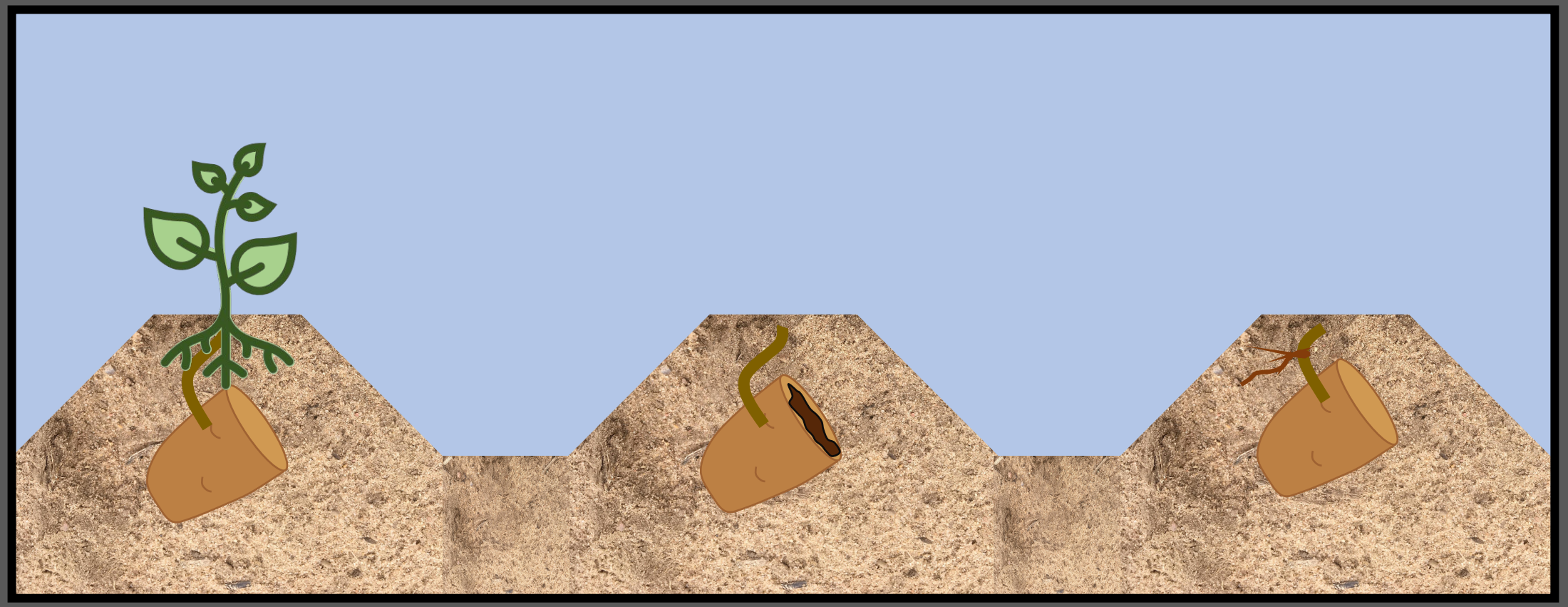
Stark, J. C., et al. (2003). Potato Production Systems

The fate of seed once planted:

Produces Health Plant

Dry Rot/ Soft Rot Decays Seed

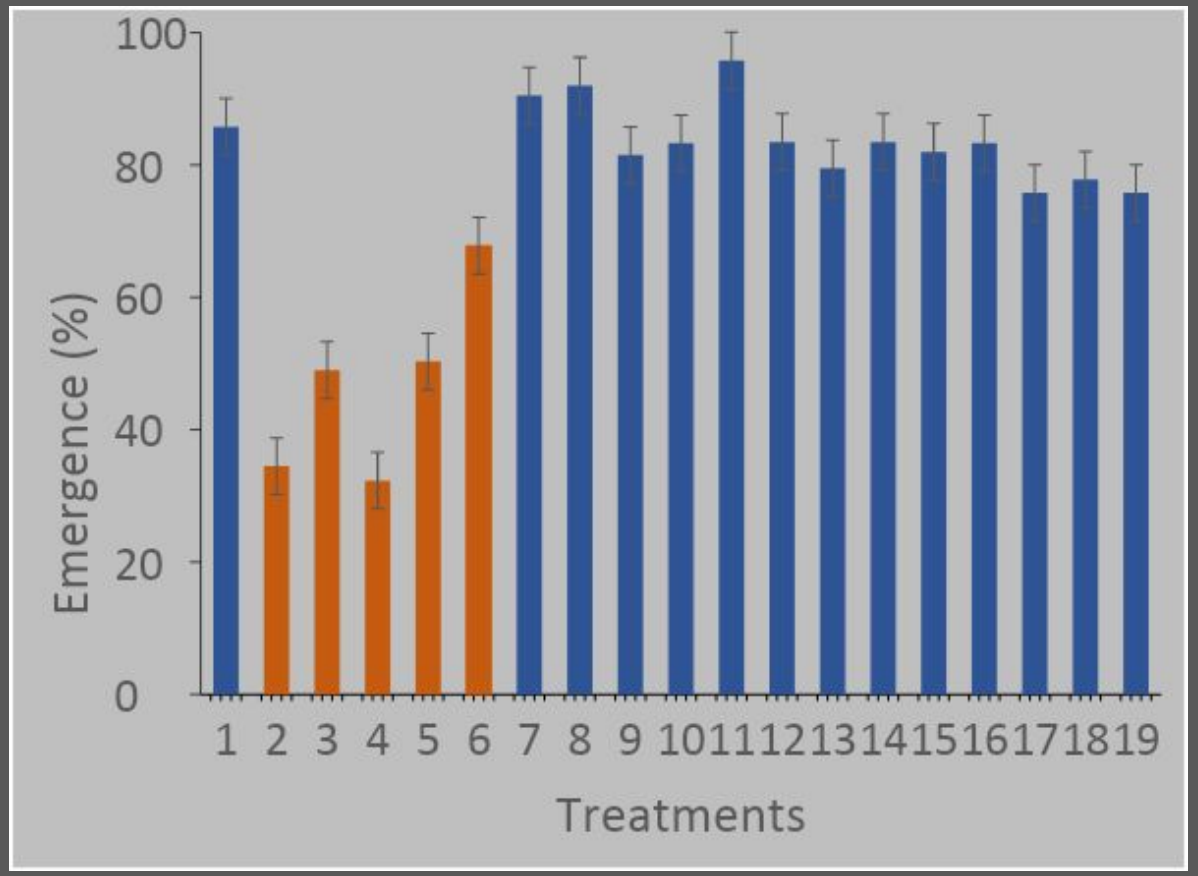
Rhizoctonia Clips Emerging Sprout



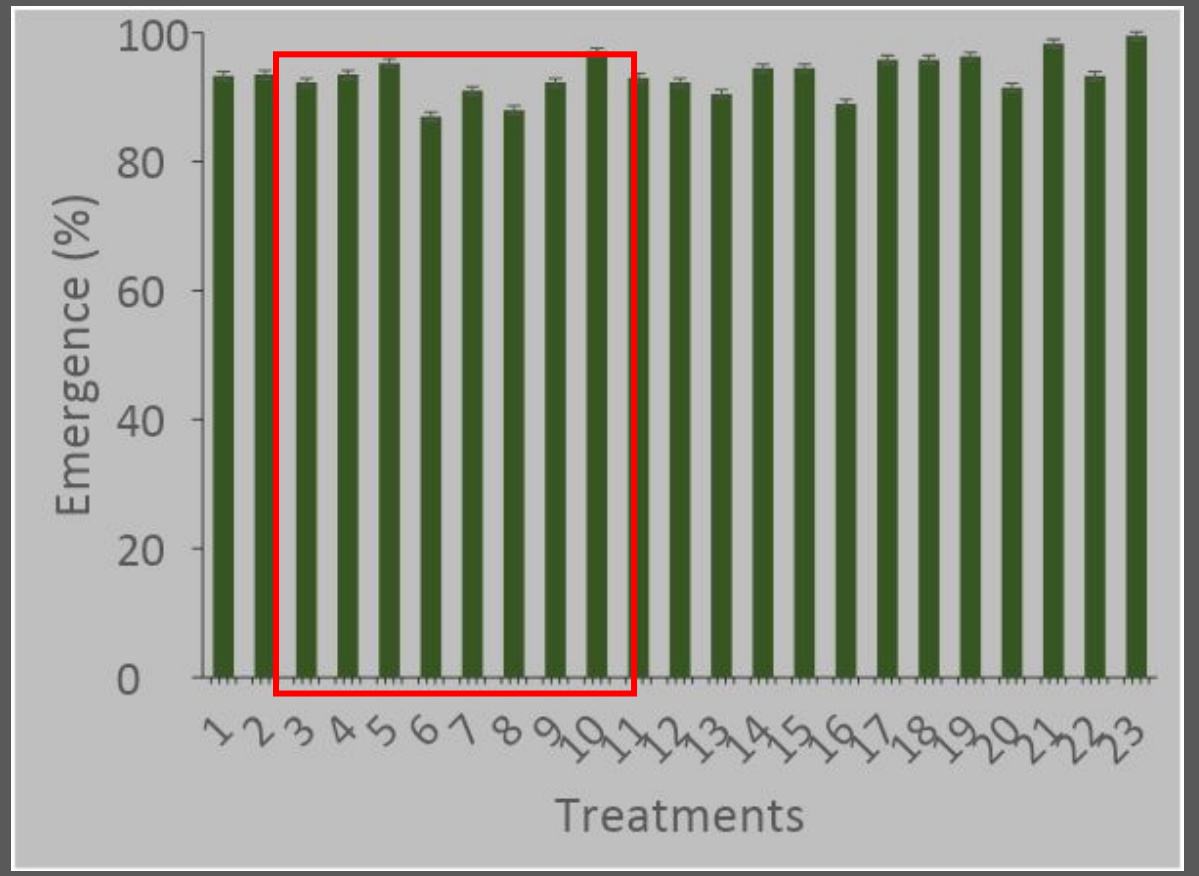
Duellman, K. M., et al. (2021).

Liquid seed treatments can reduce emergence

2017

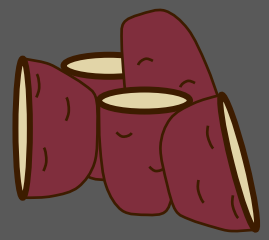


2018

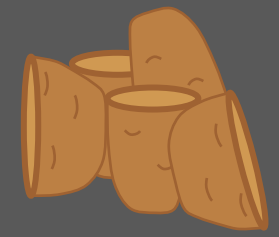


Gevens et. al. 2018, 2019. PDMR

Overall goal: Evaluate and optimize the use of liquid seed treatments in potato production.



Objectives:

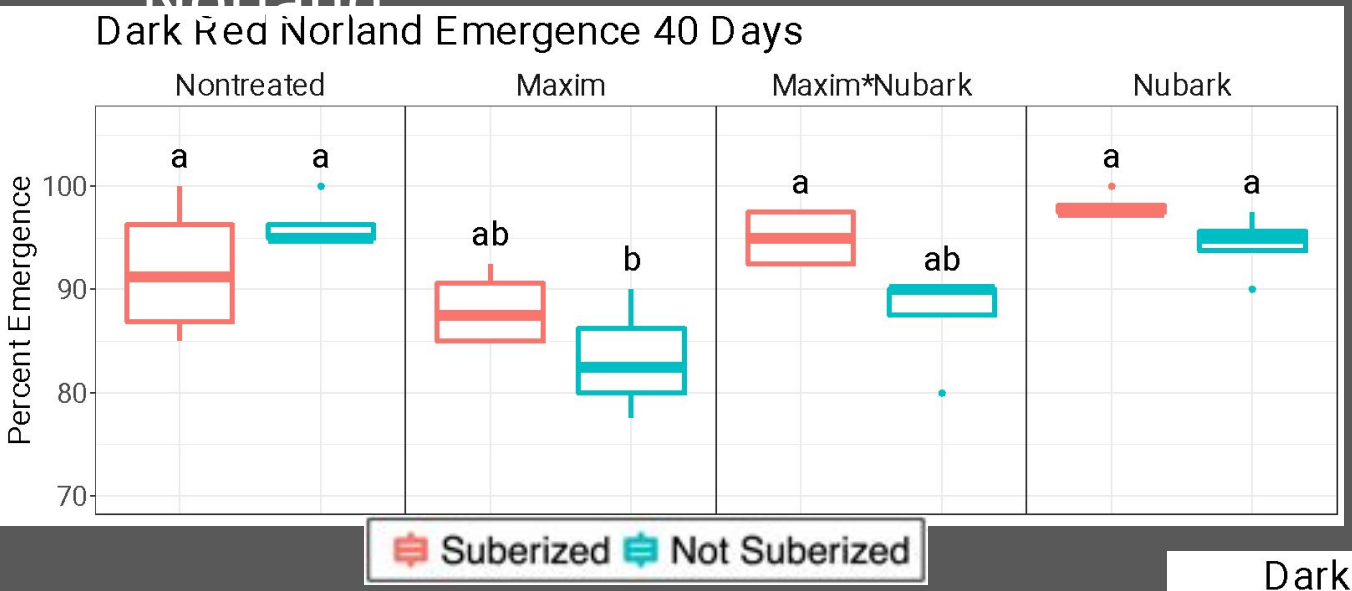


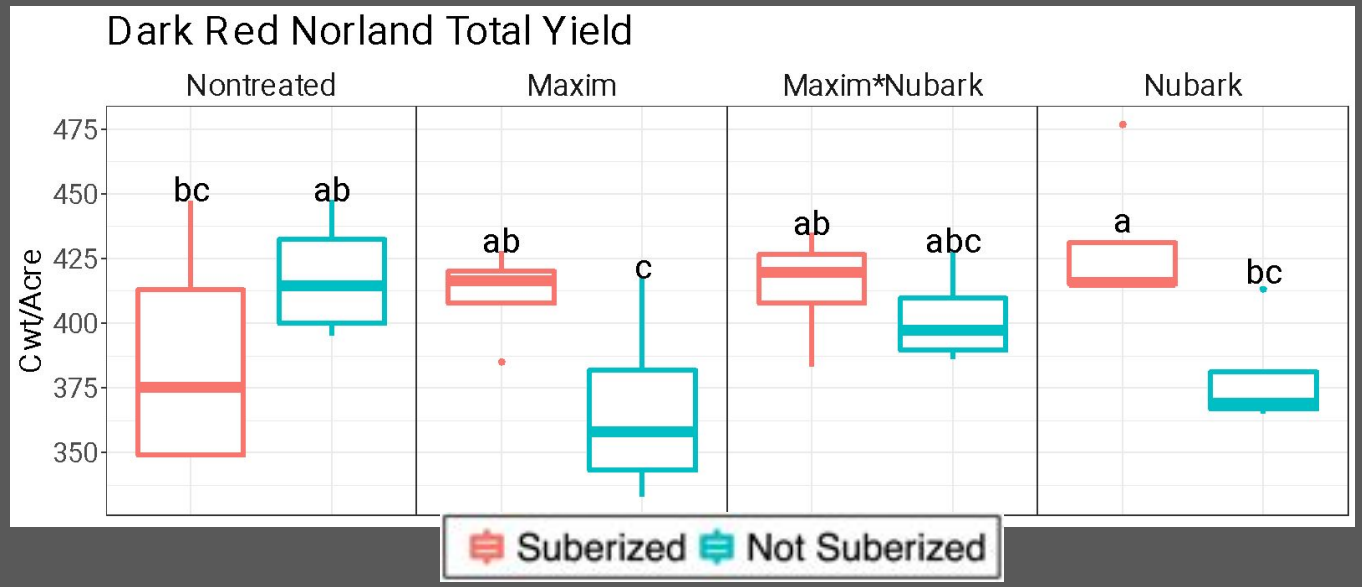
- Seed Treatment
- Seed Age
- Application Method
- Mechanism
- Temperature

Seed Potato Protocol

- Cut: 1 factor
  - Cut
- Treat: 4 factors
  - Nontreated, Maxim (fludioxonil), Maxim*Nubark, Nubark
- Suberize: 2 factors
  - Suberized, Not Suberized

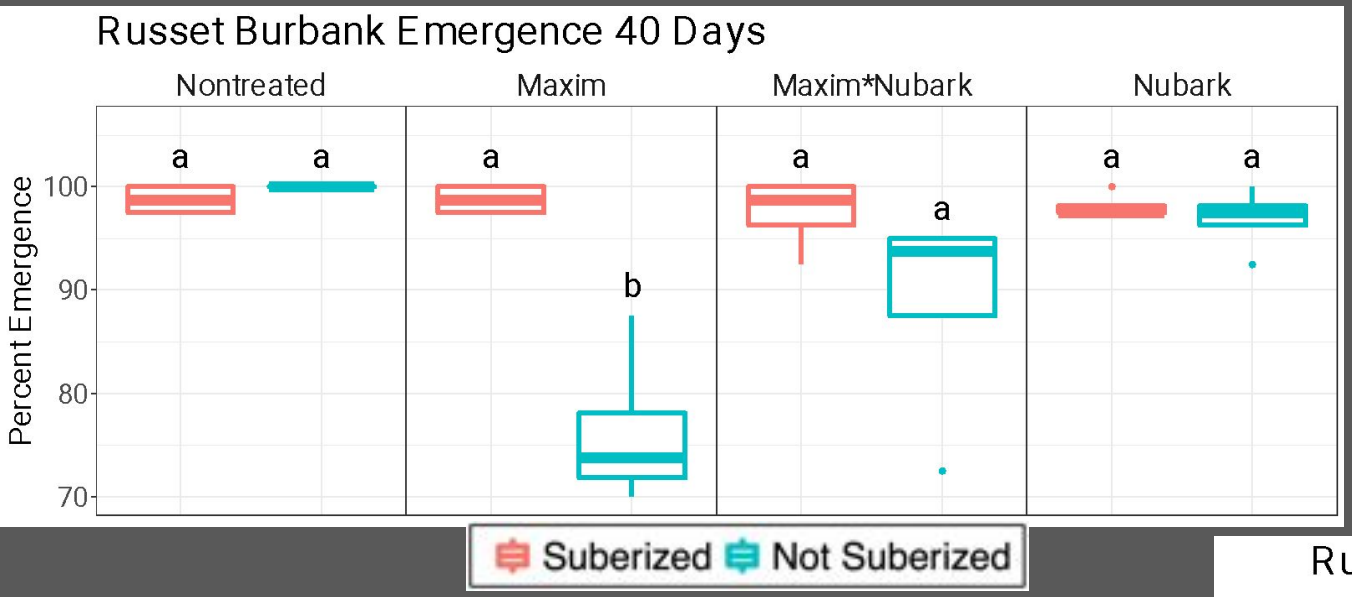
In 2019, liquid seed treatment reduced stand and yield in Dark Red Norland

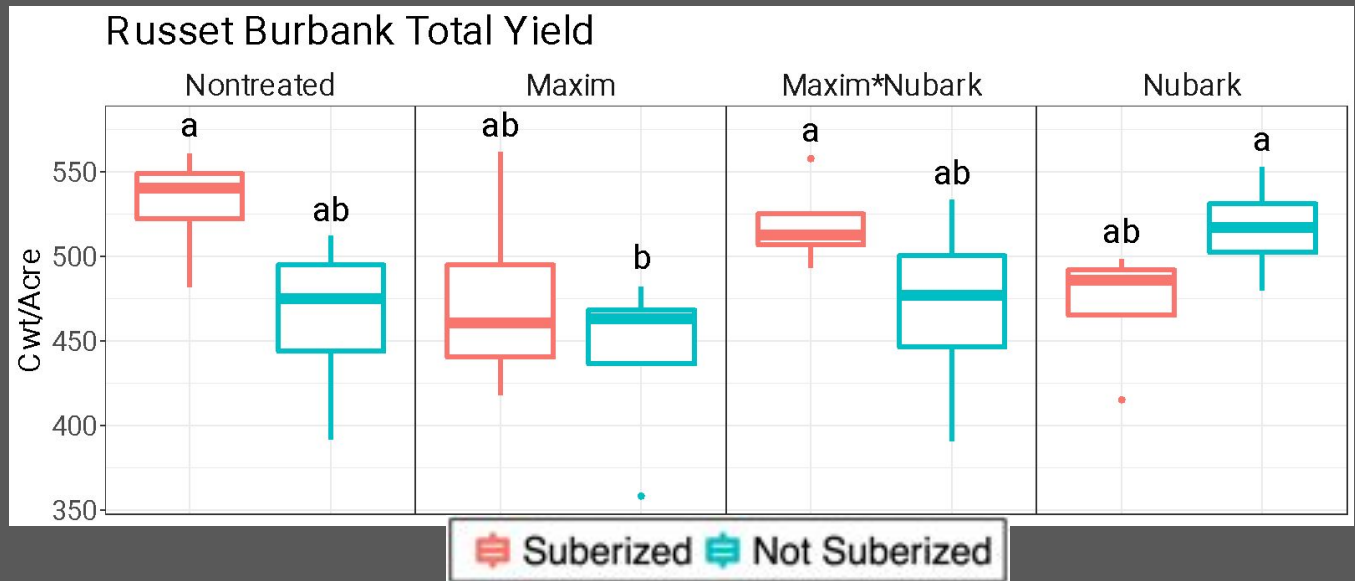


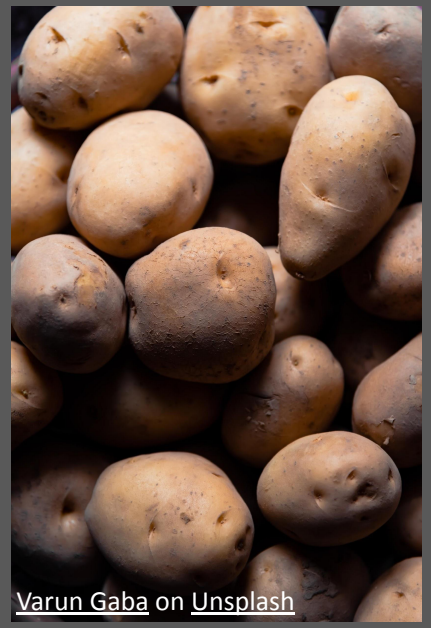


Seed Treatment

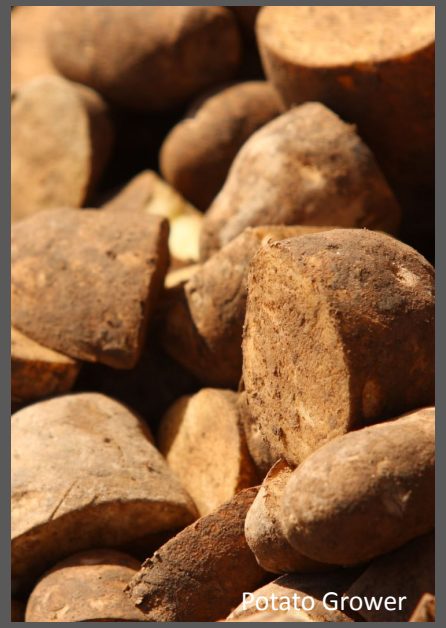
2019 Russet Burbank



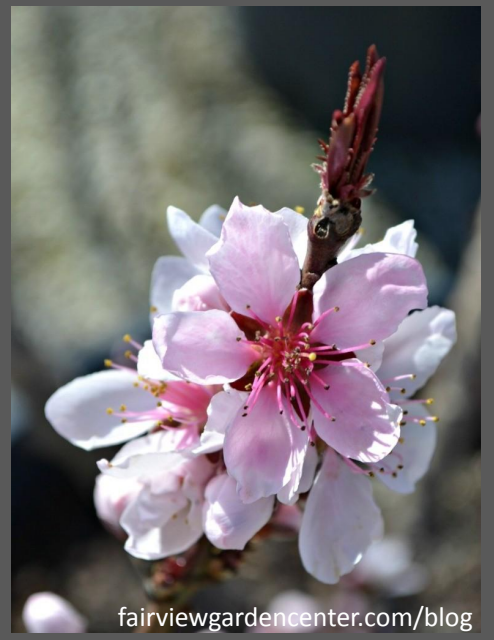




Whole vs Cut

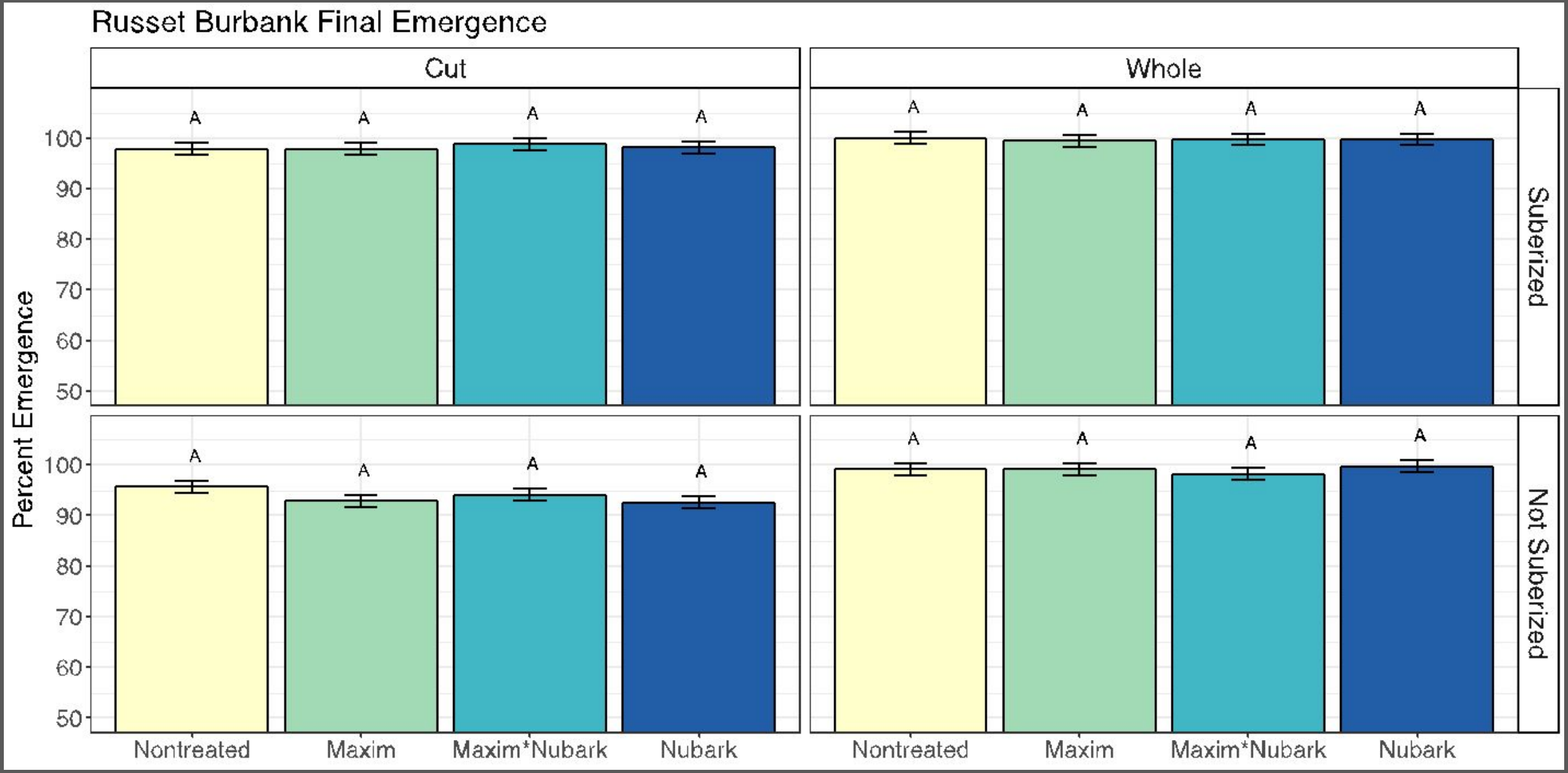


Early vs Late



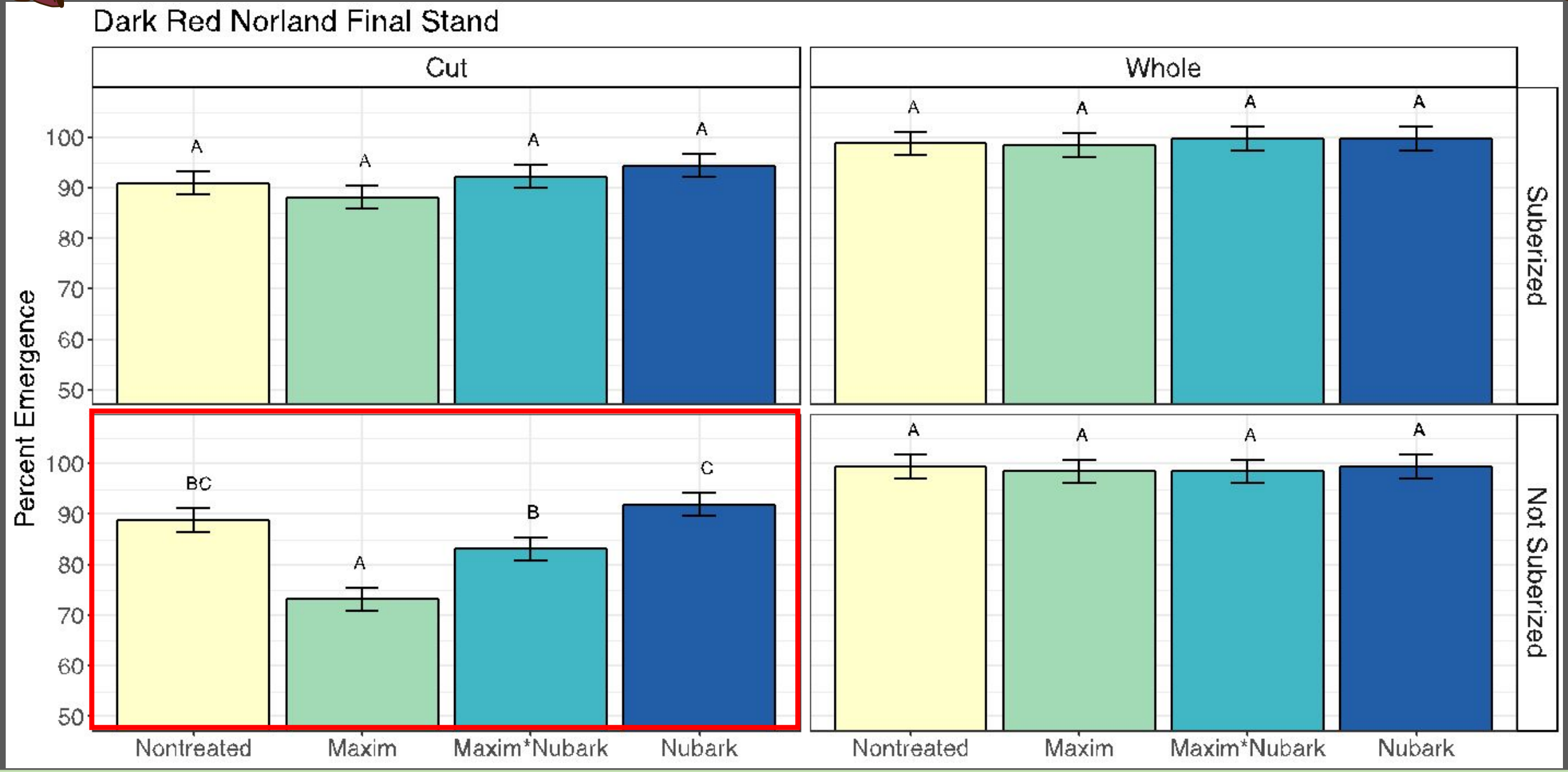
Banville, G.J., Carling, D.E. (2001) Stark, J. C., et al. (2003).

2020-2021 No differences in final stand between treatments in Russet Burbank



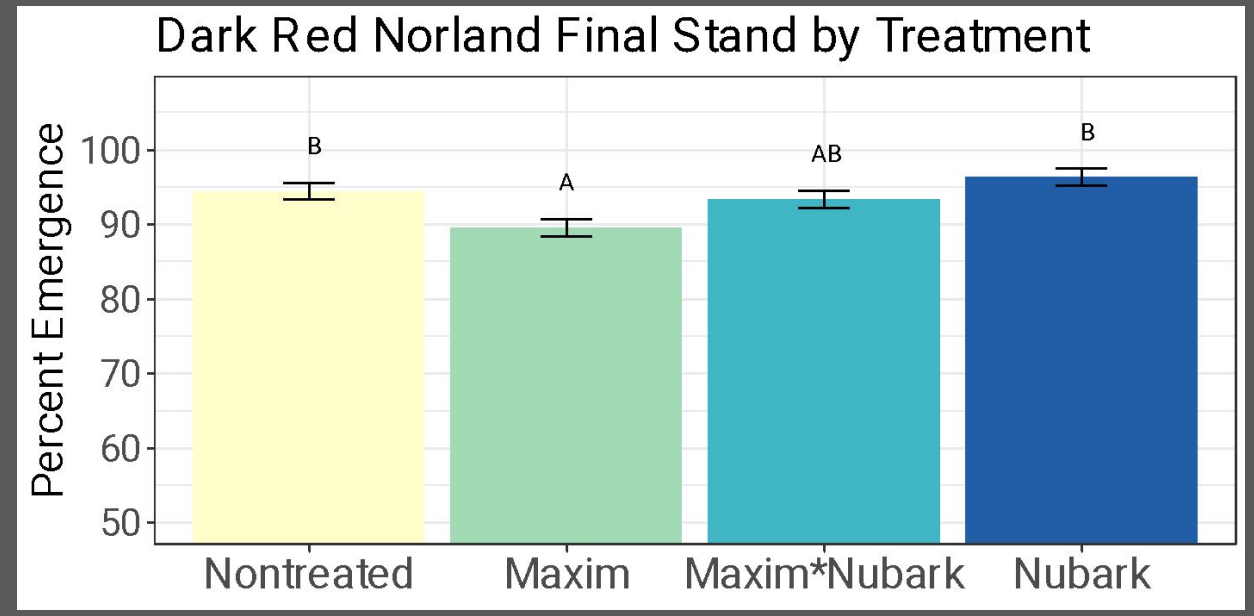
Seed Treatment

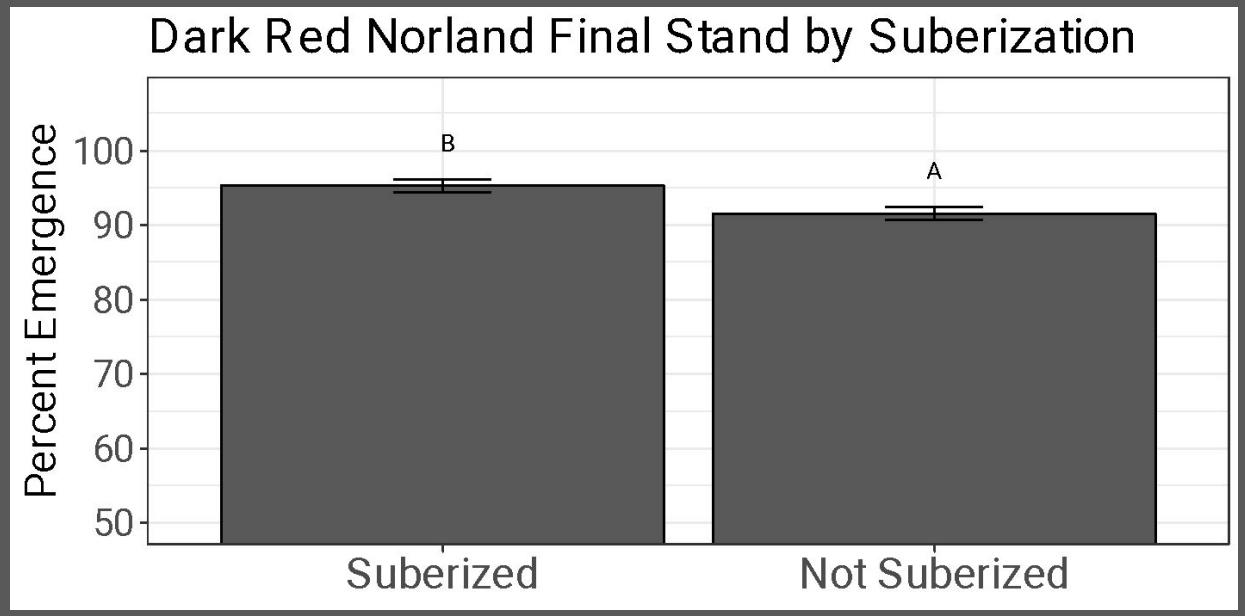
2020-2021 Cut, Not Suberized, Maxim reduced stand in Dark Red Norland

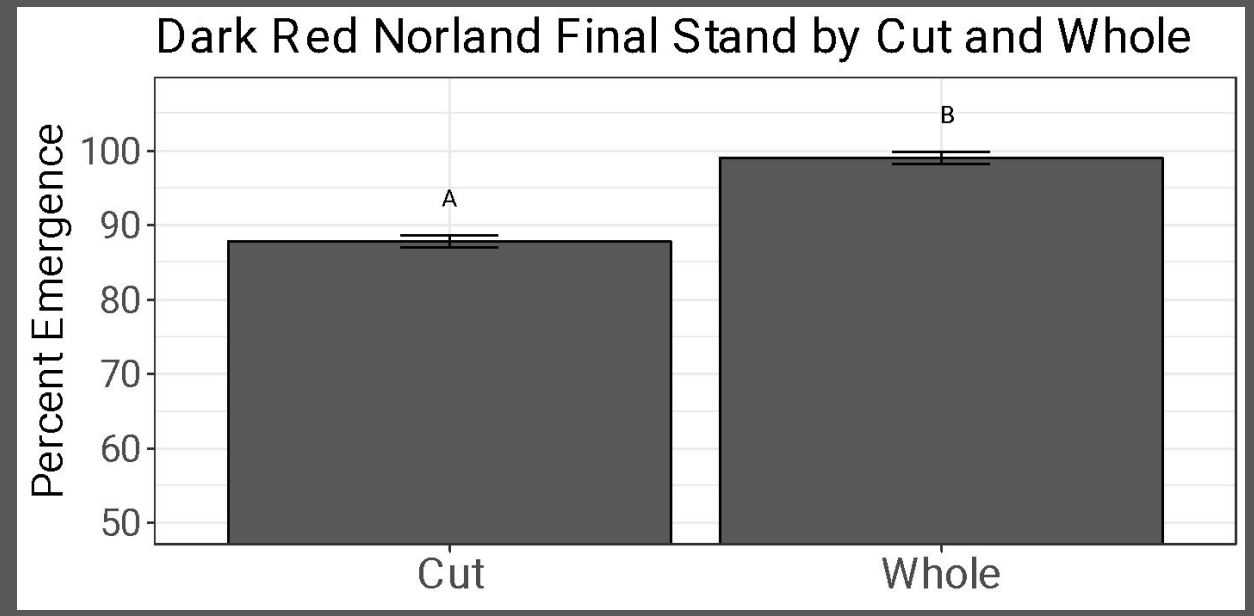


Seed Treatment

2020-2021 Cut, Not Suberized, Maxim reduced stand in Dark Red Norland

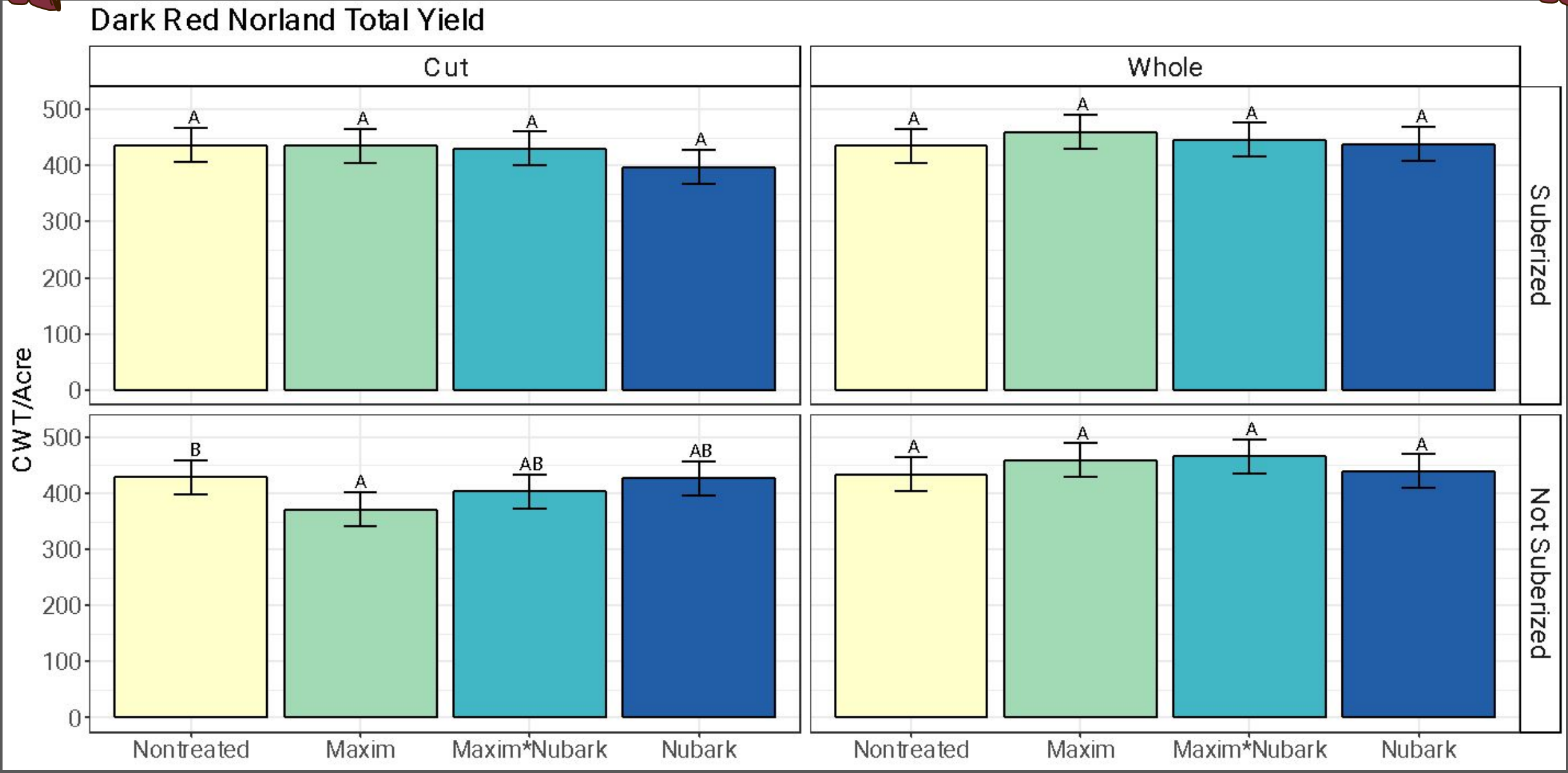




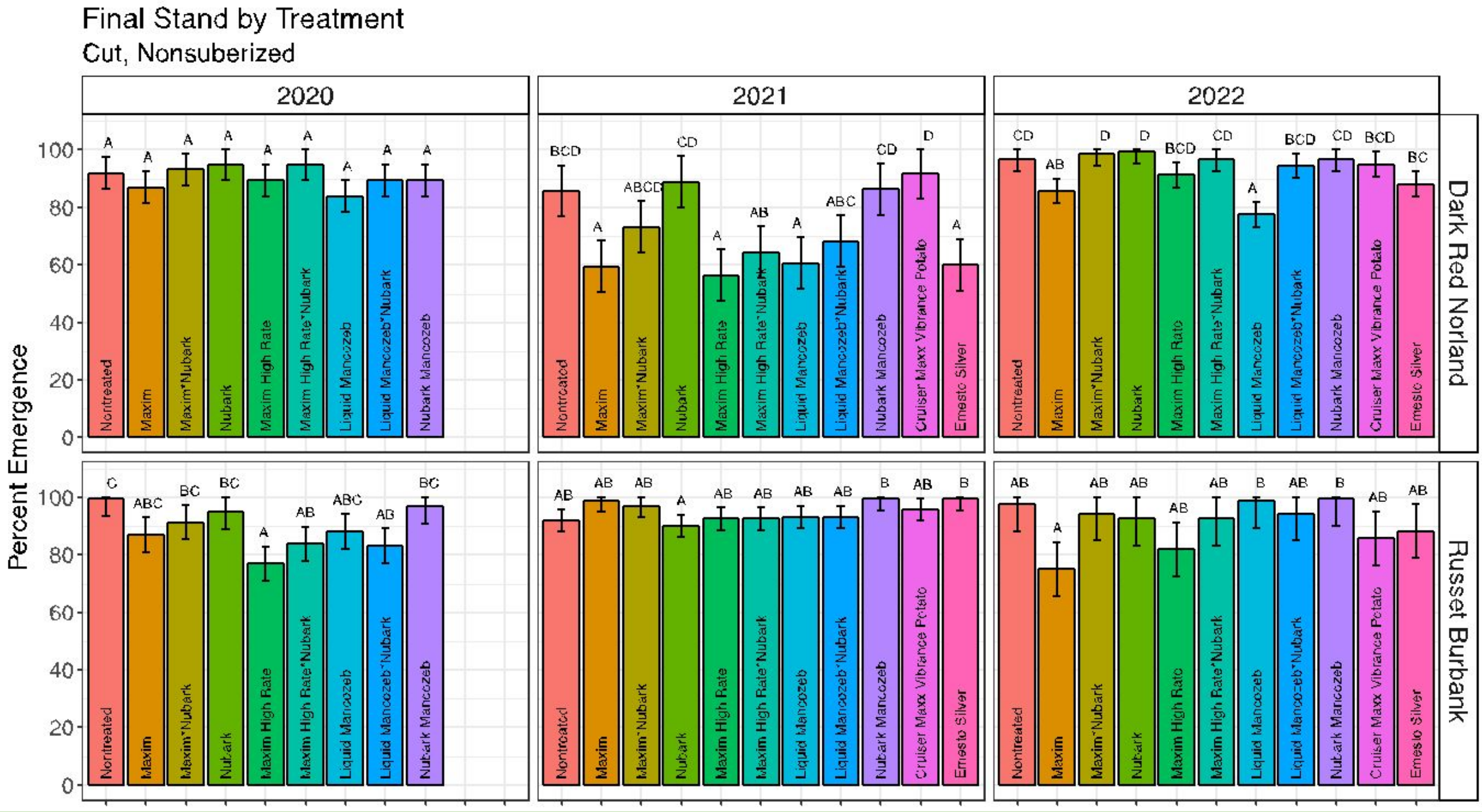


Seed Treatment

2020-2021 Cut, Not Suberized, Maxim reduced total yield in DRN



Seed Treatment


Final Stand by Treatment
Cut, Nonsuberized
2020
2021
2022
Dark Red Norland
Russet Burbank
Percent Emergence
0
20
40
60
80
100
A
A
A
A
A
A
A
A
A
BCD
A
ABCD
CD
A
AB
A
ABC
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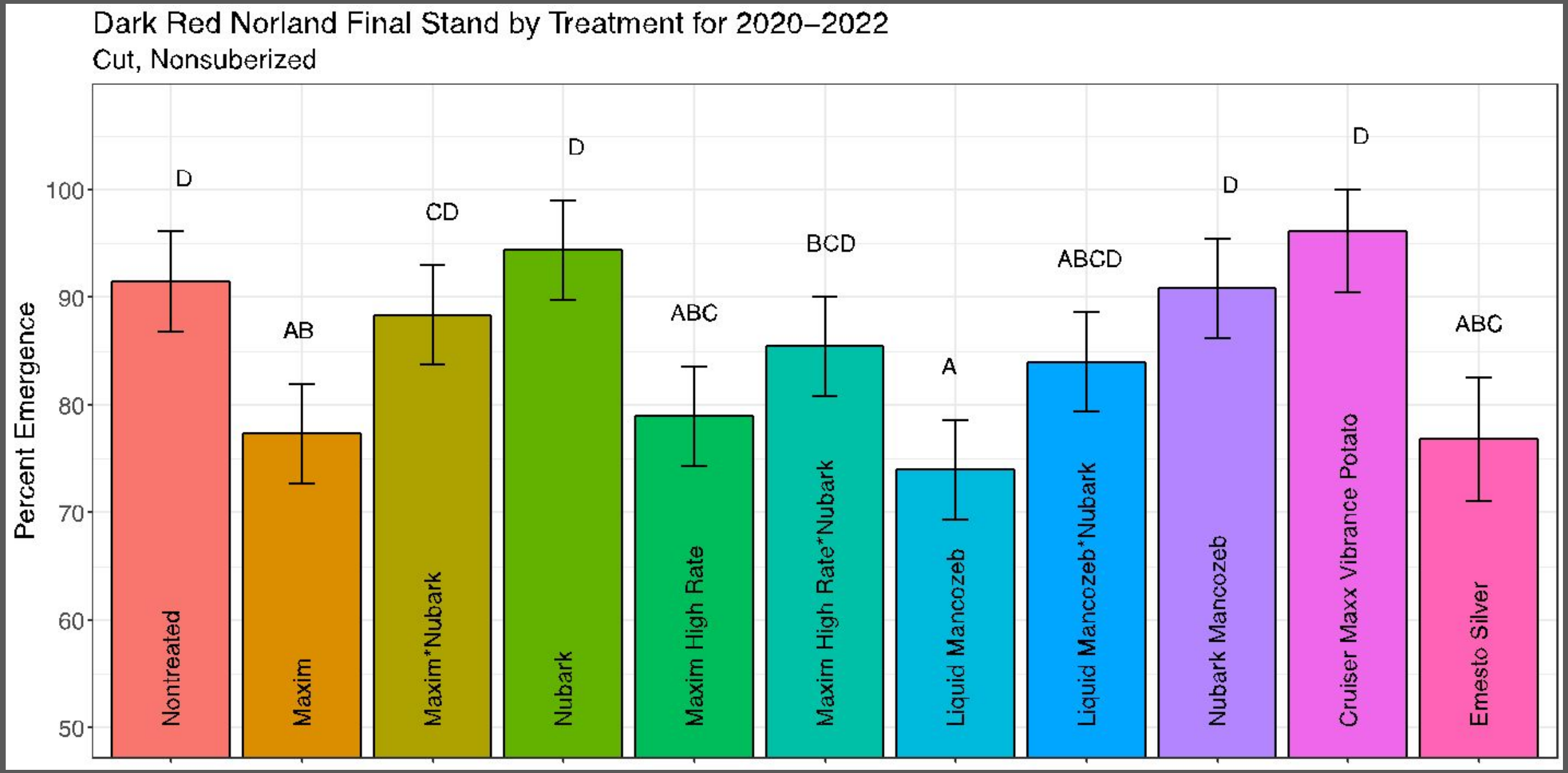
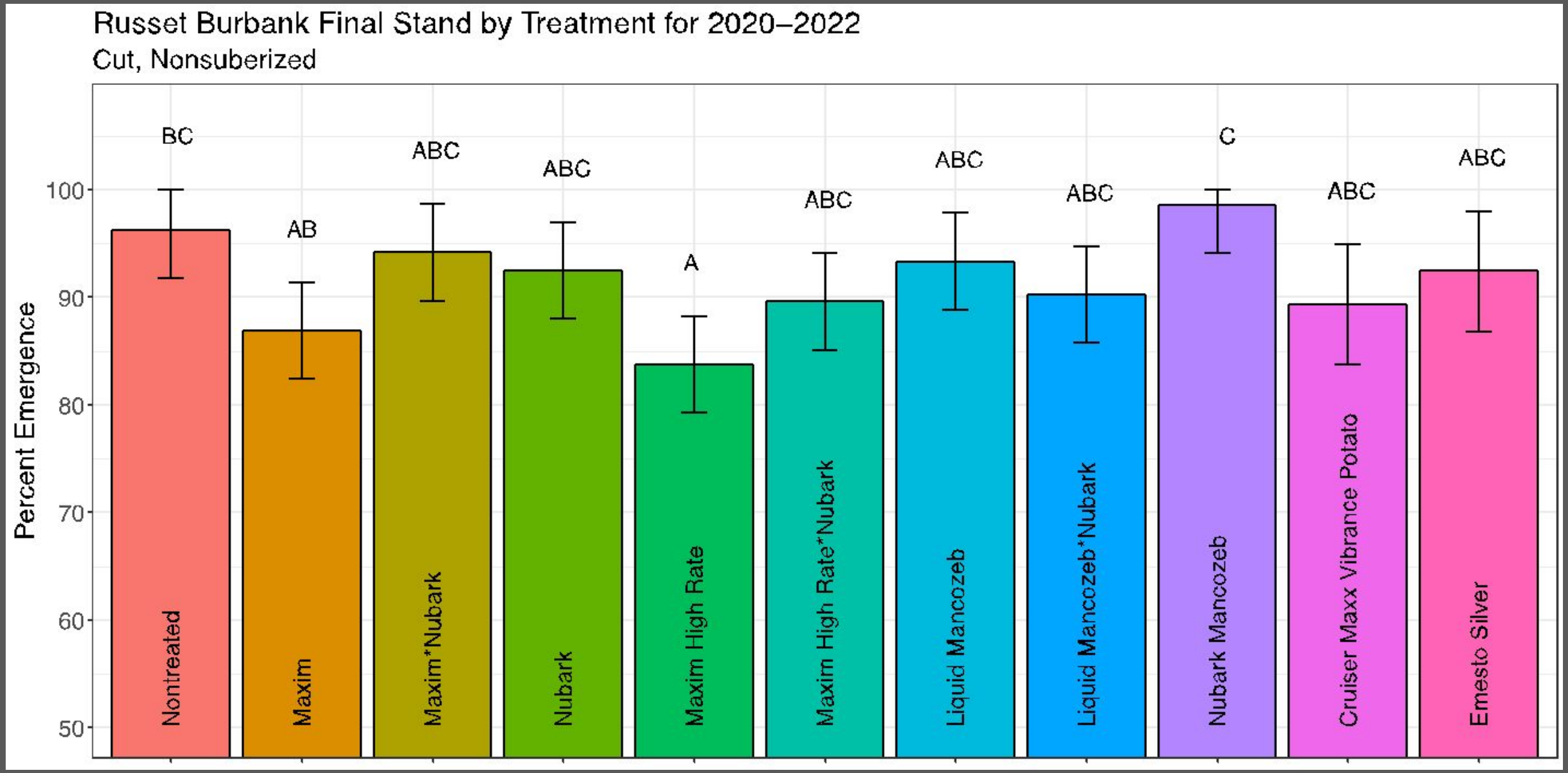
Nontreated
Maxim
Maxim*Nubark
Nubark
Maxim High Rate
Maxim High Rate*Nubark
Liquid Mancozeb
Liquid Mancozeb*Nubark
Nubark Mancozeb
Cruiser Maxx Vibrance Potato
Emesto Silver
Seed Treatment

Other liquid seed treatments had similar impact



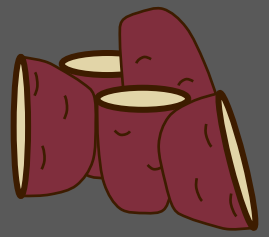
Seed Treatment

Other liquid seed treatments had similar impact



Summary: Impact of Cut, Non-suberized, Maxim

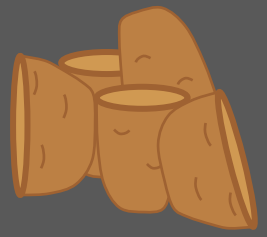
Dark Red Norland



Late plant: ~15% reduction in stand
Early Plant: ~7% reduction in stand in 2021, none 2020

Both early and late plant show significant reduction in total yield

Russet Burbank



Late plant: Delayed emergence but no stand loss
Early Plant: ~5% reduction stand in 2021 none 2020

Both early and late plant show no significant impact on total yield

-Use whole seed where possible
-When using liquid seed treatment on cut seed, always suberize, or add drying agent
-Learn unique responses on common cultivars

Seed Treatment

Objective Trials:

Seed Treatment

Seed Age

Application Method

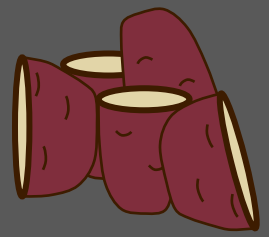
Mechanism

Temperature

Exploring the impact of seed age on effect of liquid seed treatment

Differentially Aged Seed

Cut



Treat

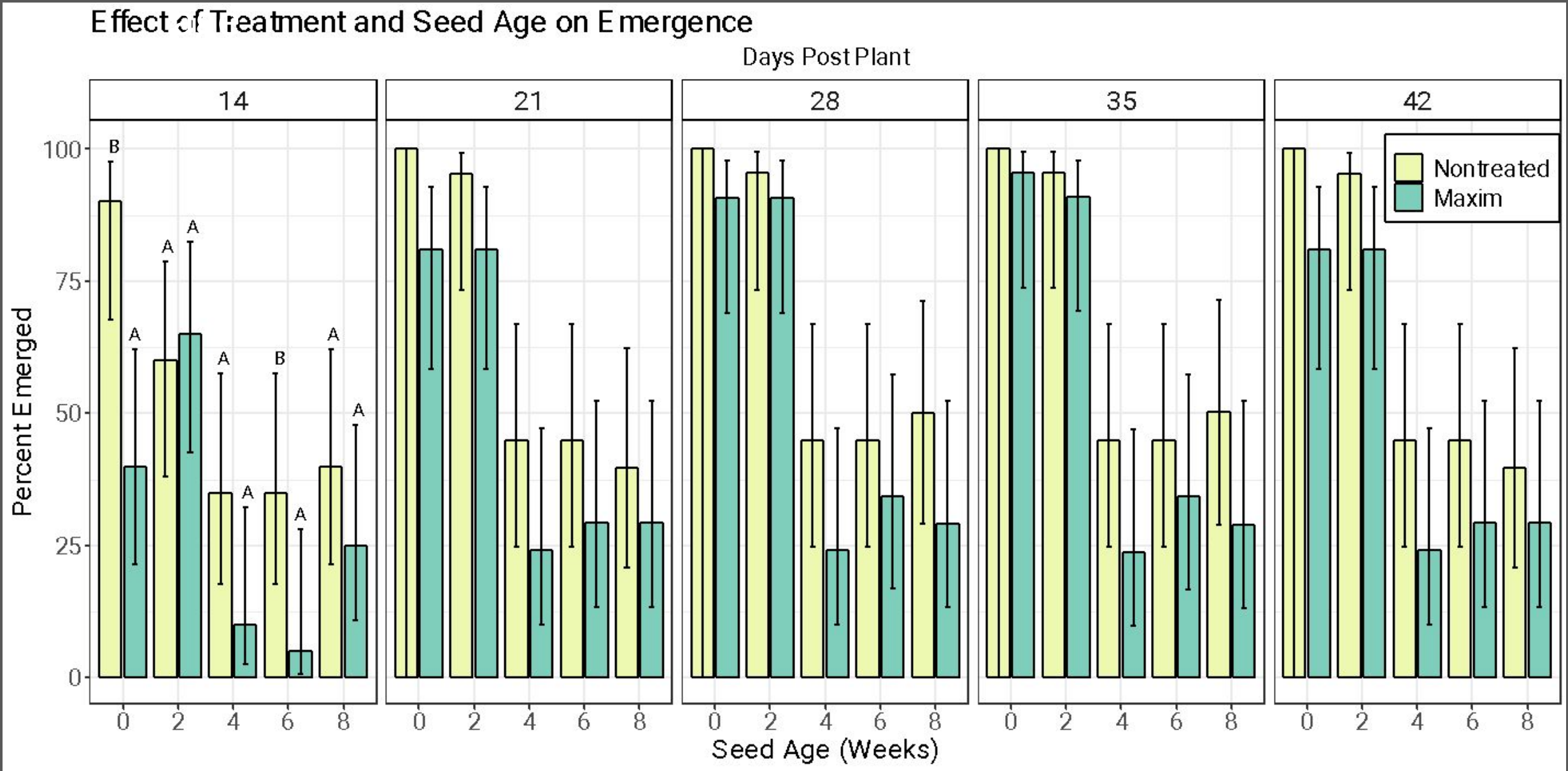
Plant

Seed Age

Physiological age of tubers at time of planting

Seed Age

Maxim numerically reduces emergence across physiological



Seed Age

Objective Trials:

Seed Treatment

Seed Age

Application Method

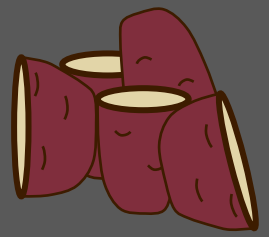
Mechanism

Temperature

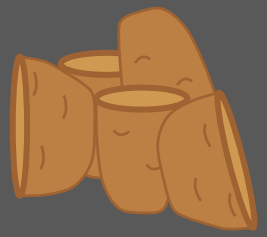
Relating small plot research to commercial production

Researcher

Red Norland



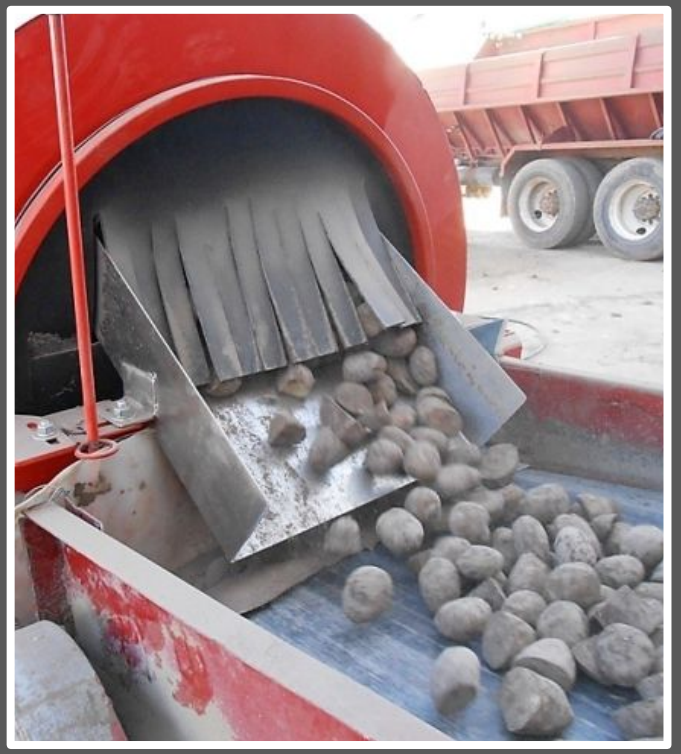
Russet Burbank



Fludioxonil

Thiamethoxam

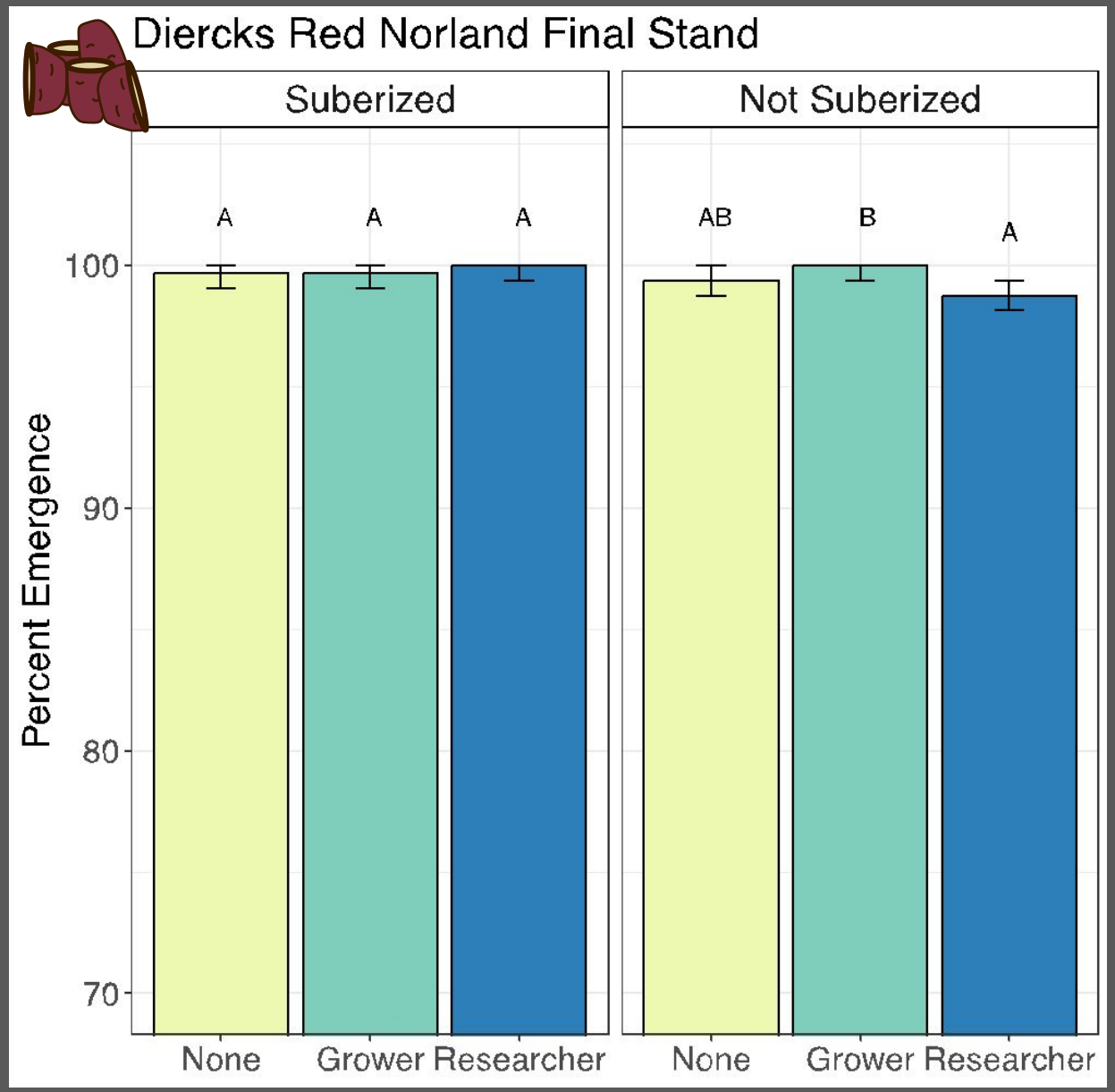
Grower



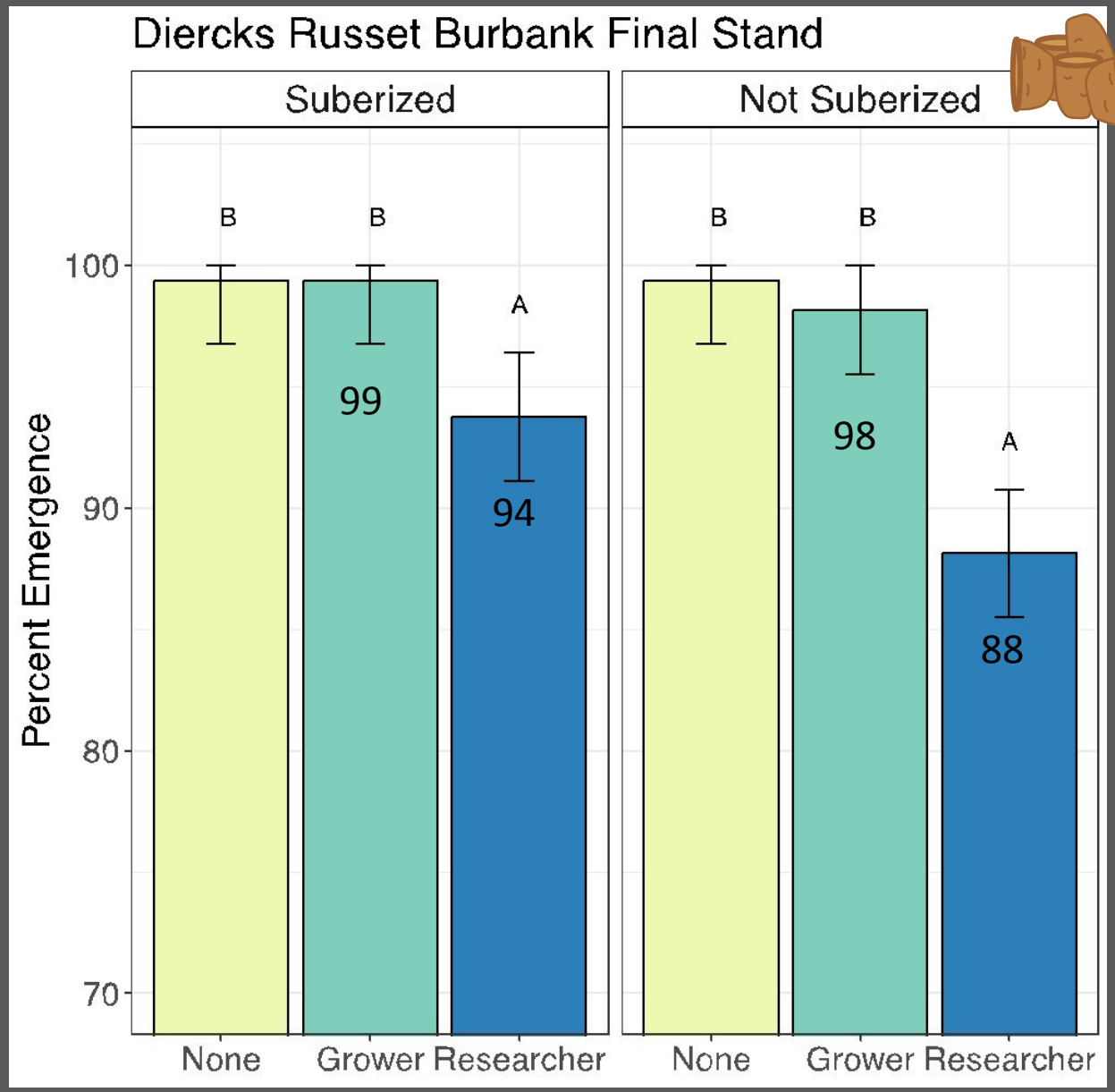
http://www.milestone-equipment.com/treater-models

Application Method

Not suberized researcher application reduced stand

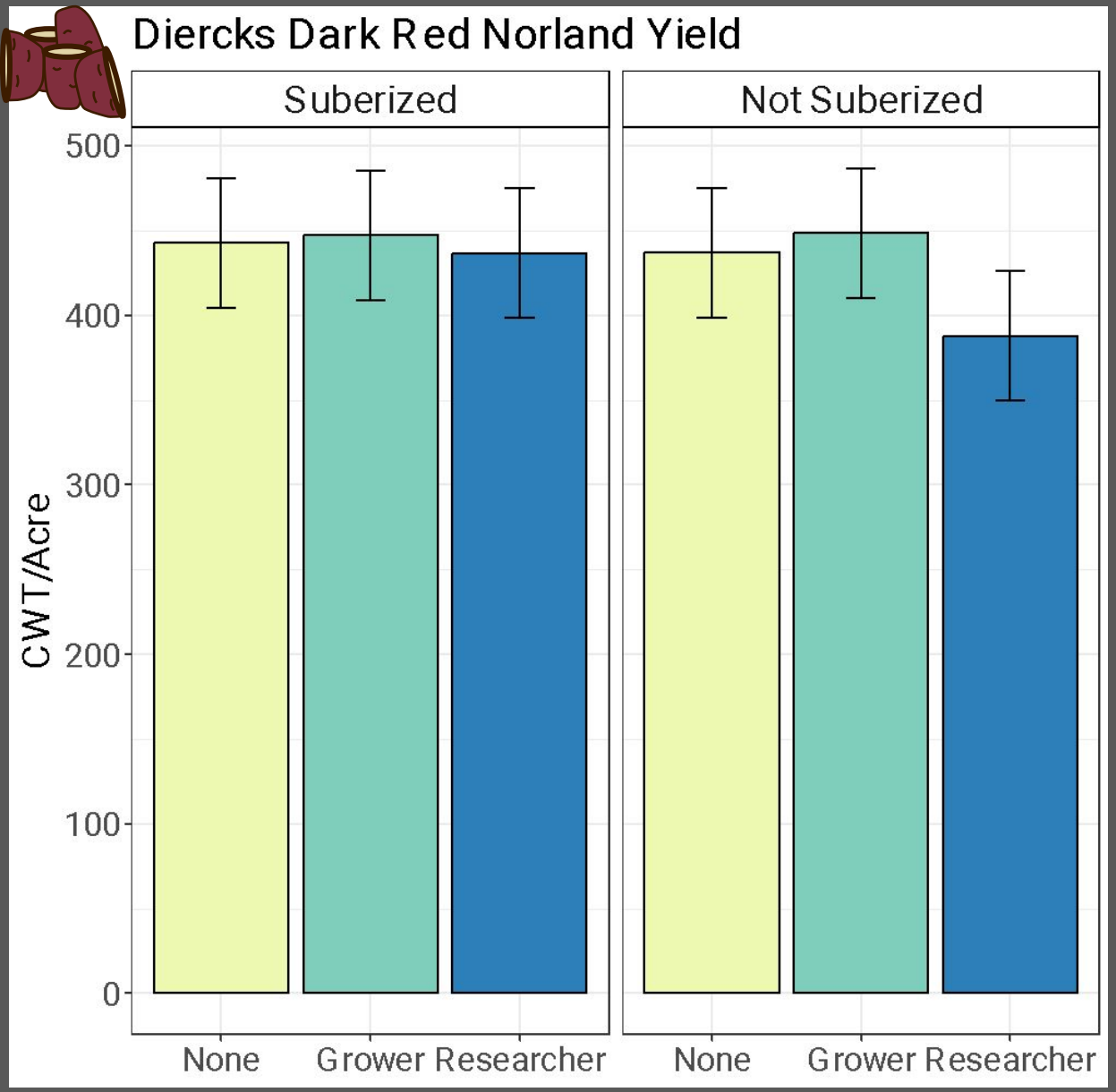


Fludioxonil

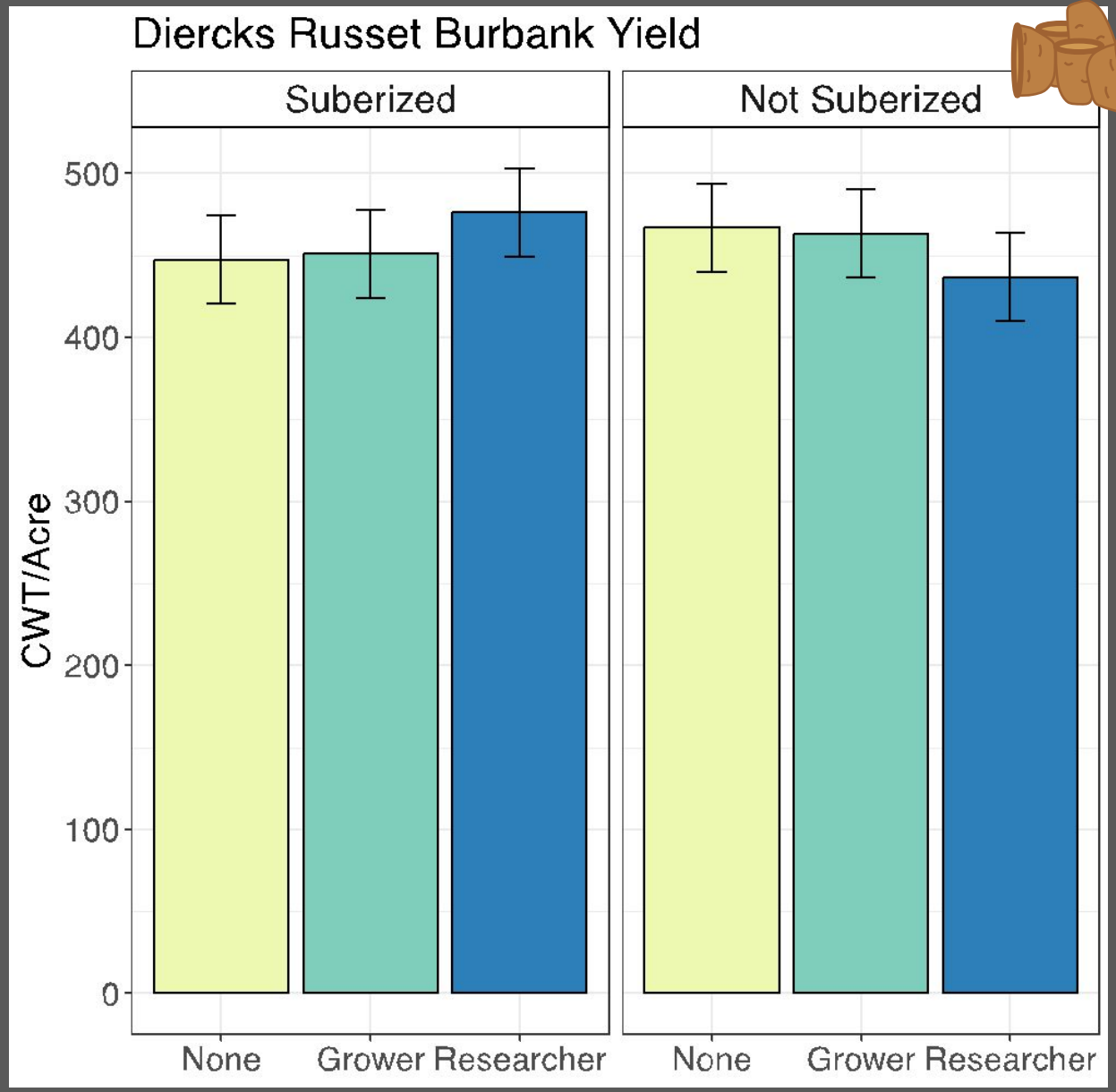


Thiamethoxam

Grower vs Research Applied



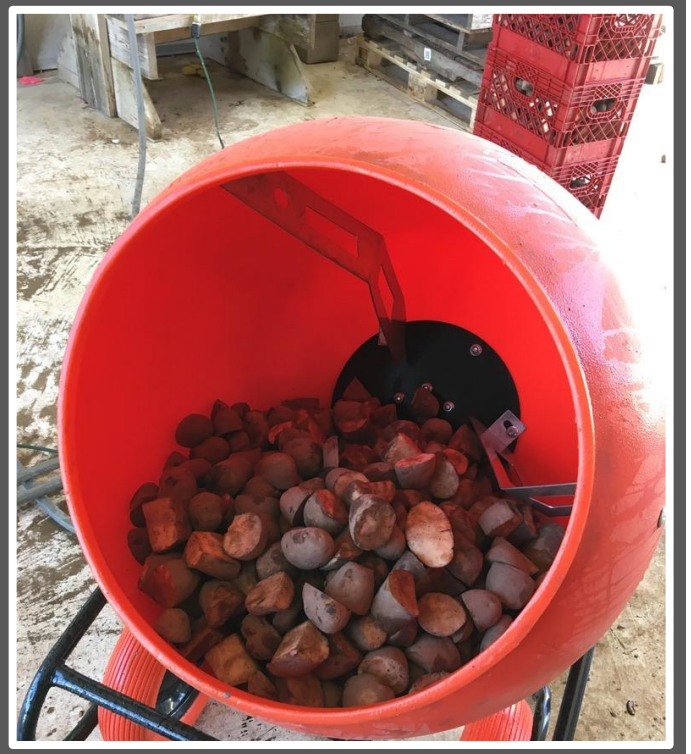
Fludioxonil



Thiamethoxam

Why does research applied have different results compared to grower applied?

Researcher



Grower

http://www.milestone-equipment.com/treater-models

Application Method

A look at different carrier volumes

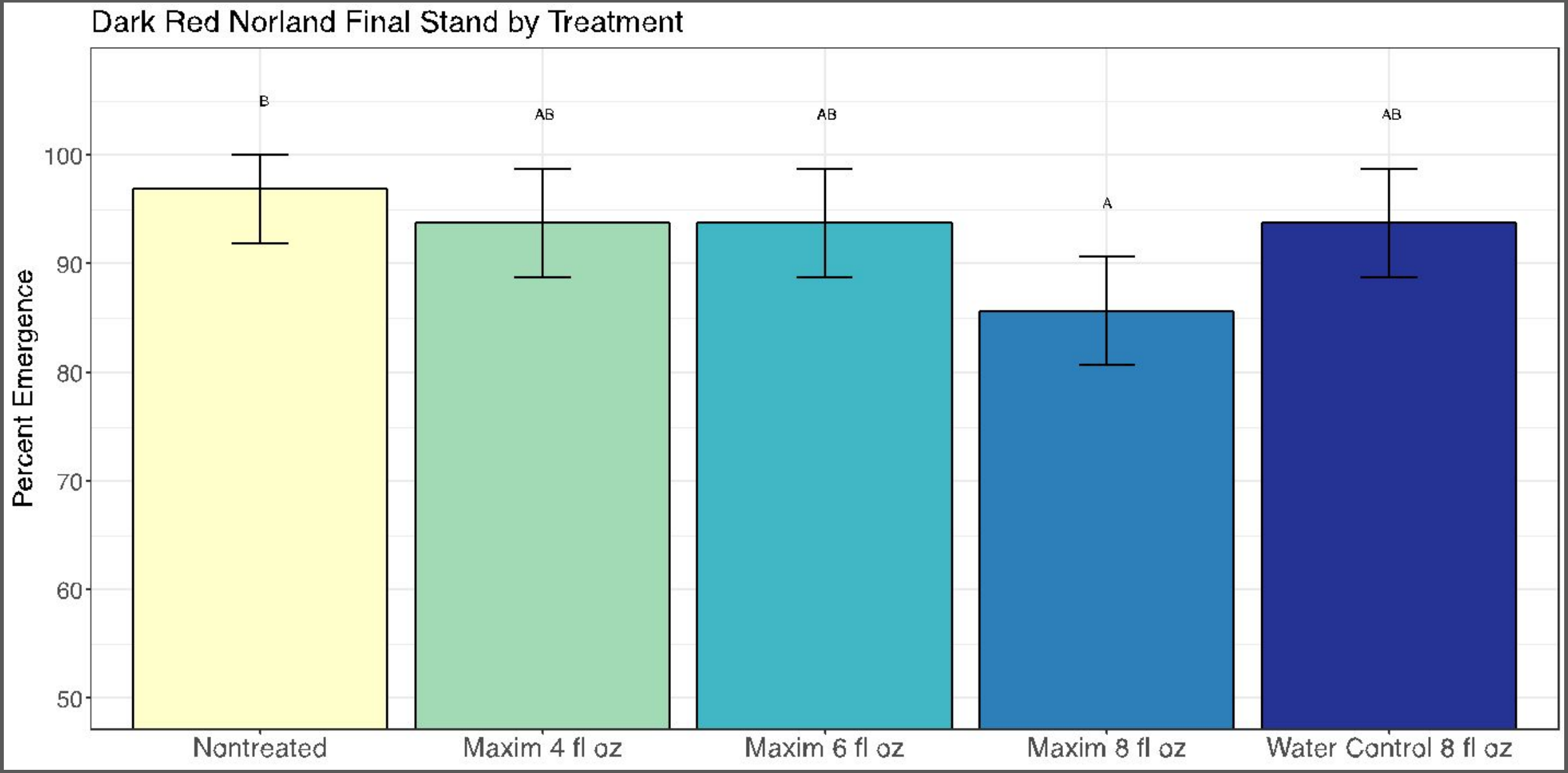
Grower Applied (4 fl oz/ CWT)

Researcher Applied (4 fl oz/ CWT)

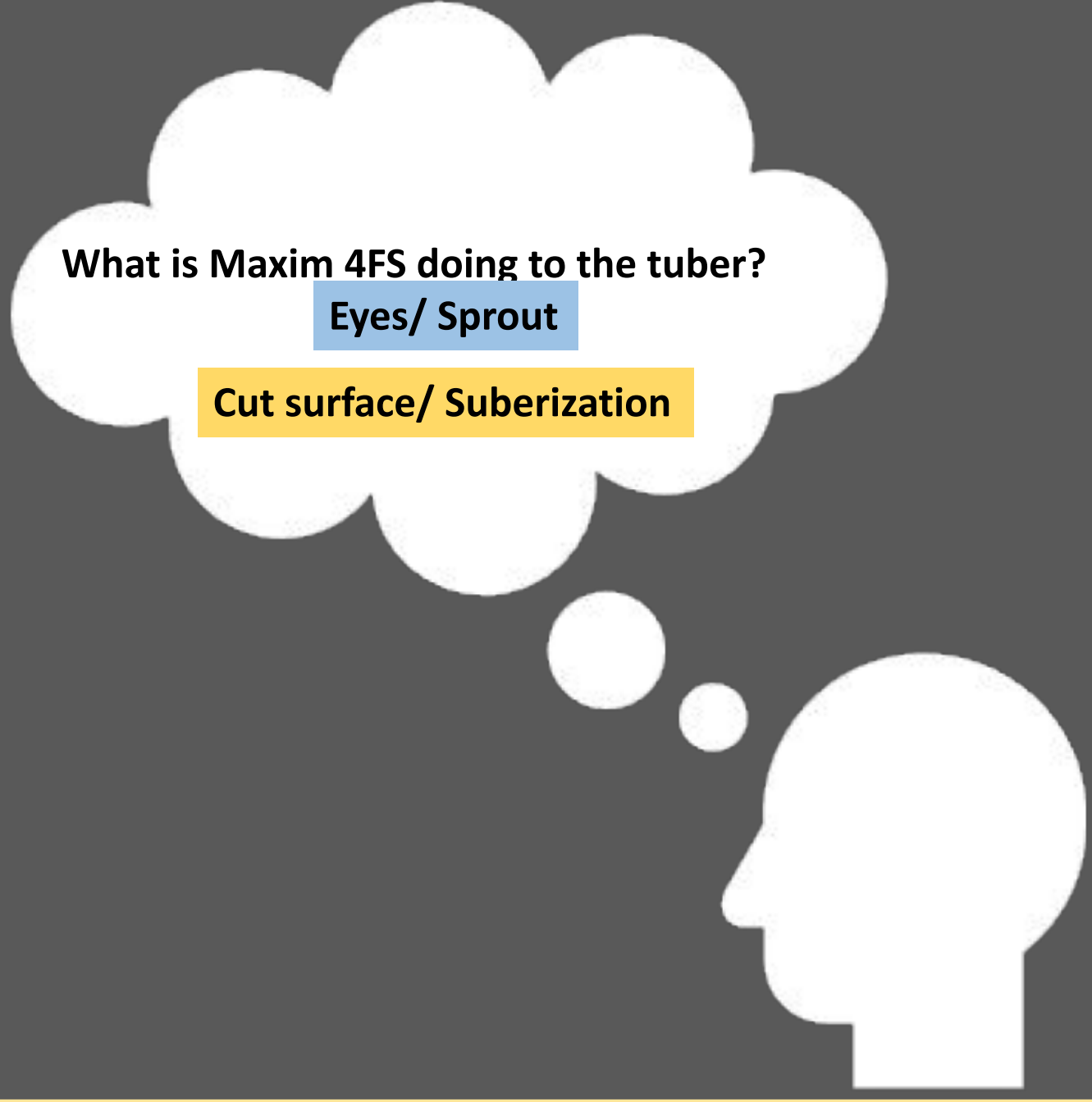
Researcher Applied (8 fl oz/ CWT)

Application Method

High carrier volume is the only treatment that differentiates itself from nontreated



Application Method



Application Method

Objective Trials:

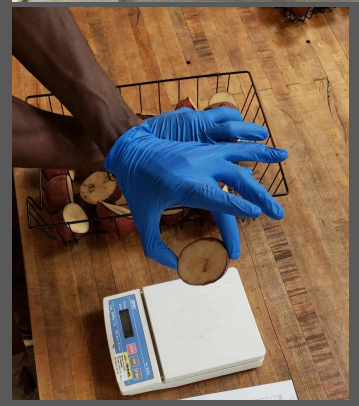
Seed Treatment

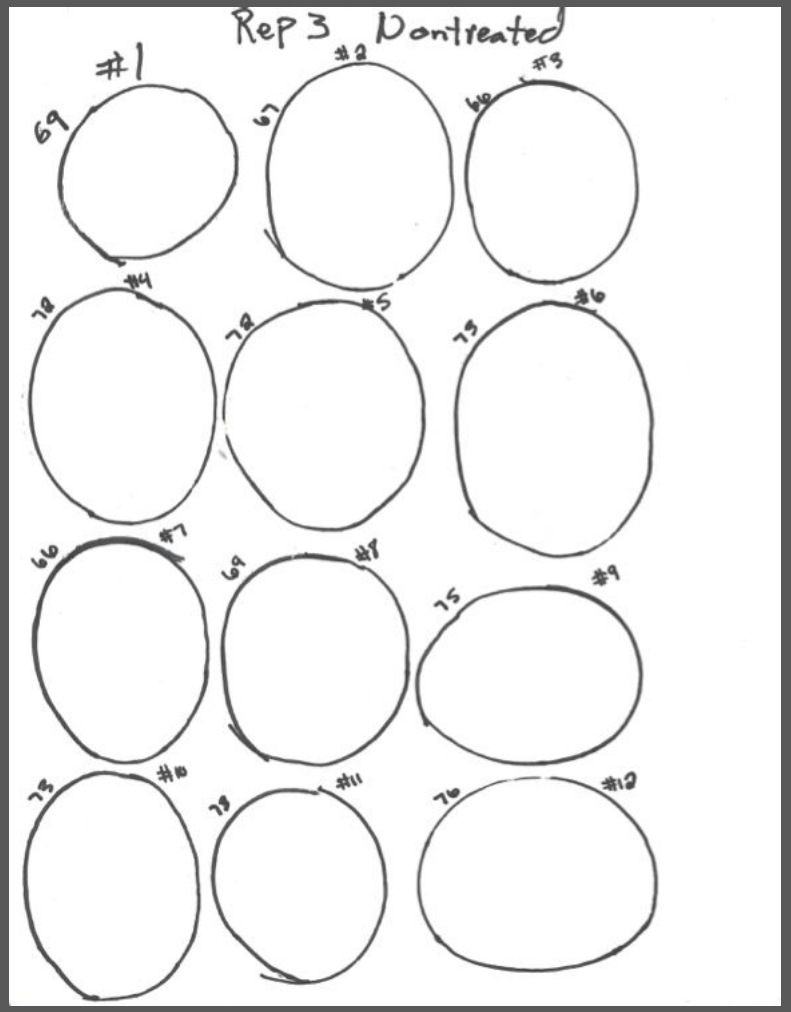
Seed Age

Application Method

Mechanism

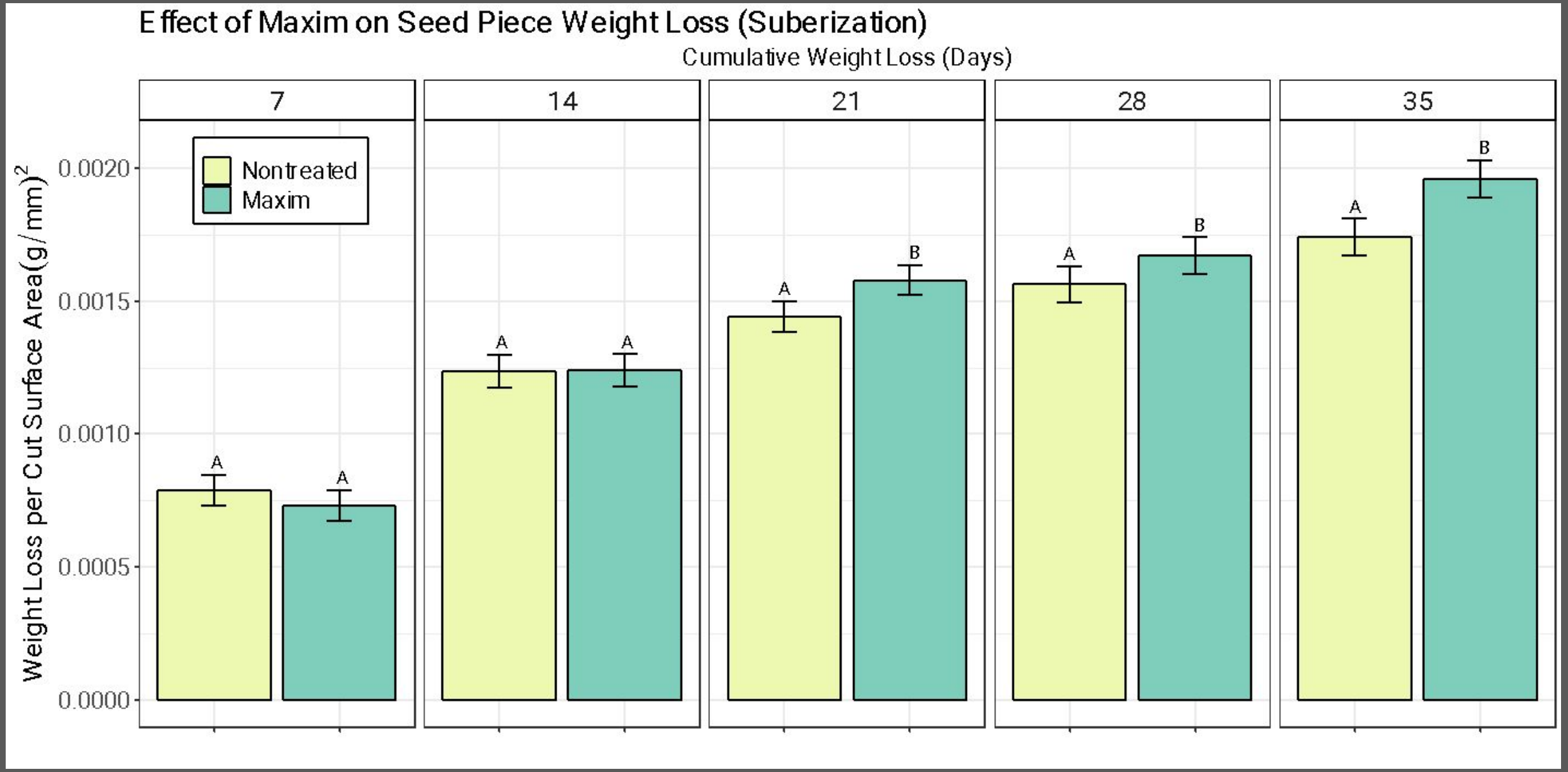
Temperature




Rep 3 Nontreated
#1
69
#2
67
#3
68
#4
70
#5
72
#6
73
#7
66
#8
75
#9
75
#10
75
#11
73
#12
76

Mechanism

Maxim shows significantly more cumulative weight loss starting at day 21



Mechanism

Eyes and Sprouting

Treatments

Location Maxim was painted on cut tuber. 15 n. 2 Replications

1. Nontreated
2. Everywhere
3. Eyes only
4. Skin only
5. Cut surface only

Mechanism

Reduced germination observed when Maxim is applied to eyes

Nontreated

Everywhere

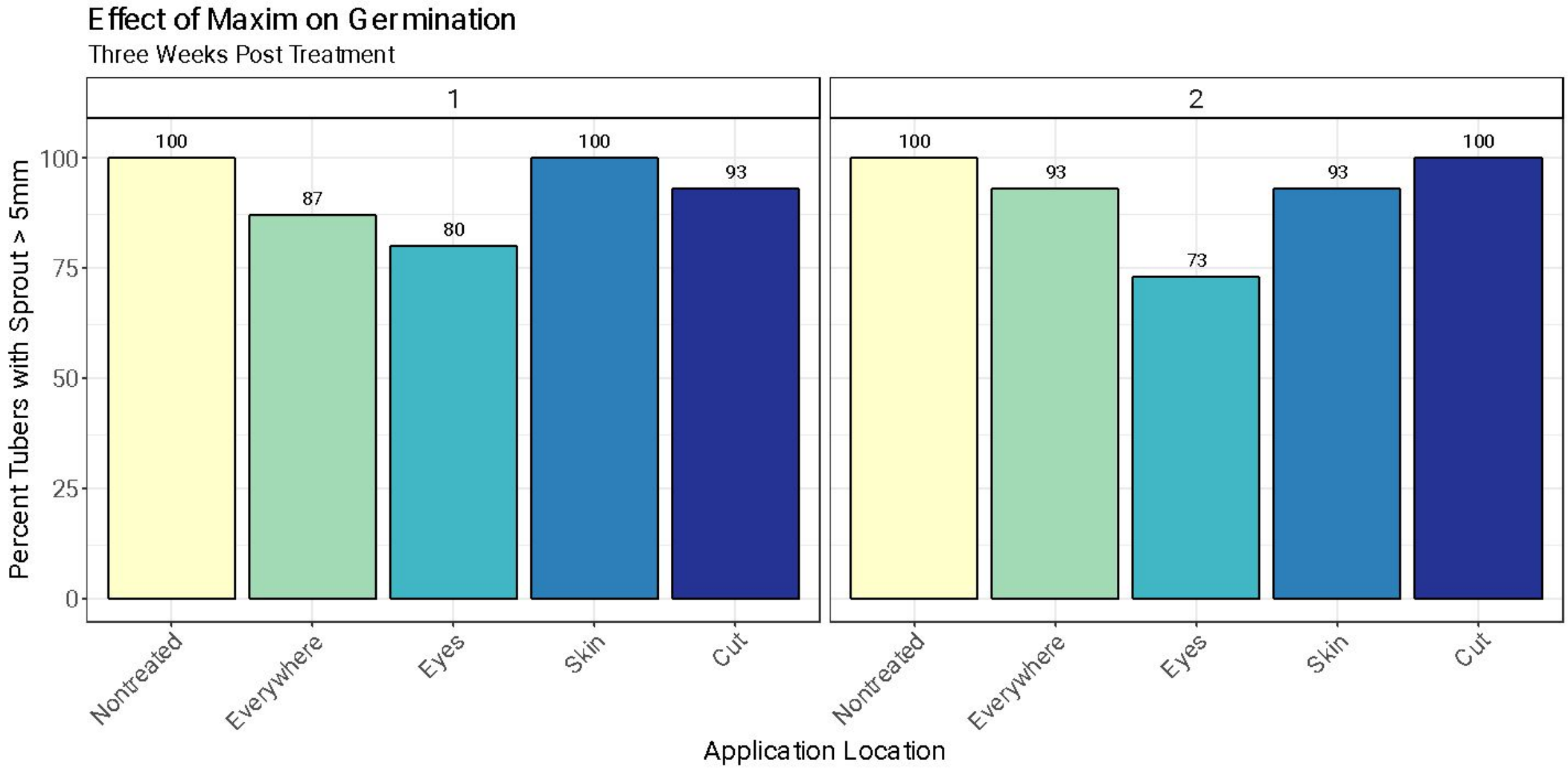
Eyes

Skin

Cut

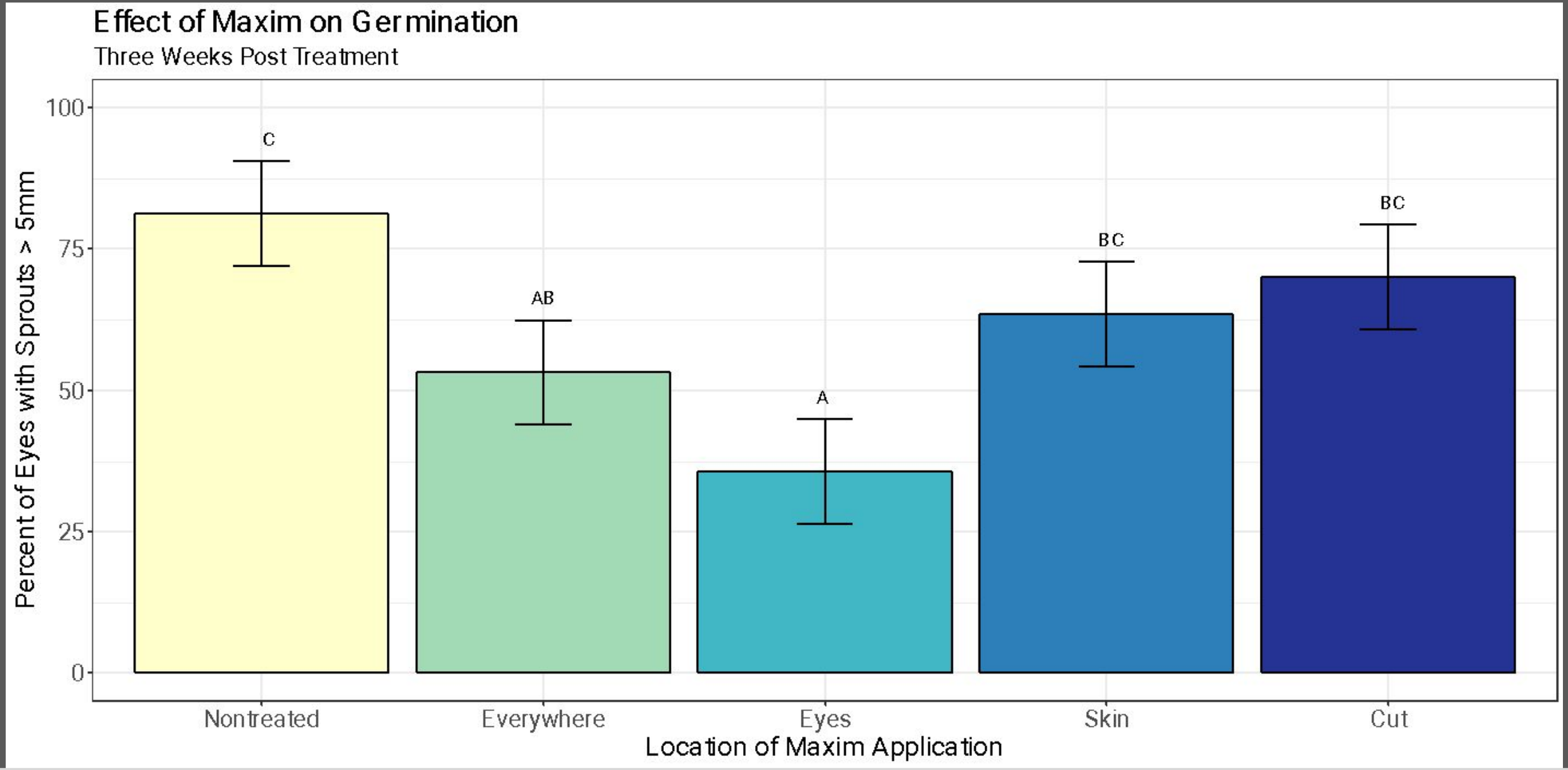
Mechanism

Maxim applied to eyes reduces tuber sprouting



Mechanism

Maxim applied to eyes reduces sprouting of individual eyes



Mechanism

Objective Trials:

Seed Treatment

Seed Age

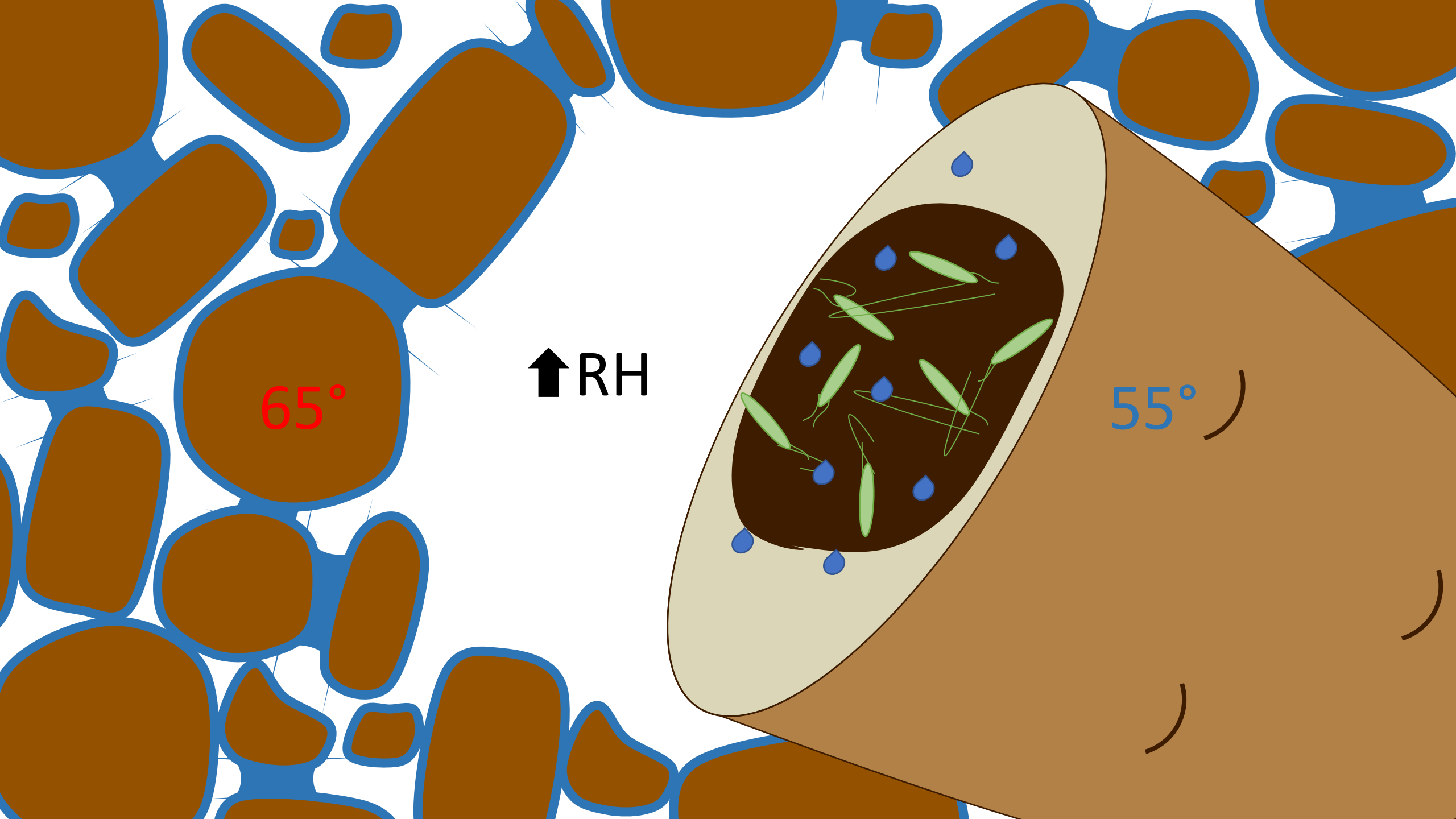
Application Method

Mechanism

Temperature

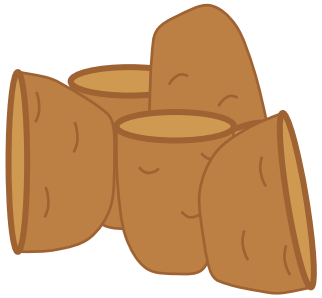
Explore the impact on seed-soil temperature differential on disease development and emergence

Temperature

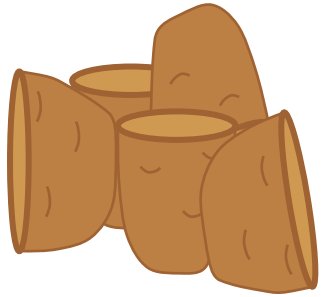

65°
RH
55°

Experimental Design

Single Cut
2-2.5 oz.



7 days 55° F



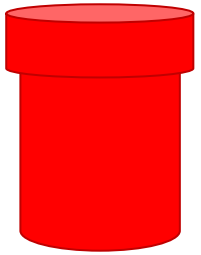
55°

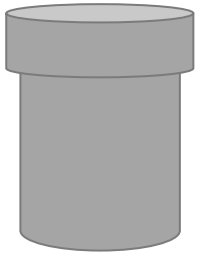
Soil Temp
at plant

65°

55°

45°



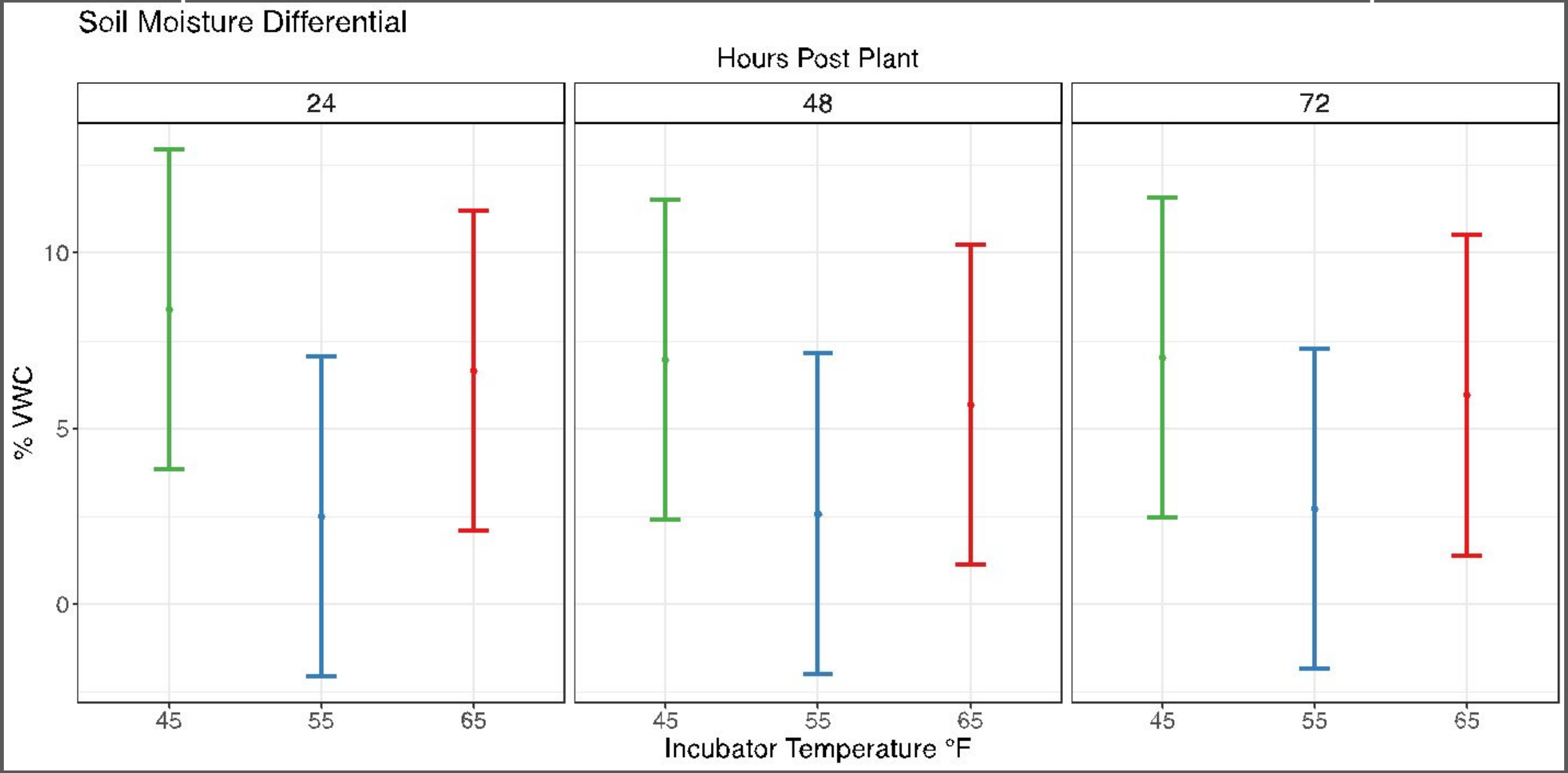


Temperature

Soil moisture and temperature probes placed next to the seed piece and in the bulk soil

Temperature

Temperature differential results in increased soil moisture at seed piece



Temperature

Seed Treatment

Seed Age

Application Method

Mechanism

Temperature

Takeaways:

-Substantially different varietal outcomes
-Use whole seed where possible
-When using liquid seed treatment on cut seed, always suberize, or add drying agent

Takeaways:

Seed Treatment

Seed Age

Application Method

Mechanism

Temperature

-Performance can have a dramatic drop off as seed ages
-Effect of Maxim is consistent across seed age

Takeaways:

Seed Treatment

Seed Age

Application Method

-Carrier volume matters
-Use minimal volume necessary for good coverage

Mechanism

Temperature

Takeaways:

Seed Treatment

Seed Age

Application Method

Mechanism

Temperature

-Maxim 4FS delays wound healing
-Maxim 4FS reduces sprouting when applied to eyes

Takeaways:

Seed Treatment

Seed Age

Application Method

Mechanism

Temperature

-Temperature differential results in increased soil moisture at seed piece
-Avoid extreme temperature differentials between seed and soil

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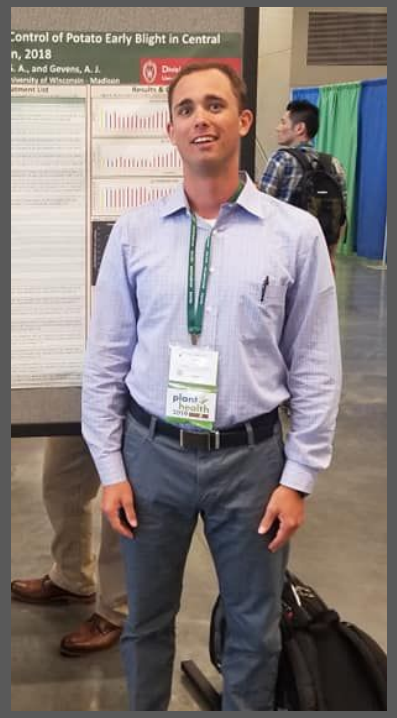

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