

**'Stop the Rot' Onion Bacterial SCRI Project
Stakeholder Advisory Panel Meeting
27 March 2024**



Stop the Rot

Objective B5: Postharvest Practices

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<https://alliumnet.com/projects/stop-the-rot/>

USDA NIFA SCRI Project No. 2019-51181-30013



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Objective B5: Postharvest applications of disinfectants to onion bulbs

2020-21 WA trial

- Bulbs harvested from:
 1. Plots inoculated with bacteria (*B. gladioli* & *P. agglomerans*)
 2. Non-inoculated plots
- Disinfectants applied postharvest by IVI with commercial equipment:
 1. Jet-Ag at 24 fl oz thermofogged for 1 h, container sealed for 8 h
 2. Sanidate 5.0 at 24 fl oz thermofogged for 1 h, container sealed for 8 h
 3. StorOx 2.0 at 24 fl oz thermofogged for 1 h, container sealed for 8 h
 4. Ozone applied at 8,500 mg ozone/hour for 8 h
 5. Non-treated control bulbs thermofogged with water
 6. Non-treated control bulbs not thermofogged
- Bulbs in commercial storage, evaluated for bacterial rot in February 2021

2021-22 (2022-23) and 2023-24 WA trials

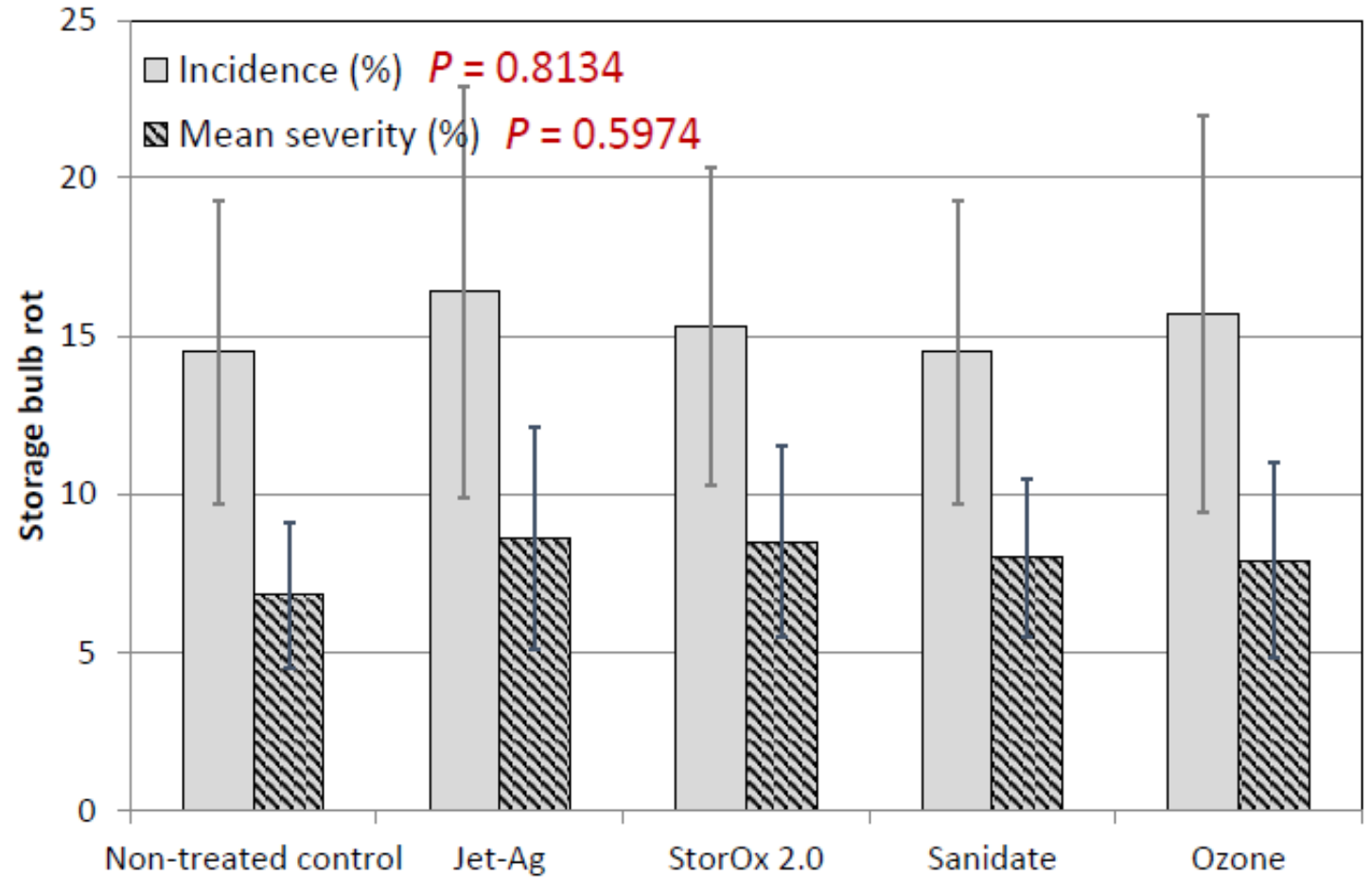
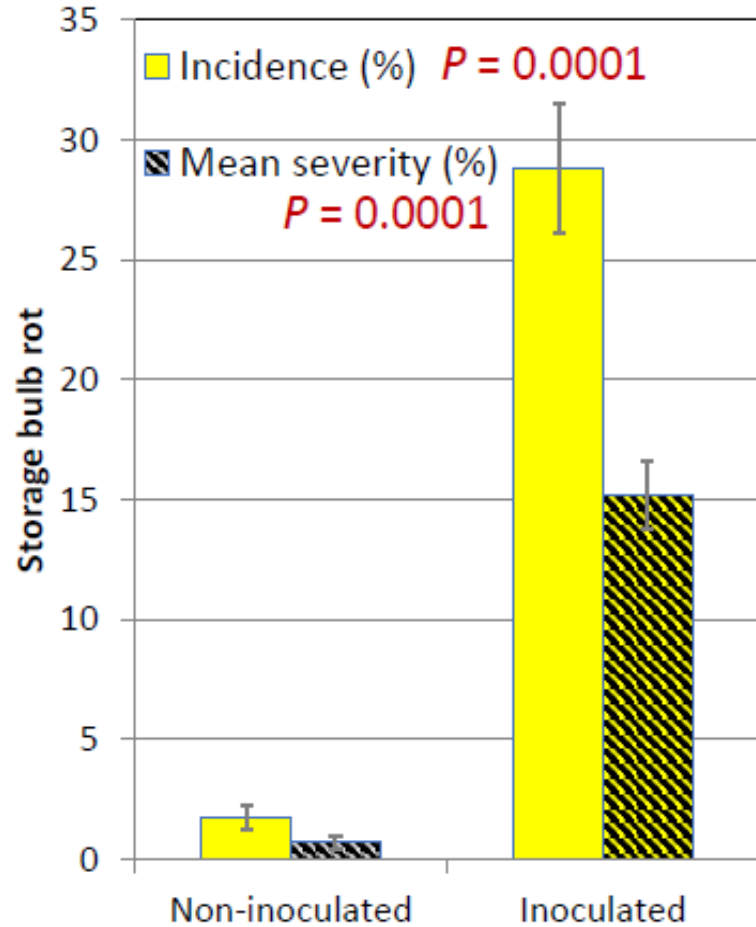
- Repeat treatments
- **Commercial storage evaluations:** Growers remove sample of bulbs during treatment, replace non-treated bulbs, evaluate for storage rots

2021-22, 2022-23 CO trials - Mark Uchanski & Jane Davey, CSU



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Objective B5: 2020 WA trial evaluating postharvest applications of disinfectants



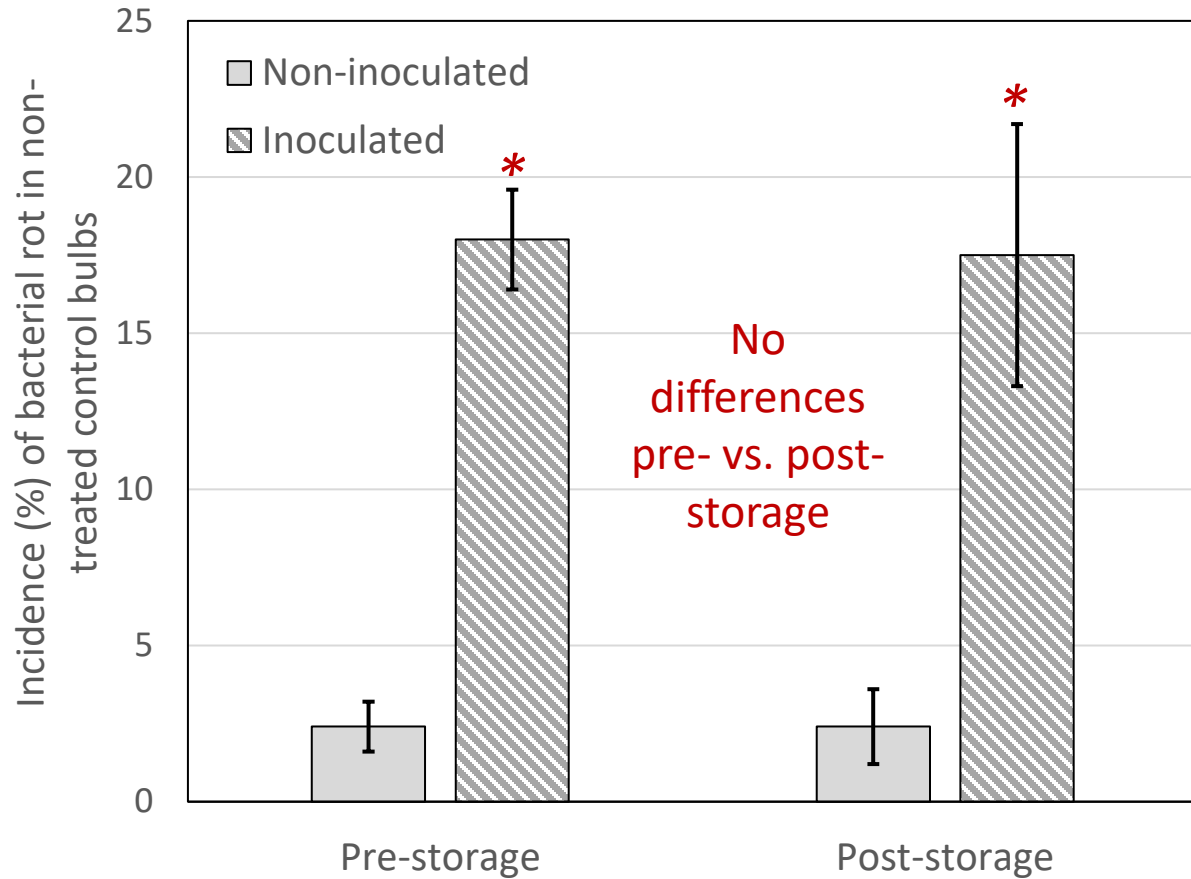
du Toit et al. 2021. Plant Disease Management Reports 15:V102.

du Toit and Waters. 2021. To disinfect or not? Onion World, July/August 2021:6-9.

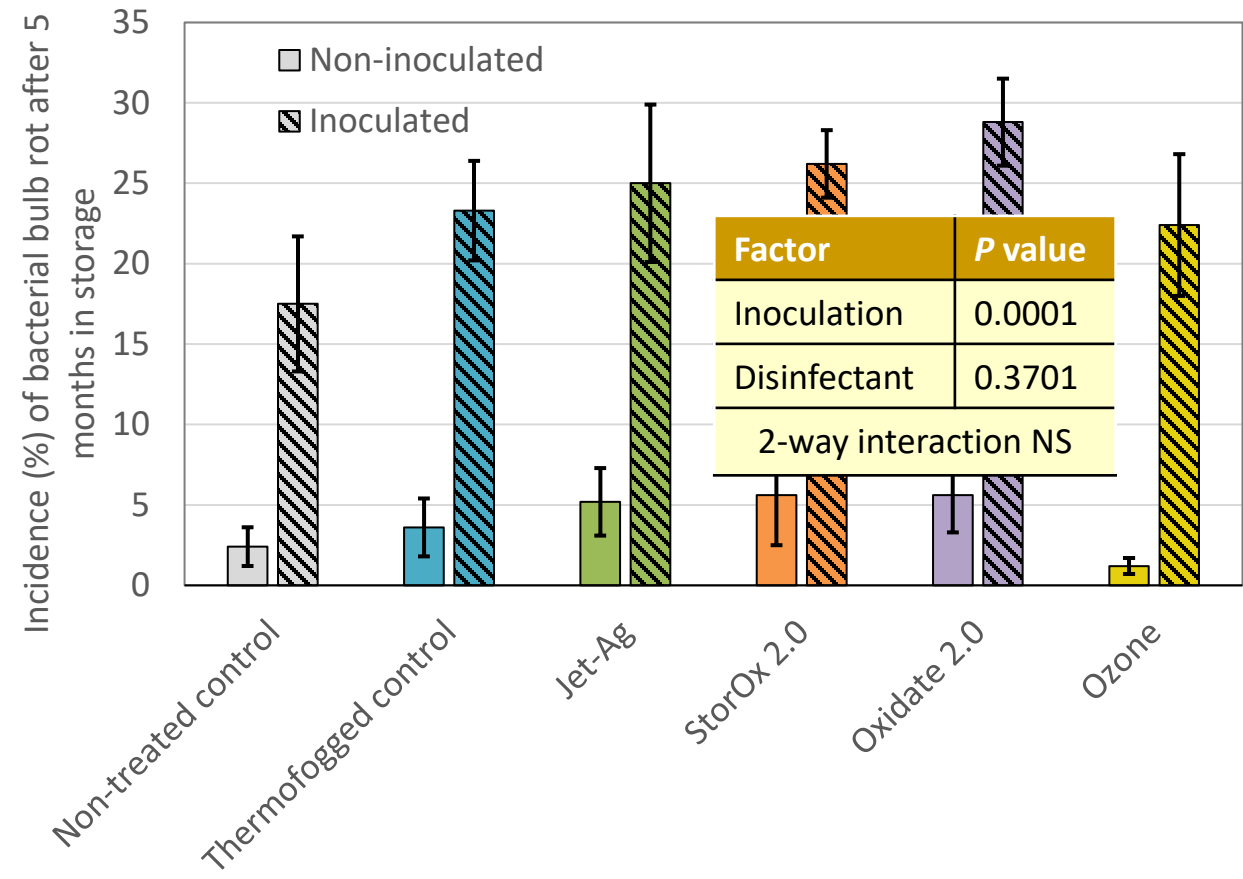
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Objective B5, Season 2 (2021): WA Postharvest Disinfectant Trial

Incidence (%) of bacterial rot in control bulbs

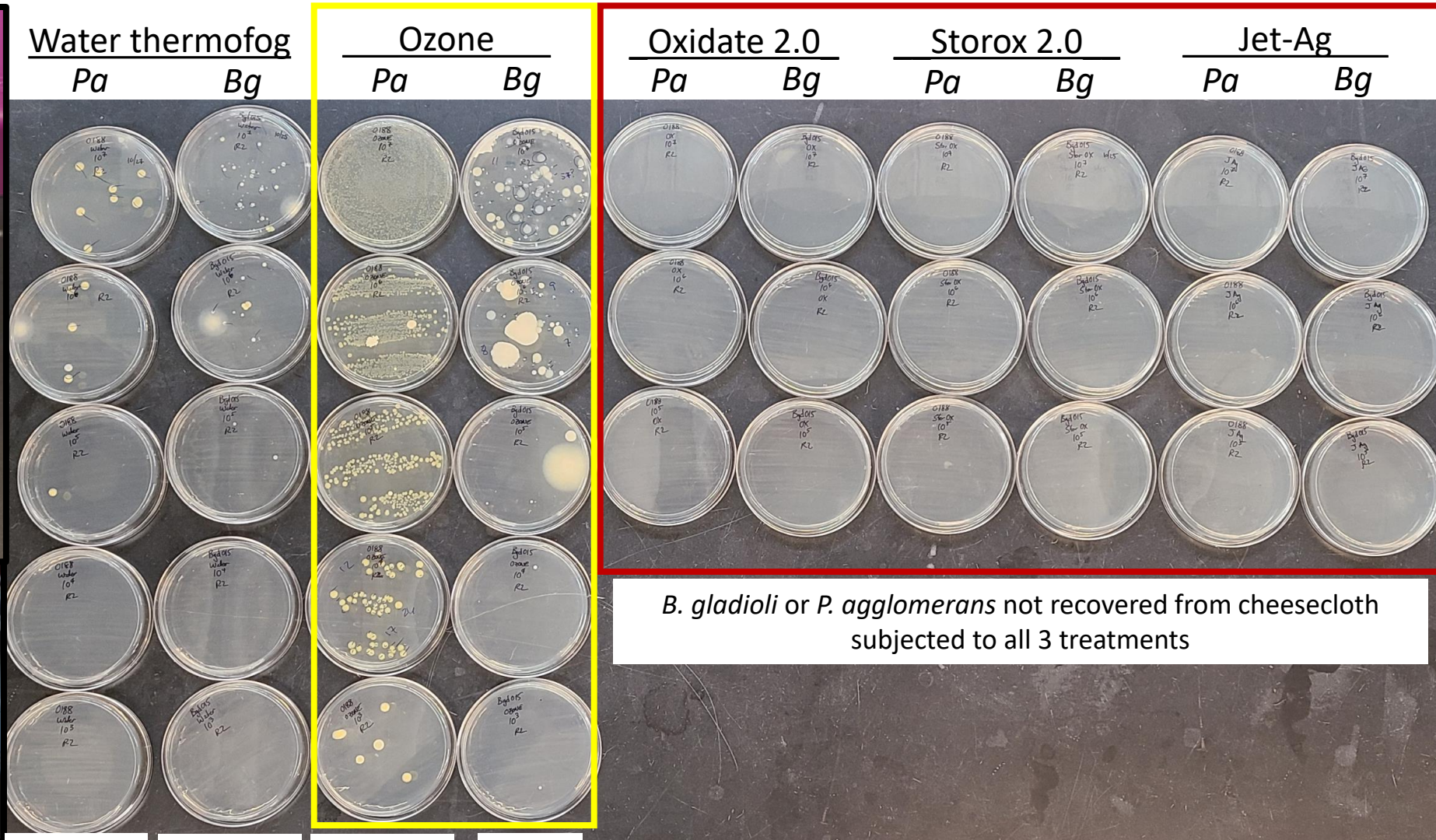
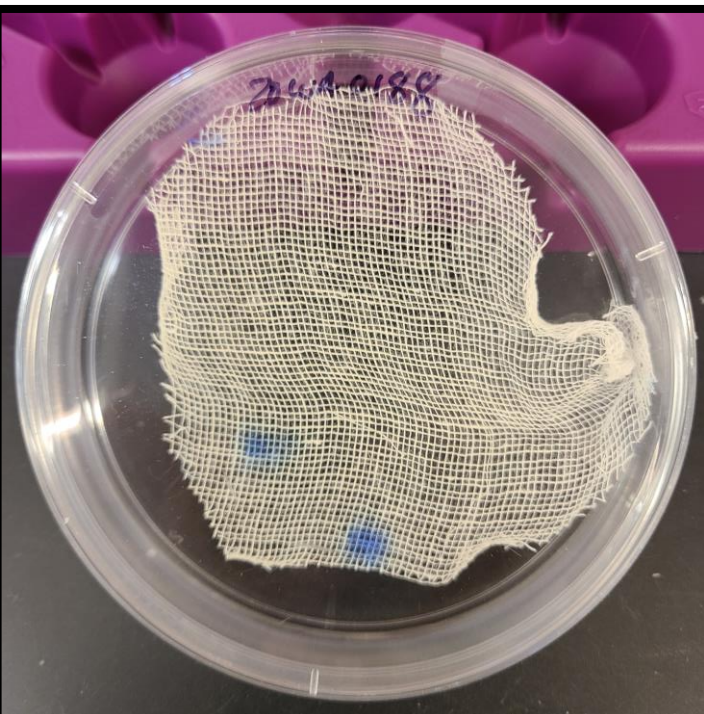


Incidence (%) of bacterial bulb rot



Objective B5: 2021 WA trial evaluating postharvest applications of disinfectants

Potential efficacy of treatments to surface of bulbs?



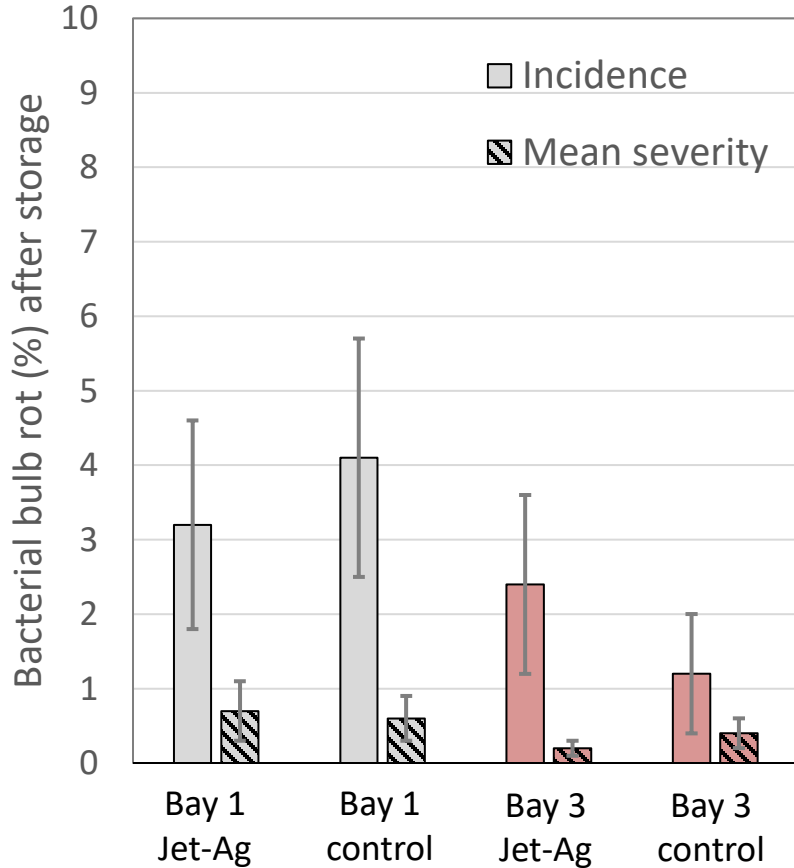
B. gladioli or *P. agglomerans* not recovered from cheesecloth subjected to all 3 treatments

1.7×10^3	3.1×10^5	1.6×10^6	0
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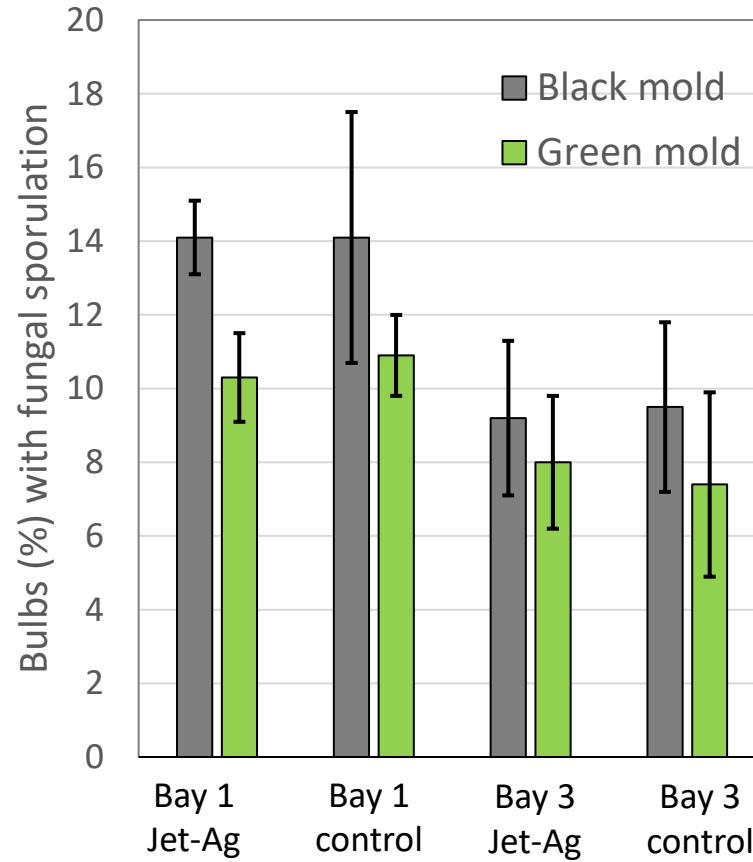
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Objective B5, Season 2 (2021): WA Grower-Cooperator Disinfectant Trial

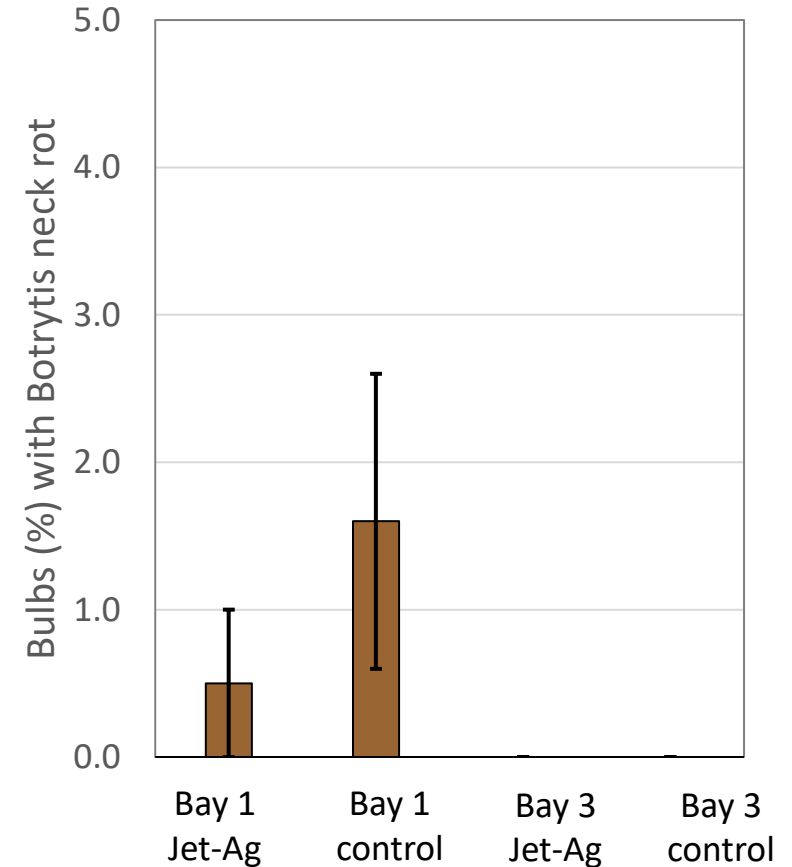
Bacterial bulb rot



Black mold & green mold



Botrytis neck rot



Inadequate disease pressure to test effects of disinfectants on bacterial/fungal bulb rots in packer's shed

2021 Colorado Postharvest Disinfectant Trial

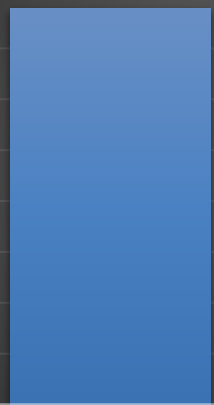


Product	Active Ingredient(s)	Product:Water (v:v)	Length of Treatment (h)	Temp.
Sanidate 5.0	23% Hydrogen Peroxide 5.3% Peroxyacetic Acid	3934ml Sanidate: 3934ml H2O	2 hours	415°F, then 300°F after 45 min
Jet-Ag	26.5% Hydrogen Peroxide 4.5% Peroxyacetic Acid	1598 ml Jet-Ag : 7867ml H2O	2 hours	210°F
H2O Fog	N. A.	9464 ml H2O (2.5 gallons)	2 hours	210°F
Non-treated	N. A.	N. A.	N.A.	N. A.

2021 Colorado Postharvest Disinfectant Trial

Bacterial Bulb Rot Incidence (%)

6.1 a



0.0 b

Inoculated Bulbs

Non-Inoculated
Bulbs

Bacterial Bulb Rot Incidence (%), Inoculated 'Avalon'

10.0



3.3



13.3



Untreated

H2O Fog

Jet-Ag (20fl oz/1000cuft)

Bacterial Bulb Rot Incidence (%), Inoculated 'Vaquero'

3.3



0



6.7



Untreated

H2O Fog

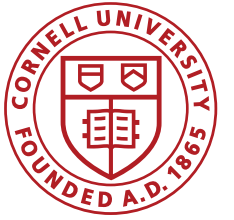
Jet-Ag (20fl oz/1000cuft)

Efficacy of disinfectants applied to onion bulbs in storage for control of slippery skin bacterial bulb rot, Fort Collins, CO, 2022-2023

Main plot and split plot treatments	Slippery skin bacterial bulb rot symptoms after 5 months in storage	
	Incidence of bulbs (%)	Severity per bulb (%)
Main Plots		
Inoculated	21.7 a*	12.5 a
Non-Inoculated	6.6 b	2.0 b
LSD	3.6	2.2
ANOVA <i>P</i> value	0.0001	0.0001
Split-plots		
Jet Ag	21.5**	13.5
Sanidate	22.6	11.9
Ozone	21.7	13.1
H2O Fog	22.4	12.9
Non-treated	20.1	11.1
LSD	13.8	8.2
ANOVA <i>P</i> value	0.4961	0.7965

NY Postharvest Practices Evaluated: The Rot Race

Postharvest Fast-Curing with Heated, Forced Air



Bacterial rot in leaves & neck,
NOT in bulb



1000-lb onion boxes stacked against a plenum
wall through which heated air is forced

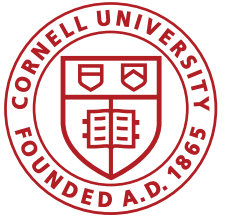
Can postharvest fast-curing
dry down the neck before
bacterial infection spreads
into the bulb?



Nothing can be done once
infection is in the bulb

The Rot Race: 2023 Trial (Hoepting, NY)

Postharvest Curing with Heated, Forced Air



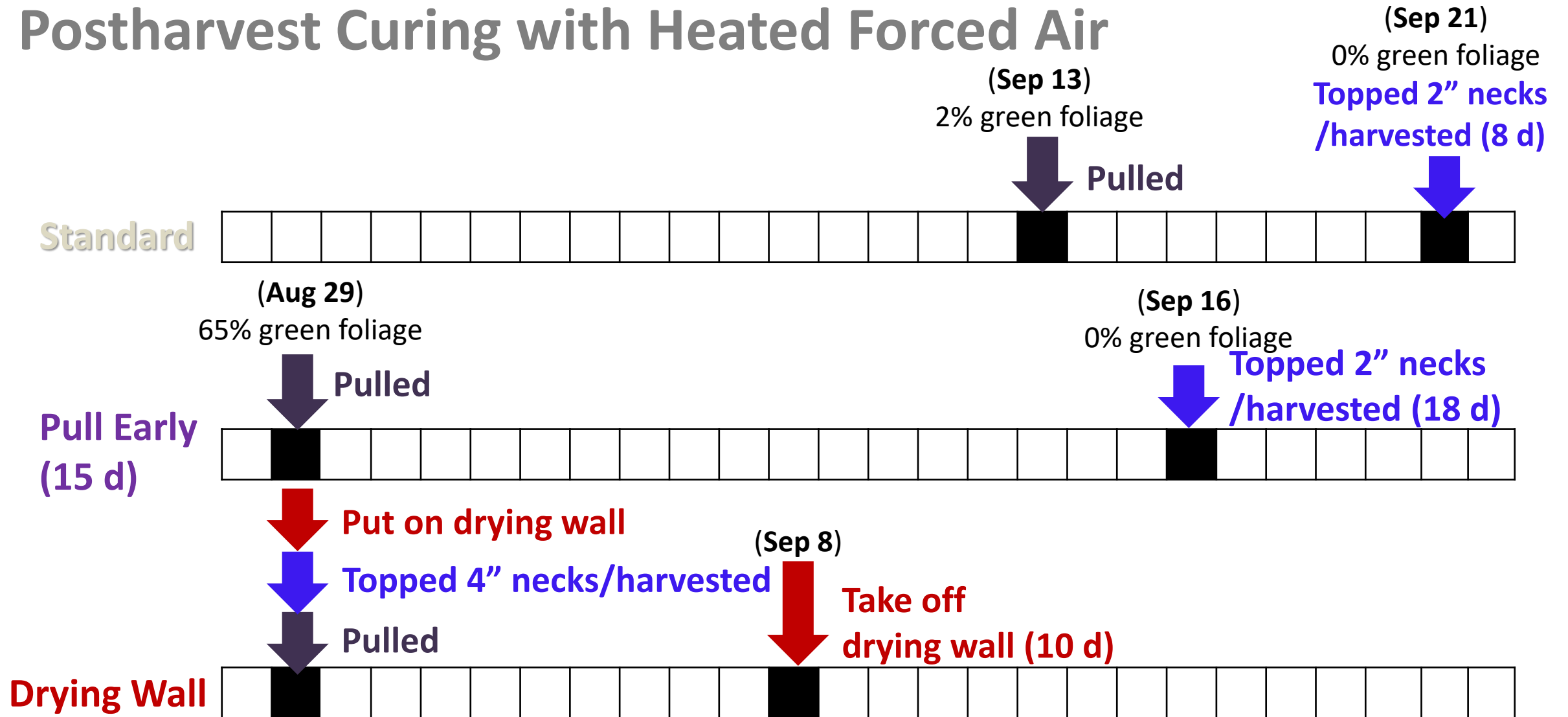
Aug 29: onions died standing up, 65% green foliage (35% leaf dieback), roots “holding on”

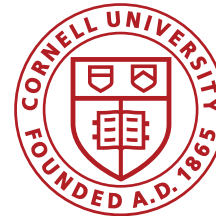
Aug 29: 79% of plants with foliar symptoms of bacterial infection. Of those:

- **81% had bacterial infections in leaf & neck (= the rot race)**
- 19% had bacterial infection in bulbs

The Rot Race: 2023 Trial (Hoepting, NY)

Postharvest Curing with Heated Forced Air



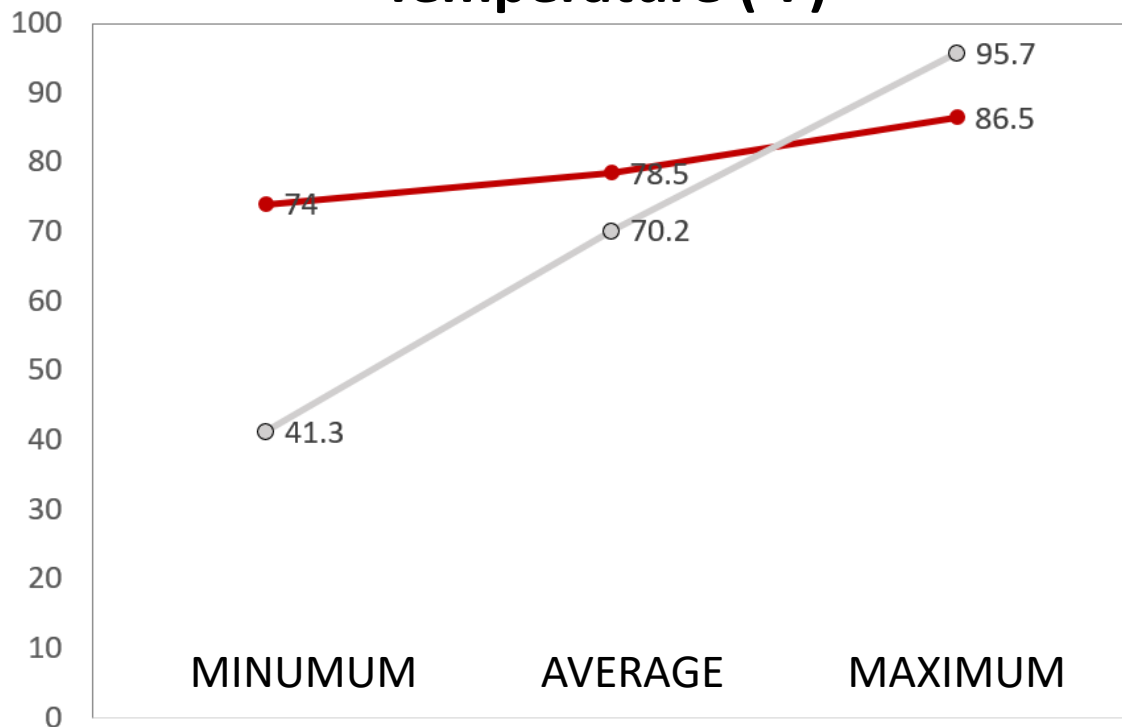


The Rot Race: 2023 New York Trial (Hoepting)

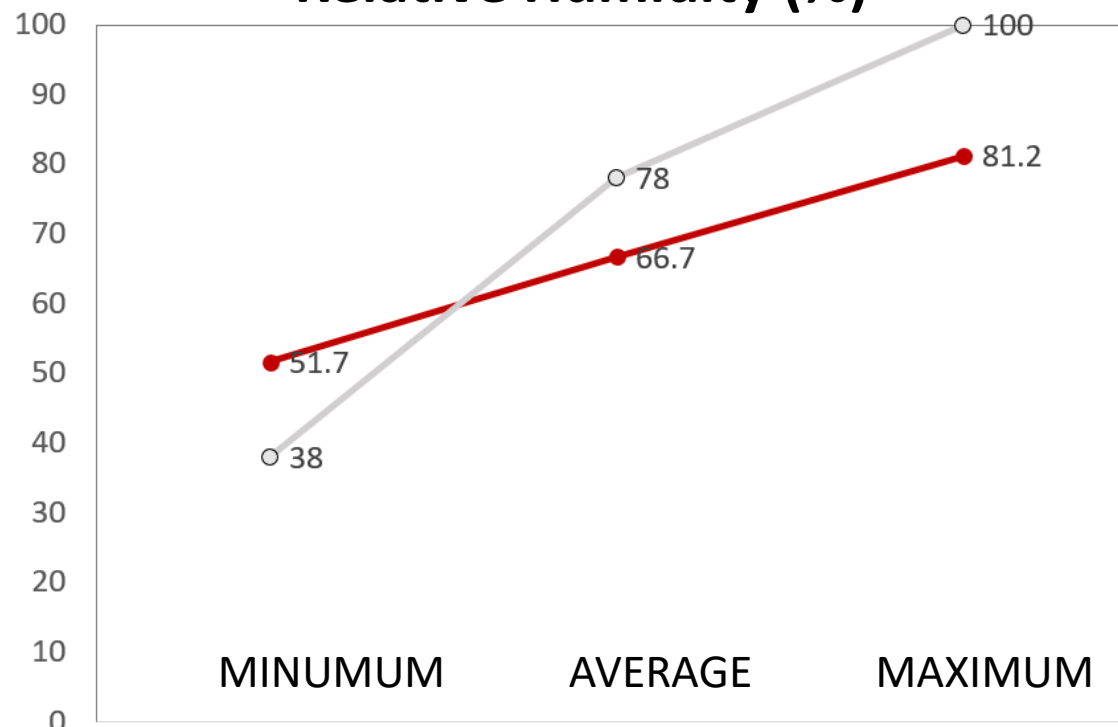
Postharvest Curing with Heated Forced Air

Aug 30 to Sep 8 = time onions in bins against drying wall

Temperature (°F)

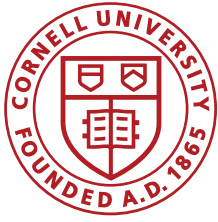


Relative Humidity (%)

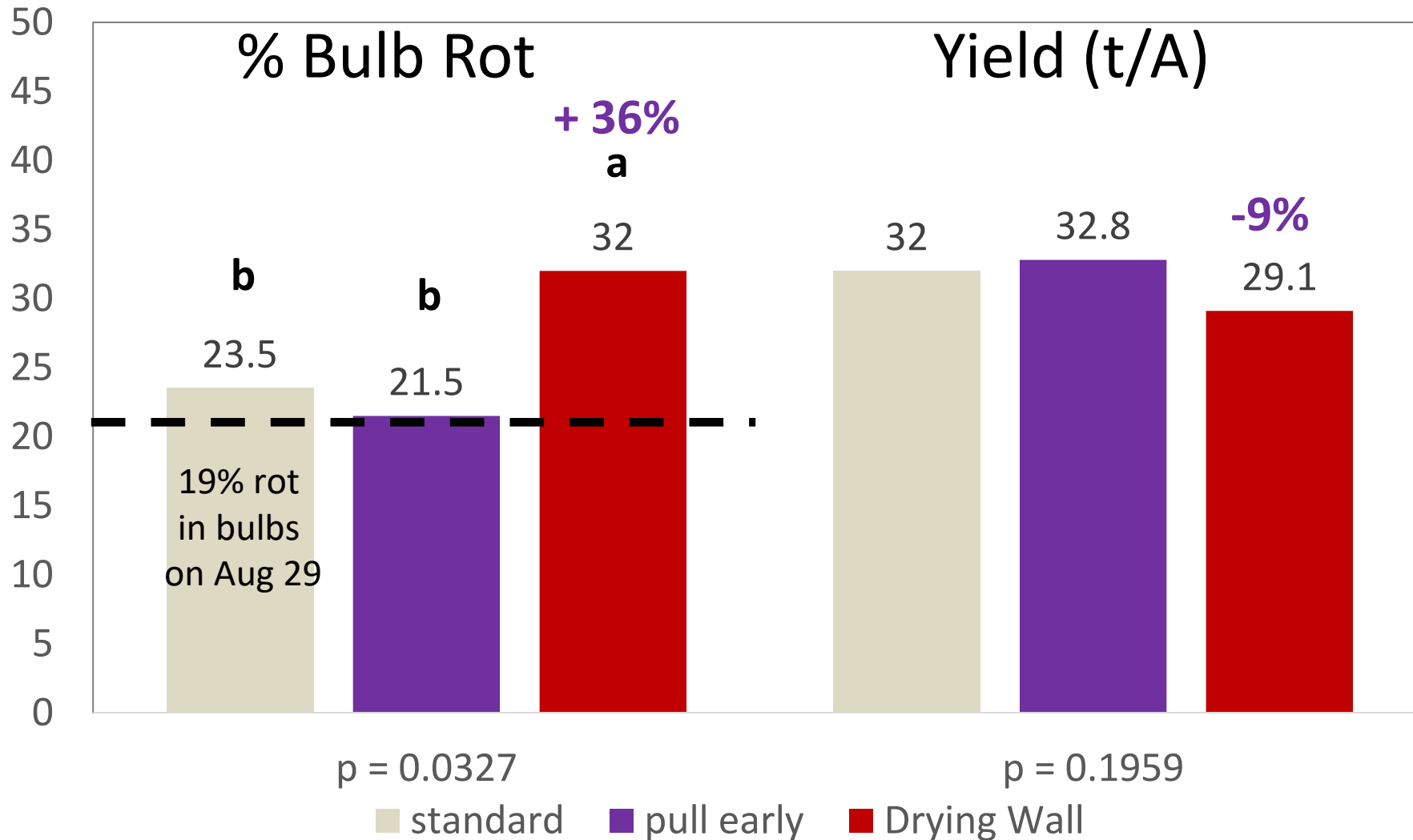


 Drying Wall  In-Field

Warmer and dryer against drying wall, with less fluctuation than field conditions



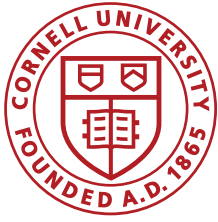
Drying Wall and Pull Early Trial: NY, 2023 (Hoepting et al.)



- Early harvest + postharvest curing resulted in more bacterial bulb rot.
- No significant differences between pulling early and standard harvest practices.
- 4-16% of foliar infections made it into the bulbs.

The Rot Race: 2023 New York Trial (Hoepting)

Postharvest Curing with Heated, Forced Air



Why did postharvest curing not work?

- Required topping when necks were still green
 - Bacterial infections introduced during topping
 - Green neck tissue = high moisture in necks, despite low humidity of drying wall.
- Higher temperatures with heated air against drying wall favored bacterial growth
 - Average 8.6°F warmer
 - Minimum 33°F warmer

The Rot Race: 2023 New York Trial (Hoepting)

Postharvest Curing with Heated Forced Air



Pulled Early
Aug 29 (65% green foliage)



Pulled Early, Topped
Sep 16 (0% green foliage)



Dry necks
(unfavorable for bacteria)

Objective B5: Postharvest practices

2024-25 Plans

Washington:

- 2023-24 trial: Finish analyzing data, submit PDMR in May
- Publish journal article with 3 seasons of postharvest disinfectant trials

New York:

- 2022, 2023 trials: Publish PDMRs

Economic analysis of cultural practices evaluated (Greg Colson, UGA)

Joint publication of postharvest practices evaluated

Onion World, Alliumnet FAQs, other outreach

Stakeholder Advisory Panel questions & feedback



Stop the Rot: Combating onion bacterial diseases with pathogenomic tools and enhanced management strategies