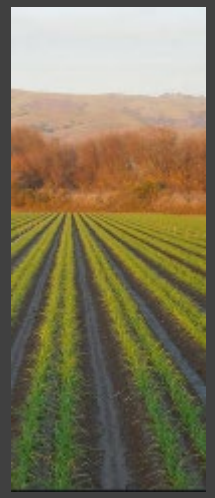

Recent investigations into Fusarium diseases of garlic, with directions into onions

CASSANDRA SWETT, ANNIKA BRIGGS, MEGAN GASTELUM, LAUREL SCHMIDT, JARETT ROSE

DEPARTMENT OF PLANT PATHOLOGY, UC DAVIS

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UC ANR

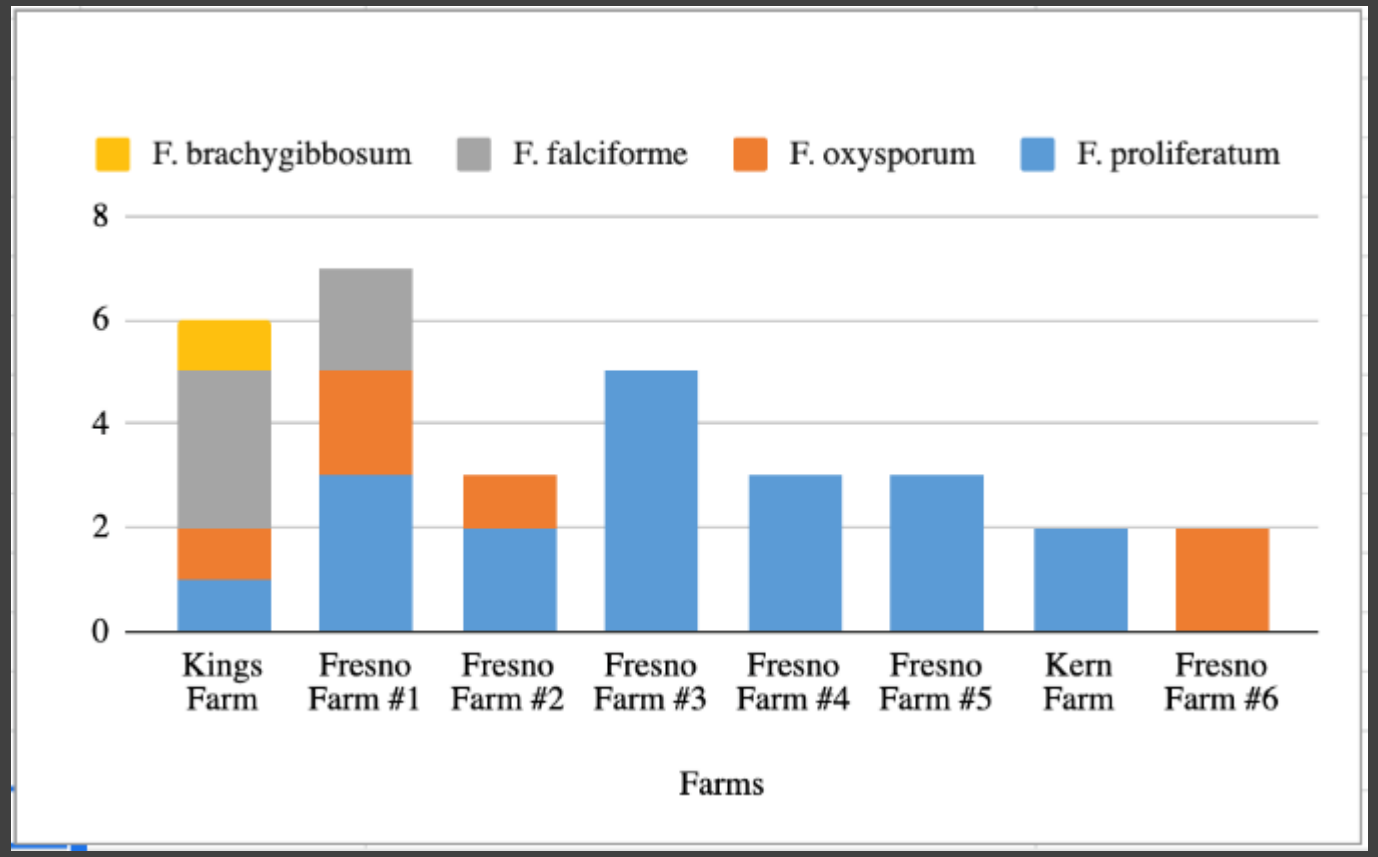
A review of Fusarium basal rot (FBR) symptoms in garlic

Basal plate rot

Will extend into cloves from the basal plate

In some cases, rot can also develop on the clove face or tip—referred to as dry rot

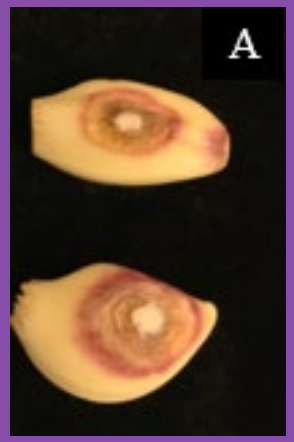
Fusarium species recovered from diseased bulb garlic



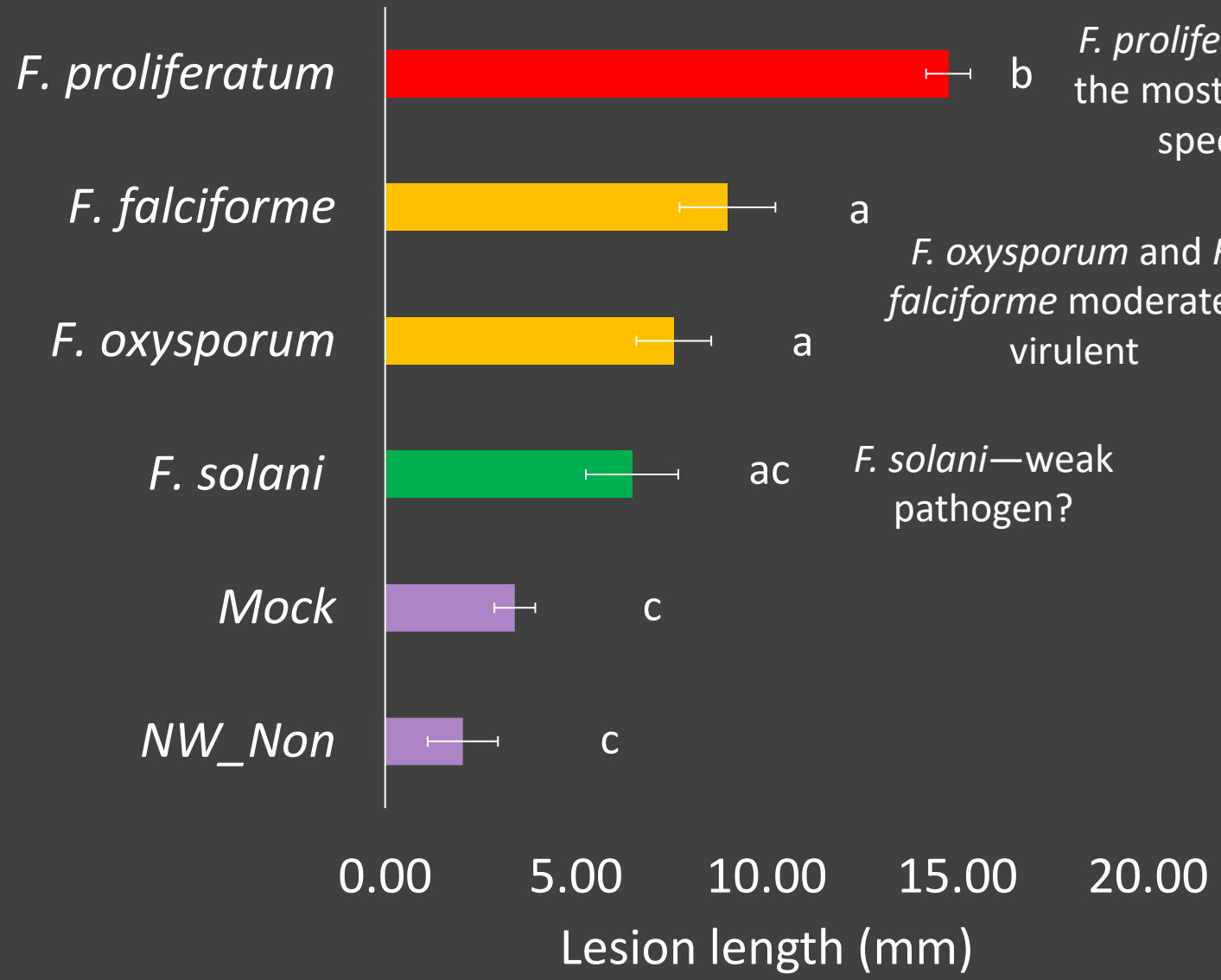
Fusarium proliferatum = most widespread, nearly all farms

F. oxysporum = 50% of farms

F. falciforme, F. solani = less common



What we are learning about FBR pathogen diversity



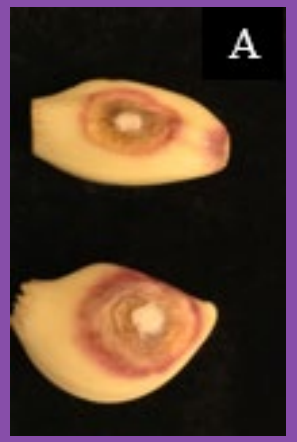
F. proliferatum is the most virulent species

F. oxysporum and *F. falciforme* moderately virulent

F. solani—weak pathogen?

F. brachygiboosum—not a pathogen

Megan Gastelum, Aimee Hopkins



What we are le
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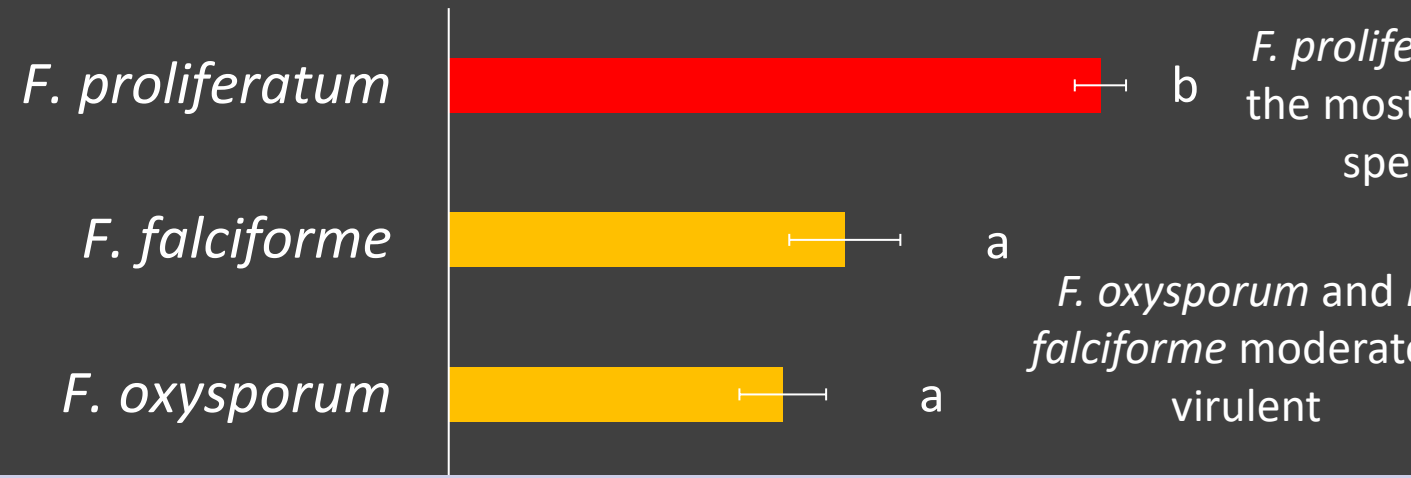
diversity

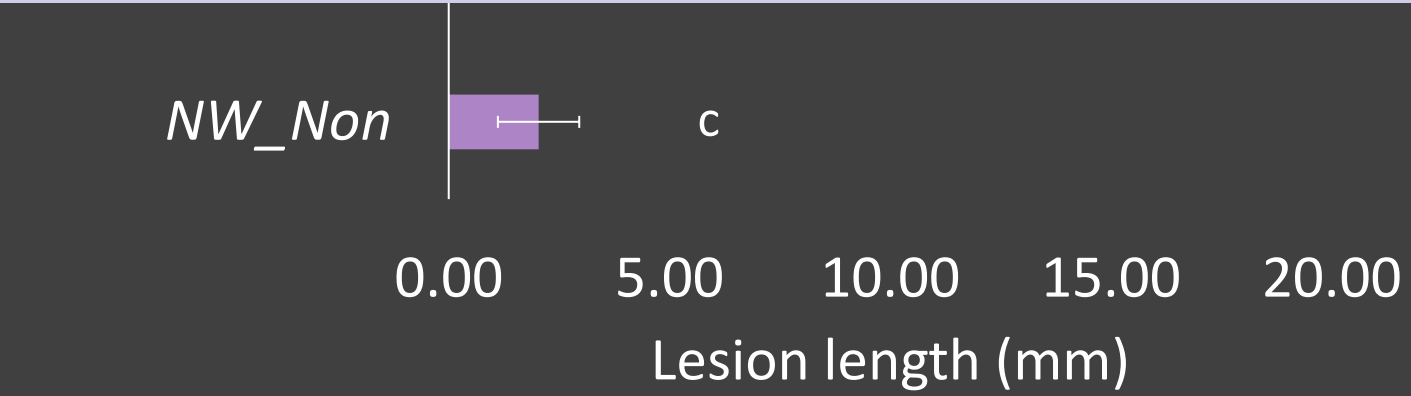


F. proliferatum is the most virulent species

F. oxysporum and *F. falciforme* moderately virulent

F. proliferatum = most important management target

Questions, comments?



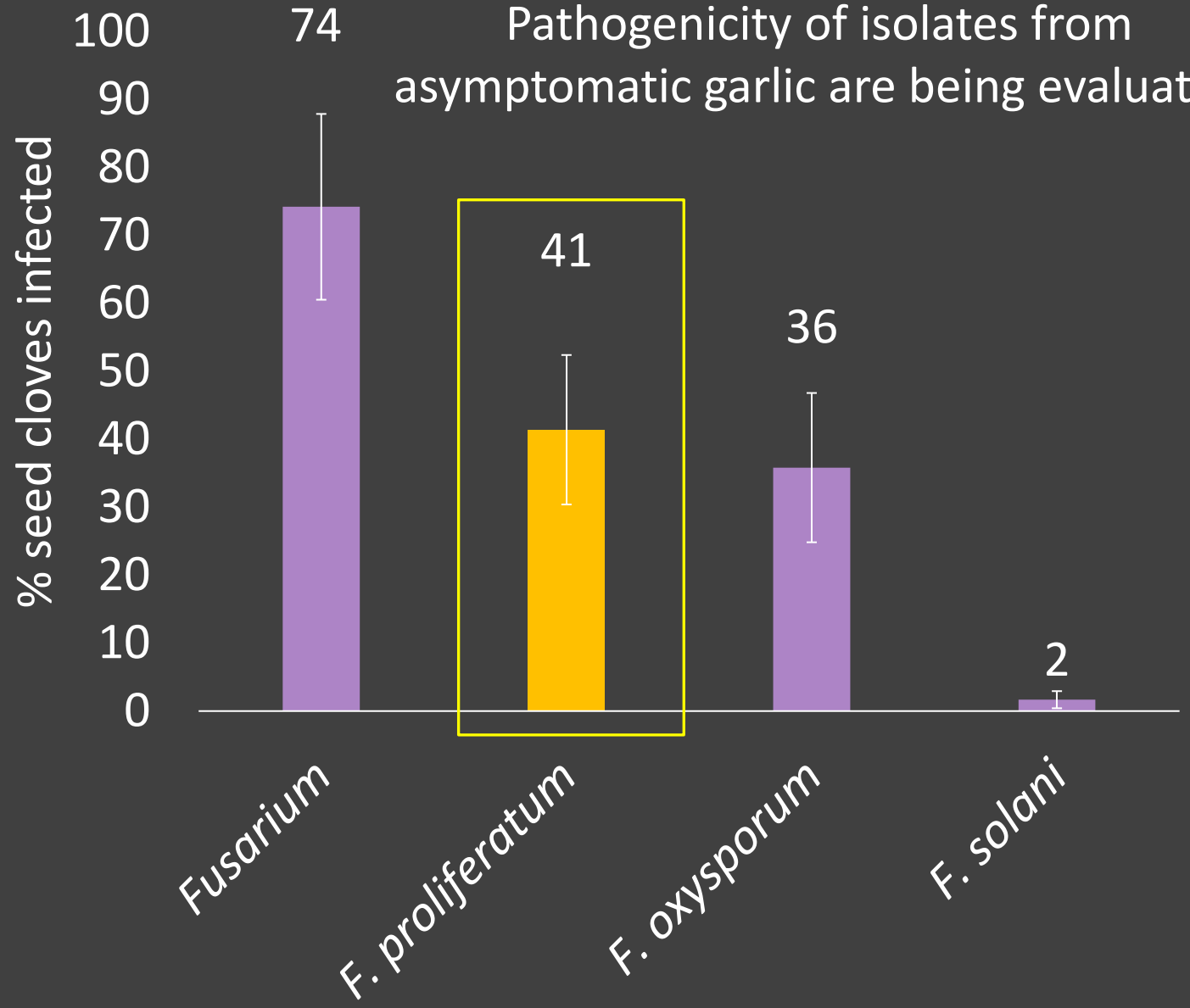
F. brachygiboosum—not a pathogen

Megan Gastelum, Aimee Hopkins

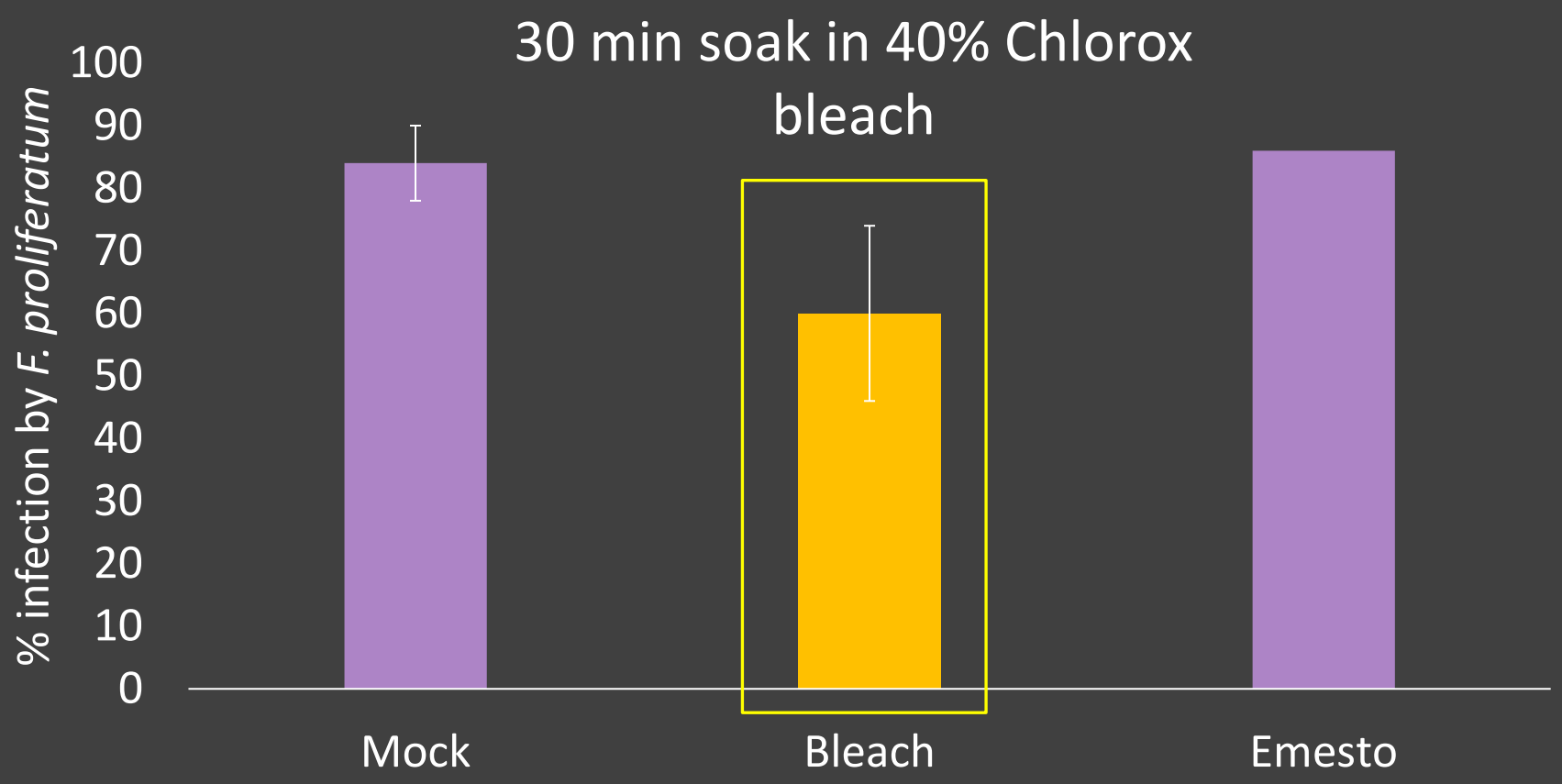
High infestation rates for *F. proliferatum* across seed lots

F. proliferatum from diseased garlic is pathogenic

Pathogenicity of isolates from asymptomatic garlic are being evaluated



Seed chemical treatment with bleach reduces *F. proliferatum* infestation levels by ~30%



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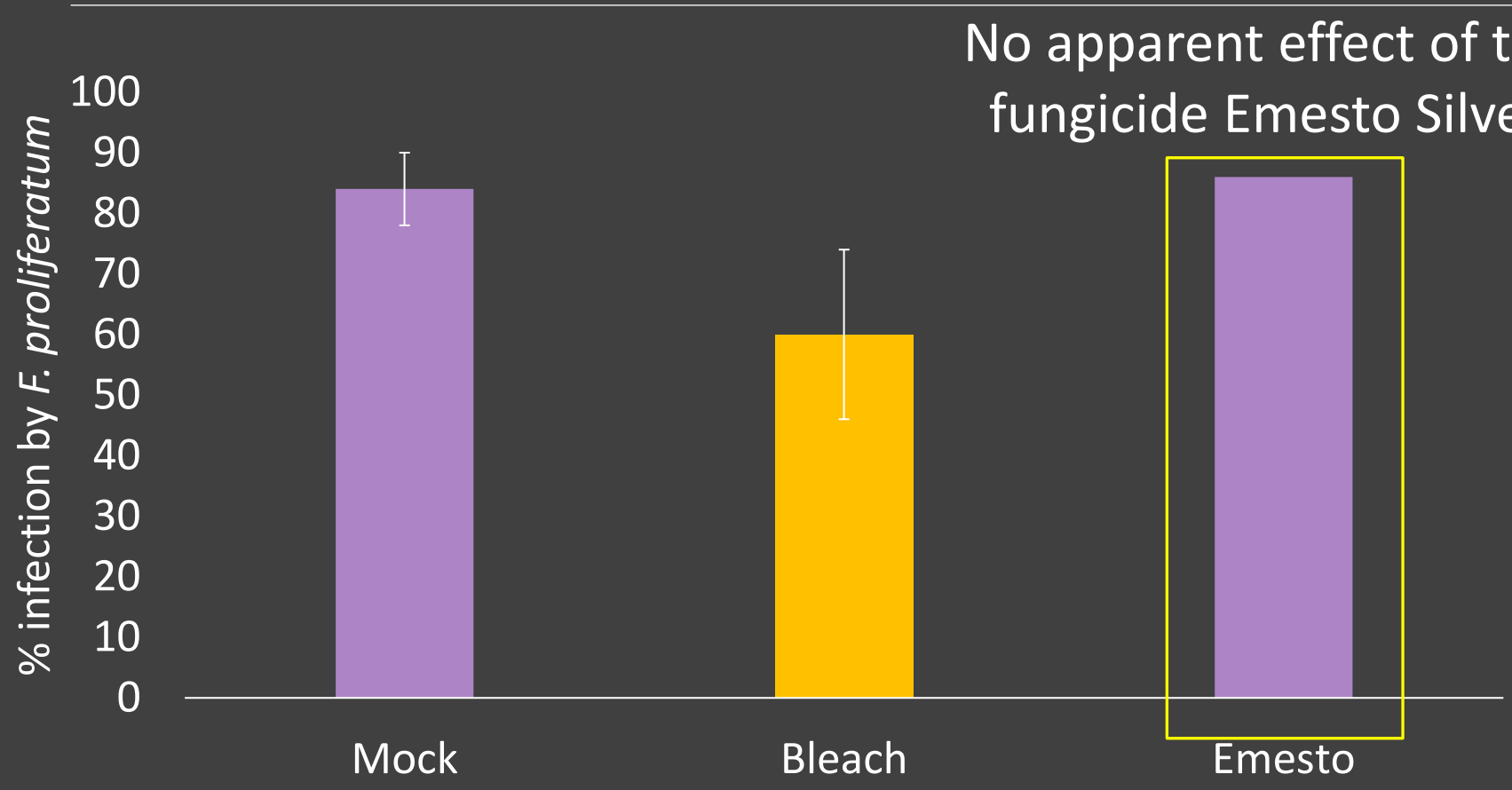
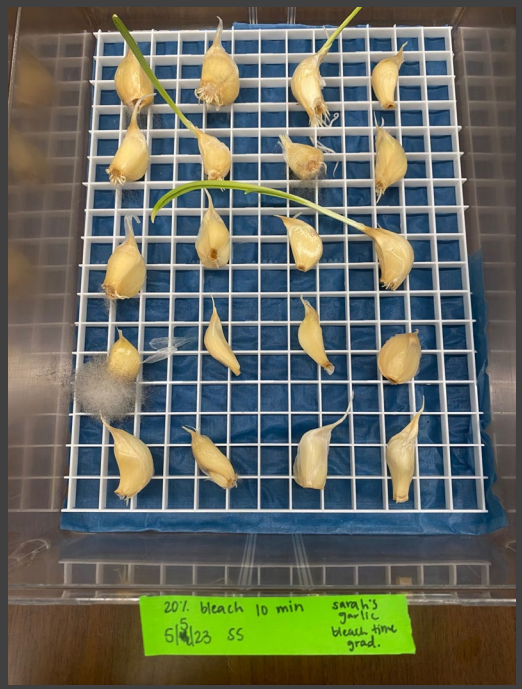
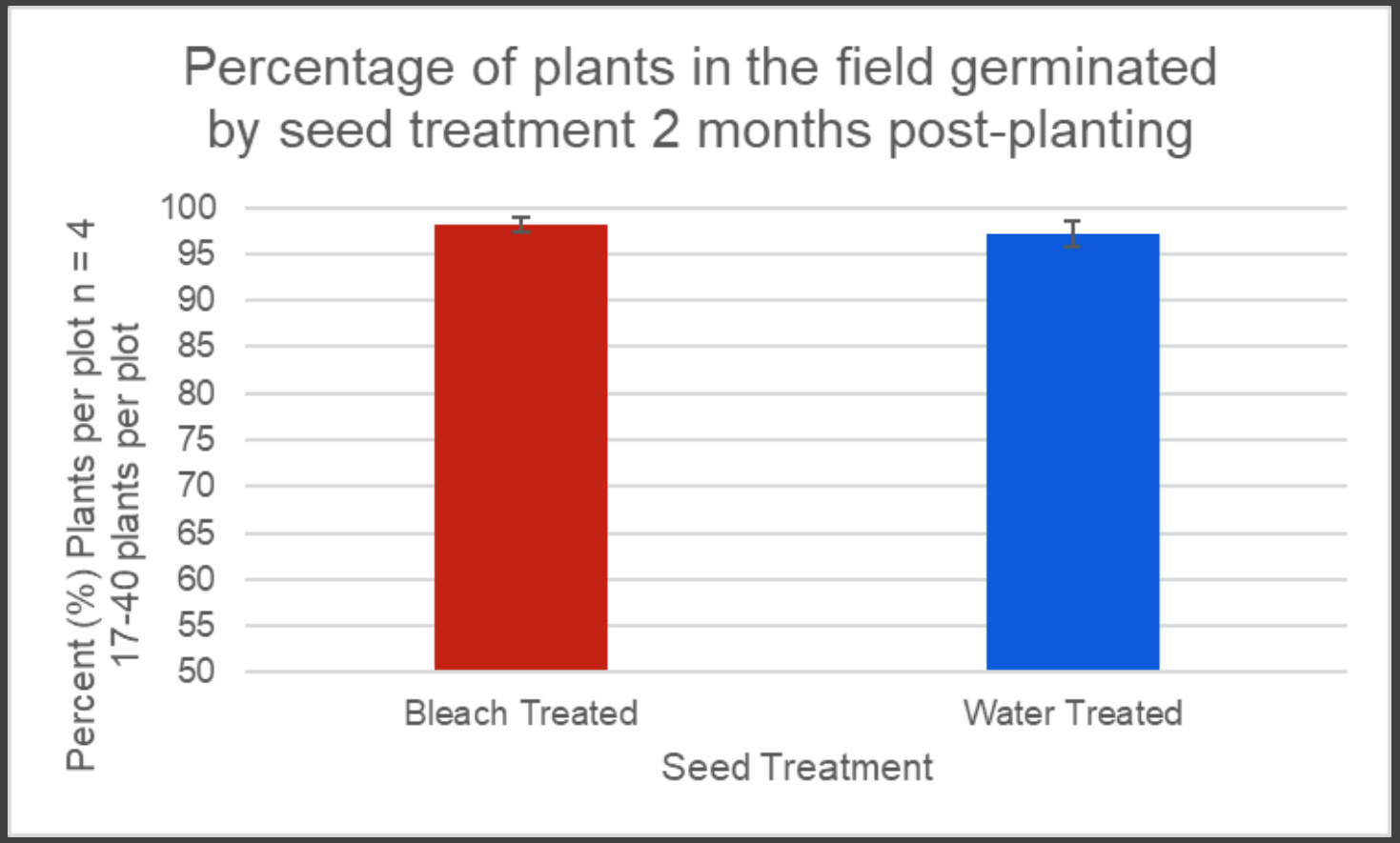






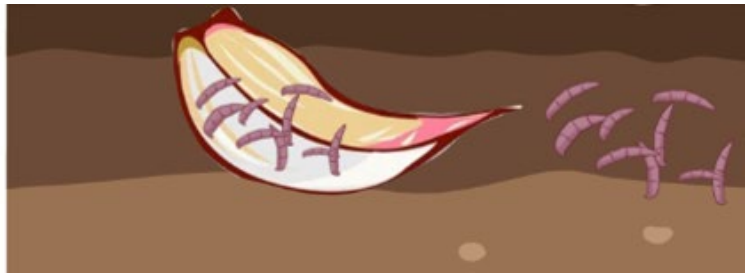
Bleach did not have an effect on field germination ($P > 0.05$)

Efficacy of seed and early season soil treatments in reducing Fusarium species infection and FBR

Soil + Seed treatment

Soil treatment

Seed treatment



Untreated

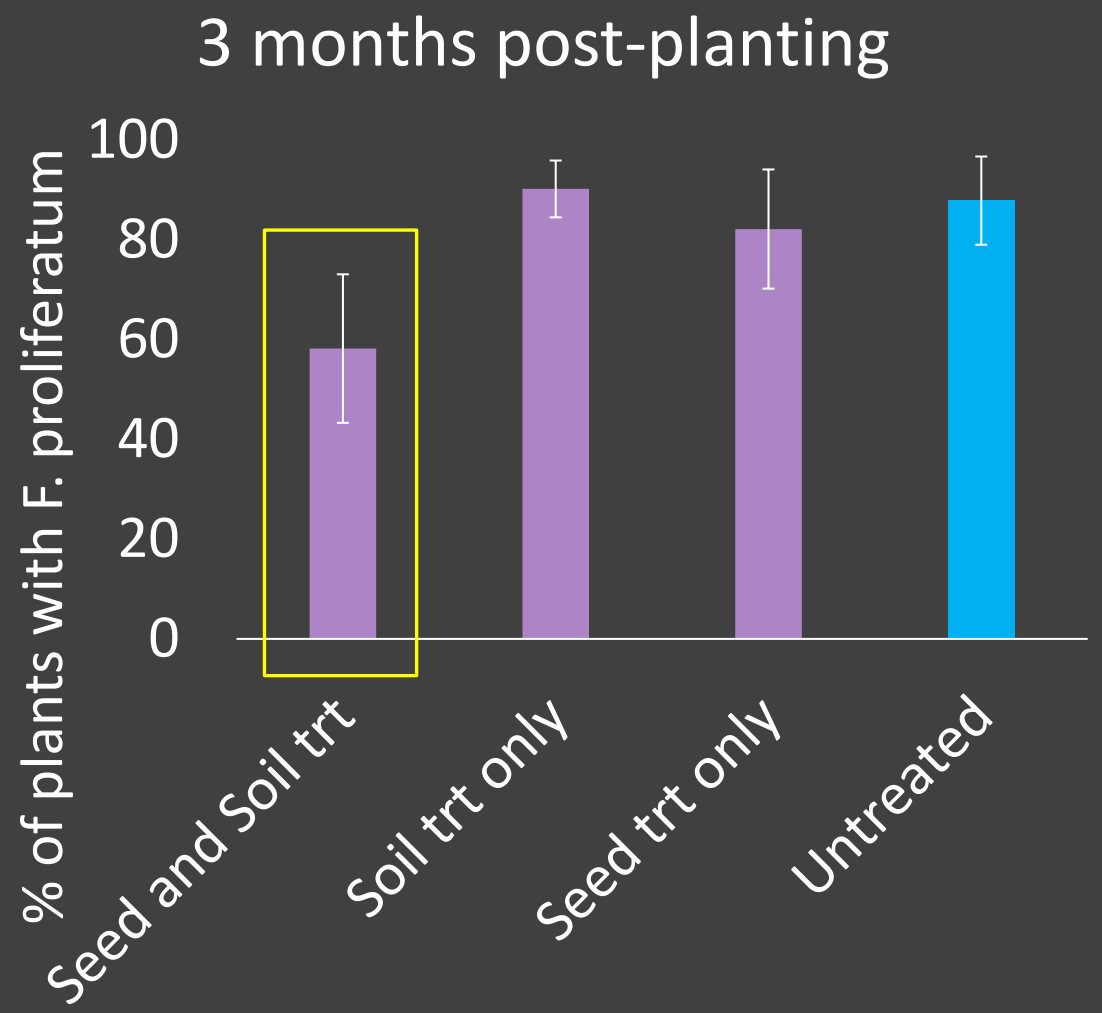
Soil treatment:
Miravis Prime

- Pre-planting
- 1 month post planting
- 2 months post planting

Seed Treatment:
Bleach

- Pre-planting
- 40% Chlorox bleach,30 mins

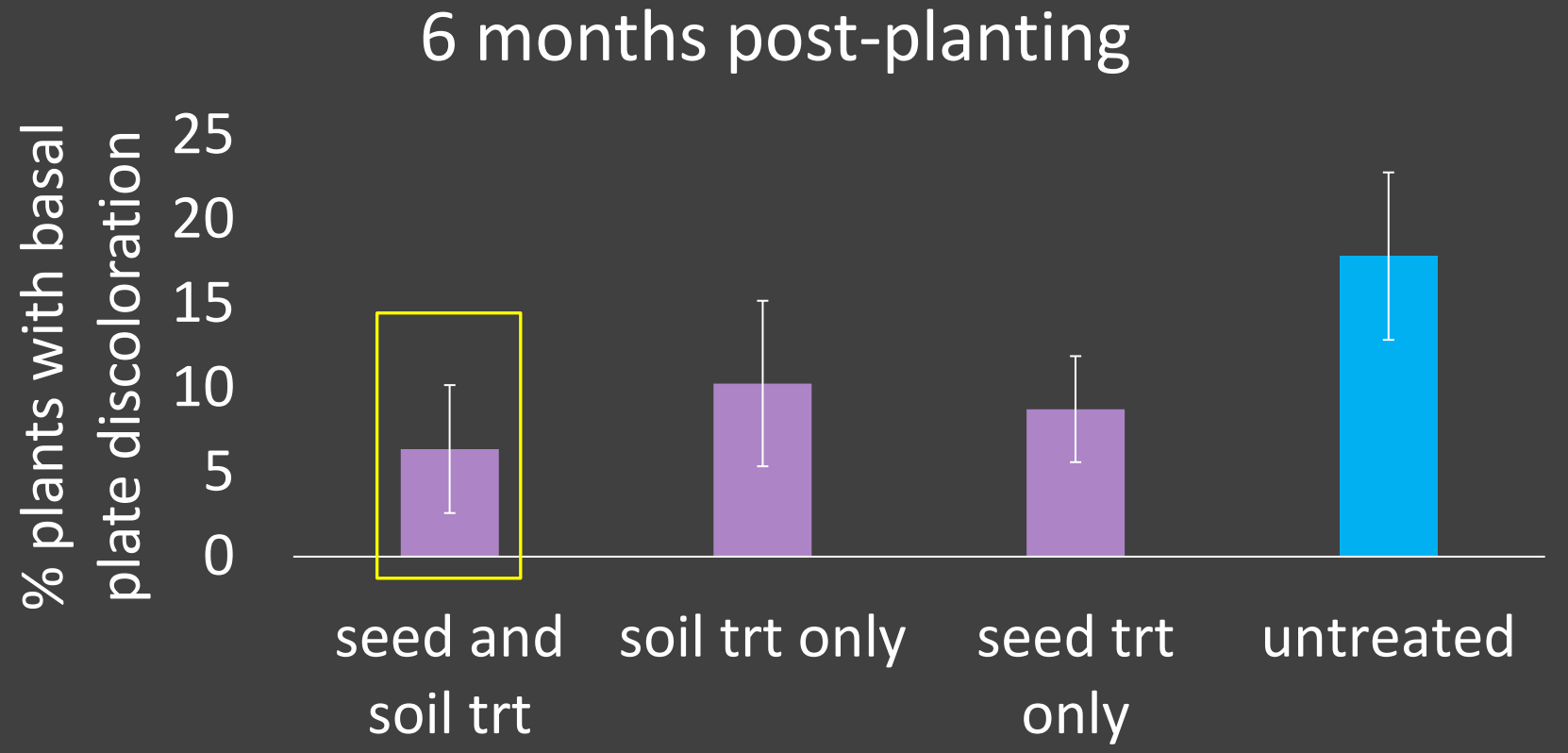
Annika Briggs, Tom Turini



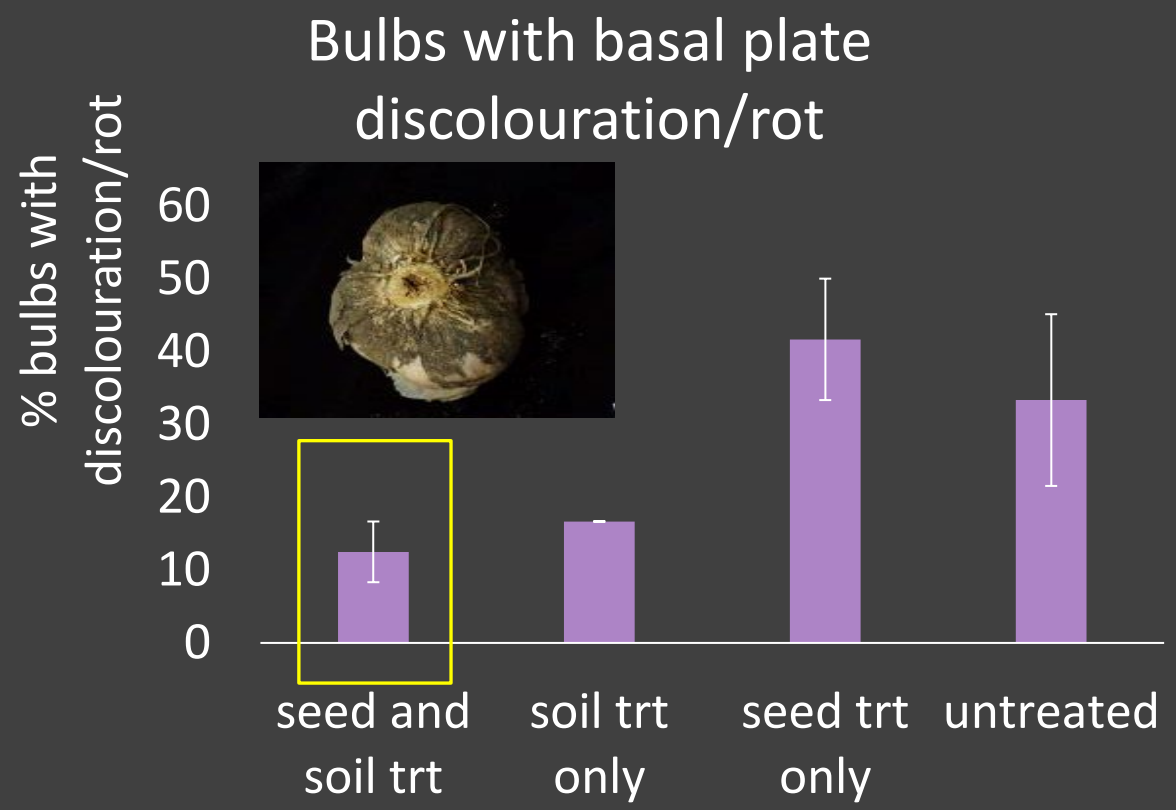
..By 3 months

Seed treatment + monthly chemigation (Nov-Jan) had the greatest efficacy in reducing *F. proliferatum* infection in daughter plants

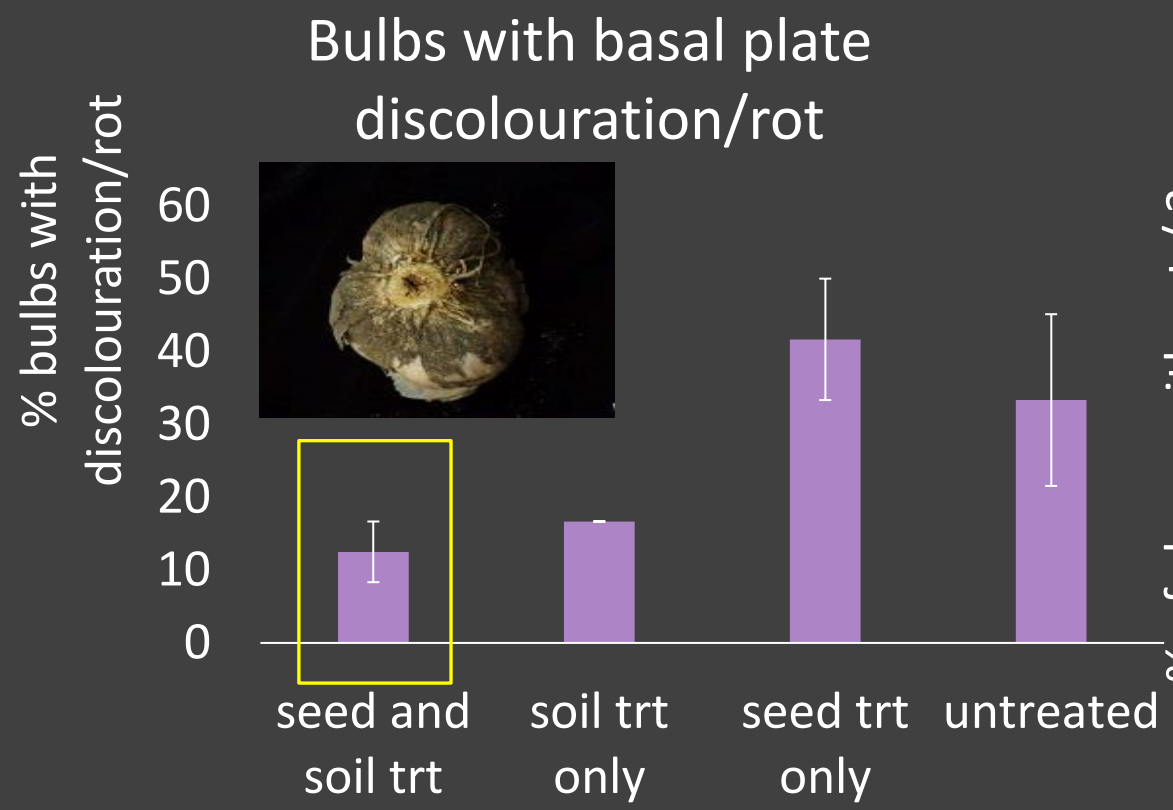
...By 6 months
Seed + soil treatment had the lowest disease levels
> 3-fold reduction in basal plate discoloration

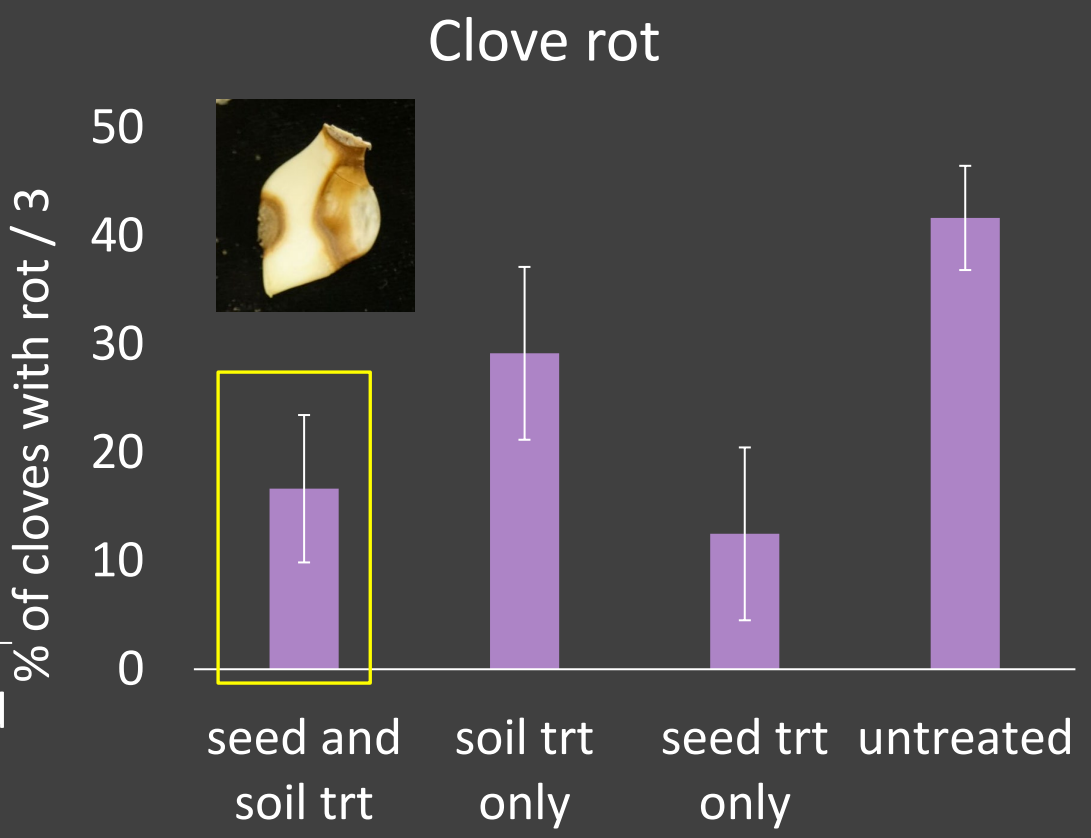


...by harvest: Seed + soil had 52% lower bulb rot levels than the check



…by harvest: Seed + soil had
52% lower bulb rot levels than the check
60% clove rot levels than the check
> Variable effects of seed and soil treatments on bulb and clove rot





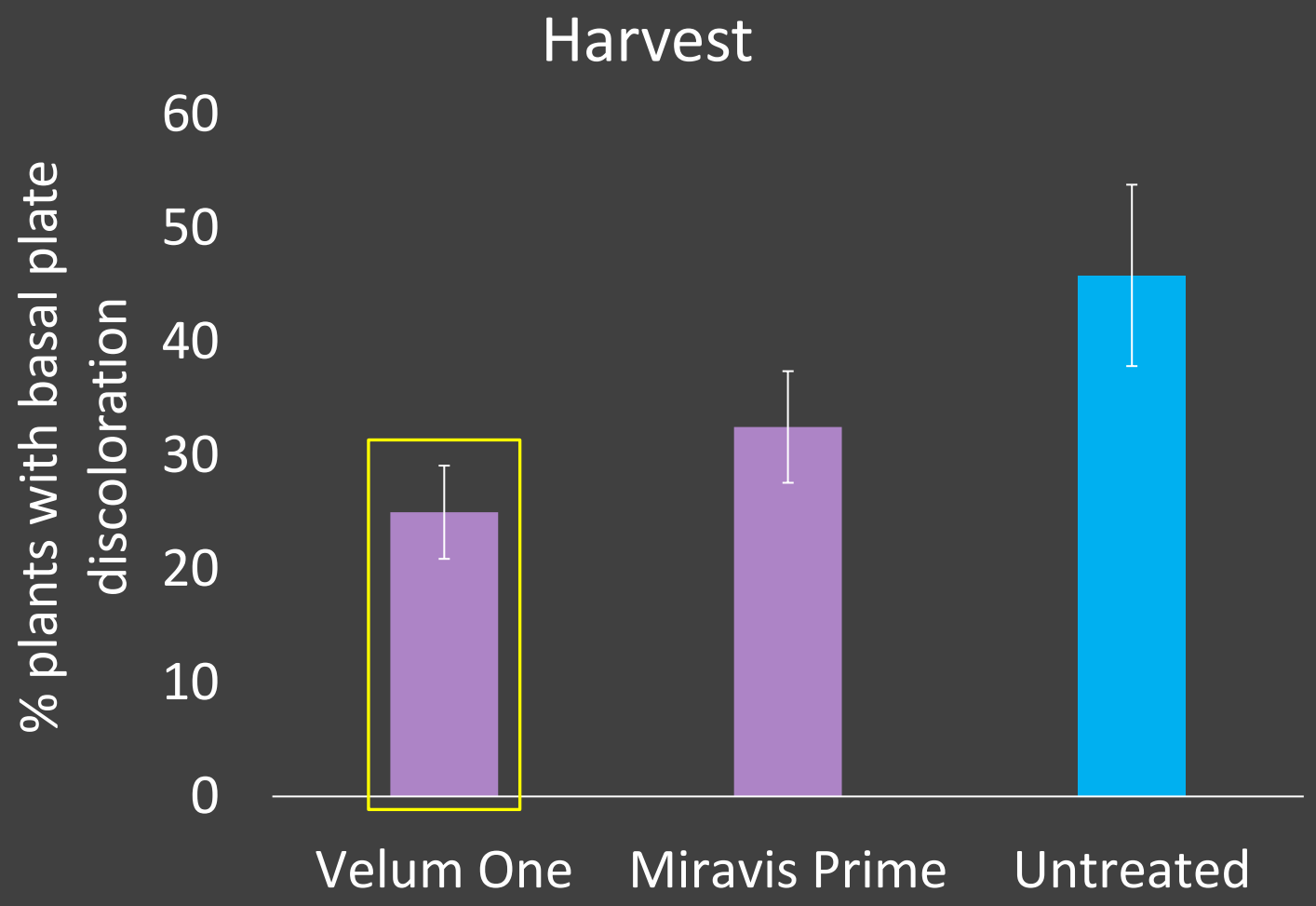
Effects on rot after 6 months in storage: TBD

Questions, comments?

Evaluating different fungicide products and timings

Treatment	Plots	Fungicide	Applications
1	11, 15, 29, 38	Velum One	Planting, January
2	12, 14, 33, 43	Velum One	January
3	3, 24, 35, 46	Velum One	January, February
4	5, 16, 36, 37	Velum One	February, March
5	4, 20, 31, 45	Velum One	January, February, March
6	7, 23, 26, 48	Miravis Prime	Planting, January
7	6, 21, 34, 40	Miravis Prime	January
8	8, 13, 28, 39	Miravis Prime	January, February
9	10, 18, 30, 47	Miravis Prime	February, March
10	9, 22, 25, 42	Miravis Prime	January, February, March
11	2, 19, 32, 41	Tebuconazole	Planting
12	1, 17, 27, 44,	Untreated	NA

Annika Briggs, Tom Turini



Velum One had the greatest efficacy

44% reduction in minor basal plate rot

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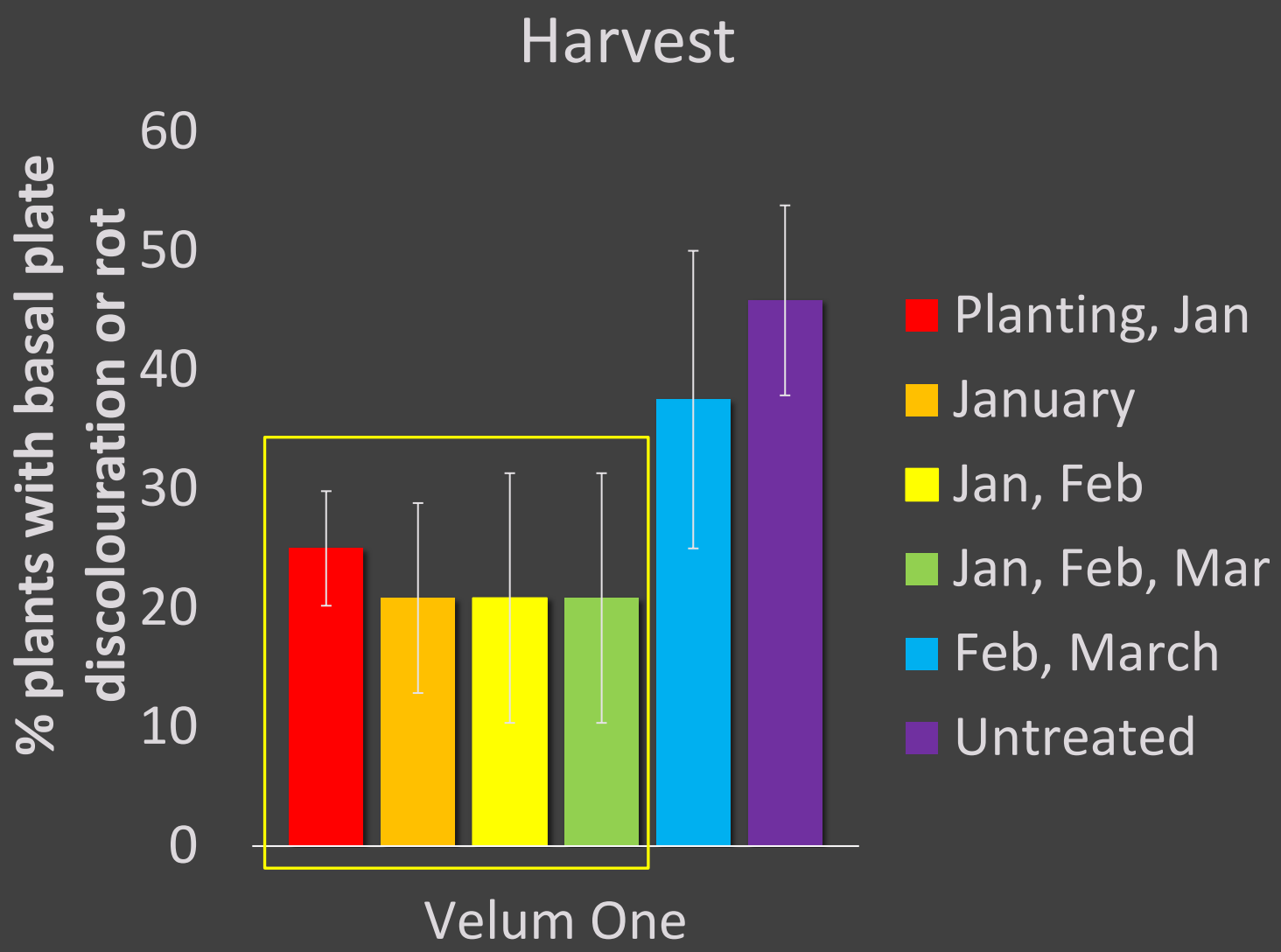


~2-fold reduction in disease for early applications

Feb-March less effective

Effects on rot after 6 months in storage: TBD

2024/5 fungicide trials-Fresno
Optimal application periods and chemical rotation programs

Trt#	Flag	Seed treatment	At Planting	Late-Jan drip	Late-Feb drip	Late March
1	Red		Velum One 6.84 fl oz	Velum One 6.84 fl oz		
2	Orange				Velum One 6.84 fl oz	Velum One 6.84 fl oz
3	Yellow		Velum One 6.84 fl oz	Velum One 6.84 fl oz	Velum One 6.84 fl oz	
4	Green		Velum One 6.84 fl oz	Velum One 6.84 fl oz	Velum One 6.84 fl oz	Velum One 6.84 fl oz
5	Blue	Emesto Silver 0.31 fl oz/100 lbs seed	Velum One 6.84 fl oz	Velum One 6.84 fl oz	Velum One 6.84 fl oz	Velum One 6.84 fl oz
6	Red Blue		TebuStar 3.6	Velum One 6.84 fl oz	Velum One 6. fl oz	
7	White	Untreated Control	Untreated Control	Untreated Control	Untreated Control	Untreated Control

Annika Briggs, Tom Turini

2024/25 fungicide trials-new

Tulelake

-Adapting to a region with soil freeze—fungicides for frost protection (Rob)

Fresno

-Efficacy against FBR in onion (Tom)

Seed and bulb onion

-Identifying *F. oxysporum* / Foc infection periods to target for chemical management. Brenna, Patricia, Rob, Tom

2024/25 fungicide trials-new

Tulelake

-Adapting to a region with soil freeze—fungicides for

Questions, comments?

-Efficacy against FBR in onion (Tom)

Seed and bulb onion

-Identifying *F. oxysporum* / Foc infection periods to target for chemical management. Brenna, Patricia, Rob, Tom

Other management opportunities

Foundation seed production

- Identification of critical control points to prevent FBR pathogen infection

- Development of control programs to reduce infections

Cultural control options

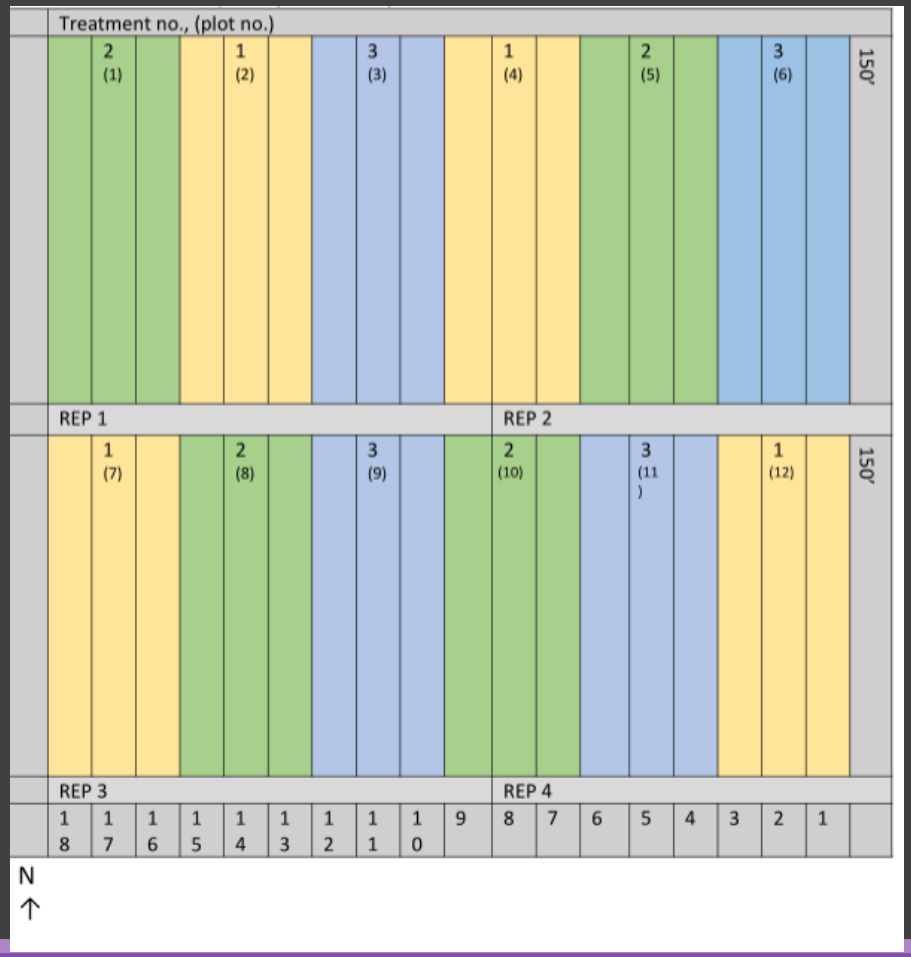
- Storage management

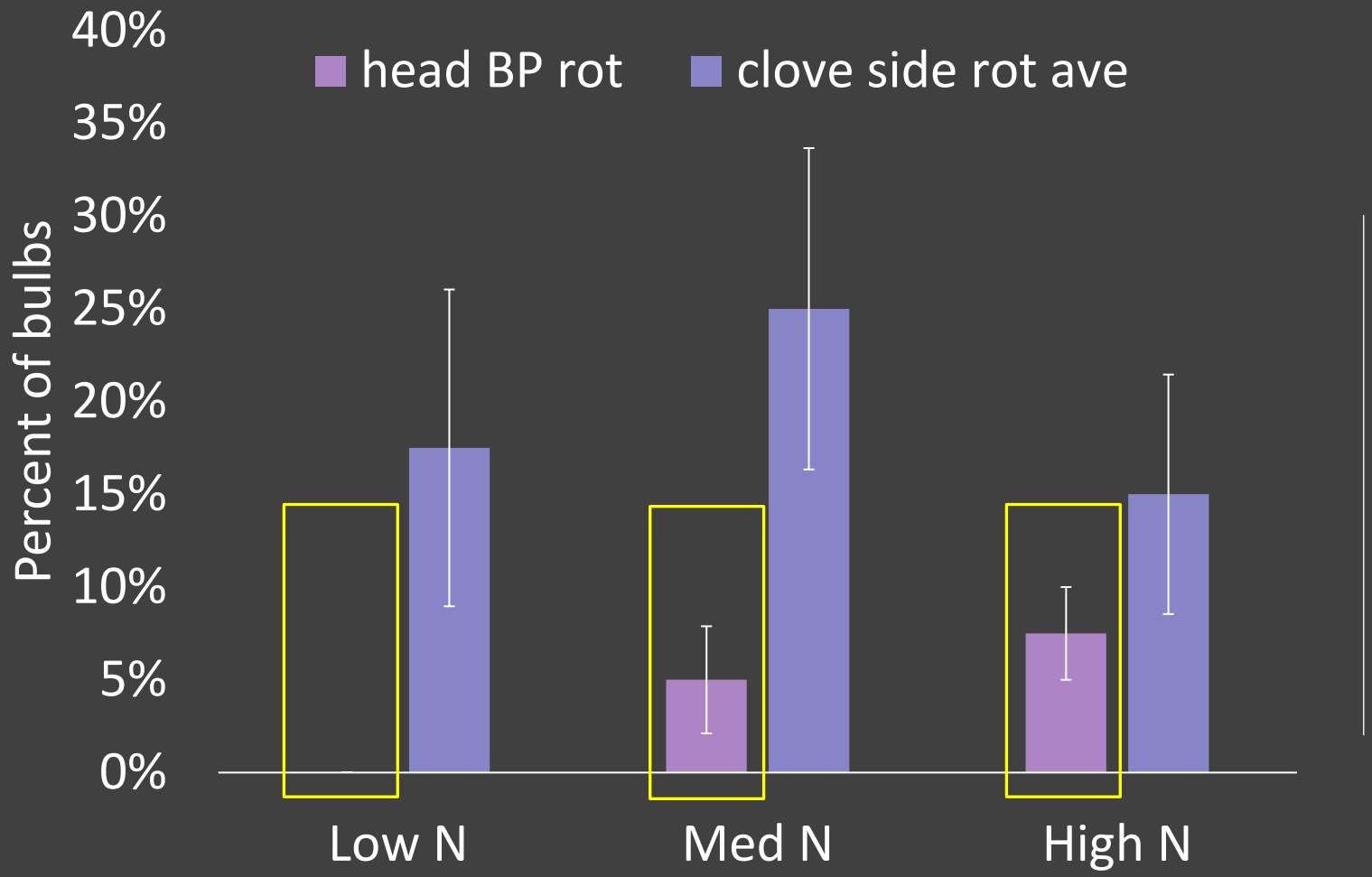
- Nutrient management

-Curing management

2023/24 Nitrogen study

1.	**75 lbs N per acre per season** 46 lbs N (soil and 11-52 preplant)* No 46-00-00, 15.33 lbs N on 14 Mar, 15.33 lbs 4 April and 15.33 lbs 25 April
2.	**150 lbs N per acre per season** - 46 lbs N (soil and 11-52 preplant)* + 36 lbs Nitrogen per acre (78 lb 46-0-0/A; 0.90 lbs/150 row ft of 40-inch bed pre-plant); 27.33 lbs N (drip 14 Mar, 27.33 lbs 4 Apr and 27.33 lbs 25 Apr
3.	**300 lbs N per acre per season** 46 lbs N (soil and 11-52 preplant)* + 109 lbs N per acre or 234 lb 46-0-0/A; (2.69 lbs/150 row ft of 40-inch bed pre-plant); 51.67 lbs N 14 Mar, 51.67 lbs 4 Apr and 51.67 lbs 25 Apr

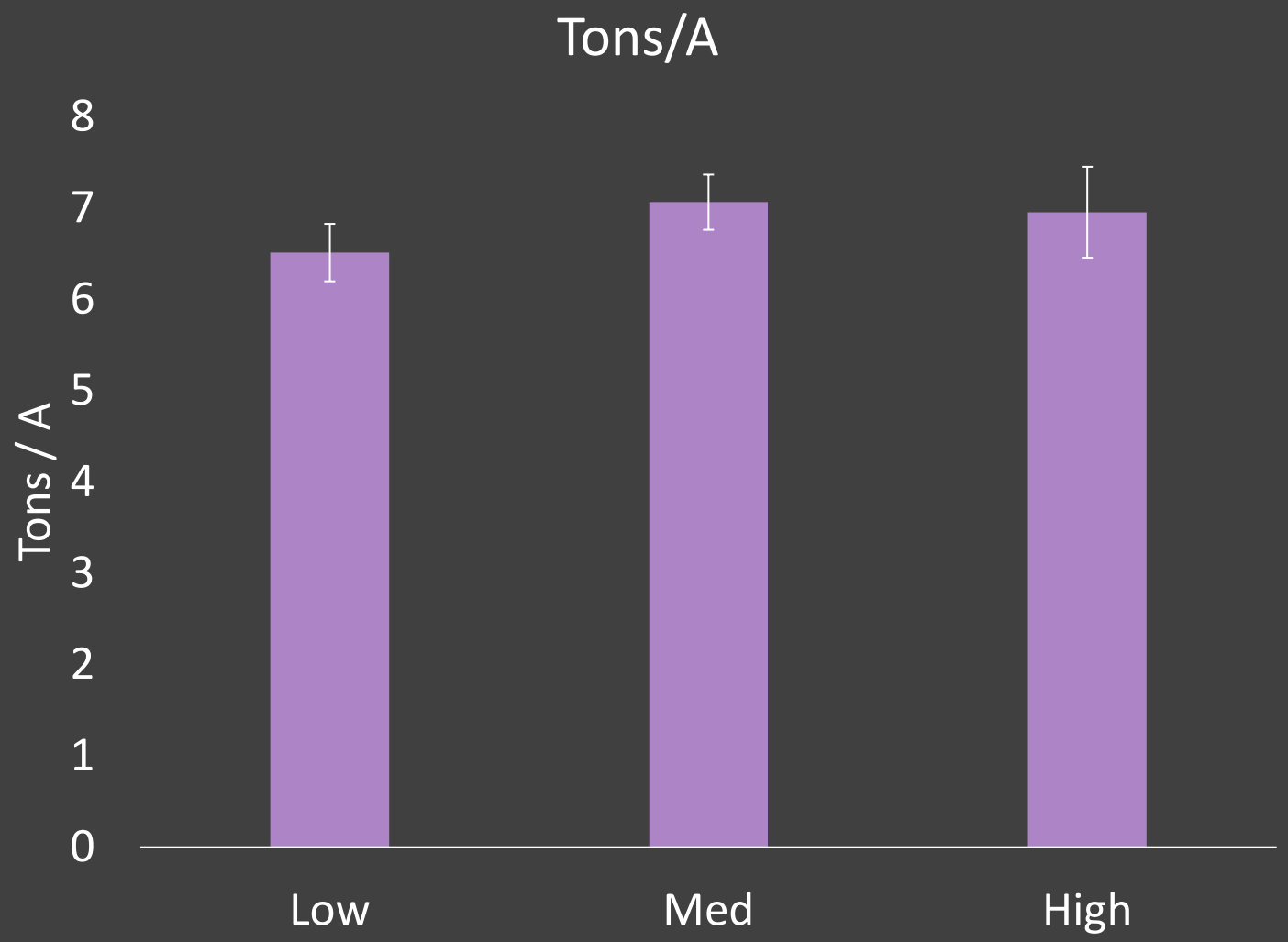




Basal rot only developed in medium and high N treatments (P = 0.09)

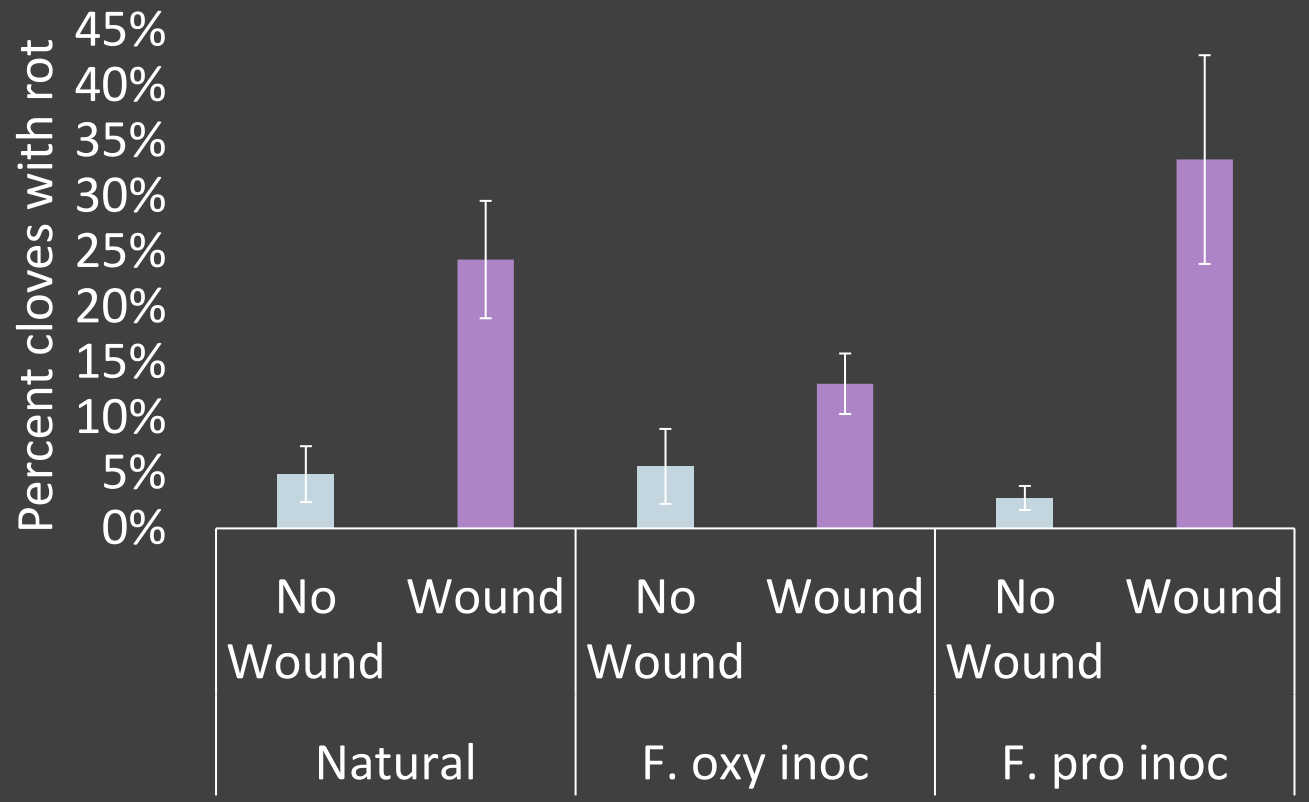
Treatment effects after 6 mo storage: TBD

Consistent with 2023



No significant effect of high N on yield

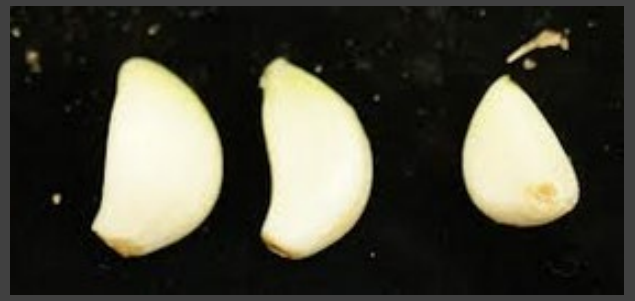
Bulb management during curing
2022: Physical wounding increased clove rot

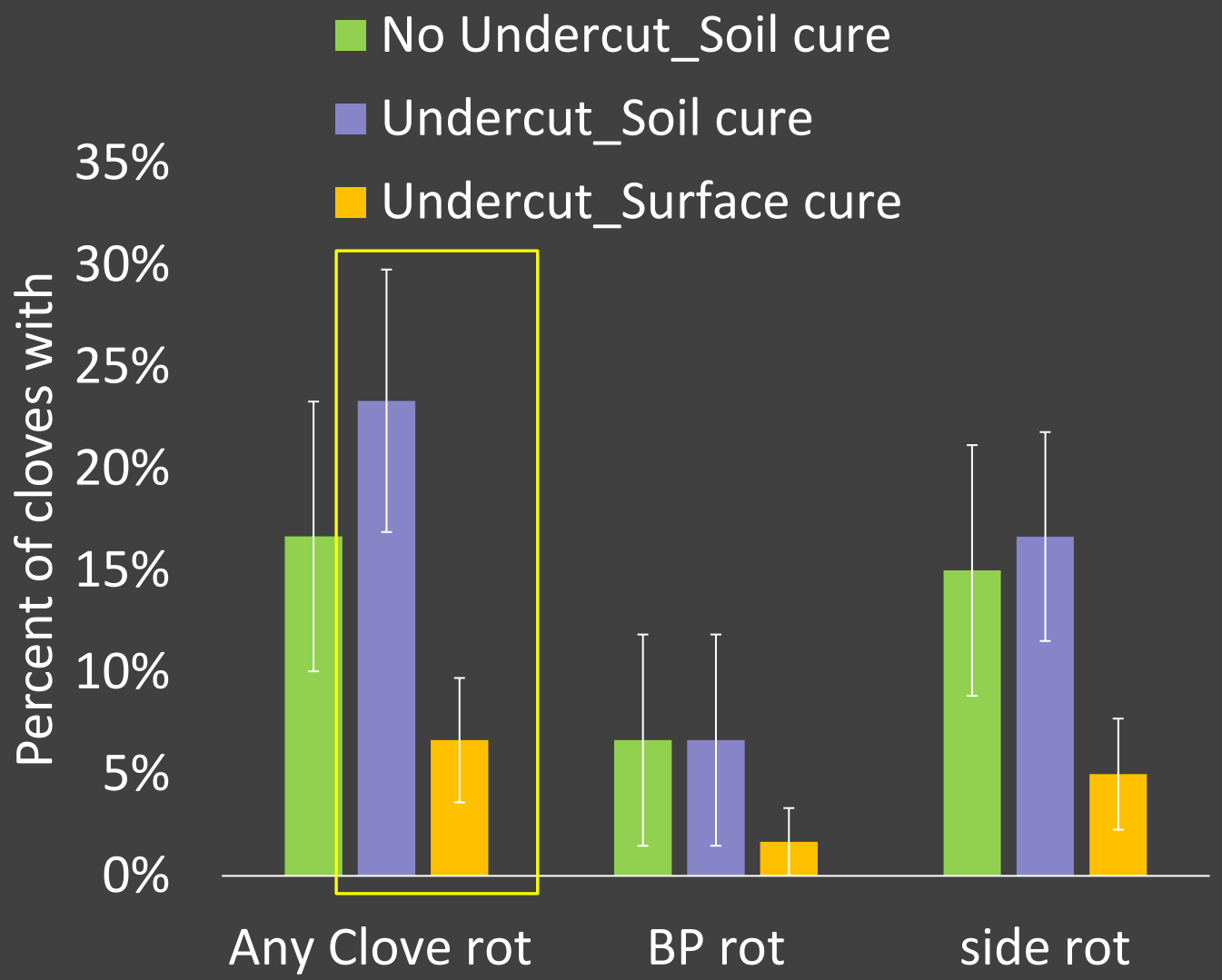


P < 0.001, ANOVA

Wound

No Wound





2024:
Bulbs left in soil had higher clove rot than surface cured

Will be evaluating after 6 mo in storage

Inconsistent results- Repeating in 2025

Summary

- Need to reduce FBR pathogen infection levels in seed production
  - Long term: working to reduce seed infection levels
- Potential efficacy of chemical-based seed treatment methods
- Seed and early season soil treatments combined have the most promise for reducing infections and FBR development
  - Need to identify optimal application periods and chemical rotation programs
- Expanding work into onion to evaluate efficacy of early season fungicide applications via sprinklers
- Integrated management requires a better understanding of how abiotic factors in the field and storage affect disease
  - Nitrogen, curing practices, temperature/O2/humidity in storage

Questions, comments?

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