

# Fusarium management in garlic: Field and Storage Considerations

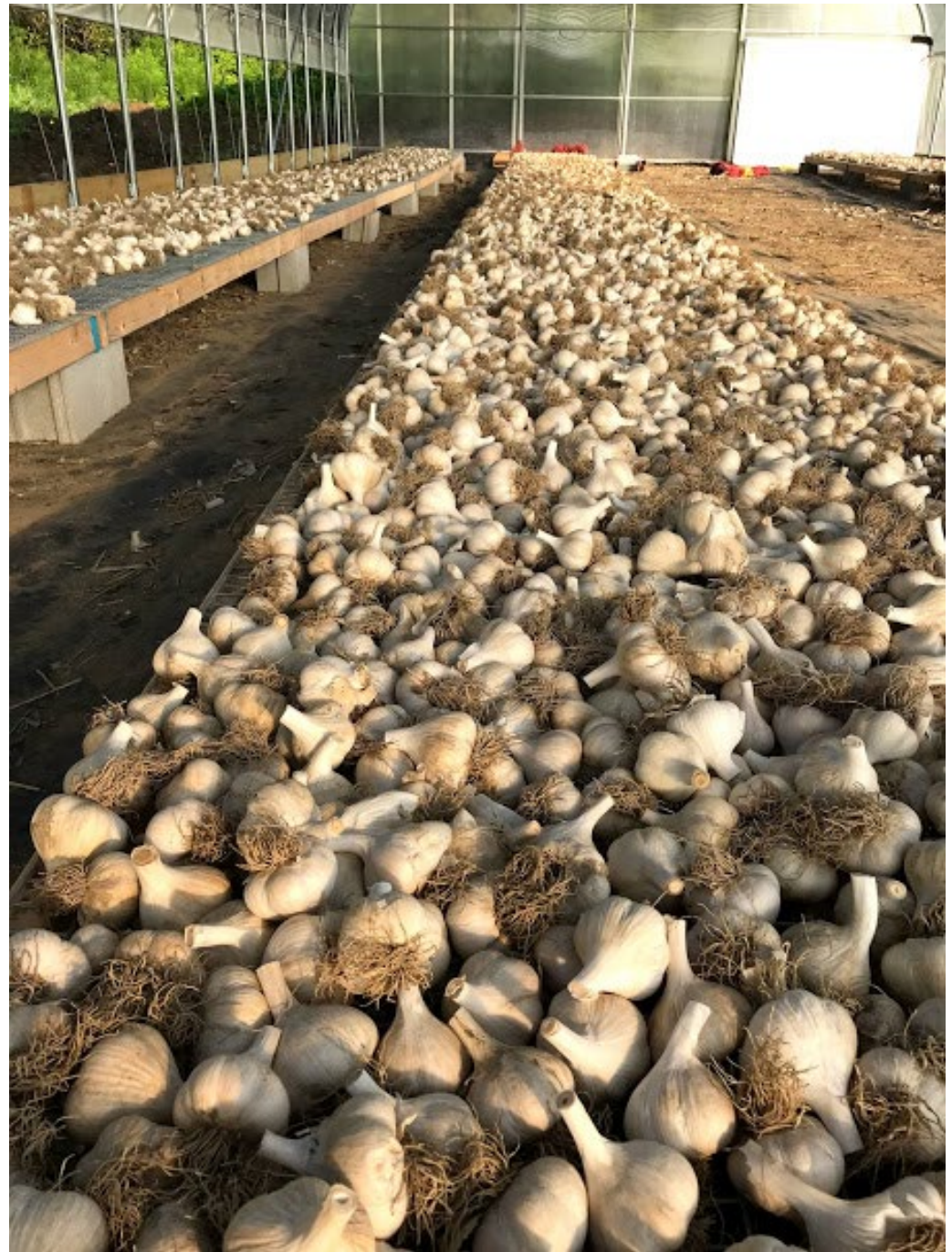
March 22, 2022



# Effects of Growing Techniques on Yield, Grade, and Fusarium Infestation Levels in Garlic

*Crystal Stewart Courtens*









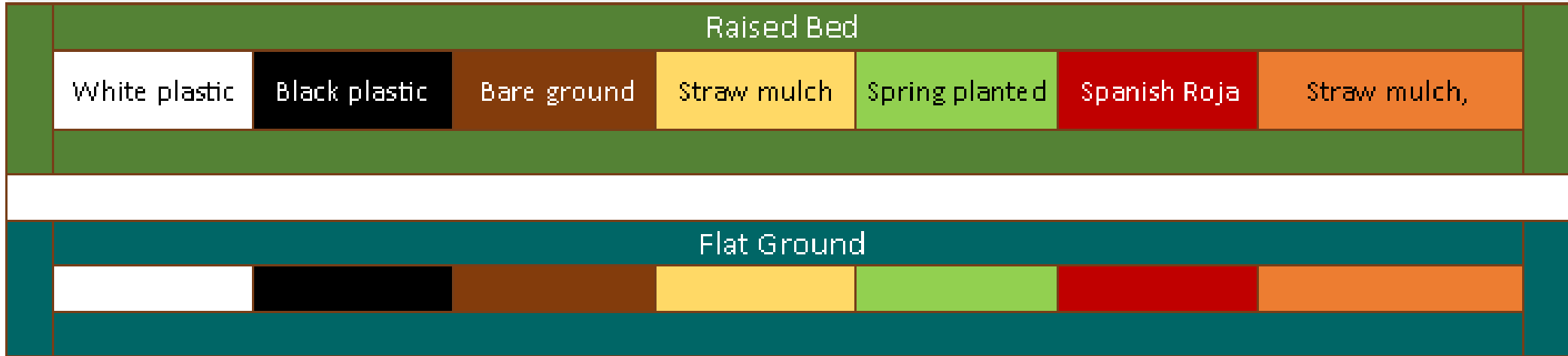
*Fusarium basal rot in June*  
Image: Crystal Stewart



Fusarium Bulb Rot Image: Crystal Stewart

# Fusarium management field trials

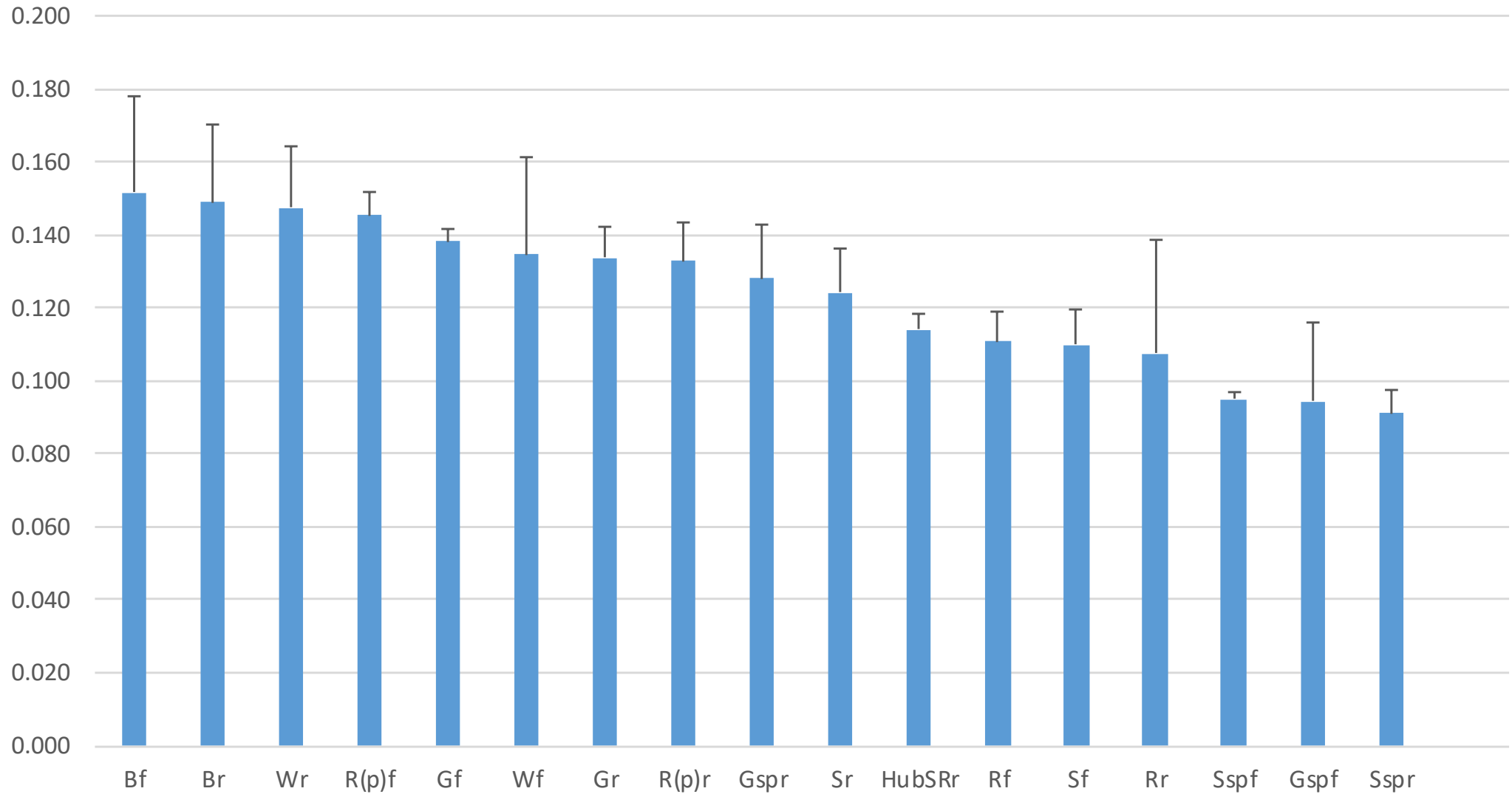
Map of the first of three replications of the garlic treatments. Following replications in the same row were randomized.



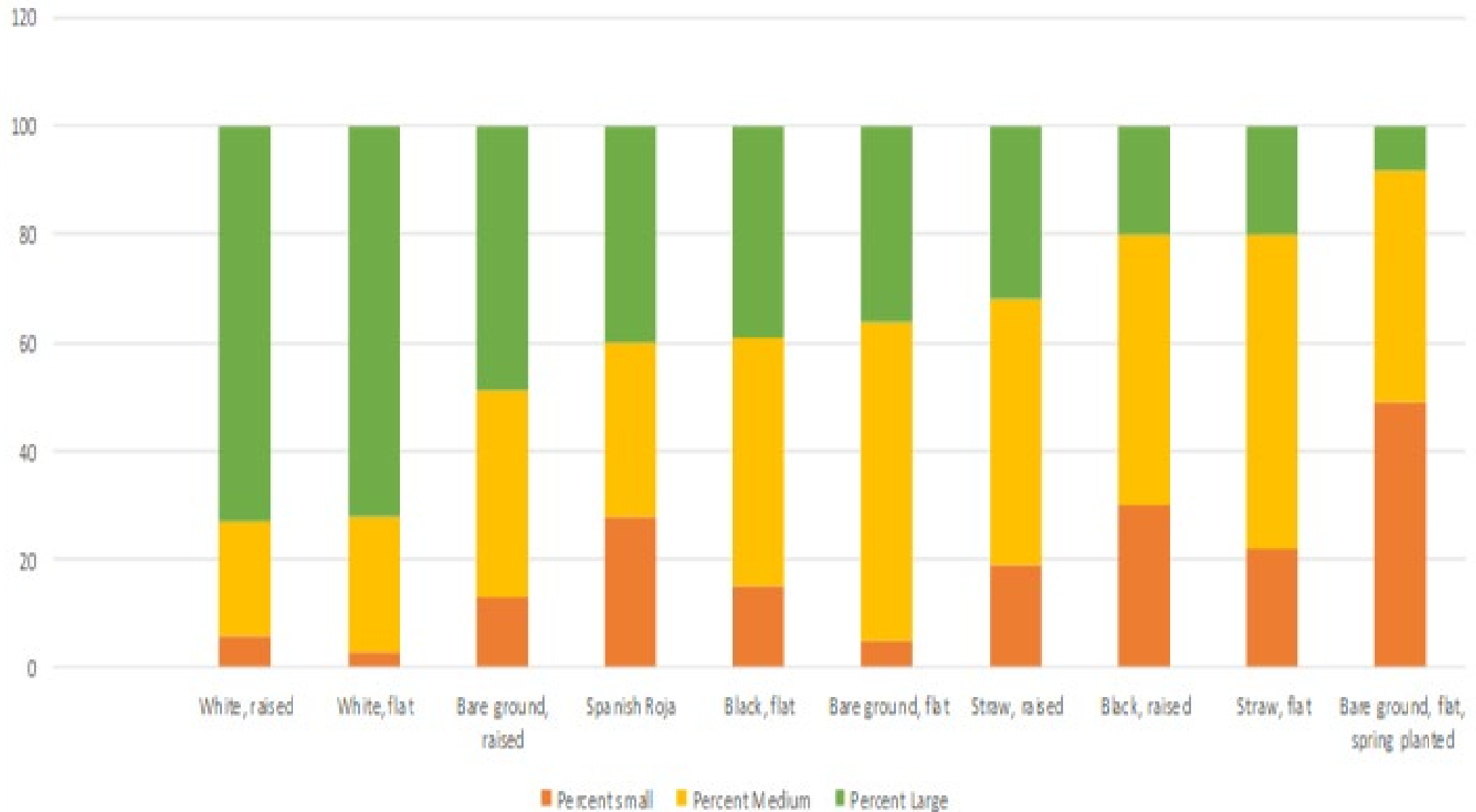




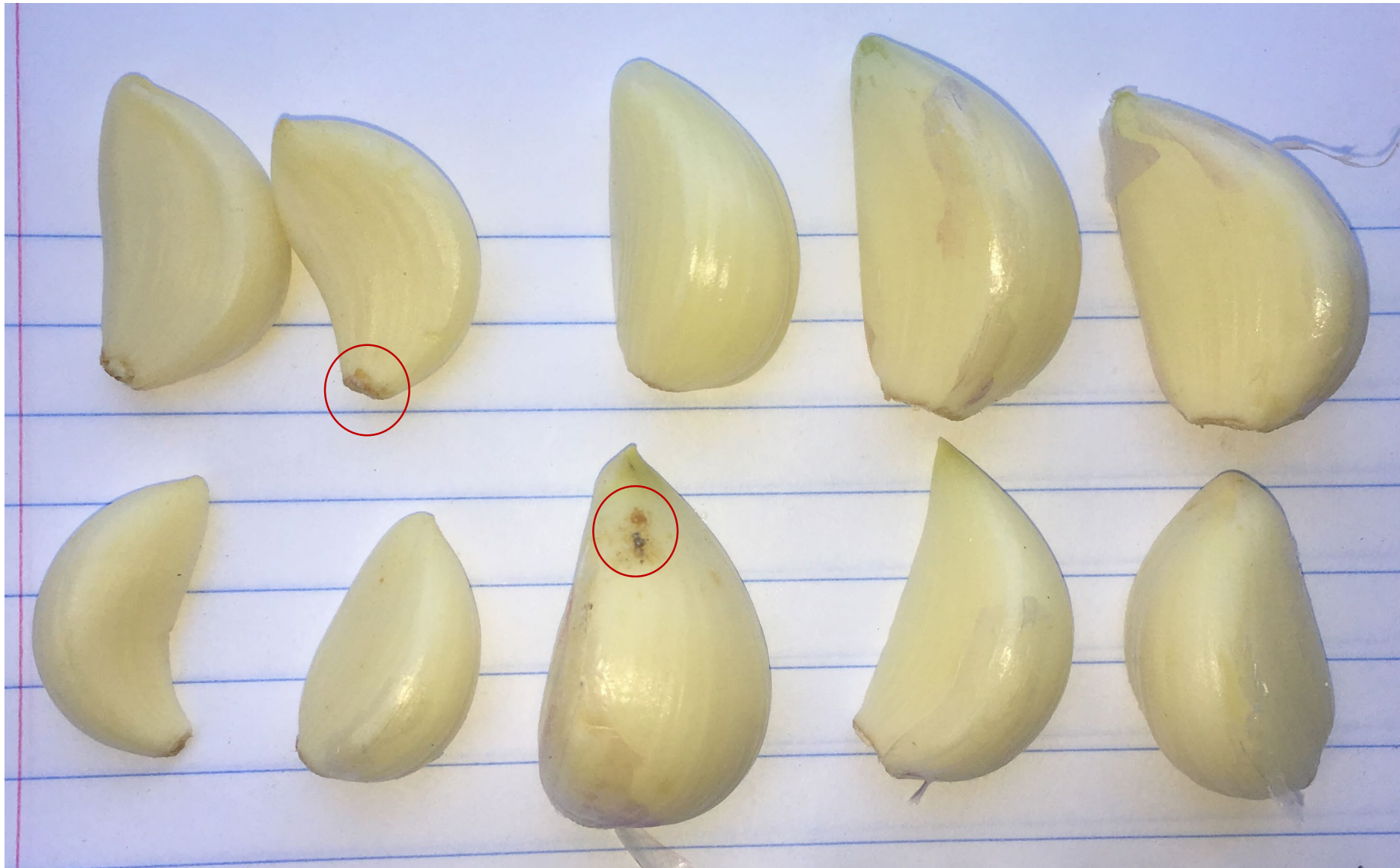
## Average of Weight per bulb (lbs)



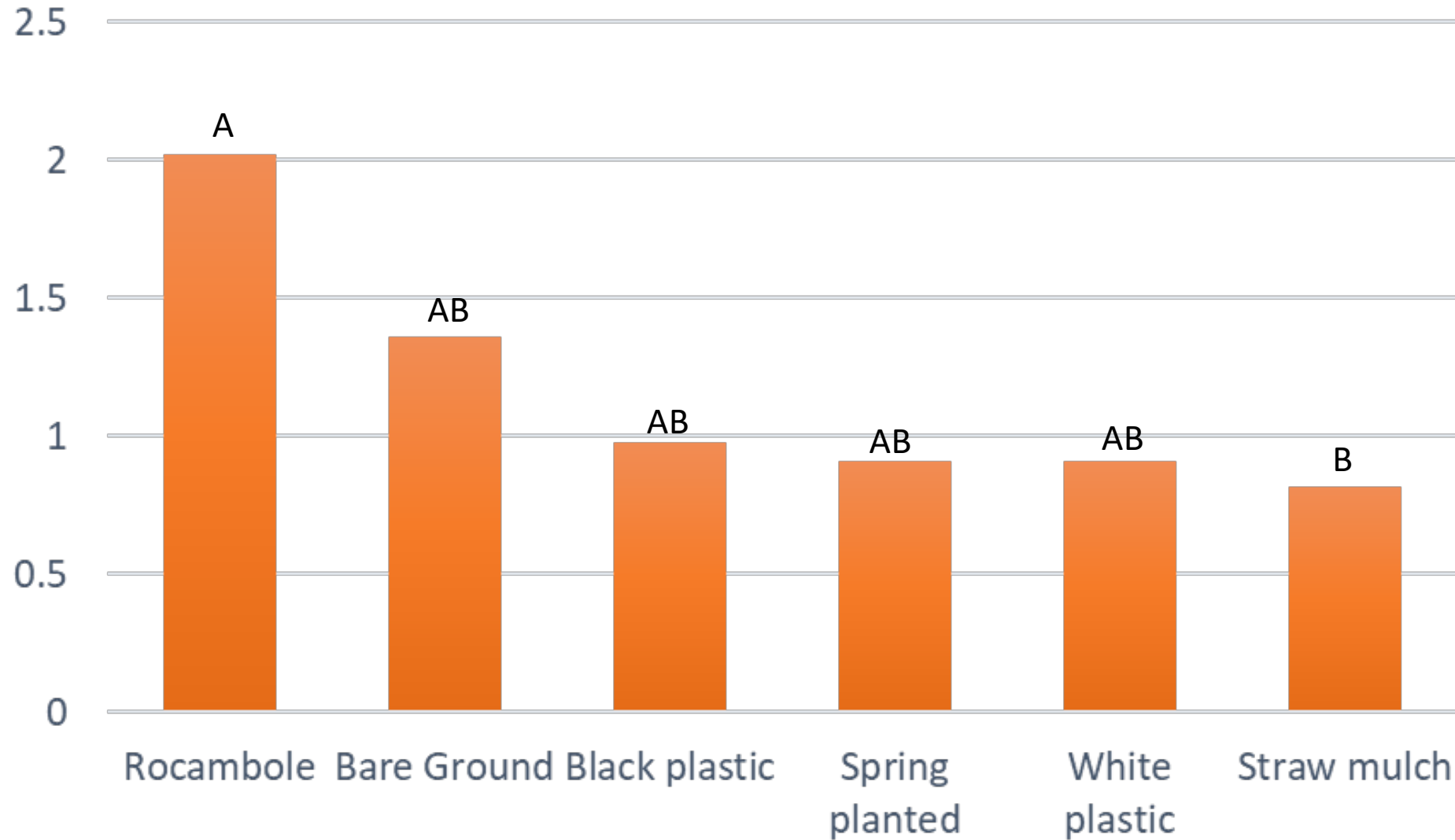
Distribution of Small, Medium and Large Bulbs







# Average Fusarium % by treatment





# The relationship between nitrogen and Fusarium

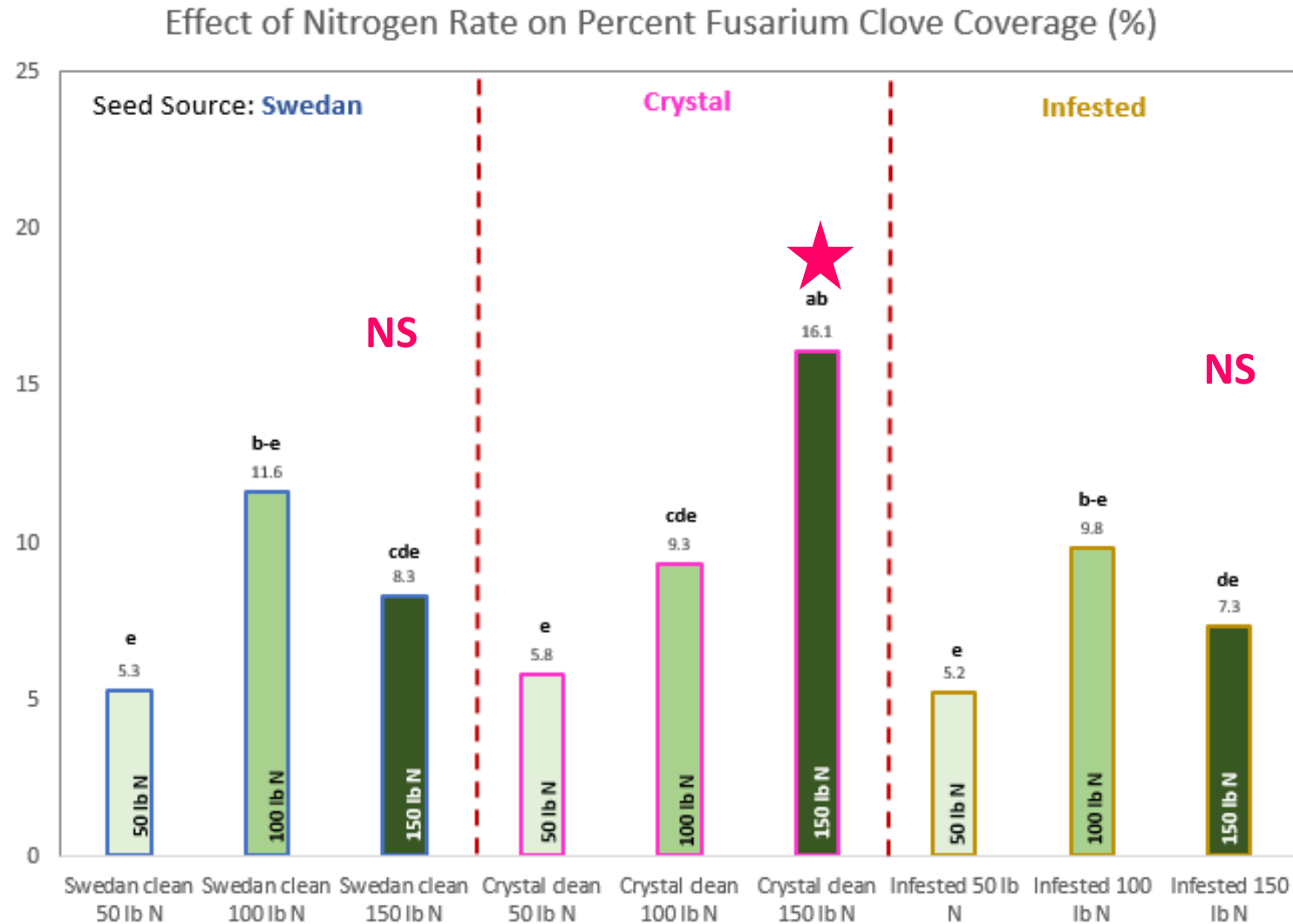
Also known as:

Fusarium



Nitrogen

# Effect of Nitrogen on Fusarium: 2017 Results – % Clove Coverage (Nov 1)



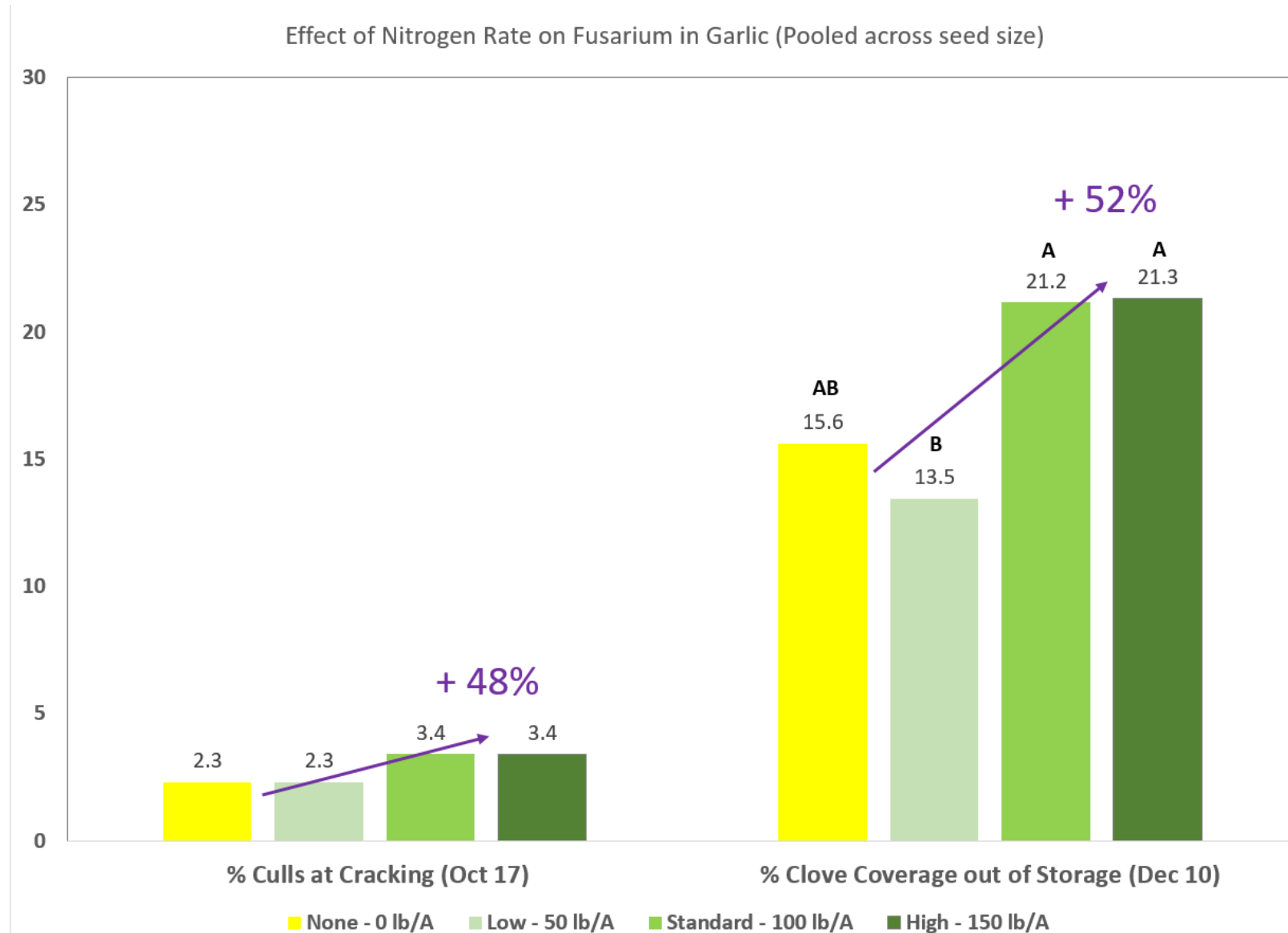
★ In **Crystal**, 150 lb N resulted in significantly almost 2x as much Fusarium as 100 lb N and 3x as much as 50 lb N.

**50 lb N** consistently had least Fusarium (<6%).



# Effect of Nitrogen on Fusarium, 2018

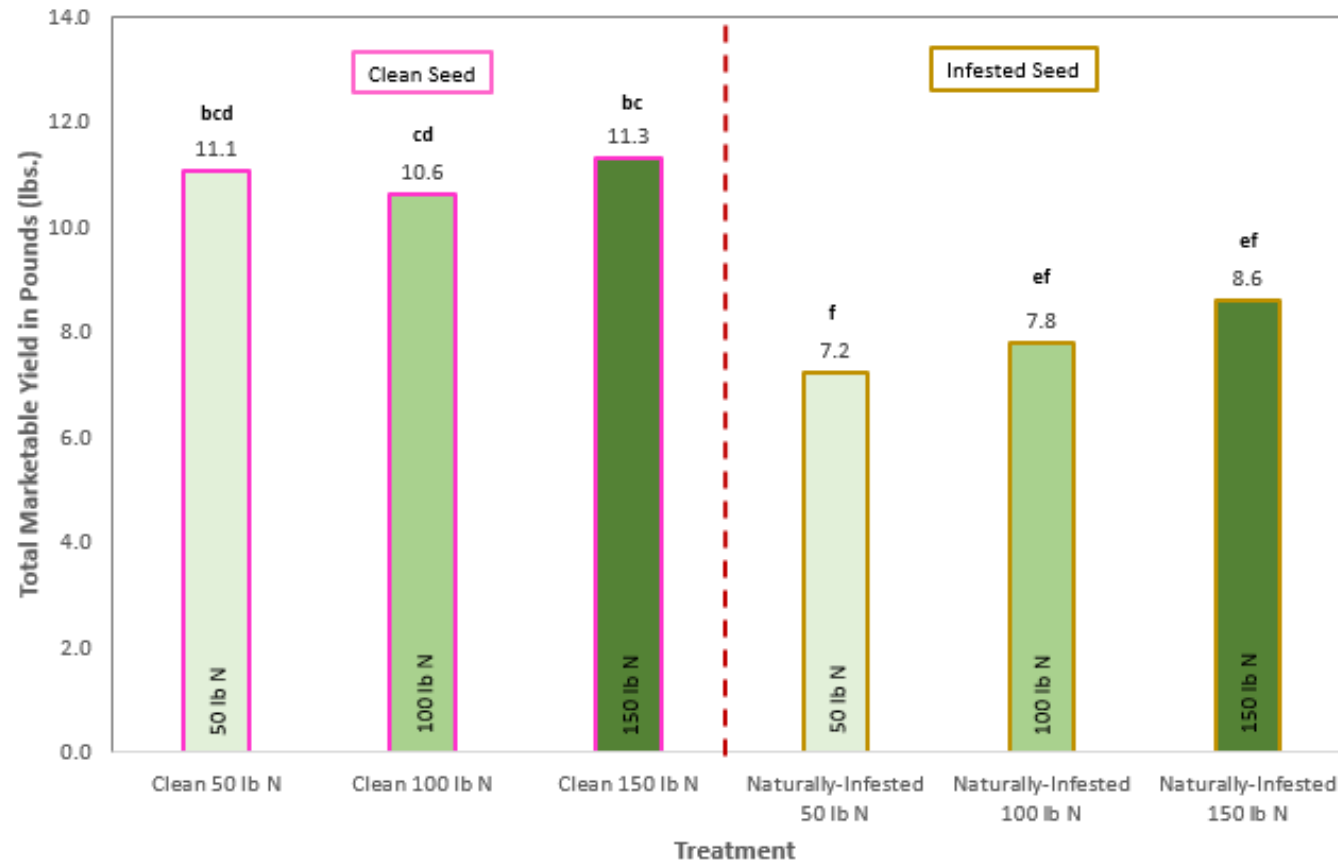
Albion, 2018



# Effect of nitrogen levels on yield

Effect of Nitrogen Rate on Total Marketable Yield (lb.)

Long Island, 2017



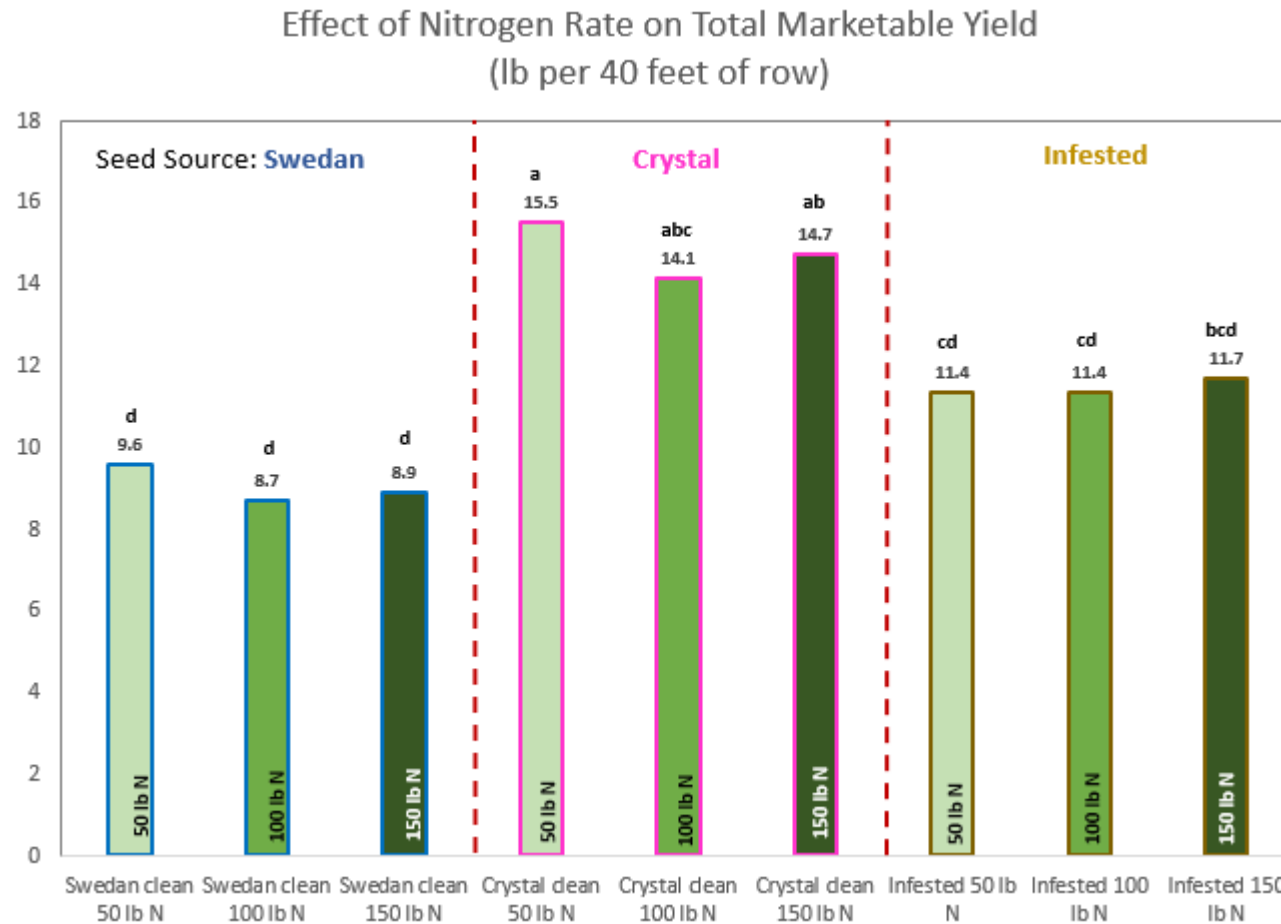
No response to applied nitrogen between 50 and 150 lb/A

Seed Source had greatest effect on yield – infested seed had lowest yield



# Effect of Nitrogen on Yield, site 2

Batavia, 2017



No response to applied nitrogen between 50 and 150 lb/A

Seed Source had greatest effect on yield – infested seed not the lowest yield

Fusarium  
product  
field trials,  
2017-2018

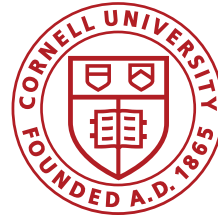








# Evaluation of Sanitizers for Fusarium Control: Treatments



Terraclean: hydrogen peroxide,  
peroxyacetic acid

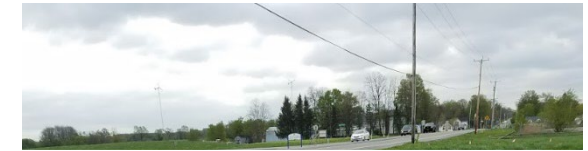


Oxidate 1%  
2 min dip  
Plant wet



Terraclean 1:500 dilution  
fb. Terragrow 1 oz/100 gal  
4 hours between Terraclean & Terragrow  
2000 ml per 20-ft

Terragrow: microbe package



- Bacillus licheniformis*
- Bacillus subtilis*
- Bacillus pumilus*
- Bacillus amyloliquefaciens*
- Bacillus megaterium*
- Trichoderma harzianum*
- Trichoderma reesei*
- Humic Acids (derived from Leonardite)
- Soy Protein Hydrolysate (microbial nutrient)
- Kelp (*Ascophyllum nodosum*) (microbial nutrient)
- Molasses (microbial nutrient)

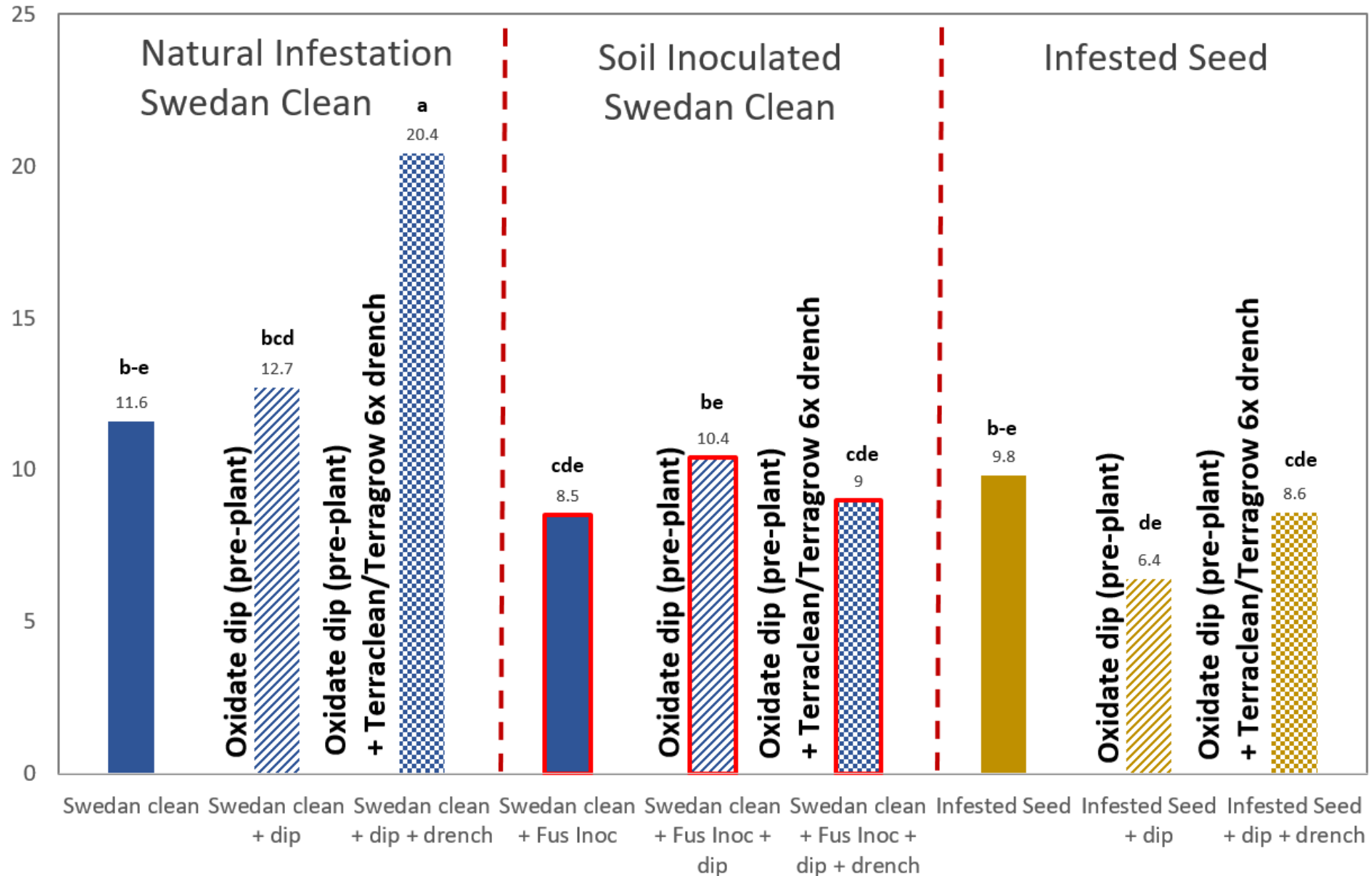


Applied every 2 weeks:  
Apr 18, May 3, May 17, Jun 1&2,  
Jun 13, Jun 28



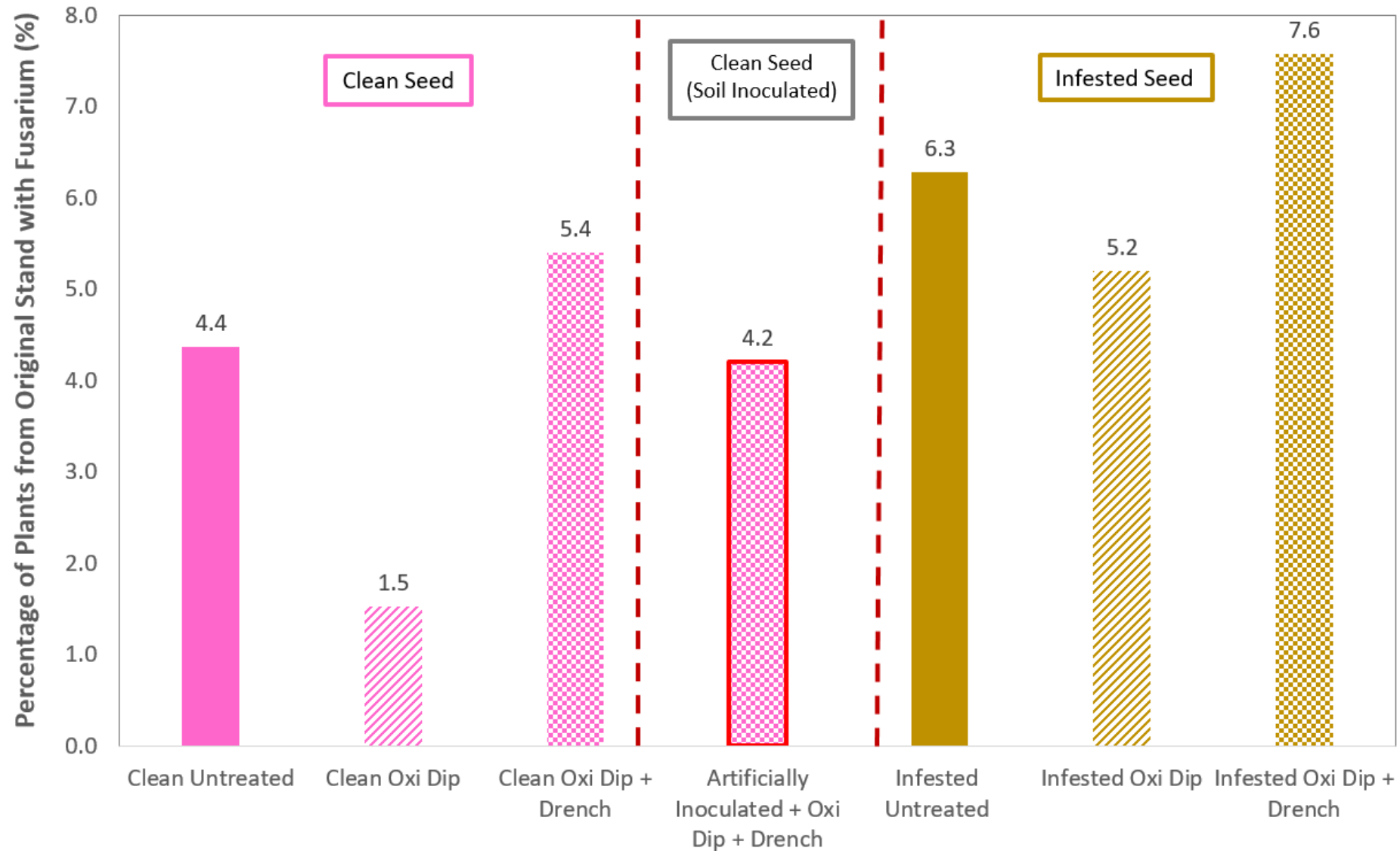
# Effect of Oxidate Dip 1% and Terraclean/Terragrow: (100 lb N) Percent Fusarium Clove Coverage (%)

Batavia, 2017

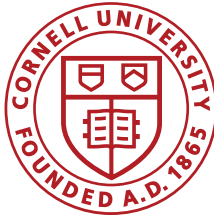


# Effect of Oxidate Dip 1% and Terraclean/Terragrow Drench on Fusarium Infestation (N=100 lb/A)

Long Island, 2017



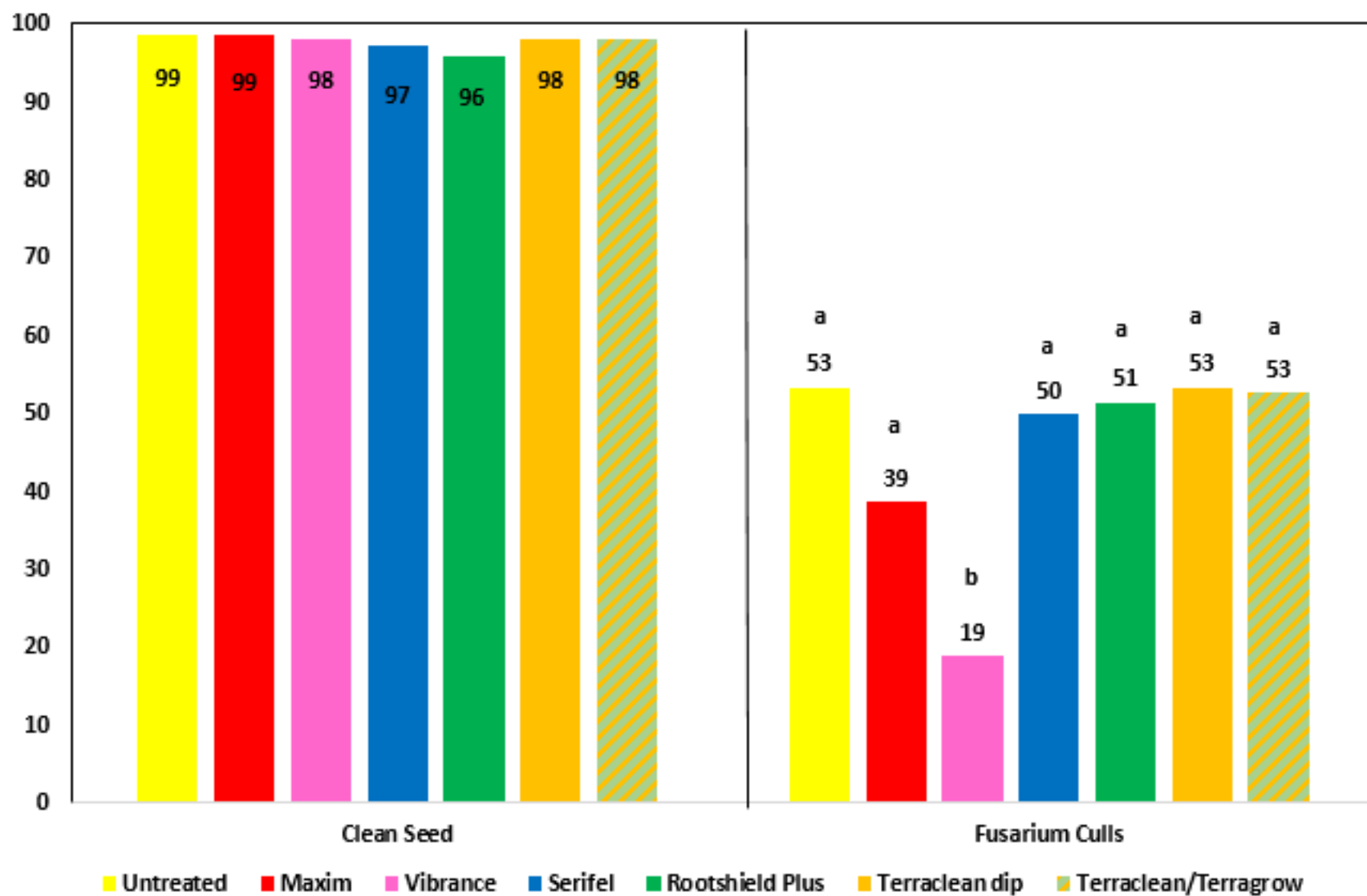
# Evaluation of Fungicides for Fusarium Control: Treatments – Albion, 2018



Trade Name	Active ingredient	FRAC Group	Application
Maxim 4FS	fludioxonil	7	Seed slurry
Vibrance	sedoxane	12	Seed slurry
Serifel	<i>Bacillus amyliqueliciens</i> strain MBI 600	44	In-furrow at planting In-season drench: May 9, 23, Jun 8, 20
Rootsheild Plus	<i>Trichoderma harzianum</i> , <i>T. virens</i>	??	2 min seed dip
Terraclean	hydrogen peroxide, peroxyacetic acid	sanitizer	2 min seed dip
Terraclean Terragrow	See above Microbe package	Sanitizer 44	In-furrow drench at planting In-season drench: Apr 23, May 9, 23, Jun 8, 20

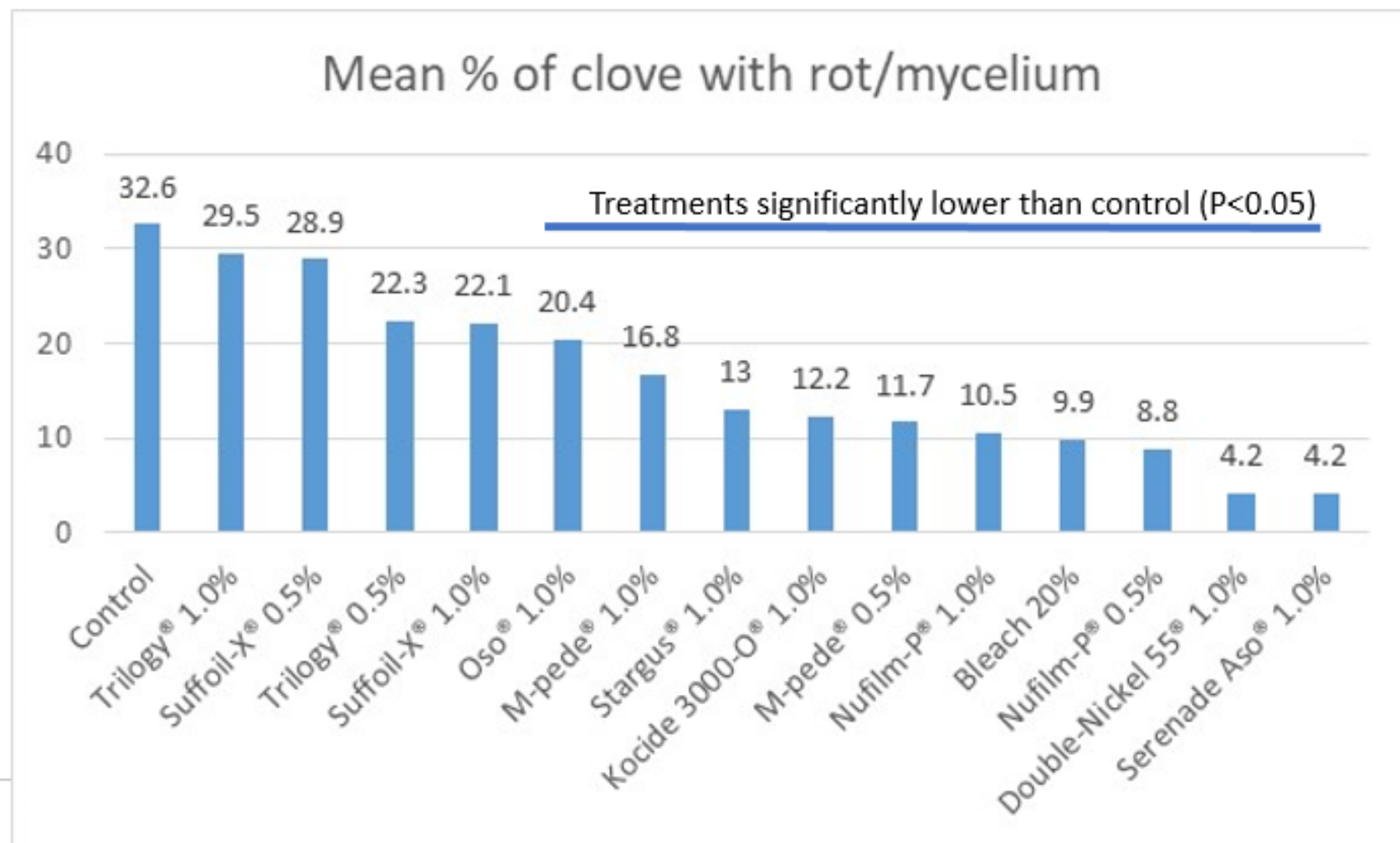


Fungicide Evaluation for Control of Fusarium Basal Rot in Garlic, Holley, 2018:  
Spring Emergence (%)



# Screening chemicals for controlling seed-borne Fusarium

- Culled cloves dipped in solutions (20 min).
- Incubated under high humidity 21 d.
- Peeled and assessed for % surface rotten or covered with active mycelium



## Effect of in-season application of chemicals against Fusarium

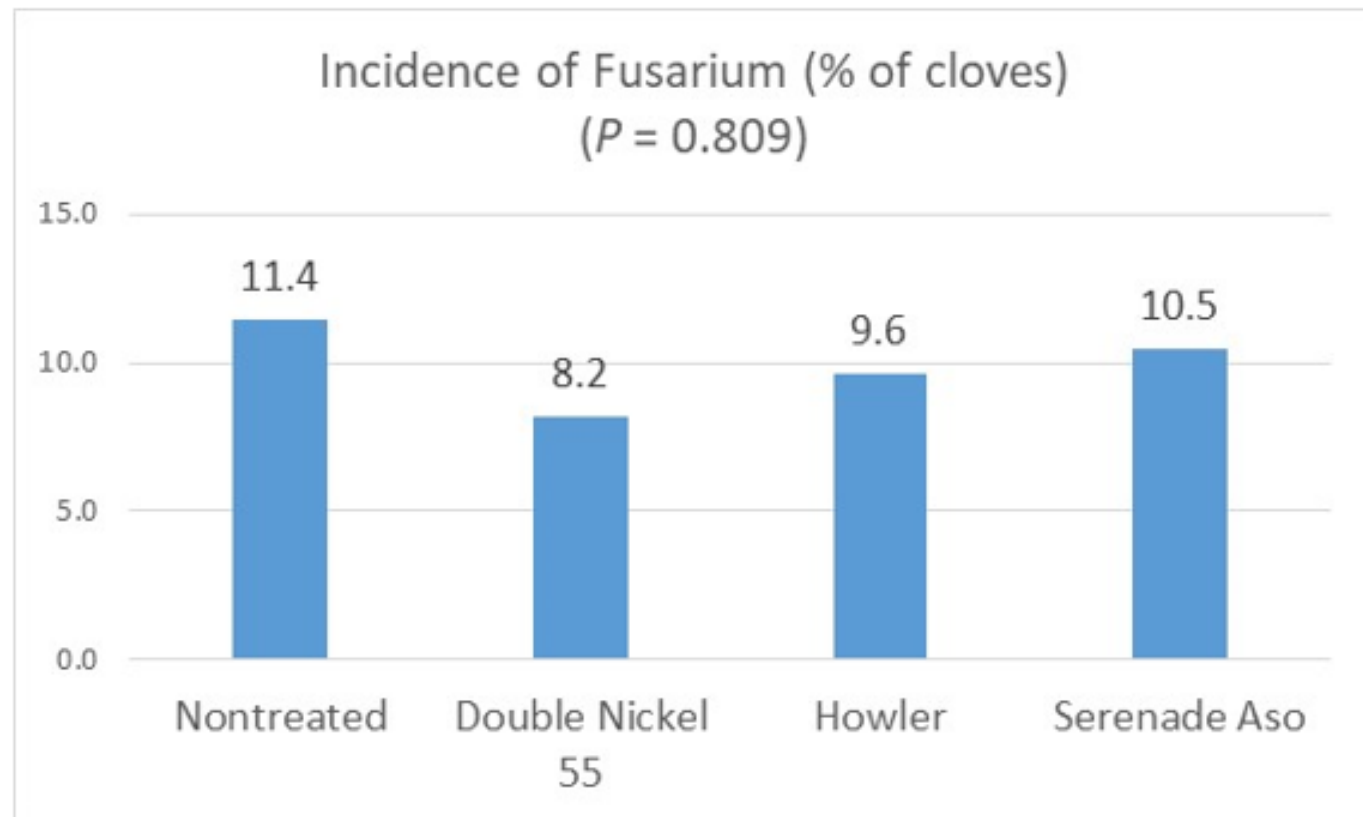
For each treatment: 3 varieties x 3 replicate plots of 30 cloves each. Seed with Fusarium.

**May 12, May 27, June 22.**

50 ml of chemical applied around base of each garlic plant.

**July 22, 2022.**

Trial harvested. One clove from each of 30 bulbs was peeled and assessed visually for presence of fungal rot.



Double Nickel 55 (2 lb/A)	6.2 g/17.5 L water/100 row feet
Howler (6.25 lb/A)	19.5 g/17.5 L water/100 row feet
Serenade Aso (4 qt/A)	26.1 ml/17.5 L water/100 row feet

None of the in-season drench treatments reduced Fusarium on harvested cloves.



# Take home lessons to manage Fusarium:

Don't over-apply nitrogen

Start with vigorous, clean seed

Find the right varieties for your site

Choose a mulch and bed system with garlic health in mind

**\*\*Fusarium is an advantageous pest, and follows damage to the crop!**



# Questions, comments, discussion?

*Many thanks to our grower cooperators in Eastern NY, western NY, and Long Island for their support and to Sandy Menasha, Christy Hoepting, and Robert Hadad for conducting trials for this project.*