EXTENDING KNOWLEDGE ›› CHANGING LIVES

NDSU | EXTENSION

Dry Bean Diseases: Rust, SCN and Hail

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Take home messages

- Rust
  - Scout. Excellent Fungicides
- SCN
  - Continues to spread
  - Varieties vary in dry bean ‘resistance’
- What the hail!?
  - CBB causes yield loss, is difficult to manage, PH

Common Bean Rust

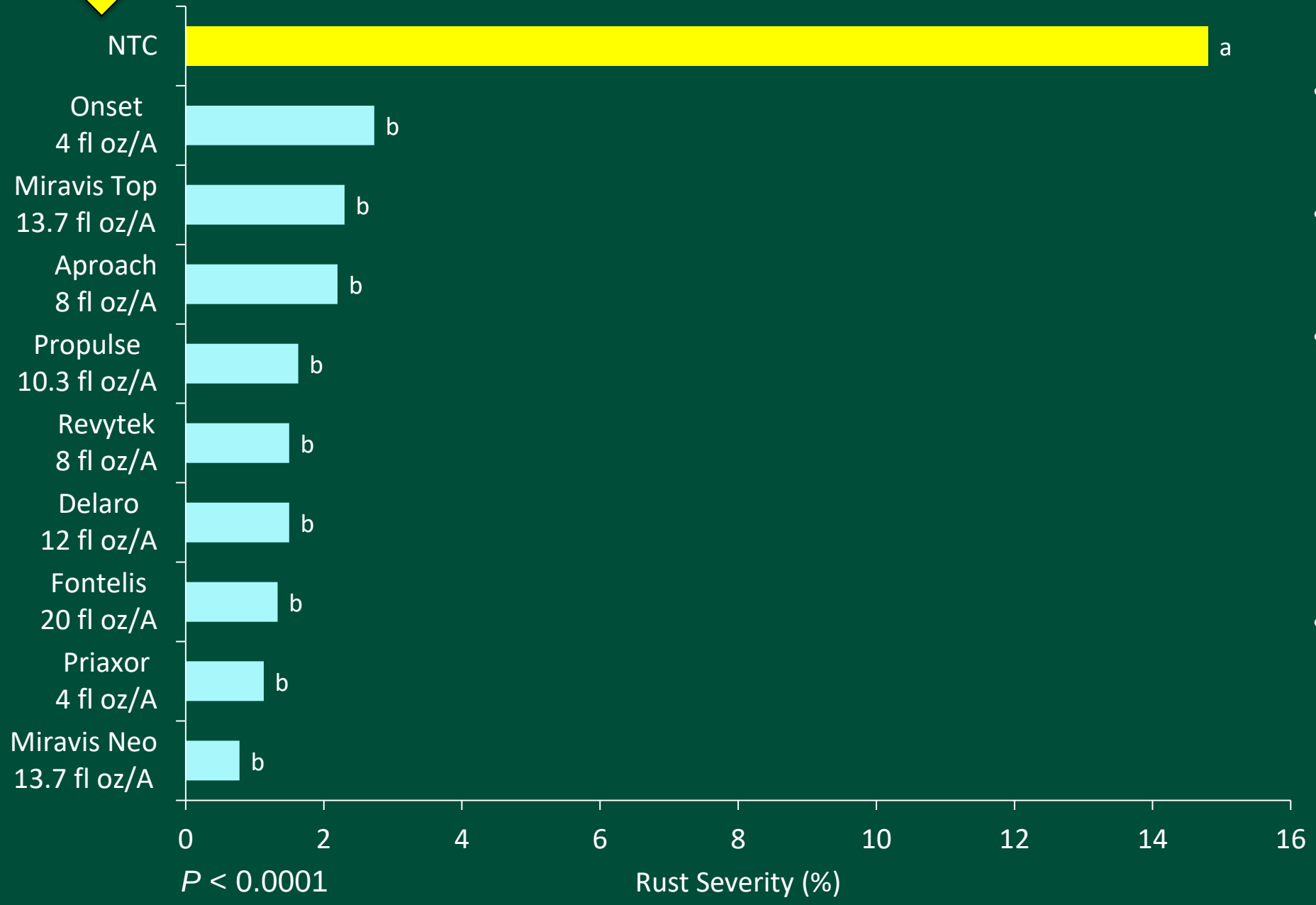
- Fungal pathogen
- Very specific to dry bean
- Can overwinter in our region
- Needs free moisture (fog, dew, etc.)
- Appears first in hot spots


Hot Spot

Rust Management

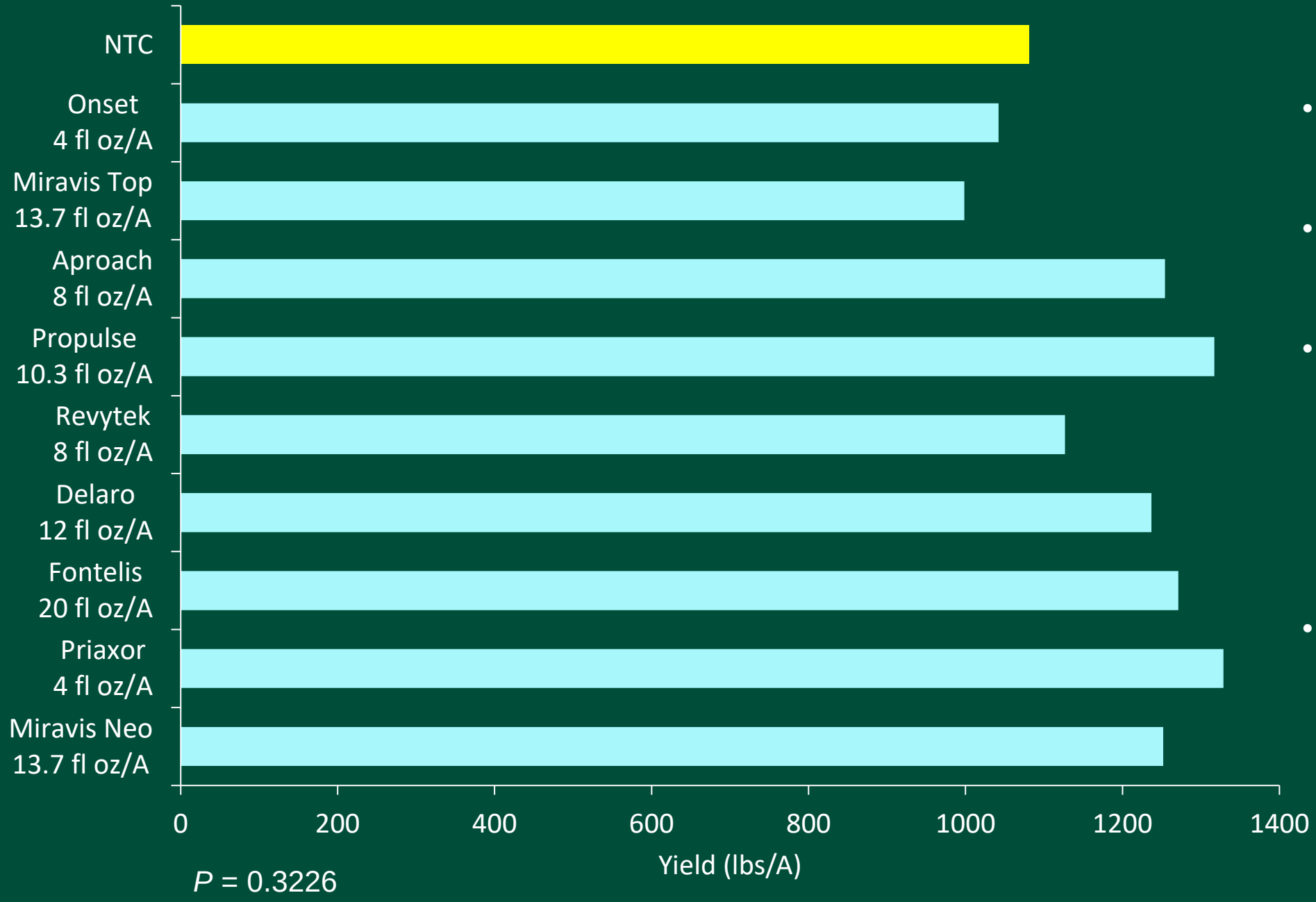
- Rotation
- Genetic Resistance
  - Awesome, if we have it (Falcon)
- Fungicides
  - Timing …. Scout
  - Typical onset is after a leaf wetness event
    - In July (most concerning) – less important later in season
  - Multiple fungicides are effective

2024 Fargo DEB Rust Severity



- Objective of the study was to evaluate the efficacy of fungicides on rust.
- Rust spores inoculated at R1/R2 (near canopy closure)
- Fungicides applied:
  - 5 days after observation of rust pustules
  - Flat Fan TJ8002 nozzles
  - 20 gpa
- Evaluated 2 weeks post fungicides application (R5/R6)

2024 Fargo DEB Rust Yield



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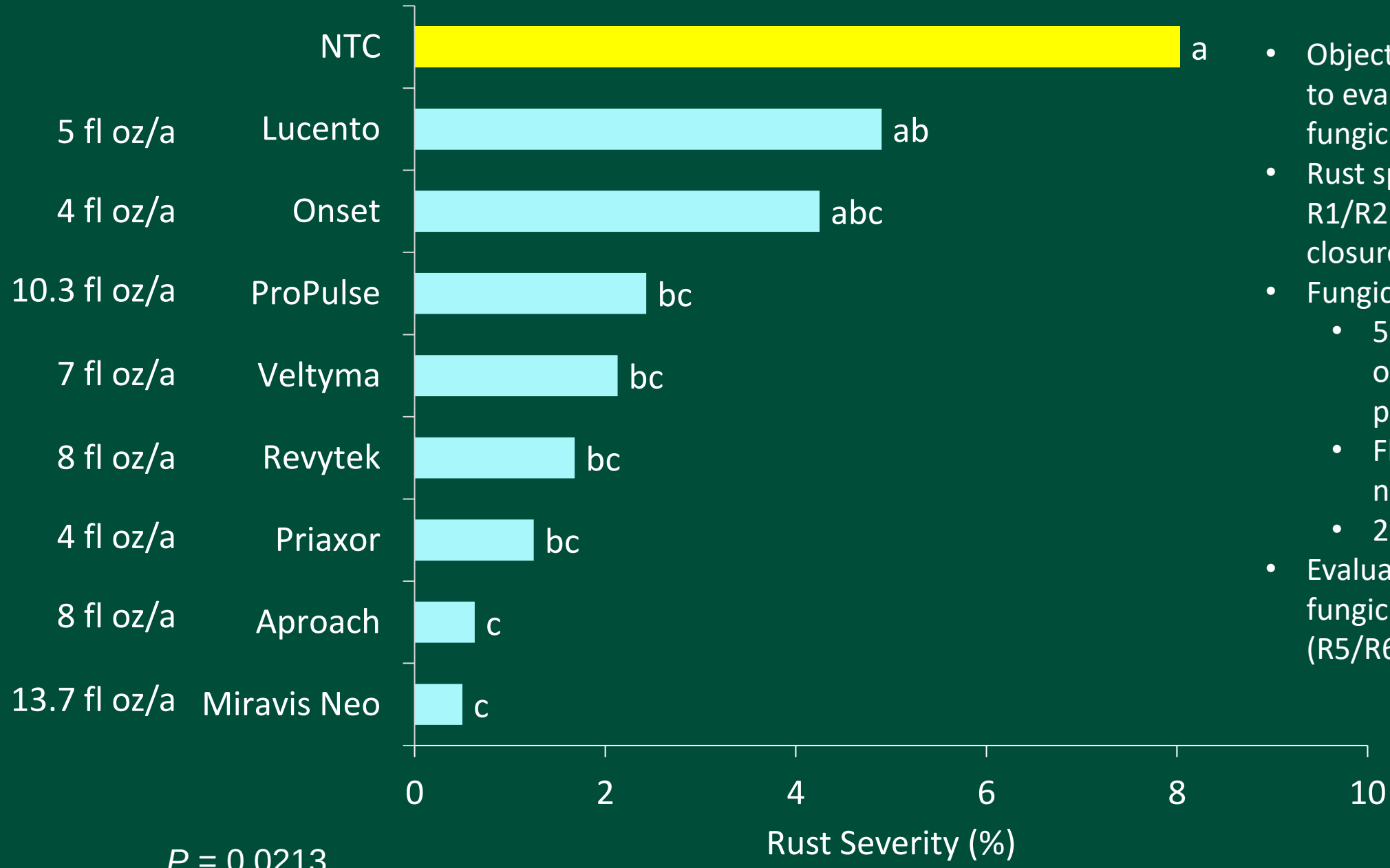
2020 Fargo DEB Rust **Severity**



P = 0.0213

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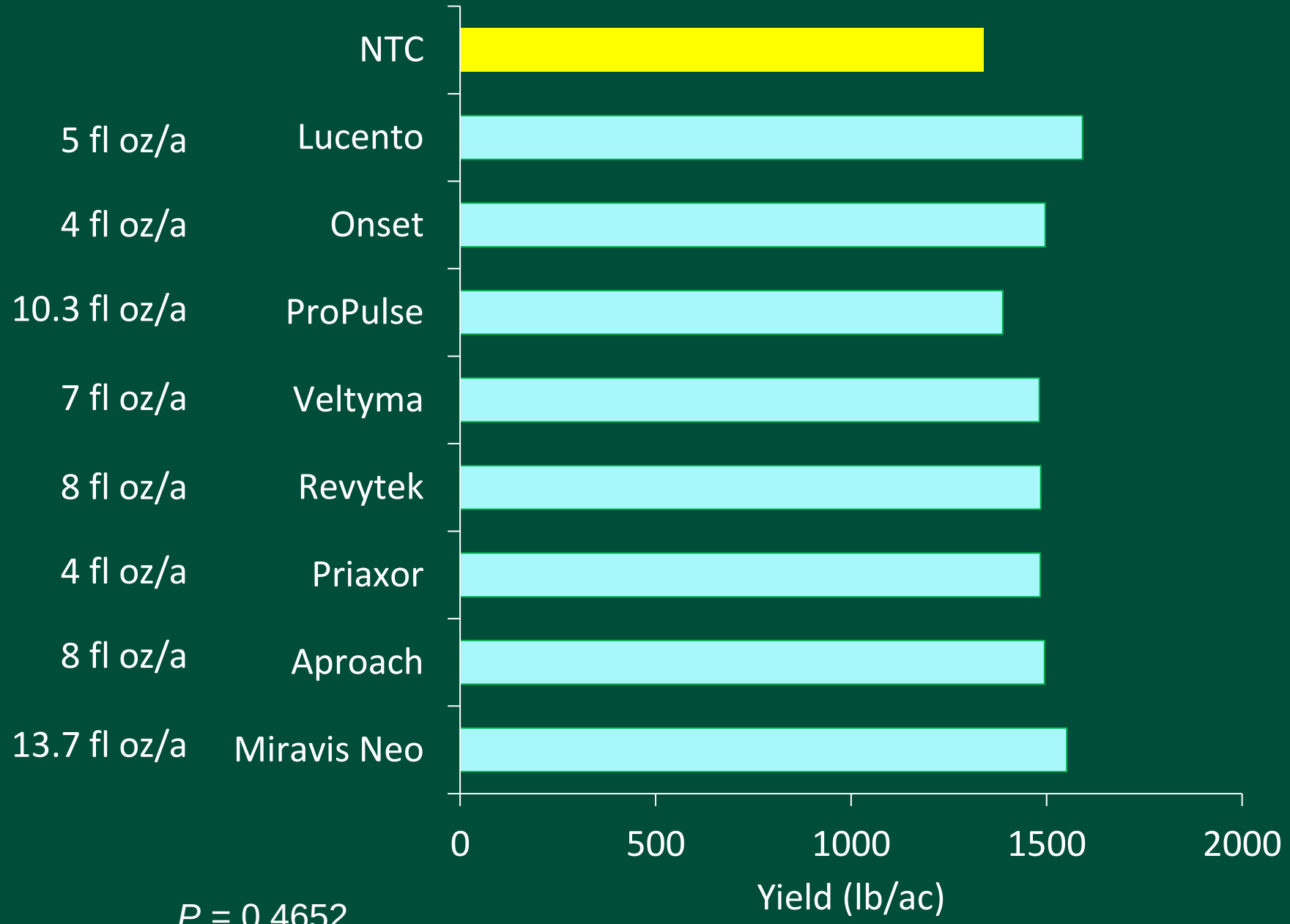

$P = 0.4652$

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Soybean Cyst Nematode

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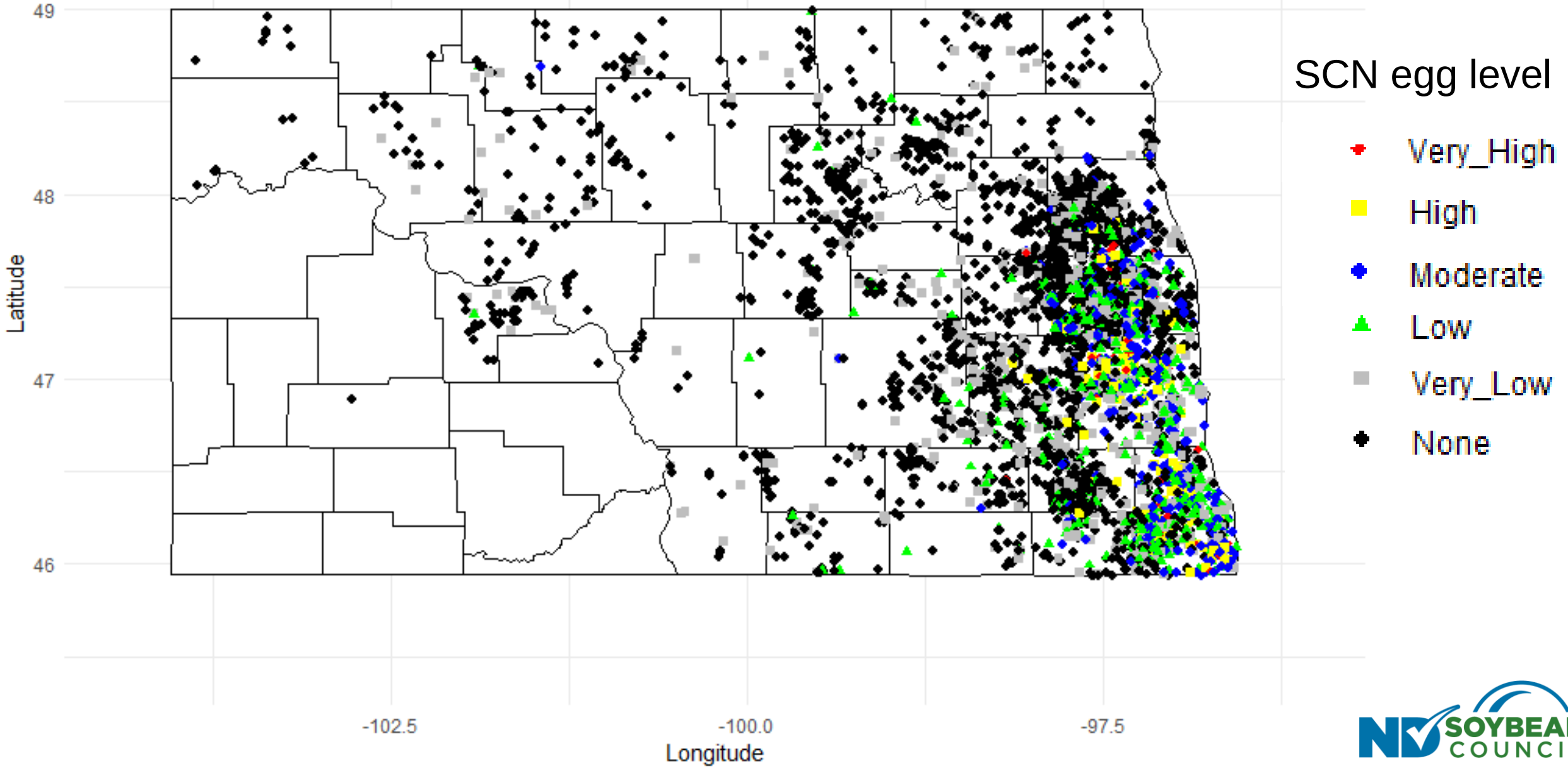
Photos: G. Yan

Soybean Cyst Nematode

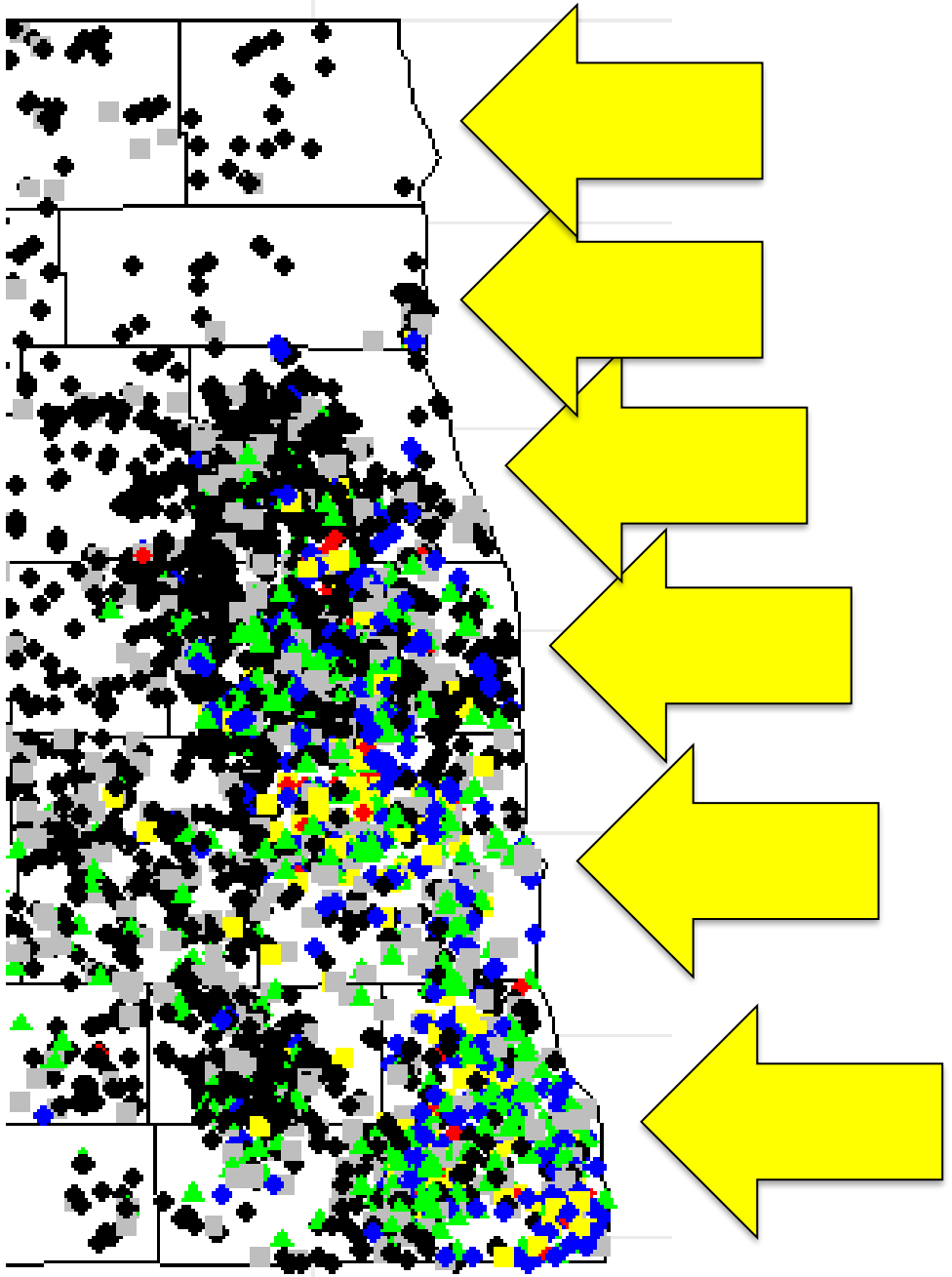
- Parasitic worm (*Heterodera glycines*)
- Infects soybean and dry bean
- Invasive, and actively expanding
- Soil borne (*moves by anything that moves soil*)
- Is favored by high pH, warm weather and dry conditions
- You don’t have above ground symptoms until its bad

NDSC-NDSU SCN Sampling 2013-2024



Courtesy: Wade Webster

NDSC-NDSU SCN Sampling 2013-2024



SCN egg level

- Very_High
- High
- Moderate
- Low
- Very_Low
- None

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Manage SCN

- Sample
  - Sample near harvest
  - Focus on likely areas (field entrance, shelter belt, etc.)
  - 6-8 inches deep and aim for the roots
- Manage SCN
  - Crop rotation, resistance (?), seed treatments (?)

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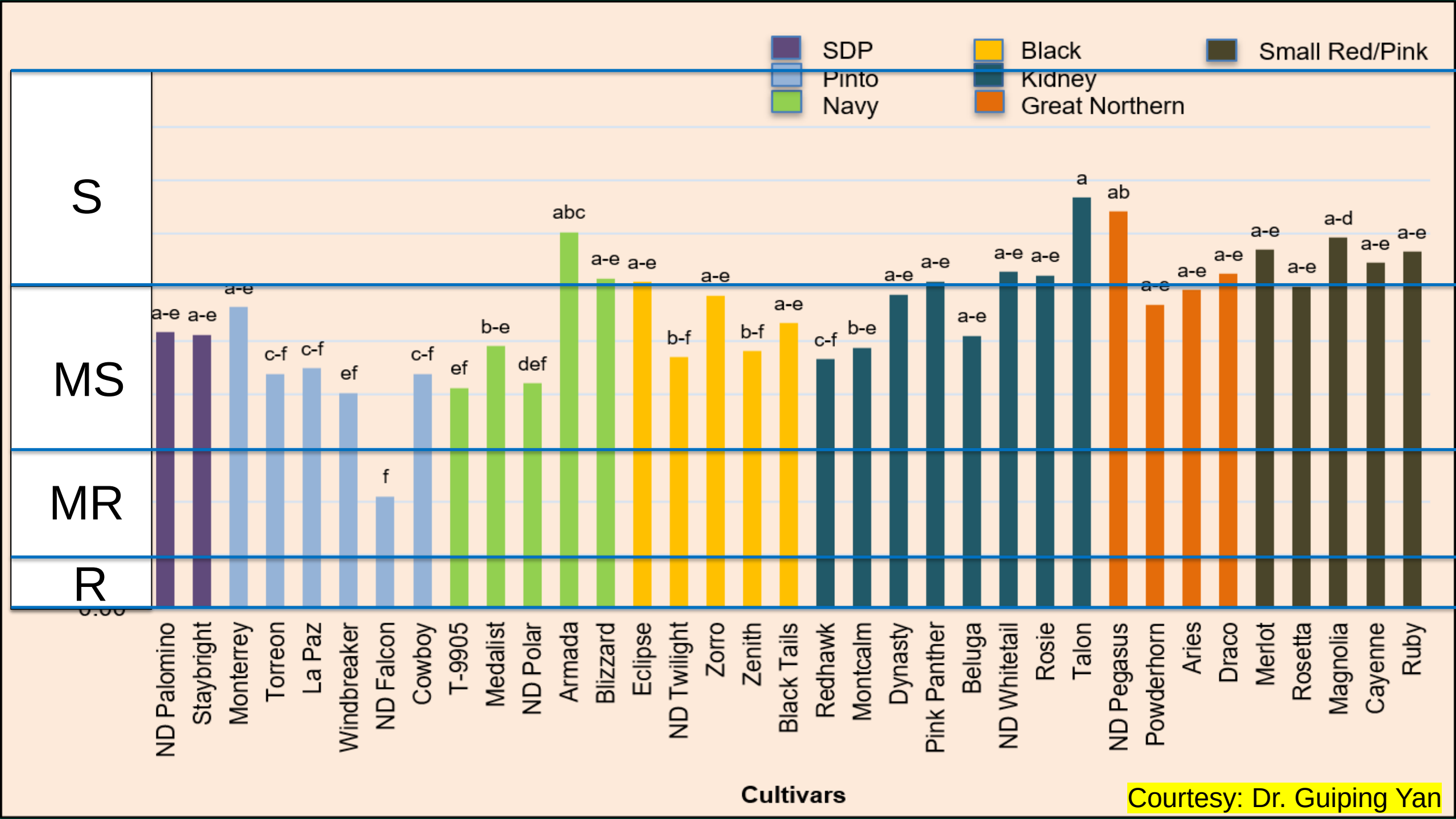


Courtesy: Dr. Guiping Yan

What the Hail!?!?!?

- North Dakota Specialty Crop Block Grant + Northarvest Bean Growers Association
- Many objectives
  - Relationship between hail, disease, yield
  - Common blight management
  - Hail and plant health

Common Bacterial Blight

- Bacterial pathogen
- Seed and residue borne
- Needs wounding and water
- Difficult to manage
  - New varieties may have some MR
  - Limited success with chemical trials

Common Bacteria Blight (CBB)

Pinto & Slow Dark Pinto

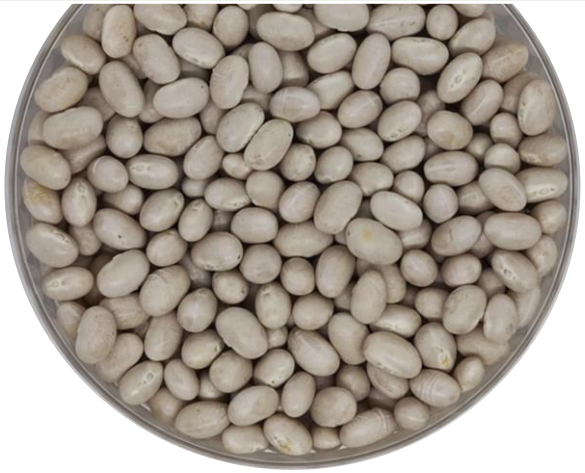
Variety	CBB (1 to 9 score)
ND Rodeo	4
ND Palomino	8
ND Falcon	4
Vibrant	6
La Paz	6
Monterrey	7

Black

Variety	CBB (1 to 9 score)
ND Twilight	4
Eclipse	7
Loreto	6
Zorro	6
Zenith	7

Navy

Variety	CBB (1 to 9 score)
ND Polar	4
Blizzard	5
HMS Medalist	6
T9905	5

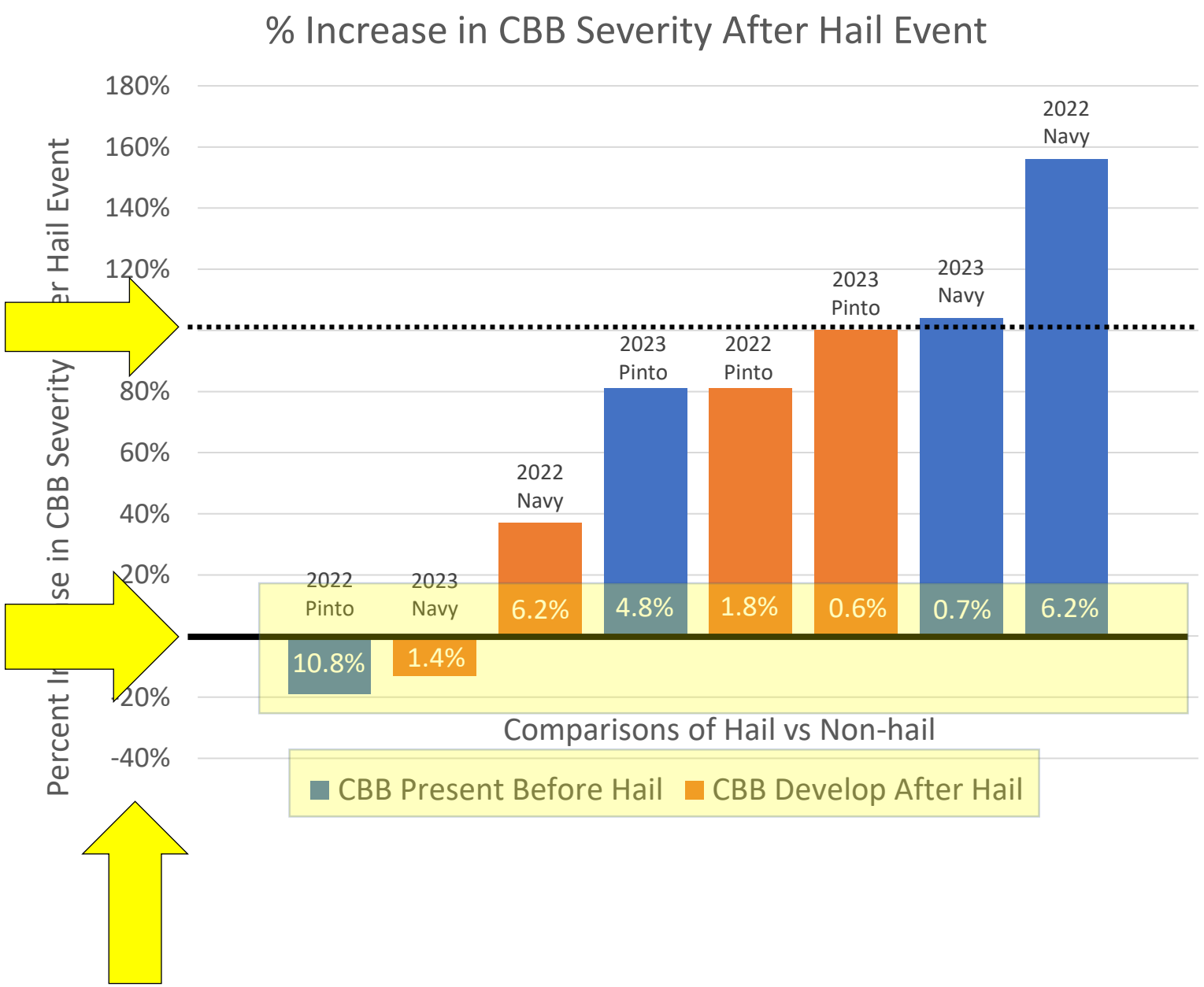


Common Bacterial Blight (*Xanthomonas axonopodis* pv. *phaseoli*) CIAT scale: 1-3=Resistant, 4-6=Intermediate, and 7-9=Susceptible.

Courtesy: Dr. Juan Osorno

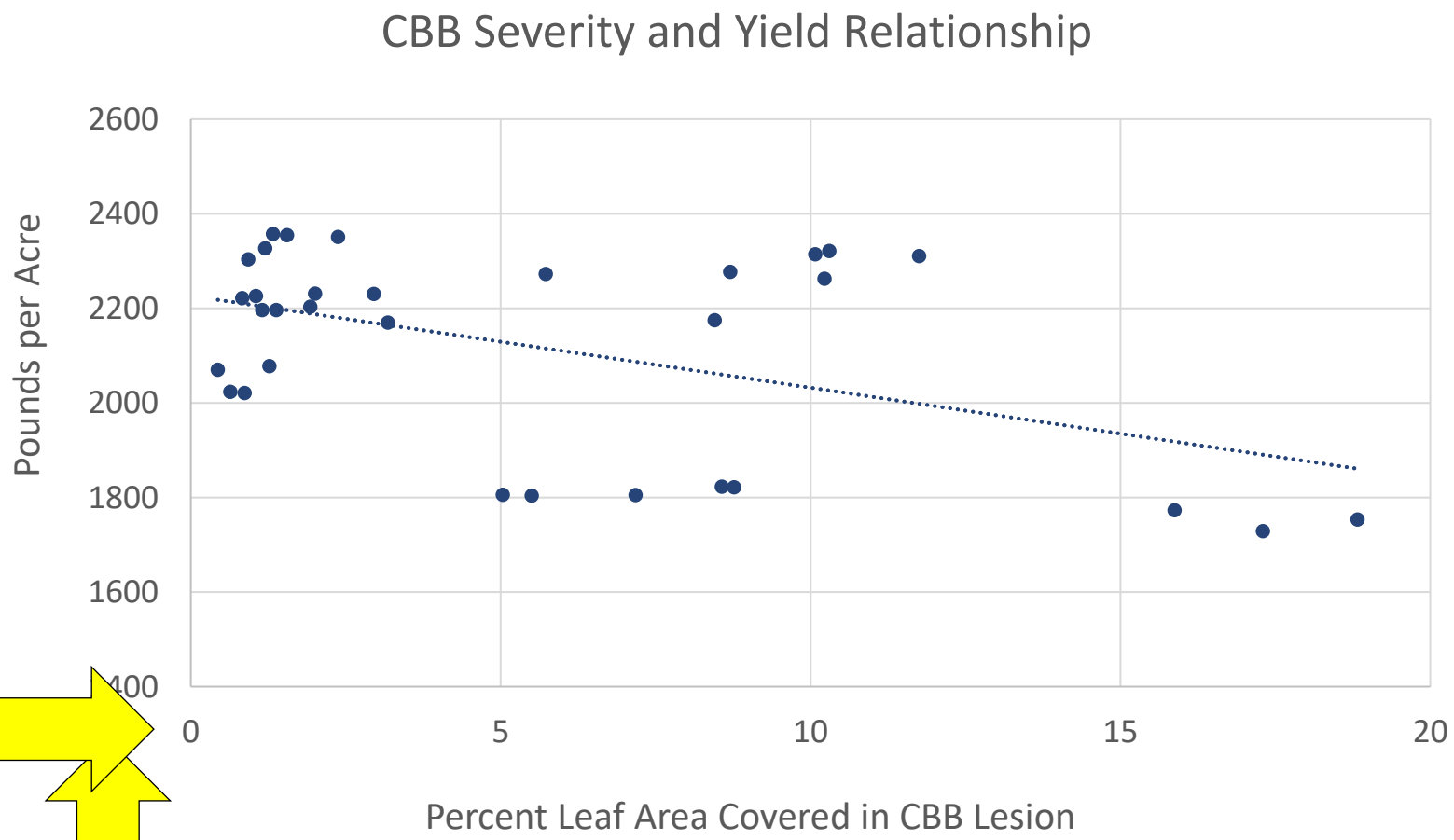

SAILING
ABOARD
THE
ADERSHIP

Increase in CBB after Hail?



- Objectives of the trials were to evaluate the effect a hail event has on disease development and determine if this effect differed whether or not disease was already present pre-hail or developed post-hail.
- Experiments conducted over multiple locations, years with multiple varieties.
- Navy bean used was ND Polar
- Pinto bean used was ND Falcon
- Timeline
  - Inoculated with the pathogen twice:
  - Early inoculation occurred 5-10 days before hail event.
  - Hail event occurred around R1-R2.
  - Product applications occurred 1-3 days after hail event.
  - Late inoculation occurred 2-5 days after hail event.
  - Ratings occurred about 2 weeks after hail event.
- Each bar indicates the % increase in severity from hail by using… $\frac{Avg.Sev\ of\ Hailed - Avg.Sev.of\ Nonhailed}{Avg.Sev\ of\ Nonhailed}$
- Blue bars indicate disease was present before hail event occurred
- Orange bars indicate disease started developing after the hail event occurred.
- 0% indicates no difference in severity between hail/no-hail treatments; 100% indicates twice as much severity in hailed treatment vs. non-hailed treatment. Numbers in bars indicate the baseline CBB Severity.
- Note: General increase in disease after hail event.
- Note: Pattern does not appear dependent on market class/year/disease intensity

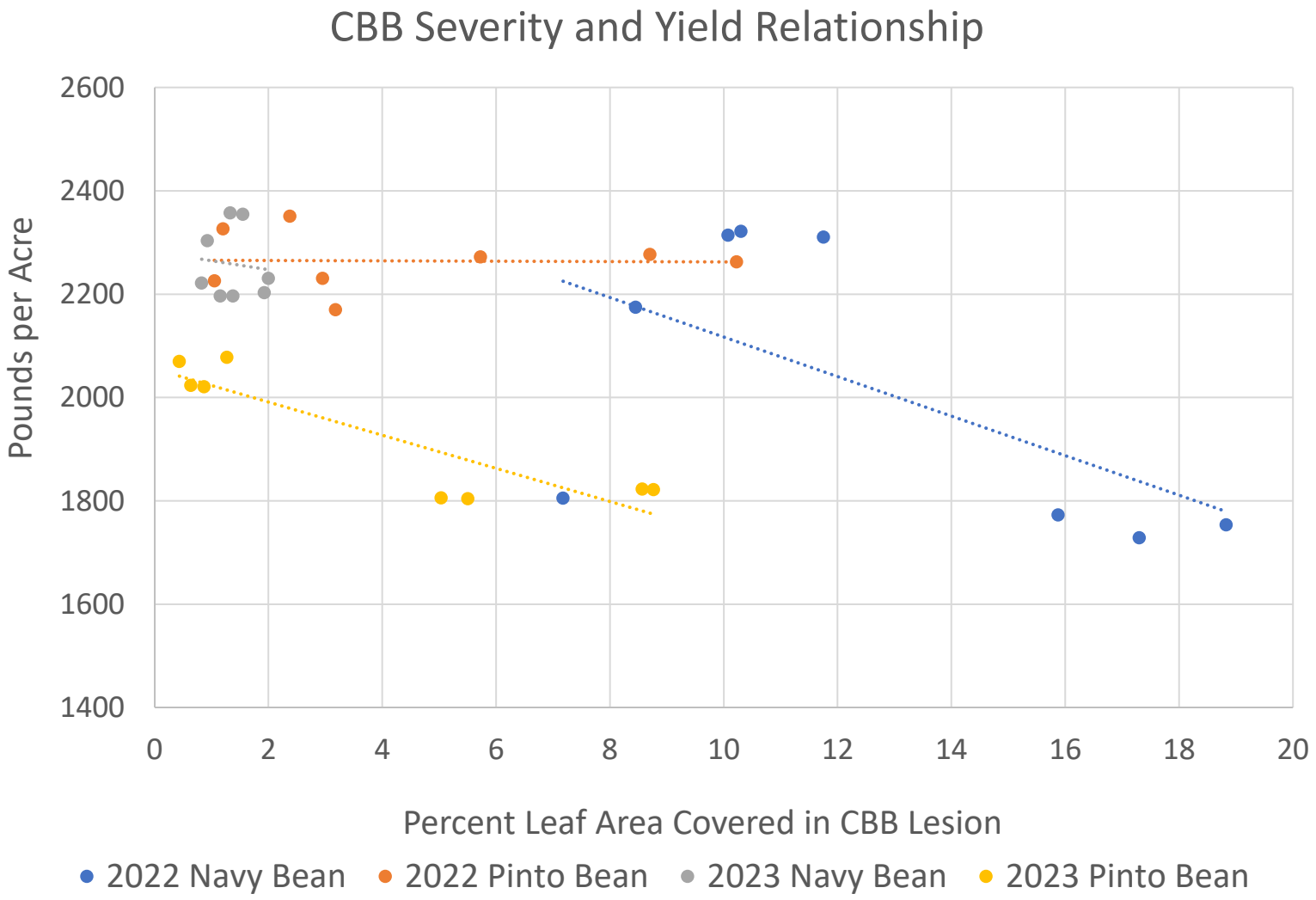
Are we able to predict yield loss?



= 0.23 (CBB Severity alone explains 23% of the variation in the data.)
Indicates a loss of 19lbs per unit increase of CBB severity

- The objective was to relate percent leaf area with CBB (severity) to yield loss across environments and market classes.
- Four pathogen inoculated trials
- Each data point represents the average severity and yield of four observations
- Note: Some negative trendlines, but not all.

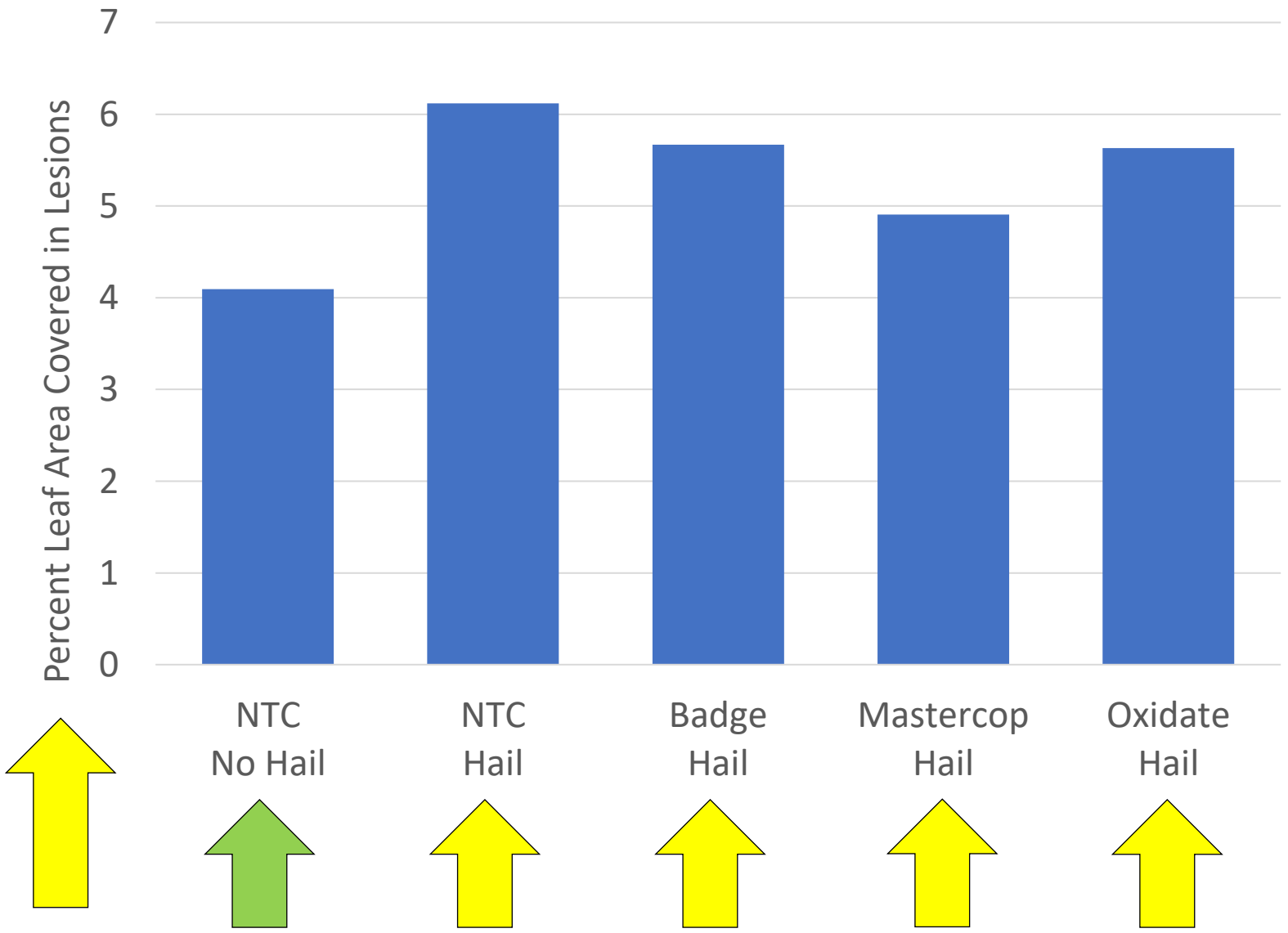
Are we able to predict yield loss?



R^2 = 0.68 (CBB Severity and Trial explain 68% of the variation in the data).

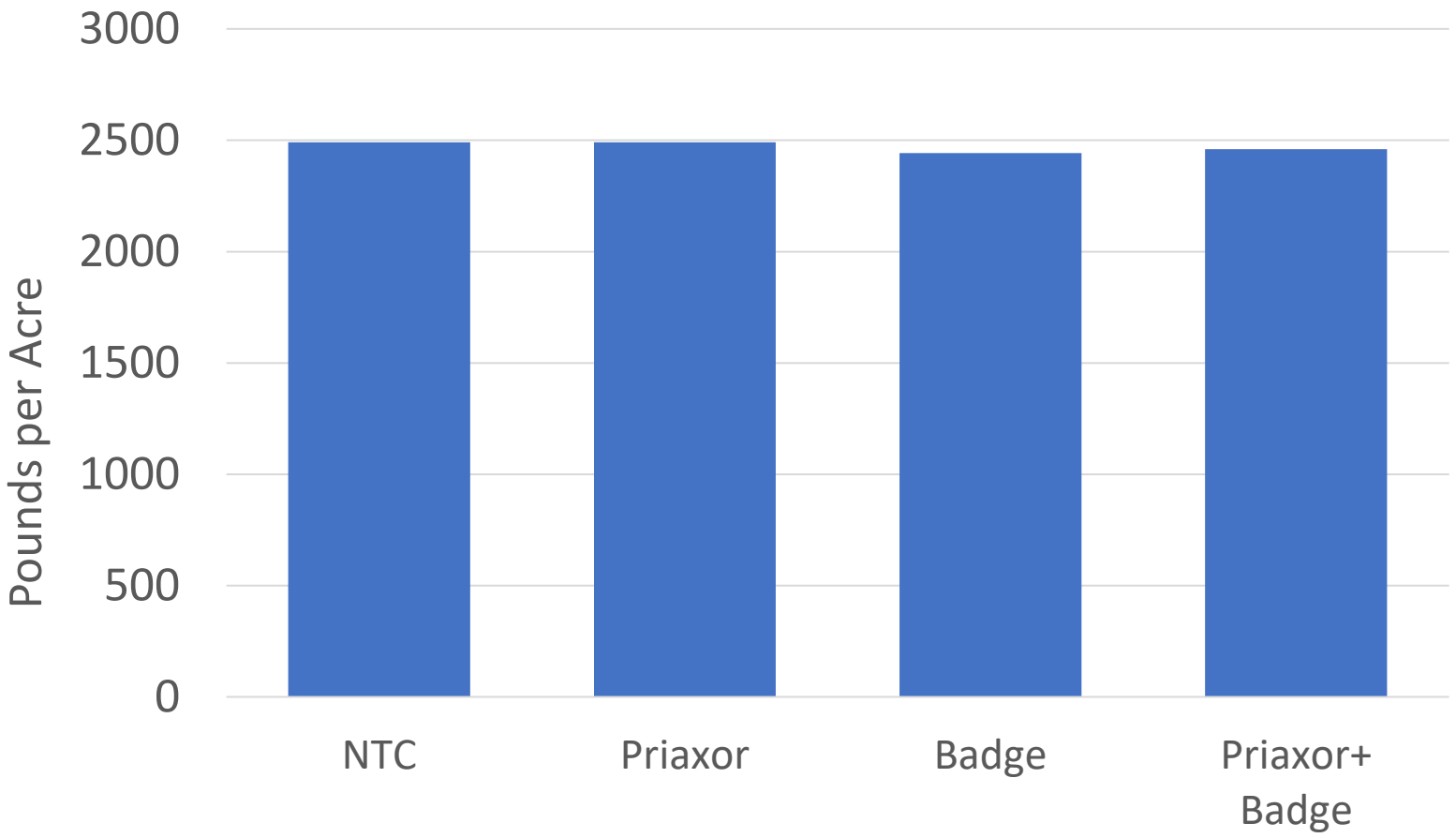
- The objective was to relate percent leaf area with CBB (severity) to yield loss across environments and market classes.
- Four pathogen inoculated trials. Each trial is grouped by a specific color.
- Each data point represents the average severity and yield of four observations
- Note: Some negative trendlines, but not all.

Chemical benefit with hail and CBB'?



- Four trials combined; 2022 Fargo Navy, 2022 Fargo Pinto, 2023 Fargo Navy, 2023 Fargo Pinto
  - Pinto = ND Falcon
  - Navy = ND Polar
- Synthetic hail application around flowering (excluding one treatment)
- Trial was inoculated with the Common Bacterial Blight pathogen
- Each bar represents 32 observations (4 trials * 8 reps)
- No significant differences were observed between treatments; **p=0.7115** (PROC GLIMMIX; SAS)

Chemical benefit with ‘no-disease’?



- The project objective was to test products in a hail-stressed environment, in the absence of disease.
- Eight trials combined; two market classes (Navy/Pinto), two years (2022/2023), two locations (Fargo/Davenport)
- Three product treatments and a non-treated control either received a synthetic hail application or no hail application.
- A yield reduction was observed from the hailing, however an interaction was not observed between the hail and product application, hence the hail/no-hail data were combined.
- Each bar represents 64 observations (8 trials * 8 reps)
- No significant differences were observed between products; **p=0.4780** (PROC GLIMMIX; SAS)

What the Hail!?!?

- Hail, in general (but not always), will increase disease (and it can be dramatic)
- Yield loss might be predictable by severity increases
  - But, not necessarily broadly
- We observed no yield benefit to chemicals in our trials
  - With CBB
  - In ‘absence’ of disease
- Quite likely greater effect with susceptible varieties

Take home messages

- Rust
  - Scout. Excellent Fungicides
- SCN
  - Continues to spread
  - Varieties vary in dry bean ‘resistance’
- Common Bacteria Blight
  - Difficult to manage

Thank You!

- Bryan Hansen, Jessica Halvorson, Wade Webster, Gabe Lakoduk, Rick Hatchett, Chris Becker, growers, partners
- Northarvest Bean Growers Association
- North Dakota Specialty Crop Block Grant Program
- Alicia, Angie, Jeff, and the ACAW committee

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