Cultivating Confidence: Ensuring Reliable Data

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NDSU | EXTENSION

Tuber Transformer

- Guaranteed to increase tuber set
- Healthier plant
- Faster row closure
- Greener plants
- Uses more sunlight

Tuber Transformer

- Faster row closure
- Improved plant growth
- Washington, USA

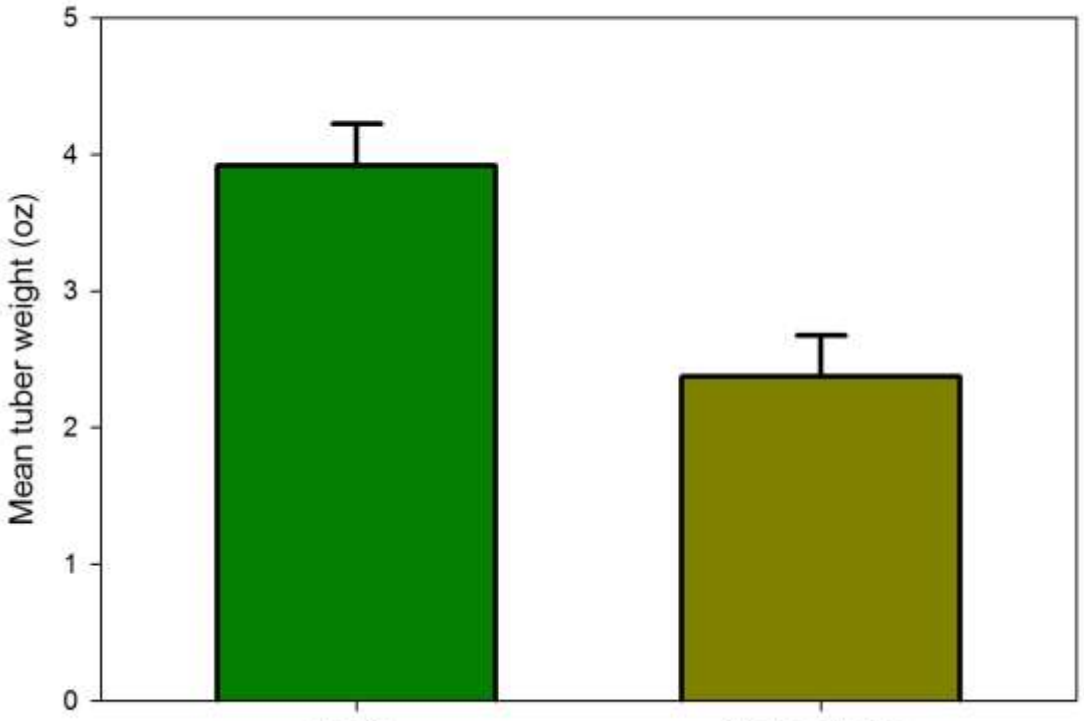
Tuber Transformer

- Taller plants
- Increased vegetative growth
- 25 cm taller on left

Tuber Transformer

Would you buy this product?

- How do you make decisions?
- Why would you use it?
- What data is used?
- How do you determine the ROI?



Probability

- What is the chance of rolling a 4 and 2 with two dice?
- The probability of rolling a 4 is $\frac{1}{6}$
- With two dice this changes to $\frac{1}{6}\ x\ \frac{1}{6} = \frac{1}{36}$

Statistics

- P-value = probability
- P-value of 0.05 indicates result 19/20 times
- P-value of 0.10 indicates result 9/10 times
- How frequently do you want the desired result?

Wins vs. Losses

- If something is better than the check, does it provide value to your farm?

WSU study

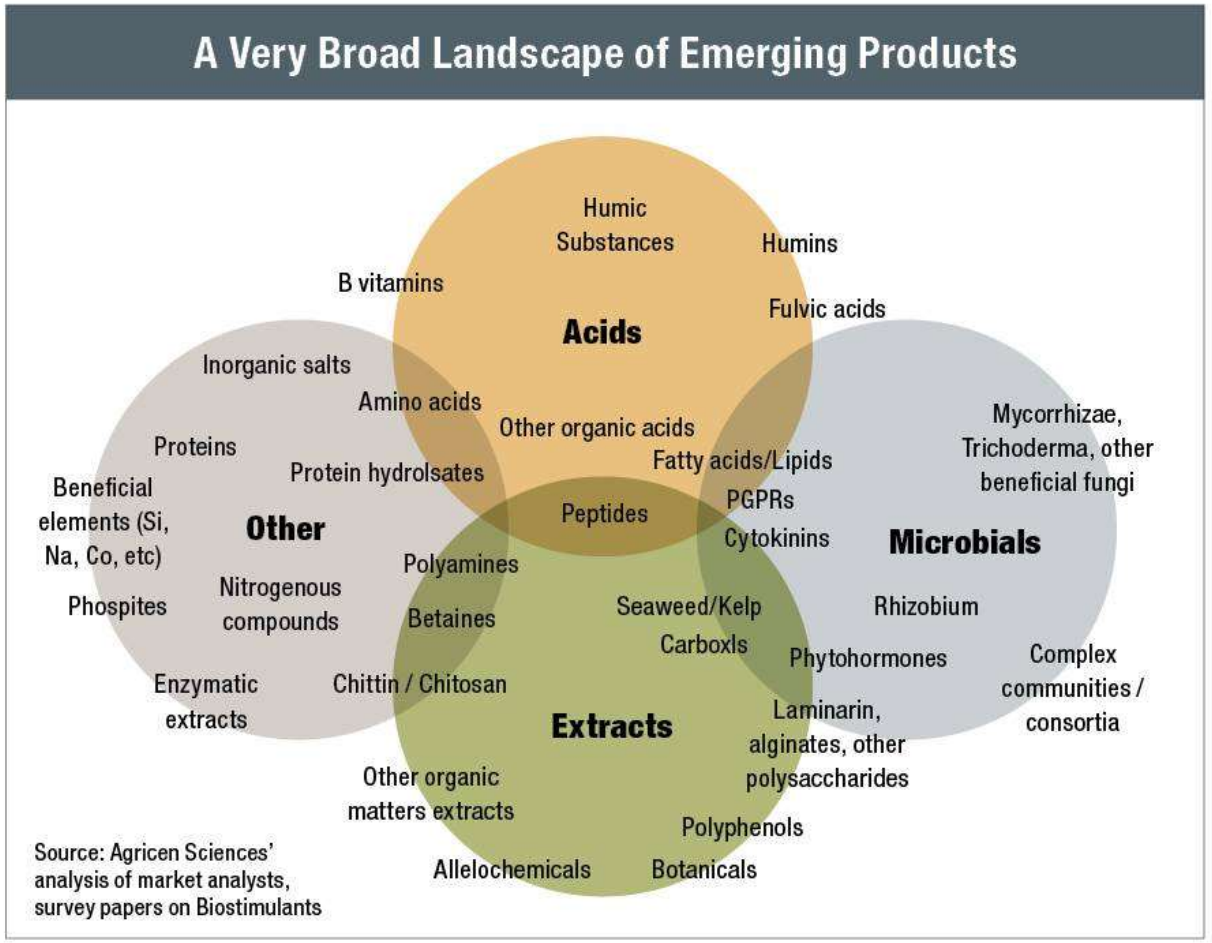
- Tested 32 products
- 3 products showed an improvement in:
  - US No. 1 yield
  - Average tuber weight
  - Specific gravity
- No improvement in adjusted gross income.

(Thurgood et al, 2022)

What is a biostimulant?

Definition

A plant biostimulant is any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrients content.



What is a biostimulant?

Common types

- Amino acids
- Microbials
- Humic acid
- Fulvic acid
- Seaweed extract
- Many more!

How are biologicals different from traditional chemistry?

- No EPA registration. Removes financial costs (registration), risk, time, and many barriers to entry.
- No efficacy data required.
- Many companies and products are new to the industry.
- Lack of regulation = questionable products
- Benefits and consistency???

EPA registration

Required

- Herbicides
- Insecticides
- Fungicides
- Plant growth regulators
- Fumigants

Not required

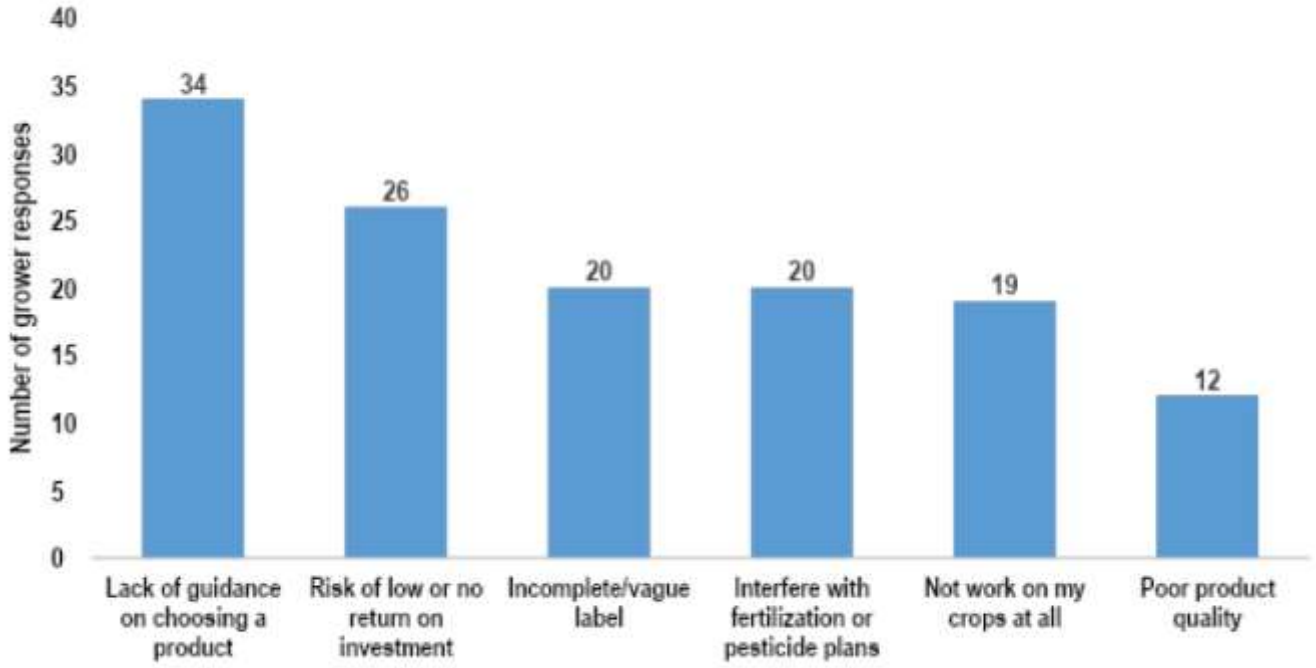
- Fertilizers (state registration)
- Biologicals or biostimulant

Biologicals

- Will have thousands in coming years
- High quantity = less 3rd party research
- Do you want to farm, or become a research facility?
  - Big learning curve for many & too many products and ideas to test
- Decide how you will handle biologicals.
- Yield improvements are small, but could have high ROI

Approach too broad with expectations too high

- Confusion
- Unreliable data
- Inconsistent results
- Vague label language
- Poor product quality



https://progressivecrop.com/2021/03/vegetable-growers-express-impressions-concerns-and-hope-for-crop-biostimulants/

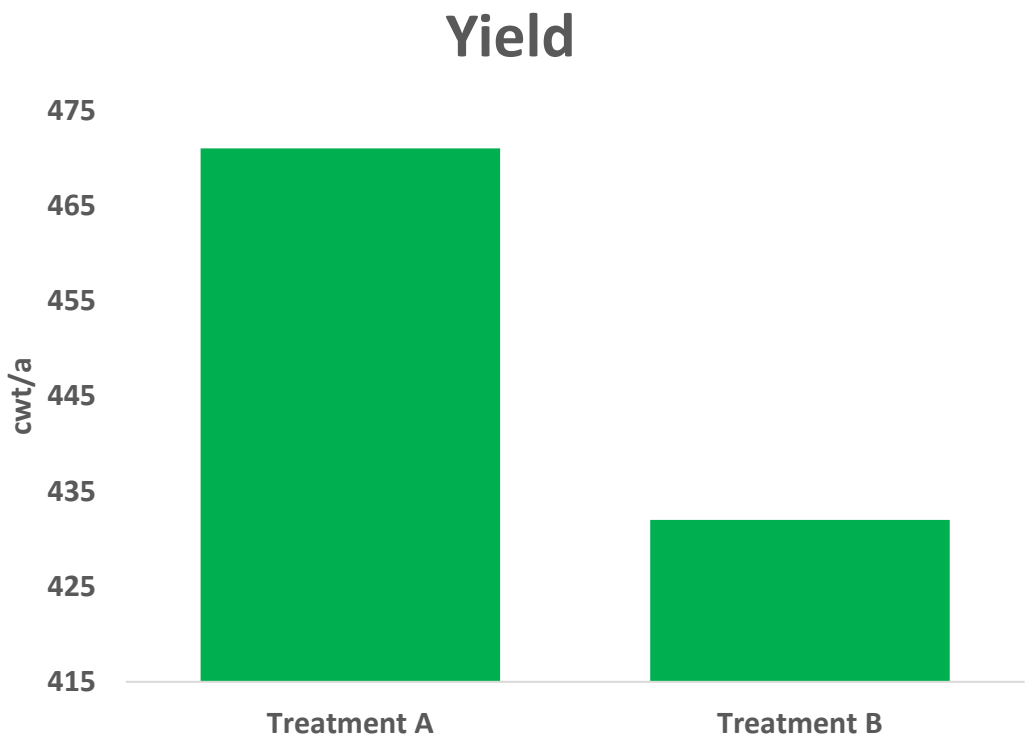
Considerations

- Ensure the product matches the need.
  - Be skeptical of products that are put on any time or any rate.
- Ask for ALL the data. Cooperate with others and share data.
- Lots of reps, careful evaluation

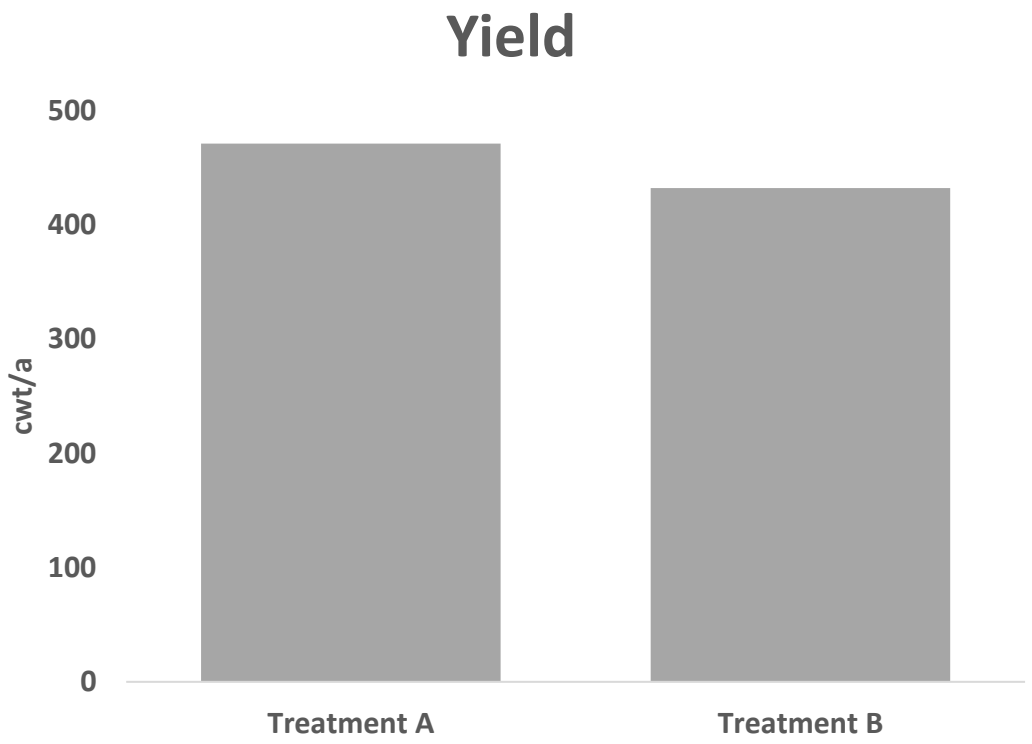
Photographs don’t count as data

Graphing data – which product would you buy?

Product A

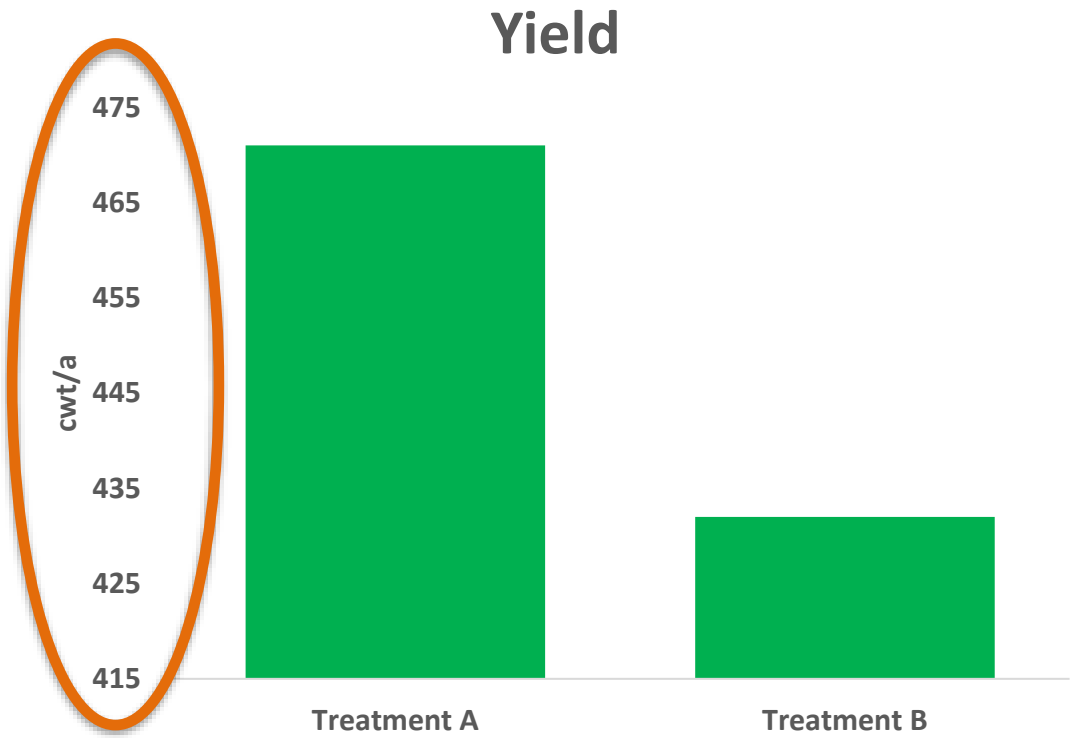


Product B

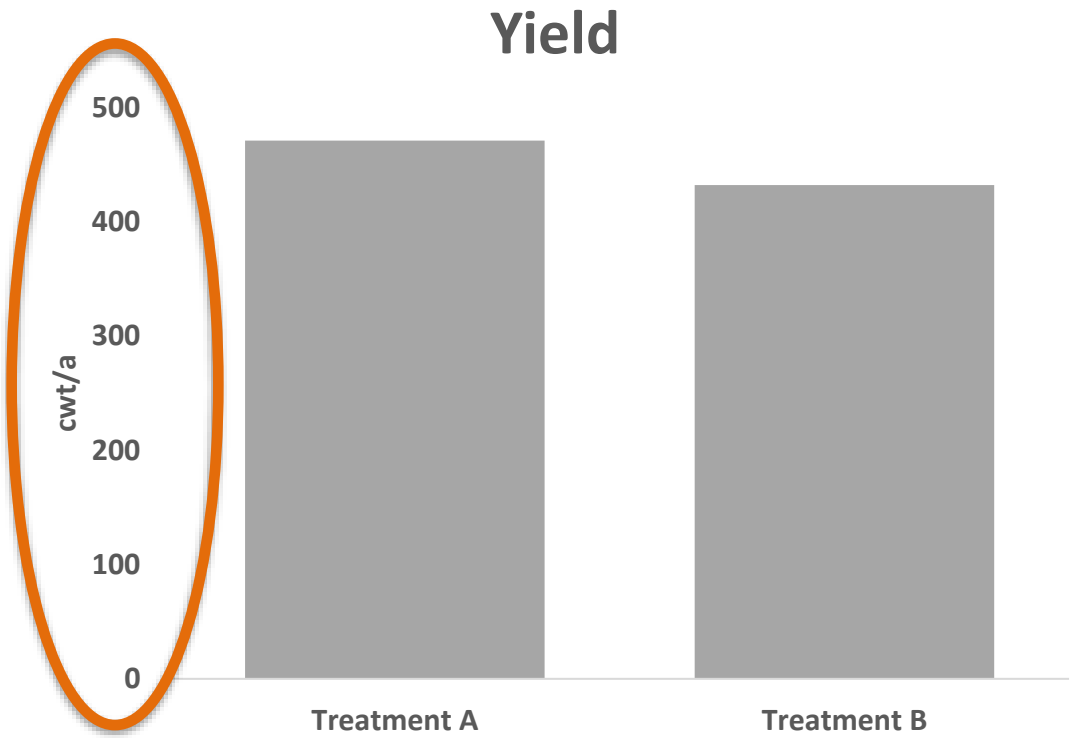


Graphing data – look at axis values

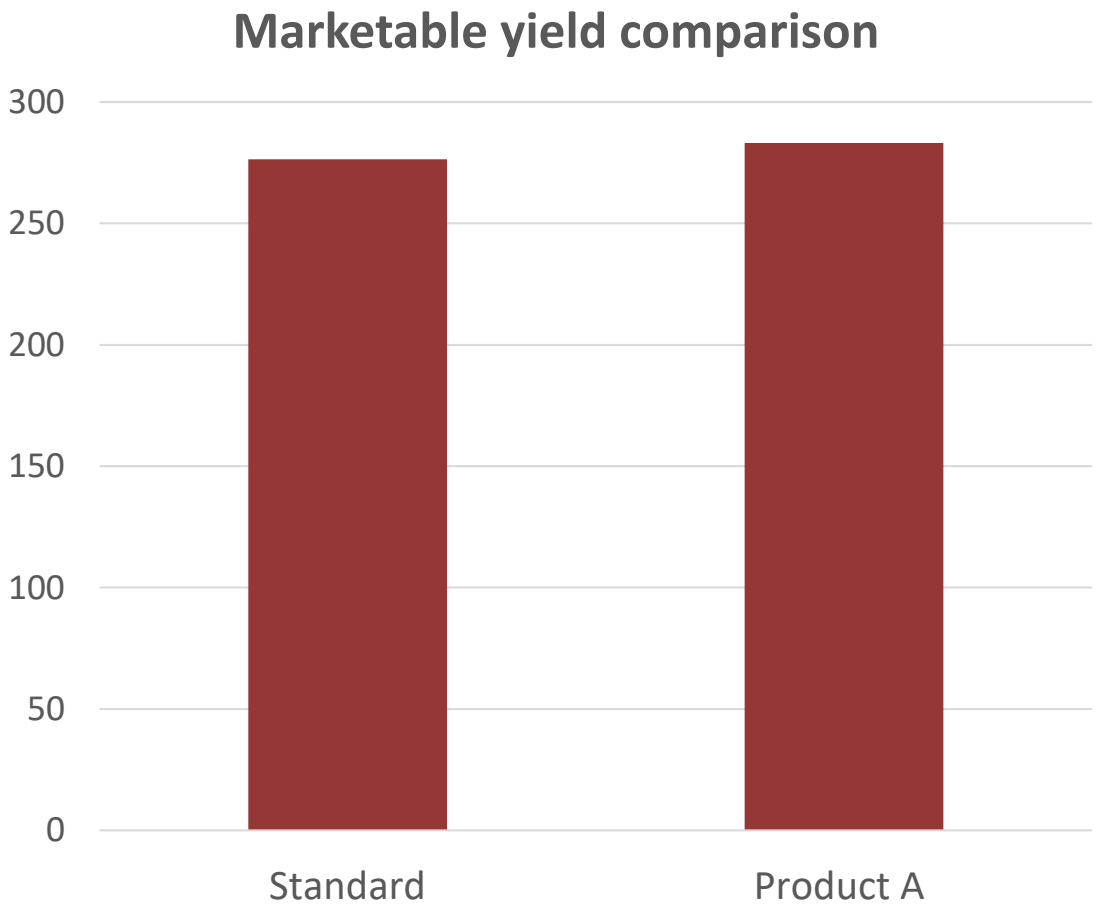
Product A

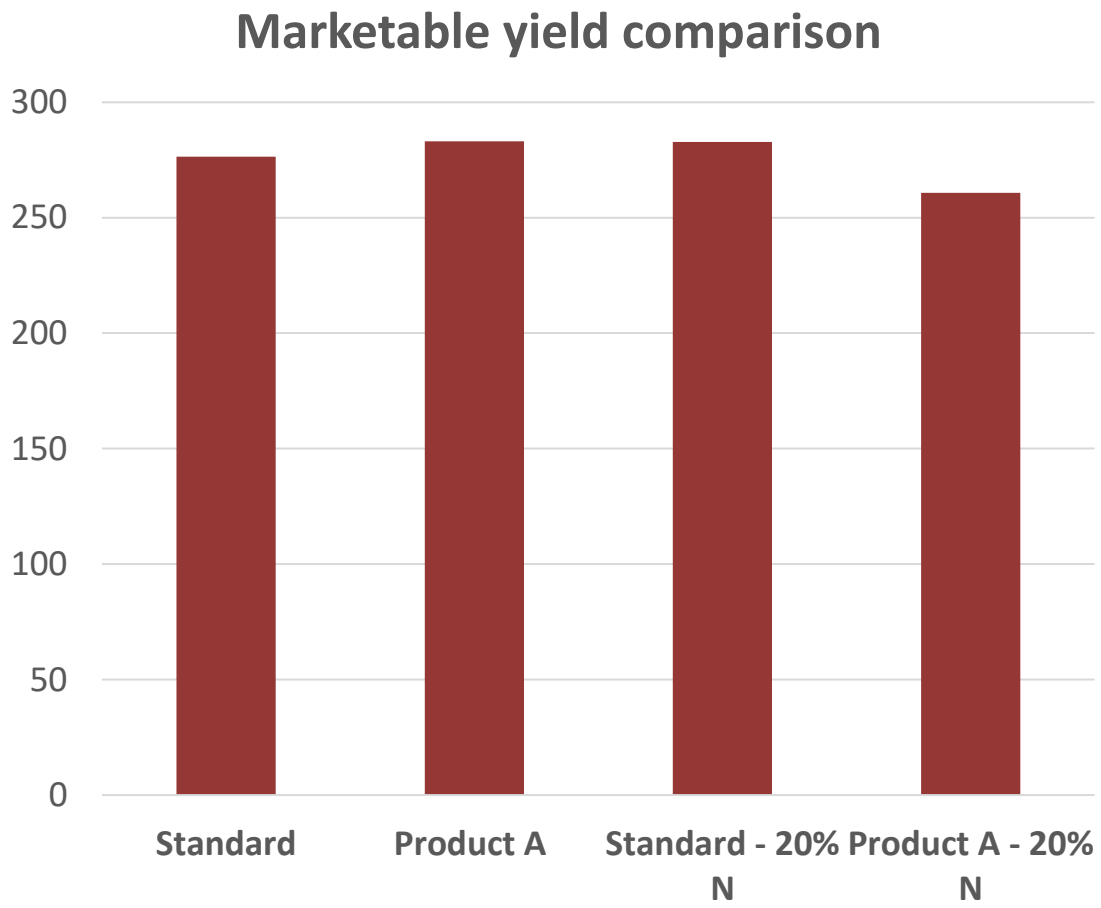


Product B



Field trial 2021



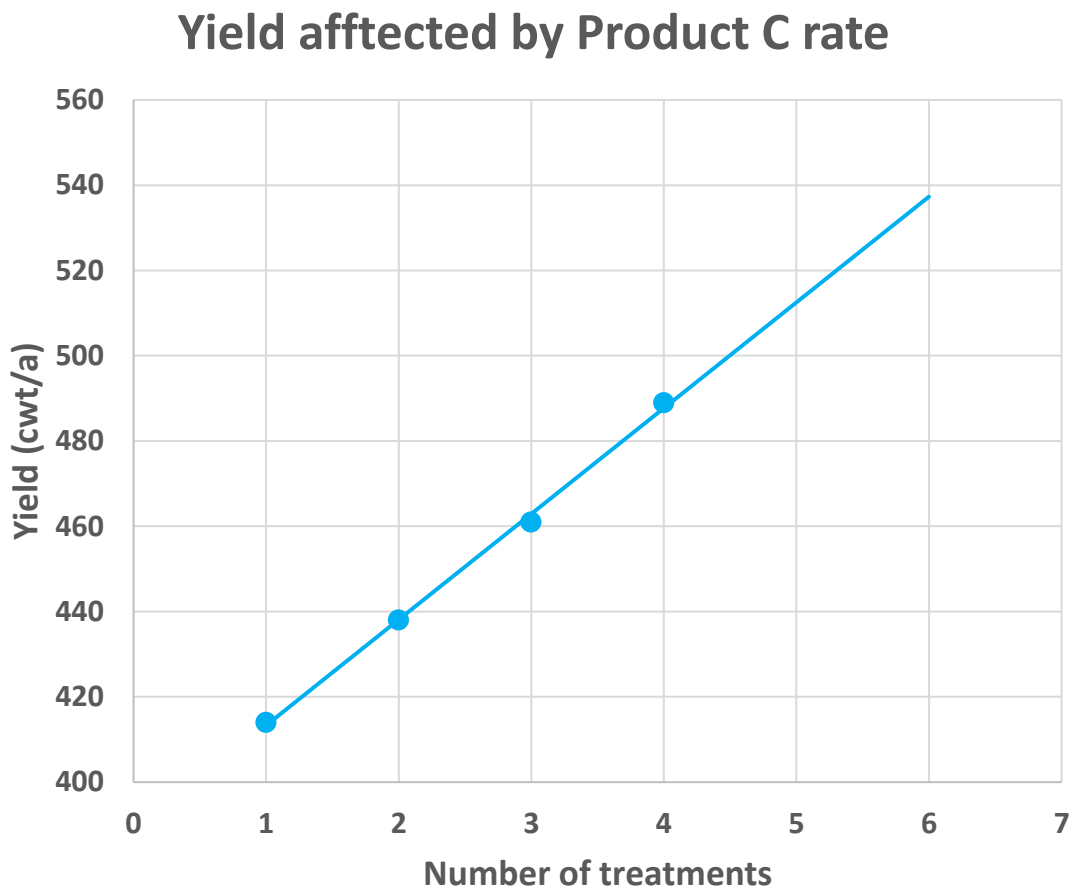


Testimonials

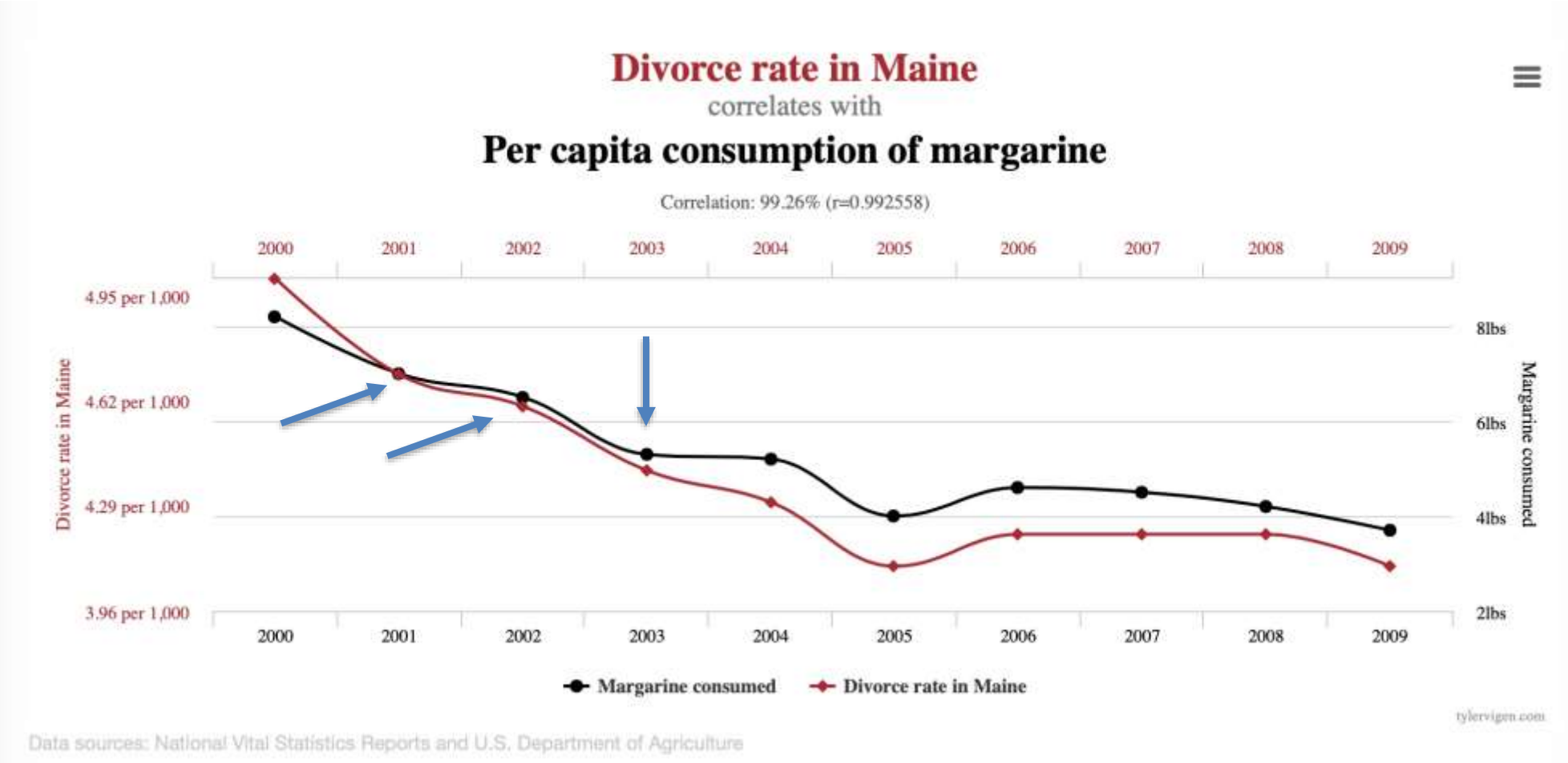
- “It has been tested by the _____”
- Are there results?
- Does it have a control or proper comparison?
- Anything that could influence the testimonial?
- Be wary of testimonials – are they only sharing the good ones?
- Check on testimonials

Data extrapolation beyond results

- Results apply to conditions similar to experiment
- 10% yield increase
  - 300 cwt = 330 cwt
  - 600 cwt = 660 cwt
- Data extrapolations



Arrows and correlations are not causation



Psychology of Sunk Cost

- The tendency to maintain an endeavor once an investment of time, money, or effort has been made.
  - Desire not to appear wasteful
  - Overly optimistic bias on probability of success
- “Too much invested to quit (or stop)”
- Just because somebody is doing something, it doesn’t mean it works.

(Arkes and Blumer, 1985, Organizational Behavior and Human Decision Processes 35:124-120)

Is it worth the money?

- Look at reputable data – does it support the claims?
- Be wary of testimonials & statements “It has been tested by ____”
- Photographs do not count as data!
- Be watchful of arrows & correlations.
- If no data are available, do your own testing.
  - Consult with a researcher to ensure your test is set up properly.
- If it’s too good to be true…

So you want to test products at your farm?

- Small plot testing

- Field scale testing
  - Split multiple fields
  - Strips in a field

Small plots in fields

- Reduced variability
- Less test product needed
- More time consuming
- Need specialized equipment
- Easier to find significance

Small plots in fields

- Even terrain
- Randomized treatments
- Within first tower
- Utilize field agronomy program

Field testing

- CHECK or CONTROL (a fair comparison)
- Understanding of differences in field
- Adequate replications
- Known area of measurements
- Standardized measurements
- Data analysis

Design

- Treatments (5)
  - Yellow area

- 1 = 0 % N
- 2 = 25 % N
- 3 = 50 % N
- 4 = 75 % N
- 5 = 100 % N (control)

Design

- Treatments (5)
  - Yellow area
- Replicates (6)
  - Blue area

Design

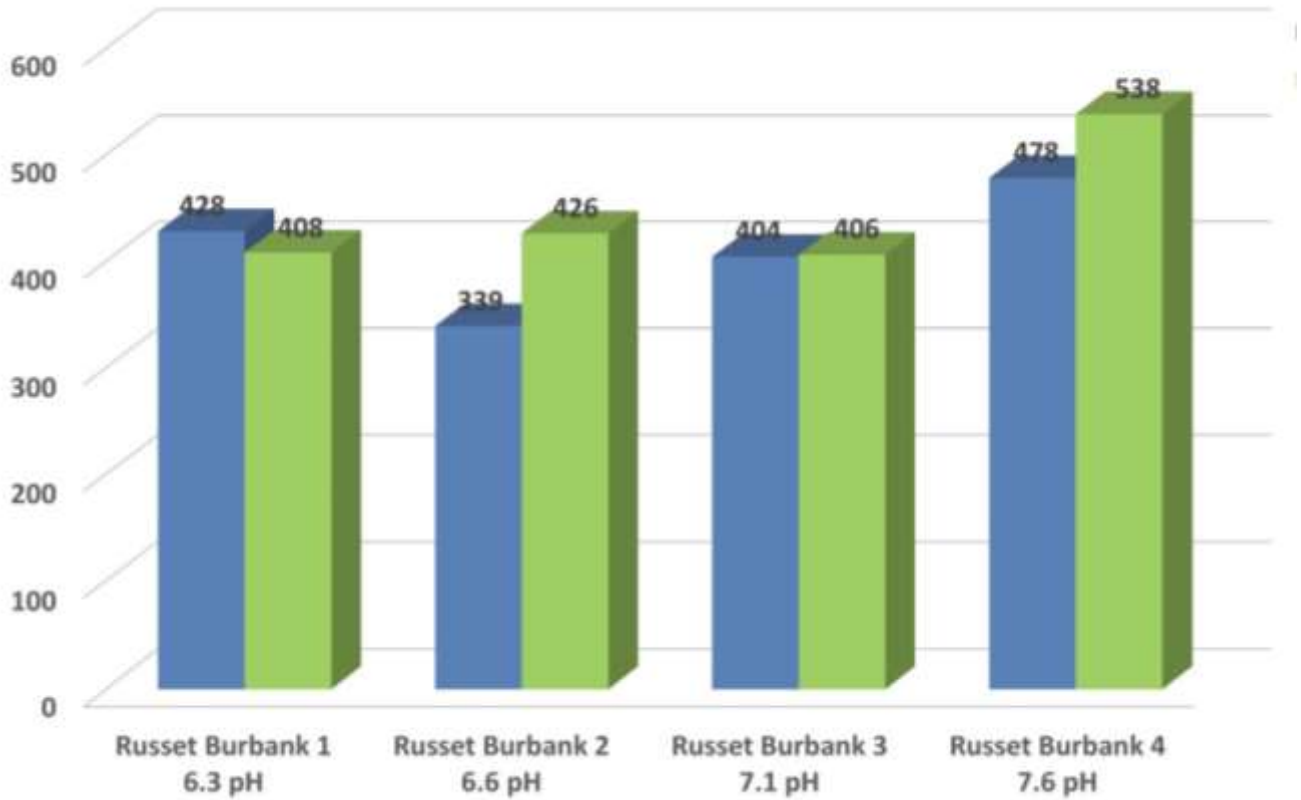
- 30 “plots” with data
- This can be analyzed
- Provide confidence with statistics

Measurement

- Determine size to sample
- More row feet = better data
- Sample
  - Dig by hand
  - Select and area from windrow
  - Weigh trucks

Data

- Multiple replicates you can look at averages
- Highs and lows
- What is consistently shown?



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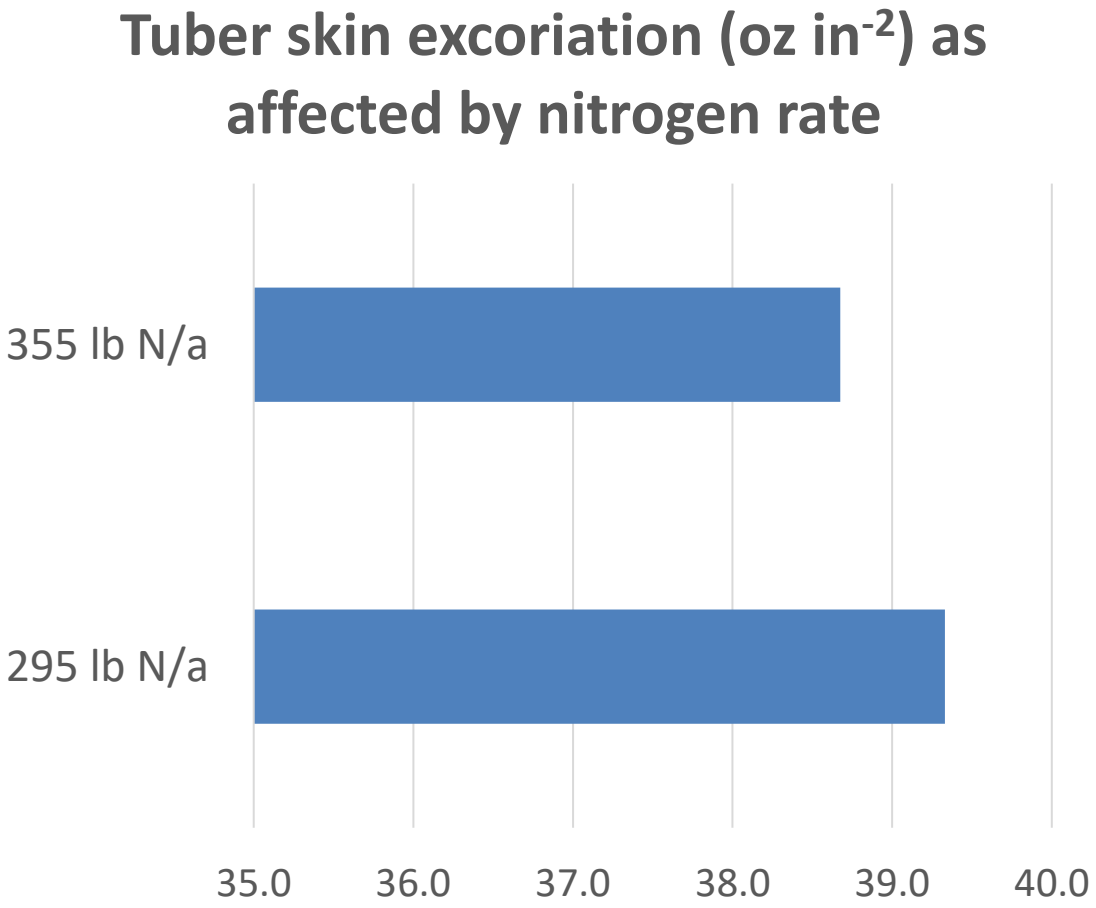
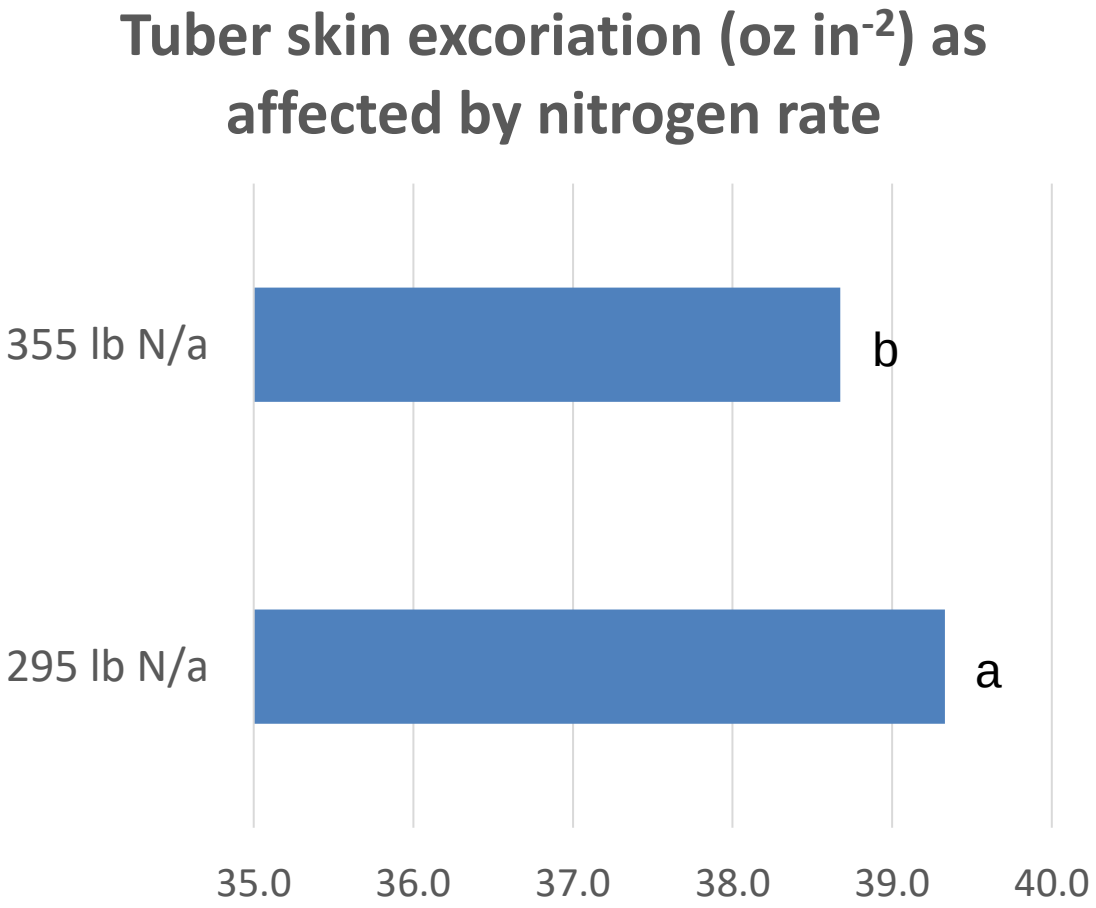
Nitrogen rate



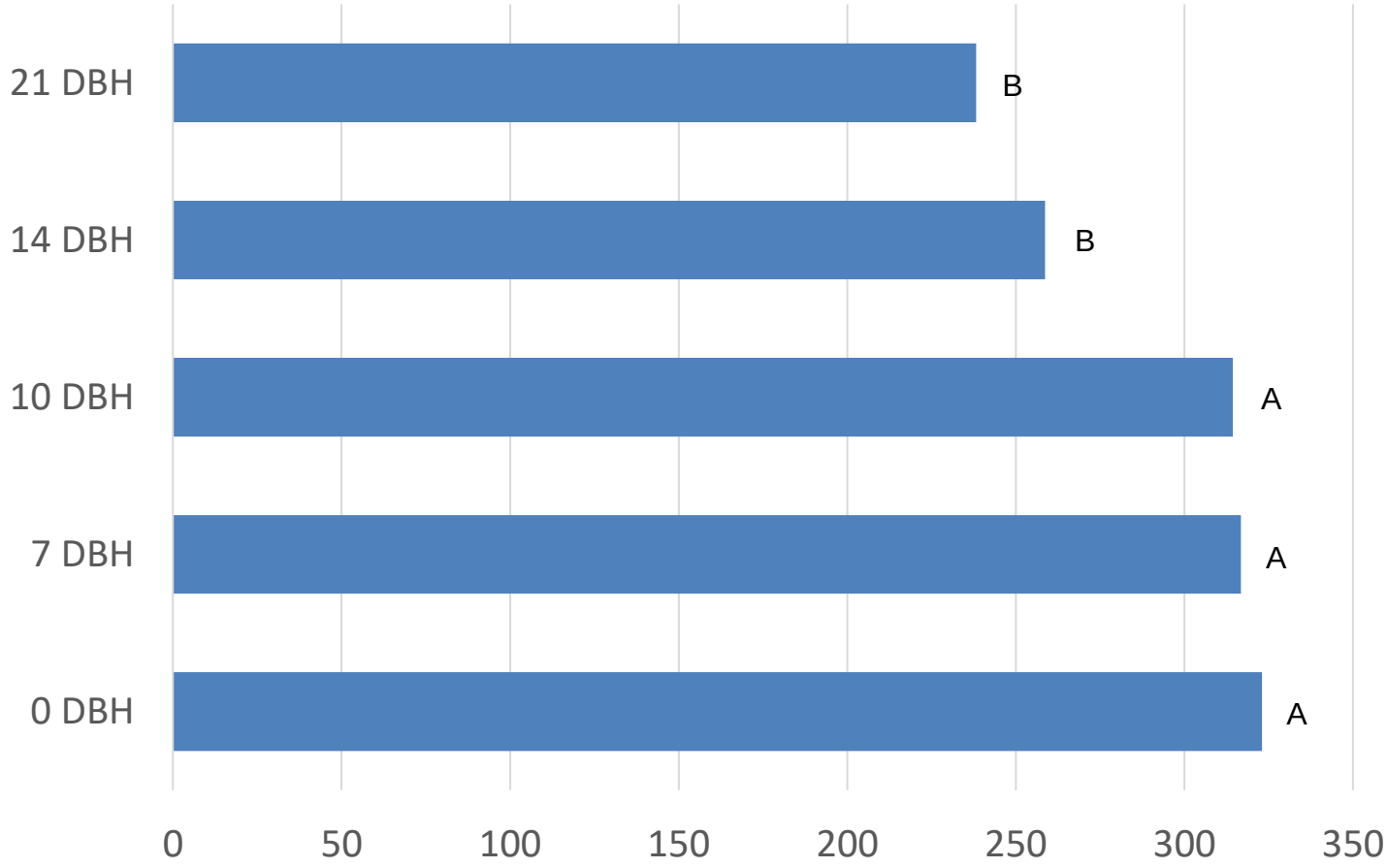
Nitrogen rate

- Higher nitrogen rate resulted weaker skin at p=0.05



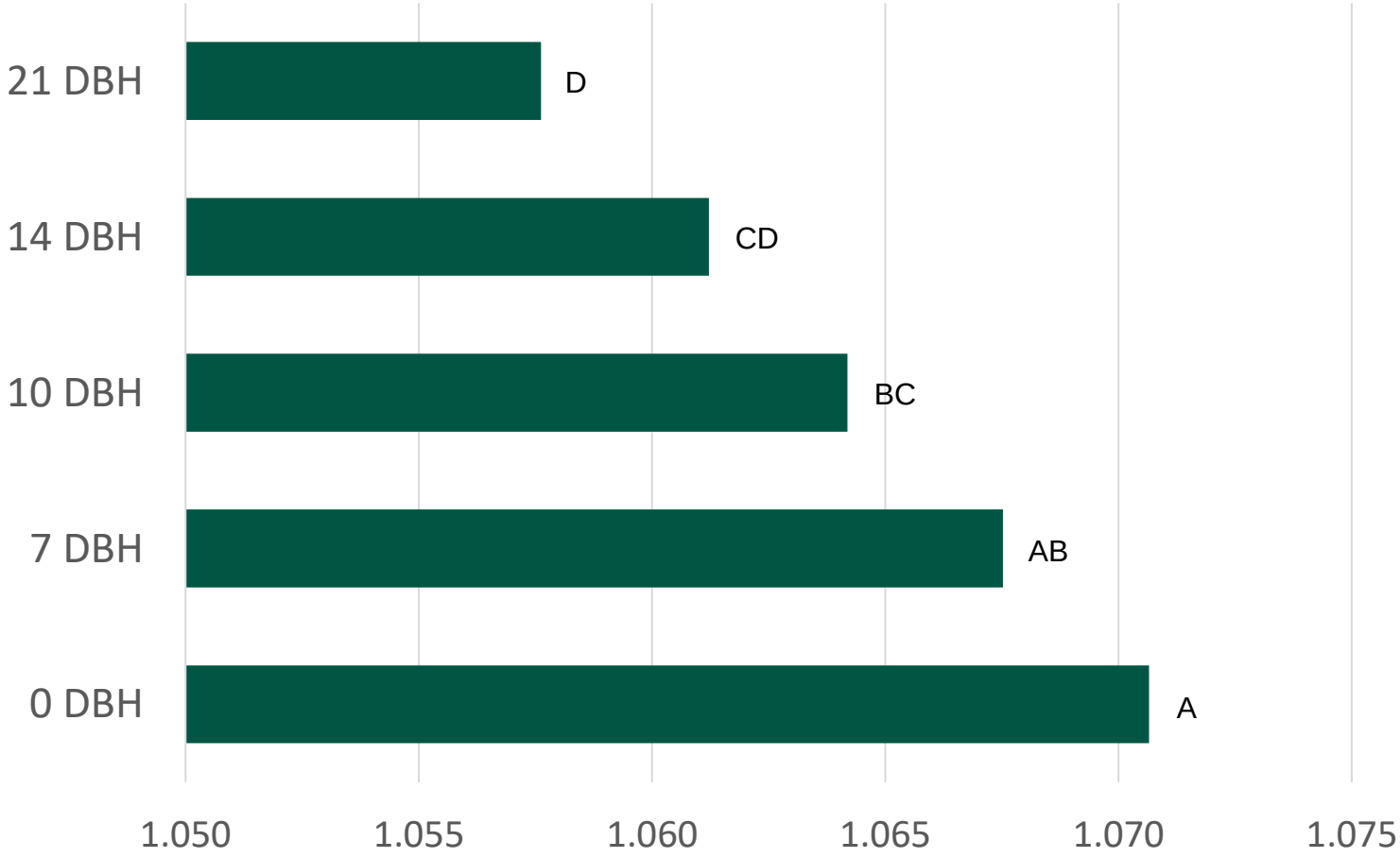
Marketable yield of Russet Burbank as affect by vine kill timing of days before harvest (DBH)

- Marketable yield decreased when vine kill occurred at 14 or 21 DBH at p=0.05

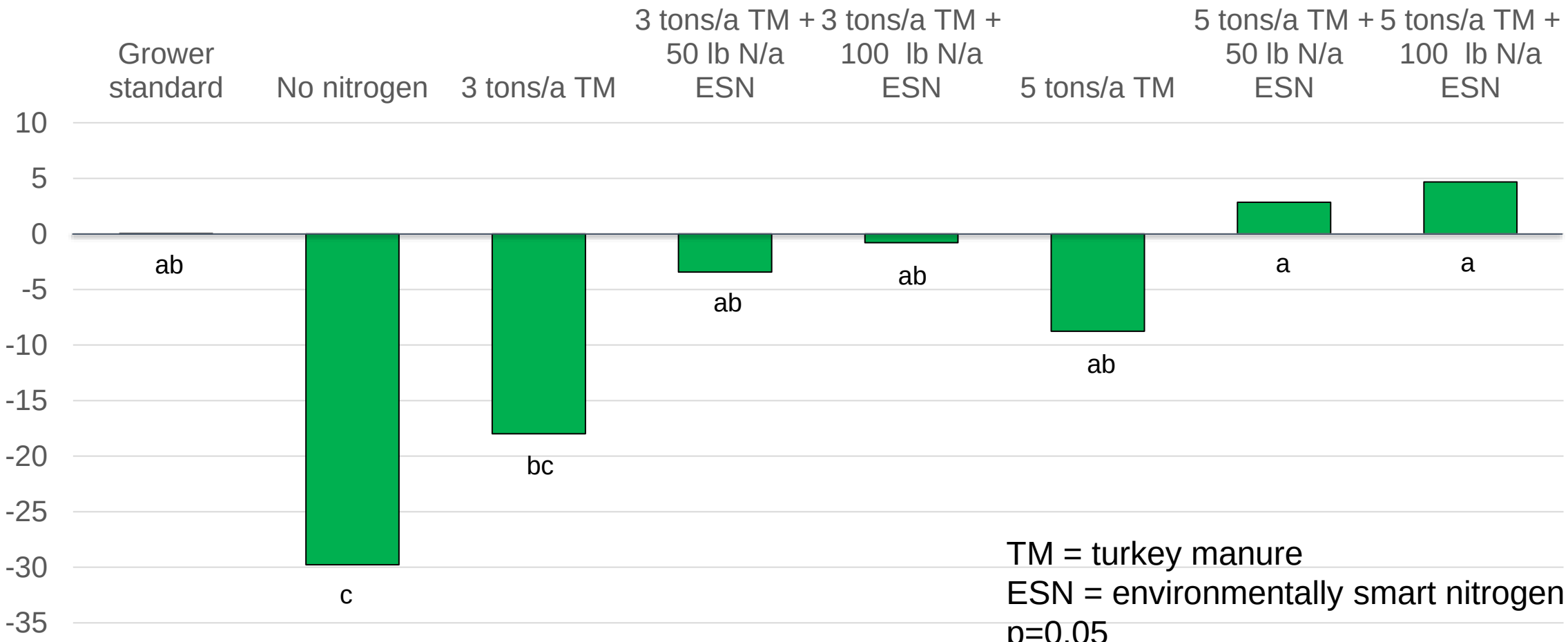


Specific gravity of Russet Burbank as affect by vine kill timing of days before harvest (DBH)

- SG was low.
- SG increased as vine kill was delayed at at p=0.05



Percent change from grower standard on Russet Burbank marketable yield 2021-2022



TM = turkey manure
ESN = environmentally smart nitrogen
p=0.05

How will you make decisions?

- What information do you need?
- How do you describe success?
- What changes can be made?

Questions?