

Provisional Recommendation

Hemp

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**INDUSTRIAL HEMP
PROGRAM**

Provisional Recommendation

Hemp

Fertilizer rates

	Target pH	lbs/acre/cropping season					
		N		P ₂ O ₅		K ₂ O	
		Rate	Evidence	Rate	Evidence	Rate	Evidence
<i>Fiber</i>							
300,000 plants/ac	6.25-7.5	50	Multi-year, multi-site unpublished trial	0-30	Multi-site, unpublished trial	50	Literature, Operations
750,000 plants/ac	6.25-7.5	150		0-30		100	
<i>Seed</i>							
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300,000 plants/ac	6.25-7.5	150		0-30		100	
<i>Flower</i>							
3,000 plants/ac	6.25-7.5	150	Multi-year, unpublished	0-30	Single-site, unpublished trial	50	Literature, Operations
15,000 plants/ac	6.25-7.5	150		0-30		100	



INDUSTRIAL HEMP PROGRAM

Definitions and Disclosures

Hemp (aka, Industrial Hemp)

- *Cannabis sativa* L.
- delta-9 Tetrahydrocannabinol < 0.3% per dry weight
- Multiple production systems = Flower, Fiber, Seed

UF IFAS
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Assessment of Non-Native Plants in Florida's Natural Areas

CENTRAL, NORTH, SOUTH

High Invasion Risk

Total score: 15

History of invasiveness

- ▶ Naturalised beyond native range (+1)
- ▶ Disturbance weed (+2)
- ▶ Environmental weed (+4)



Definitions and Disclosures

Flower



Fiber



Seed



Definitions and Disclosures

Flower



- Raised bed
- Transplanted
- 6,000-25,000 plants/ha
- 90-120 days
- Females without pollen
- Hand harvest flowers
- High cost – high value

Fiber / Seed



- On-the-flat
- Direct seed
- 1-2.5 million plants/ha
- 90-120 days
- Males with pollen
- Machine harvest stems/seed
- Low cost – low value

Definitions and Disclosures

FDACS - OAWP

- 2023 - 2020 (026885): Industrial hemp yield response curve estimation for various nitrogen and phosphorus rates in Florida
- 2025 - 2023 (029969): Impact of nitrogen fertilizer application rate and timing to hemp (*Cannabis sativa*) yield response and nitrogen cycling in three Florida agroecosystems & (029677) Field Evaluation of CRF in Support of BMPs for Industrial Hemp

FDACS - AES

- 2023: Accelerating collaborative hemp fertilizer research to BMP development of rate, timing, source, and site-specific management
- 2024: Visibility for hemp fertilizer research and BMP development

Published Outcomes

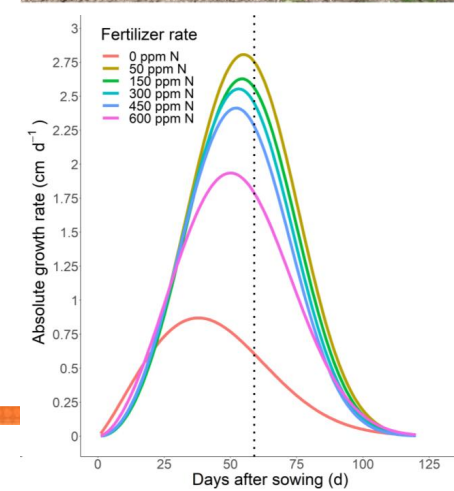
Mylavarapu R, Brym ZT, Monserrate LG, Mulvaney MJ. 2020. Hemp fertilization: Current knowledge, gaps and efforts in Florida: A 2020 Report. Electronic Data Information Source, SL476. doi.org/10.32473/edis-ss689-2020



Kaur NG, Sharma L, Moserrate LAG, Brym ZT. 2023. Nitrogen fertilization impact on hemp (*Cannabis sativa* L.) crop production: a review. Agronomy Journal, 115, 1557– 1570. https://doi.org/10.1002/agj2.21345



Anderson SL, Pearson B, Kjelgren R, Brym ZT. 2021. Response of essential oil hemp (*Cannabis sativa* L.) growth, biomass, and cannabinoid profiles to varying fertigation rates. PLoS ONE. 16(7). e0252985. https://doi.org/10.1371/journal.pone.0252985



Hemp Fertilizer Guidelines

Nitrogen

- Not to exceed 150 lb N / acre
- Less N for fiber
- Split applications

Phosphorous

- Test soil
- Guide: 0 - 125 lb P₂O₅ / acre
- Research: 20 - 70 lb P₂O₅ / acre

Potassium

- Test soil
- Guide: 0 - 120 lb K₂O / acre
- Research: 65 - 120 lb K₂O / acre

Hemp Fertilization: Current Knowledge, Gaps and Efforts in Florida: A 2020 Report¹

Rao Mylavarapu, Zachary Brym, Luis Monserrate, and Michael J. Mulvaney²



<https://edis.ifas.ufl.edu/ss689>

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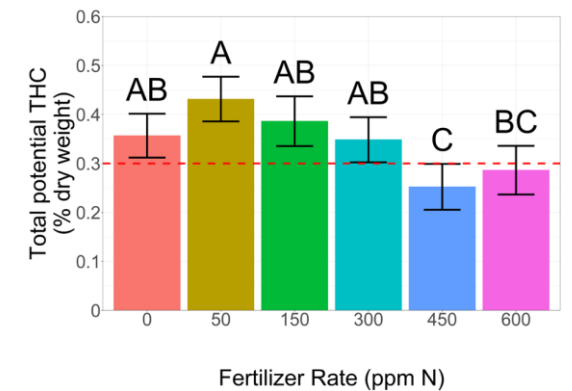
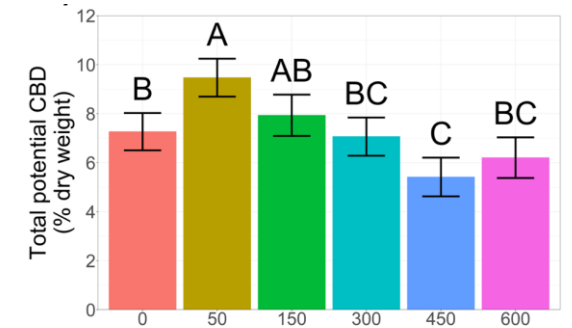
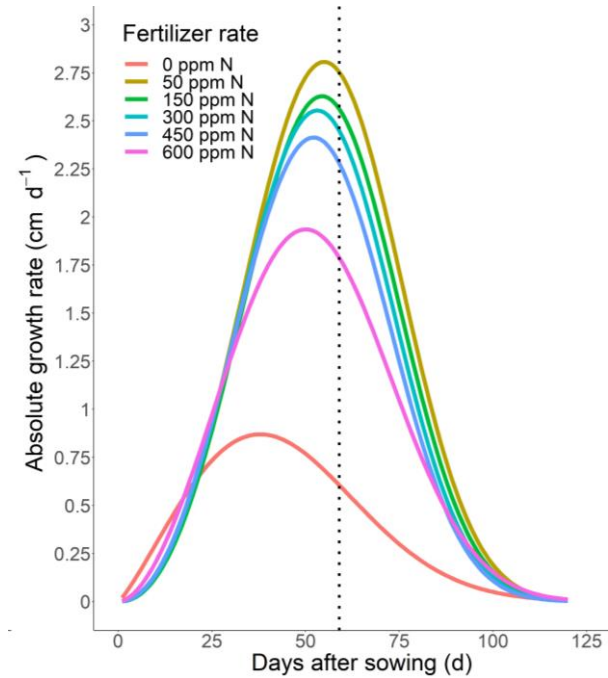
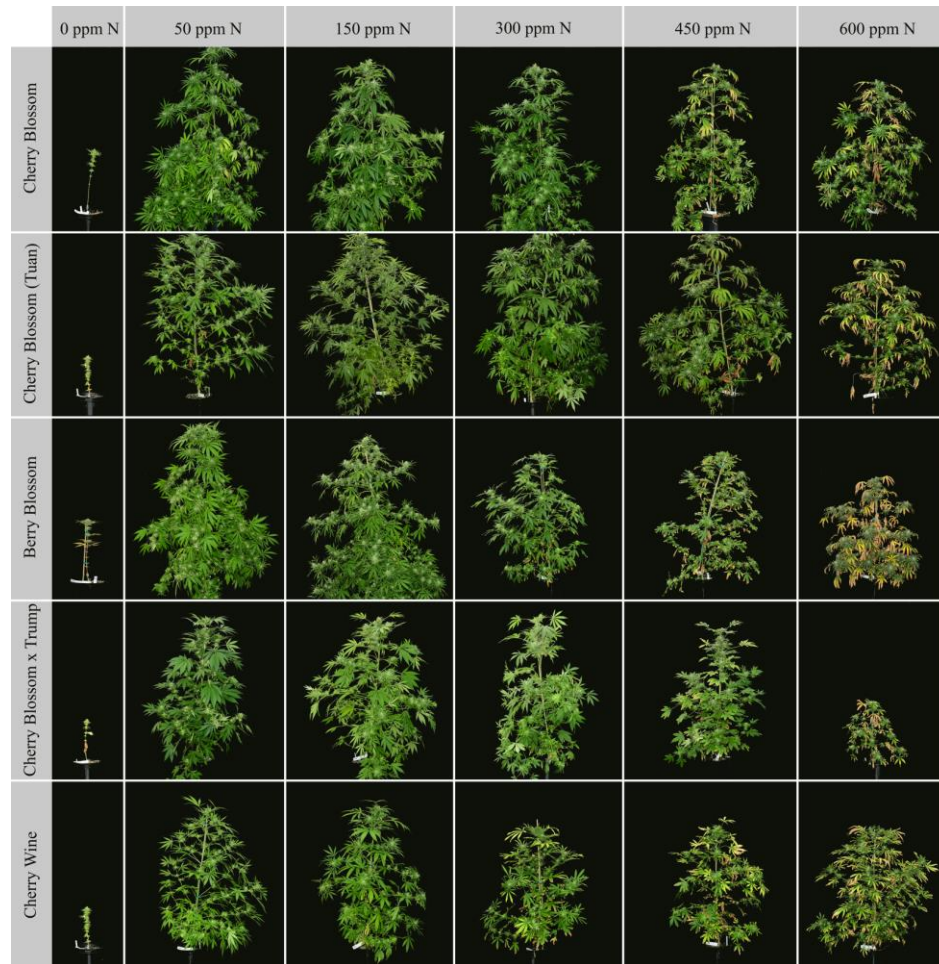


<https://edis.ifas.ufl.edu/ss689>

Caveats

- Research outside FL
- Mostly grain/fiber

Indoor - Flower

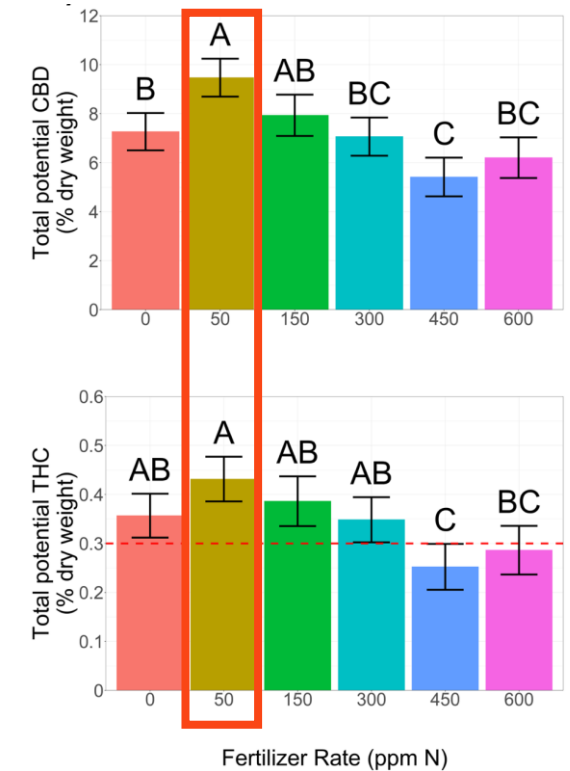
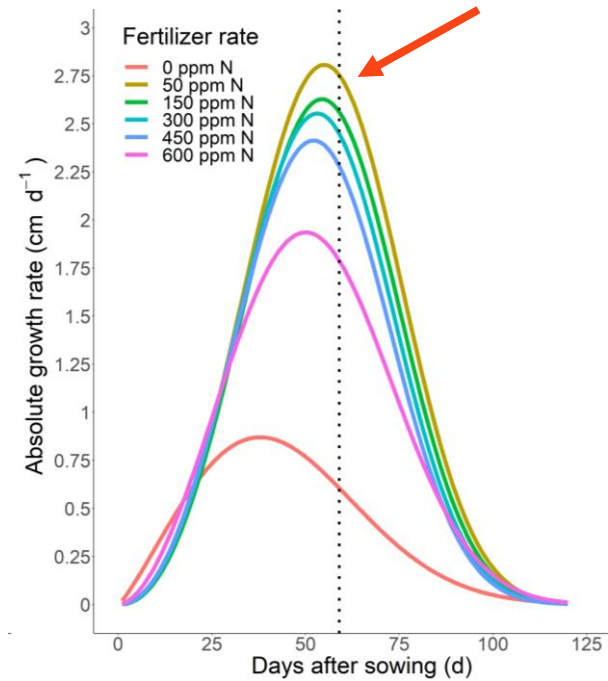
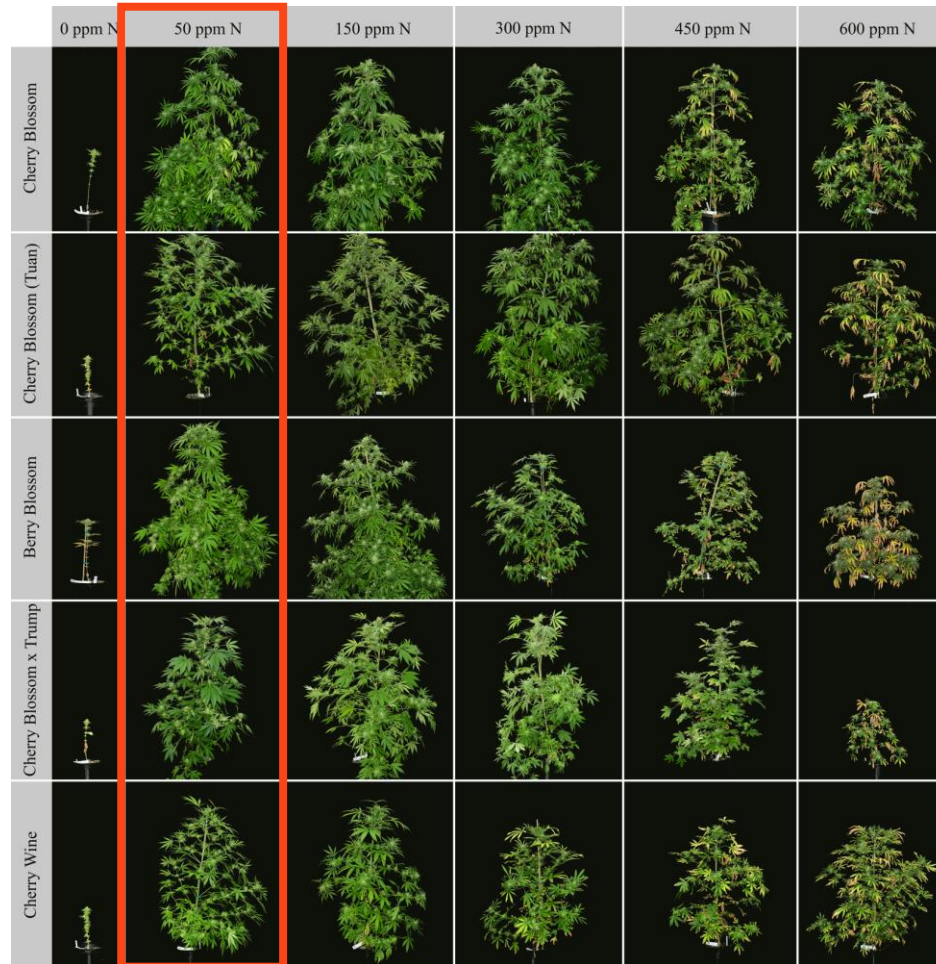


Anderson, Pearson, et al. - <https://doi.org/10.1371/journal.pone.0252985>

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Indoor - Flower

50 ppm N continuous



Anderson, Pearson, et al. - <https://doi.org/10.1371/journal.pone.0252985>

Luis Monserrate

Outdoor Multi-Site Research

Location	Coordinates	Soil Series	Soil pH	Soil N ^z	Soil P ^y
WFREC (Jay, FL)	30.7725° N, 87.1382° W	Dothan fine sandy loam	6.25	553	29
PSREU (Citra, FL)	29.4023° N, 82.1709° W	Arredondo sand	6.25	290	1255
TREC (Homestead, FL)	25.4687° N, 80.5007° W	Krome gravelly loam	8.4	1758	107

^z Baseline soil nitrogen (N) reported as Total Kjeldahl Nitrogen [ppm].

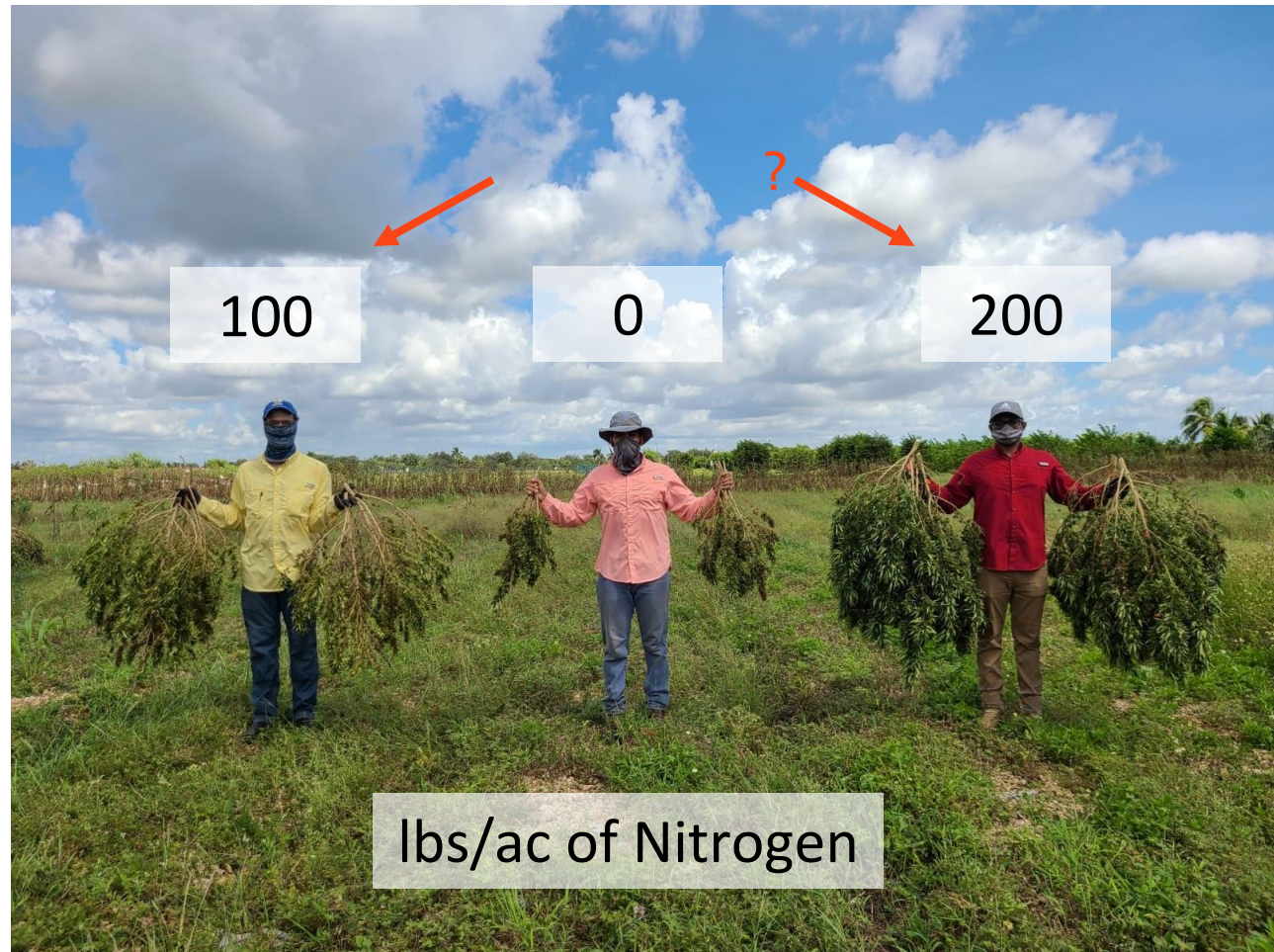
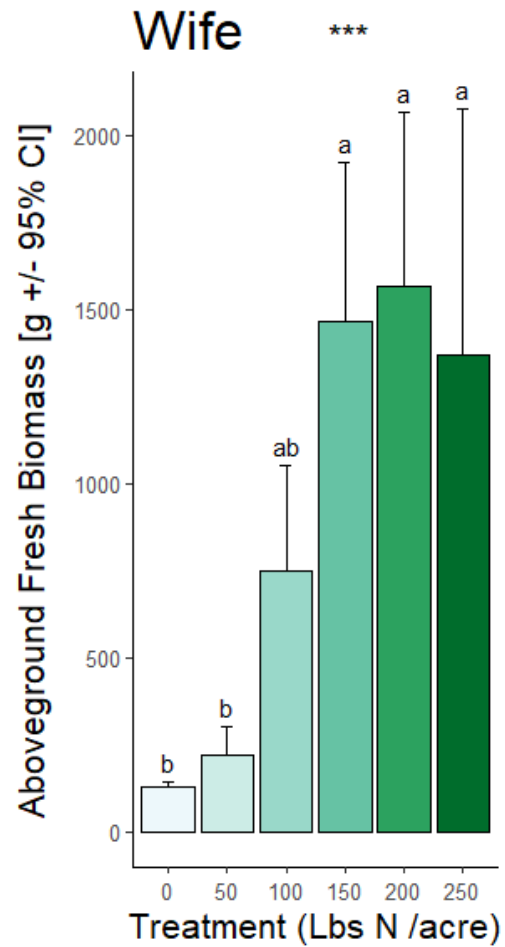
^y Baseline soil phosphorus (P) reported as Total Phosphorus.

- Seed rate: 200,000 – 750,000 live seeds/acre or 1,200 – 10,000 plants/acre
- Experimental design: RCBD
- N rates: 0, 56, 112, 168, 224, 280 kg/ha
- Saturated Background Rates of P,K, and Micros
- Split N application: 2-3 based on site soil type or weekly
- Irrigation: Overhead or Drip Irrigation

Flower - 2020-2022 - TREC



Flower - 2020



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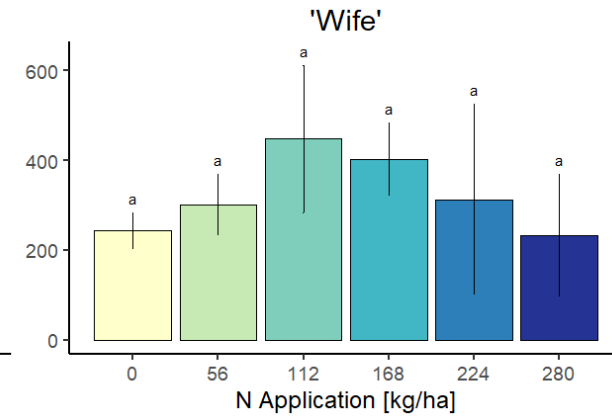
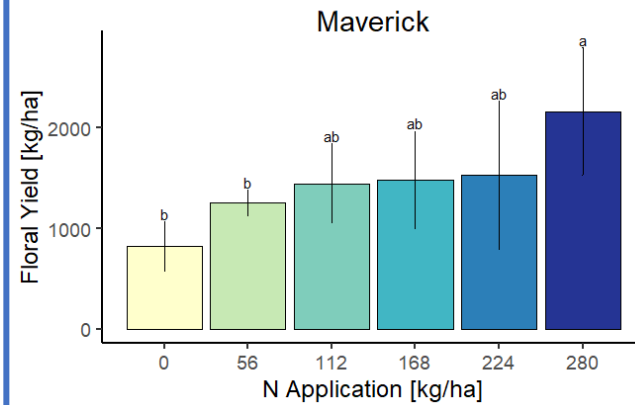
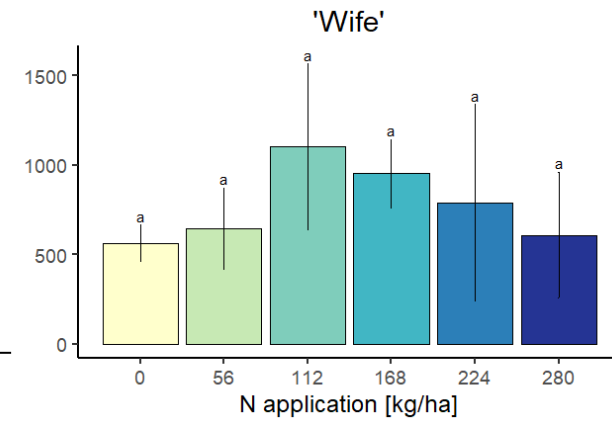
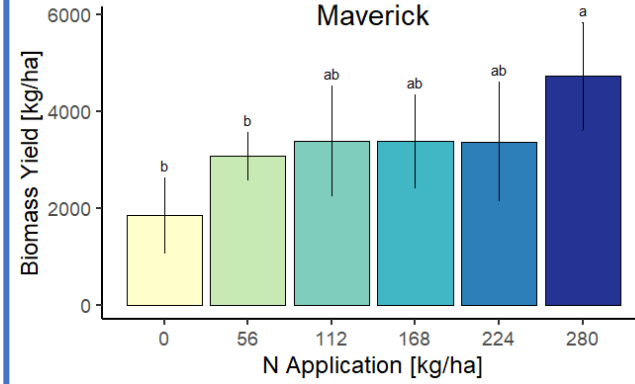
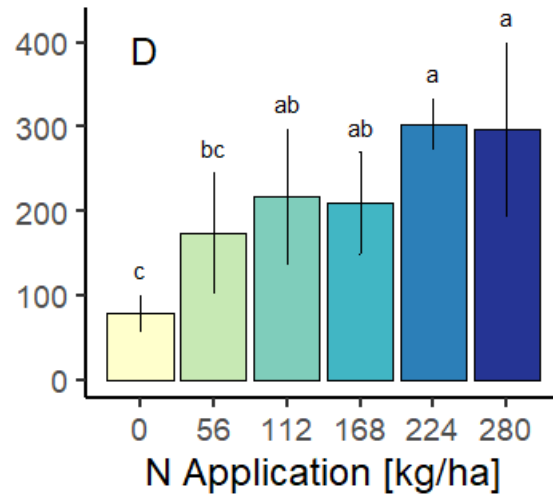
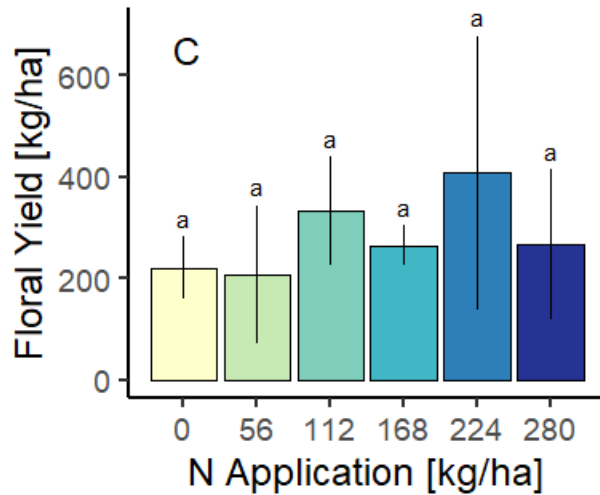
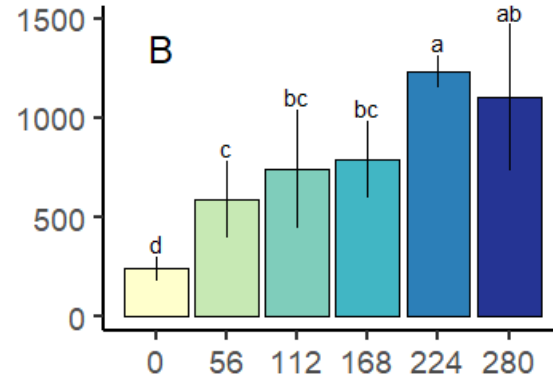
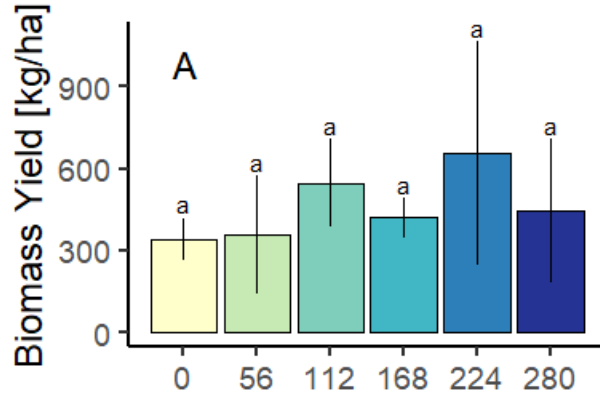
Flower -

2021

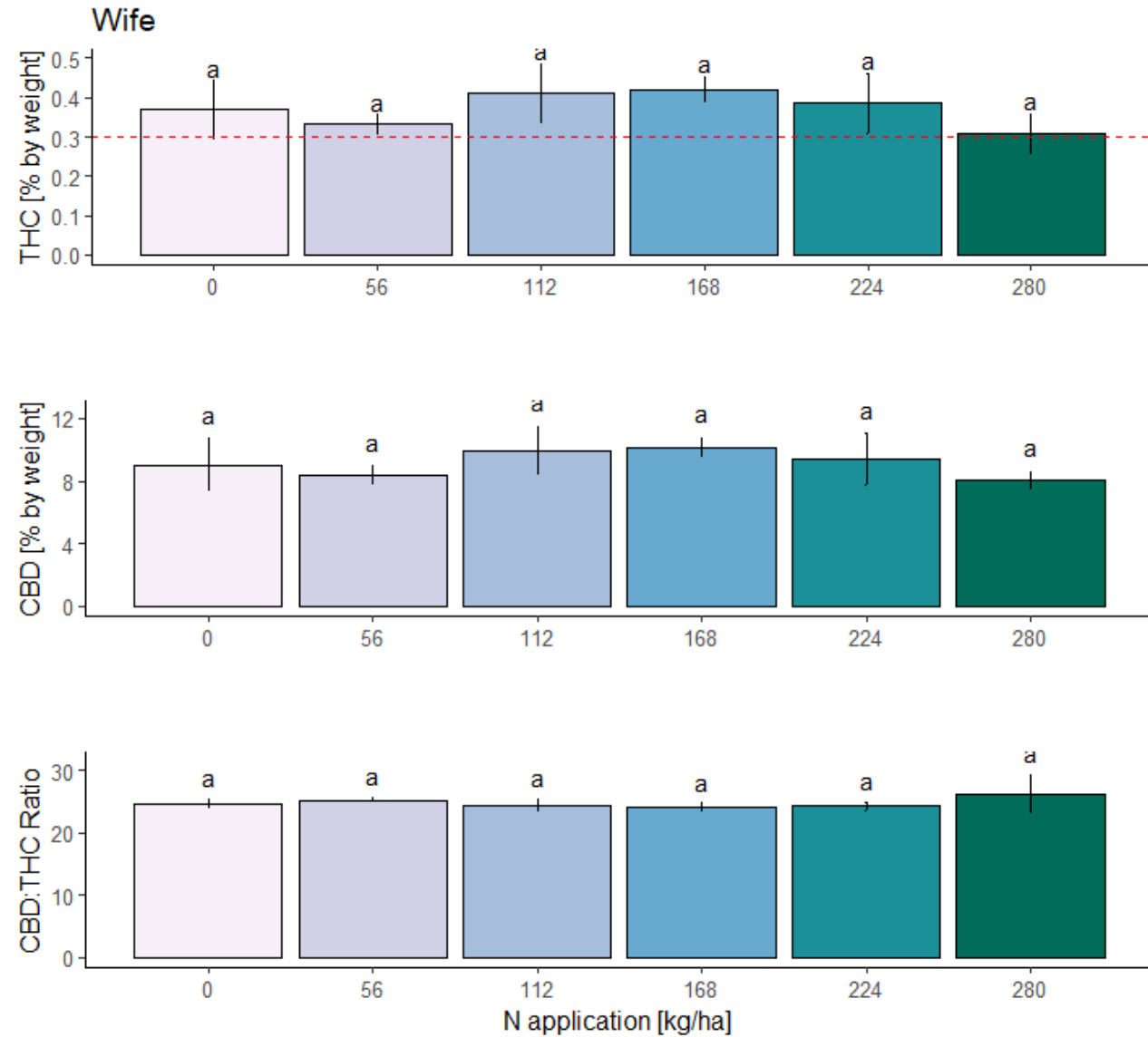
2022

Maverick

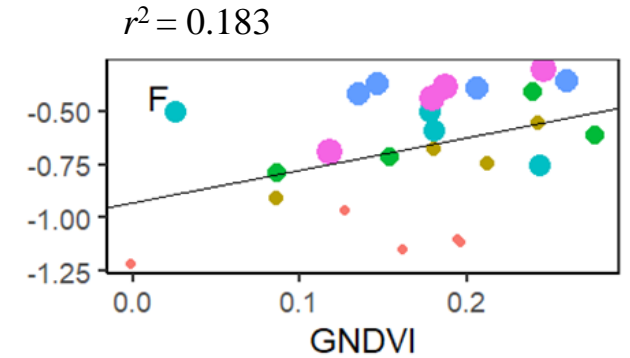
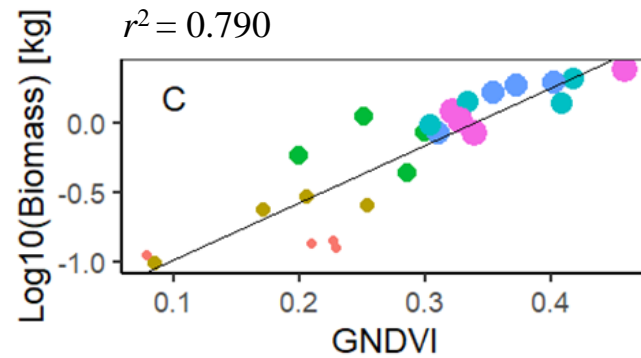
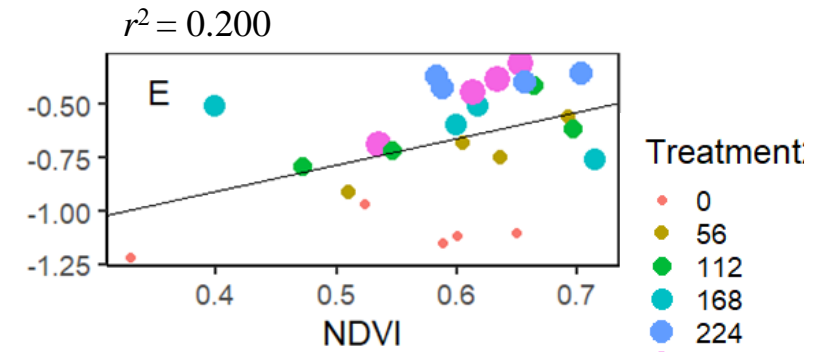
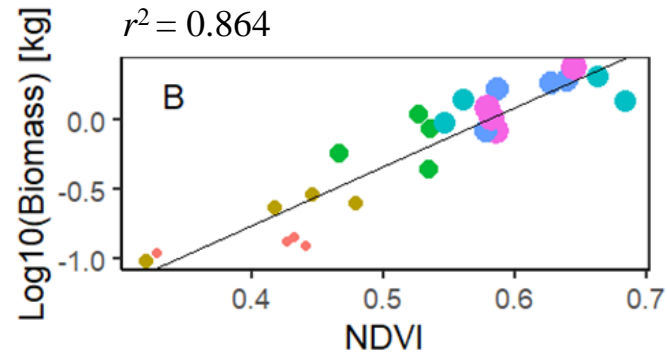
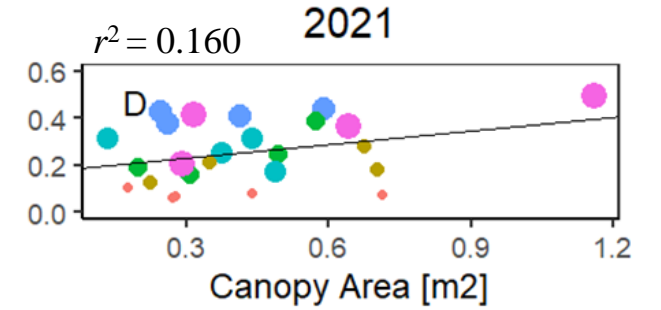
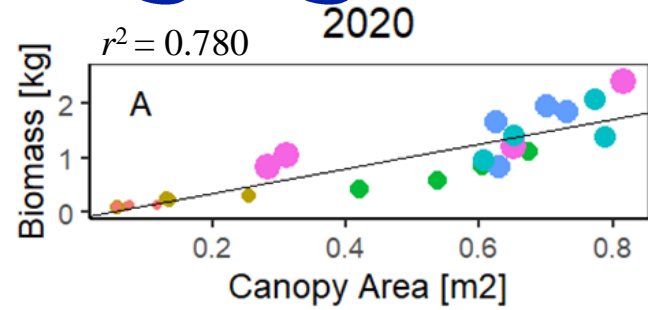
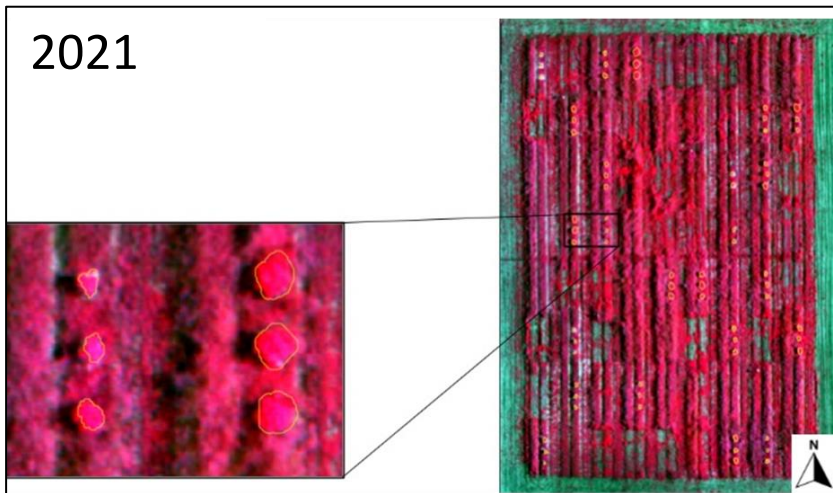
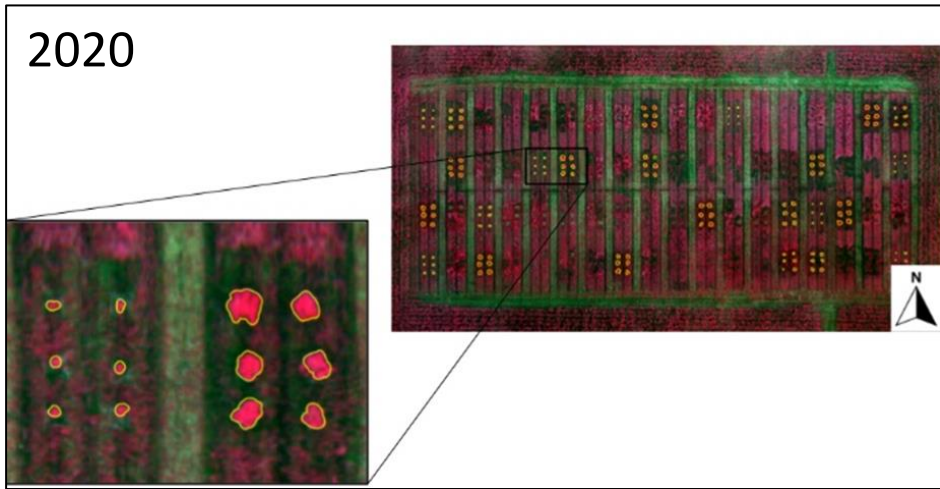
Wife



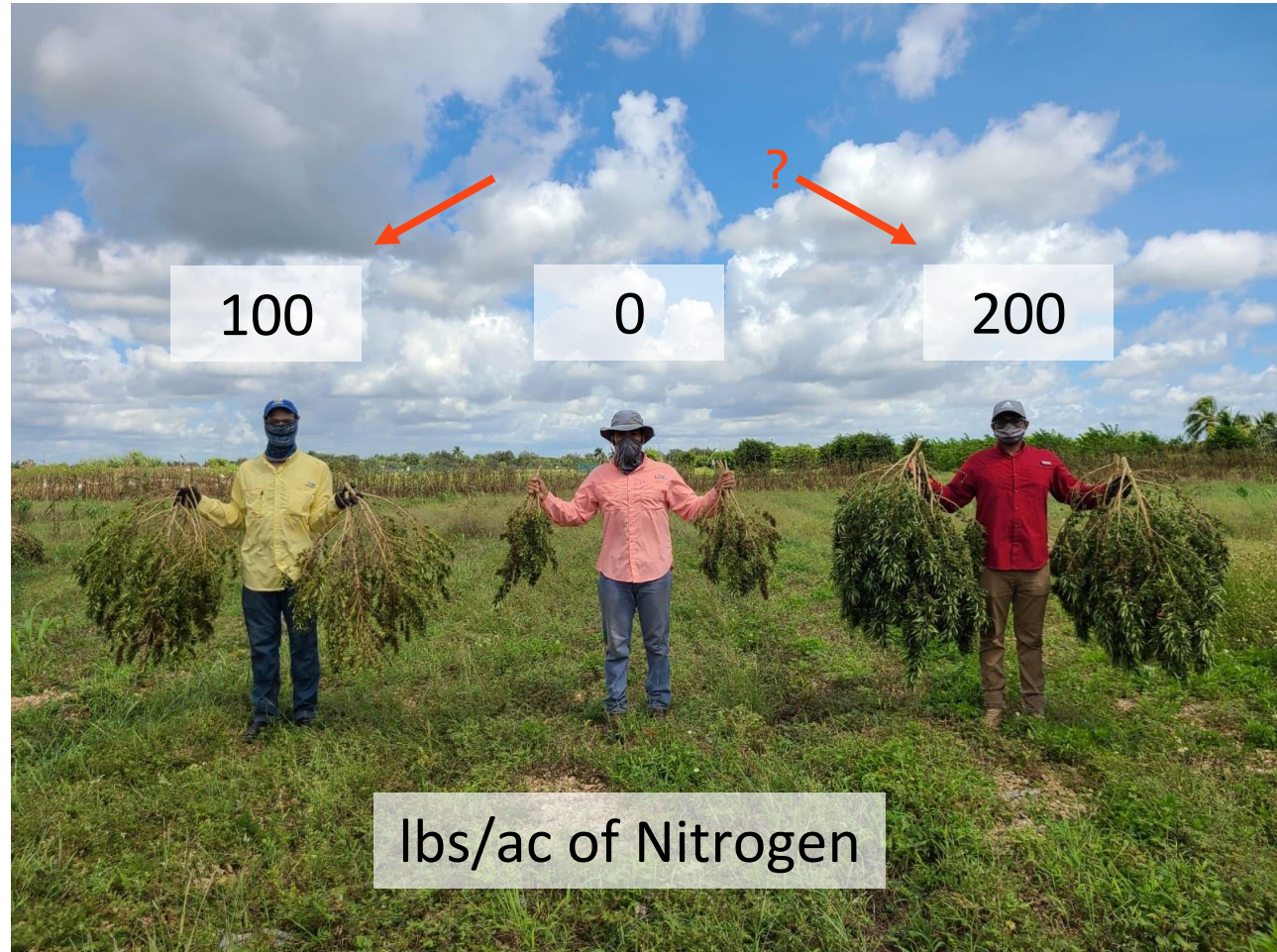
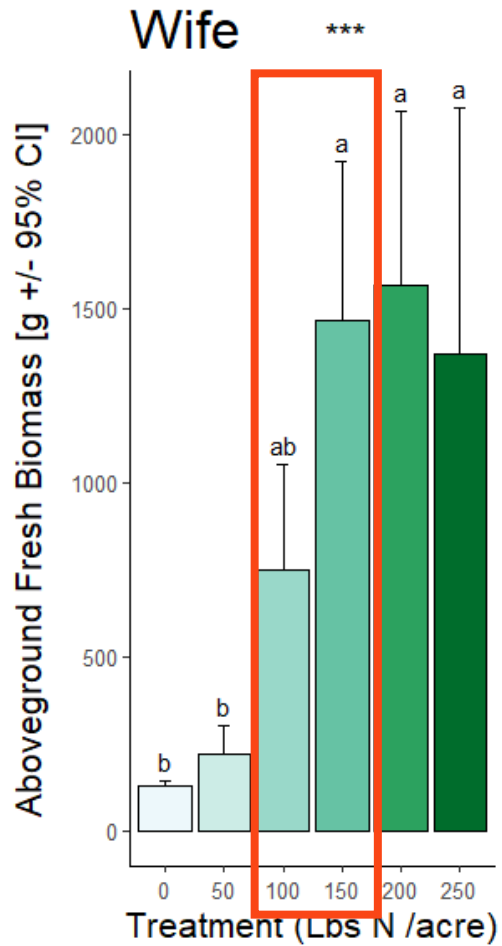
Cannabinoids -



Flower - Aerial Imaging



Outdoor - Flower 100-150 lbs N/ac??



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Fiber and Seed - 2021-2023

WFREC



PSREU

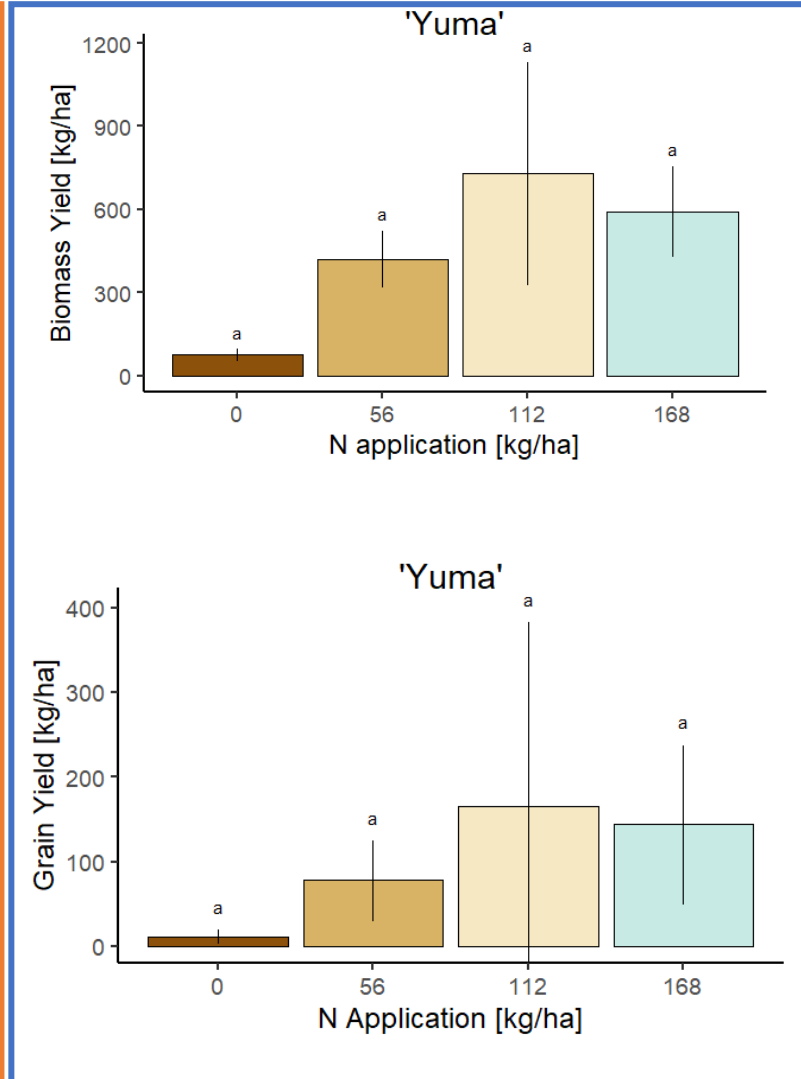
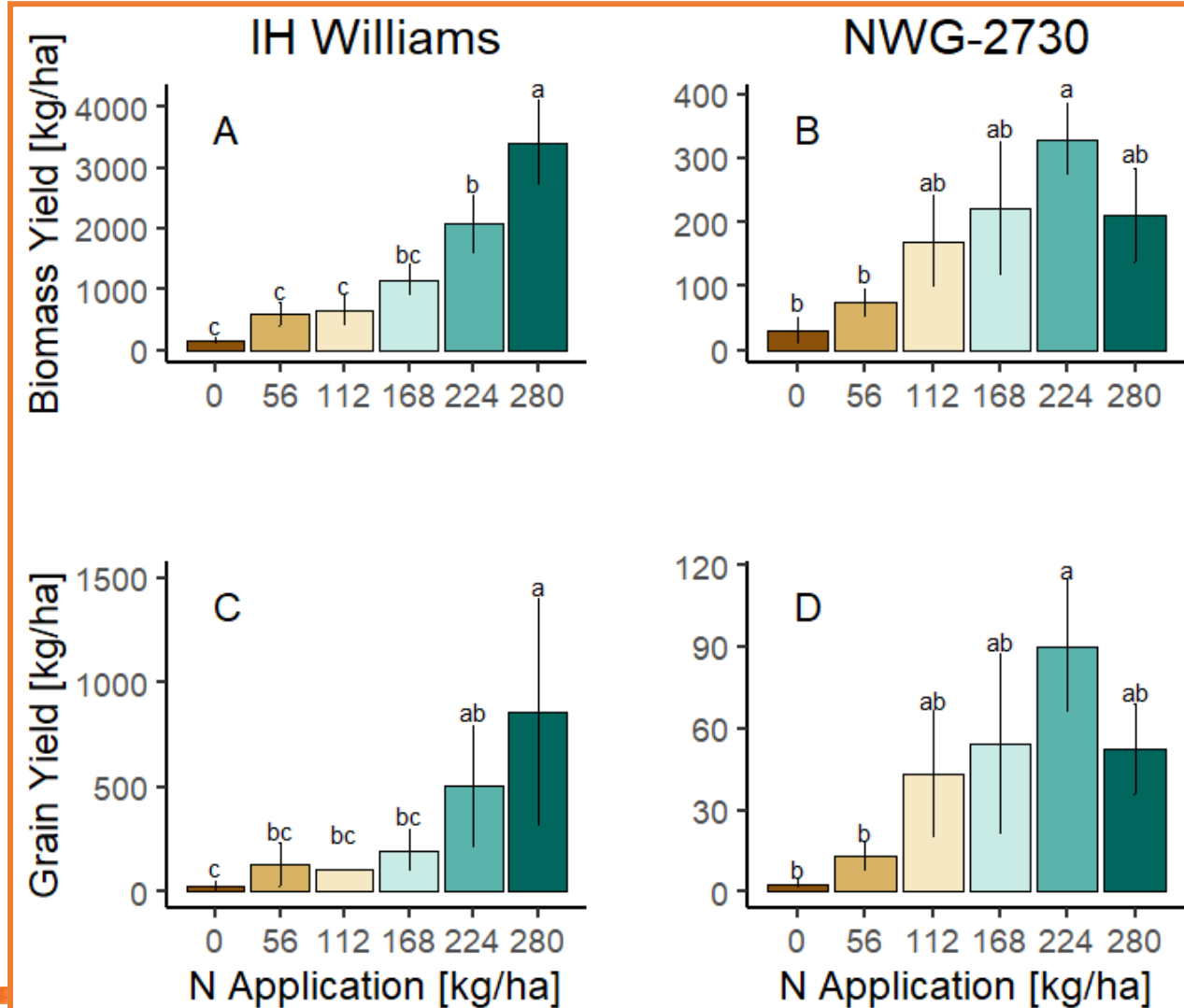


TREC

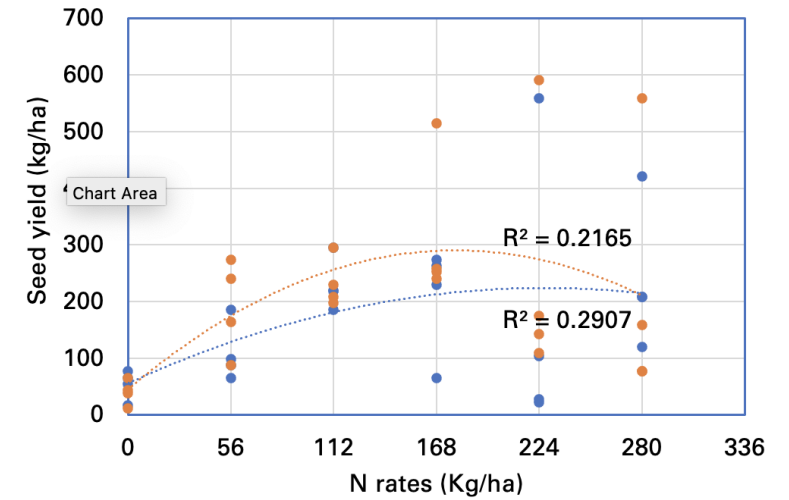
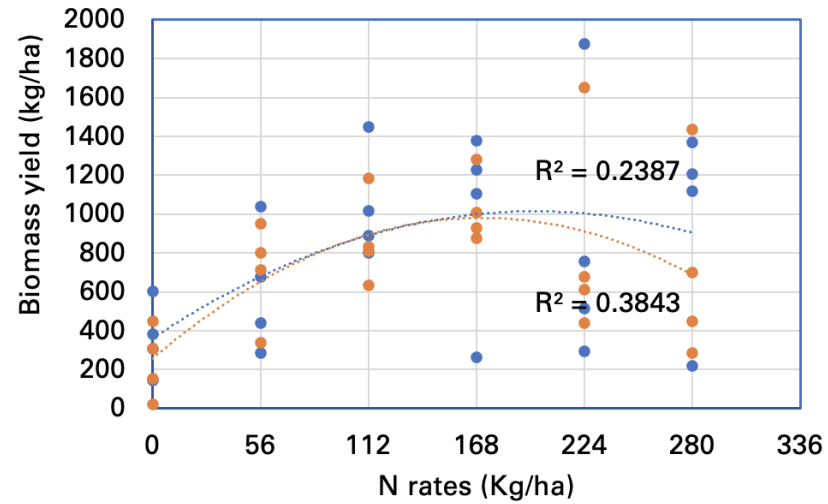
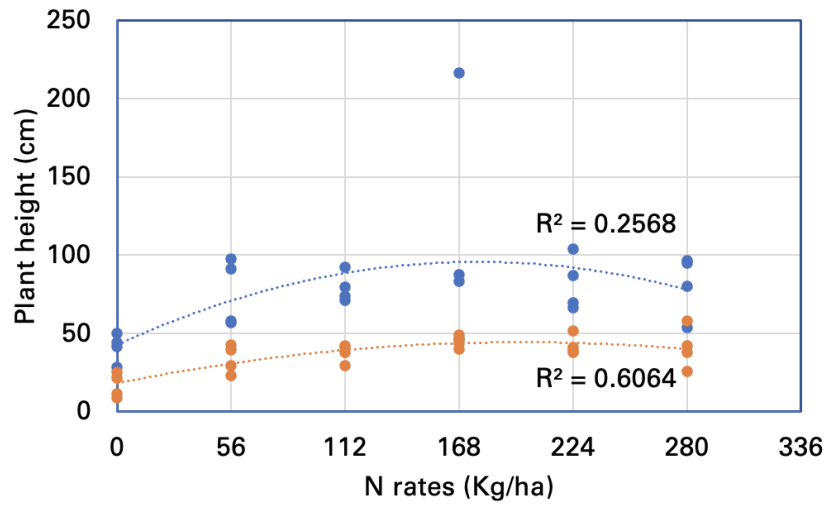


Fiber / Seed - 2021

2022 - TREC

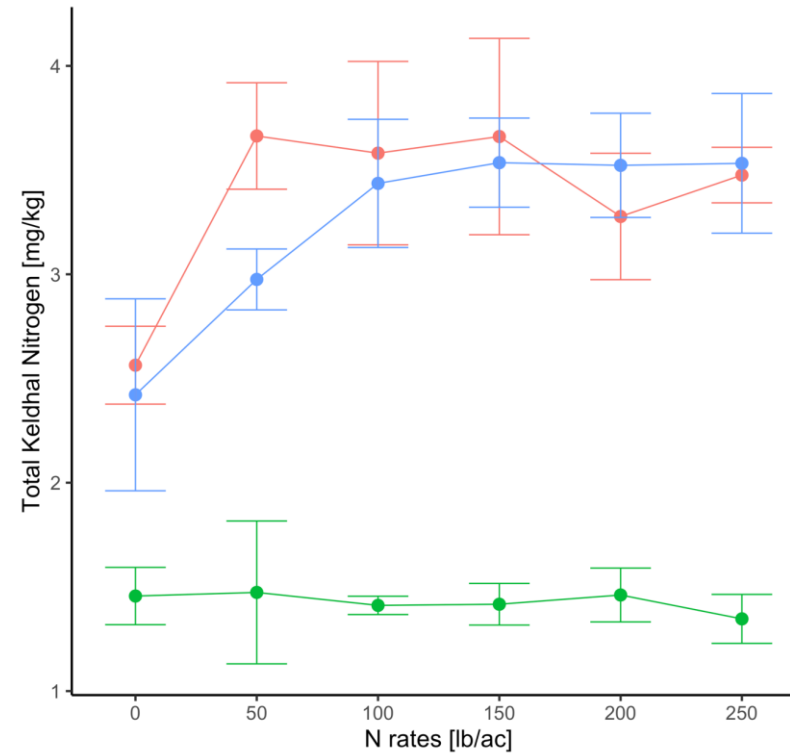
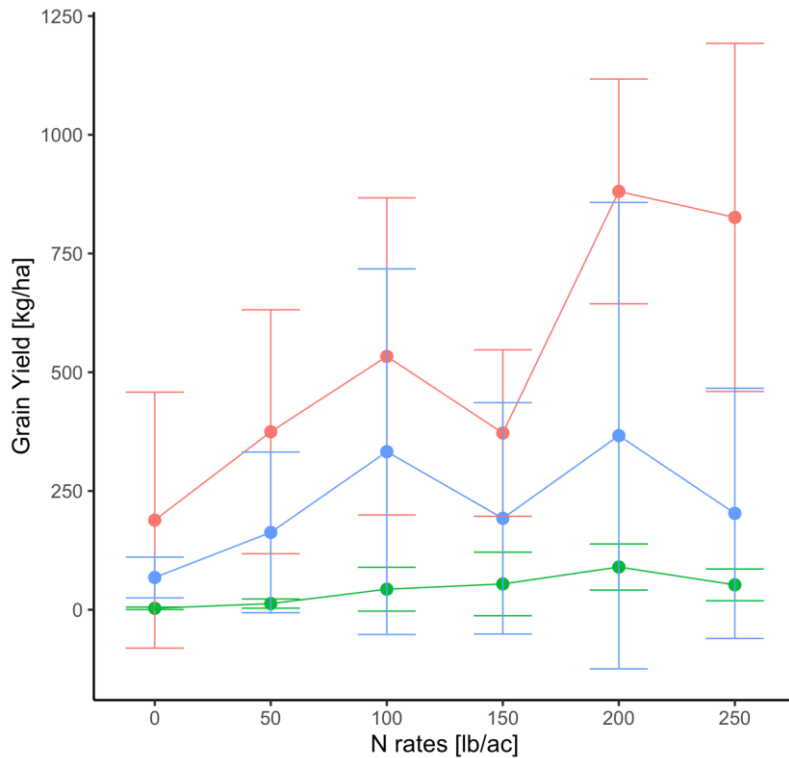


Fiber / Seed - 2021 - PSREU



- Bialobrzekie
- X-59
- Poly. (Bialobrzekie)
- Poly. (X-59)

Fiber / Seed - 2021 Multi-site



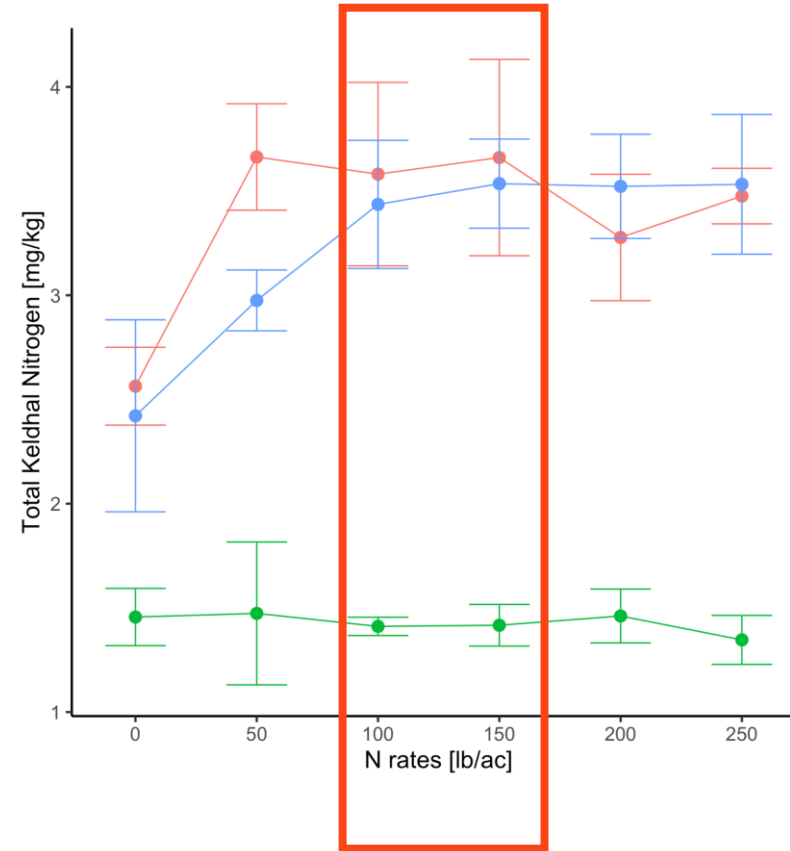
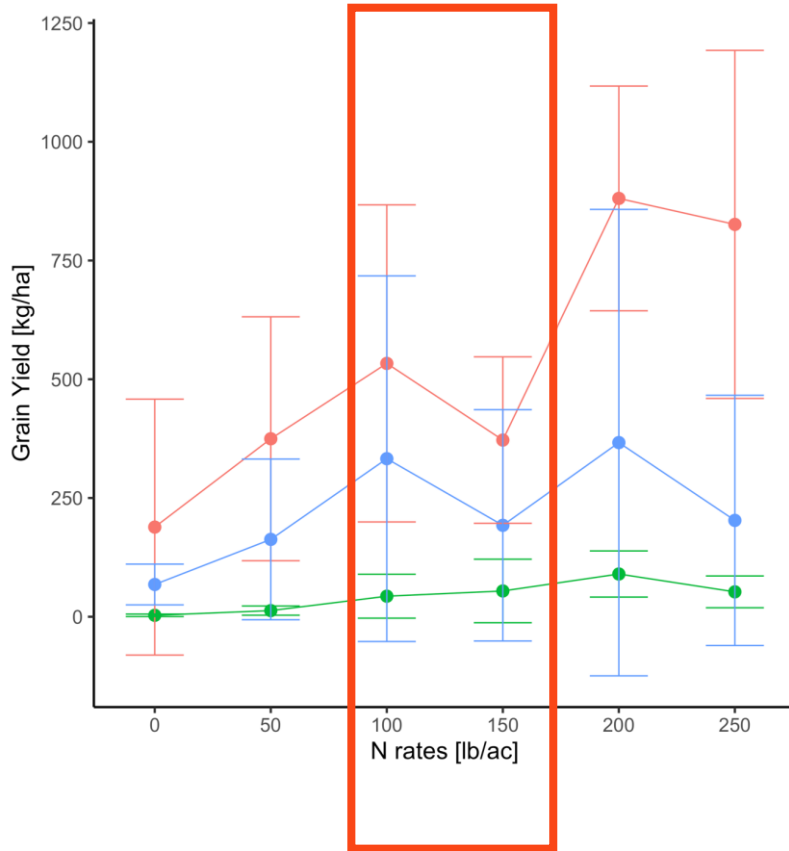
Sites
 ● PSREU
 ● TREC
 ● WFREC



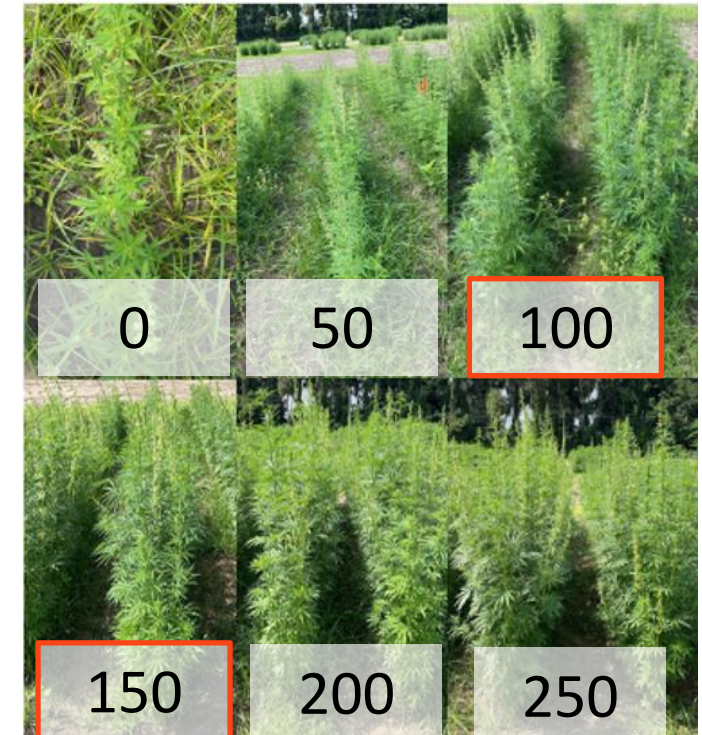
lbs/ac of Nitrogen

Outdoor - Fiber / Seed

100-150 lbs N/ac??



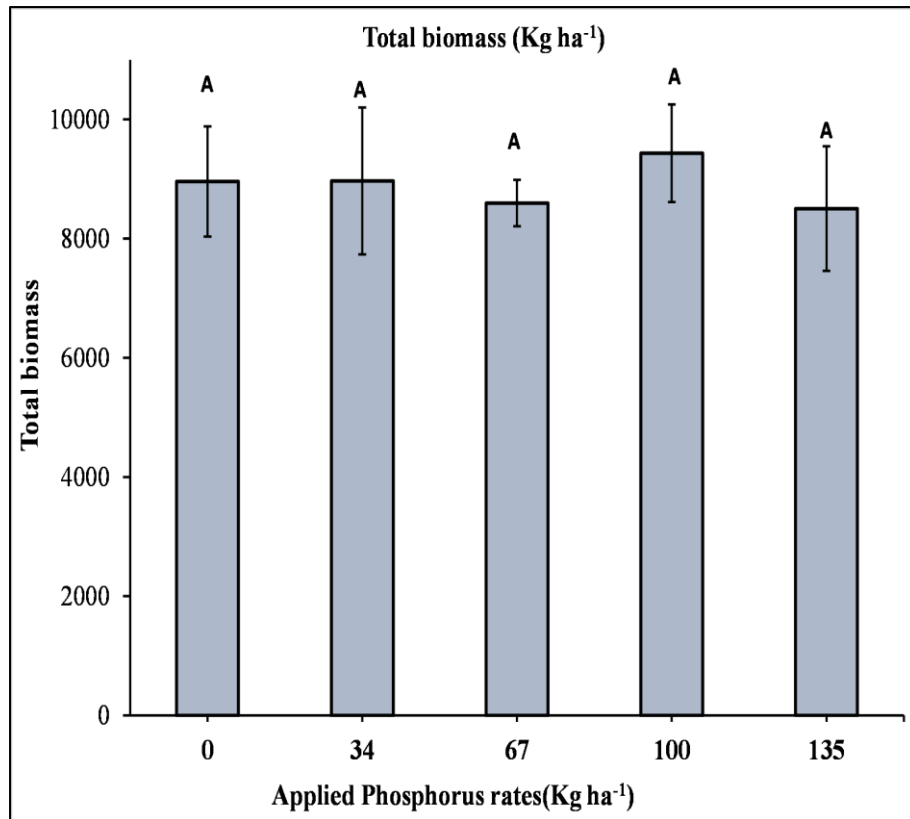
Sites
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● TREC
● WFREC



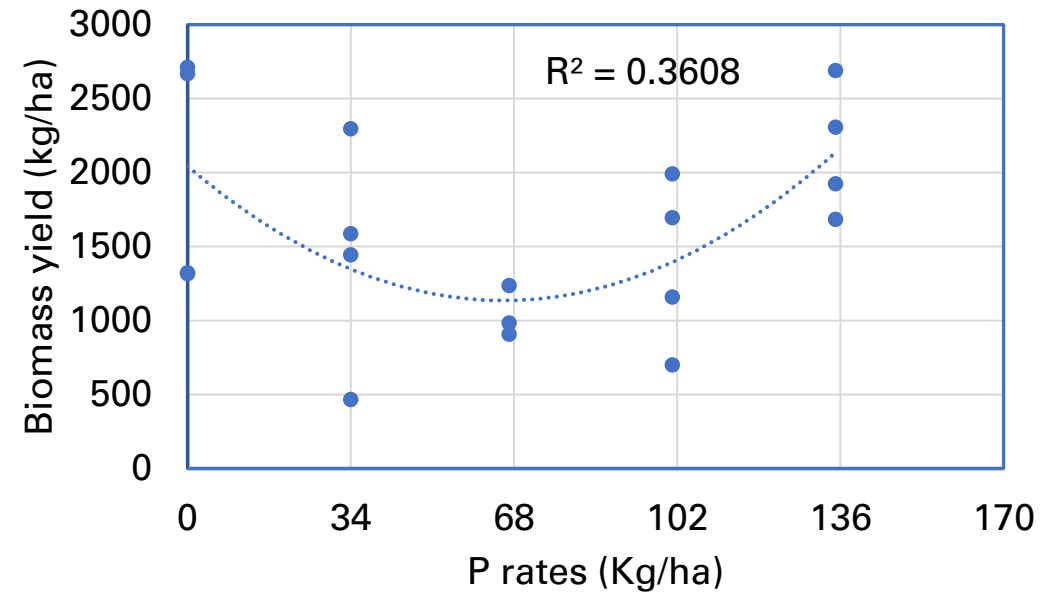
lbs/ac of Nitrogen

Fiber / Seed – Phosphorous No response?

WFREC - 2021 - IH Williams



PSREU - 2021 - X-59



BMP Development for Florida

Preliminary research support for nitrogen guideline (< 150 lb N /acre).

Split applications (50 lb N /acre) Florida best practice.

More does not mean better, especially P.

Excess N can delay flowering and cannabinoids.

THC production more genetic than environmental.

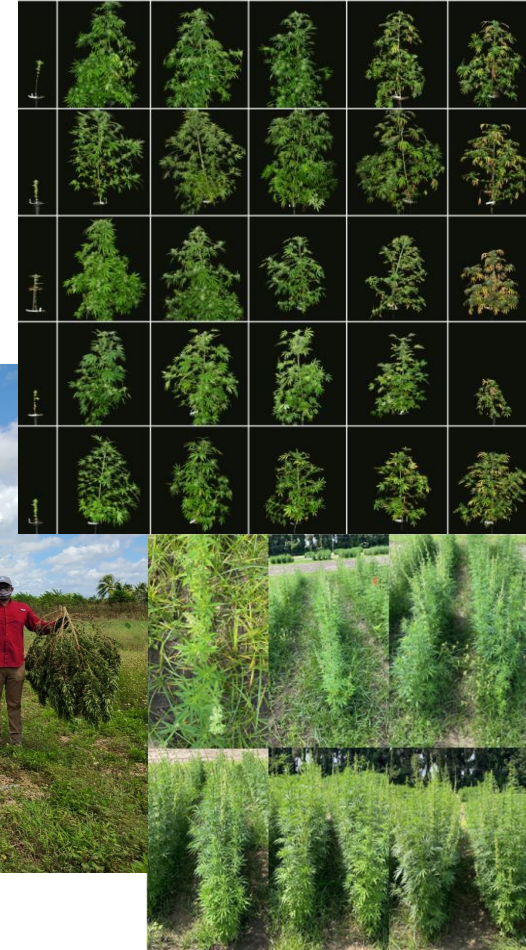
Watch out for micronutrient deficiency and toxicity.



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programs.ifas.ufl.edu/hemp



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