

# Cotton Physiology

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**C****OTTON**  
PHYSIOLOGY LAB

# Introduction

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**Nitrogen (N) deficiency** limits yield by...

- Decreasing plant growth.
- Limiting photosynthetic capacity of the canopy
- Decreasing fruiting sites and/or fruit retention.

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## **N excess** may...

- produce rank growth.
- limit fruit retention.
- delay maturity.

# Introduction

## Drought stress



# Introduction

## Water Excess



# Introduction

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## Mepiquat chloride...

- decreases internode elongation.
- controls vegetative growth.
- increases fruit retention on lower nodes.
- hastens maturity.

# Introduction

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***Anything that affects growth or lint yield has the potential to affect nutrient uptake and nutrient use efficiency.***

# Hypothesis & Objective

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**Hypothesis** → Each factor (irrigation, nitrogen, and MC) will differentially affect biomass, nutrient uptake and yield to generate differences in nitrogen use efficiency.

**Objective** → To assess biomass, nutrient uptake, and yield in cotton in response to irrigation, nitrogen application, and MC management strategy.



# Materials & Methods

# Experimental Details

## Irrigation Treatments:

**Irrigated** → 100% Etc replacement

**Dryland** → No supplemental irrigation after stand establishment



**VRI Pivot**

# Experimental Details

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**2** → Moderate treatment (12 oz/acre Pix at FF; 16 oz/acre Pix two weeks later)

**3** → Aggressive (10 oz/acre at 8 leaf stage + two applications noted above).

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## N Rate Treatments:

- 0
- 120 lbs/acre (135 kg/ha)
- 180 lbs/acre (202 kg/ha)

## Replications: 3

Design: Split-split plot

Location: Stripling Irrigation Research Park, Camilla, GA.

# Experimental Details




# Experimental Details

854	851	848	845	842	839	836	833	830	827	824	821	818	815	812	809	806	803
853	850	847	844	841	838	835	832	829	826	823	820	817	814	811	808	805	802
852	849	846	843	840	837	834	831	828	825	822	819	816	813	810	807	804	801
Dryland			Irrigated			Irrigated			Dryland			Irrigated			Dryland		

Pivot Point


Alleys are 10 ft

 120 lbs N/ha

Not to Scale!

 180 lbs N/ha

Plots are 8 rows x 60 ft

 0 lbs N/ha

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 Untreated

Not to Scale!

 Moderate

Plots are 8 rows x 60 ft

 Aggressive



# Measurements

- **Biomass**
  - ✓ Vegetative
  - ✓ Reproductive
  - ✓ Total
- **N uptake and nitrogen use efficiency**
  - ✓ N concentration (%)
  - ✓ N uptake (Biomass x Concentration)
  - ✓  $iNUE = \text{lint yield} / \text{N uptake}$



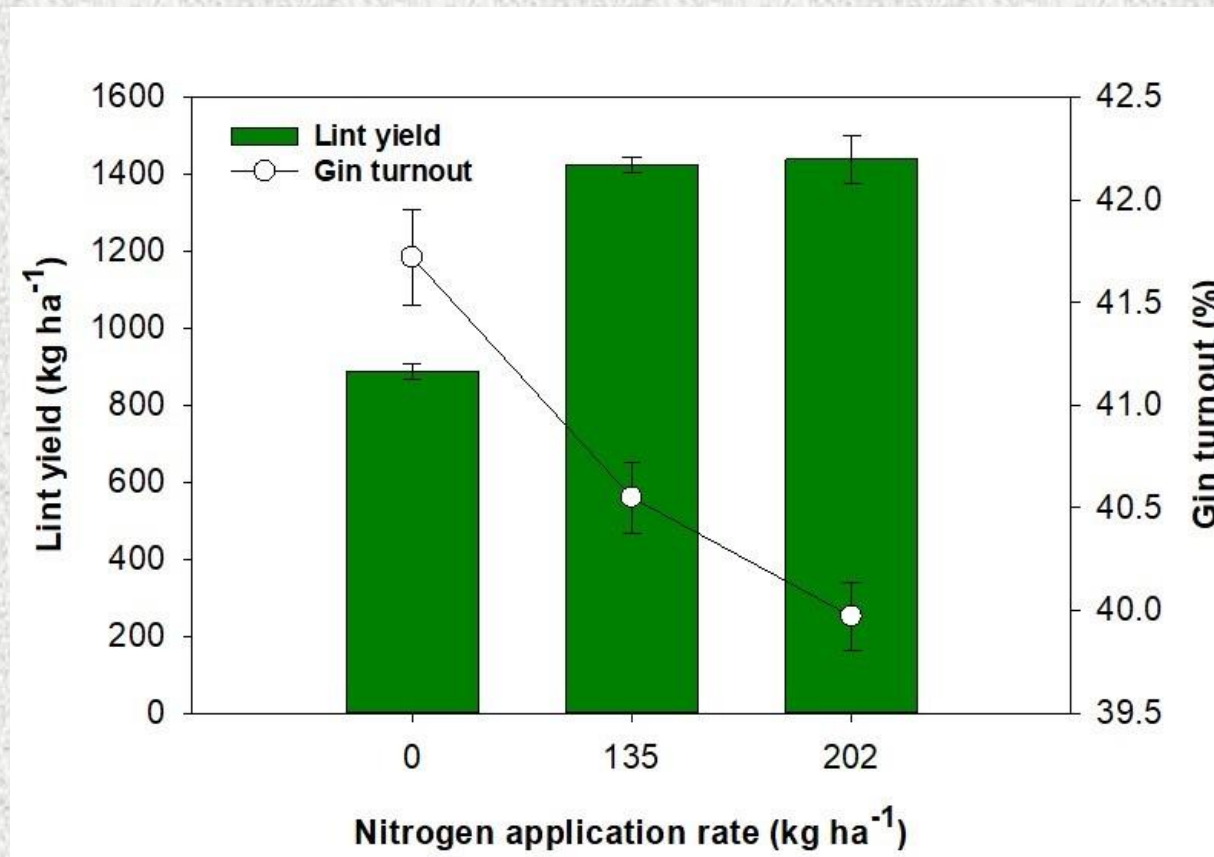
# Measurements

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- **Lint yield, gin turnout**
  - ✓ Seedcotton harvested
  - ✓ Gin turnout determined at MicroGin

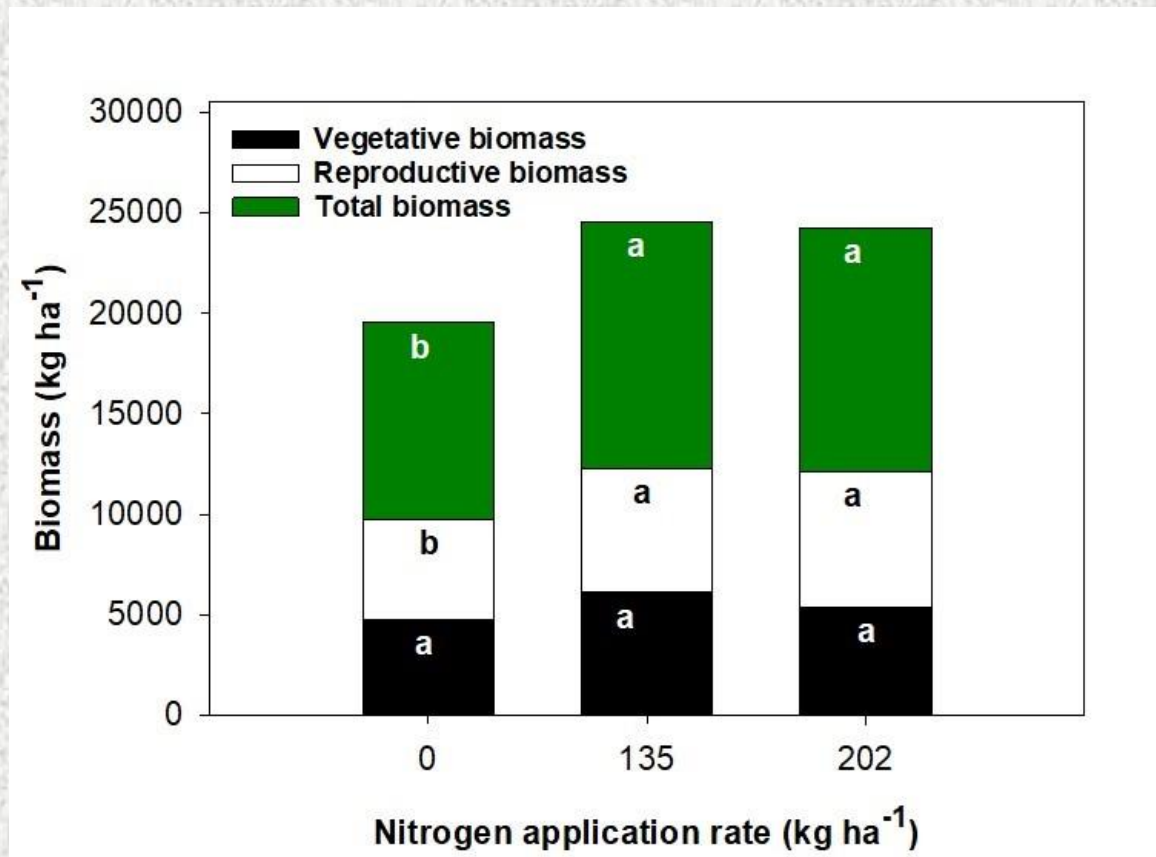


N Rate

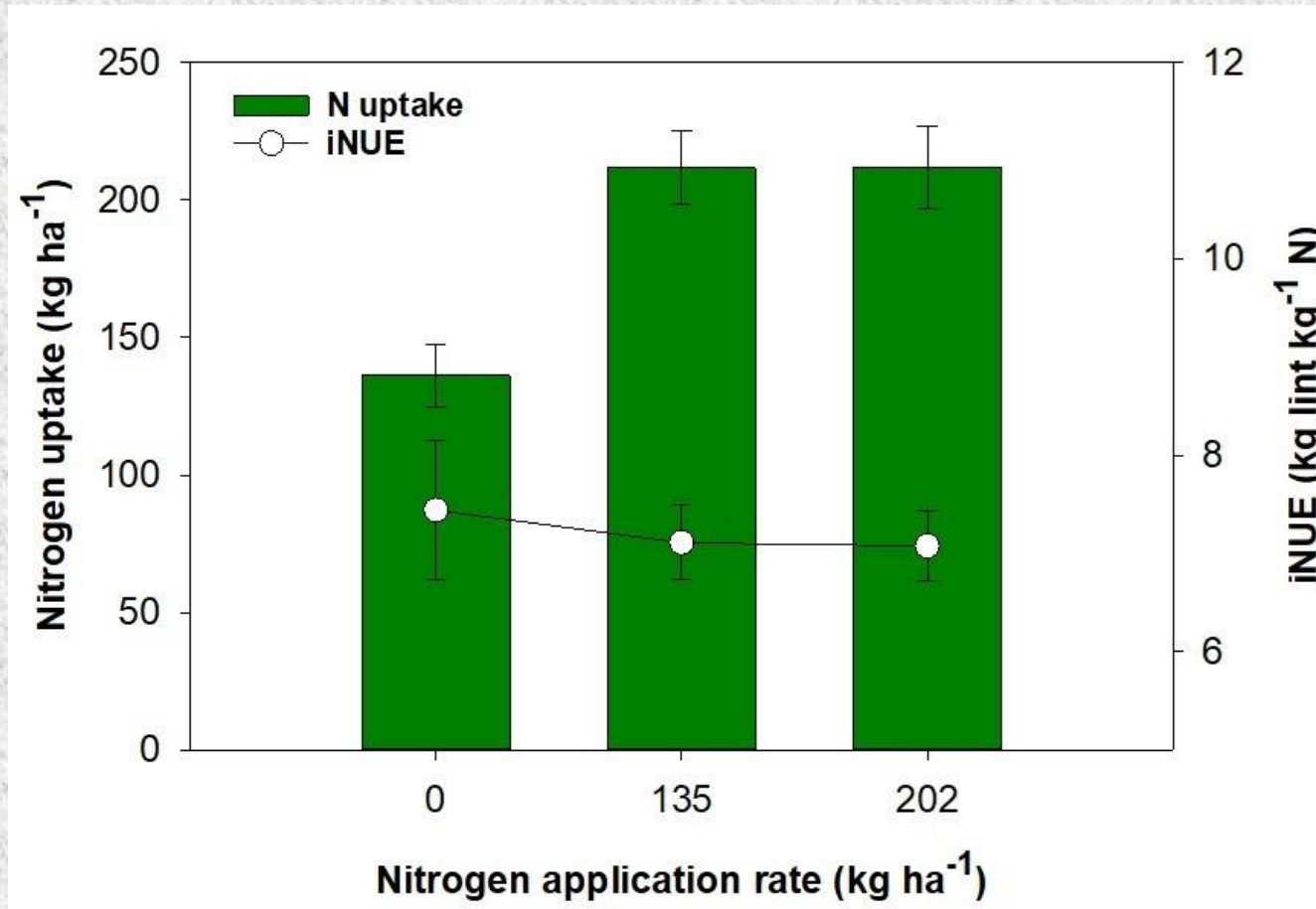
# Lint Yield & Gin Turnout



# Biomass

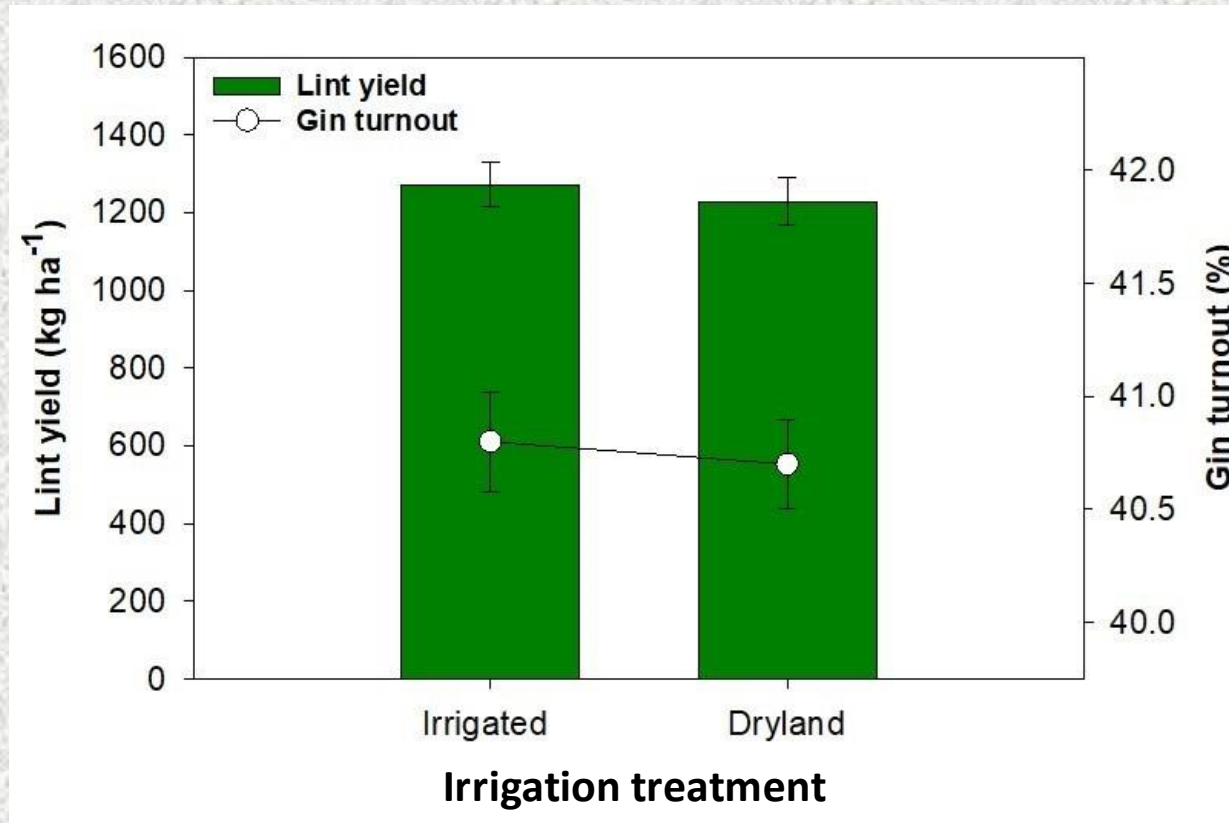


# N uptake & N Use Efficiency



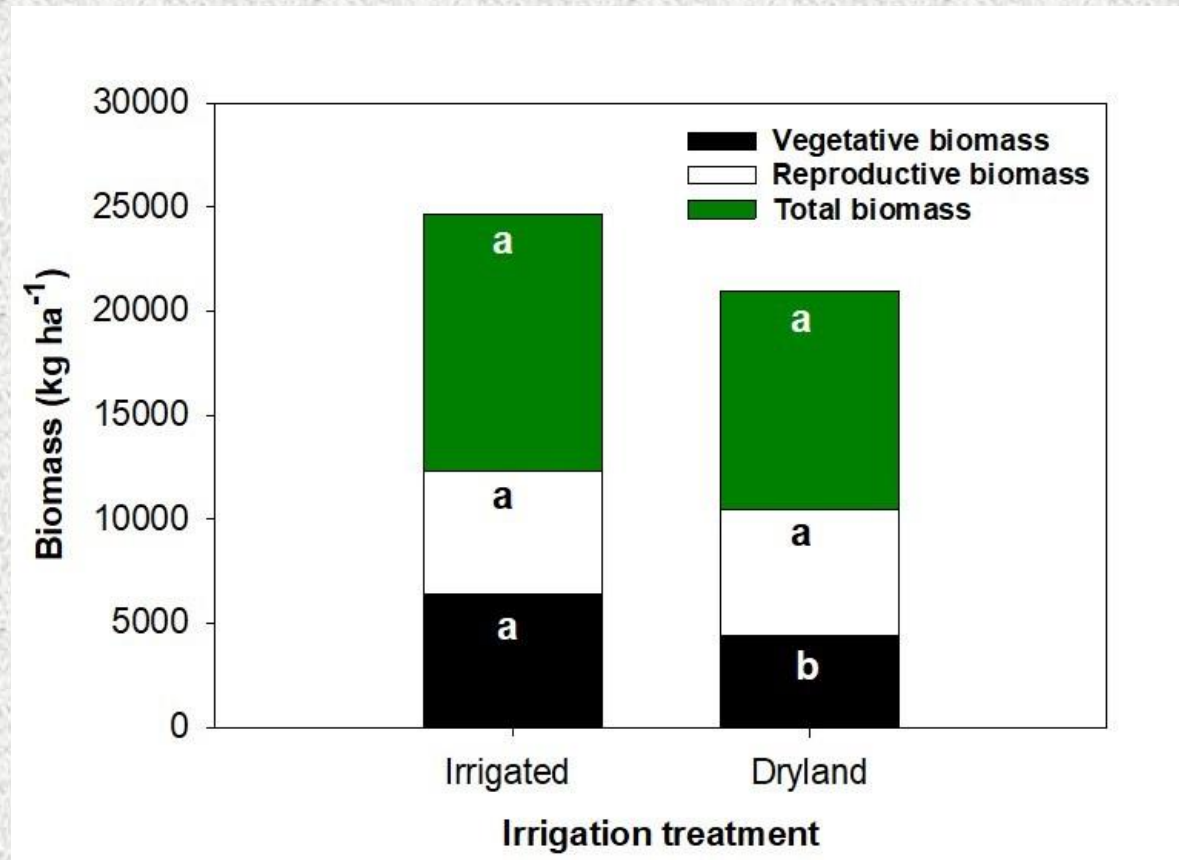
# Irrigation

# Lint & Gin Turnout

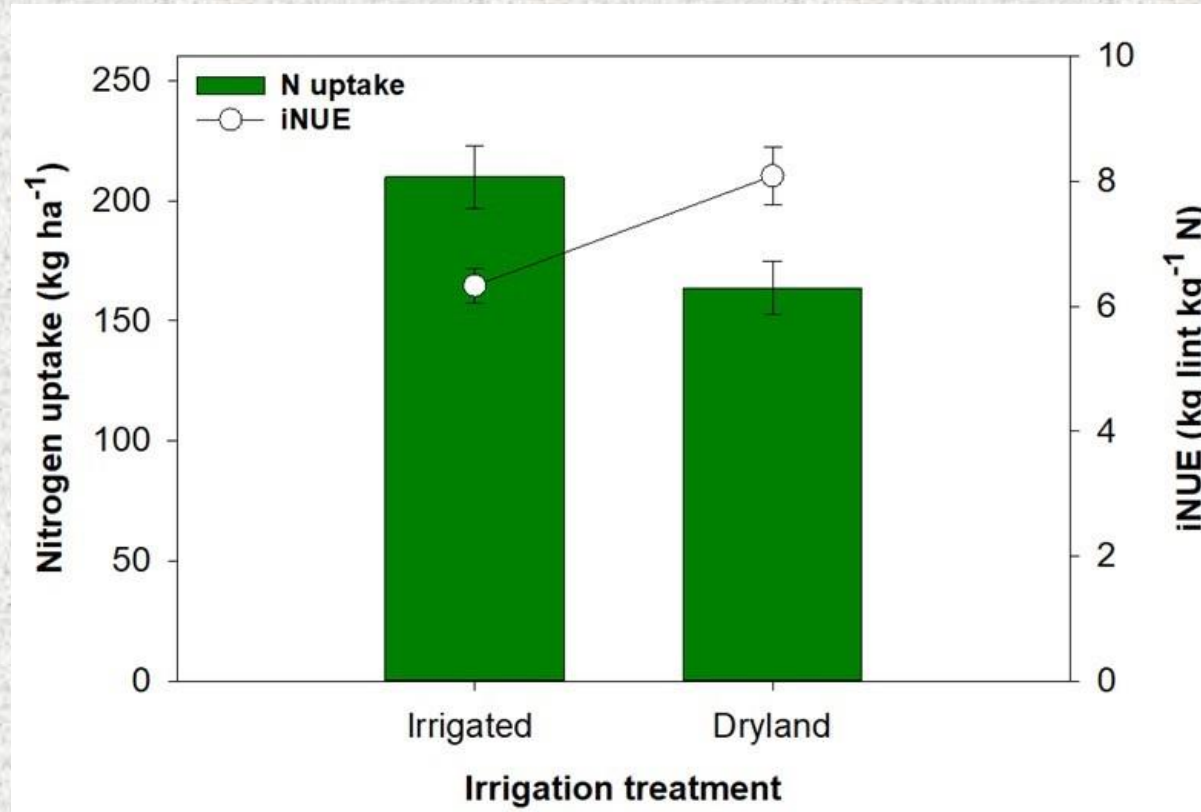




# Biomass

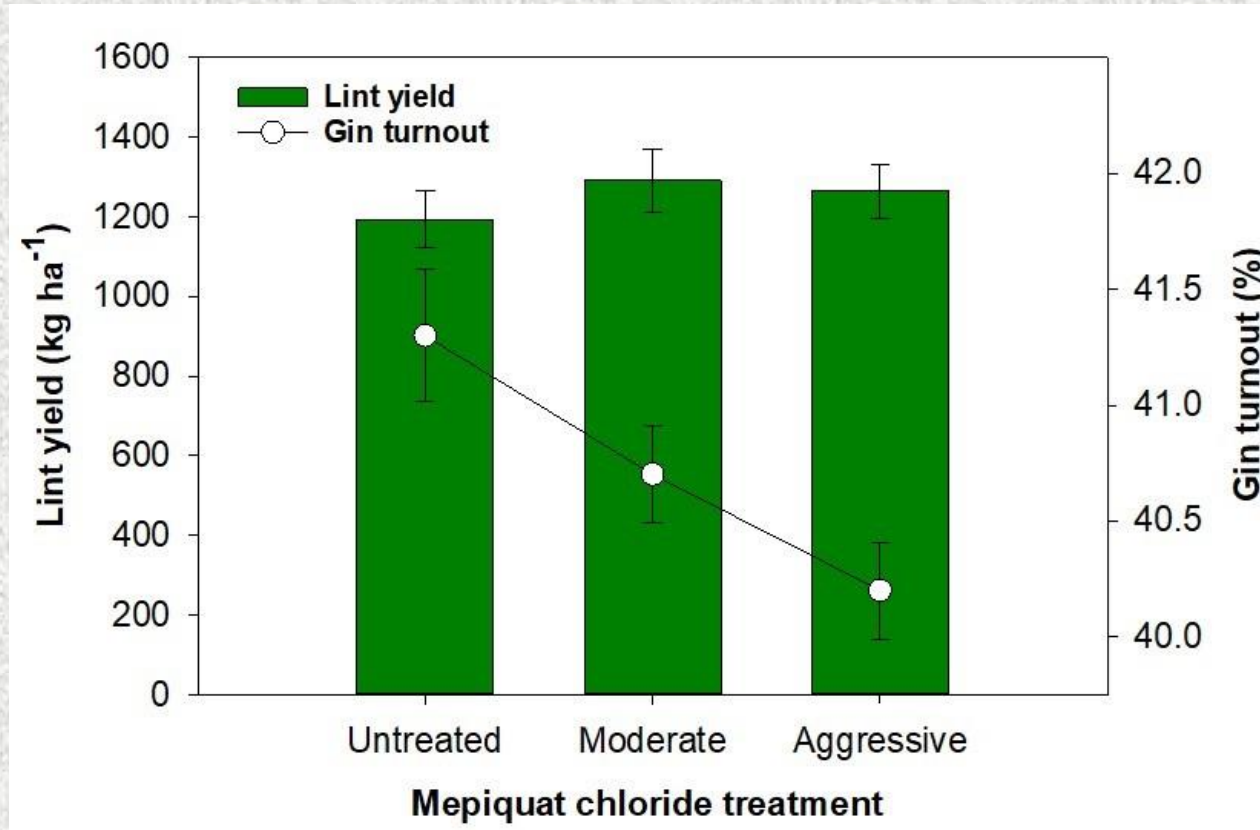


# N uptake & N Use Efficiency

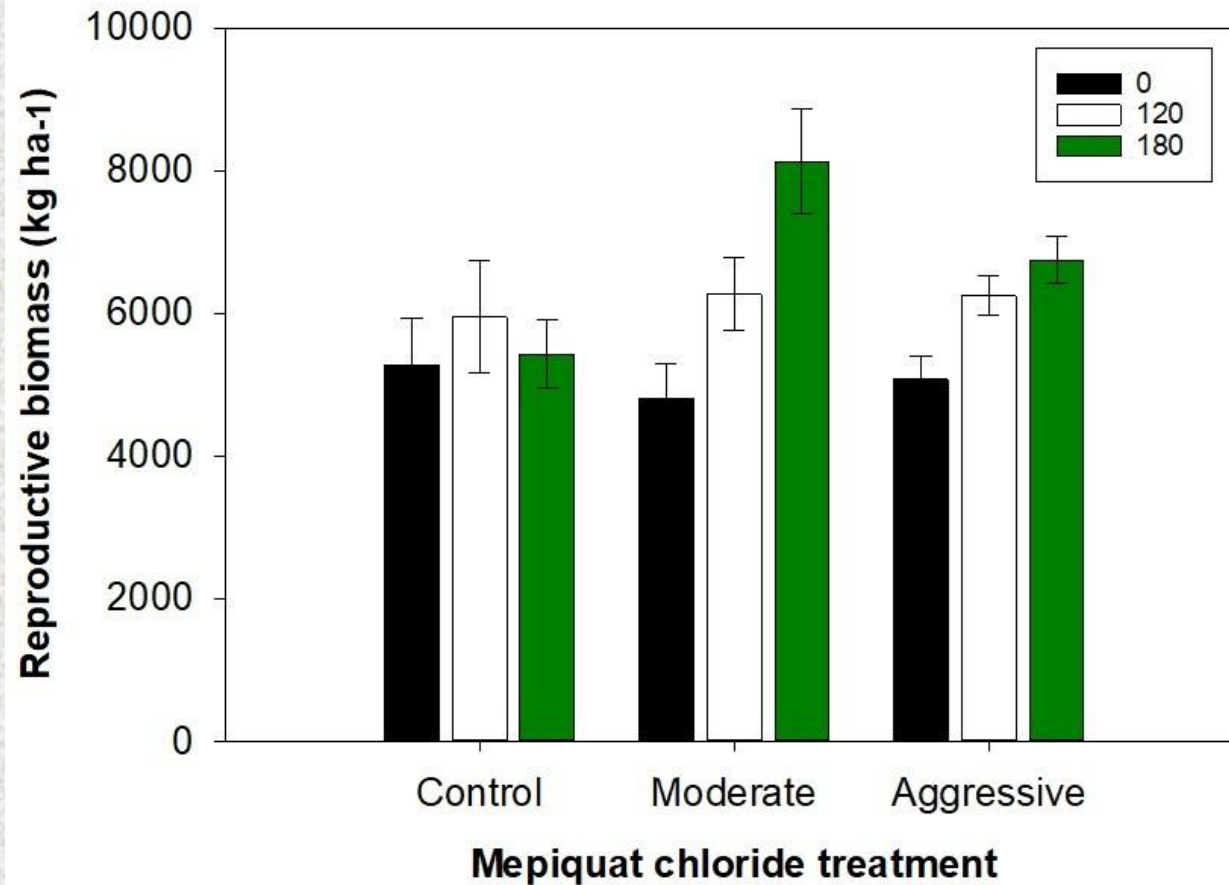


# Growth Management

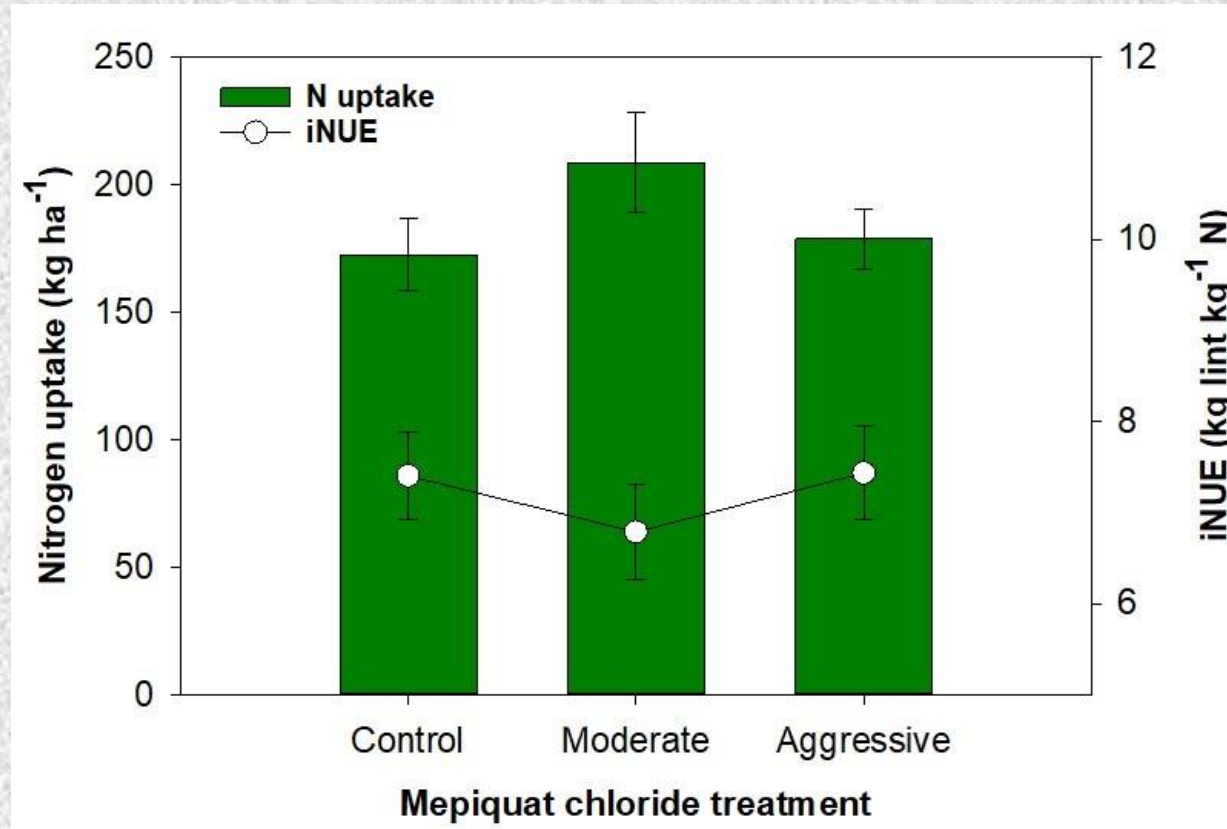
# Lint & Gin Turnout



# Reproductive Biomass



# N uptake & N Use Efficiency



# Conclusions

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- ✓ Nitrogen treatments producing an average N uptake of 190 lbs N per acre maximized lint yield and reproductive biomass.

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**Why?**



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# Conclusions

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- ✓ Gin turnout declined, and iNUE was unaffected at yield-maximizing N Rates.
- ✓ Irrigation treatment had no effect on lint yield or gin turnout during the 2022 season.
- ✓ Irrigated treatment had higher vegetative biomass and N uptake, lower iNUE.

→ **Practical implications?**

# Conclusions

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# Conclusions

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- ✓ **MC effects on lint yield and gin turnout?**
- ✓ **N uptake and iNUE were unaffected by MC.**
- ✓ **Positive effects of increased N application on reproductive biomass were only realized in moderate or aggressive MC treatment plots.**

- Will Vance
- Lola Sexton
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# Acknowledgements



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**Questions?**