


# Undercover farming: Assessment of cover crop and integrated weed management for Georgia row-crops



H. C. Lindell, M. C. Bocz, T. L. Grey, E. P. Prostko, A. S. Culpepper, F. Meeks, N. T. Basinger

# Outline

- Living Mulch Affect on Palmer Amaranth  
Attributes in Cotton
- Cereal Grain Covercrop in Peanuts

Cover crop and living mulch  
systems with herbicide on Palmer  
Amaranth (*Amaranthus palmeri* S.  
Wats.) population dynamics

# Cotton and Cover Crops

*“Herbicides provide great control*

***But...***

*Herbicide reliance ↗ herbicide resistance to multiple mechanisms of action”*



Example of living mulch between cotton strips

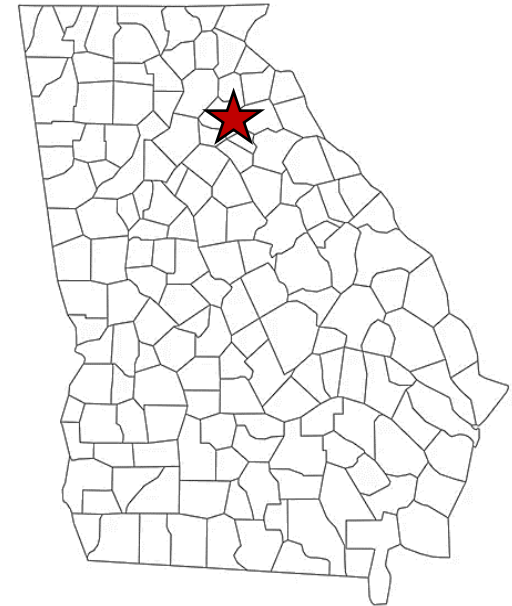
- Palmer amaranth is currently resistant to 5 MOA
- Cover crops
  - alter soil environment + decrease light to soil surface
  - Physical barrier + weed suppression
  - Reduce exposure to herbicide (*Wiggins et al. 2017, Hand et al. 2021*)
  - Herbicide more effective (*Wallace et al. 2019*)
- Low overall adoption <15%

- Annual: terminated before cash crop
- Perennial (living mulch): grows synchronously with cash crop
  - Nitrogen release; cost saver (*Hill et al. 2017*)
  - Potential tradeoffs

# Materials and Methods

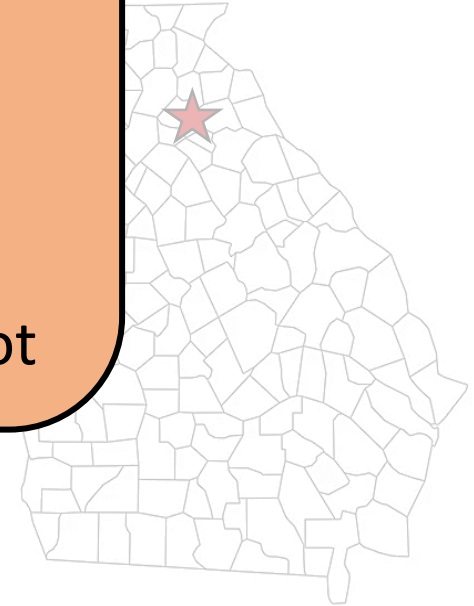
- Watkinsville, GA: 2020, 2021, 2022, 2023
- Cover crops and living mulch (two annuals, one perennial, & bare ground):
  - Cereal rye (*Secale cereale* L.) at 100 lb ac
  - Crimson clover (*Trifolium incarnatum* L.) at 20 lb ac
  - White clover (*Trifolium repens* L. 'Durana<sup>®</sup>') at 20 lb ac
  - Bare ground
- DG 3615 Cotton (38,000 seed/acre)
  - Irrigated based on UGA check book method (Porter, 2021)
- Plots 36 ft by 54 ft
- Randomized complete block design

} annuals  
— perennial



- No previous Palmer amaranth population
- (2020) 25,000 seed m<sup>-2</sup> (Palmer amaranth) placed in 9 m<sup>-2</sup> subplots
- 20 soil cores (annually) for seed bank density
- Seeds collected from end-of-season added back to each plot

- Watskin
- Cover c
- ground
- Cere
- Crim
- White clover
- Bare ground
- DG 3615 Cotton
- Irrigated bas
- Randomized co



CR

BG

LM

CC

# Herbicide Management



- Burndown application for CR, CC, and BG
- Strip width spray of 20 cm for LM
- Herbicide management based on seedling emergence
- NO residuals

Herbicide	Rate	WAP	
		2022	2023
glufosinate-ammonium	32 oz/ac	3	3
glufosinate-ammonium	32 oz/ac	7	7
glyphosate + carfentrazone-ethyl	32 oz/ac and 2 oz/ac	11	NA

**B. Seedlings**



2. Seedling survival =  $\frac{C}{B}$

**C. Adult plants**



3. Fecundity =  $\frac{D}{C}$

1. Seedling recruitment =  $\frac{B}{A}$

*Palmer amaranth lifecycle*

Seed production

Seed survival

**A. Seed bank**



**D. Seeds**





# Seedbank



Cover crop	Germinated seedlings m <sup>-2</sup>			
	2020	2021	2022	2023
BG	3229a	3846a	5152a	1380b
CC	3796a	5424a	8407a	4191b
CR	3871a	2194a	4783a	1208b
LM	2416a	3525a	3550a	12475a

*Palmer amaranth lifecycle*

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Seed production

Seed survival

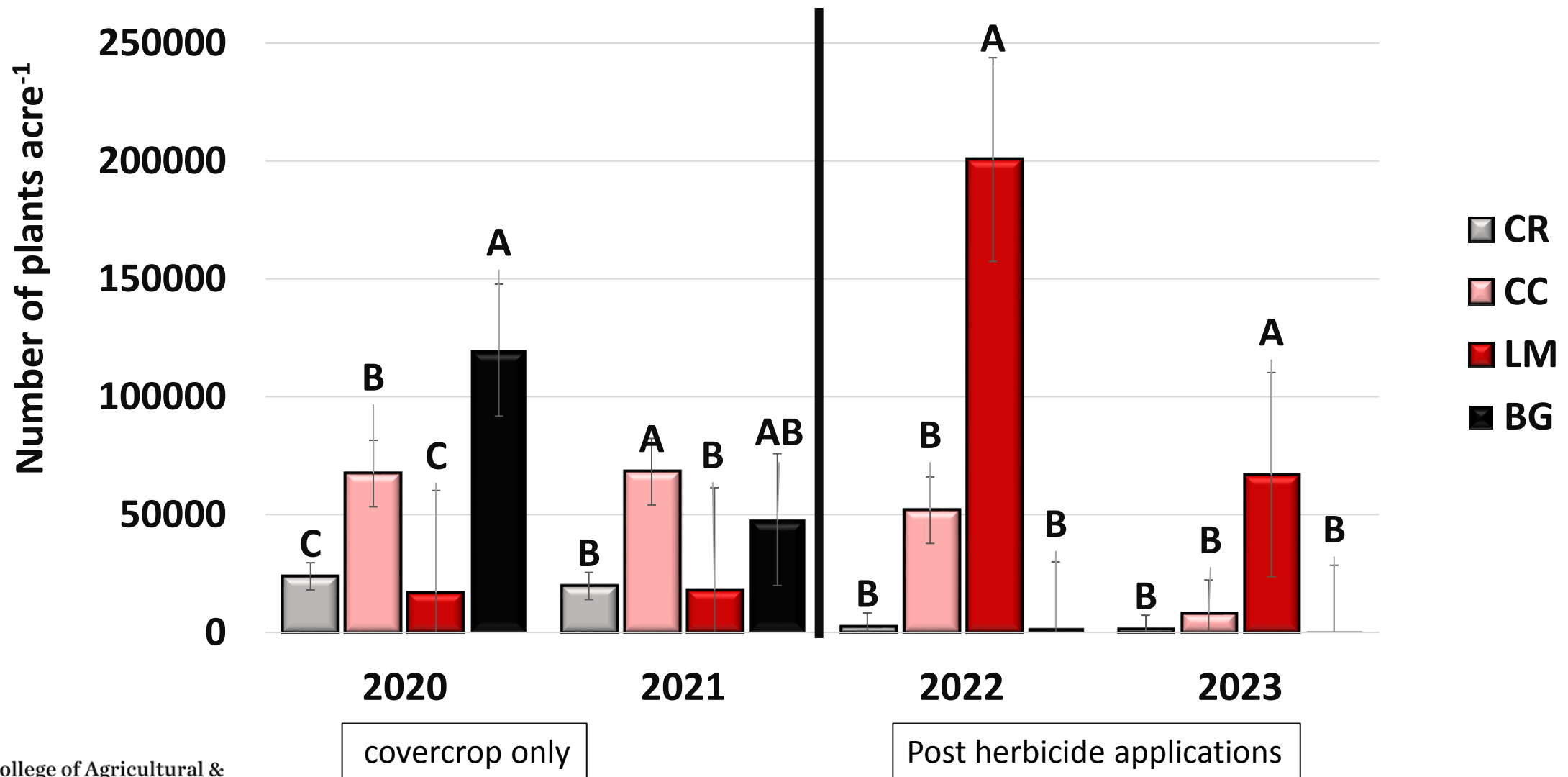
**A. Seed bank**



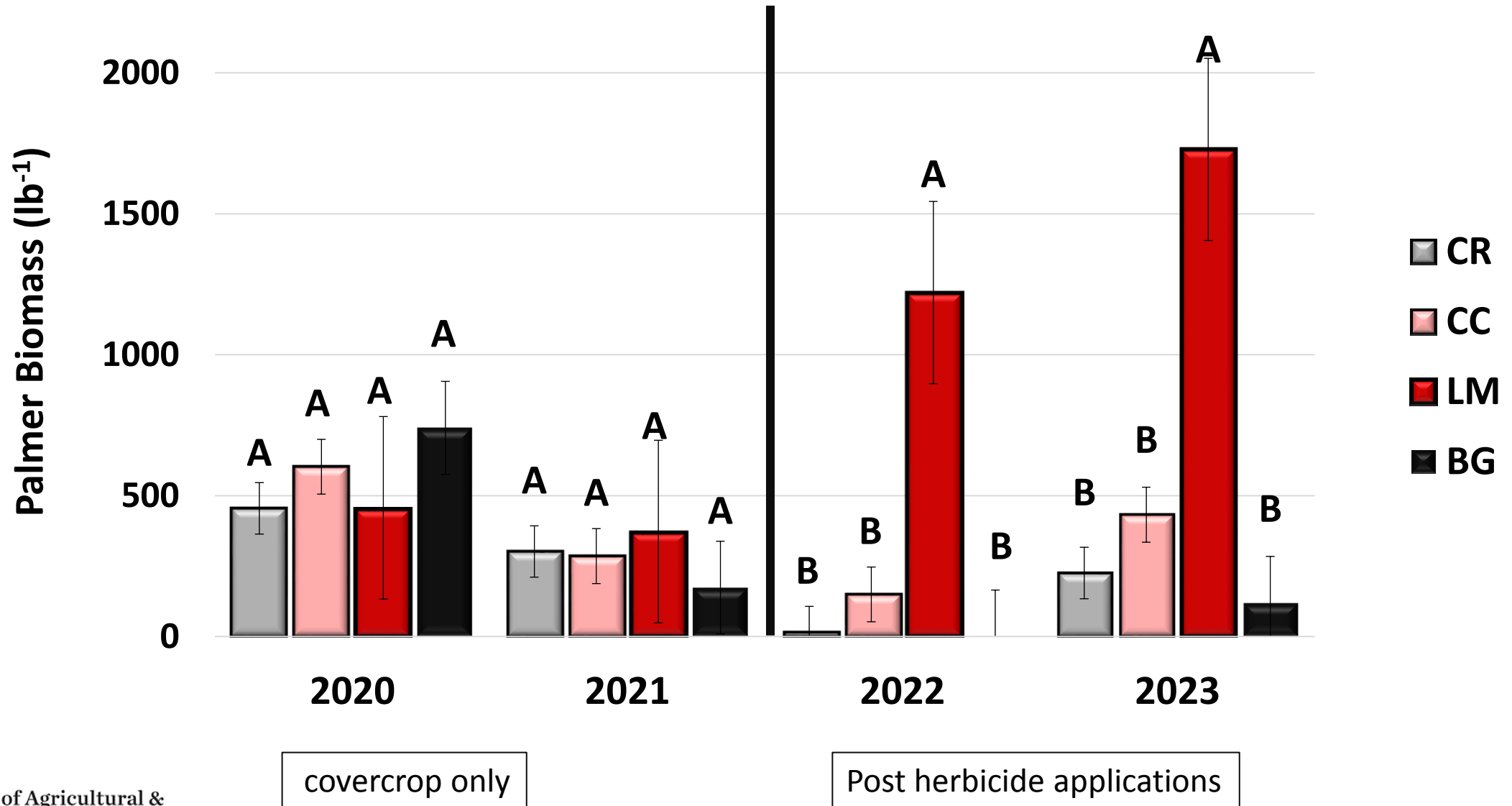
**D. Seeds**



# Palmer Amaranth: EOS Number of plants



# Palmer Amaranth: EOS Biomass



*Palmer amaranth lifecycle*

**B. Seedlings**



**C. Adult plants**



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Seed production

Seed survival

**A. Seed bank**



**D. Seeds**



# 2022 Plots



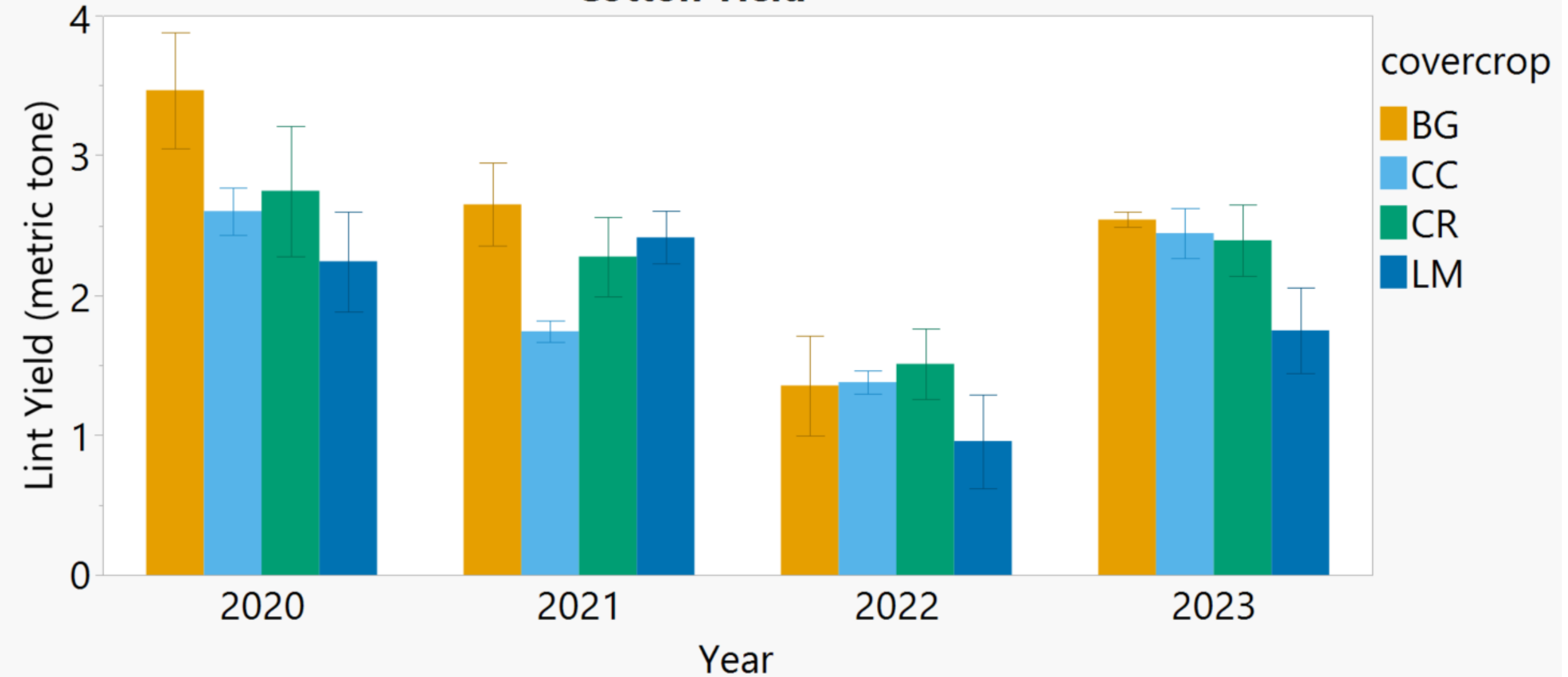
Living mulch + strip width application



Cereal rye + broadcast application



# Cotton Yield



**No significant difference between cover  
crop treatments**

# Take Home

- Without herbicides, cereal rye and living mulch effectively reduced palmer amaranth plant number
- Herbicides with covercrops reduced palmer amaranth plant number and biomass in cereal rye, crimson clover, and bare ground scenarios
- Covercrop did not affect cotton yield for years 1, 2, 3, and 4



Evaluating planting arrangement,  
herbicide persistence, and weed  
management using cereal rye  
cover crop in Georgia peanut

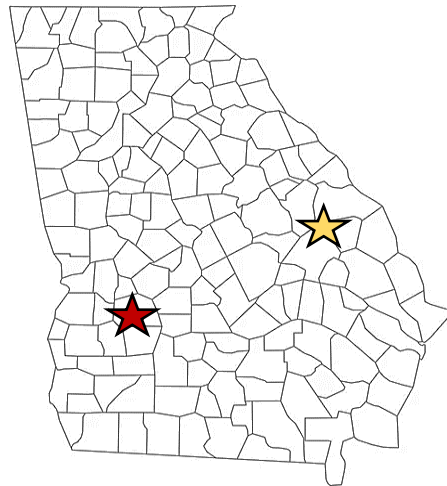
# Peanuts and Cover Crops



- Georgia makes up >52% peanut production
- 11 recorded cases of herbicide resistant weeds in Georgia (*Heap 2023*)
- Cover crops affect herbicide efficacy, alter weed control, and create a risk for peanut injury from carryover (*Perkins 2020*)
- Evaluations of the potential risk/benefits of cover crops in peanut production is crucial

# Materials and Methods

- Trial locations for:
  - 2023: ★ Midville and ★ Tifton, GA
- Variety: Georgia-06G
  - High yielding and TSWV resistant runner cultivar
  - Plot size 12 ft by 30 ft
- Seeds planted at 88,000 seeds acre<sup>-1</sup>



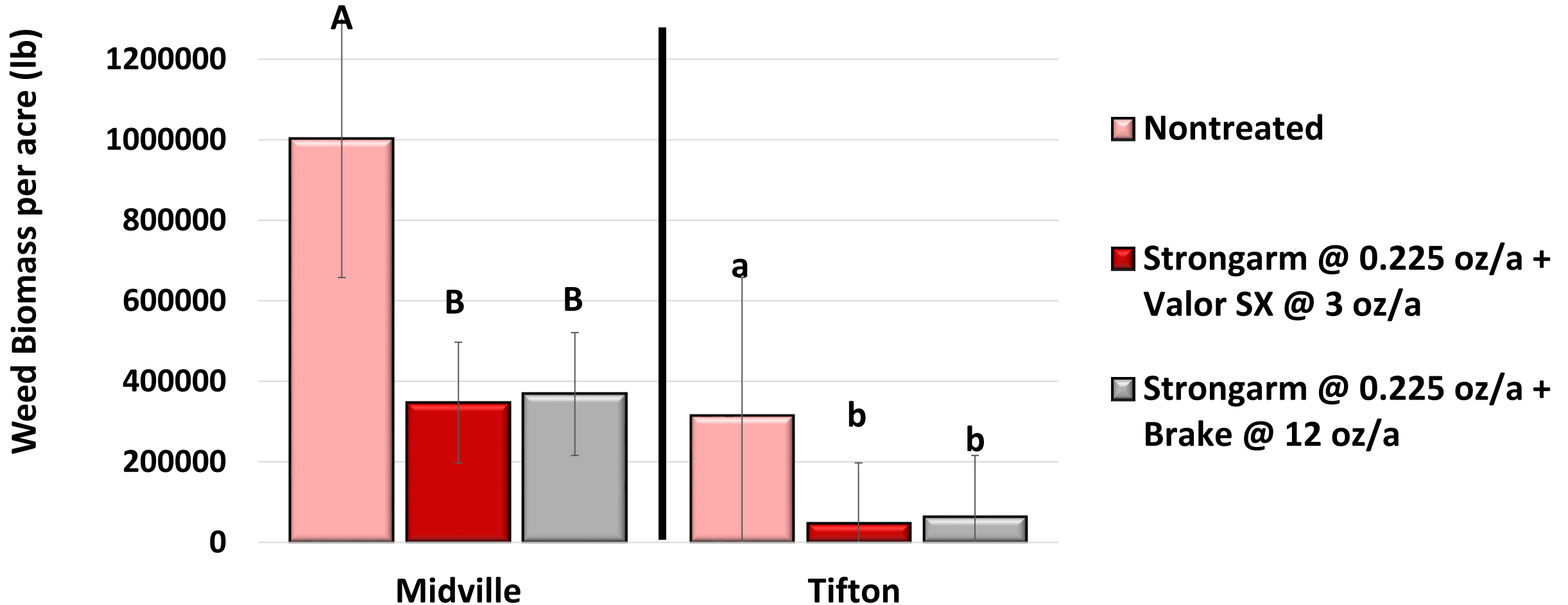
# Materials and Methods

50 lbs/A 100% cereal rye drilled in Tifton (37,082 lb/ac biomass), and a cereal grain mix (70% cereal rye; 20% oat; 10% wheat) broadcast at 70 lb/A in Midville (103,195 lb/ac biomass)

- Midville planted 5/8; PREs applied 5/9; POSTs applied 6/6
- Tifton planted 5/8; PREs applied 5/9; POSTs applied 6/8

Table 1. Proposed treatment structure.			
Cover crop	Planting	PRE	POST
No Cover crop	Single	None	None
		Paraquat+Prowl+Valor+Strongarm	Cadre +Warrant+2,4DB
		Paraquat+Prowl+Strongarm+Brake	Cadre +Warrant+2,4DB
	Twin	None	None
		Paraquat+Prowl+Valor+Strongarm	Cadre +Warrant+2,4DB
		Paraquat+Prowl+Strongarm+Brake	Cadre +Warrant+2,4DB
Cereal Grain	Single	None	None
		Paraquat+Prowl+Valor+Strongarm	Cadre +Warrant+2,4DB
		Paraquat+Prowl+Strongarm+Brake	Cadre +Warrant+2,4DB
	Twin	None	None
		Paraquat+Prowl+Valor+Strongarm	Cadre +Warrant+2,4DB
		Paraquat+Prowl+Strongarm+Brake	Cadre +Warrant+2,4DB

# Weed Biomass: Herbicide Effect



■ Nontreated

■ Strongarm @ 0.225 oz/a +  
Valor SX @ 3 oz/a

■ Strongarm @ 0.225 oz/a +  
Brake @ 12 oz/a

Nontreated

Strongarm @ 0.225 oz/a + Valor SX @ 3 oz/a +  
Gramoxone 3SL @ 20.8 oz/a + Prowl 32 oz/a

Strongarm @ 0.225 oz/a + Brake @ 12 oz/a  
Gramoxone 3SL @ 20.8 oz/a + Prowl 32 oz/a

Twin-row



Single-row



Midville 6/26/2023 – 7 WAP/WAT

Tifton, GA – August 10  
12 WAP



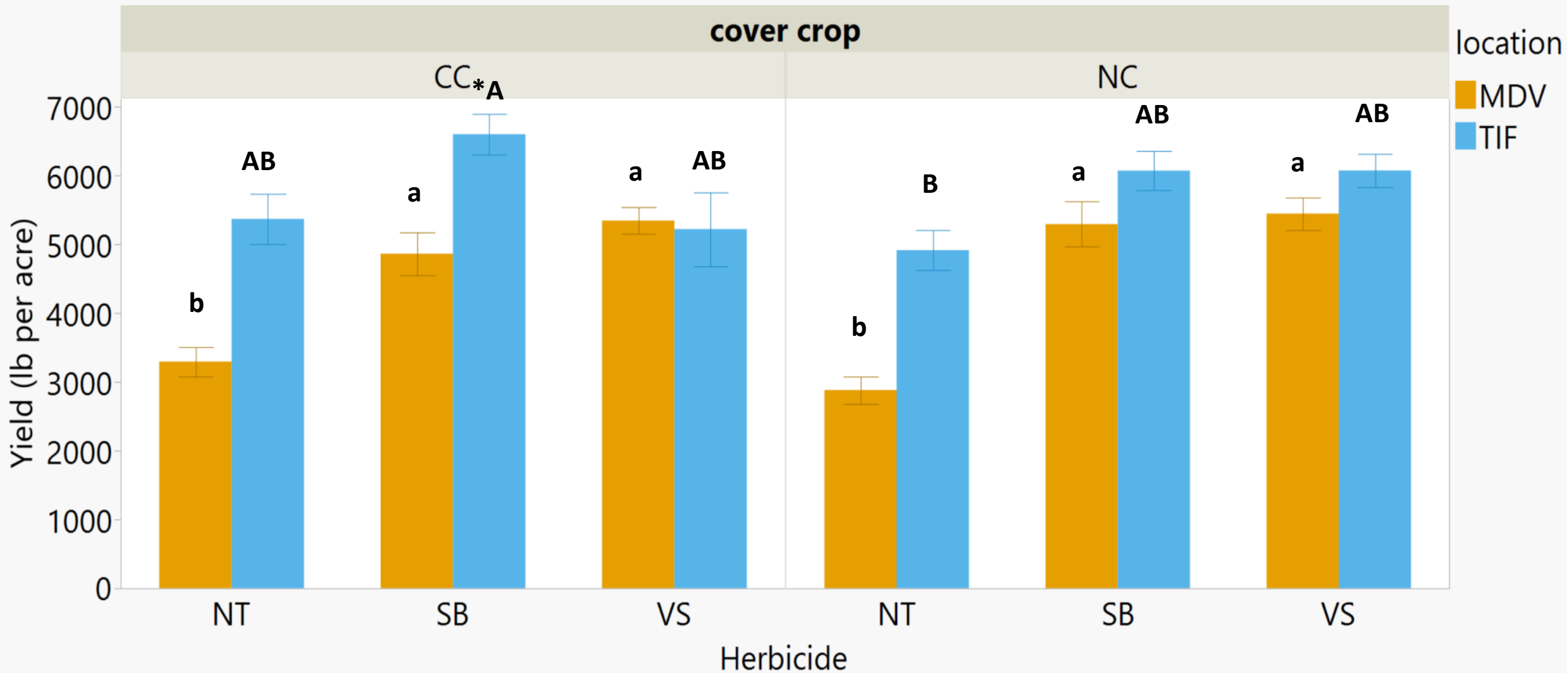
Single-row + nontreated



Twin-row + nontreated

**Weed biomass at the end of the season is 68% higher in single-row peanuts compared to twin-row**

# Peanut Yield



NT = nontreated

SB = Strongarm @ 0.225 oz/a + Brake @ 12 oz/a

VS = Strongarm @ 0.225 oz/a + Valor SX @ 3 oz/a

Yield was not affected by planting arrangement



# Take Home

- Multiple tank mix herbicides reduce weed biomass compared to nontreated, regardless of cover crop or planting arrangement
- At Midville, where late emerging weeds occurred, herbicide use increased peanut yield
- Twin-row reduced biomass from early emerging weeds at Tifton, GA by 68%
- Yield was affected by herbicide and covercrop at Tifton


# Acknowledgments

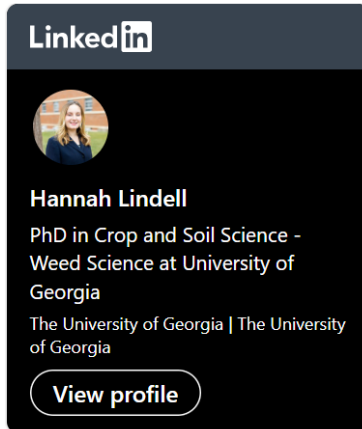
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# Thank you for listening

**For any further questions, please  
contact me at  
[hcl00025@uga.edu](mailto:hcl00025@uga.edu)**

 **@lind\_han9**



**LinkedIn**



**Hannah Lindell**  
PhD in Crop and Soil Science -  
Weed Science at University of  
Georgia  
The University of Georgia | The University  
of Georgia

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