

MOTHER AND DAUGHTER CHIPPING POTATO CULTIVAR RESPONSES TO SUBLETHAL RATES OF GLYPHOSATE AND DICAMBA



History

- 2000s - Weed resistance to glyphosate
- 2016 - Dicamba resistant soybeans released
- 2017 - The perfect storm
- 2018 - New rules



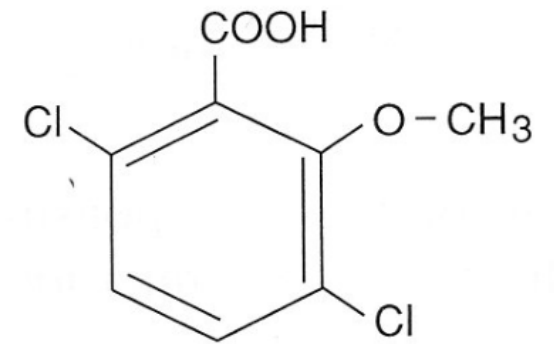
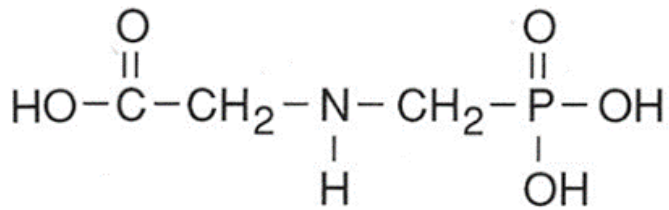
Introduction

- The purpose of dicamba-tolerant soybeans was to offer growers a solution to control glyphosate-resistant weeds
- It is likely that instances of injury will occur
 - Spray drift
 - Volatilization
 - Tank contamination



Objective

- Determine the impact of sublethal dicamba and/or glyphosate rates on 'Atlantic' and 'Dakota Pearl' chipping potatoes.
- Determine the response of daughter tubers when the mother plants have received a sublethal rate of glyphosate and/or dicamba.



'ATLANTIC' AND 'DAKOTA PEARL' SEED POTATOES RESPONSES TO GLYPHOSATE AND DICAMBA DRIFT



Experiment One: Design

- Randomized Complete Block Design (RCBD)
 - 5 Treatments
 - 2 Cultivars
 - 4 Replicates
 - Combined over 2 locations in 2018



Planting in Oakes, North Dakota 2018

Materials and Methods

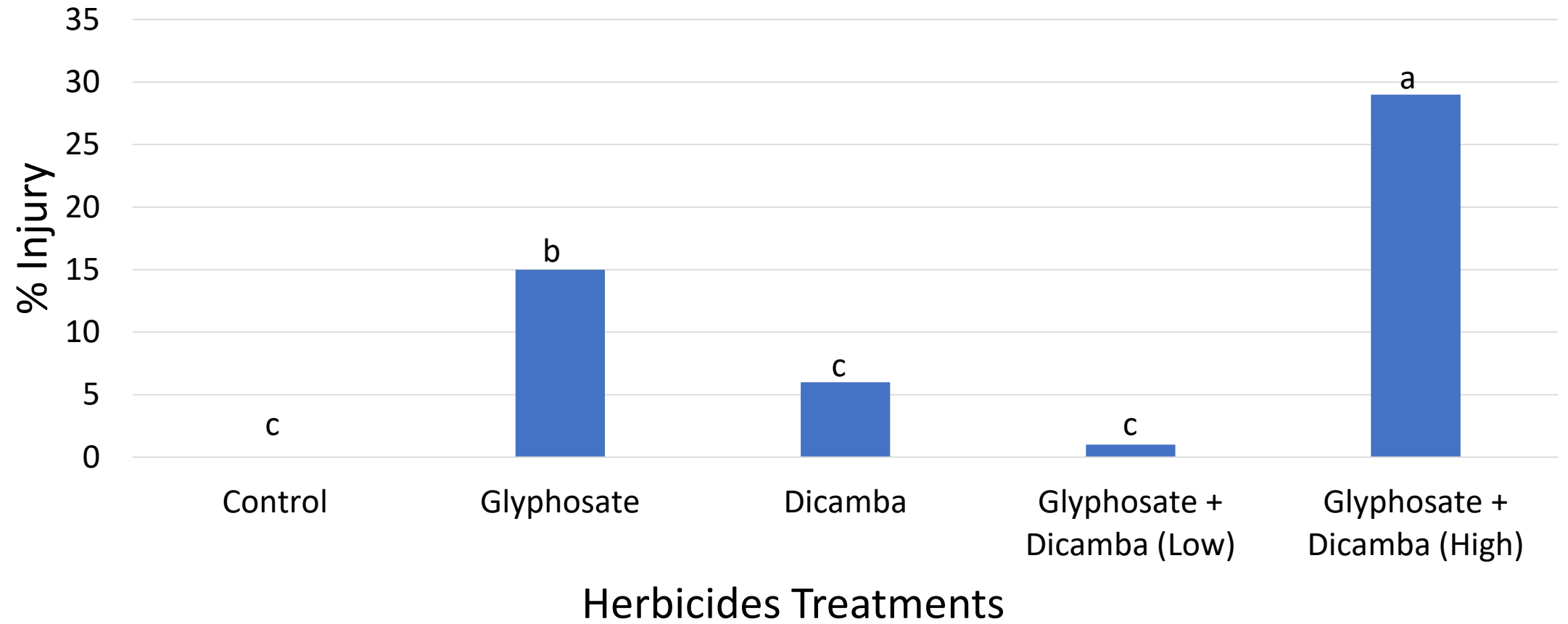


- Seeds pieces were cut to 70 g
- Field Planting
 - Depth of 10 cm
 - 31 cm apart
 - Row length was 6.1 m
 - 91 cm row wide
- Sprayed on June 26th at tuber initiation (TI)

Glyphosate and Dicamba Spray Drift

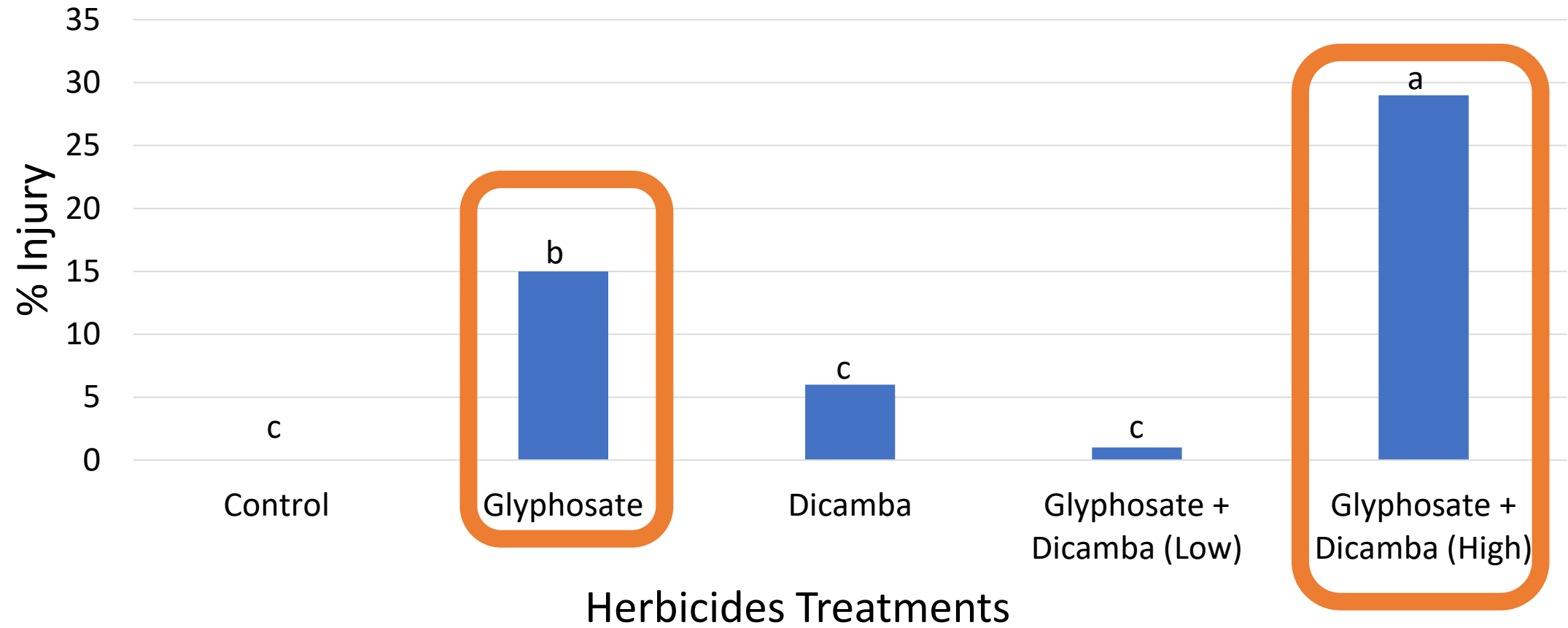
Treatment	Herbicide rate	
	g ae ha ⁻¹	% of field use rate
Non-treated	0	0
Glyphosate + Dicamba (High)	197 99	12 9
Glyphosate + Dicamba (Low)	40 20	2 2
Dicamba	99	9
Glyphosate	197	12

Visible Plant Injury Ratings 7 Days After Treatment



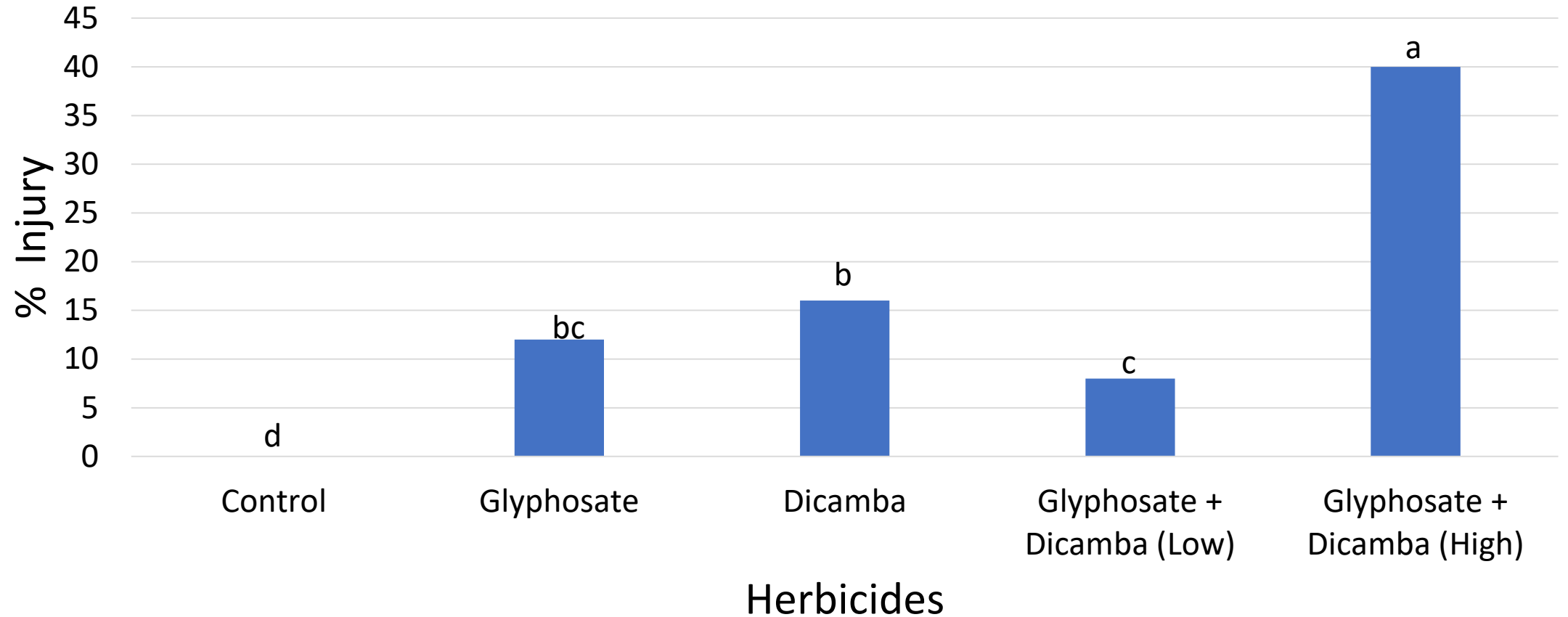
^aNumbers followed by the same letter are not significantly different according to LS Mean separation comparison at $\alpha=0.05$.

Visible Plant Injury Ratings 7 Days After Treatment



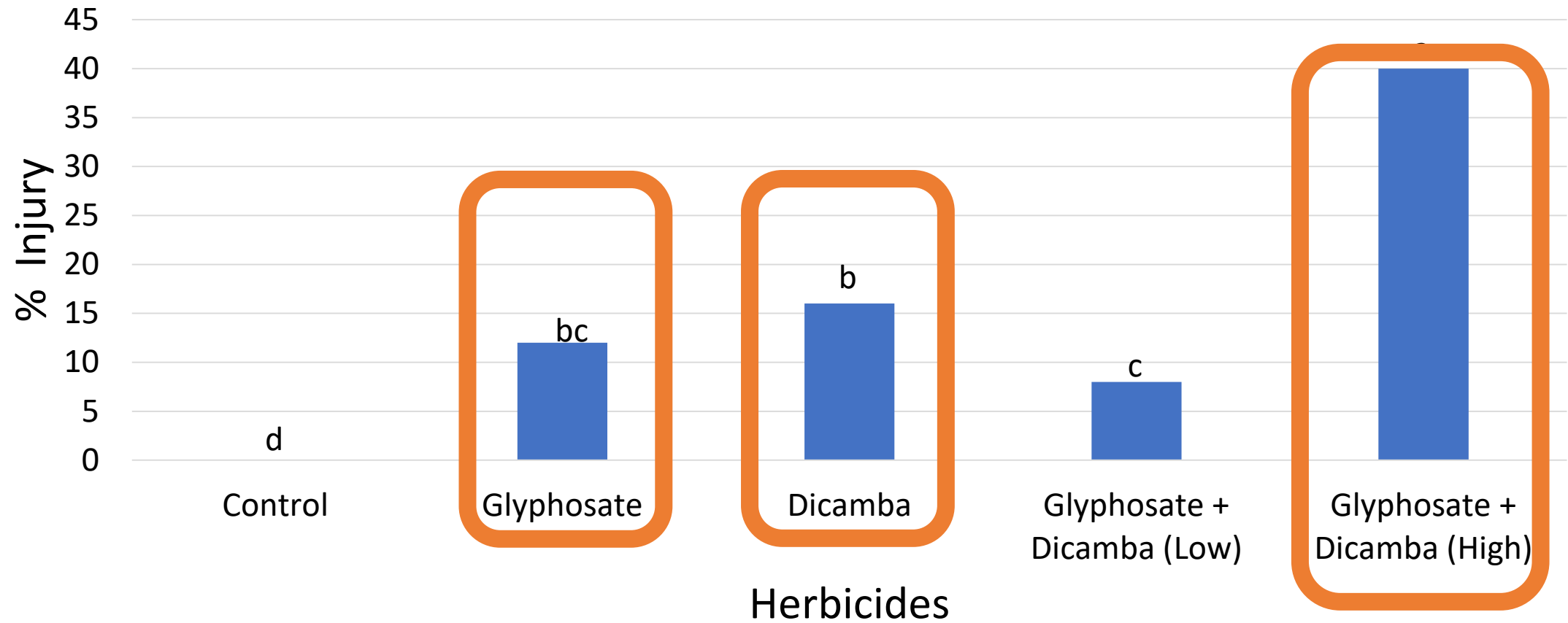
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Visible Plant Injury Ratings 21 Days After Treatments



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Visible Plant Injury Ratings 21 Days After Treatments



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Visible Results 21 Days After Application to Atlantic

A. Dicamba (99g ae ha⁻¹) +
Glyphosate (197g ae ha⁻¹)



B. Dicamba (20g ae ha⁻¹) +
Glyphosate (40g ae ha⁻¹)



C. Dicamba (99g ae ha⁻¹)



D. Glyphosate (197 g ae ha⁻¹)



Graded Yield



Cultivar	Potato Tuber Yield ^a						
	<113 g	113-169 g	170-282 g	>282 g	Total Yield		
	T ha ⁻¹						
Atlantic	7	15	7	8	37		
Dakota Pearl	12	14	6	5	37		
Herbicide	T ha ⁻¹						
Glyphosate	Dicamba	<113	113-169	170-282	>282	Total Yield	
g ae ha ⁻¹		T ha ⁻¹					
0	0	6 d	17 a	9 a	13 a	46 a	
197	99	12 b	11 b	3 c	2 c	28 c	
40	20	7 cd	17 a	8 a	8 b	42 a	
0	99	9 c	14 b	6 b	5 bc	34 b	
197	0	16 a	12 b	4 c	3 c	35 b	
Cultivar x Herbicide	T ha ⁻¹						
Glyphosate	Dicamba	<113	113-169	170-282	>282	Total Yield	
g ae ha ⁻¹		T ha ⁻¹					
Atlantic	0	0	5 f	17 a	9 a	17	48
	197	99	9 cde	10 c	4 de	3	26
	40	20	6 ef	18 a	8 ab	9	41
	0	99	8 cdef	12 bc	5 cd	7	32
	197	0	10 cd	16 a	7 bc	5	38
Dakota Pearl	0	0	7 def	17 a	9 a	11	44
	197	99	15 b	11 bc	2 e	1	29
	40	20	9 cde	17 a	8 ab	8	42
	0	99	11 c	15 ab	7 bc	4	37
	197	0	21 a	8 c	2 e	1	32
P-value							
Cultivar		0.0673	0.5654	0.1794	0.1264	0.9608	
Herbicide		0.0017	0.0110	0.0010	0.0119	0.0036	
Cultivar x Herbicide		0.0372	0.0369	0.0192	0.3371	0.1877	

Graded Yield



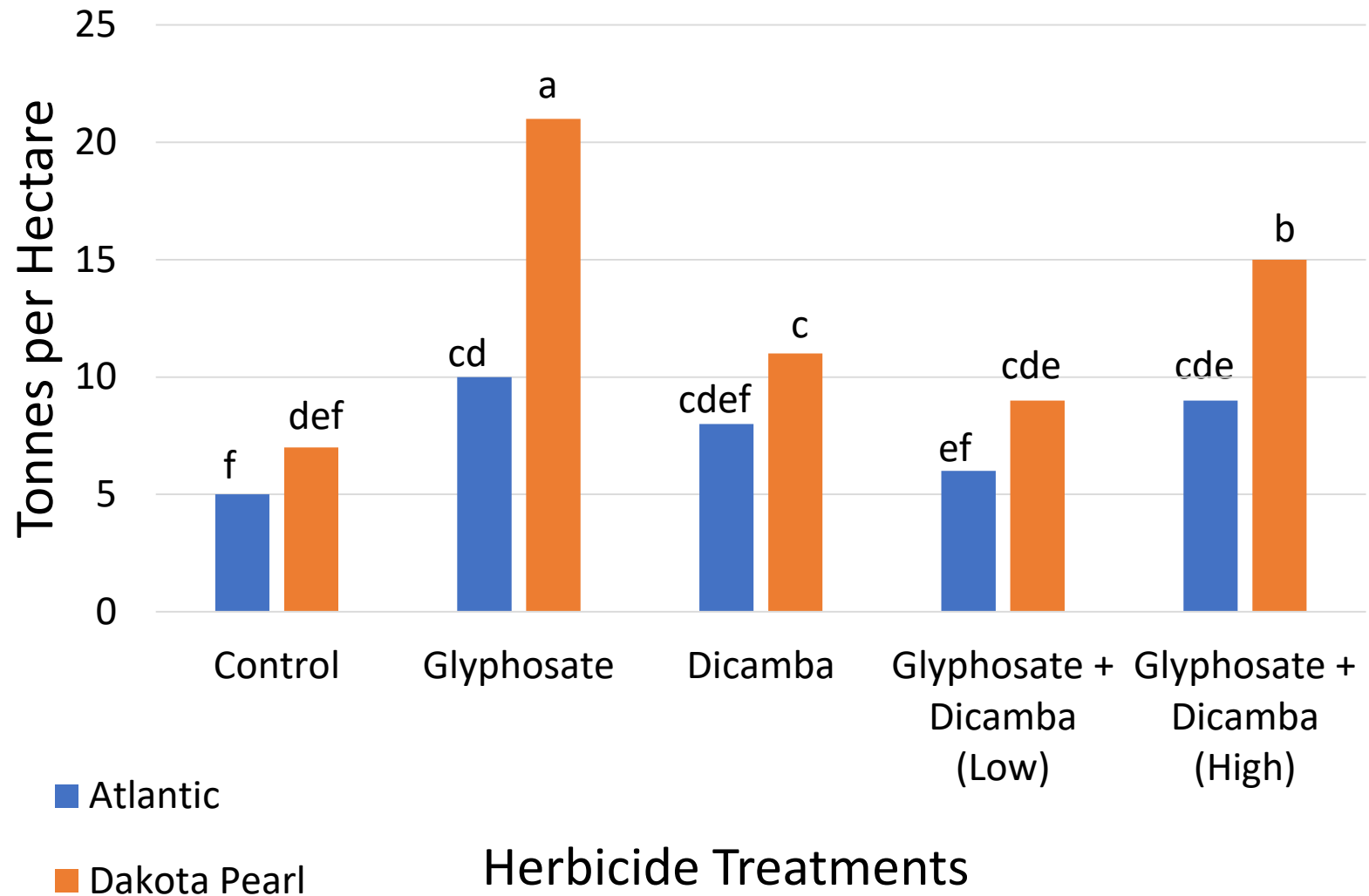
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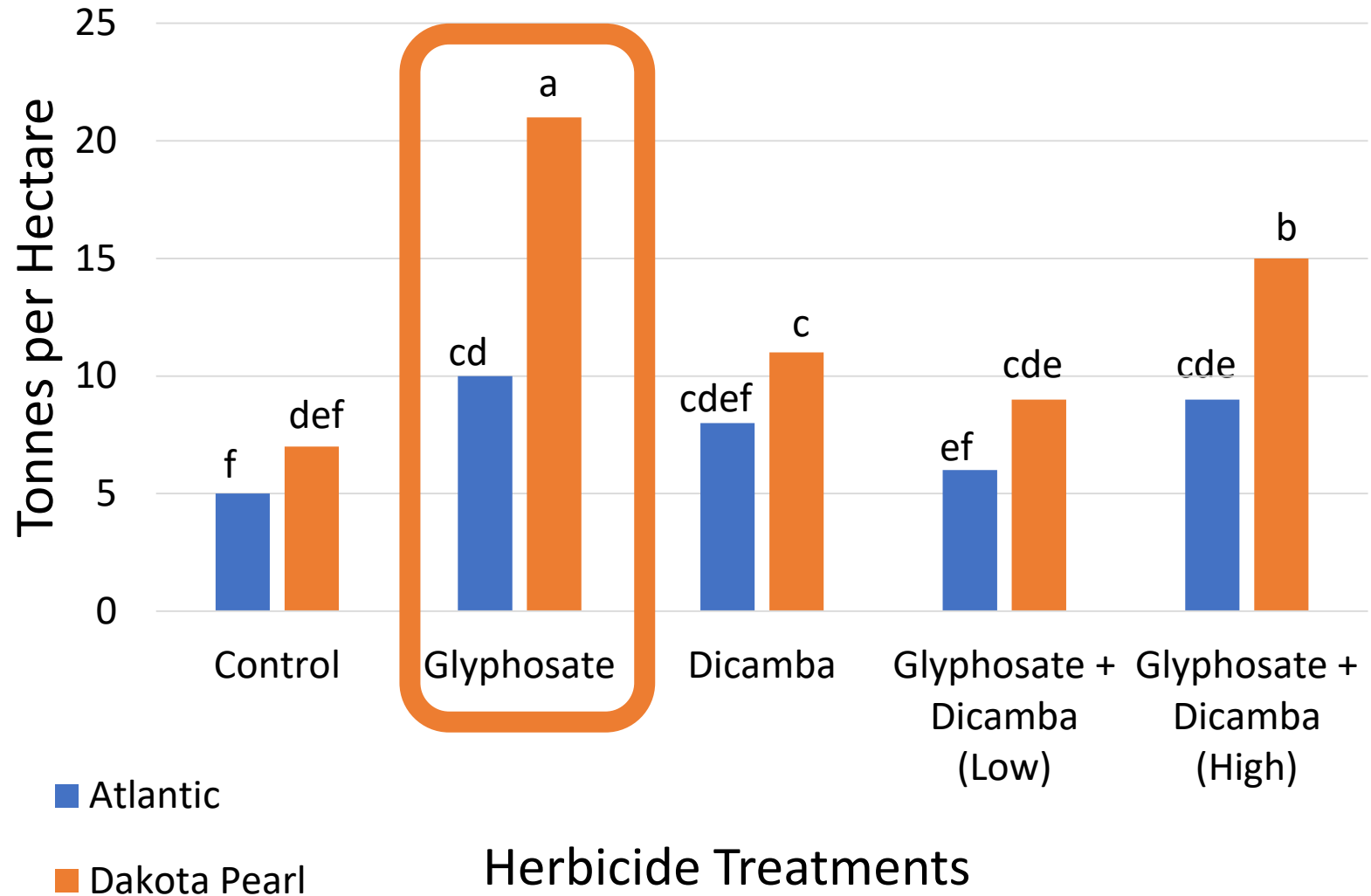
P-value	<113	113-169	170-282	>282	Total Yield
Herbicide	0.0017	0.0110	0.0010	0.0119	0.0036
Cultivar x Herbicide	0.0572	0.0507	0.0192	0.0571	0.1077

Tubers <133 g Interaction Between Herbicide X Cultivar



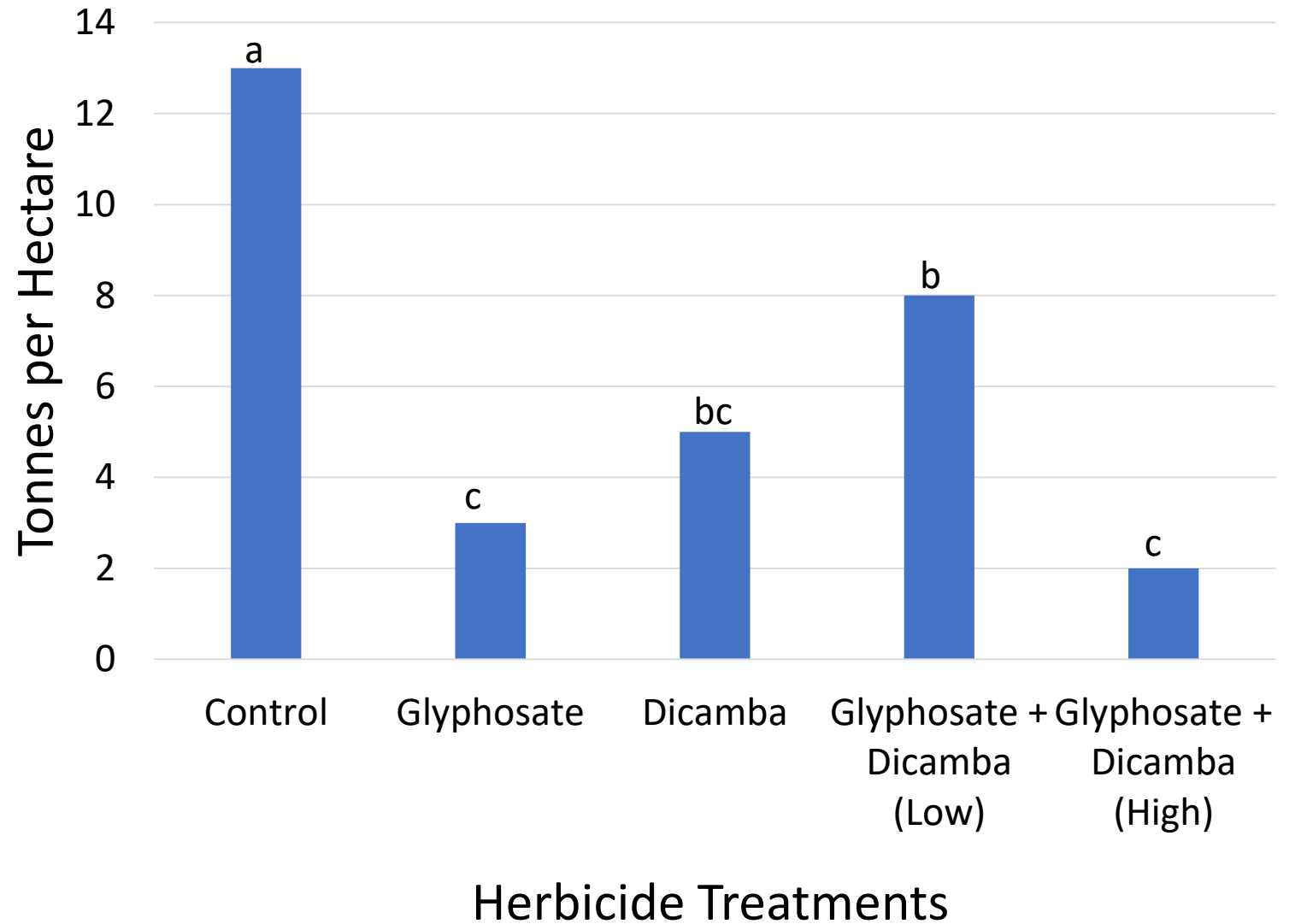
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Tubers <133 g Interaction Between Herbicide X Cultivar



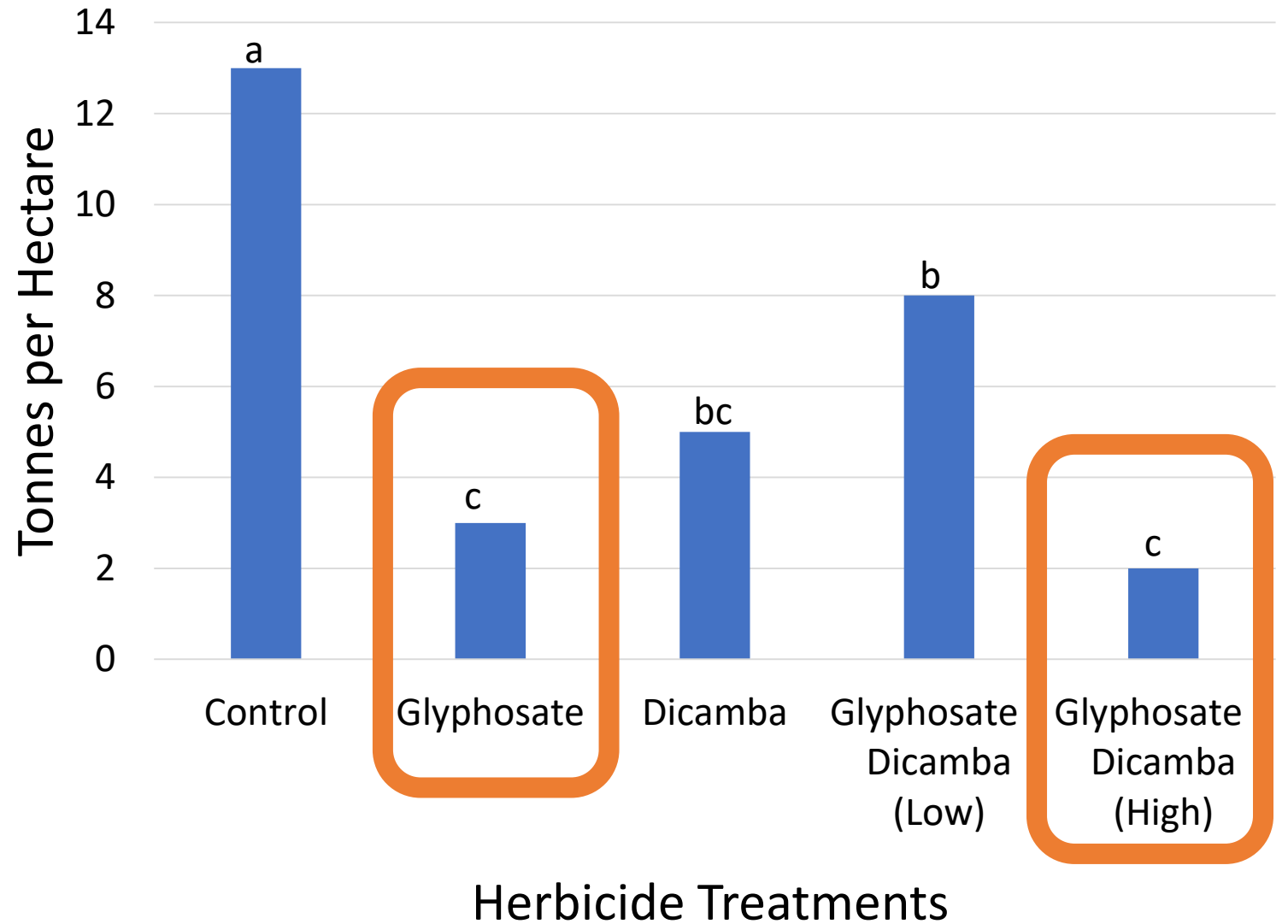
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Tubers > 282 g



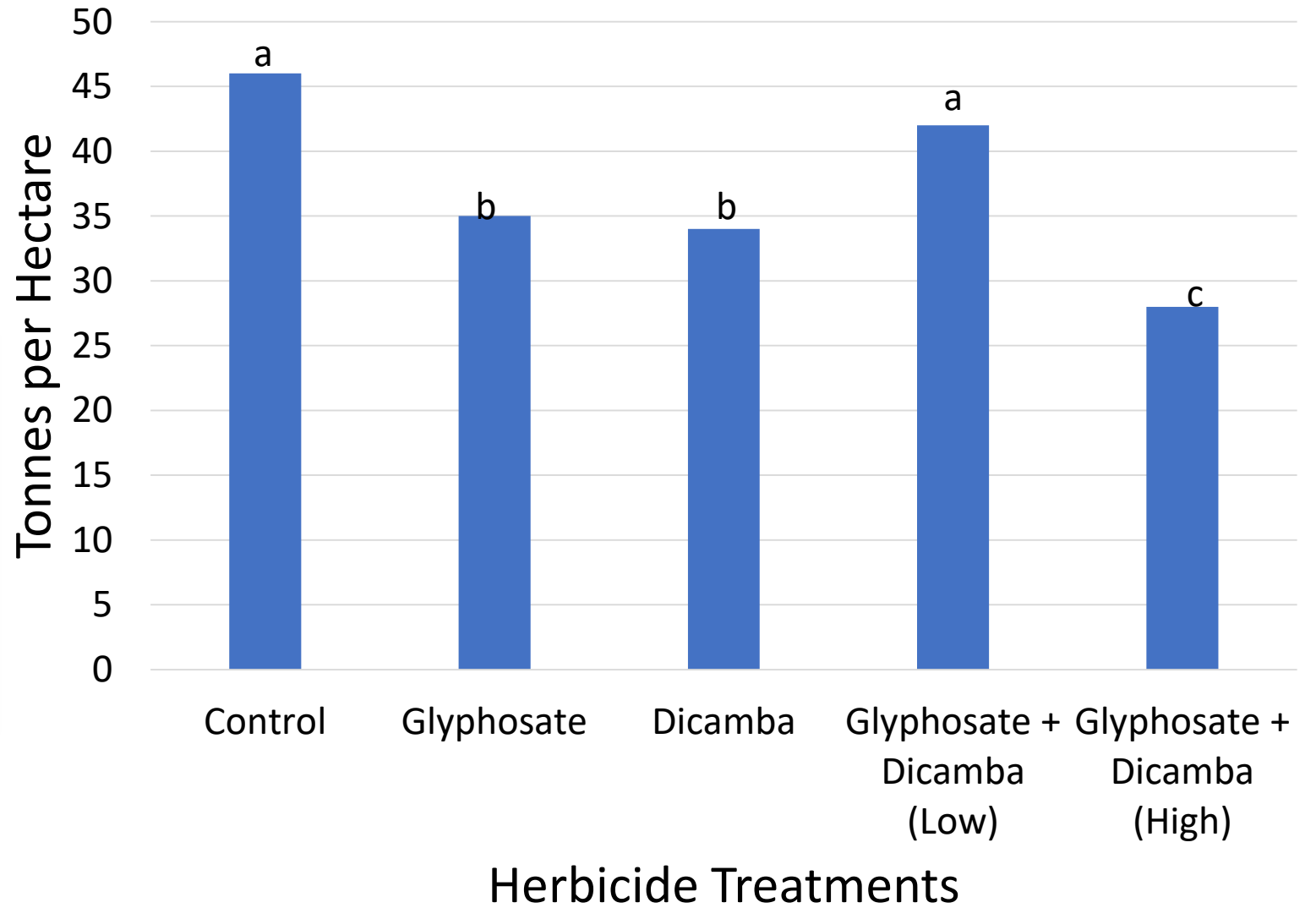
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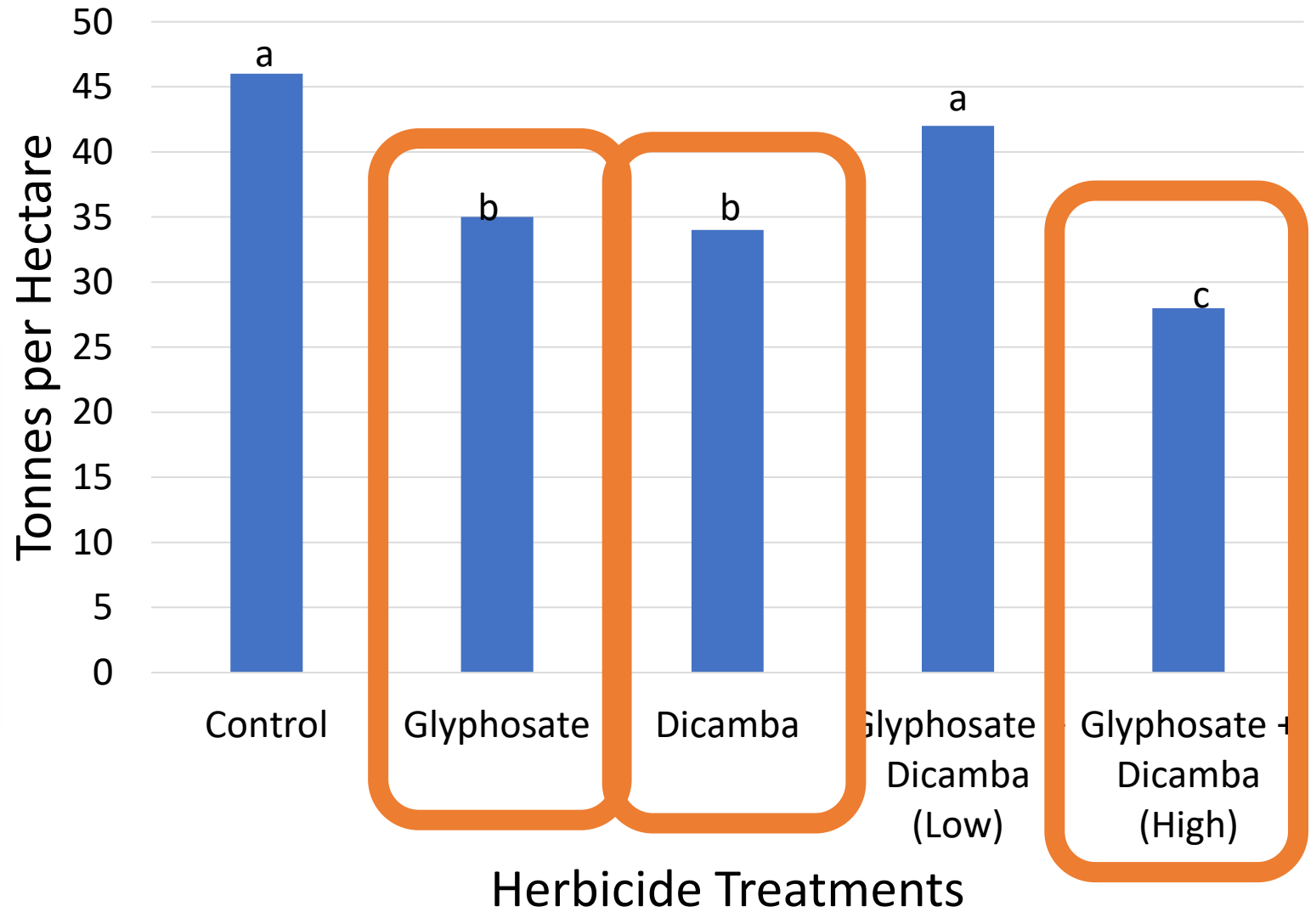
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Total Yield



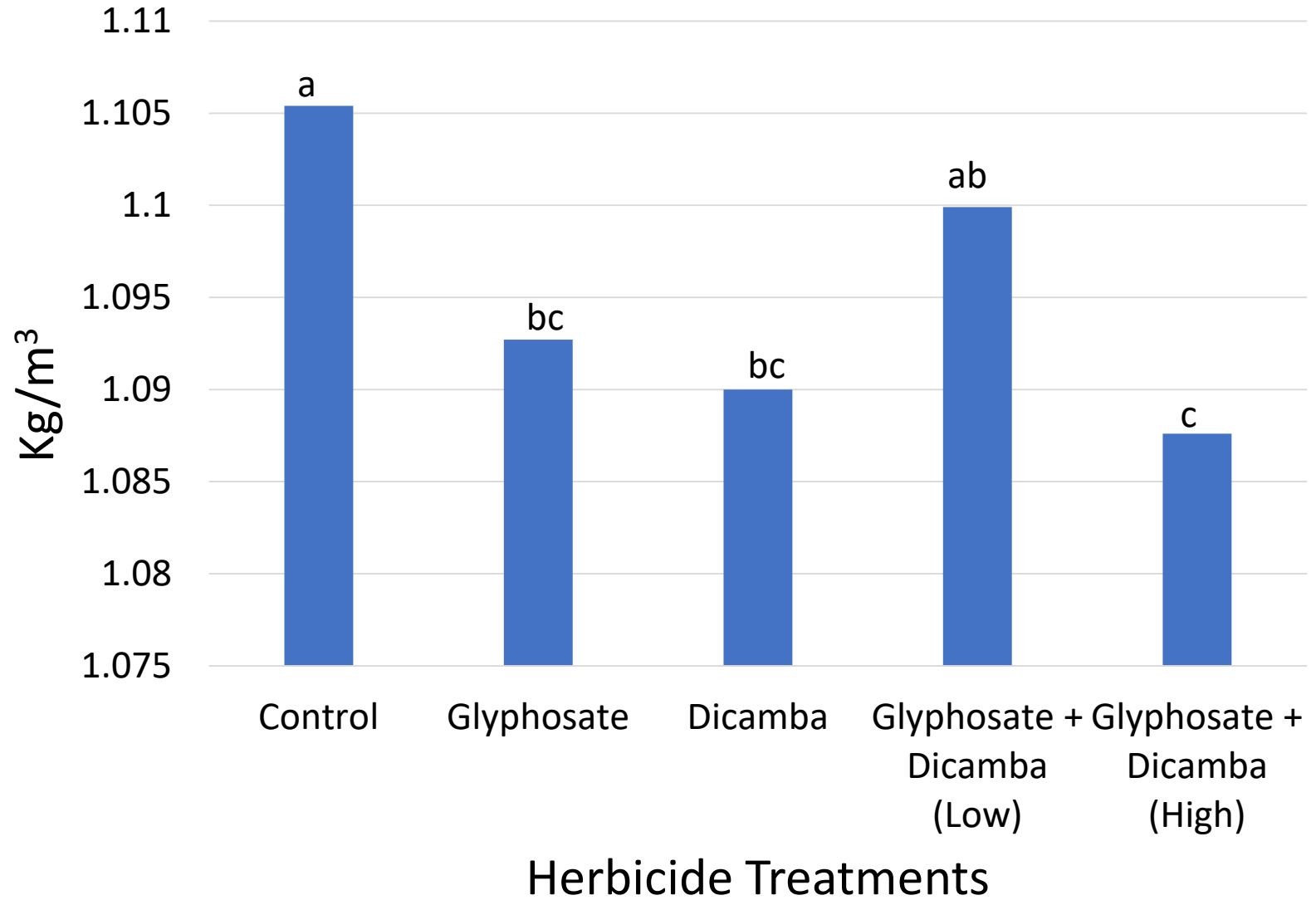
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Total Yield



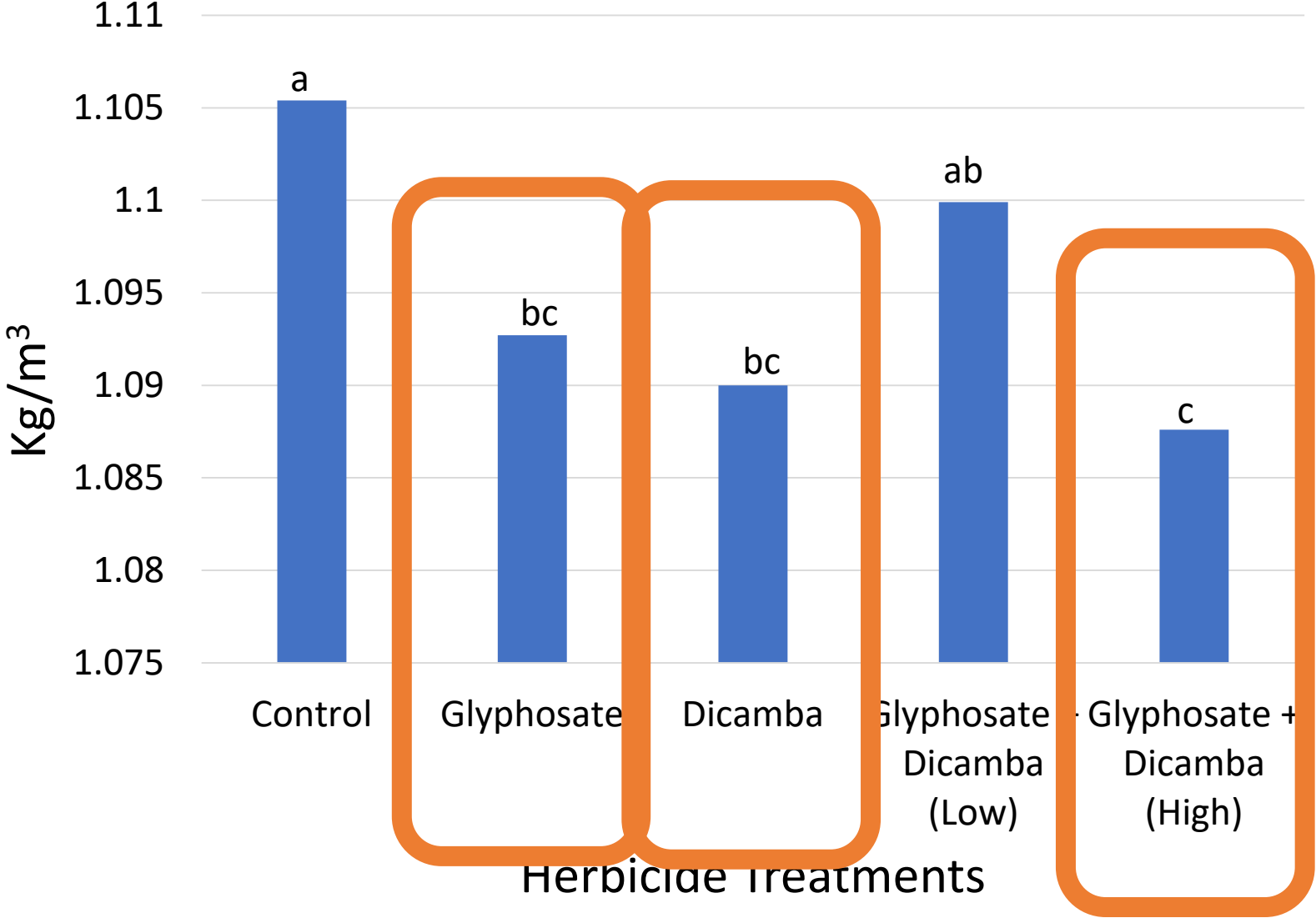
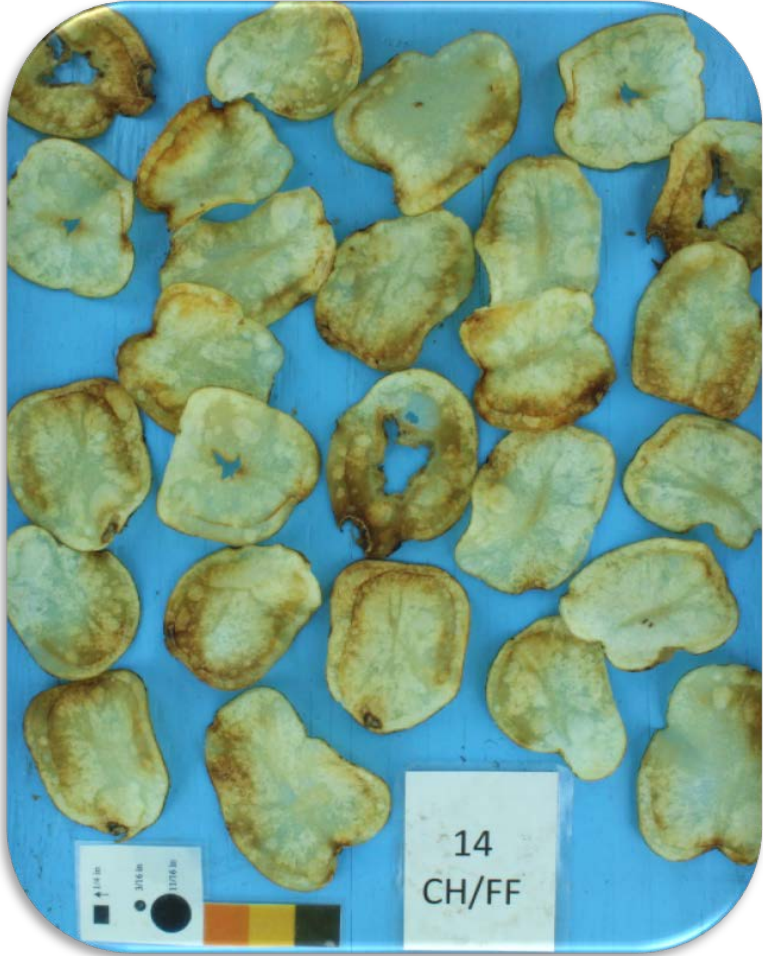
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Specific Gravity



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Specific Gravity



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Conclusion

- Growers could experience up to 40% visible plant injury 21 days after a potential off-target drift from glyphosate and/or dicamba
- Plants treated with glyphosate (197 g ae ha⁻¹), dicamba (99 g ae ha⁻¹), or the high rate combination had a 24 to 41% reduction in total yield
- 'Dakota Pearl' is more sensitive to glyphosate than 'Atlantic'

2019 Daughter Tubers



**'ATLANTIC' AND 'DAKOTA PEARL' DAUGHTER
TUBER RESPONSES TO SUBLETHAL GLYPHOSATE
AND DICAMBA FROM THE PREVIOUS
GROWING SEASON**

Experiment Two: Design

- Randomized Complete Block Design (RCBD)
 - 5 Treatments
 - 2 Cultivars
 - 4 Replicates
 - Combined over 2 locations in 2019



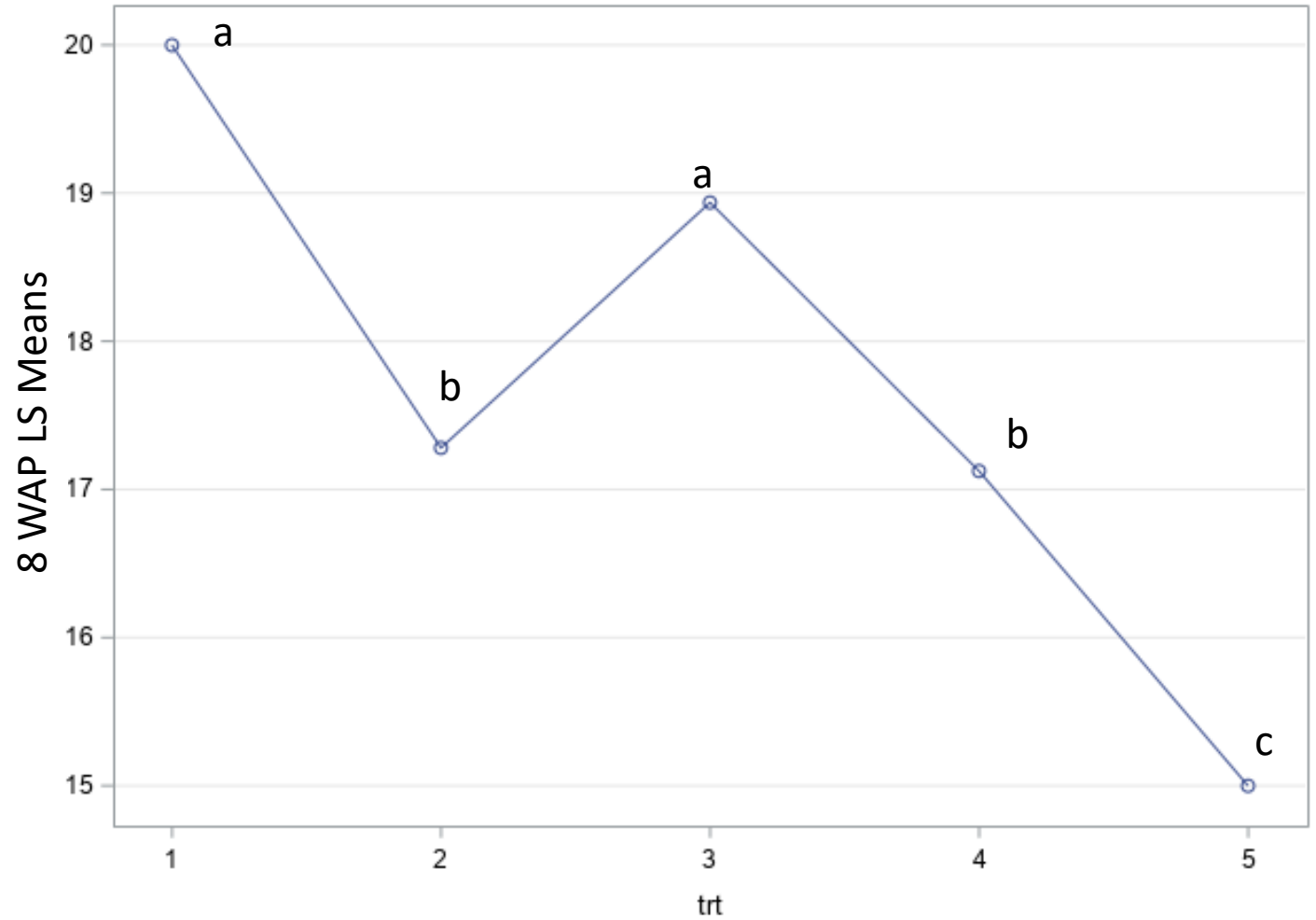
Materials and Methods



'Dakota Pearl' daughter tubers from mother plants treated with glyphosate (197 g)

- Seeds pieces were cut to 70 g
- Field Planting
 - Depth of 10 cm
 - 31 cm apart
 - Row length was 6.1 m
 - 91 cm row wide
- Planted May 13th 2019

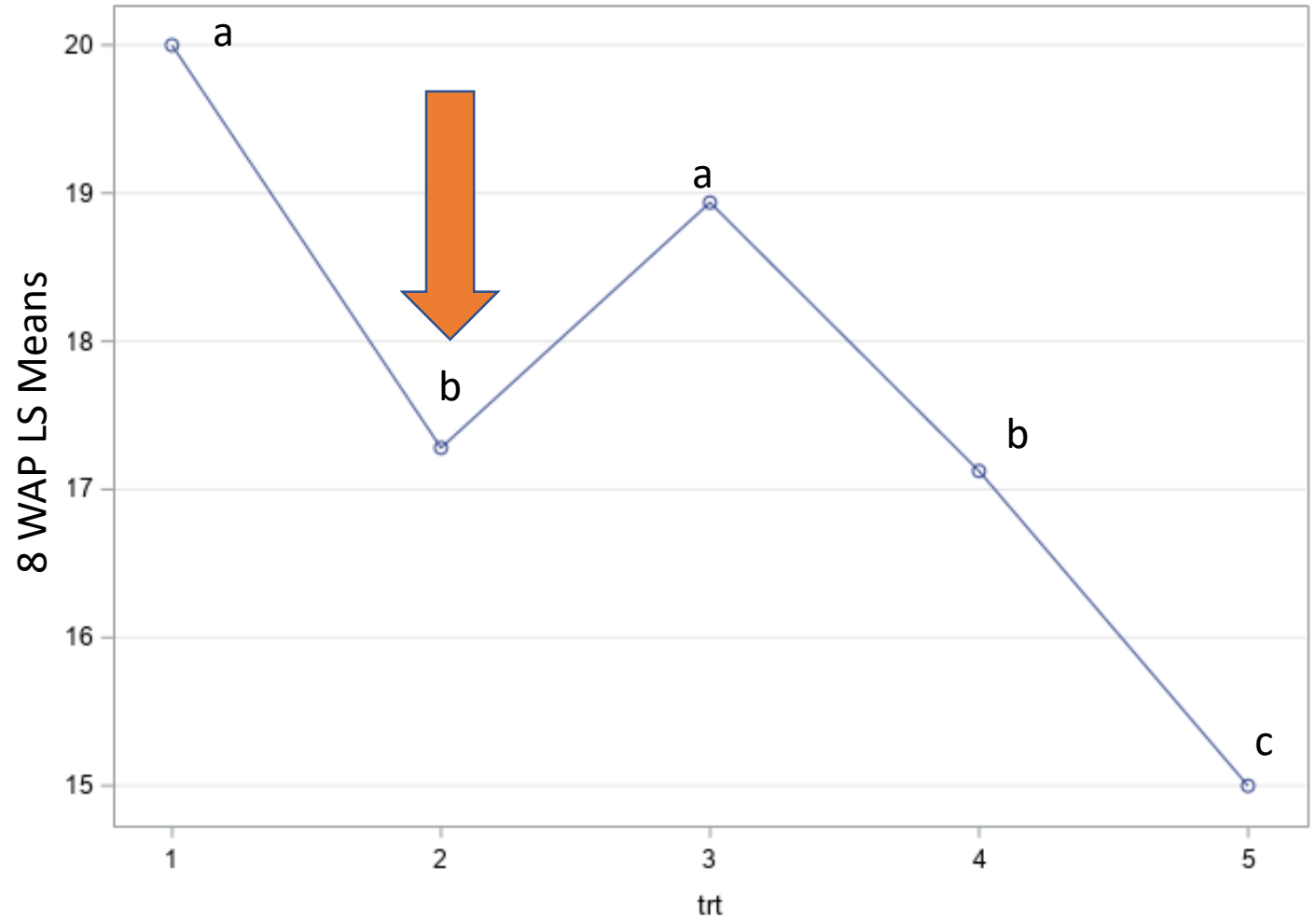
Emergence 8 WAP



Treatments

1. Control
2. High combination of Dicamba + Glyphosate
3. Low combination of Dicamba + Glyphosate
4. Dicamba
5. Glyphosate

Emergence 8 WAP

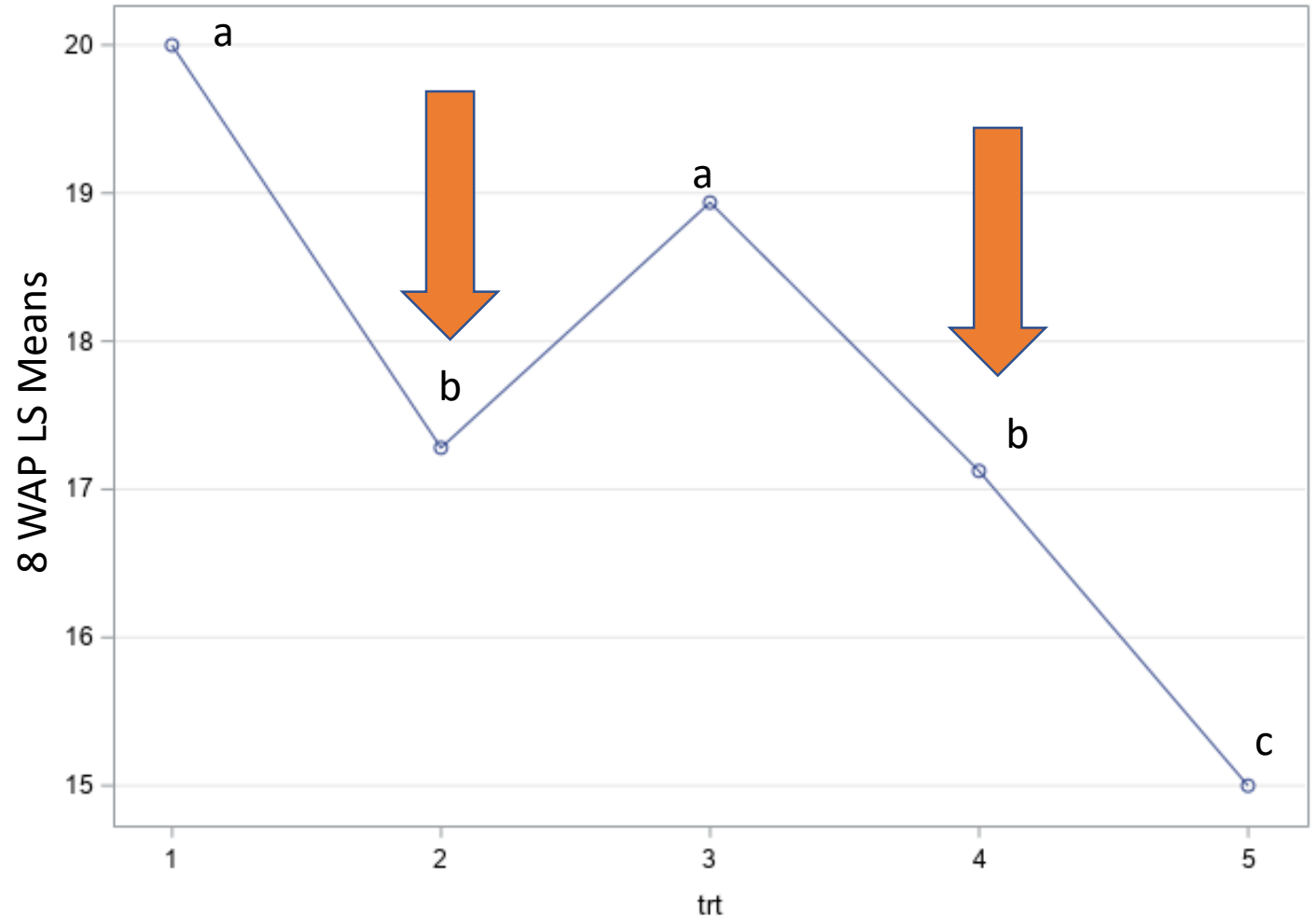


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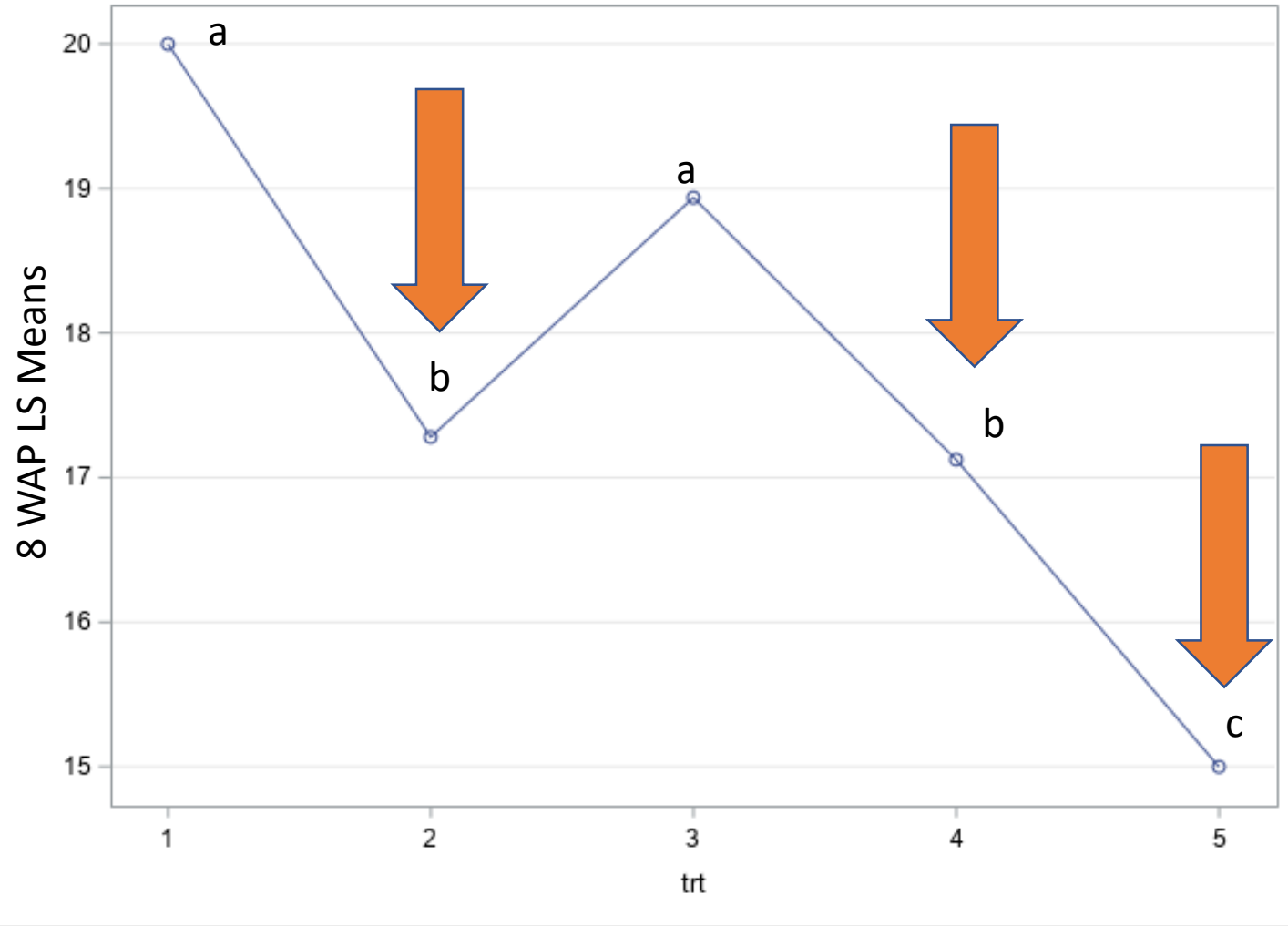


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Emergence & WAP

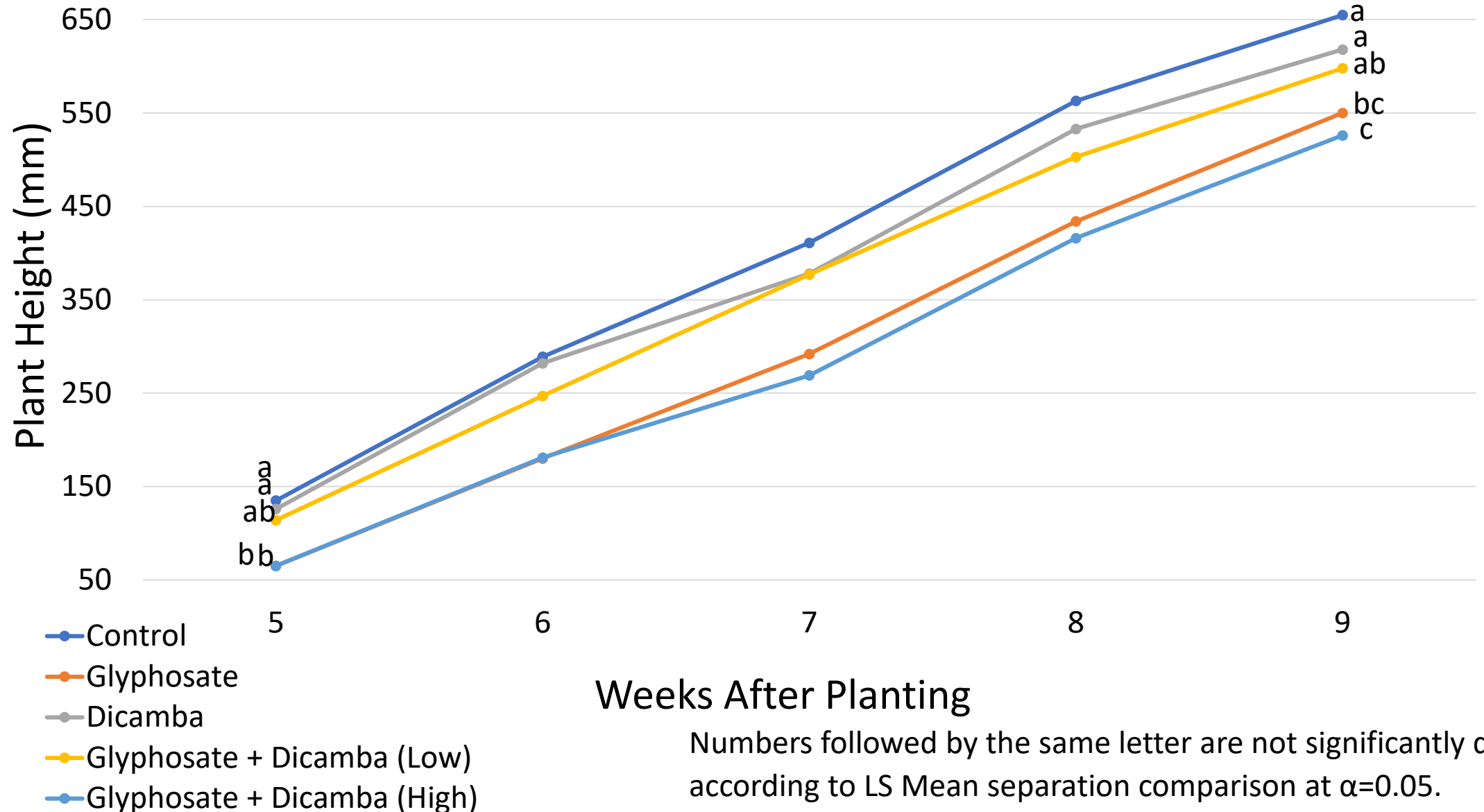


Treatments

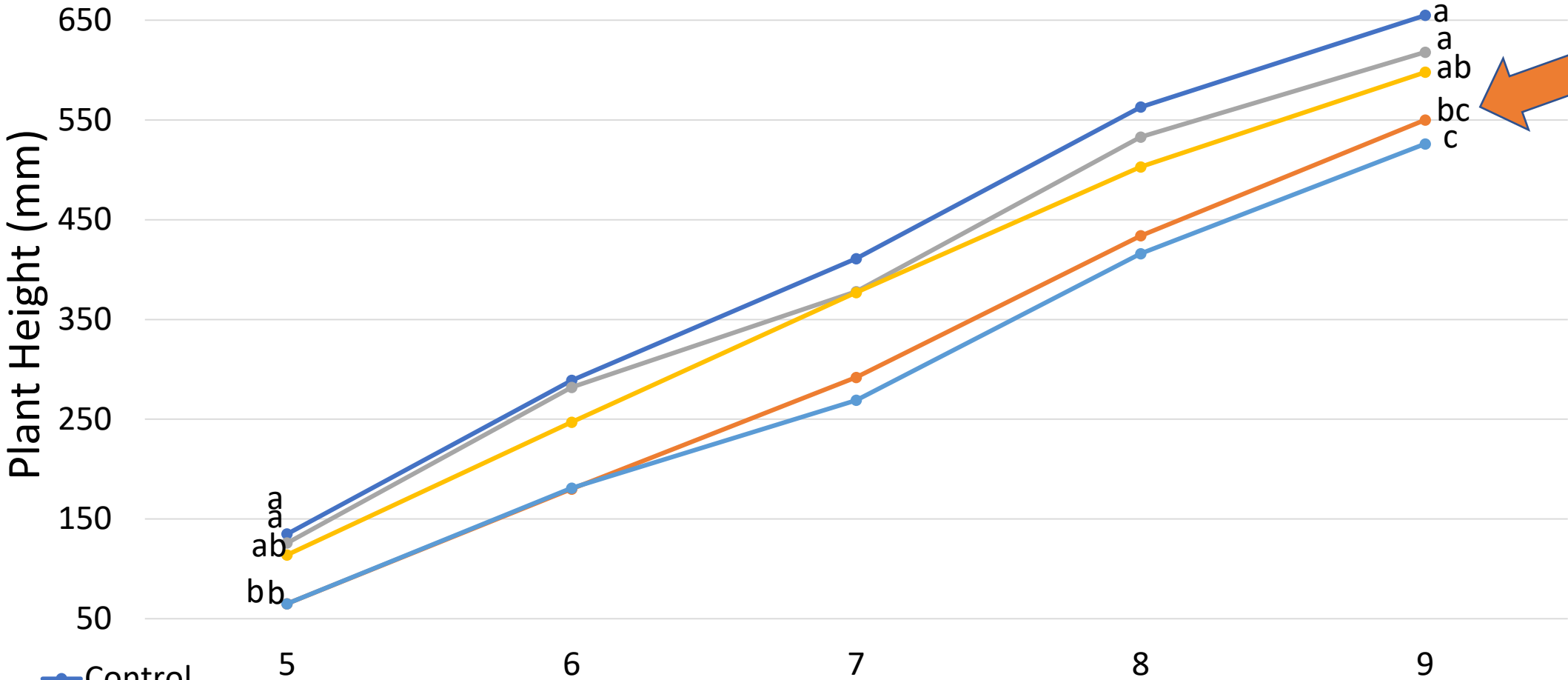
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Plant Height 5 to 9 Weeks After Planting



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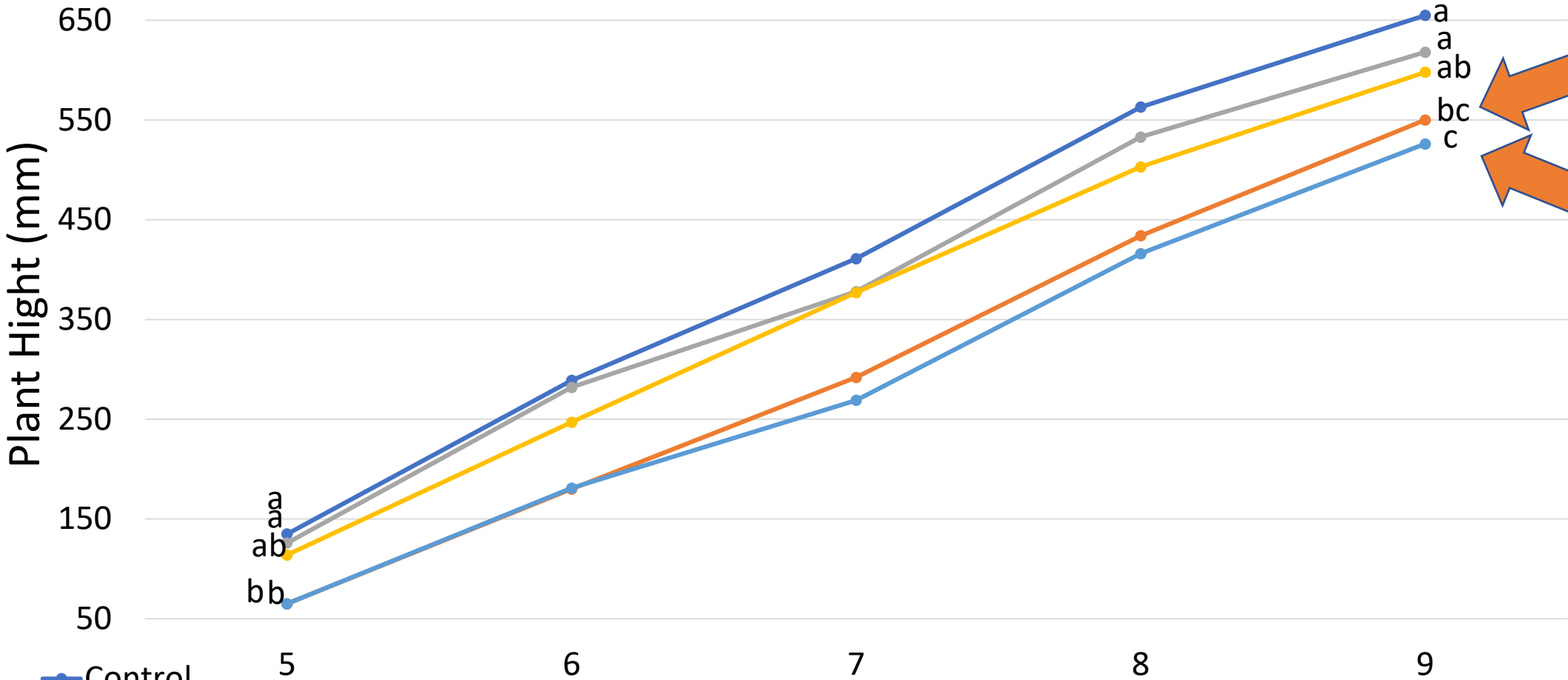


- Control
- Glyphosate
- Dicamba
- Glyphosate + Dicamba (Low)
- Glyphosate + Dicamba (High)

Weeks After Planting

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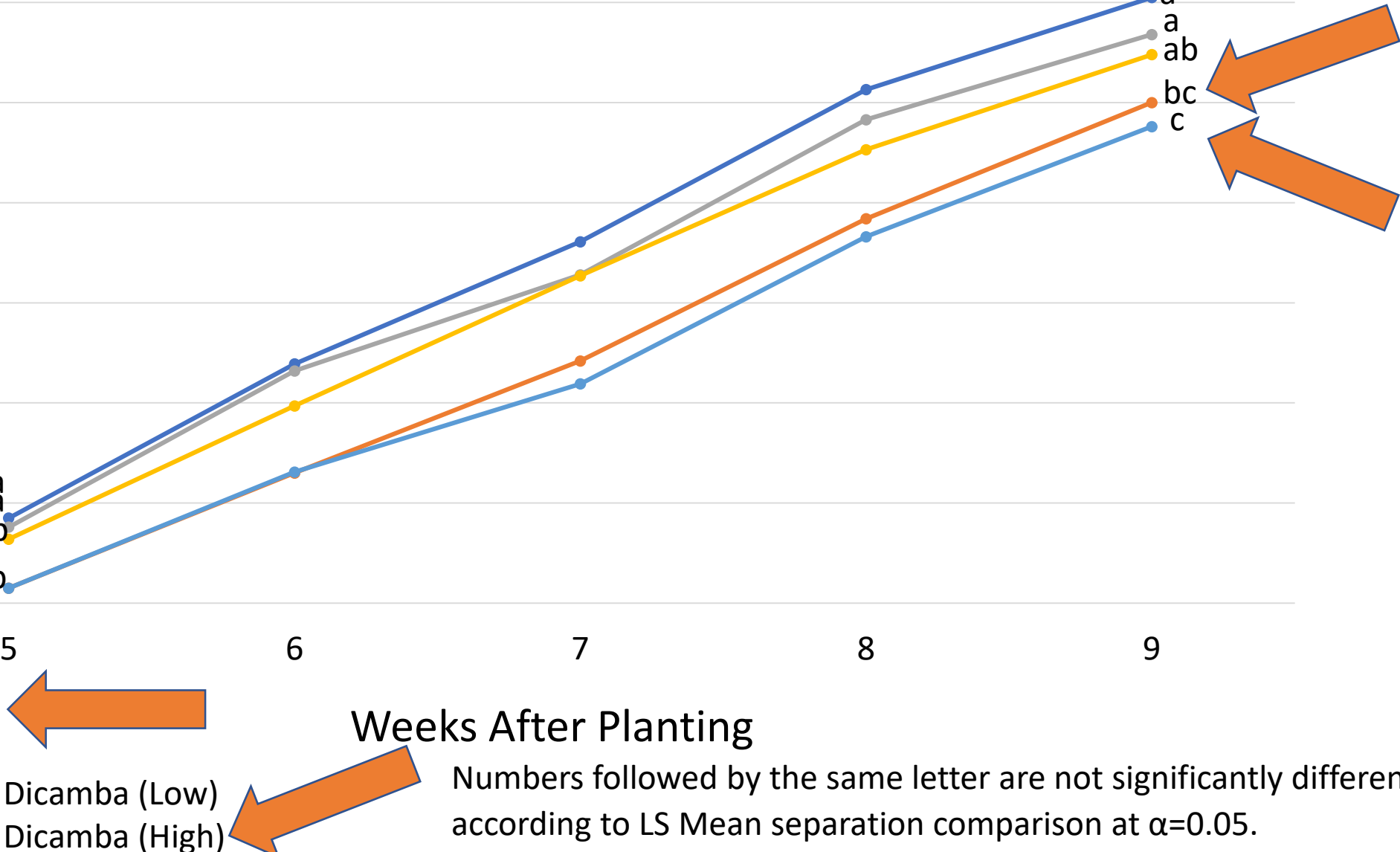
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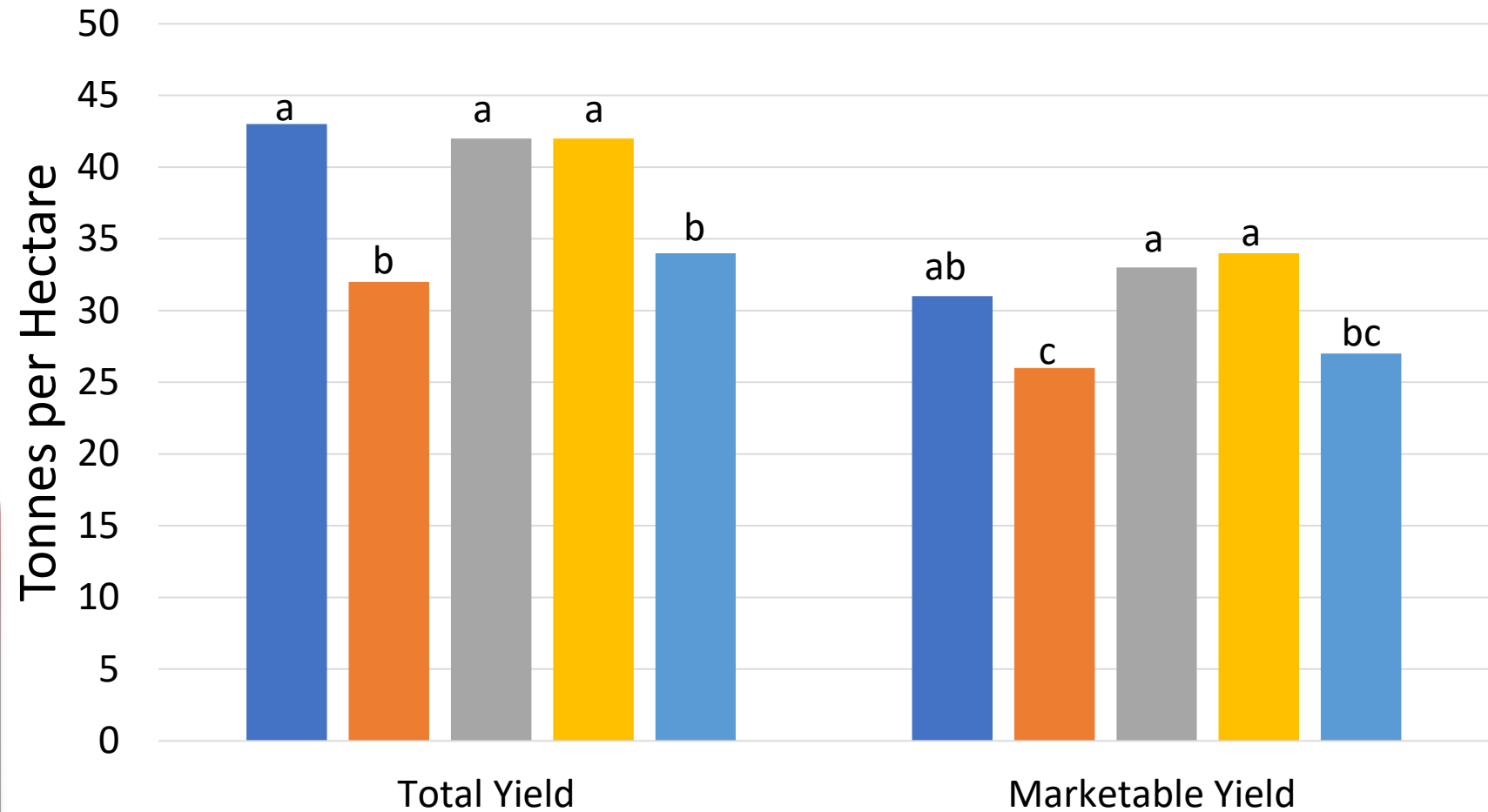
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Total and Marketable Yield

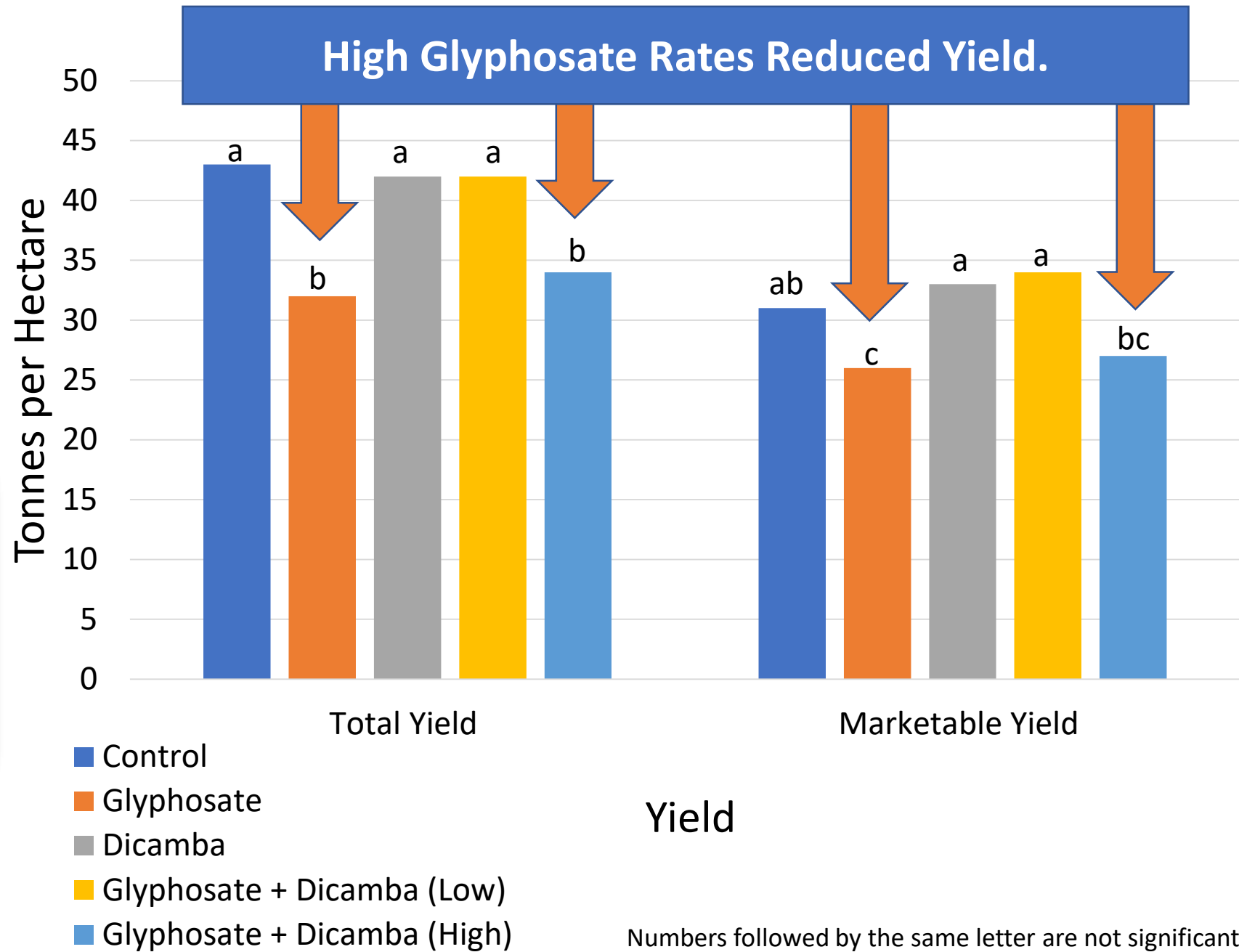


- Control
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Yield

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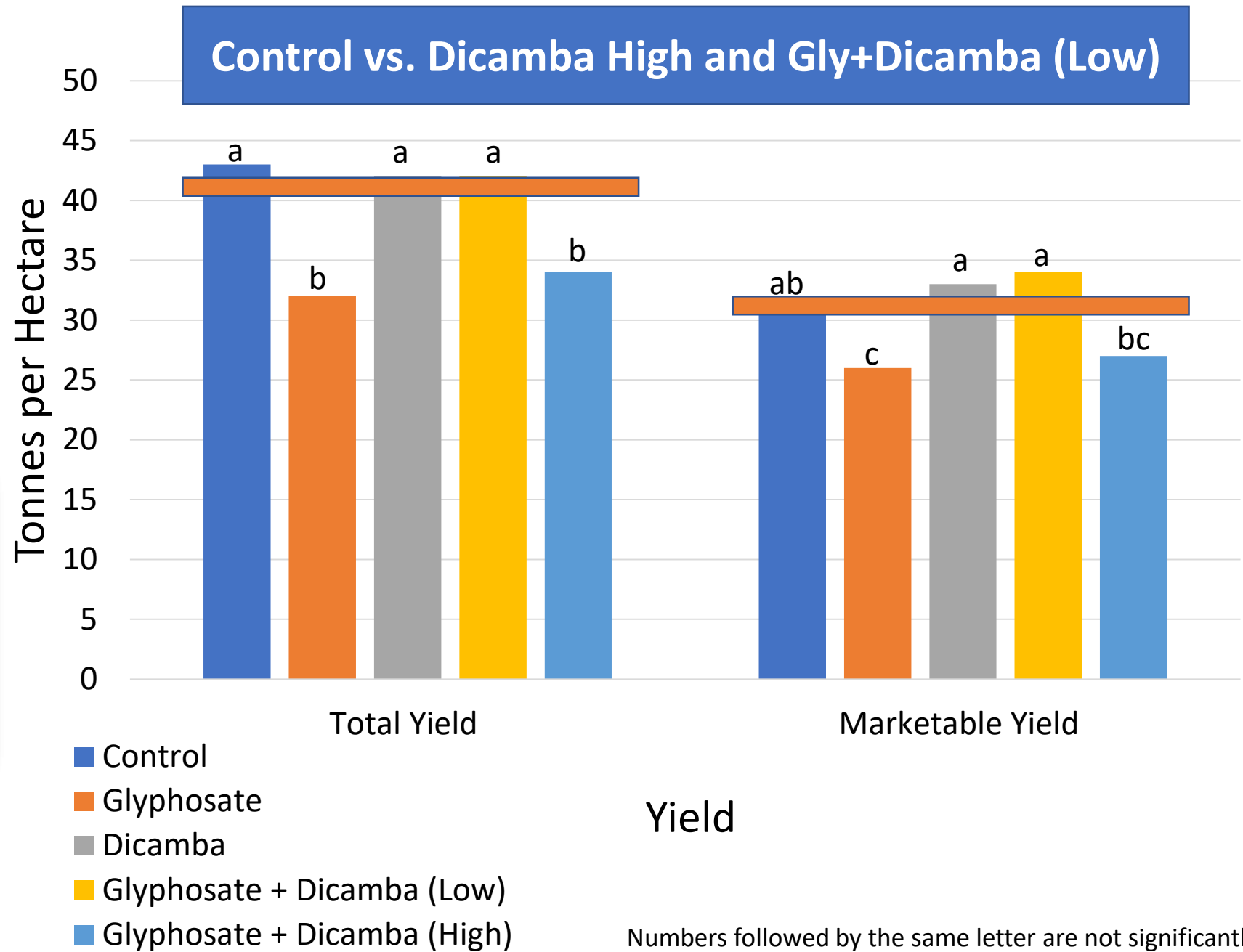
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Yield

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Total and Marketable Yield



Conclusion

- 8 WAP there was a 20 % decrease in emerged daughter plants among all treatments when compared to control
- Dicamba and Dicamba + Glyphosate (Low) Combination:
 - No reduction in plant height
 - No total yield reduction
 - No marketable yield reduction
- Glyphosate:
 - 13% Reduction in plant height
 - 20% Total yield reduction
 - 16% Marketable yield reduction
- Dicamba + Glyphosate (High) Combination:
 - 20% Reduction in plant height
 - 20% Total yield reduction
 - No difference in marketable yield

Thank You!

- Dr. Harlene Hatterman-Valenti
- Committee Members
 - Dr. Andy Robinson
 - Dr. Gary Secor
- Collin Auwarter
- Dr. Susie Thompson
- Dr. Jawahar Jyoti
- The HVC Crew

