



Influence of High Surfactant Oil Concentrate Adjuvants on Herbicide Efficacy

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Adjuvants

- ▶ Adjuvants are used to modify herbicidal activity or application characteristics to improve herbicide performance
 - ▶ Activator Adjuvants
 - ▶ Utility Adjuvants
- ▶ The ability of adjuvants to enhance herbicide efficacy depends on many different factors

Surfactant Adjuvants

- ▶ Used to increase:
 - ▶ Spreading and wetting
 - ▶ Spray retention
 - ▶ Emulsifying and dispersing oil soluble molecules in water
- ▶ Types of surfactants
 - ▶ Nonionic surfactant (NIS)
 - ▶ Most common class of surfactant
 - ▶ Ionic surfactants
 - ▶ Anionic surfactant
 - ▶ Cationic surfactant

Oil Adjuvants

- ▶ Increases penetration through the leaf cuticle
- ▶ Oil adjuvant classes
 - ▶ Petroleum Oil Concentrate (POC)
 - ▶ Based upon paraffinic oils
 - ▶ Made up of 80 to 85% paraffinic oil and 15 to 20% emulsifier surfactant
 - ▶ Methylated Seed Oil (MSO)
 - ▶ Based on seed oils that are trans-esterified
 - ▶ Made up of 80 to 90% methylated seed oil and 10 to 20% emulsifier surfactant

HSOC Adjuvants

- ▶ Developed to enhance lipophilic herbicides without antagonizing hydrophilic herbicides
 - ▶ Contain at least 50% oil with 25 to 50% emulsifier surfactant
 - ▶ Either MSO based (HSMOC) or POC based (HSPOC)
 - ▶ Can have any type of emulsifier adjuvant

Herbicides

<u>Herbicide</u>	<u>Site of Action</u>	<u>Selectivity</u>	<u>Affinity</u>	<u>Log K_{ow}</u>
Glyphosate	EPSPS Inhibitor	Nonselective	Hydrophilic	-2.77 to -3.22
Dicamba	Plant Growth Regulator	Dicot species	Slightly hydrophilic	-0.54
Tembotrione	HPPD Inhibitor	Monocot / dicot species	Slightly lipophilic	0.08

HSOC Adjuvant Screening Trials

- ▶ No new chemistry of herbicide
- ▶ Tank-mixes of different herbicides
- ▶ Limited published research on HSOC adjuvants
- ▶ Multiple industry HSOC adjuvants will be tank-mixed with glyphosate and either dicamba or tembotrione

No	Treatment	Rate ha ⁻¹
1	Untreated	
2	Glyphosate	473 g
3	Glyphosate + Activator 90	473 g + 1 % v/v
4	Glyphosate + Superspread MSO	473 g + 1169 ml
5	Glyphosate + Destiny HC	473 g + 1169 ml
6	Dicamba	214 g
7	Dicamba + Activator 90	214 g + 1 % v/v
8	Dicamba + Superspread MSO	214 g + 1169 ml
9	Dicamba + Destiny HC	214 g + 1169 ml
10	Glyphosate + Dicamba	473 g + 214 g
11	Glyphosate + Dicamba + Activator 90	473 g + 214 g + 1 % v/v
12	Glyphosate + Dicamba + Superspread MSO	473 g + 214 g + 1169 ml
13	Glyphosate + Dicamba + Destiny HC (HSMOC 1)	473 g + 214 g + 1169 ml
14-24	Glyphosate + Dicamba + HSMOC 2-12	473 g + 214 g + 1169 ml
25	Glyphosate + Superb HC	473 g + 1169 ml
26	Dicamba + Superb HC	214 g + 1169 ml
27	Glyphosate + Dicamba + Herbimax POC	473 g + 214 g + 1169 ml
28	Glyphosate + Dicamba + Superb HC (HSPOC 1)	473 g + 214 g + 1169 ml
29-34	Glyphosate + Dicamba + HSPOC 2-7	473 g + 214 g + 1169 ml

Materials and Methods

Glyphosate and Dicamba Trial

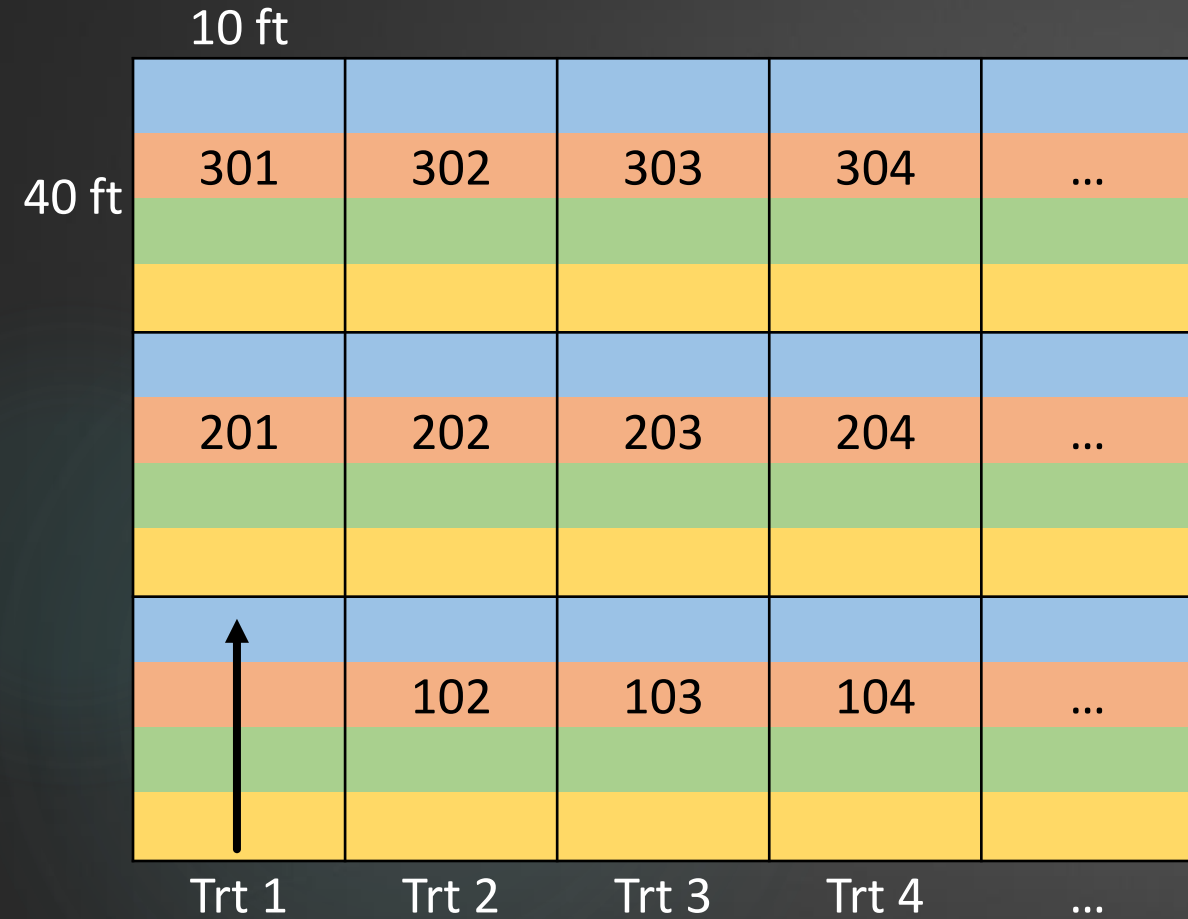
- Trials conducted in 2015 and 2016

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4	Glyphosate + Superspread MSO	473 g + 1169 ml
5	Glyphosate + Destiny HC	473 g + 1169 ml
6	Tembotrione	46 g
7	Tembotrione + Activator 90	46 g + 1 % v/v
8	Tembotrione + Superspread MSO	46 g + 1169 ml
9	Tembotrione + Destiny HC	46 g + 1169 ml
10	Glyphosate + Tembotrione	473 g + 46 g
11	Glyphosate + Tembotrione + Activator 90	473 g + 46 g + 1 % v/v
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Glyphosate and Tembotrione Trial

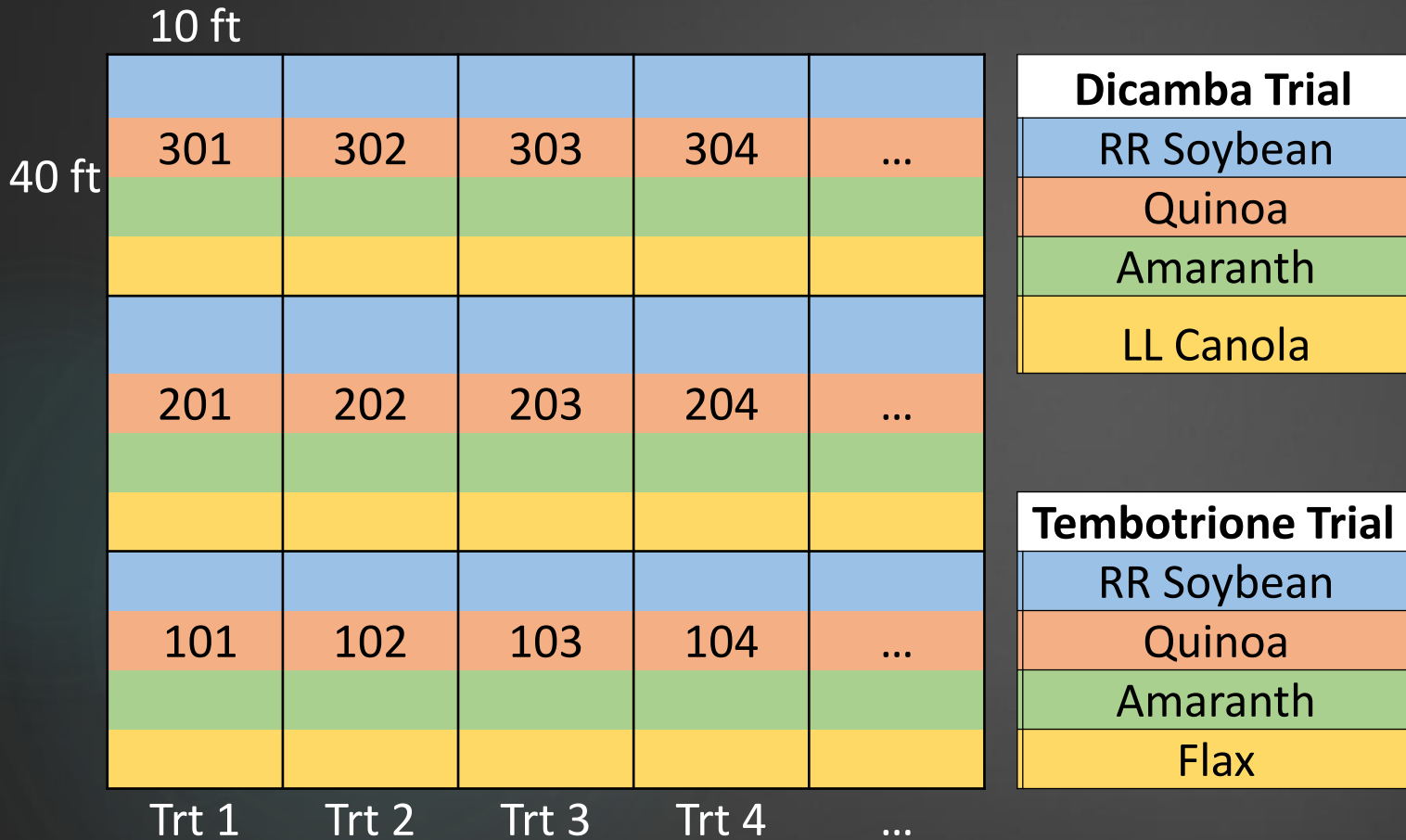
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Trial Layout



- Randomized complete block design
- Dimensions = 10 x 40 ft
- Three replications
- Four assay species
 - Height at application = 12 – 14 in.
- Nozzles = Turbo Teejet 11001 nozzles delivering 8.5 GPA at 40 psi

Indicator Species



➤ RR soybean = dicamba and tembotrione

➤ Amaranth = glyphosate, dicamba, and tembotrione

➤ Quinoa = glyphosate, dicamba, and tembotrione

➤ Canola = glyphosate

➤ Flax = glyphosate

Data Collection

- ▶ Evaluations taken 14 and 28 days after application
 - ▶ Visual evaluations of plant phytotoxicity
 - ▶ Quantitative evaluations of plant height
 - ▶ Data represented as percent height reduction
 - ▶ Photographs

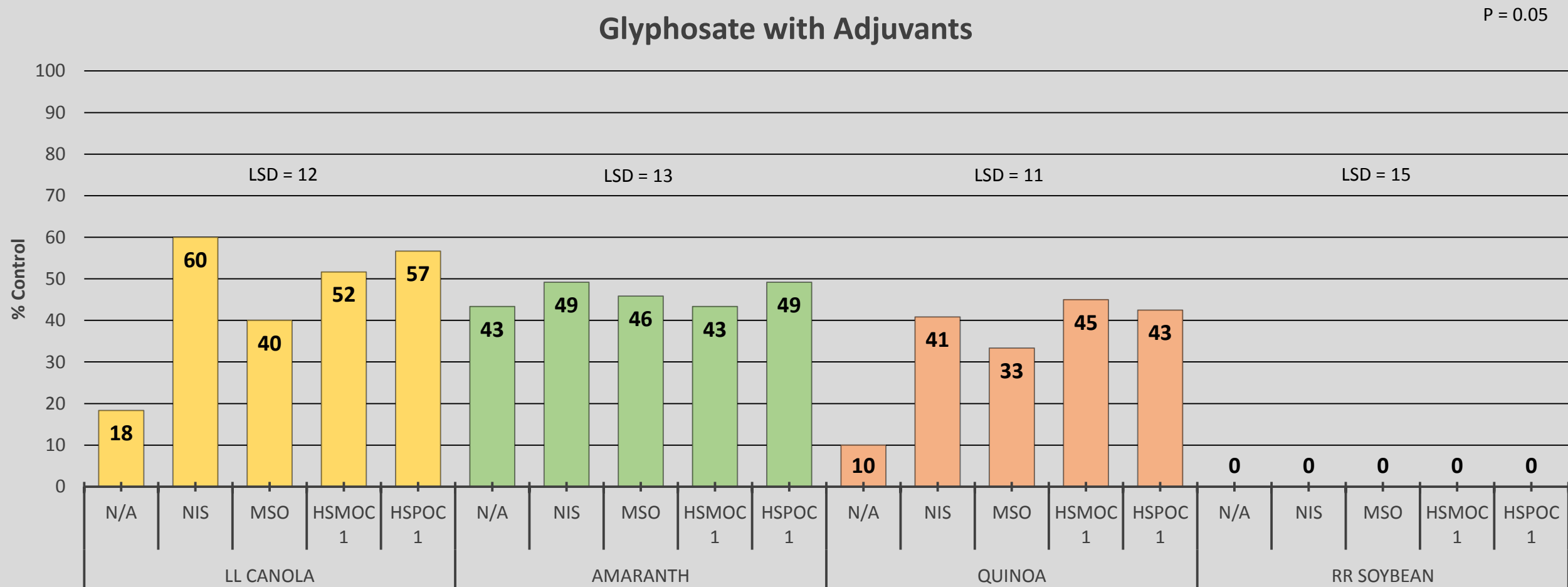
Data Analysis

- ▶ Data from 2015 and 2016 were combined using Statistical Analysis System (SAS)
- ▶ Data were analyzed using ANOVA analysis
 - ▶ Linear contrast of HSMOC vs HSPOC adjuvants
- ▶ Means separation = Fisher's F-protected LSD
 - ▶ $p = 0.05$

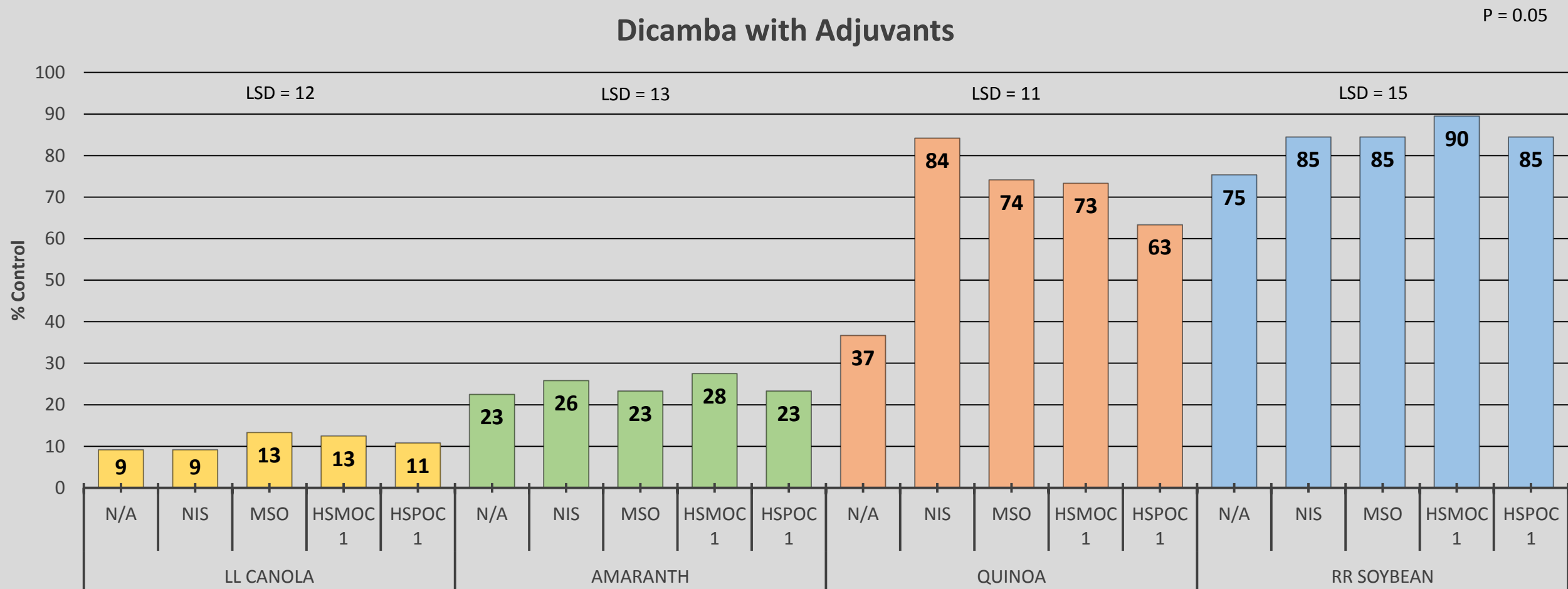
Glyphosate and Dicamba Trial



Glyphosate and Dicamba Trial



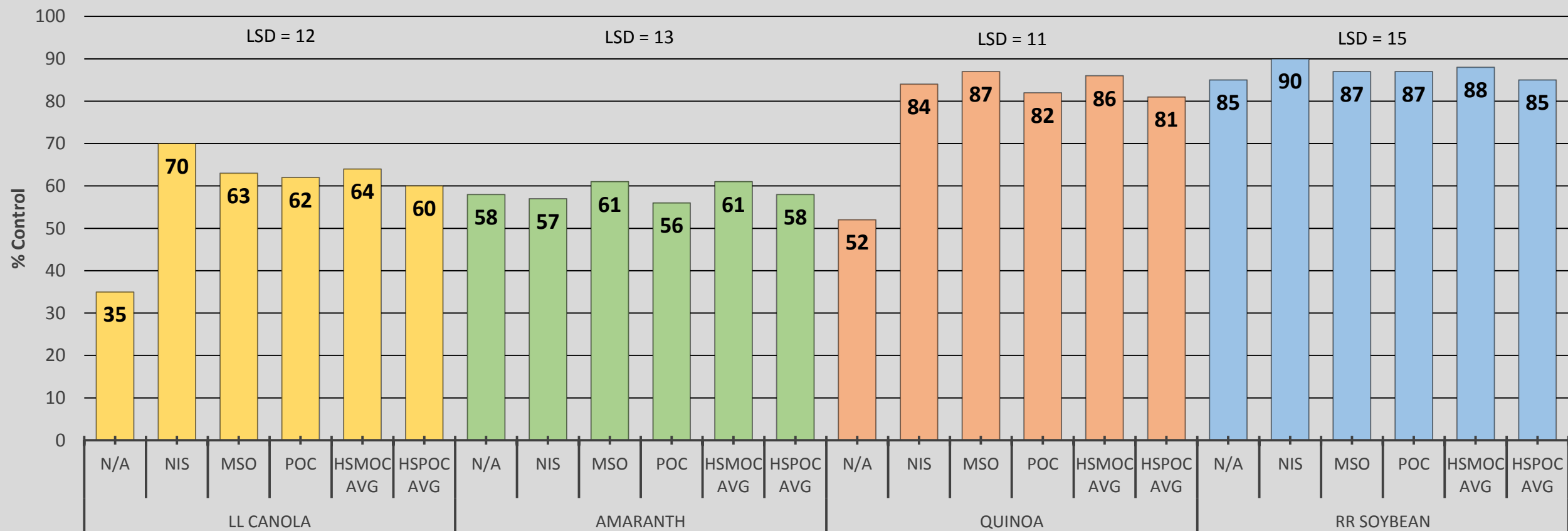
Glyphosate and Dicamba Trial



Glyphosate and Dicamba Trial

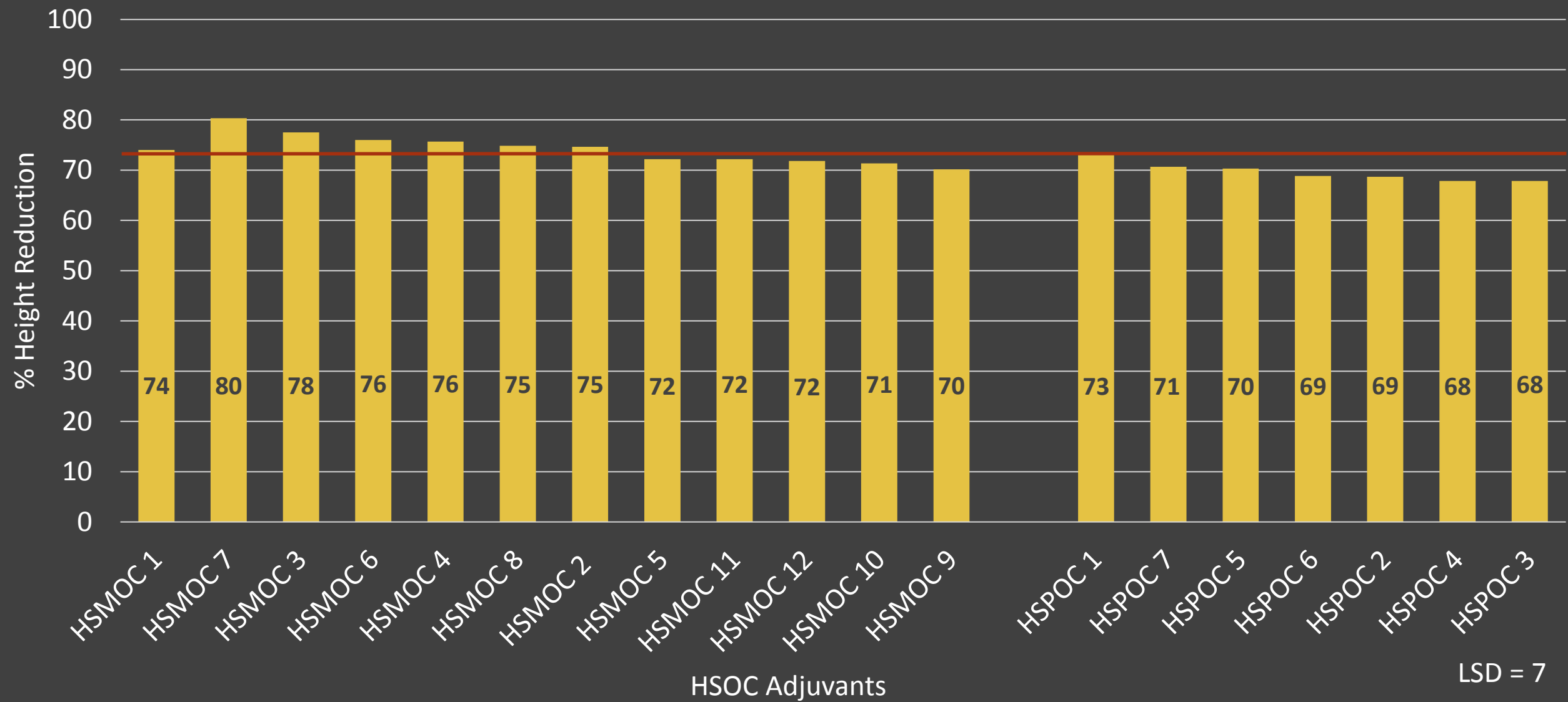
Glyphosate and Dicamba with Adjuvants

P = 0.05



Glyphosate and Dicamba with HSOC

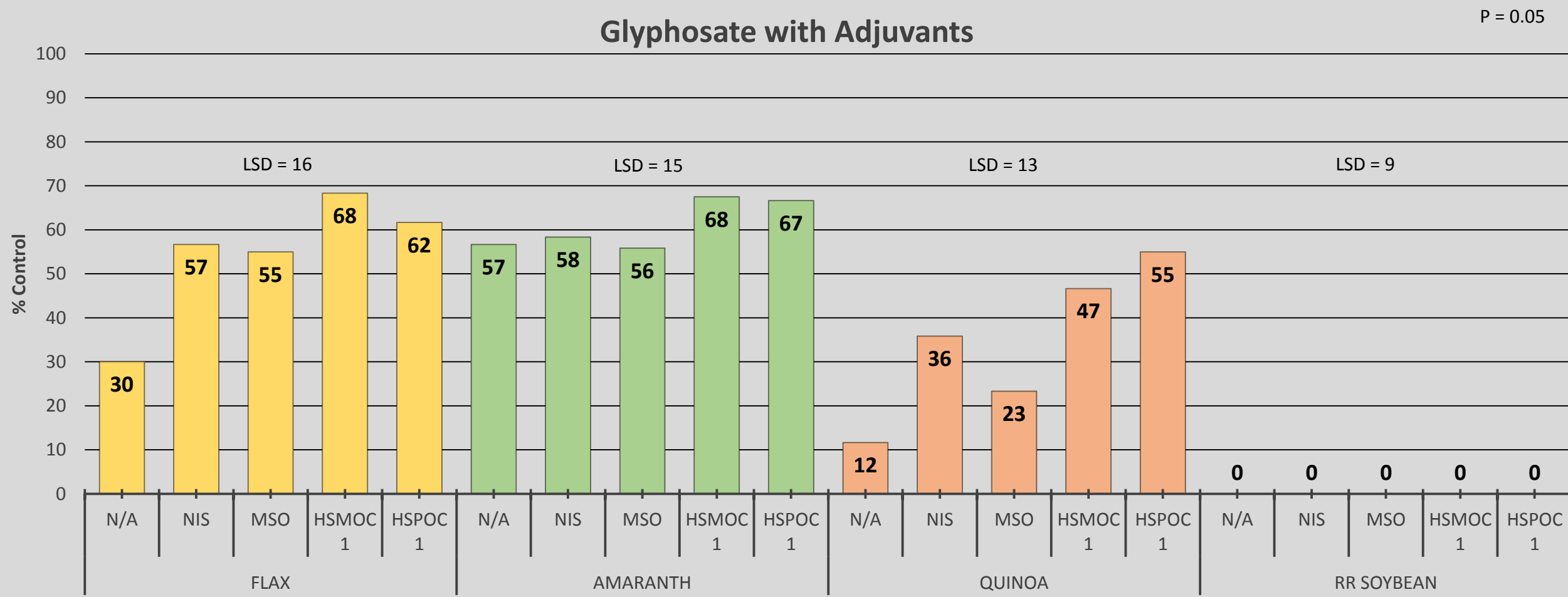
Adjuvants Across All Species



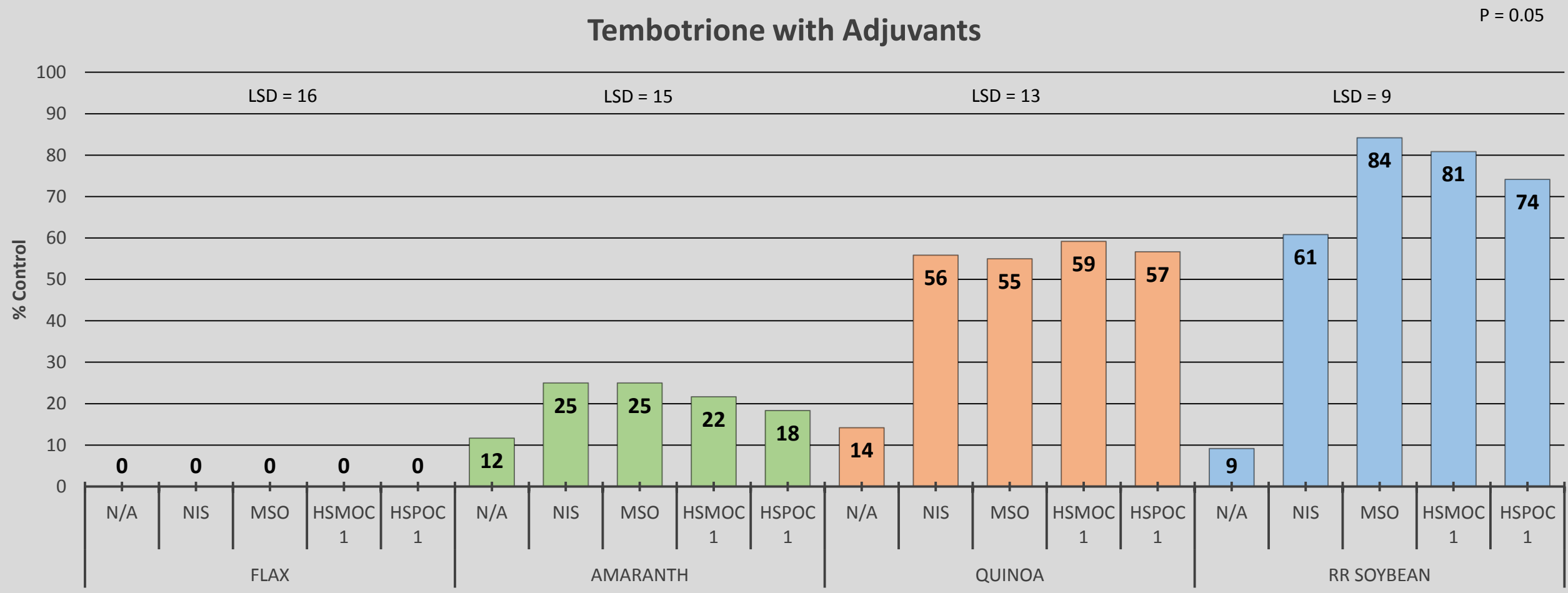
Glyphosate and Tembotrione Trial



Glyphosate and Tembotrione Trial



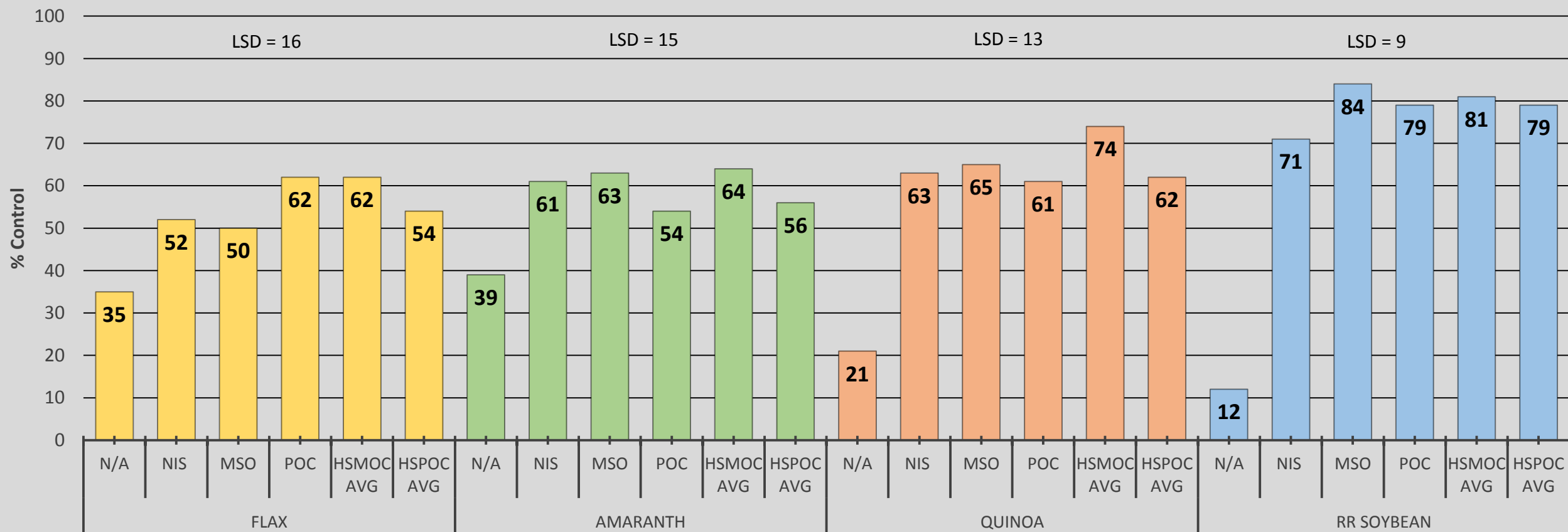
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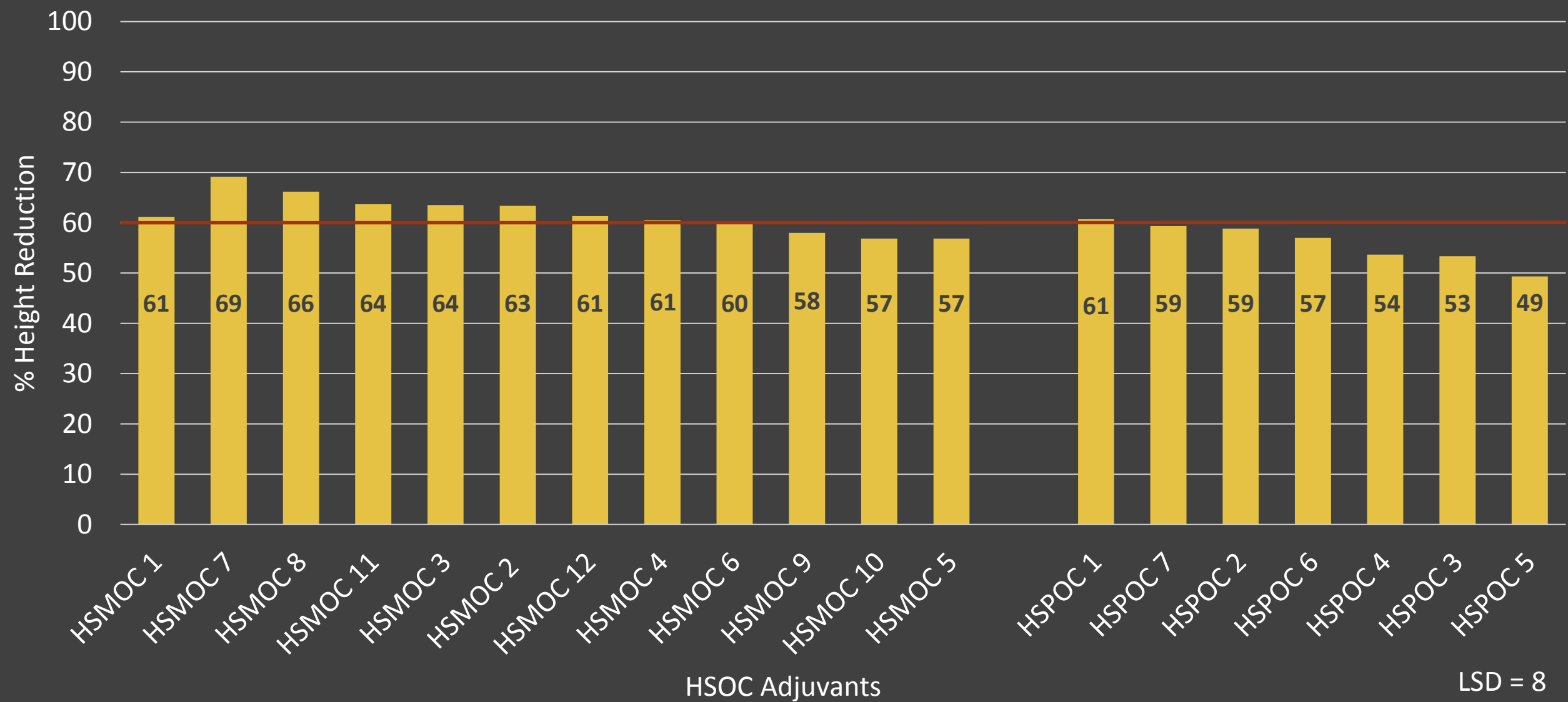
Glyphosate and Tembotrione Trial

Glyphosate and Tembotrione with Adjuvants

P = 0.05



Glyphosate and Tembotrione with HSOC Adjuvants Across All Species



Summary

- ▶ No glyphosate antagonism with oil adjuvants
- ▶ Herbicide enhancement with adjuvants depends on herbicide(s), weed(s), and adjuvant type
- ▶ Average HSMOC adjuvants and HSPOC ratings appeared to be similar; however, separate analysis revealed HSMOC adjuvants increased species control more than HSPOC adjuvants
- ▶ Few statistical differences within HSMOC adjuvants in both trials
- ▶ No statistical difference within HSPOC adjuvants within the Glyphosate + Dicamba Trial and few differences within the Glyphosate + Tembotrione Trial

THANK YOU FOR LISTENING!



ANY QUESTIONS?