Weed Management Trials in Specialty Crops

High –Value Crops Project, North Dakota State University

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Onion Weed Control Trials

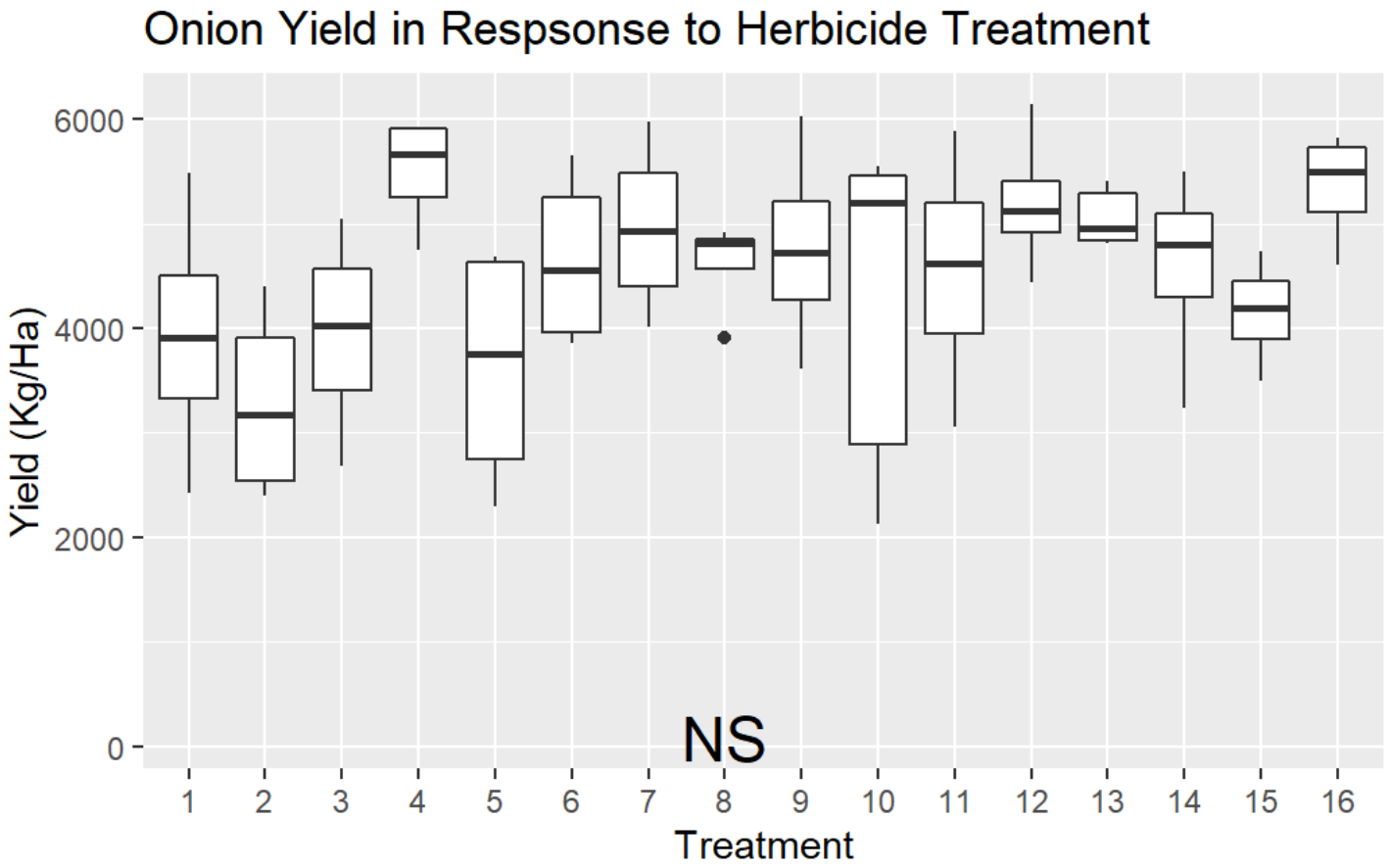
- Conducted field trials to evaluate early-season weed control and crop safety.
  - Early-season weed control difficult.
    - Seeded onion emerge slowly.
    - Few herbicides registered before onion 2-true-leaf-stage.
    - Early weed competition controls onion diameter at harvest.
  - Satellite HydroCap vs. Prowl H2O label restrictions.
  - Nortron weed control inconsistent.
  - Dacthal weed control inconsistent and expensive.

Grower Field

- All followed by Chateau

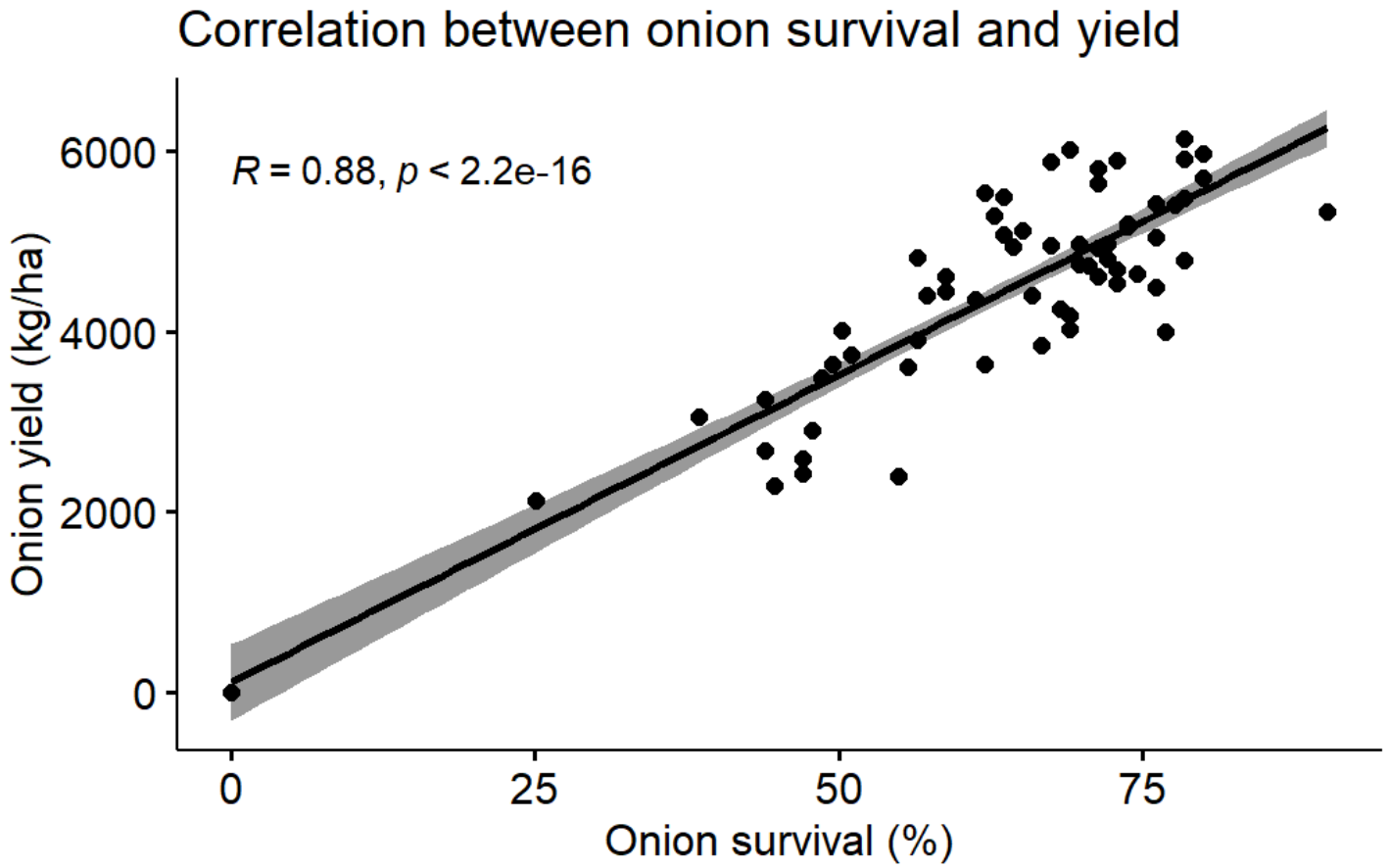
	PRE		1 Leaf		1 Leaf		2-3 Leaf	
TRT								
1	Dacthal	10 pt/a			Goal Tender	4 floz/a		
2	Prowl H2O	1.5 pt/a			Goal Tender	4 floz/a		
3			Prowl H2O	1.5 pt/a	Goal Tender	4 floz/a		
4	RoundUp	22 floz/a	Prowl H2O	1.5 pt/a	Goal Tender	4 floz/a		
5	Satellite Hydrocap	1.5 pt/a			Goal Tender	4 floz/a		
6			Satellite Hydrocap	1.5 pt/a	Goal Tender	4 floz/a		
7	RoundUp	22 floz/a	Satellite Hydrocap	1.5 pt/a	Goal Tender	4 floz/a		
8	Nortron	1 pt/a			Goal Tender	4 floz/a		
9			Nortron	1 pt/a	Goal Tender	4 floz/a		
10	Nortron	1 pt/a			Goal Tender	4 floz/a		
	Satellite Hydrocap	1.5 pt/a						
11	Nortron	1 pt/a			Goal Tender	4 floz/a		
	Satellite Hydrocap	0.75 pt/a						
12	Nortron	0.5 pt/a			Goal Tender	4 floz/a		
	Satellite Hydrocap	1.5 pt/a						
13	Nortron	0.5 pt/a			Goal Tender	4 floz/a		
	Satellite Hydrocap	0.75 pt/a						
14	Nortron	2 pt/a					Satellite Hydrocap	1.5 pt/a
	Satellite Hydrocap	1.5 pt/a						
15	Nortron	2 pt/a					Satellite Hydrocap	1.5 pt/a
	Satellite Hydrocap	0.75 pt/a						
16	Nortron	1.5 pt/a					Satellite Hydrocap	1.5 pt/a
	Satellite Hydrocap	1.5 pt/a						

No significant effects of herbicide on yield



But… stand loss appears to be a bigger issue

- Stand loss was associated with reduced yield
- Why?



Oakes REC

All followed by Chateau

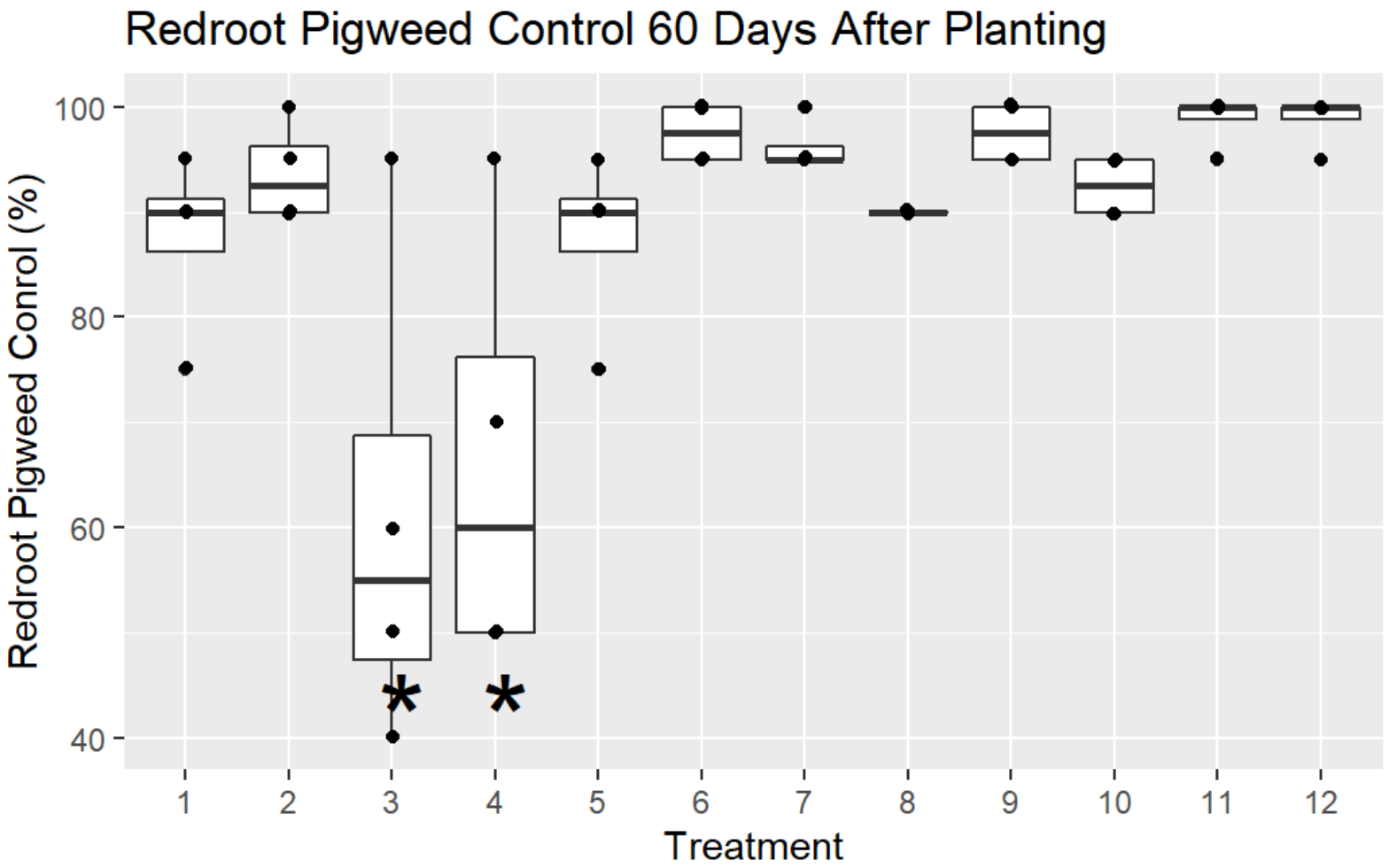
#	Herbicide		Timing
1	Dacthal	10lb/a	PRE
	Goal Tender	4floz/a	1 Leaf
2	Nortron	1pt/a	PRE
	Satellite Hydrocap	1.5pt/a	PRE
	Goal Tender	4floz/a	1 Leaf
3	Satellite Hydrocap	0.75pt/a	PRE
	Goal Tender	4floz/a	1 Leaf
4	Satellite Hydrocap	1.5pt/a	PRE
	Goal Tender	4floz/a	1 Leaf
5	Satellite Hydrocap	1.5pt/a	Delayed PRE
	Goal Tender	4floz/a	1 Leaf
6	Satellite Hydrocap	1.5pt/a	Delayed PRE
	Buctril	1pt/a	Delayed PRE
	Goal Tender	4floz/a	1 Leaf
7	Satellite Hydrocap	1.5pt/a	Delayed PRE
	RoundUP	22floz/a	Delayed PRE
	Goal Tender	4floz/a	1 Leaf
8	Prowl H2O	1.5pt/a	Flag
	Goal Tender	4floz/a	1 Leaf
9	Buctril	1pt/a	Delayed PRE
	Prowl H2O	1.5pt/a	Flag
	Goal Tender	4floz/a	1 Leaf
10	RoundUP	22floz/a	Delayed PRE
	Prowl H2O	1.5pt/a	Flag
	Goal Tender	4floz/a	1 Leaf
11	Nortron	1.36pt/a	Delayed PRE
	Goal Tender	4floz/a	1 Leaf
12	Nortron	2.72pt/a	Delayed PRE
	Goal Tender	4floz/a	1 Leaf

Redroot pigweed Control - Oakes

- Trts 3 and 4 are pendimethalin 10 Days after planting (Satellite Hydrocap 0.75 pt/ac or 1.5 pt/ac) followed by Goaltender.

Trts 5 and 6 are pendimethalin 18 days after planting (Satellite Hydrocap 0.75 pt/ac or 1.5 pt/ac) followed by Goaltender.

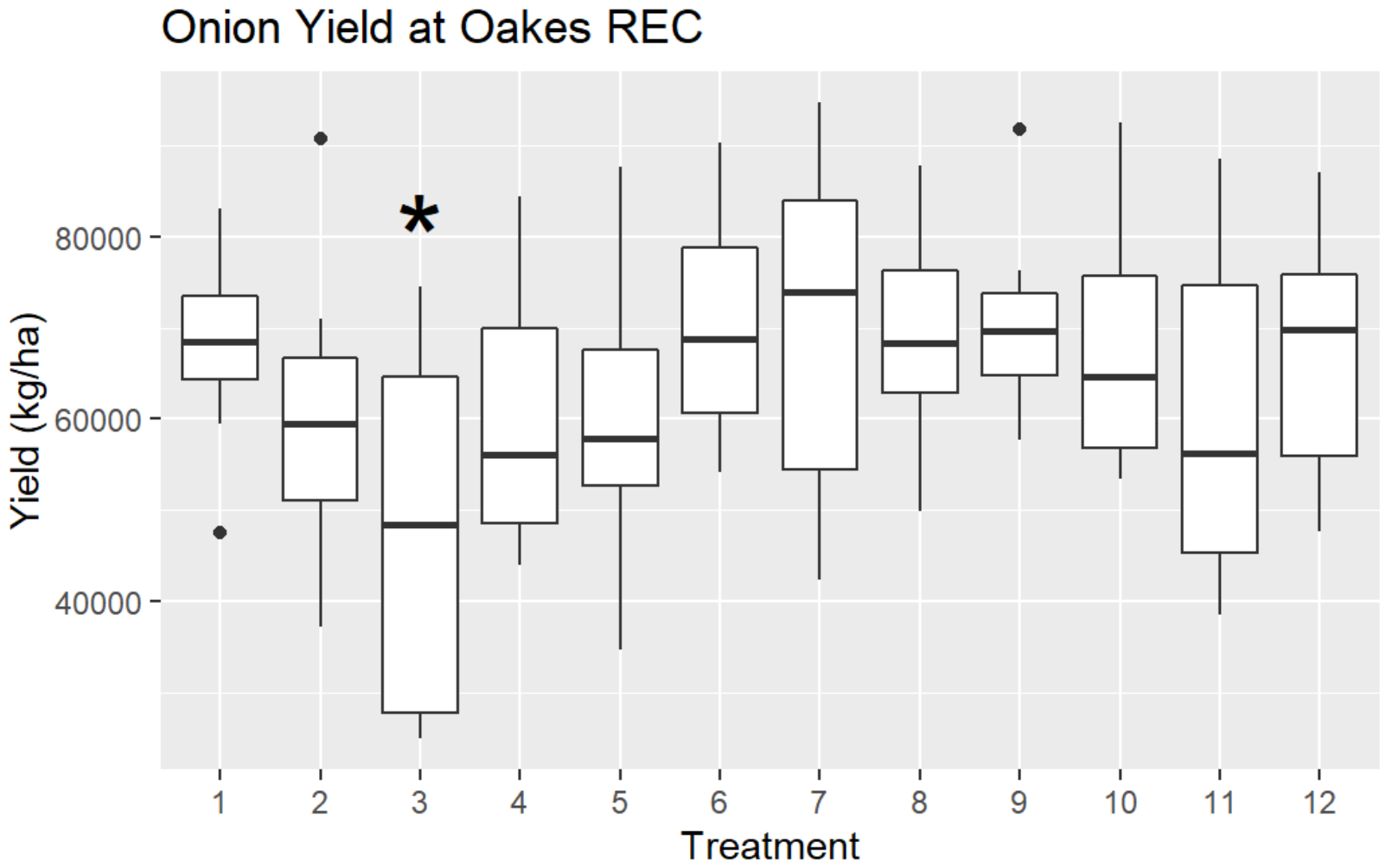
Timing is important!



Yield

Trts 1-4 PRE, 5-7 & 11-12 delayed PRE, 8-10 Flag leaf

- Treatment 3 is Satellite Hydrocap (pendimethalin) 0.75 pt/ac followed by Goaltender followed by Chateau



Reducing Chateau Injury to Potato

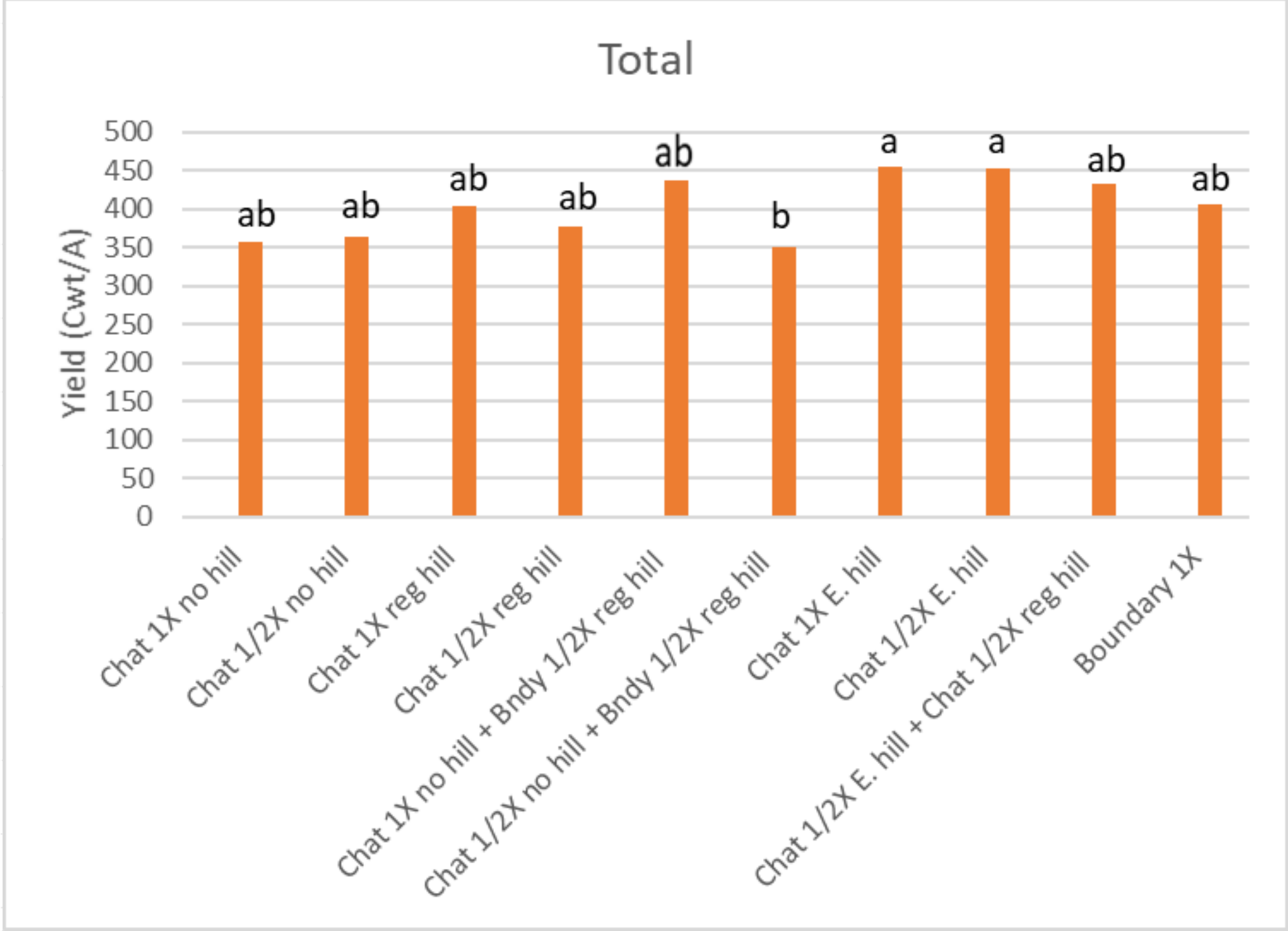
- Flumioxazin has caused potato injury.
  - Several important potato growing states can’t use flumioxazin in potatoes.
  - Label has strict application timings.
- Be sure a minimum of 2 inches of soil covers the vegetative portion of potato plants.
- Growers primarily rely on metribuzin for broadleaf weed control.
  - Does not control nightshade species.
  - Increasing numbers of triazine resistant weeds.

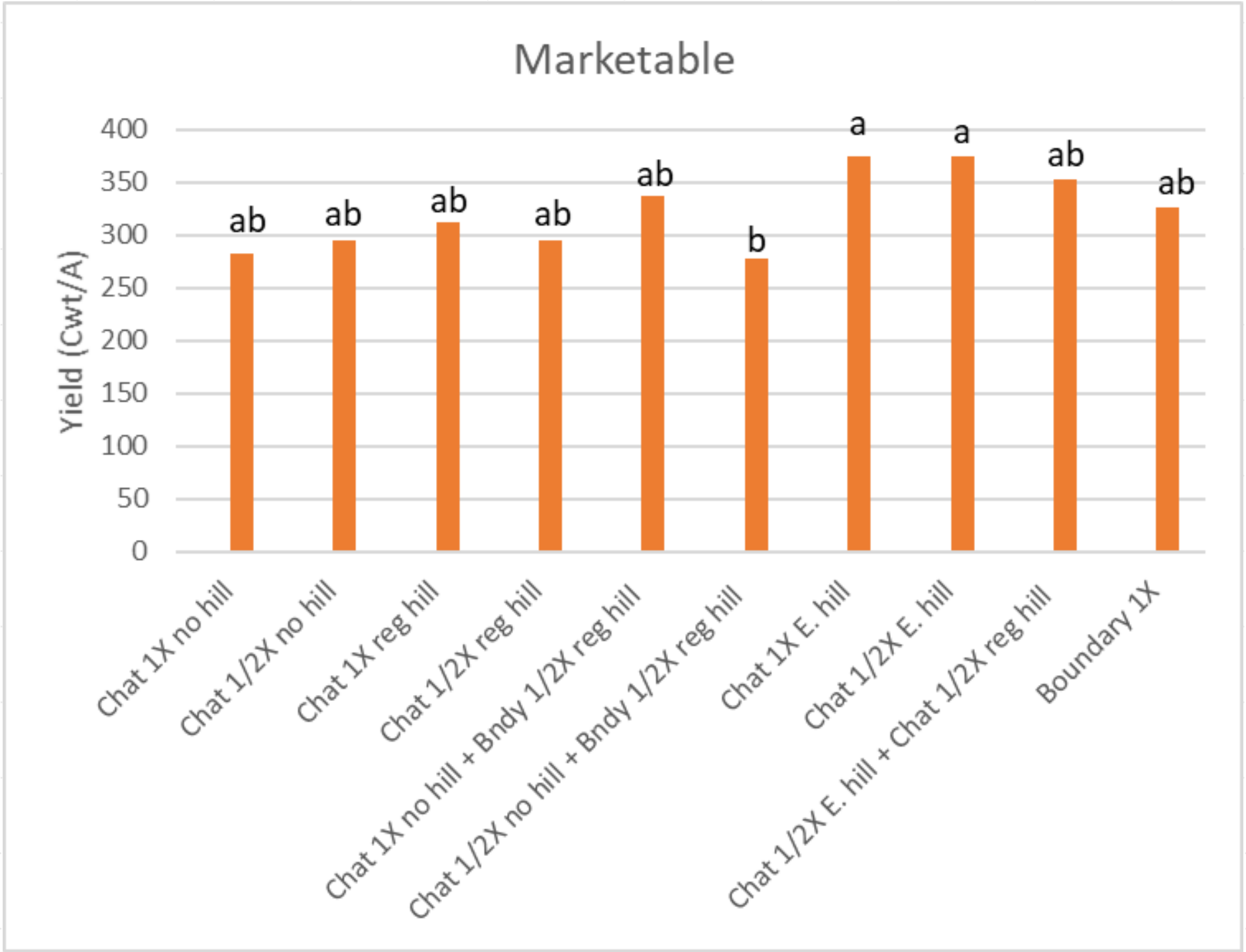
Treatments

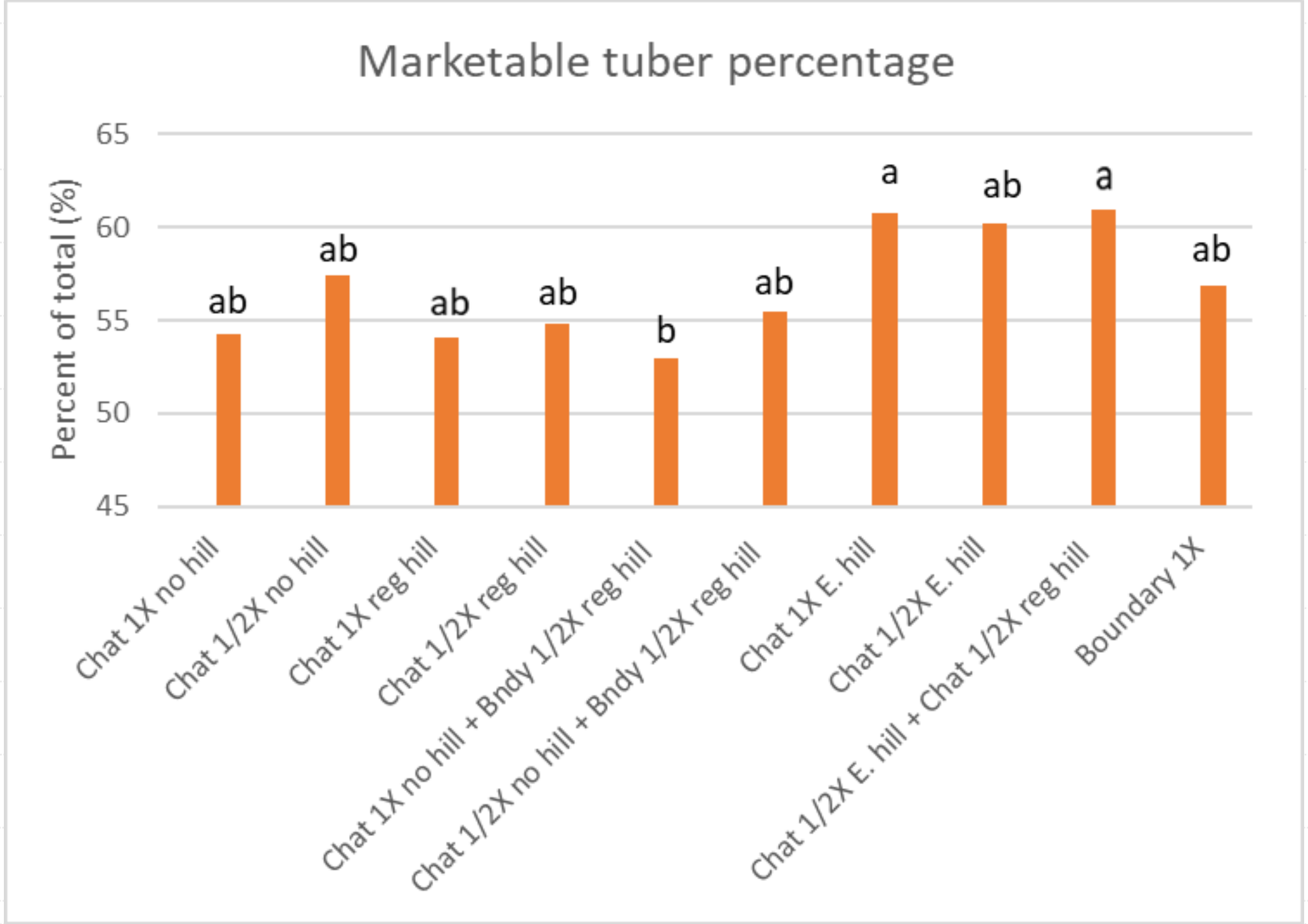
1	Chateau	1.5 oz	After Plant	2 DAP	Chat 1X no hill
2	Chateau	0.75 oz	After Plant	2 DAP	Chat 1/2X no hill
3	Chateau	1.5 oz	Normal Hill	9 DAP	Chat 1X reg hill
4	Chateau	0.75 oz	Normal Hill	9 DAP	Chat 1/2X reg hill
5	Chateau	1.5 oz	After Plant	2 DAP	Chat 1X no hill +
	Boundary	1 pt	Normal Hill	9 DAP	Bndy 1/2X reg hill
6	Chateau	0.75 oz	After Plant	2 DAP	Chat 1/2X no hill +
	Boundary	1 pt	Normal Hill	9 DAP	Bndy 1/2X reg hill
7	Chateau	1.5 oz	After E. Hill	2 DAP	Chat 1X E. hill
8	Chateau	0.75	After E. Hill	2 DAP	Chat 1/2X E. hill
9	Chateau	0.75	After E. Hill	2 DAP	Chat 1/2X E. hill +
	Chateau	0.75	Normal Hill	9 DAP	Chat 1/2X reg hill
10	Boundary	2 pt	Normal Hill	9 DAP	Boundary 1X

Results

- At 34 days after planting, all treatments provided excellent control of pigweeds, lambsquarters, and nightshades.
- At 34 days after planting, no difference in plant stands.
- At 34 days after planting, no potato injury was observed
- At 64 days after planting, Canopeo pictures were taken to evaluate stunting or delay in growth.
  - No Significant differences between treatments.


Total
Yield (Cwt/A)
500
450
400
350
300
250
200
150
100
50
0
ab
ab
ab
ab
ab
b
a
a
ab
ab
Chat 1X no hill
Chat 1/2X no hill
Chat 1X reg hill
Chat 1/2X reg hill
Chat 1X no hill + Bndy 1/2X reg hill
Chat 1/2X no hill + Bndy 1/2X reg hill
Chat 1X E. hill
Chat 1/2X E. hill
Chat 1/2X E. hill + Chat 1/2X reg hill
Boundary 1X


Marketable
Yield (Cwt/A)
400
350
300
250
200
150
100
50
0
ab
ab
ab
ab
ab
b
a
a
ab
ab
Chat 1X no hill
Chat 1/2X no hill
Chat 1X reg hill
Chat 1/2X reg hill
Chat 1X no hill + Bndy 1/2X reg hill
Chat 1/2X no hill + Bndy 1/2X reg hill
Chat 1X E. hill
Chat 1/2X E. hill
Chat 1/2X E. hill + Chat 1/2X reg hill
Boundary 1X


Marketable tuber percentage
Percent of total (%)
65
60
55
50
45
ab
ab
ab
ab
b
ab
a
ab
a
ab
Chat 1X no hill
Chat 1/2X no hill
Chat 1X reg hill
Chat 1/2X reg hill
Chat 1X no hill + Bndy 1/2X reg hill
Chat 1/2X no hill + Bndy 1/2X reg hill
Chat 1X E. hill
Chat 1/2X E. hill
Chat 1/2X E. hill + Chat 1/2X reg hill
Boundary 1X

Conclusions

Plots treated with Chat 1X EH and Chat 0.5X EH had the greatest total and marketable tuber yield, which were greater than yields in Chat 0.5X NoH + Bndy 0.5X RegH.

Plots treated with Chat 1X EH and Chat 0.5X EH + Chat 0.5X RegH had the greatest % marketable tubers (~ 60%), which were greater than % mark. tubers for Chat 1X NoH + Bndy 0.5X RegH.

None of the application methods caused visible potato injury (little rainfall). In 2022 will incorporate two irrigation timings (0.25 & 1 inch) two days after applications.

Multi-State Evaluation of Pumpkin/Squash Tolerance to Delayed PRE Applications of *S*-metolachlor.

- Thierry E Besancon, Rutgers University
  Sushila Chaudhari, Michigan State University
  Douglas Doohan, The Ohio State University
  Harlene M Hatterman-Valenti, North Dakota State University
  Katherine M Jennings, North Carolina State University
  Dwight Lingenfelter, Penn State University
  Stephen L Meyers, Purdue University
  Lynn M Sosnoskie, Cornell University
  Mark VanGessel, University of Delaware
  Kurt M Vollmer, University of Maryland

Treatments – planted 5/20, rained 6/1

1	Untreated			
2	S-metolachlor	Dual Magnum	1.33 pt/a	14 DAP
3	S-metolachlor	Dual Magnum	2.66 pt/a	14 DAP
4	S-metolachlor	Dual Magnum	1.33 pt/a	28 DAP
5	S-metolachlor	Dual Magnum	2.66 pt/a	28 DAP
6	S-metolachlor	Dual Magnum	2.66 pt/a	14 DAP
	Halosulfuron	Sandea	0.50 oz/a	
	NIS	NIS	0.25% v/v	
7	S-metolachlor	Dual Magnum	2.66 pt/a	28 DAP
	Halosulfuron	Sandea	0.50 oz/a	
	NIS	NIS	0.25% v/v	
8	Fomesafen	Reflex	8 floz/a	14 DAP
9	Fomesafen	Reflex	16 floz/a	14 DAP

Crop injury and Venice Mallow control

	Injury				Venice Mallow control		
Trt	Red Kuri	Jack O latern	Butternut		Red Kuri	Jack O latern	Butternut
2	5 bc	**5 c**	**5 bc**		**74 c**	**79 c**	**70 b**
3	**18 b**	**5 c**	**8 b**		**73 c**	**80 bc**	**61 b**
4	**3 c**	**5 c**	**6 b**		**78 c**	**78 c**	**65 b**
5	8 bc	**5 c**	**15 a**		**76 c**	**75 c**	**54 b**
6	4 bc	**5 c**	**5 bc**		**95 ab**	**99 a**	**94 a**
7	**34 a**	**11 a**	**9 b**		**100 a**	**100 a**	**94 a**
8	5 bc	9 ab	**5 bc**		88 b	**86 b**	**66 b**
9	**3 c**	**6 bc**	**5 bc**		91 b	**86 b**	**68 b**

Crop fruit number and weight

	Fruit number				Fruit weight		
Trt	Red Kuri	Jack O lantern	Butternut		Red Kuri	Jack O lantern	Butternut
1	**2.0 b**	3.0 a	4.3 a		**0.9 b**	**8.6 bc**	4.7 ab
2	3.3 ab	3.3 a	3.8 a		**1.5 b**	**10.3 bc**	**4.3 b**
3	3.0 ab	2.5 a	4.3 a		1.6 ab	**7.7 c**	4.6 ab
4	3.8 ab	4.3 a	3.8 a		2.0 ab	14.1 abc	**3.8 b**
5	2.8 ab	3.0 a	3.5 a		**1.2 b**	**8.2 bc**	**4.0 b**
6	2.5 ab	3.5 a	5.0 a		**2.8 a**	13.0 abc	**6.3 a**
7	3.3 ab	2.8 a	4.8 a		1.9 ab	**8.3 bc**	4.5 ab
8	**4.0 a**	4.5 a	4.8 a		2.1 ab	15.0 ab	4.9 ab
9	2.5 ab	4.5 a	3.3 a		1.7 ab	**17.6 a**	**4.2 b**

Conclusions

- Delaying the Sandea application increased visible injury for Red Kuri squash and Jack O Lantern pumpkins, but visible injury did not correlate with decreased fruit # or fruit wt.
- Excellent early pigweed and common lambsquarters control.
- Only Sandea could provide good/excel. Venice Mallow weed control.
- Lack of rainfall had a greater effect on pumpkin and squash yield than herbicide injury or weed control.

Herbicide Drift

- Cassandra Brown (The Ohio St. Univ.) received a NCR IPM Center grant to:
  - Complete a series of fact sheets primarily focused on dicamba and 2,4-D drift, Dicamba and 2,4-D Fact Sheet Series | Herbicide-Drift Risk Management for Specialty Crops (ohio-state.edu).
  - Complete NCR specialty crop herbicide drift survey.

Survey Results

- **Many repeat drift events among respondents. 20% experienced a yearly drift event (2016-2020), 36% who had drift in 2019 or 2020, had it both years, 9-10% had $10,000-50,000 in damage – significant amount.**
- Farm size, market channels, and whether they have crop insurance correlated to under-reporting.
- This succeeds in quantifying the extent of the problem. No one can say this isn't a problem based on reporting, because the reporting is clearly not happening.
- 50% who experienced drift sought info. Also rules out misdiagnosis.
- This is a problem for which we have few resources, resolutions, and remediations. Clearly research is needed.
- **Underreporting is a big story here. Also, the lack of resolution in most cases. Many growers have no hope.**
- We talked our commissioner of Ag about this issue, they didn't get very far. Need more details on underreporting, who's underreporting, and why they aren't reporting.
- Is it the proximity or sensitivity that makes grapes a major respondent group? Could be focus on extension grape folks to get word out.
- **Interesting responses to question about information sources. Often Ext. Specialists are contacted for help that can't be provided. Can't change legislation or provide legal advice, etc. Frustrating for growers and Extension Specialists.**
- Government specialists tend to be defensive about this issue.
- Surprised so few people were forced to destroy a crop due to drift, might be interesting to see what those crops were (suspect tomatoes).
- Yield loss is pretty subjective. Drift might be blamed for other cultural problems.
- Fuzzy area. For example, it's not directly a drift loss, but a vine has less photosynthetic ability after drift damage, could impact winter hardiness, etc.
- **Drift occurrence didn't increase from 2016 – 2020. Might hint that 2,4-D is main problem for grape growers – used since the 1940's.**
- AAPCO data showed a similar trend. Dicamba complaints decreased in 2018/2019, but not sure why (could be less reporting).
- Better detection is a key research area. It's hard to get the state out to collect official data before it's too late. Obvious symptoms but can't detect PGRs by that time. Are there after-effects, metabolites that could be measured?
- Growers are frustrated. They'll talk to neighbors, but don't see a point in going to the state.

Integrated Weed Management in Hemp: A Multistate Effort to Evaluate Practices and Develop Recommendations.

- Lynn Sosniskie – Cornell AgriTech, Matthew Cutulle – Clemson, Harlene Hatterman-Valenti – North Dakota State, Karla Gage – Southern Illinois, and Michael Flessner – Virginia Tech,
- Goals: 1) describe the competitiveness of grain, fiber, and floral hemp with weeds, 2) evaluate the efficacy and safety of integrated weed management practices in this emerging crop, and 3) develop and disseminate extension materials.