NDSU Carrington Research Extension Center: **Review of selected weed management studies**

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EXTENDING KNOWLEDGE ›› CHANGING LIVES

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Presentation content

1. Fall-established cover crop response to soybean herbicides
2. Winter rye planting dates and rates: weed suppression in soybean
3. Winter rye as a cover crop with pinto bean: weed suppression
4. Tolerance of broadleaf crops to preplant, low-rate dicamba for early season weed control

Fall-established Cover Crop Tolerance to Soybean Herbicides

North Dakota Soybean Council
Our World Is Growing

Can cool-season cover crops be successfully fall established 2-4 months after soybean herbicides with soil residual were previously applied?

Fall-established Cover Crop Tolerance to Soybean Herbicides

- **Study:**
  - **Fargo, 2016** (K. Howatt)
    - 11 corn and soybean herbicides (no crop); 10 cover crops

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  - **Fargo, 2018 and 2020; Carrington, 2018-20**
    (G. Endres, K. Howatt, J. Mettler and M. Ostlie)

    Soybean herbicides:
    - Soil-applied: **Sencor, Pursuit, Spartan, Valor and Zidua**
    - POST: **Engenia, Flexstar and Liberty** (and Raptor - Fargo)

    Cover crops:
    - **barley, winter rye, field pea, flax, radish, turnip** (rapeseed/canola and lentil - Fargo)

Fall-established cover crop tolerance to soybean herbicides, 2019, Carrington

Table.

Herbicide			Cover crop injury[1]											
			20-Sep						9-Oct					
Treatment	Rate	Application timing[2]	Barley	Winter rye	Field pea	Flax	Radish	Turnip	Barley	Winter rye	Field pea	Flax	Radish	Turnip
	fl oz product/A		%											
Sencor 75 DF	0.33 lb		0	0	0	0	13	20	0	0	0	15	25	22
Spartan 4F	10		0	0	0	0	22	0	0	0	0	0	22	0
Valor SX	3 oz		10	0	0	0	0	0	20	0	0	0	0	0
Zidua SC	4		0	12	0	0	20	0	0	0	0	3	22	12
Pursuit	3	PRE	0	0	0	0	0	0	0	0	0	8	0	0
Engenia + CA Ridion	12.8 + 2% v/v		0	0	0	0	0	0	0	0	0	10	0	0
Flexstar + MSO	12 + 24	POST	3	7	0	0	0	7	0	0	0	0	12	8
C.V. (%)			412						274					
LSD (0.10)			NS						NS					

[1]Biomass and/or stand reduction.

[2]PRE=May 21; POST=June 18.

Risk of cover crop injury due to soybean herbicides with soil residual, Carrington and Fargo, 2016-20.[1]

Site-years	Herbicide	Risk of cover crop injury							
		Barley	Winter rye	Field pea	Flax	Radish	Turnip	Lentil	Rapeseed/ Canola
	Soil								
6	Sencor 75 DF	Low	Low	Low	Low	Medium	Medium	Low	Low
6	Spartan 4F	Low	Low	Low	Low	High	Medium	Medium	Medium
6	Valor SX	Low	Low	Low	Low	High	High	Low	High
6	Zidua SC	Low	Low	Low	Low	Medium	Low	Low	Medium
5	Pursuit	Low	Low	Low	High	High	High	Low	Low
	POST								
5	Engenia	Low	Low	Low	Low	Low	Low	Low	Low
6	Flexstar	Low	Low	Low	Low	High	Medium	Low	Medium
2	Liberty 280	Low	Low	Low	Low	Low	Low	Low	Low
2	Raptor	Low	Low	Low	Low	Low	Low	Low	Low

[1]Low risk = 0-20% injury; Medium risk = 21-50% injury; and High risk = >50% injury. Greatest injury recorded for each treament was used to determine risk level.

Published in 2021 ND Weed Control Guide, p. 106

Summary

- All **herbicides** injured cover crops, but not consistently
  - Medium to High injury (ranked based on number of cover crops affected)
    - Pursuit and Valor, Spartan, Flexstar, and Sencor and Zidua
- **Cover crop** risk
  - Low
    - barley, winter rye, field pea and flax
  - Med to high
    - radish, turnip and rapeseed/canola

Winter rye cover crop planting date and rate impact on soil, weeds, and soybean, Carrington, 2019-20

What is an appropriate fall planting date and rate for winter rye based on your cover crop goals?

Weed suppression in soybean among winter rye planting dates and rates, Carrington, 2020[1]

Rye planting treatment		**Rye**		**Weed suppression** (May 28)	
	Rate	Plant density (May 8)		Foxtail	Kochia
Date	lb/A	plt/A	plt/ft^2	%	
Sept 26, 2019	25	338,650	8	52	55
	50	796,800	18	56	79
	75	1,149,700	26	71	83
Nov 1, 2019	25	162,200	4	10	0
	50	401,250	9	10	0
	75	591,950	14	16	0

[1]Rye (tillering to boot stages) terminated with glyphosate on May 29 (day of soybean planting).

Summary

- **Winter rye cover crop planting dates and rates**

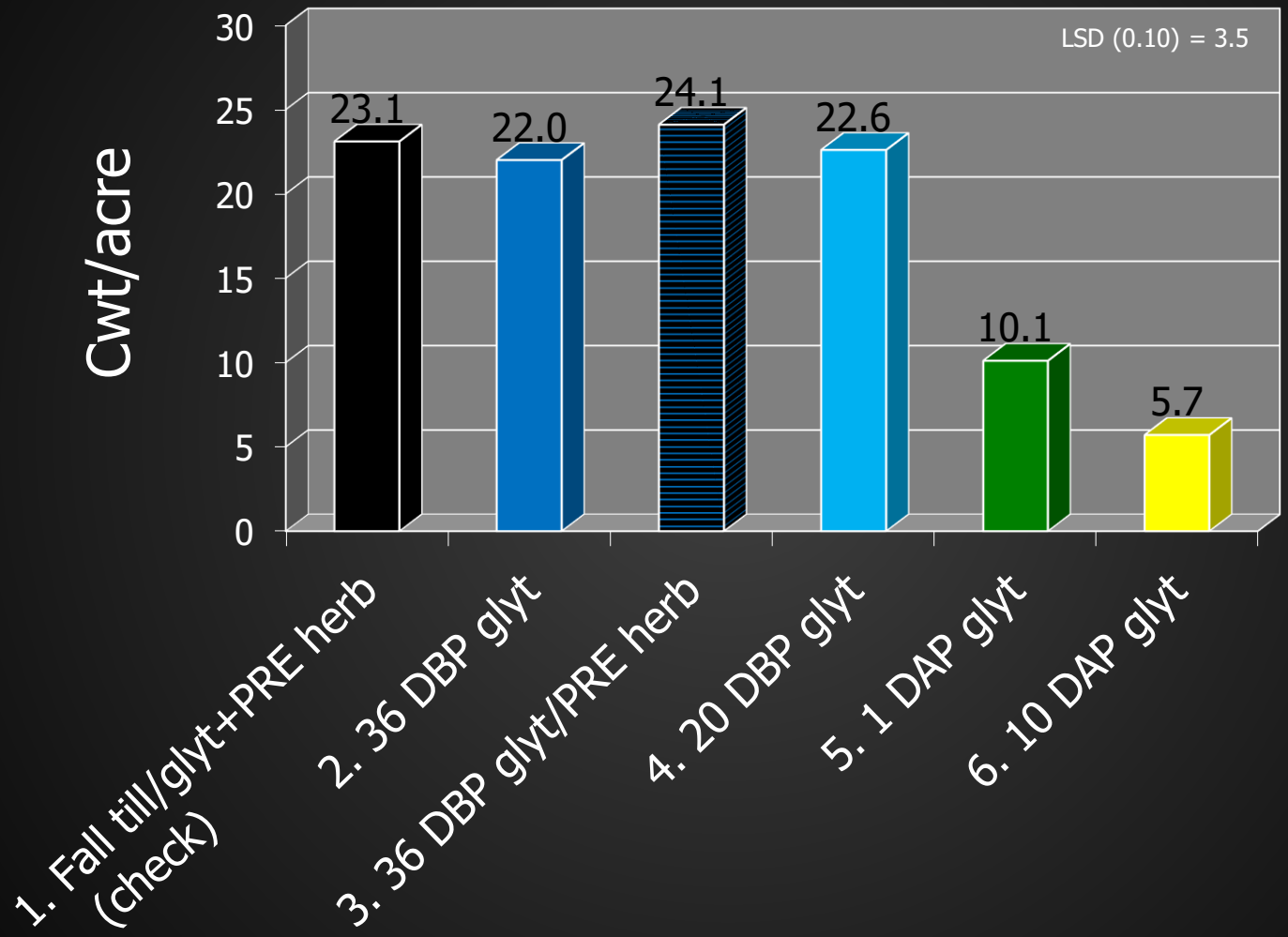
  (Preliminary)

  - **Weed control**
    - 2019 (foxtail): similar among treatments
    - 2020 (foxtail and kochia): first date with 50-75 lb/A (≥800,000 plt/A)
  - Soybean plant development and seed yield: similar among treatments

Winter rye cover crop for pinto bean, Carrington, 2017-20

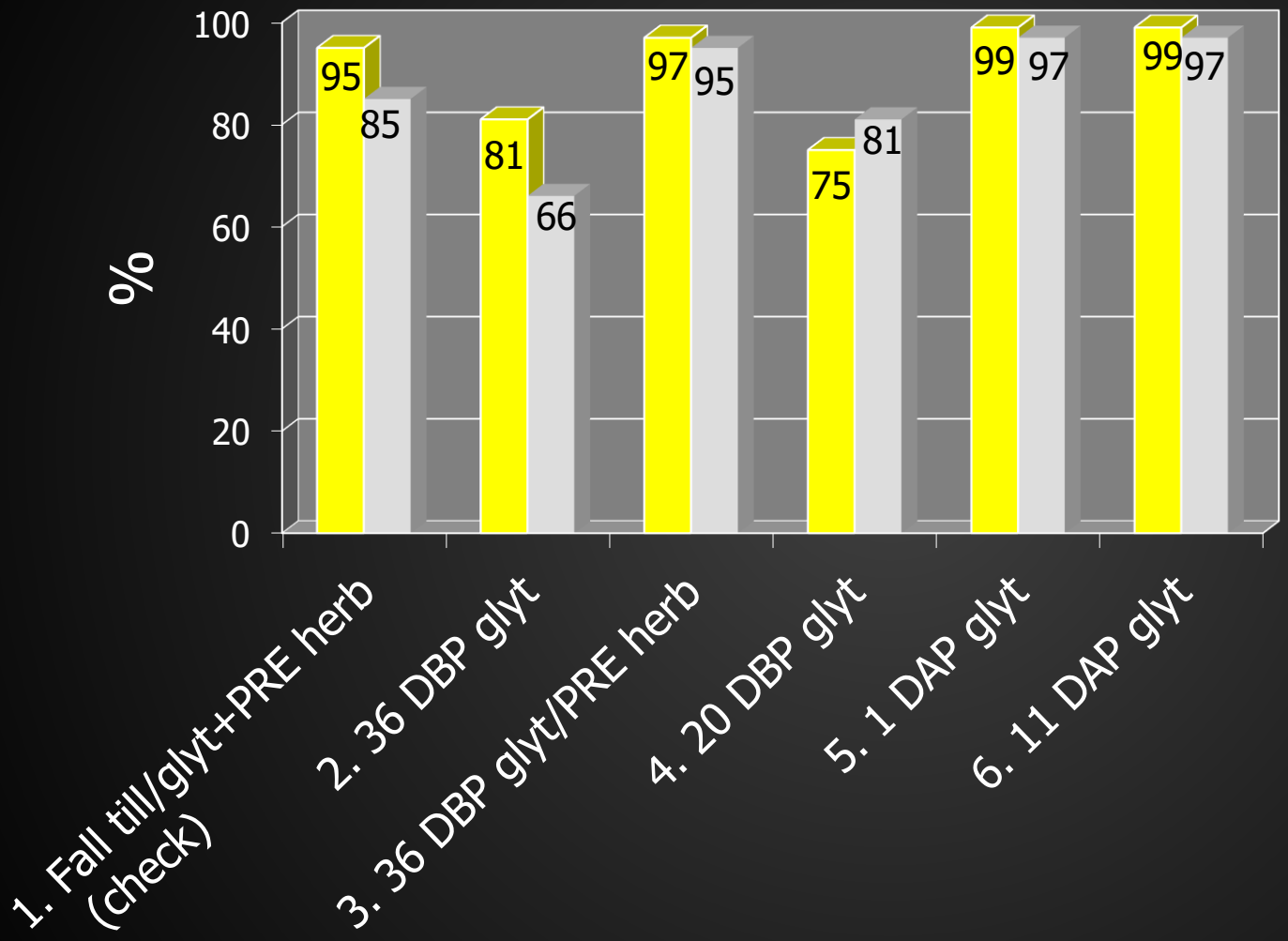
Pinto bean yield?
Rye termination timing?
Weed control?

Pinto bean yield among rye termination treatments, Carrington, 2020[1]



[1]DBP=days before planting; DAP=days after planting. Glyt=Roundup Powermax at 28.4 fl oz/A; PRE=Spartan Elite at 20 fl oz/A. 'ND Palomino' direct planted in 30" rows on **June 4**. POST herbicide applied across trial on June 25.

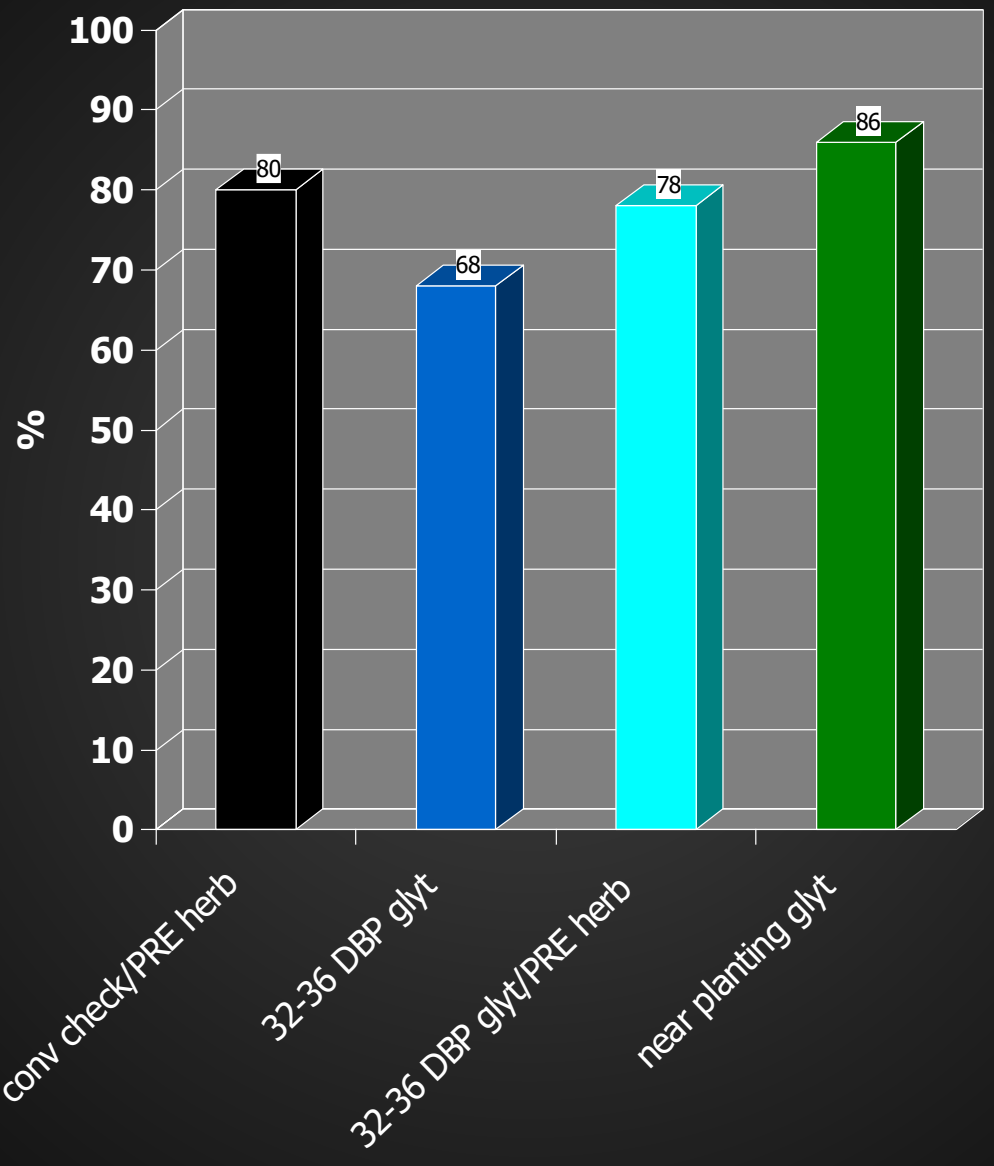
Weed control[1] in pinto bean among rye termination treatments, Carrington, 2020



Yellow = gr and ye foxtail;
LSD (0.10) = 6
Grey = common lambsquarters;
LSD (0.10) = 13

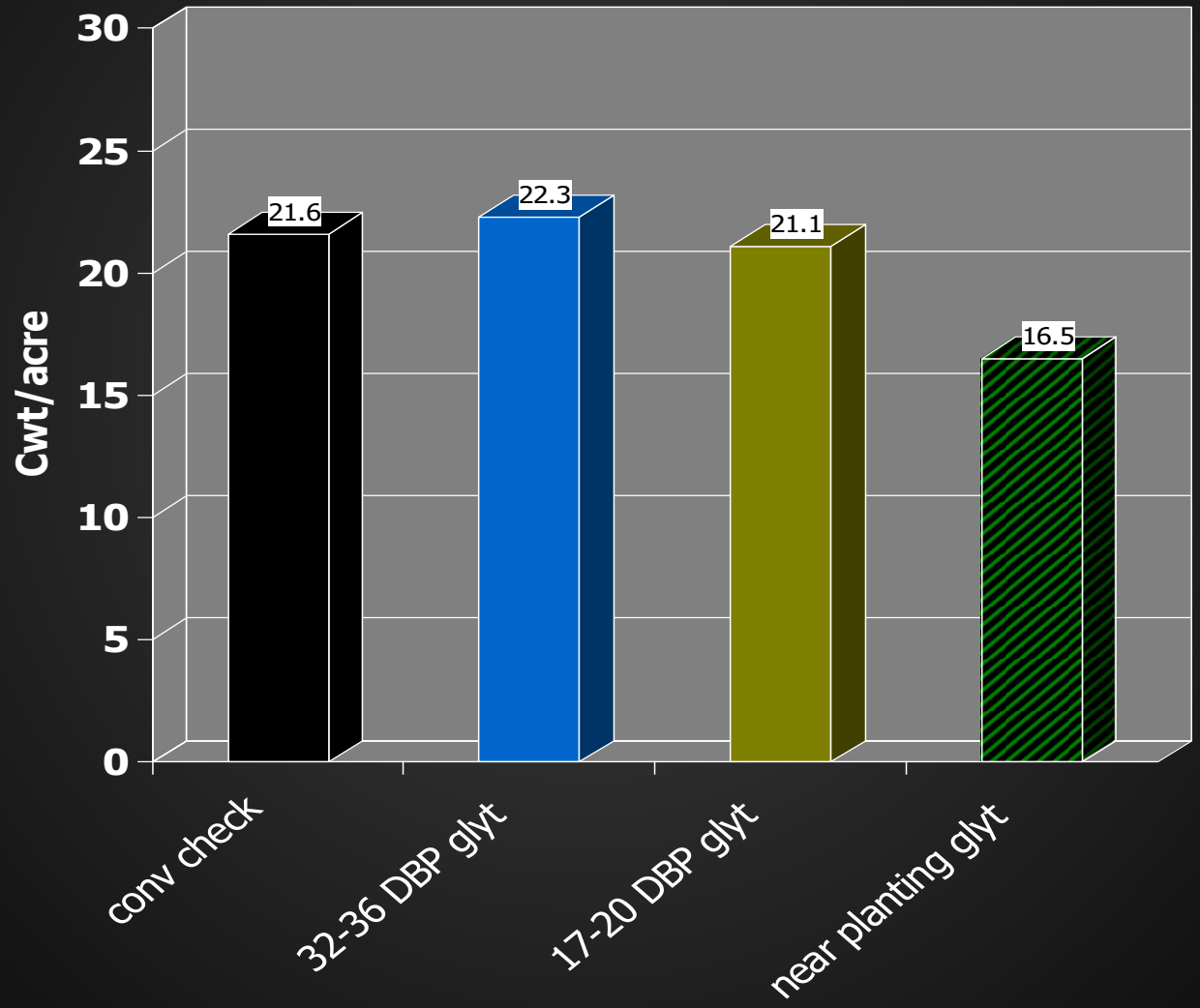
[1]Visual evaluation 3 weeks after bean planting (prior to POST herbicide applied across trial for general weed control).
DBP=days before planting; DAP=days after planting. Glyt=Roundup Powermax at 28.4 fl oz/A; PRE=Spartan Elite at 20 fl oz/A.
'ND Palomino' direct planted in 30" rows on June 4.

Foxtail control[1] in pinto bean with conventional check, and several spring termination timings of rye, Carrington, 2018-20 (3 site years)



[1]Visual evaluation 3-4 weeks after bean planting (prior to POST herbicide application across trial for general weed control).

Pinto bean yield with conventional check, and several spring termination timings of rye, Carrington, 2018-20 (3 site-years)



Summary

- Balance live rye period for benefits (including weed suppression) vs negative impact on dry bean (moisture stress)
- Rye supplement to soil-applied herbicide
  - potentially a substitute
  - timely POST herbicide app
    - Rye provides reduced weed density and smaller weeds
  - watch for tolerant weed species (e.g. legumes [black medic], lanceleaf sage)

Summary of weed control with winter rye as preplant cover crop in soybean and pinto bean, Carrington REC, 2018-20

Weed	Control (%)[1]		Number of research trials
	Average	Range[2]	
Foxtail	**68**	**0-99**	**7**
Common lambsquarters	72	66-97	1
Kochia	36	0-83	1

[1]Visual evaluation ranging from at soybean or pinto bean planting to one month after planting.
[2]Among all trial treatments with rye.

Tolerance of broadleaf crops to preplant (PP) low-rate dicamba for early season weed control

- Limited number of PP burndown herbicides available for soybean, dry bean and sunflower that control herbicide-resistant broadleaf weeds, provide initial soil residual safe to crop, and are low cost.
  - Low rates of **dicamba** may fit this description but waiting periods between dicamba application and planting plus annual rainfall restrictions generally restrict use of the herbicide, due to *potential* crop injury.

Carrington, 2020

Objective and Description of Research Study, 2021

- **Primary objective**
  - Build a ND database that provides a reference for farmers and crop advisers to make decisions if considering use of this strategy.

- **Locations**
  - Carrington (irrigated site) and North Central (Minot) RECs, and Fargo
- **Crops**
  - Soybean, pinto bean and sunflower.
- **Treatments**
  - untreated crop checks
  - PP dicamba (Clarity or generic) applied at 4 fl oz product/A
  - two planting dates plus two rainfall (irrigation) timings

Thank you for your attention.

Questions?

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