NDSU Carrington Research Extension Center: **Weed Management update**

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EXTENDING KNOWLEDGE ›› CHANGING LIVES

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Presentation content

1. Winter rye as a cover crop preceding soybean and pinto bean: weed suppression
2. Tolerance of broadleaf crops to preplant, low-rate dicamba for early season weed control
3. Herbicide SOA quiz

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	%	
Sept 26, 2019	25	338,650	52	55
	50	796,800	56	**79**
	75	1,149,700	**71**	**83**
Nov 1, 2019	25	162,200	10	0
	50	401,250	10	0
	75	591,950	16	0

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

A2050 (March 2022)

Winter Rye as a Preceding Cover Crop for Pinto Bean Production in North Dakota

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Historic dry bean production in North Dakota has primarily involved conventional tillage. Conventional-tilled soils are susceptible to soil erosion before a bean crop is established and after harvest. Also, long-term soil productivity likely declines with conventional tillage. However, dry bean production with reduced tillage is slowly increasing. A 2020 dry bean grower survey (Knodel et al., 2021) indicated 65% of North Dakota acres were grown using conventional tillage compared to 35% with minimum tillage, no-till or strip-till systems.

Use of cover crops plus reduced tillage will reduce soil erosion and increase long-term soil productivity. The 2020 dry bean grower survey indicates 17% of North Dakota dry bean acres included a cover crop, primarily intended for soil and moisture conservation, weed management and to improve soil health.

Winter (cereal) rye is a common cover crop used in North Dakota and has many advantages when properly managed (Ransom et al., 2021). Expected advantages with winter rye, established prior to pinto bean production and with timely termination, include reduction in soil erosion, supplement weed management, utilize excess soil moisture and improved efficiency with direct harvest of bean seed (e.g., timely harvest and clean seed).

A study commenced at the Carrington REC during fall 2017 with seeding winter rye to provide living ground cover in the fall and spring prior to pinto bean production, providing benefits including protection from soil erosion and aid in weed management. Objectives included determining optimum time for terminating rye based on bean planting date, assessing weed suppression and measuring productivity of the bean crop. The study was completed in 2021, providing a four-year database on the production strategy.

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Materials and Methods

ND Dylan winter rye was seeded with a no-till drill in 7-inch rows into small grain or soybean residue at 60-65 lb per acre during Sep. 17 to Oct. 8, 2017-20. Late-fall rye growth stages ranged from plants not emerged to 2-leaf. Early spring rye plant populations were 432,000 plants per acre in 2020 and 354,000 plants per acre in 2021 (data not available for 2018-19). Lariat or ND Palomino pinto bean was seeded with a no-till planter in 21- or 30-inch rows into no residue (tilled plots), rye residue or living rye ("green planted") during May 31 to June 4, 2018-21 at rates targeted to establish 70,000 pinto bean plants per acre.

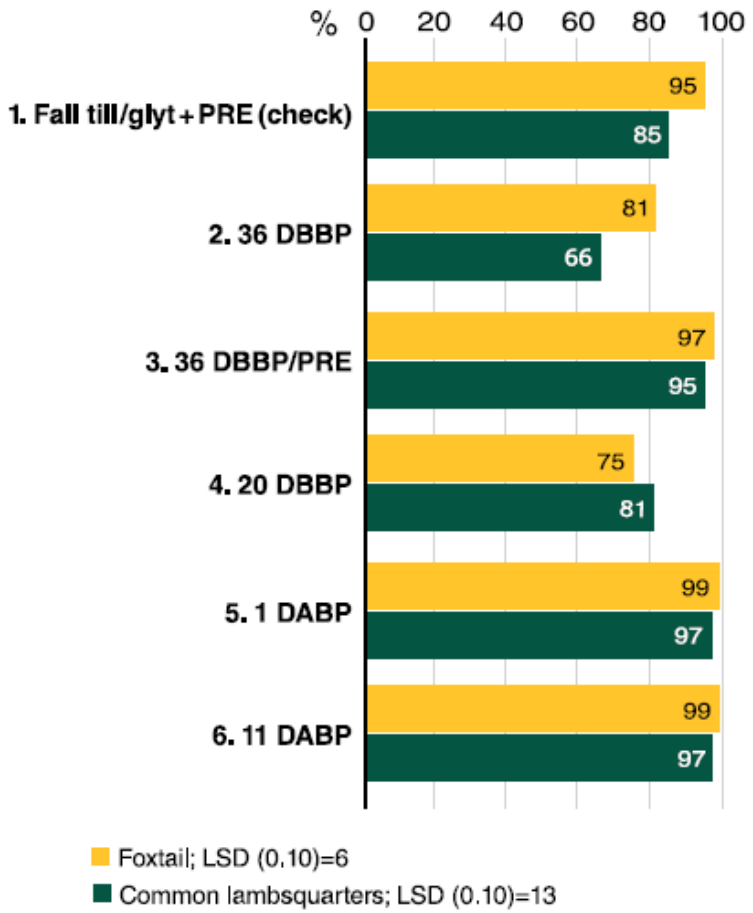
Standard treatments (trts) based on rye termination and pinto bean planting dates (and rye growth stages among years):

1. Conventional production system check—fall and/or spring tillage followed by preplant (PP) or pre-emergence (PRE) glyphosate (Roundup Powermax at 28.4 fl oz per acre plus adjuvant) and PRE Spartan Charge (5 fl oz per acre) or Spartan Elite (20 fl oz per acre).
2. PP glyphosate 29-36 days before bean planting (DBBP) (1-leaf to tiller).
3. PP glyphosate 29-36 DBBP plus PRE herbicide (1-leaf to tiller).
4. PP glyphosate 16-20 DBBP (tiller).
5. PP or PRE glyphosate 5 DBBP to 1 day after bean planting (DABP) (2-joint to boot).
6. PRE glyphosate 7-11 DABP (flag to flower).

After visual evaluation of weed control associated with trts, post-emergence herbicides were applied across each trial for general weed control. At bean seed maturity, plants were hand-pulled for field drying and threshed via combine.

Web search:
NDSU rye pinto bean

Figure 3. Weed control in pinto bean among rye termination treatments with glyphosate, Carrington, 2020.[1]



[1]Visual evaluation 3 weeks after bean planting (prior to POST herbicide applied across trial for general weed control). DBBP = days before bean planting; DABP = days after bean planting. Glyphosate = 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.

Summary of weed control with winter rye as preplant cover crop in soybean and pinto bean, Carrington REC, 2018-22

Weed	Control (%)[1]		Number of research trials
	Average	Range[2]	
Foxtail	**70**	**0-99**	**10**
Horseweed	31	22-40	1
Kochia	47	0-89	2
Common lambsquarters	72	66-97	1
Redroot and prostrate pigweed	69	54-81	1
Wild buckwheat	79	64-94	1

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


Broadleaf Crop
Tolerance to
Preplant
Dicamba

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

- Limited number of PP burndown herbicides available for conservation-till dry bean and sunflower that control low-cost, early season broadleaf weed control.
  - 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.

Objective and Description of Research Study, 2021-22

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

- **Locations**
  - **Carrington** (irrigated site) **and North Central (Minot) RECs, and Prosper**
- **Crops**
  - Soybean (non Xtend)**, pinto bean and sunflower**.
- **Treatments**
  - **untreated crop checks**
  - **PP dicamba** (Clarity or generic) **applied at <u>4 fl oz product/A</u>**
    - **planting date <1 wk after dic app and no rain;**
    - **planting date >2 wk after dic app plus rainfall (irrigation) <u>≥</u>1”**

Planting dates and water following dicamba application, ND, 2021-22

Location	Dicamba application date	First planting date	Total water (inches) from dic app	Second planting date	Total water (inches) from dic app
2021					
Prosper	May 17	May 19	0	June 2	0.74
Carrington	May 13	May 19	0.08	June 1	2.16
Minot	May 7	May 14	0	May 27	0.96
2022					
Prosper	June 3	June 10	0	June 17	0.62
Carrington	June 3	June 6	0	June 23	3.01
Minot	May 27	June 1	0.06	June 16	0.84

Pinto bean injury (June 14, 2021; Carrington): Dic app May 13; 'ND Palomino' planted May 19

PINTO BEAN results, ND, 2021-22

- **Plant injury** (1-2 weeks after plant emergence)
  - First planting dates: 23-91%
  - Second planting dates: 0-46%

- **Plant stand reduction** (early season)
  - First planting dates: 0-73%
  - Second planting dates: 0-19%

Pinto bean seed yield with PP low-rate dicamba, ND, 2021-22

Planting date	Herbicide	Cwt/A				
		Carr 2021	Prosper 2022	Carr 2022	Minot 2022	4 site-year average
First	Untreated check	31.3	31.1	27.1	10.3	25.0
	dicamba	29.9	21.8	24.4	11.2	21.8
Second	Untreated check	30.7	22.8	22.6	10.2	21.6
	dicamba	30.4	22.4	26.7	13.9	23.4
LSD (0.05)		NS	7.3	NS	NS	x

Injury symptoms with early planted sunflower, Prosper, 2021.

SUNFLOWER results, ND, 2021-22

- **Plant injury** (1-2 weeks after plant emergence)
  - First planting dates: 0-23%
  - Second planting dates: 0-9%

- **Plant stand reduction** (early season)
  - First planting dates: 0-22%
  - Second planting dates: similar to untreated checks, except at Minot in 2021 (12% reduction)

Sunflower seed yield with PP low-rate dicamba, ND, 2021-22

Planting date	Treatment	Cwt/Acre				
		Carrington 2021	Prosper 2022	Carrington 2022	Minot 2022	4 site-year average
First	Untreated check	25.8	41.4	20.1	23.9	27.8
	Dicamba	30.0	41.0	19.4	23.5	28.5
Second	Untreated check	25.2	41.8	21.1	21.9	27.5
	Dicamba	24.1	42.4	26.3	23.1	29.0
LSD (0.05)		NS				x

SUMMARY: Tolerance of broadleaf crops to PP low-rate dicamba, ND, 2021-22

- **Pinto bean** generally moderate to high plant injury and stand reduction with first planting dates; low to moderate injury and minimal stand reduction with second planting dates. Seed yield maintained with second planting dates but loss likely with no rain and prompt planting after dicamba.

- **Sunflower** had no to moderate plant injury and stand reduction with first planting dates; no to low with second planting dates. Seed yield not impacted by dicamba.

Herbicide Site of-Action demo, Carrington REC

W253-23 This Publication Supercedes All Previous Issues

2023

North Dakota Weed Control Guide

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Pages 98-99

SOA Group 1, 2, 4, 5, 9, 10, 22, 27

corn

barley

1: clethodim/Select

SOA Group **1,** 2, 4, 5, 9, 10, 22, 27

wheat

soybean (RR)

9: glyphosate/RU PowerMax

SOA Group **1**, 2, 4, 5, **9**, 10, 22, 27

Field pea

Soybean (XF)

4: dicamba/Engenia

2,4-D/Enlist One

SOA Group **1**, 2, **4**, 5, **9**, 10, 22, 27

corn

soybean

2: imazamox/Raptor

thiencarbazone/Varro

SOA Group **1, 2, 4**, 5, **9**, 10, 22, 27

corn

2 DAT

22: paraquat/Gramoxone Inteon

SOA Group **1, 2, 4**, 5, **9**, 10, **22,** 27

soybean (RR2X)

flax

10: glufosinate/Liberty 280

SOA Group **1, 2, 4**, 5, **9, 10, 22,** 27

HRSW and wild buckwheat

5: atrazine

SOA Group **1, 2, 4, 5, 9, 10, 22,** 27

Soybean (RRX)

27: tembotrione/Laudis

isoxaflutole/Balance Flexx

Comments or questions?

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