University of Wyoming

College of Agriculture, Life Sciences and Natural Resources
Powell Research and Extension Center

2026 Field Day

A Message from the Director on 2026 Field Day
June 30, 2026

Dear Producers, Agricultural Professionals, Community Members, and Colleagues:

It is my pleasure to welcome you to the 2026 University of Wyoming Powell Research and Extension Center (PREC) Field Day, taking place here at our beautiful farm in Northwest Wyoming.

This year at PREC, we are home to 26 research trials, 3 foundation seed plots, and 4 crops in commercial production, grown for the purpose of regenerating the land between research trials. Our team also manages two additional research projects at grower-cooperator fields in the region. Our trials span partnerships with 13 UW faculty, staff, graduate students, and postdocs (not including those studies managed entirely by our own team), 2 external research entities (government and academic), and 8 industry partners. PREC is more than just dry beans, sugarbeets, barley, and corn; for the 2026 field season, we have 18 different plant species we are managing! Although each trial addresses a distinct set of research questions, all of our projects share the collective mission of bringing applied research to our stakeholders. We are proud of our team's ability to manage so many different crops and projects with so many different needs and objectives. It is no small feat, and we are happy to share our work and the work of our colleagues here with you today.

This year's effort has been truly collaborative to bring you Field Day programming that is important and relevant to our state, and more specifically, the Big Horn Basin. I'd like to thank the staffs of PREC, Seed Lab, and Seed Certification for their help in planning and executing today's event.

Thank you for attending and we hope you enjoy our Field Day. Please feel free to reach out to me directly with any feedback about PREC, our mission, or Field Day.

Andrea Garfinkel
Director/Associate Professor
Powell Research and Extension Center
agarfink@uwyo.edu
307-410-4092

EVENT SCHEDULE

9:30 am – Registration and Ag Tech Demos

10:00 am – Brief Welcoming Remarks

10:05 am – Tour begins

10:10-10:20 am – Optimizing Nitrogen and Potassium Rates for Higher Sugar Beet Yield and Quality in Wyoming, Dr. Tanumoy Bera

10:25-10:35am – The Relationship Between Nitrogen fertilizer and Plant Growth Regulators in Grass Seed, Heidi Pick

10:35-10:45am – Understanding and Managing Thrips in Wyoming Grass Seed Production, Dr. Nupur Sarkar

10:50-11:15am – Drone v. Ground Rig Spray Demonstration

11:20-11:55am – Evaluating crop safety of pendimethalin (Prowl® H2O herbicide), Sugarbeet tolerance to preplant burndown herbicides, & Burndown herbicide safety evaluation in Dry Bean, Ian Waldecker

12:00pm – BBQ Lunch and Raffle

THANK YOU

TO OUR LOCAL CONTRIBUTORS:

- Blair's Market
- Big Horn Co-op
- White Ink Printing & Shipping
- Murdoch's Ranch & Home Supply
- WYOld West Brewing Company
- Briess Malt & Ingredients Co.
- Simplot

Optimizing Nitrogen and Potassium Management for Sugar Beet Production in Wyoming

Tanumoy Bera[1], Andrea R. Garfinkel[2], Andrew R. Kniss[3]

Sugar beet is one of the most economically important crops for Wyoming growers. However, recent production trends have shown yield stagnation or even declines despite improvements in genetics and crop management practices. One possible explanation is that nutrient management is not fully optimized for current production systems. Nitrogen (N) is often the most limiting nutrient for crop growth, including sugar beet. However, excessive N application can promote excessive leafy growth, increase impurities in the harvested roots, reduce sugar concentration, and ultimately lower sugar yield and profitability. Potassium (K) is another essential macronutrient that plays a critical role in root development, sugar transport, and sucrose accumulation. Although Wyoming's alkaline soils have historically tested sufficient in K, recent observations from crop consultants suggest reduced K availability in some fields. This may be related to the high calcium (Ca) and magnesium (Mg) concentrations common in these soils, which can interfere with K availability and uptake.

To address these complementary hypotheses, a field study was initiated at the University of Wyoming Powell Research and Extension Center to determine optimal N and K fertilizer rates for maximizing sugar beet yield, sugar quality, and economic returns. The study includes five N rates (50, 80, 100, 125, and 150% of the recommended N rate based on soil tests) and three K rates (0, 50, and 100 lb K/ac). All plots are managed according to local industry standards under a furrow-irrigated production system. This is the first year of the study (Figure 1), and the results will provide region-specific recommendations for N and K management to help growers improve nutrient-use efficiency, profitability, and long-term sustainability of sugar beet production in Wyoming.

Acknowledgment: *This research was supported by funding provided by the Western Sugar Cooperative.*

Contact: Tanumoy Bera (tbera@uwyo.edu)

Fig. 1. Sugar beet research plots at the Powell Research and Extension Center, Powell, Wyoming.

[1] Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY
[2] Department of Plant Sciences, University of Wyoming, Powell Research & Extension Center, Powell, WY
[3] Department of Plant Sciences, University of Wyoming, Laramie, WY

Understanding and Managing Thrips in Wyoming Grass Seed Production

***Nupur Sarkar*[1], *Scott Schell*[2], *Andrea Garfinkel*[3]**

Thrips have become an increasing concern for grass seed growers in the Bighorn Basin, where infestations can cause “silver top” symptoms, reduced seed set, and lower seed quality. Very little information is available on which thrips species are present, when populations are most active, and what management options work best under WY conditions.

This project aims to provide practical guide to support thrips management in grass seed production. Specifically, we are seeking to answer the following questions:

1. Besides grass thrips (*Anaphothrips obscurus*), are other thrips species contributing to damage in WY grass seed production systems?
2. When do thrips populations reach peak infestation levels, and are some grass varieties more susceptible than others?
3. Can new insecticide chemistries provide effective thrips suppression?

To address these questions, we are monitoring thrips in commercial grass seed fields throughout the growing season using sweep net sampling, sticky traps, and seed head sampling. We are also evaluating new insecticide product, Vertento® (PLINAZOLIN technology) and its optimum rate under commercial production system for thrips management. Information generated from this project will be used to develop grower-focused resources, including fact sheets and field guides on thrips damage symptoms, and monitoring methods, as well as technical reports summarizing on-farm insecticide evaluations and management recommendations. The ultimate goal is to help growers make informed management decisions, improve thrips control, and support efforts to expand insecticide options for profitable grass seed production.

Contact: Nupur Sarkar (nsarkar@uwyo.edu); Scott Schell (SSchell@uwyo.edu)

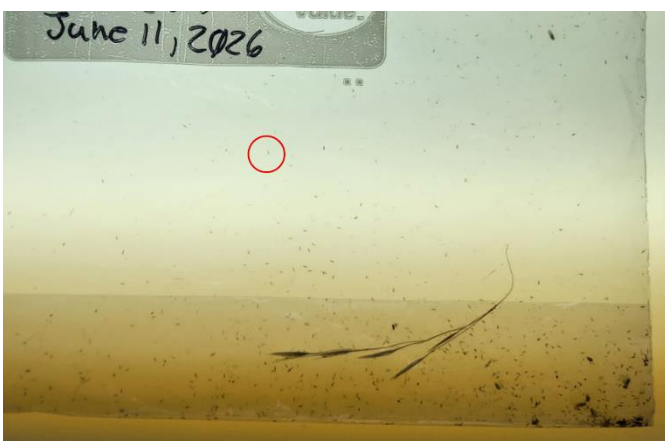

Fig. 1. Thrips collected from a grass field using a sweep net; the red circle indicates a single thrips (left). Magnified views of different life stages of thrips (right).

[1] Department of Ecosystem Science & Management, University of Wyoming, Laramie, WY
[2] Extension, Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY
[3] Department of Plant Sciences, University of Wyoming, Powell Research & Extension Center, Powell, WY

The Relationship Between Nitrogen fertilizer and Plant Growth Regulators in Grass Seed

Heidi Pick[1], Surendra Bhattarai[2], Andrea Garfinkel[3]

Grass seed is one of the largest agriculture sub-categories of production in the Big Horn Basin and northwestern Wyoming, coming in at 3845 acres in 2025. Grass seed is a large industry here, and supplies seeds to local and regional farmers for a forage crop or pastureland, as well as state and federal agencies for reclamation work of public lands and roadways. In their best interest, seed growers aim to have the highest seed yield for their crops. Seed yield is a result of genetics as well as environmental conditions, such as fertilization practices. Nitrogen (N) is the most high-demand and most limiting nutrient in grass growth while also being highly mobile in the soil in areas of high rainfall or irrigation. While increasing grass growth, applied N also increases seed yield by increasing seed size and quantity of seed produced. As seed yield increases, plants become at greater risk of lodging, which makes harvest increasingly more difficult. To aid in the decreased risk of lodging, many local growers use a Plant Growth Regulator (PGR) to stunt the vertical growth of their grasses and strengthen the stems. This 3-year trial will include Timothy, Mountain Brome, and Western Wheatgrass, all of which are commonly grown for grass seed in this region. This study will test the 3 different grass species' responses to variable rates of Nitrogen fertilizer and PGRs to determine the optimal rate of N and PGRs as well as the interactive effect between N rate and PGR application on seed yield. 2026 is the establishment year for these grasses, and data will be collected in years 2 and 3.

Contact: Heidi Pick (hpick@uwyo.edu)

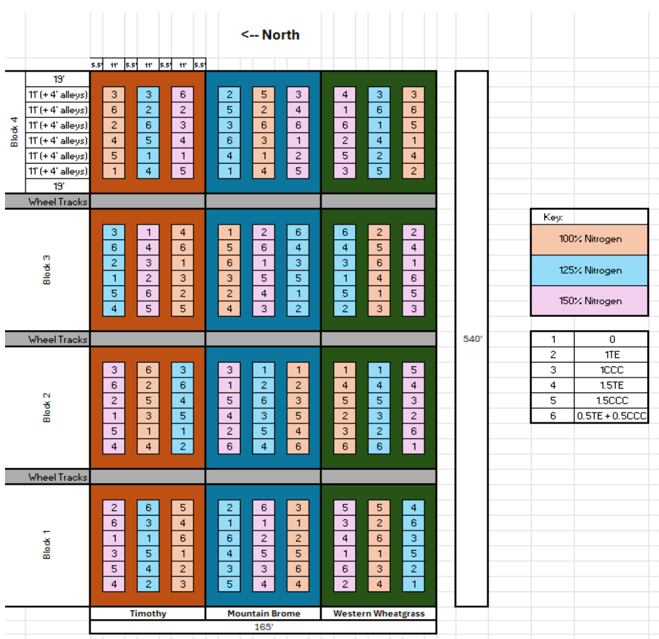

Fig. 1. Plot map with treatments (left), observing grass field (top right), Timothy seed field (bottom right)

[1] Masters Student, University of Wyoming, Powell Research & Extension Center, Powell, WY
[2] Department of Plant Sciences, University of Wyoming, Laramie, WY
[3] Department of Plant Sciences, University of Wyoming, Powell Research & Extension Center, Powell, WY

Evaluating crop safety of pendimethalin (Prowl® H2O herbicide)

Ian Waldecker[1], Jenna Meeks[2], Andrew Kniss[3]

Pigweeds (*Amaranthus palmeri*, *Amaranthus tuberculatus*, *Amaranthus powellii*, and *Amaranthus retroflexus*) are the most challenging weed species sugarbeet growers across the United States must manage on their farms. Kochia (*Bassia scoparia*) is arguably the second most damaging weed species, and remains the primary challenge in much of the Western U.S. Both pigweeds and kochia have developed widespread resistance to glyphosate (Roundup) and triflusulfuron-methyl (UpBeet), leaving sugarbeet producers with few effective herbicide options. The only “rescue” herbicides (with POST activity) for pigweeds and kochia, acifluorfen and phenmedipham, have shown some utility in small plot trials and greenhouse studies, but limited commercial success. Pendimethalin applied early POST, may control glyphosate resistant kochia and Palmer amaranth and reduce the number of these weeds requiring a POST “rescue” treatment. It is critical to understand crop safety to evaluate the potential of pendimethalin as a POST applied residual herbicide option for late-emerging weeds. Soil type, precipitation and irrigation patterns, temperature, relative humidity, and adjuvant/tank mix partners all can impact the efficacy and crop safety of herbicides. The aim of this study is to thoroughly evaluate sugarbeet crop safety across all sugarbeet production regions in a coordinated manner.

Project Locations: Colorado, Wyoming, Nebraska, Idaho, Oregon, Michigan, North Dakota and Montana.

Contact: Ian Waldecker (iwaldeck@uwyo.edu)

May-19-2026 (2026_SB04-Prowl) ARM 2026.0 Tour Report Page 1 of 4

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Sugarbeet safety of pendimethalin alone and in combination with glyphosate

Trial ID: 2026_SB04
Protocol ID: 2026_SB04 Location: Trial Year: 2026
Study Director: Andrew Kniss Sponsor Contact:
Investigator: Andrew Kniss

Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Appl Code	Appl Description	Rep 1	2	3	4	Notes
1	HERB	Roundup PowerMax 3	4.8	LBAE/GAL	SL	30	fl oz/a	B	2-4 true leaf	101	204	301	406	
	ADJ	AMS	100	%	SG	17	lb/100 gal	B	2-4 true leaf					
2	HERB	Nortron	4.0	LBA/GAL	SC	40	fl oz/a	A	PRE	102	205	306	403	
	HERB	Roundup PowerMax 3	4.8	LBAE/GAL	SL	30	fl oz/a	B	2-4 true leaf					
	ADJ	AMS	100	%	SG	17	lb/100 gal	B	2-4 true leaf					
3	HERB	Prowl H20	3.8	LBA/GAL	SC	2	pt/a	B	2-4 true leaf	103	206	304	401	
4	HERB	Prowl H20	3.8	LBA/GAL	SC	4	pt/a	B	2-4 true leaf	104	201	305	402	
5	HERB	Roundup PowerMax 3	4.8	LBAE/GAL	SL	30	fl oz/a	B	2-4 true leaf	105	203	302	404	
	HERB	Prowl H20	3.8	LBA/GAL	SC	2	pt/a	B	2-4 true leaf					
	ADJ	AMS	100	%	SG	17	lb/100 gal	B	2-4 true leaf					
6	HERB	Roundup PowerMax 3	4.8	LBAE/GAL	SL	30	fl oz/a	B	2-4 true leaf	106	202	303	405	
	HERB	Prowl H20	3.8	LBA/GAL	SC	4	pt/a	B	2-4 true leaf					
	ADJ	AMS	100	%	SG	17	lb/100 gal	B	2-4 true leaf					

Sort Order: Replicate 1

Fig. 1. Treatment list for study.

[1]Graduate Student, Department of Plant Sciences, University of Wyoming, Laramie, WY
[2]Sustainable Agriculture Research Center, Department of Plant Sciences, University of Wyoming, Lingle, WY
[3]Department of Plant Sciences, University of Wyoming, Laramie, WY

Sugarbeet tolerance to preplant burndown herbicides

Ian Waldecker[1], Jenna Meeks[2], Andrew Kniss[3]

In the Western Sugar production region, there are currently no effective herbicides (POST or residual) to control glyphosate-resistant kochia. In this project, we are screening herbicides that may provide selectivity to control troublesome weeds at or before planting (kochia, especially, but others as well) but will also provide acceptable crop safety. Some of these products have been evaluated before by researchers in Wyoming (Steve Miller & Andrew Kniss) and Nebraska (Robert Wilson). In that previous work, several active ingredients showed promise but lacked sufficient kochia efficacy or crop selectivity (these include Vida, Liberty, and Command). Because Wyoming sugarbeet growers now have access to metamitron, it is important to screen all of these options for crop tolerance in the presence and absence of Goltix + Nortron (metamitron + ethofumesate) herbicide. Group 15 and Group 5 herbicides (ethofumesate and metamitron, respectively) are known to synergize herbicides with other sites of action (such as bleacher herbicides, Group 13 and 27). It is possible that when co-applied with Goltix + Nortron, sugarbeet injury may be enhanced compared to when the burndown herbicide is applied by itself.

Project Locations: Powell (PREC) and Lingle (SAREC), Wyoming

Contact: Ian Waldecker (iwaldeck@uwyo.edu)

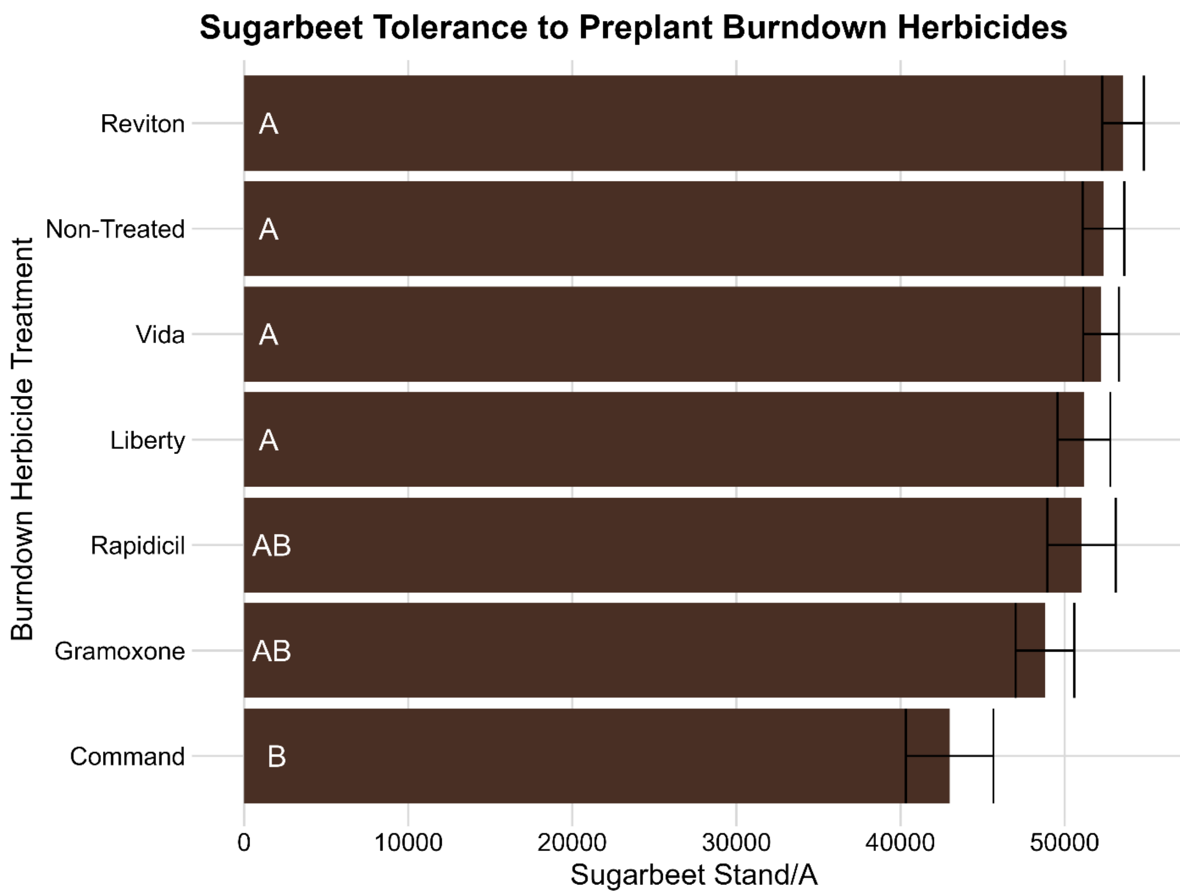

Fig. 1. Note: this figure includes experimental data on some herbicides not registered for use in sugarbeet. Never apply herbicides that are not labeled for use in sugarbeet.

Jun-26-2026 (2026_SB12-PreplantSafety-PREC) ARM 2026.0 Tour Report Page 1 of 1

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Sugarbeet response to herbicides applied before planting

Trial ID: 2026_SB02
Protocol ID: 2026_SB02 Location: Trial Year: 2026
Study Director: Ian Waldecker Sponsor Contact:
Investigator: Andrew Kniss

Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Appl Code	Appl Description	Rep 1	2	3	4	Notes
1	CHK	Untreated Check								101	208	314	405	
	CHK	No tank-mix partner												
2	CHK	Untreated Check								102	207	313	406	
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
3	HERB	Liberty 280 SL	2.34	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant	103	212	302	407	
	ADJ	Ammonium Sulfate	100	%	SG	17	lb/100 gal	A	1 d Preplant					
	CHK	No tank-mix partner												
4	HERB	Liberty 280 SL	2.34	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant	104	211	301	408	
	ADJ	Ammonium Sulfate	100	%	SG	17	lb/100 gal	A	1 d Preplant					
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
5	HERB	Vida	0.208	LBA/GAL	L	2	fl oz/a	A	1 d Preplant	105	213	303	411	
	ADJ	pH buffering agent	100	%	SL	0.5	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	1	qt/a	A	1 d Preplant					
	CHK	No tank-mix partner												
6	HERB	Vida	0.208	LBA/GAL	L	2	fl oz/a	A	1 d Preplant	106	214	304	412	
	ADJ	pH buffering agent	100	%	SL	0.5	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	1	qt/a	A	1 d Preplant					
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
7	HERB	Command 3ME	3	LBA/GAL	MS	10.7	fl oz/a	A	1 d Preplant	107	206	312	409	
	CHK	No tank-mix partner												
8	HERB	Command 3ME	3	LBA/GAL	MS	10.7	fl oz/a	A	1 d Preplant	108	205	311	410	
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
9	HERB	Gramoxone SL 2.0	2	LBA/GAL	SL	4	pt/a	A	1 d Preplant	109	202	305	403	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	CHK	No tank-mix partner												
10	HERB	Gramoxone SL 2.0	2	LBA/GAL	SL	4	pt/a	A	1 d Preplant	110	201	306	404	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
11	HERB	Reviton	2.83	LBA/GAL	SC	1	fl oz/a	A	1 d Preplant	111	204	310	414	
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
	CHK	No tank-mix partner												
12	HERB	Reviton	2.83	LBA/GAL	SC	1	fl oz/a	A	1 d Preplant	112	203	309	413	
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					
13	HERB	Rapidicil	0.46	LBA/GAL	SL	5	fl oz/a	A	1 d Preplant	113	209	307	402	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
	CHK	No tank-mix partner												
14	HERB	Rapidicil	0.46	LBA/GAL	SL	5	fl oz/a	A	1 d Preplant	114	210	308	401	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
	HERB	Goltix 700 SC	700	g/L	SC	64	fl oz/a	A	1 d Preplant					
	HERB	Nortron	4	LBA/GAL	SC	40	fl oz/a	A	1 d Preplant					

Sort Order: Replicate 1

Fig. 2. Treatment list for study.

[1]Graduate Student, Department of Plant Sciences, University of Wyoming, Laramie, WY
[2]Sustainable Agriculture Research Center, Department of Plant Sciences, University of Wyoming, Lingle, WY
[3]Department of Plant Sciences, University of Wyoming, Laramie, WY

Burndown herbicide safety evaluation in Dry Bean

Ian Waldecker[1], Jenna Meeks[2], Andrew Kniss[3]

Dry Bean growers who have adopted conservation tillage practices often have emerged weeds at the time of dry bean planting. Several new herbicide active ingredients have been released in the last several years that are labeled to control emerged weeds at soybean planting. These herbicides include two Group 14 herbicides, Reviton (tiafenacil) and Rapidicil (epyrifenacil). In this study, crop safety of these herbicides was evaluated with treatments applied 1 day before planting. Both Reviton and Rapidicil were applied alone and with two common residual herbicide programs: Prowl H20 + Outlook and Valor. Dry bean emergence, visual injury symptoms, and yield will all be collected throughout the growing season to measure safety to these herbicides. Having additional herbicide modes of action that can control emerged weeds at dry bean planting will allow growers to manage difficult weeds that have evolved resistance to other herbicides, such as glyphosate.

Project Locations: Powell (PREC) and Lingle (SAREC), Wyoming and Scottsbluff, Nebraska.

Contact: Ian Waldecker (iwaldeck@uwyo.edu)

Fig. 1. Example of herbicide injury on dry bean seen during the trial.

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Dry Bean tolerance to Preplant PPO herbicides-PREC

Trial ID: 2026_DB12
Protocol ID: 2026_DB01 Location: Trial Year: 2026
Study Director: Ian Waldecker Sponsor Contact:
Investigator: Andrew Kniss

Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Appl Code	Appl Description	Rep 1	2	3	4	Notes
1	CHK	Untreated								101	203	309	402	
2	HERB	Rapidicil	0.46	LBA/GAL	SL	5	fl oz/a	A	1 d Preplant	102	215	313	415	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
3	HERB	Rapidicil	0.46	LBA/GAL	SL	5	fl oz/a	A	1 d Preplant	103	204	314	408	
	HERB	Prowl H20	3.8	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant					
	HERB	Outlook	6	LBA/GAL	EC	14	fl oz/a	A	1 d Preplant					
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
4	HERB	Rapidicil	0.46	LBA/GAL	SL	10	fl oz/a	A	1 d Preplant	104	201	312	404	
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
5	HERB	Rapidicil	0.46	LBA/GAL	SL	10	fl oz/a	A	1 d Preplant	105	207	305	407	
	HERB	Prowl H20	3.8	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant					
	HERB	Outlook	6	LBA/GAL	EC	14	fl oz/a	A	1 d Preplant					
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
6	HERB	Reviton	2.83	LBA/GAL	SC	1	fl oz/a	A	1 d Preplant	106	210	315	406	
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
7	HERB	Reviton	2.83	LBA/GAL	SC	1	fl oz/a	A	1 d Preplant	107	212	302	405	
	HERB	Prowl H20	3.8	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant					
	HERB	Outlook	6	LBA/GAL	EC	14	fl oz/a	A	1 d Preplant					
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
8	HERB	Reviton	2.83	LBA/GAL	SC	2	fl oz/a	A	1 d Preplant	108	202	303	411	
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
9	HERB	Reviton	2.83	LBA/GAL	SC	2	fl oz/a	A	1 d Preplant	109	205	310	412	
	HERB	Prowl H20	3.8	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant					
	HERB	Outlook	6	LBA/GAL	EC	14	fl oz/a	A	1 d Preplant					
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
10	HERB	Prowl H20	3.8	LBA/GAL	SL	32	fl oz/a	A	1 d Preplant	110	206	308	413	
	HERB	Outlook	6	LBA/GAL	EC	14	fl oz/a	A	1 d Preplant					
11	HERB	Valor EZ	4	LBA/GAL	SC	1.5	fl oz/a	A	1 d Preplant	111	208	301	403	
12	HERB	Rapidicil	0.46	LBA/GAL	SL	5	fl oz/a	A	1 d Preplant	112	214	306	414	
	HERB	Valor EZ	4	LBA/GAL	SC	1.5	fl oz/a	A	1 d Preplant					
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
13	HERB	Reviton	2.83	LBA/GAL	SC	1	fl oz/a	A	1 d Preplant	113	211	307	410	
	HERB	Valor EZ	4	LBA/GAL	SC	1.5	fl oz/a	A	1 d Preplant					
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					
14	HERB	Rapidicil	0.46	LBA/GAL	SL	10	fl oz/a	A	1 d Preplant	114	209	304	409	
	HERB	Valor EZ	4	LBA/GAL	SC	1.5	fl oz/a	A	1 d Preplant					
	ADJ	NIS	100	%	SL	0.25	% v/v	A	1 d Preplant					
	ADJ	COC	100	%	SL	2	pt/a	A	1 d Preplant					
15	HERB	Reviton	2.83	LBA/GAL	SC	2	fl oz/a	A	1 d Preplant	115	213	311	401	
	HERB	Valor EZ	4	LBA/GAL	SC	1.5	fl oz/a	A	1 d Preplant					
	ADJ	MSO	100	%	SL	1.5	pt/a	A	1 d Preplant					
	ADJ	AMS	100	%	SG	17	lb/100 gal	A	1 d Preplant					

Sort Order: Replicate 1

Fig. 2. Treatment list for study.

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Coal Char as a Soil Amendment for Wyoming Cropping Systems

Resham Thapa[1], Lauren Sielski[2], Jennifer Bell[2]

Coal char, a carbon-rich material produced from Wyoming coal through pyrolysis, is being evaluated as a novel soil amendment to improve soil health and crop productivity in Wyoming's semi-arid environments. This research at the Powell Research and Extension Center (PREC) with Coal char application of 10 and 20 tons per acre in the spring of 2021, investigates the potential of coal char to enhance soil physical, chemical, and biological properties while promoting sustainable agricultural production. Due to its porous structure and high carbon content, coal char can improve soil water-holding capacity, reduce bulk density, and increase nutrient retention, which are particularly important for irrigated and water-limited cropping systems.

Current research at PREC includes evaluating coal char application rates, monitoring soil health indicators, and assessing crop responses in specialty and field crop production systems. Preliminary findings suggest that coal char amendments can improve soil quality and support plant growth while contributing to long-term carbon storage in soils. Overall, our results indicate that coal char has potential as an alternative soil amendment for enhancing crop productivity in semiarid soils, particularly when integrated with appropriate nutrient management.

This research explores an innovative and value-added use of Wyoming coal resources by converting coal-derived materials into beneficial soil amendments. The results will help determine the feasibility of coal char as a sustainable management practice for improving soil health, enhancing agricultural resilience, and supporting climate-smart farming systems in Wyoming by promoting clean use of coal.

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Fig. 1. Coal char applied at 10 and 20 tons per acre (left) and sugar beet in the coal char (right) Coal char was applied in the field in 2021.

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Evaluation of Agronomic and Physiological Traits in USDA Mungbean Germplasm

Ademola Aina[1], Rebecca Atkinson[2], Donna K. Harris[3]

To address the limited availability of warm-season legume options currently used across the Mountain West, we are evaluating the agronomic performance of the USDA mungbean germplasm collection. This collection comprises 410 mungbean accessions originating from forty-two countries across multiple continents. Mungbean (*Vigna radiata* L. Wilczek) is drought tolerant, early maturing, and capable of producing high seed yields, making it a promising alternative legume for semi-arid environments such as Montana and Wyoming, where cropping systems are often constrained by low annual precipitation, temperature extremes, and recurrent drought. As a drought-tolerant crop and an important source of highly digestible protein, successful integration of mungbean into dryland cropping systems in Wyoming and other Mountain West states could enhance crop diversification, provide an affordable protein source for both livestock and human consumption, and contribute to improved soil health. This study will assess mungbean growth patterns, agronomic traits, seed quality, and forage quality to identify accessions with superior adaptation, yield stability, and water-use efficiency under semi-arid growing conditions.

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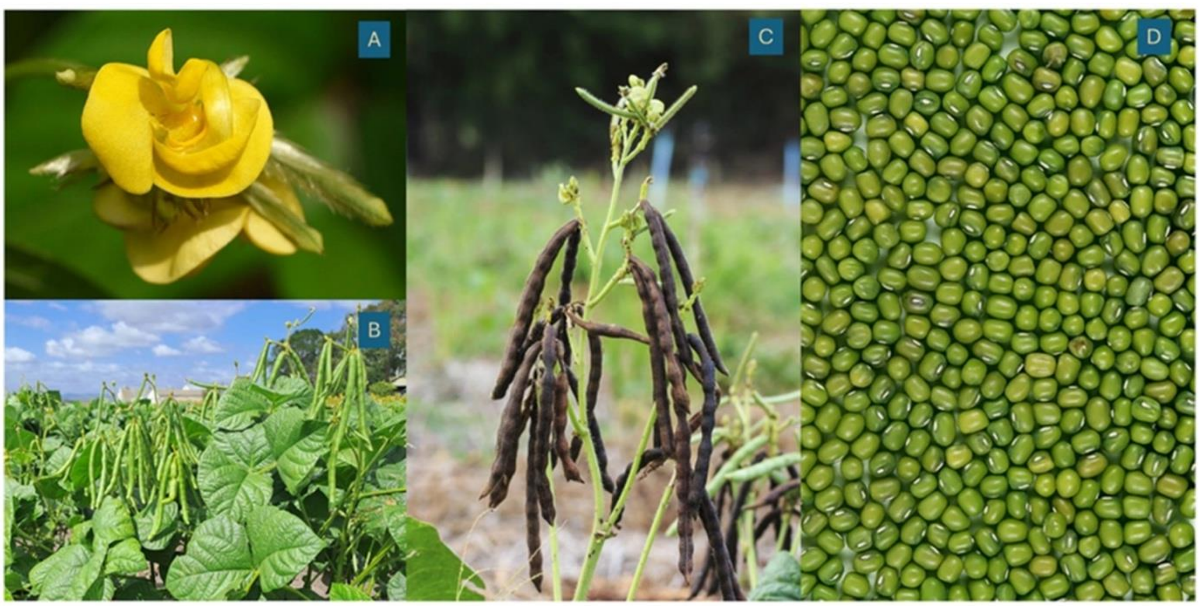

Fig. 1. Mungbeans. **(A)** Flower, photo credit: CABI compendium. **(B)** Leaves and fresh pods, photo credit: Australian mungbean association. **(C)** Dry and mature pods, photo credit: It_man_47. **(D)** Seeds, photo credit: World Vegetable Center.

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Optimizing Planting Date and Irrigation Management for Chickpea Production in Wyoming

Dipanjoli Baral Dola[1], Jim Heitholt[2], Donna Harris[3]

Chickpea (*Cicer arietinum* L.) production in the semi-arid regions of Wyoming is often limited by water scarcity and temperature stress during critical growth stages. This study evaluated the effects of planting date and irrigation regime on the growth, development, and seed yield of chickpea genotypes in the Bighorn Basin of Wyoming. A field experiment was conducted at the Powell Research and Extension Center using 40 chickpea lines, including released cultivars and experimental accessions. Three planting dates (early, mid, and late) were combined with three irrigation regimes based on crop evapotranspiration (ET) replacement levels: 100%, 80%, and 60% ET. Growth, physiological, and yield-related traits, including plant height, phenology, canopy characteristics, seed yield, and yield components, were recorded throughout the growing season.

The objective was to identify management practices that optimize chickpea productivity while improving water-use efficiency. Significant variation was observed among genotypes and management treatments. Preliminary observations indicated that late planting generally resulted in slightly greater seed yield and overall crop performance compared with early and mid planting dates, suggesting improved adaptation to local environmental conditions. Deficit irrigation affected growth and yield, although several accessions maintained acceptable productivity under reduced water availability, indicating potential drought tolerance. These findings highlight the importance of optimizing planting date and irrigation management for chickpea production in semi-arid environments and provide valuable information for identifying drought-resilient germplasm and developing sustainable production strategies for Wyoming and similar regions.

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Fig. 1. Overview of the chickpea field experiment (left) and first planting operation (right) conducted at the Powell Research & Extension Center, Wyoming.

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Cooperative Dry Bean Nursery

Heidi Pick[1], Donna Harris[2], Andrea Garfinkel[3]

The University of Wyoming coordinates the dry bean variety performance evaluation at the Powell Research and Extension Center location in a continuous and on-going program. In cooperation with the National Cooperative Dry Bean Nursery (CBDN) as well as industry partners (ADM and Treasure Valley), and with funding from the Wyoming Bean Commission, a wide range of germplasm is evaluated each year, assisting producers in selecting varieties best suited for Wyoming soils and climate. This year we have a total of 39 entries. The plots are treated with commercial fertilizers and herbicides, and planted at 90,000 seeds per acre. Data on emergence, stand counts, days to flowering and maturity, growth habit, lodging, seed yield, and 100 seed weight will be recorded. Samples will be harvested by hand and threshed using a Haldrup lab thresher.

The CDBN includes beans of all market classes, including Pinto, Black, Kidneys, Great Northerns, as well as Yellow beans and Popping beans. The past couple years have resulted in some new up-and-coming WY-bred prospects that are consistently yielding higher than our industry check Monterrey.

Results
Results from previous years can be found at: https://wyomingbeanresearch.info/research-reports/

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Fig. 1. 2025 CDBN during flowering stage (left), 2025 CDBN hand-harvesting (right)

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2026 Barley Variety Trials

Heidi Pick[1], Andrea Garfinkel[2]

The University of Wyoming Powell Research and Extension Center (PREC) conducts barley variety performance trials in cooperation with USDA-ARS and as part of an ongoing research program. We also perform variety trials for Briess Malt & Ingredients Co. The purpose of these nurseries are to observe and evaluate the performance of different malt barley varieties under different growing conditions across the Pacific Northwest, Intermountain West, and Northern Great Plains regions, including northwest Wyoming. Barley yield and quality vary greatly across regions and varieties, so we want to observe each variety in multiple locations for growers and producers to be able to decide the best-suited varieties for their needs. Data on grain yield, plant height, lodging, and protein are some of the factors to be considered by farmers and industry professionals. These experiments have been located at PREC since 2001. The barley is planted at 100 pounds per acre and is grown with commercially-used fertilizers and herbicides. Data measurements include emergence date, heading and maturity dates, height, lodging, grain yield, test weight, moisture, and kernel plumpness. Plots will be harvested using a Zurn combine.

In the past couple years, USDA-ARS has a couple promising new varieties, while the other breeding lines in the trials have been continually out yielded by current industry favorites.

Results
Results from previous years can be found at:
https://www.uwyo.edu/uwexpstn/research-results-impacts/variety-trials/barley.html

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Fig1. Barley planting in April 2026 with our plot drill (left) and barley strip trial (right)

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Wyoming Legume Research

Donna Harris[1], Shae Milne[1], Clement Nyam[1], Price Akiina[1]

Wyoming-Grown Breeding Lines

Improving agricultural efficiency is a complex task and can be approached from many angles. One such facet we are addressing here at the University of Wyoming is plant breeding techniques to improve key crops grown within the state. From crosses between parent plants exhibiting enhanced local adaptability, we have generated 75 field pea and 335 dry bean breeding lines. Each of these plants are different from their siblings and display a unique combination of traits. During this growing season, we will record phenotypic data on maturity rate, growth habit, and others to identify the best performing field pea and dry bean lines for Wyoming. This data will then be used to select the best genotype from amongst our breeding lines. Field pea selection will be focused on forage quality and stand establishment, while dry bean lines will be selected for improved yields, fast maturity, and slow darkening traits. In addition to our breeding lines, dry bean lines that have already been fully developed at the University of Wyoming and display stable and uniform traits are currently being grown alongside commercial varieties. Results from this trial will establish the competitiveness of newly developed bean lines, and their potential to be a new variety.

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Pea and Chickpea Increases

Grain legumes, such as field pea and chickpea have demonstrated their adaptability to the spring and summer conditions in the semiarid Intermountain West and Northern Plains of the USA. However, the potential of these species to be grown agronomically as a winter food/feed crop has not been fully recognized in the region, in part due to their cold sensitivity. Novel research efforts addressing cold tolerance are going to be crucial to enhance the economic viability of producing these crops. Our objective is to identify, develop, and characterize cold-tolerant chickpea and field pea lines. We have screened more than 300 accessions of each species from their respective USDA core germplasm collections, which represent maximum diversity for each species. To continue screening field pea and chickpea germplasm, we have established seed increase fields at PREC to generate the required seed for overwinter trials and controlled environment testing.

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Lima Bean Variety Trials

In collaboration with a researcher at the University of Delaware, we are growing five different varieties of baby lima beans to test their yield and adaptability to the climate of Wyoming.

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Canopy Temperature to Estimate Dry Bean Yield

Canopy temperature is a valuable, non-destructive physiological indicator for predicting crop yield. However, this relationship remains poorly understood in dry bean (Phaseolus vulgaris L.), and scaling data collection remains a labor-intensive bottleneck. This study evaluated the relationship between dry bean yield and canopy temperature using small unmanned aerial vehicles (sUAVs) across multiple developmental stages. Twelve dry bean genotypes were grown across two environments, and canopy temperature was monitored from 21 to 80 days after planting (DAP), spanning the vegetative and reproductive phases. Correlation analysis revealed that canopy temperature during the V5 to R1 stages had the strongest significant negative association with final yield, peaking at the R1 stage ($r = -0.739$). These findings demonstrate the potential of sUAV-based thermal imaging as a high-throughput phenotyping tool to accelerate yield prediction and selection in dry bean breeding programs.

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