2025
Annual Report

University of Wyoming

College of Agriculture, Life Sciences and Natural Resources

Sheridan Research and Extension Center

Table Of Contents

Partners & Collaborators

Thank you to our partners and collaborators who help to make all of this work possible! We are also immensely grateful for our finacial support from the Joe and Arlene Watt Foundation, Jerry Schuman Rangeland Restoration Fellowship Program, and the L. Jean Martinez WRRC Fund.

A Note From the Directors

Greetings,

It has been another busy year at ShREC, where we have remained committed to conducting science with real-world applications. This means pursuing research questions that directly benefit growers, producers, and land managers. While our research mission has remained unchanged, there have been several notable changes at ShREC over the past year.

First, Dr. Eric Webster retired from his role as Director of the Agricultural Experiment Station (AES), and he will be greatly missed in that position. Dr. Webster played a pivotal role in supporting ShREC's growth and success, helping secure state-of-the-art equipment and infrastructure improvements that have strengthened our research capabilities. We are grateful for his leadership and dedication and wish him all the best in his retirement.

Currently, Dr. Brian Mealor has stepped into the role of Interim AES Director, and Tyler Jones has assumed the role of Interim Director of ShREC while continuing to serve as Farm Manager. Despite these transitions, the research and productivity of the center have continued to thrive and expand. We remain committed to addressing agricultural issues producers face locally, across the state, and even throughout the west.

Summaries included in this year's report address a variety of important topics including pest management, forage production, genetic crop improvement, remote sensing, and rangeland management and restoration. You will also find updates on collaborative efforts with groups located in Sheridan and surrounding communities. If you are interested in collaborating with us or have questions about a particular project, we encourage you to reach out!

Lastly, we would like to express our sincere gratitude and appreciation to the ShREC team and our many partners for all that we have accomplished this year. It takes a large and dedicated team to perform all of the tasks at an experiment farm. Our team's collaborative efforts and hard work have helped answer important research questions and advance practical solutions for agriculture and natural resource management in our region. Thank you to everyone who has contributed to our success.

We hope that as you explore this year's issue, you find meaningful approaches to tackling your agricultural concerns! With gratitude,

Tyler Jones – Interim Director of ShREC and Farm Manager
Brian Mealor – Interim Director of AES and Professor

About SHREC

The Sheridan Research and Extension Center (ShREC) is one of four University of Wyoming R&E sites in Wyoming. It is in the U.S. Department of Agriculture (USDA) Plant Hardiness Zone 4 with an average growing season of 120 days and average annual precipitation of 15 inches. ShREC now has two active sites within Sheridan County. First, the Wyarno station site, originally established in 1915, is located nearly seven miles east of Sheridan near Wyarno. This site consists of approximately 300 acres of dry land with an elevation of about 3,800 feet. The second and main office site is located just south of Sheridan. In 2013 the University of Wyoming purchased and renovated the Watt Regional Agriculture Center on Sheridan College (SC) campus. It then subleases the Adams Ranch located directly south of the new office location. The Adams Ranch consists of approx. 500 acres, to be utilized for research and educational activities. Since most of the Adams Ranch is under irrigation, the scope of ShREC has expanded even further.

At ShREC we are able to provide dry land and irrigated land for studies to facilitate research and education on agriculture, forage management, horticulture, plant improvement, and weed science, along with various other possibilities.

Meet Our Team

Brian Mealor
Interim Associate Dean – AES; Professor

FARM TEAM

Tyler Jones
Interim Assistant Director/Farm Manager

Mike Albrecht
Farm Manager

Eric Heinrich
Assistant Farm Manager

Will Graves
Farm Crew

SHREC TEAM

Rochelle Koltiska
Office Associate

Beth Fowers
Associate Research Scientist

Ademola Aina
Assistant Research Scientist

Shae Milne
Research Associate

Donna Harris
Assistant Professor

IMAGINE TEAM

Jaycie Arndt
Assistant Research Scientist

Nancy Fleming
Assistant Research Scientist

Morgan Frost
Post Doctoral Research Associate

Cassie Hengel
Assistant Research Scientist

Chloe Mattilio
GIS Specialist

Claire Visconti
Assistant Research Scientist

HARRIS LAB

Ilyas Ahmad
Post Doctoral Research Associate

Price Akiina – Ph.D.
Dipanjoli Dola – Ph.D.
Clement Nyam – Ph.D.
Grace Vinarao – Ph.D.
Heidi Schueler – M.S.
Charles Grimes – M.S.
Shae Milne-M.S.

MEALOR LAB

Jaycie Arndt – Ph.D.
Peter Cole – M.S.
Cassie Hengle – M.S.

INTERNS

Ethan Jones
Ella Meyer
Bailey Yeager
Madison Clarke
Emma Talbott
Logan Holey
Henry Jones (Evan)
Levi Crane
Lillee Madison
Dean Jeffers
Ruby Swallow
Halle Fegler
Cristal Rico
Chelsea Turner

Farm Updates

ALFALFA WEEVIL MANAGEMENT

Alfalfa weevil continue to be a problematic pest at both center locations, throughout Sheridan County, and the State of Wyoming. We consider alfalfa weevil research a critical program at ShREC. Throughout our project updates you will find studies tackling this complex issue from multiple angles. Dr. Harris along with master's candidate Heidi Schueler, is investigating hundreds of alfalfa accessions with the goal of identifying plants whose traits promote reduced weevil susceptibility. Dr. Beth Fowers and farm manager Tyler Jones have engaged in monitoring weevil resistance and susceptibility to available insecticides. Finally, both the Wyarno and Adam's Ranch farms are part of a larger study evaluating best management practices for weevil control. We hope that our efforts generate valuable management recommendations for producers throughout our state.

CROP MANAGEMENT PROFILES

If you have visited the center in the last few years, you may have observed some crops that seem unfamiliar or unexpected. In 2025 alone we grew soybeans, dry edible beans, chickpeas, field peas, sugar beets, cowpeas, sweet corn, ladino clover, wheat, spring barley, winter barley, oats, triticale, alfalfa, and a wide variety of perennial grasses. We also harvested seed from western wheatgrass and prairie coneflower. In 2026 we will plant mung beans, popping beans, and sainfoin as well. Often it may take a few trial runs to determine how best to produce each crop in our environment. One way we plan to offer value to our agricultural community is by developing and making available crop production profiles. The two-page documents describe our standard procedures for planting, maintaining, and harvesting each crop based on conditions unique to our area. They should be a great starting point for anyone seeking to try something new. We plan to post them on the ShREC website as they are completed.

A NOTE ON VARIETY SELECTION

One of the most frequent questions we are asked at ShREC is "what should I plant?". While we cannot determine precisely what fits each producer's unique needs, we can provide data that helps producers decide for themselves what will get the job done. In that regard we have heavily reengaged in what was a primary function of Wyoming Ag Experiment Station: Variety Testing. In this year's report you will find summaries of alfalfa and perennial grass variety trials. We have hosted in the past and again plan to house winter barley, spring forage barley, and spring cereal grain variety trials. We are fortunate to have as part of our staff Dr. Donna Harris, who as a plant breeder spends countless hours using breeding techniques to find plants that which provide better yields, improved quality, great drought tolerance, and even herbicide tolerance.

If in this year's report, you don't see data posted for a specific crop you are interested in, don't hesitate to reach out. Chances are good we have data! If not, you may have just given us something new to try.

Collaborations

2025 University of Wyoming Teaching Kitchen at UW Watt Agriculture Center

In 2012 when the University of Wyoming purchased the Joe & Arlene Watt Agriculture Center from Northern Wyoming Community College District (Sheridan College), the building underwent an extensive interior remodeling through mid-2013, to accommodate numerous departments of the University of Wyoming into one central location. Upon completion, a fully operational Teaching Kitchen was established for the Centsible Nutrition Program (CNP) and Nutrition and Food Safety program. CNP is a state-wide cooking and nutrition education program to teach free classes about healthy lifestyles and cooking to qualified individuals in Wyoming. CNP educators also work with community partners on projects like gardens, food pantries, and schools. CNP is funded by the USDA through two grants, the Expanded Food and Nutrition Education Program (EFNEP) and the Supplemental Nutrition Assistance Program-Education (SNAP-Ed). The Teaching Kitchen is still actively utilized by many departments within the building; CNP, 4-H Sheridan County Extension, Community Vitality & Health, Sheridan Research & Extension Center, and Plant Sciences. The space is benefical to each department as to the instructed class/workshop/meeting that is held by each department within the building.

In June 2024 the University of Wyoming and Northern Wyoming Community College District (Sheridan College) entered into a Memorandum of Understanding (MOU), to provide shared space in the UW Teaching Kitchen in support and partnership with the Culinary Arts and Hospitality program of Sheridan College for teaching and learning in the hospitality field. Under the instructors of Sheridan College Hospitality & Tourism program, Sheridan College students were able to learn life skills in cooking through hands-on instruction; where they can earn a Certificate of Culinary Arts & Hospitality.

Acknowledgements: With the MOU between the University of Wyoming and Northern Wyoming Community College District (Sheridan College) a collaboration was established to provide space for new classes with additional students in learning essential skills and leadership to be successful in the Culinary Arts and Hospitality program.

Cent$ible Nutrition Program

Sheridan College

STUDENT TOURS – SHERIDAN COLLEGE AG CLASSES

The Survey of Natural Resources Management class has included the research station on their list of informational visits for the past few years. This year 10 students participated in the tour and learned about careers and education paths in natural resources, drone demonstrations for data collection, discussion on integrated farm management and planning with practice collecting soils for field analysis, and some of the equipment that is used seed cleaning. Students were given the opportunity to learn about some of the components of what occurs at the research station and then do parts of what was discussed.

The Horticulture Science class has occasionally also toured the station and this year we gave the students a tour of the greenhouse with UW graduate students discussing their projects while allowing Sheridan College students the opportunity to ask questions. We also toured the rest of the UW building discussing equipment and work spaces. The plant breeding program was an important component of the tour as different projects were discussed. The students also got to learn about how seed cleaning can occur with a demonstration of some of our lab-sized cleaning equipment.

STUDENT TOURS – BIG HORN MIDDLE SCHOOL CLASS

A 7th grade class from the Big Horn School toured the station with an emphasis on the greenhouse. Students were able to see the variety of projects within the greenhouse and learn about how our specific greenhouses work along with some of the issues we deal with and how we correct them. We also brought the students into the classroom and gave them opportunities to ask questions they had about watering systems, fertilization, and other topics that were not already discussed in the greenhouse.

Field Tours

2025 Field Day – Adam's Ranch

The annual agricultural Field Day is held as an educational event taking place on one of our two farm locations to share current research with producers, stakeholders, and other educational departments. We emphasize findings and methods that may be used to increase awareness about agricultural practices and equipment, introduce new innovative technologies, and share research results.

Field Day was held on Tuesday, July 1, 2025, at the UW Watt Agriculture Center along with the Adams Ranch irrigated fields. The field day started in the morning with greetings and updates from College of Agriculture representatives Associate Dean and AES Director - Dr. Eric Webster along with Dean of the College of Agriculture, Life Sciences and Natural Resources - Dr. Kelly Crane. A full morning schedule of research updates conducted by professors, research scientists, postdocs, graduate students, and interns. Topics included: forage crop studies of alfalfa, winter hay barley, spring barley, soybean cover crops and winter peas, along with avian control, alfalfa weevil monitoring updates, lateral pivot, Wyoming peppers, orchard grasses, updates on invasive annual grasses in northeast Wyoming, wildlife recovery updates, and demonstrations of unmanned aerial data collection system with drones. Upon the tour's completion, lunch was provided at the UW Watt Agriculture Center with additional presentations and time for additional questions and answers.

We are looking forward to the 2026 Sheridan Research & Extension Center Field Day as we will celebrate the 110-year anniversary at its Wyarno location to mark the continuous research and agriculture projects established since 1916. We will also take time to mark the 136th anniversary of Wyoming Agriculture Experiment Stations (1890-2026) to appreciate and honor their land-grant heritage and missions.

Acknowledgments: On behalf of all of us with ShREC we would like to thank all of the producers and land managers who have participated in our workshops, trainings, research and educational efforts. We appreciate all who have attended our annual Field Days along with the University of Wyoming departments and other educational entities that have shown interest in our research studies and reached out to us throughout the years. Special thanks to our funding supporters through grants and the gift of access to the Adams Ranch facility, we deeply appreciate your support of ShREC to keep the vision of our land grant university viable through our Agricultural Experiment Station.

And lastly, this event could not be possible without all the AES and Plant Sciences members at ShREC for their tremendous efforts each year with their leadership skills, mentorship, and thoroughness for ShREC to achieve the goals in conducting this viable event to present many agricultural research projects in Sheridan County for the University of Wyoming.

Contact: Rochelle Koltiska or Tyler Jones at
shrec@uwyo.edu or 307-673-285

UW Courses Taught at SHREC

Plant Breeding (PLNT 4520)
Dr. Donna Harris

This course will provide you with the essential elements, including the fundamental principles and theories, of the science of plant breeding and will examine the role that plant breeding plays in plant improvement and variety development both from a seed industry standpoint as well as from the perspective of a public plant breeding program. You will also learn how to apply new technologies in genetics and genomics in a plant breeding program and gain an understanding of their benefits and limitations.

Plant Biotechnology (PLNT 4050/5050)
Dr. Donna Harris

Introduces students to why and how transgenic crops are developed, including the role of transgenic crops in plant breeding and in agriculture. Students will learn how transgenic plants are handled in a breeding program, and the laws and regulations that govern their use.

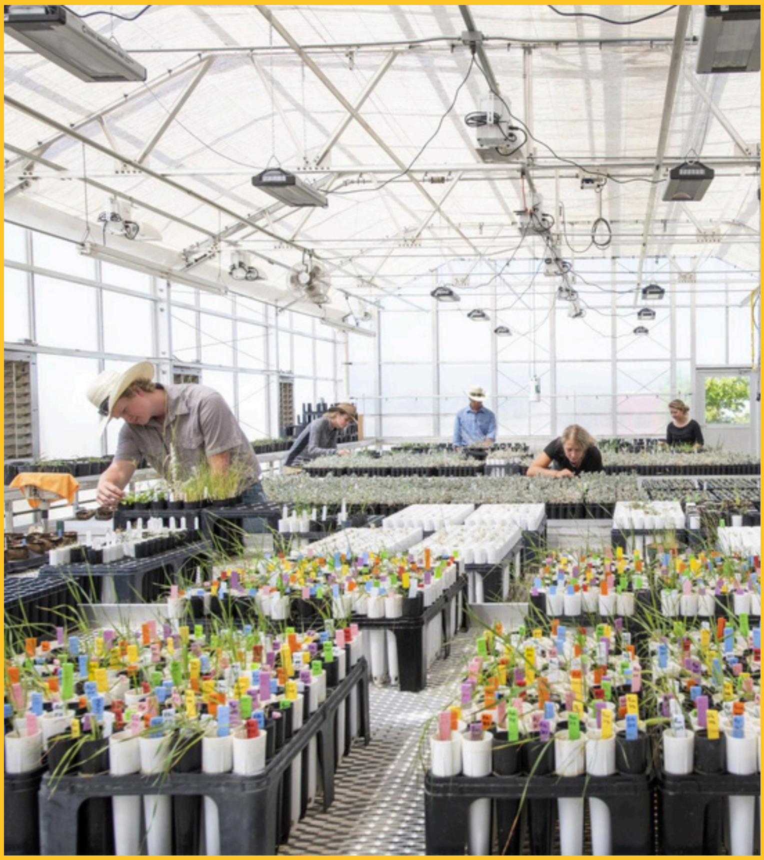
Sheridan College- Adjunct Instruction

Principles of Rangeland Management (REWM 2000)- Spring 2025
Jaycie Arndt & Tyler Jones

This course provides students with an understanding of the basic principles of rangeland management as applied to various regions and vegetative types. The components of rangelands are studied and how soil, water, plants, and animals respond to management actions. Students learn skills, tools, and technology used in rangeland management, natural resource conservation and range livestock production careers.

Greenhouse Management (HORT 2010)
Heidi Schueler

This course examines the production techniques and facilities management of commercial greenhouses, while students are engaged in cultivation of bedding plants from propagation to sale. Students will obtain skills in sexual and asexual propagation, maintenance of plant growth and health, and management of plant nutrient requirements.



Research

Alfalfa Varietal Testing for Irrigated Hayfields

Tyler Jones (1), Clint Beiermann (2), and Surendra Bhattarai (3)

Introduction
Alfalfa represents the top revenue generating crop for the state of Wyoming, occupying the most expansive acreage and providing a critical forage resource for the states larger livestock industry. In recent years, ShREC personnel have fielded several calls requesting varietal recommendations. Our more recent trials were limited only to Round-Up Ready® varieties. Inquiries made it clear that updated tests utilizing this technology and those containing conventional traits were necessary.

Selecting an alfalfa variety is no easy task. Varieties contain a multitude of disease packages, dormancy levels, winter hardiness levels, drought tolerance traits, salt tolerant traits, among others. A study thoroughly comparing all traits would be incredibly large and could occupy an entire research program. We attempted an approach that would be manageable and capture a wide range of available options for growers to consider. Companies, both local and distributing on a national scale were invited to submit varieties thought to be most productive in our region.

Objectives
Provide forage quality and productivity comparisons of commercially available alfalfa varieties in irrigated conditions for northern Wyoming.

Materials & Methods
25 varieties were solicited for entry and placed in a pivot irrigated field at ShREC in Sheridan WY. Varieties were planted in 5' x 12' plots at a 20 PLS lb.ac-1 rate using a 7-row Land Pride minimum-till drill (7" spacing). When germination and purity were not provided by the supplier, samples were sent to the Wyoming Seed Analysis Laboratory for testing. Each entry was replicated four times per location using a lattice design.

Planting occurred May 17, 2024. Plots are managed using herbicides compatible with conventional alfalfa varieties. Target first cutting growth stage is 1/10th bloom, with subsequent cuttings occurring on 30-day intervals. 2024 (establishment year) results are not reported here. Plots were harvested and weighed using a Hege 212 forage harvester. Subsamples were gathered for each plot, weighed, oven-dried to remove moisture, and weighed again to provide corrections for in-field whole plot weights. Subsamples were then ground and tested for quality using near infrared spectroscopy.

Results
Statistical significance ($p<0.05$) was rarely observed for 2025 single cutting or season total yield or quality factors (Table 1). Alfalfa weevil larvae (*Hypera postica*) were present during first cutting growth. Insecticides were applied, however, our plot configuration made uniform application difficult. We have since re-structured plots to provide easier, and more uniform applications in the future. While we cannot assert that yields are similar or different among entries for 2025, we did observe a few general trends.

First, the varieties trending towards highest mean yields fell in the 3-4.5 fall dormancy range. Dormancy levels of 2.5 or 5 typically resulted in mid to lower comparative yields. Second, when discussing forage crops, suggestions for varietal selection and even harvest timing center on trying to strike a compromise between yield and quality. No variety in this trial tested less than 'good', and several have tested 'premium' or greater across all cuttings. 'Signature', 'Powell', and 'FSG 329' are examples of varieties that sustained high mean yields while testing 'premium' or 'supreme' for every cutting.

Finally, though we could not show them to be statistically different, varieties containing the Round-Up Ready trait were concentrated mostly towards the lower end of the yield range. A companion study to this trial was implemented which compares yields of Round-Up Ready varieties when managed with glyphosate versus when herbicides compatible with conventional varieties are employed. Data from that trial may help clarify if yield reductions we observed in this study are attributable to increased weed competition or strictly varietal performance.

Acknowledgements
We would like to thank our cooperators, both local and nationally who submitted varieties to include in this trial. We would also like to thank those whose inquiries led to the creation of this project.

Contact Information and Affiliations

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- Surendra Bhattarai – *Assistant Professor, Forage Agronomy, surendra.bhattarai@uwyo.edu*

Keywords: alfalfa, variety, irrigation, hay

Table 1. 2025 Mean Irrigated Dry-Matter Alfalfa Yield by Variety and Cutting. Productivity is reported in ton's acre-1. Dormancy (FD) is reported on a scale with smaller values representing more dormant varieties, and larger values representing less dormant varieties. Mean relative forage quality (RFQ) scores are reported, alongside the crude protein (%) derived USDA Hay Quality Designation (Good 18-20%; Premium 20-22%; Supreme >22%). Bolded values indicated significant difference ($p<0.05$). Some varieties are obtainable through multiple sources. Asterisks (*) represent varieties that are no longer commercially available.

				1st			2nd			3rd			Season
Variety	Source	Trait	FD	$T.ac^{-1}$	RFQ	Class	$T.ac^{-1}$	RFQ	Class	$T.ac^{-1}$	RFQ	Class	$T.ac^{-1}$
6525R	Nexgrow	Roundup Ready®	5	1.71	144	*Premium*	1.28	175	*Supreme*	0.57	200	*Supreme*	3.37
FSG 527	Allied Seed	Conventional	5	1.37	142	*Premium*	1.41	168	*Supreme*	0.65	211	*Supreme*	3.47
High Five	Allied Seed	Conventional	5	1.56	156	*Premium*	1.35	205	*Supreme*	0.60	200	*Supreme*	3.58
RR AphaTron AA	Croplan	Roundup Ready®	4.5	1.59	146	*Premium*	1.22	190	*Supreme*	0.58	180	*Supreme*	3.60
FSG 450	Allied Seed	Conventional	4	1.78	155	*Premium*	1.42	173	*Premium*	0.65	191	*Supreme*	3.65
RR Saltiva	Croplan	Roundup Ready®	5	1.64	157	*Premium*	1.29	177	*Premium*	0.58	188	*Supreme*	3.69
RR Stratica*	Croplan	Roundup Ready®	4.5	1.79	136	*Good*	1.31	178	*Supreme*	0.59	199	*Supreme*	3.70
1080 High Country	Northwest Seeds	Conventional	2.5	1.95	145	*Good*	1.17	192	*Supreme*	0.64	202	*Supreme*	3.73
Prime Cut	Millborn Seeds	Conventional	4	1.80	155	*Premium*	1.20	187	*Supreme*	0.66	197	*Supreme*	3.79
438RR	Allied Seed	Roundup Ready®	4	1.92	170	*Premium*	1.36	213	*Supreme*	0.72	214	*Supreme*	3.82
GS 47M	Innvictis	Conventional	4	1.74	145	*Premium*	1.59	188	*Supreme*	0.54	210	*Supreme*	3.88
WL 3521HQ	W-L Alfalfa	Conventional	5	1.84	164	*Premium*	1.33	178	*Supreme*	0.71	190	*Supreme*	3.88
Bail King	Agassiz Seed	Conventional	2.5	2.14	151	*Premium*	1.26	181	*Supreme*	0.63	208	*Supreme*	3.88
ISS 37Q	Innvictis	Conventional	5	2.01	166	*Premium*	1.39	193	*Supreme*	0.56	201	*Supreme*	3.89
Ameristand 428TQ	America's Alfalfa	Traffic Tested®	4.5	2.06	132	*Good*	1.42	162	*Premium*	0.61	210	*Supreme*	3.89
GS MPIII-MaxQ	Innvictis	Conventional	5	1.99	141	*Good*	1.31	189	*Supreme*	0.58	221	*Supreme*	3.99
Alfabar*	Barenbrug	Conventional	NA	2.13	143	*Good*	1.44	206	*Supreme*	0.68	203	*Supreme*	4.09
1080 Top Cut	Northwest Seeds	Conventional	3	1.77	135	*Good*	1.51	193	*Supreme*	0.63	187	*Supreme*	4.10
FSG 329	Allied Seed	Conventional	3	**2.20**	146	*Premium*	1.40	187	*Supreme*	0.58	200	*Supreme*	4.15
RR463*	Alforex	Roundup Ready®	4	1.79	134	*Good*	1.62	176	*Supreme*	0.66	203	*Supreme*	4.15
Final Answer	Millborn Seeds	Conventional	4.5	1.91	140	*Good*	1.52	179	*Supreme*	0.72	190	*Supreme*	4.16
Powell	Haystack Mt. Brand	Conventional	3	**2.19**	160	*Premium*	1.48	166	*Premium*	0.70	199	*Supreme*	4.23
Signature	Allied Seed	Conventional	4	1.94	157	*Premium*	1.53	187	*Supreme*	0.64	213	*Supreme*	4.26
4C4013*	LG Seeds	Conventional	4	1.72	143	*Good*	1.55	186	*Supreme*	0.86	212	*Supreme*	4.26
Lander	Haystack Mt. Brand	Conventional	3.5	2.04	141	*Good*	1.51	163	*Premium*	0.79	175	*Supreme*	4.32

Research

Local Suitability of Improved Perennial Grass Varieties for Dryland Forage Production

Tyler Jones, Beth Fowers

Introduction

A goal of the Sheridan Research & Extension Center is to identify crops or varieties that are suitable for our region. ShREC recently collaborated with the USDA-ARS to host a dryland forage trial which included released and experimental grass varieties. This trial concluded in 2021. One standout was Arsenal Meadow Brome. This product has since been released by Barenbrug USA. It was brought to our attention through this experience that many improved dryland grass varieties have been released which may provide greater productivity, longevity, and palatability than those currently used by producers in our area. Our on-going collaboration with Barenbrug has afforded us the opportunity to test additional plant materials. Working with Barenbrug, we selected grass varieties and mixes that could be suitable for dryland forage production. Materials were selected based on their adaptation to a 14-16" precipitation zone, though some entries are marketed for zones receiving more or less precipitation.

Objectives

Our goal is to identify which varieties or blends are most suited for our region when considering yield, quality, and longevity.

Materials & Methods

11 perennial grass varieties/blends were seeded on May 4th, 2023 into a dryland hayfield near Wyarno, Wyoming using a minimum-till style plot drill (Table 1). Each entry was replicated four times and randomized using an RCB design. Plot dimensions were 15ft * 50ft. Glyphosate was applied at a rate of 2.75 lb.ai.ac-1 directly after planting. Plots were not harvested in 2023 as is typical of first year dryland hayfields. A broadcast application of 95-50-25 (units N, P, and K) fertilizer was applied May 10th, 2024. Fertilizer was also applied April 11th, 2025 (95-0-0). Harvest occurred on June 16, 2024, and June 16, 2025, using a Hege 212 plot harvester. Sub samples were collected and weighed before and after being oven dried to remove moisture. These samples were then ground to <1mm and analyzed using near-infrared spectroscopy to extract forage quality. Annual precipitation for each year was variable. A total of 22.25, 10.68, and 17.41 inches were received in 2023, 2024, 2025 respectively. The 130-year average for Wyarno is 14.84 inches.

Results and Discussion

2023 presented ideal conditions to establish dryland perennial grass. All plots were established successfully but were not harvested. Severe drought conditions were present in 2024. Arsenal meadow brome, Barricade, and Renegaide were the most productive entries in drought conditions (Table 1). Notably, both Barricade and Renegaide mixes include Arsenal. These entries were also the most productive in 2025 when precipitation was above average. We observed no significant varietal difference for orchardgrass entries either year. Tall fescue entries (including Stockmaster) provided inconsistent production in 2024 and were the low producers in 2025. Nutritive quality as measured by RFQ (relative forage quality) was similar for all entries both years. Of note, quality was generally higher in 2024 under drought conditions. While not in the replicated trial, many of our dryland hay fields are planted to a blend of Arsenal meadow brome and HLR orchardgrass (11 lbs.ac-1 and 6.25 lbs.ac-1 respectively). In the same field containing the replicated trial, this blend yielded 1.78 T.ac-1. This level of production slots above orchardgrass alone but below Arsenal meadow brome alone. It also appears to be less productive than the Barricade and Renegaide blends currently offered by Barenbrug, though we cannot assert any statistical differences. Our observations with previous Barenbrug products demonstrated their capability of performing under a wide range of environmental conditions. Those observations are being confirmed again in this trial. Future efforts will focus on quantifying proportions of plots attributed to each species including undesirable weeds.

Acknowledgements
We would like to thank Bryan Weech (formerly with Barenbrug), Luke Wilson, and Robin Lamp for assistance in entry selection, donation of seed, and for their continued observation and participation in this project.

Table 1. Seed Rate (lbs.ac-1), Dry Matter Yield (Ton.ac-1), and Relative Feed Quality of 11 perennial grass varieties and blends selected for dryland hay production in northeast, WY established in 2023. Statistical differences ($p<0.05$) in mean dry matter hay yield and RFQ are represented by letter designations in each column. Results are comparable only within year.

			2024		2025	
Species	**Variety**	**Rate lbs.ac^{-1}**	**Ton.ac^{-1}**	**RFQ**	**Ton.ac^{-1}**	**RFQ**
Orchardgrass	Ammo	12.5	1.17 abc	90 ab	1.36 abc	86 a
	Barlegro	12.5	1.29 abc	87 a	1.7 abc	86 a
	Intensiv	12.5	1.22 abc	90 ab	1.46 abc	91 a
	HLR[a]	12.5	1.28 abc	87 a	1.57 abc	88 a
Meadow Brome	Arsenal	22.5	1.9 d	90 ab	1.84 abc	88 a
Tall Fescue	Armory	25	1.32 abc	94 ab	1.11 ab	91 a
	STF-43[b]	25	1.08 a	96 b	1.22 ab	81 a
Blend	Barricade[c]	27.5	1.64 bcd	91 ab	1.94 bc	84 a
	Renegaide[d]	27.5	1.71 cd	90 ab	2.11 c	82 a
	Haymaster[e]	27.5	1.12 a	94 ab	1.43 abc	88 a
	Stockmaster[f]	27.5	0.94 a	104 c	1.07 a	85 a

[a]Orchardgrass blend, included Ammo, Barlegro, and Intensiv varieties at the time of planting
[b]Tall fescue blend
[c]Arsenal Meadow brome, Artillary smooth brome, Armory tall fescue, intermediate wheatgrass, Hammon creeping wheatgrass
[d]Ammo orchardgrass, Arsenal meadow brome, Artillary smooth brome, Armory tall fescue, Hamman creeping wheatgrass
[e]STF-43 tall fescue, Barfleo timothy, Artillary smooth brome, Arsenal meadow brome, HLR orchardgrass
[f]BarOptima & E34 tall fescue, Remington & NEA2 perennial ryegrass, orchardgrass

Research

Warm Season Perennial Grass Suitability for Semi-Arid Forage Production

Tyler Jones, Beth Fowers, Brian Mealor

Introduction

Improved cool-season perennial grasses are a staple hay and grazing resource in semi-arid pastures and hay fields. Common species include smooth brome, meadow brome, tall fescue, ryegrass, timothy, orchard-grass, slender wheatgrass, and intermediate wheatgrass. These species green up early, tolerate hard frosts, capitalize on spring moisture, and are nutrient dense. Significant effort has been directed towards breeding for improved yield, drought tolerance, palatability, and establishment ease. Still, a limitation for cool season species is their inability to continue growth during warm and dry summer months. In rainfed situations, it is common for these species to reach senescence by late June. At this stage, quality and palatability are greatly reduced. Regrowth is possible with supplemental irrigation; however, growth is often slow and yields are far lower than for first cutting.

Remnants of short and mixed grass prairie ecotypes can be found across northeast Wyoming. In these systems we frequently observe warm-season perennial grass species like big and little bluestem, prairie sandreed, blue grama, and buffalo grass. The C4 photosynthetic pathway allows these species to withstand warm temperatures and maintain growth late into summer due to higher water use efficiency. They are almost non-existent in improved semi-arid pasture settings.
In previous research utilizing warm and cool season cover crop blends, we noticed that production was stable across years with variable precipitation and temperature. Additionally, warm season annual grasses like millet and sorghum continued to grow and stay green late into the summer. We hypothesized that a similar strategy could improve the productivity and stability of multi-harvest perennial grass hayfields and pastures.

Objectives

The goal of this project was two-fold: first, identify suitable warm season grasses for semi-arid dryland and irrigated forage production; and second, compare species production in a two-cut system planted with and without a cool season component.

Methods

Each of the 11 warm season entries were planted using a dual cone 7-row, minimum-till research drill with 7" row spacing (Table 1). Seed was arranged for each plot using two packages. Package A always contained the warm season crop and was distributed across 4 rows. Package B covered the remaining three rows and contained the cool season grass when plots were split or the remaining warm season seed for monoculture plots. Arsenal meadow brome was selected as the cool season species. Plots are 5' x 20' and arranged in an RCB design with 5 replicates, placed at three locations in Sheridan County, WY (Table 2). Plots were harvested twice yearly, beginning the year after planting.

production in 2024 and were the low producers in 2025. Nutritive quality as measured by RFQ (relative forage quality) was similar for all entries both years. Of note, quality was generally higher in 2024 under drought conditions. While not in the replicated trial, many of our dryland hay fields are planted to a blend of Arsenal meadow brome and HLR orchardgrass (11 lbs.ac-1 and 6.25 lbs.ac-1 respectively). In the same field containing the replicated trial, this blend yielded 1.78 T.ac-1. This level of production slots above orchardgrass alone but below Arsenal meadow brome alone. It also appears to be less productive than the Barricade and Renegaide blends currently offered by Barenbrug, though we cannot assert any statistical differences. Our observations with previous Barenbrug products demonstrated their capability of performing under a wide range of environmental conditions. Those observations are being confirmed again in this trial. Future efforts will focus on quantifying proportions of plots attributed to each species including undesirable weeds.

Acknowledgements
We would like to thank Bryan Weech (formerly with Barenbrug), Luke Wilson, and Robin Lamp for assistance in entry selection, donation of seed, and for their continued observation and participation in this project.

Table 1. Warm Season Perennial Grass Entries. Entries were selected based on reported suitability for northeast WY growing conditions. Each entry was planted alone and in a 57/43 % split with the cool season meadow brome.

Variety	Species	Rate lbs.ac-1
Bison	Big bluestem	8
Kaw	Big bluestem	8
Centennial	Sand bluestem	8
Chet	Sand bluestem	8
Camper	Little bluestem	4
Cheyenne	Indiangrass	7
Tomahawk	Indiangrass	7
Blackwell	Switchgrass	3
Dacotah	Switchgrass	3
Forestburg	Switchgrass	3
Pierre	Sideoats gramma	6

Table 2. Trial Locations and Target Supplemental Irrigation. Wyarno is located 10 miles NE of Sheridan. Both locations receive 14-16” of average annual precipitation. K-Line pods are mobile sprinkler units connected via poly pipe. The pivot site is vertically irrigated using a center pivot.

Site ID	Location	Planted	Irrigation
Rainfed	Wyarno, WY	2022	0”
K-Line	Sheridan, WY	2022	6”
Pivot	Sheridan, WY	2021	12”

Results

Our attempts to establish each warm season grass were initially met with difficulty. Seeds of some varieties, like the bluestems are very light and hairy causing them to stick together and plug the drill. The original dryland site failed because of this. We observed that blending these species with cracked corn improved seed flow stand establishment. Across the three sites using this seeding method, we were able to successfully establish each of the 11 varieties. Generally, establishment was slow and many species appeared to have failed in year 1, however by year two and three, plots filled in somewhat uniformly.

When comparing mean productivity by site from 2023 to 2025, we identified 3 general patterns: a) species that performed best as a monoculture, b) species that performed best when mixed, and c) species that performed similarly alone or mixed.

a) Species that provided higher irrigated productivity as a monoculture included Kaw Big bluestem, Cheyenne Indiangrass, and Forestburg Switchgrass. Without supplemental irrigation, this list was reduced to Cheyenne Indiangrass alone.

b) While not statistically significant, it was consistent that mean yields for Pierre Sideoats grama and Camper little bluestem were always greater when paired with the cool season species irrespective of site. These were the lowest producing entries in the study across all years. Camper little bluestem was the most difficult species to establish and produced very little biomass until year 3. Pierre Sideoats grama produced very consistent stands, but its physiological characteristics are such that it produces lots of seed and little leaf material.

c) We found that Chet Sand Bluestem, Centennial Sand Bluestem, Tomahawk Indiangrass, Blackwell Switchgrass, Dacotah Switchgrass, and Bison Big Bluestem all performed similarly within location. Examples of this are irrigated Blackwell switchgrass which produced 2.3 Tons ac.-1 split and alone, and Chet Sand bluestem which yielded 1.1 Tons ac.-1 at the rainfed site as a monoculture and mixed.

As a preliminary trial, we successfully identified species that could be plausible options for integration into hayfield and pastures. Our study design allowed us to generally compare selected warm season varietal productivity with and without the cool season meadow brome but does contain some limitations. First, Arsenal meadow brome was not included as a monoculture, therefore we are unable to accurately determine if adding a warm season component improved season-long productivity when compared to cool season only environment. Second, whole plot biomass is insufficient for determining what competitive effects exist for each species. Stand counts and separation of warm and cool season species appeared to have failed in year 1, however by year two and three, plots filled in somewhat uniformly.

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Table 5. Trial Locations and Target Supplemental Irrigation. Wyarno is located 10 miles NE of Sheridan. Both locations receive 14-16" of average annual precipitation. K-Line pods are mobile sprinkler units connected via poly pipe. The pivot site is vertically irrigated using a center pivot.

Variety	Plot Type	T.ac-1	SE	Group
Cheyenne	Split	2.68	608.2	cdef
Tomahawk	Mono	2.69	608.2	cdef
Kaw	Split	2.82	608.2	def
Forestburg	Mono	3.42	608.2	efg
Cheyenne	Mono	3.55	608.2	fg
Kaw	Mono	4.31	608.2	g

Table 3. Trial Locations and Target Supplemental Irrigation. Wyarno is located 10 miles NE of Sheridan. Both locations receive 14-16" of average annual precipitation. K-Line pods are mobile sprinkler units connected via poly pipe. The pivot site is vertically irrigated using a center pivot.

Variety	Plot Type	T.ac-1	SE	Group
Centennial	Split	1.29	347.2	bcde
Kaw	Mono	1.32	347.2	bcde
Forestburg	Split	1.39	347.2	cde
Cheyenne	Mono	1.53	347.2	de
Forestburg	Mono	1.79	347.2	e

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Keywords: forage, hay, pasture, grass, warm-season

Figure 1. Rainfed Trial Replication. Established in 2022. Image taken prior to second harvest, August 2025. The bottom center plot pictured is Pierre Sideoats grama, with Bison Big bluestem (split) on the left, and Tomahawk Indiangrass on the right.

Figure 2. Cheyenne Indiangrass pictured at the irrigated site prior to second cutting September 2024.

Research

Evaluating Automated Laser Bird Deterrent for Large Area Crop Protection in Cereal and Forage Cropping Systems

Tyler Jones, Beth Fowers

Introduction

The Sheridan Research & Extension Center (ShREC) serves as one of four research sites in the University of Wyoming Ag Experiment Station System. Our farm facilitates a variety of research in small grain, forage, vegetable, and native seed production systems. A critical component of our research is our ever-expanding plant breeding program, which has faced significant setbacks at the hands of both migratory and non-migratory birds. Canada geese have been the primary migratory species, and often target field-pea, chickpea, and dry-edible bean fields. Other non-migratory species like starlings, magpies, and red-wing black birds have caused significant losses to grain trials. We sought to determine if laser repellent technology could provide meaningful protection for critical research plots, and more broadly, provide large scale protection against multiple common bird pests in a variety of cropping systems.

Objectives

Evaluate laser repellent technology as a multi-acre crop protection tool against common migratory and non-migratory birds in small grain and legume cropping systems.

Materials & Methods

Four cereal grains, two legumes, and 4 cereal-legume blends frequently targeted by avian predators, were planted at two locations 2,500 ft apart on the ShREC farm (Table 1). Both had previously contained studies negatively impacted by various birds. Location A (44.75 N 109.943 W) was protected by the automated laser, location B (44.75N 106.92 W) was left unprotected, hereafter referred to as protected or unprotected sites. A randomized complete block design with four replicates was used. Plots measured 10'*20'. Two passes per plot were required using our 5', 7-row Land Pride minimum till drill. Planting occurred April 16, 2025. Plots were fertilized and irrigated equally at both locations.

The AVIX Autonomic Mark II laser was fixed to an 18-foot extendable light pole mounted on a diesel generator. The laser was left standing except in cases of high wind or when the center pivot passed over. Installation and programming occurred June 2, 2025, with protection beginning June 30th. The laser was powered up approximately 1 hour before sunrise and shut down approximately an hour after sunset.

Avian impact was assessed using three metrics: visitation frequency, biomass production, and grain/seed yield. Species and their visitation frequency were tracked using trail/game cameras. Two cameras facing perpendicular directions were placed at each plot and set to capture three images following any triggering movement. When reviewing images, bird presence/absence was recorded hourly until final harvest. Biomass production was assessed for each entry on July 2nd at the time of peak forage quality. Half of each plot was harvested using a Hege 212 forage harvester and weighed. Sub-samples from each plot were simultaneously collected, weighed, oven-dried until a stable weight was reached, and weighed again. Sub-sample moisture loss was calculated and used for moisture corrections on whole plot weights.

The remaining half of each plot was left to allow grain/seed to mature. Grain was hand harvested when ripe in two 0.25m2 frames per plot by clipping stems with seed heads. Samples were threshed and weighed to determine yield. Harvest occurred August 13th, and the study was terminated.

Table 1. List of Entries by Variety & Species. Each entry is included first by its variety. The annual clover blend is comprised of 3 species and includes Yuchi Arrowleaf clover, Elite II Berseem clover, and Dixie Crimson clover. Clover varieties mature at different rates. Entries containing species A and Species B entries are blended, with each entry being included at half of the full seeding rate.

Entry	Species A	Seed Rate #/ac	Species B	Seed Rate #/ac
1	Goliath Oat	100	NA	NA
2	CDC Haymaker Oat	100	NA	NA
3	Vaquero Barley	100	NA	NA
4	Flex 719 Triticale	100	NA	NA
5	Annual Clover Blend	10	NA	NA
6	4010 Forage Pea	80	NA	NA
7	CDC Haymaker Oat	50	4010 Forage Pea	40
8	CDC Haymaker Oat	50	Annual Clover Blend	5
9	Vaquero Barley	50	4010 Forage Pea	40
10	Vaquero Barley	50	Annual Clover Blend	5

Analysis
Biomass and seed productivity were analyzed using a two-way ANOVA in R1. Site was considered a factor and block a source of error. Least squared means were derived using the multcomp package2 and adjusted using the Tukey method.

Results and Discussion
The use of game cameras allowed us to record bird presence at each location (**Figure 1**). Due to similarities in visitation, time was grouped into four-hour intervals beginning at 5 a.m. and concluding at 9 p.m. Two instances of bird activity were captured between 9 p.m. and 5 a.m., so this time frame was combined into a single larger group. Activity was first recorded on July 2nd and remained consistent at both locations until the study was terminated. Of the 45 days between the onset of laser protection and termination of the study, 38 days of activity were recorded at the protected site, while 34 occurred at the unprotected site. The unprotected site was close in proximity to a frequently travelled road through the farm, which may have resulted in slightly fewer visits due to more frequent human activity. At the protected location, visits were more frequent between 5 a.m. and 1 p.m. while at the unprotected site, birds frequented the plot most often between 9 a.m. and 5 p.m.

A significant site by entry interaction was observed for seed production ($p<0.05$, Table 2). There was not a consistent trend despite this interaction. For example, CDC Haymaker oats + clover yielded more at the protected site whereas Goliath oats demonstrated higher yields when unprotected. Entries containing barley were the lowest producing grain plots at both sites. This is likely because barley ripened earlier than oat or triticale entries and therefore birds could consume the grain earlier as well. Pea and clover plots also experienced substantial predation, and most plots had no seed. Whitetail deer were frequently observed in game camera photos during nighttime hours. Several plots were heavily trampled because of their activity. We were able to avoid sampling trampled areas when harvesting grain. Trampled plots were more difficult to harvest for biomass.

Entry was a significant factor ($p<0.05$) for biomass production; however, site was not (Table 3). Clover and pea entries produced significantly less biomass than plots incorporating a small grain at both locations. As was suspected there was no evidence of bird impact on biomass production.
Considering the similarities in bird visit frequency and inconsistent grain yield data, there was no observable impact from the AVIX Autonomic Mark II. This laser is highly programmable, so alterations in settings may have provided greater impact. The primary challenge with our study site was that the area covered by the laser was large (10 acres). Small non-migratory birds were often deterred or spooked by the laser and would initially leave, however the time before the laser returned was enough to allow the birds to return. When first approached by the laser, Canada Geese would relocate to a nearby hayfield until the next morning. Over time they began to relocate only as far as it took to avoid the laser, and by the end of the study they were no longer deterred at all.

The laser is programmed such that several patterns can be used to cover individual areas. We used a pattern for each individual study needing protection, and then two larger patterns to cover the entire field and all studies within it. The frequency at which the laser returns to a pattern can be increased, however for every area you increase laser presence, you also decrease its presence across the remaining patterns. It is possible that we tried to protect an area too large and were therefore not able to return to each individual pattern with enough frequency to prevent the birds from becoming accustomed to the laser. Finally, it is recommended that the laser be installed up to a month in advance of suspected bird activity, especially for migratory birds. Due to mechanical issues with the generator powering the laser, this was not possible. However, we were still able to turn the laser on before bird activity was observed.
Laser technology seems to provide some level of control, however the results of our study suggest that its effectiveness is limited to smaller areas unless multiple units can be used.

1. R Core Team. (2025). R: A language and environment for statistical computing (Version 4.5.1) [Computer software]. R Foundation for Statistical Computing. https://www.R-project.org/
2. Hothorn, T., Bretz, F., Westfall, P. (2008). *Simultaneous Inference in General Parametric Models*. Biometric Journal, 50(3), 346-363. https://doi.org/10.1002/bimj.200810425.

Table 2. Mean Seed Yield lbs.ac-1 by Site and Entry. Entry is listed alongside its corresponding site (protected/unprotected). Significant mean separations are represented by letter displays. Weights were recorded directly after threshing.

Entry	Site	Seed lbs.ac-1	SE	Group
pea	protected	0	148	a
clover	unprotected	0	148	a
Vaquero barley + clover	unprotected	0	148	a
clover	protected	0	148	a
Vaquero barley	unprotected	0.26	148	a
pea	unprotected	1.12	148	a
Vaquero barley + clover	protected	6.13	148	a
Vaquero barley + pea	protected	12.43	148	a
Vaquero barley + pea	unprotected	122.6	148	ab
Vaquero barley	protected	185.56	148	abc
Goliath oat	protected	483.29	148	abcd
CDC Haymaker oat	protected	778.9	148	abcde
Flex 719 triticale	unprotected	816.73	148	bcde
CDC Haymaker oat + pea	protected	909.05	148	bcde
CDC Haymaker oat + pea	unprotected	913.87	148	cde
Goliath oat	unprotected	1075.21	148	def
Flex 719 triticale	protected	1153.31	148	def
CDC Haymaker oat + clover	unprotected	1365.92	148	ef
CDC Haymaker oat	unprotected	1507.63	148	ef
CDC Haymaker oat + clover	protected	1714.58	148	f

Table 3. Mean Biomass Production lbs.ac-1 by Entry. Significant mean separations (p<0.05) are represented by group symbol. Site was not a significant factor in determining biomass productivity.

Entry	Biomass lbs.ac-1	SE	Group
clover	2842	501	a
pea	3315	501	a
goliath oat	5817	529	b
CDC Haymaker oat + pea	6187	501	b
Vaquero barley + clover	6323	501	b
CDC Haymaker oat + clover	6478	529	b
CDC Haymaker oat	6865	501	b
Vaquero barley + pea	6944	501	b
Vaquero barley	7049	501	b
Flex 719 triticale	7827	501	b

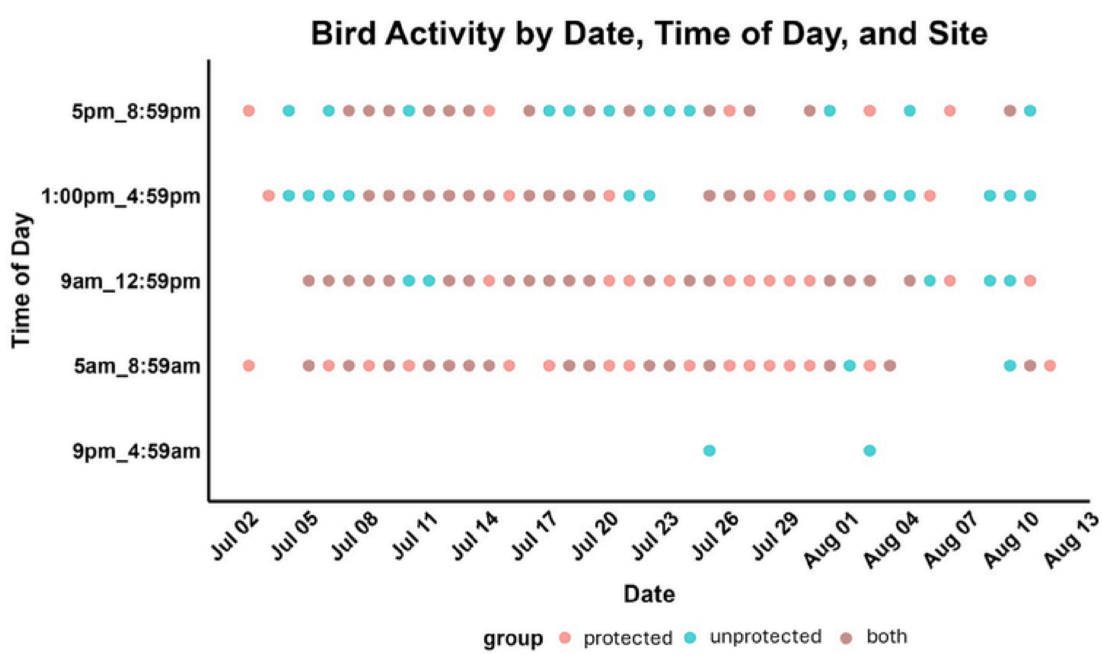

Figure 1. Scatterplot depicting bird activity at each study site by date and time interval. Time interval is displayed on the x-axis and begins from bottom to top with the nighttime interval, then ascends through the day in 4-hour blocks. Group and Site are synonymous. Activity at the protected site is represented in pink, activity at the unprotected site is represented in blue, and instances where birds were present at both sites during the same date/time are purple.

Research

Monitoring Alfalfa Weevil Pyrethroid Resistance in Sheridan County, Wyoming

Tyler Jones, Beth Fowers

Introduction

Alfalfa Weevil (Hypera postica) are a significant pest in alfalfa hay and seed production systems nationwide. Larvae feed on alfalfa leaves and large infestations can result in a skeleton-like appearance and a white to silver color due to leaf loss. Feeding often causes significant reductions to stand productivity and quality. In 2021, samples from the ShREC alfalfa fields were submitted to Montana State University as part of a multi-state research project that identified alfalfa weevil resistance to several type II pyrethroid insecticides (mode-of-action 3A). High levels of resistance were identified in two Sheridan populations, exposed to frequent applications of Mustang Maxx (Zeta-cypermethrin), a type-II pyrethroid insecticide.

In response, ShREC adopted Integrated Pest Management strategies to mitigate weevil damage (see Long Term IPM report). This change in management approach requires rotation of insecticide modes of action, however alternatives are extremely limited. To more effectively assess the viability of IPM, and the response of weevil populations to IPM practices, it was determined that resistance monitoring should be conducted.

Objectives

Monitor population level resistance to pyrethroid insecticides and identify alternative chemistries which may provide effective control.

Methods

Solutions for treatment were prepared by combining acetone (95%), deionized water (5%), and pesticides (by rate) in a 5 gal/ac carrier volume mix. Three rates each of Baythroid XL (1.4, 2.8, and 5.6 fl.oz.ac-1) and Mustang Maxx (2, 4, and 8 fl.oz.ac-1) were used. All rates were selected based on allowable rate per cut. The 1x rate represents the suggested maximum for larvae control, the 2x rate corresponds to the maximum for alfalfa generally, and the 0.5x rate is near the minimum allowed, though not exact. One ml of each solution was placed into individual 42 ml vials. An acetone and water only solution was used for the control. Uncapped vials were placed onto an unheated hotdog roller allowing for the solution to evenly dry on the interior surface of the vials. Sweep nets were used to collect 3-4th instar larvae from dryland and irrigated alfalfa fields at our two locations. They were allowed to settle in cool temperatures for up to 1 day. 10 larvae were placed in each vial and stored for 24 hours in the dark at room temperature. They were then placed in glass petri dishes on hot plates (43-50C) and observed. Larvae that cold crawl one body length were considered alive. Some probing was necessary to encourage movement. Testing was replicated 6 days later.

Results

Our goal was to develop dose-response curves; however, we had insufficient application rates and samples to induce curvature. A 3-way ANOVA was then selected to compare treatment means, with treatment (insecticide*rate), site, and sampling date as main effects. Date was used as the identifier for which round of testing data is generated from. A significant ($p = 0.021$) treatment*date effect was observed. In the first run, we saw 21.25% mortality in the control. Suspecting that we did not handle larvae gently enough, thereby inducing non-chemical mortality, a second round of testing was conducted 6 days later. Specialized tweezers for handling sensitive insects were used in round two resulting in a mean control mortality of only 3.88%. In that test Baythroid XL and Mustang Maxx resulted in significantly higher mortality than the control ($p<0.05$). For 2x treatments induced 90% or greater mortality. At the recommended rate for weevil larvae (1x), we observed 80% mortality for both insecticides. Rodbell et al. (2022) reported that samples from these same fields were highly resistant to Type-II pyrethroids including Mustang Maxx. High resistance was defined as populations susceptible to 10x the minimum labeled rate. Populations in the moderate resistance category fell between the minimum and 10x minimum range.

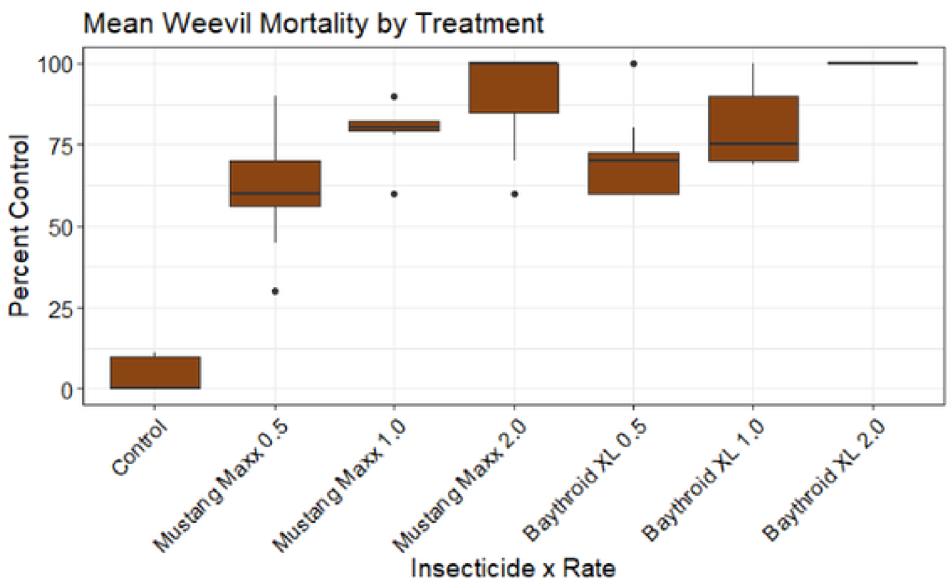

Figure 1. Mean Weevil Mortality by Treatment (Test 2 Only). Site was not a significant factor; therefore results efficacy is averaged across site. Treatments are indicated by insecticide trade name followed by test rate. Letters represent significant mean separations among treatments ($p<0.05$).

The minimum rate for Mustang Maxx is 2.24 fl.oz.ac-1 with a maximum of 8 oz per cutting. Baythroid XL can be applied at a minimum of 0.8 and maximum of 5.6 fl.oz.ac-1 per cutting. 1x treatments were equivalent to the top recommended rate for alfalfa weevil control, with the 2x rate corresponding to the maximum rate allowed per cutting for alfalfa in general. Given that for both insecticides >90% control was achieved with the maximum per cutting rate for alfalfa, and 55% or less control was observed with our 0.5x treatment (slightly greater than the minimum allowable rate), our populations could be considered moderately resistant to these pyrethroid chemistries. Though different than results reported by Rodbell et al., caution should be taken since samples are limited to a single collection. In 2026 we plan to expand our study to include additional labeled chemistries and will incorporate a wider range of application rates. We hope to include additional pyrethroids, indoxacarb (Steward EC), and chlorpyrifos (formerly Lorsban) if available.

Keywords: alfalfa weevil, insecticide, resistance, integrated pest management.

Research

A Long-Term Evaluation of Integrated Pest Management Practices for Alfalfa Weevil Control

Tyler Jones, Beth Fowers, Brian Mealor

Introduction

In 2021, The University of Wyoming participated in a multi-state project assessing alfalfa weevil (Hypera postica) resistance to commonly used pyrethroid insecticides under the direction of Dr. Kevin Wanner and then PhD candidate Erica Rodbell. Larvae samples collected on Sheridan Research & Extension Center fields were among those found to be highly resistant to Type II pyrethroid insecticides (MOA 3A)1. As is true in many western states, alfalfa is a staple crop in Wyoming both as a forage resource and for seed production. The discovery of resistance coincided with federal restrictions for chlorpyrifos based insecticides, leaving producers with few weevil management options2.

Integrated pest management (IPM) practices are often cited as the best approach to manage these situations because the combination of biological, cultural, mechanical, and chemical controls can be used together and in rotation and can have synergistic effects3,4. IPM best management practices are thought to reduce dependency upon chemical controls and thereby slow the development of resistance in weevil populations4. IPM is encompassed by three basic principles: 1) maintaining insect populations below economic injury thresholds, 2) use of all available control tactics, and 3) conserving environmental and crop quality6. Current best management practices for insect pest populations used to achieve these principles are:

1. Rotating insecticide modes of action (MOA)
2. Apply insecticides at the highest labeled rate
3. Incorporate cultural, mechanical, and biological controls when available
4. Monitor pest populations and use economic thresholds to determine the necessity for treatment.

While monitoring and using thresholds to treat are both reasonable and effective, significant challenges with remaining recommendations exist for alfalfa weevil management. First, resistance and regulation have severely limited the number of viable chemicals effective in controlling weevil, making MOA rotation very difficult2,5. Furthermore, it is unclear if resistance to one active ingredient within a MOA is indicative of resistance to all actives within that same class. Biological control agents exist; however, populations are not always self-sustaining and have not provided adequate control alone. Finally, the only proven cultural/mechanical technique is early harvest, which can result in reduced yields2. Due to the nature and expense of long-term research trials, few have been conducted in general, and we are not aware of any targeting alfalfa weevil management that considers IPM practices in this new and limited context.

Objectives

Our objectives are to assess the long-term viability of IPM based recommendations for alfalfa weevil at farm scale while accounting for environment (rainfed/irrigated), stand age, stand composition, crop productivity, and crop quality. We also aim to provide resources to decision makers that will empower them to make timely and cost-effective decisions while managing insecticide resistant alfalfa weevil.

Methods

1. Monitoring:
2. 20, 180° sweeps at three locations in each alfalfa or alfalfa/grass field weekly, beginning when alfalfa reaches approximately 10" in height.
3. Collect biomass at each sweep site consistent with actual harvest timeline.
4. Treatment:
5. Economic threshold set at 10-12 larvae per sweep.
6. Treat only when threshold is reached on a field-by-field basis.
7. Rotate insecticide modes of action.
8. Apply insecticides at the maximum labeled rate.
9. Screen insecticides for resistance, add efficacious products to rotation.
10. Incorporate early harvest when possible.

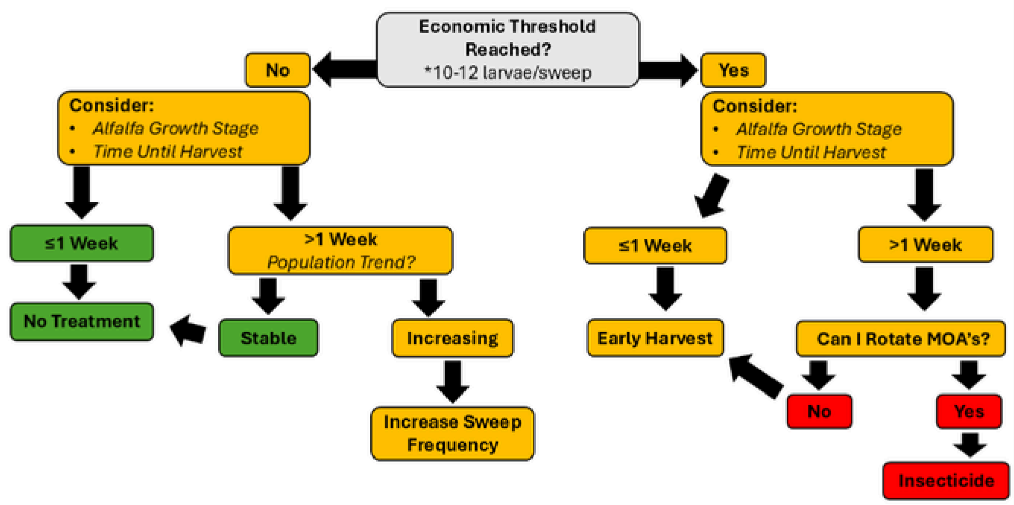

Figure 1. Alfalfa Weevil Treatment Decision Making Model. Workflow starts within the context of weekly sweeps. Mean weevil per sweep number is compared to economic threshold. If exceed, user follows workflow to the right. If not reached, flow left. When considering treatments, the user should be aware of pre-harvest restrictions related to each insecticide. For example, a product with a 20-day pre-harvest interval will not be applicable if the field is 15 days from typical harvest.

Due to the complex nature of treatment decisions, we have developed a decision-making model to assist us in our efforts to adhere to these principles (Figure 1).

Project Update

2025 – Larval counts ranged from 27-100 mean weevil per sweep approximately 1 month prior to harvest. Steward (indoxacarb) applied to all monoculture alfalfa fields, and some alfalfa/grass mix stands.
2024 – Most fields contained consistent low weevil counts. Only 1 field exceeded the threshold and received an application of Baythroid XL (beta-cyfluthrin). Anticipated harvest was 2-3 weeks away at the time of treatment.
2023 – 4.5 mean larvae/sweep. Conditions were wet and cool. No treatment or early harvest required.
2022 – 20-60 mean larvae/sweep. This was the first application of Steward EC (indoxacarb).
2021 – This project was not developed yet, so monitoring data is not available, however this was the last

year Mustang Maxx (Zeta-cypermethrin) was applied. Data from this year coincided with the confirmation of weevil resistance to this product.

Takeaways, 2026 Outlook, and What's Next…

To this point we have successfully adhered to IPM principles. Data correlating productivity and quality of our many alfalfa stands to treatments will be forthcoming. 2026 will be a critical year for this project as we have used a Type II pyrethroid and indoxacarb within the last two years on some fields. We have not tested weevil resistance to Type I pyrethroids and are uncertain regarding product efficacy. The most logical option will be to employ early harvest as we explore alternatives in our 2026 resistance tests.

Key Words: integrated pest management, alfalfa, alfalfa weevil, insecticide

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Research

Evaluation of Diverse Field Pea Accessions from USDA Germplasm Collection under Dryland Conditions

Grace B. Vinarao, Shae Milne, Donna K. Harris

Introduction

Field pea is an economically important pulse crop widely cultivated for human consumption and animal feed because of its nutritional profile. However, drought stress continuously impedes global field pea production, underscoring the need to develop drought-tolerant varieties. Grain yield is a polygenic trait influenced by environmental factors. Therefore, breeding for drought-tolerant genotypes is challenging. Hence, identifying key traits for indirect selection of grain yield and drought tolerance can be useful for field pea breeding programs.

Methods

A total of 96 field pea plant introductions (PIs) from the USDA germplasm collection and five check varieties were evaluated under dryland conditions. This study was conducted during the 2024 and 2025 growing seasons at the Wyarno Research Experiment Station in a randomized complete block design with three replications. To identify traits that may be useful for indirect selection of grain yield, field pea accessions were assessed using key agronomic traits, including canopy temperature, normalized difference vegetation index, 100-seed weight, days to flowering, days to maturity, and plant height.

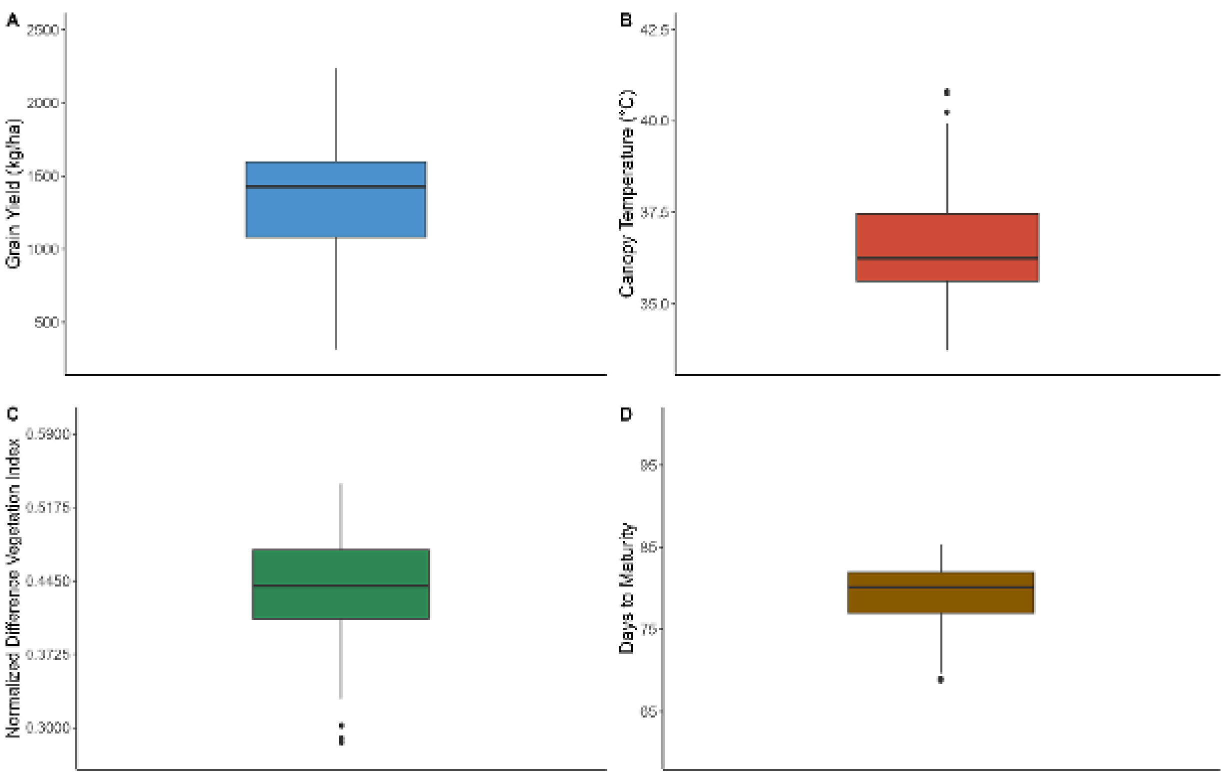

Figure 1. Variation in agronomic traits: (A) grain yield, (B) canopy temperature, (C) normalized difference vegetation index, and (D) days to maturity under dryland conditions.

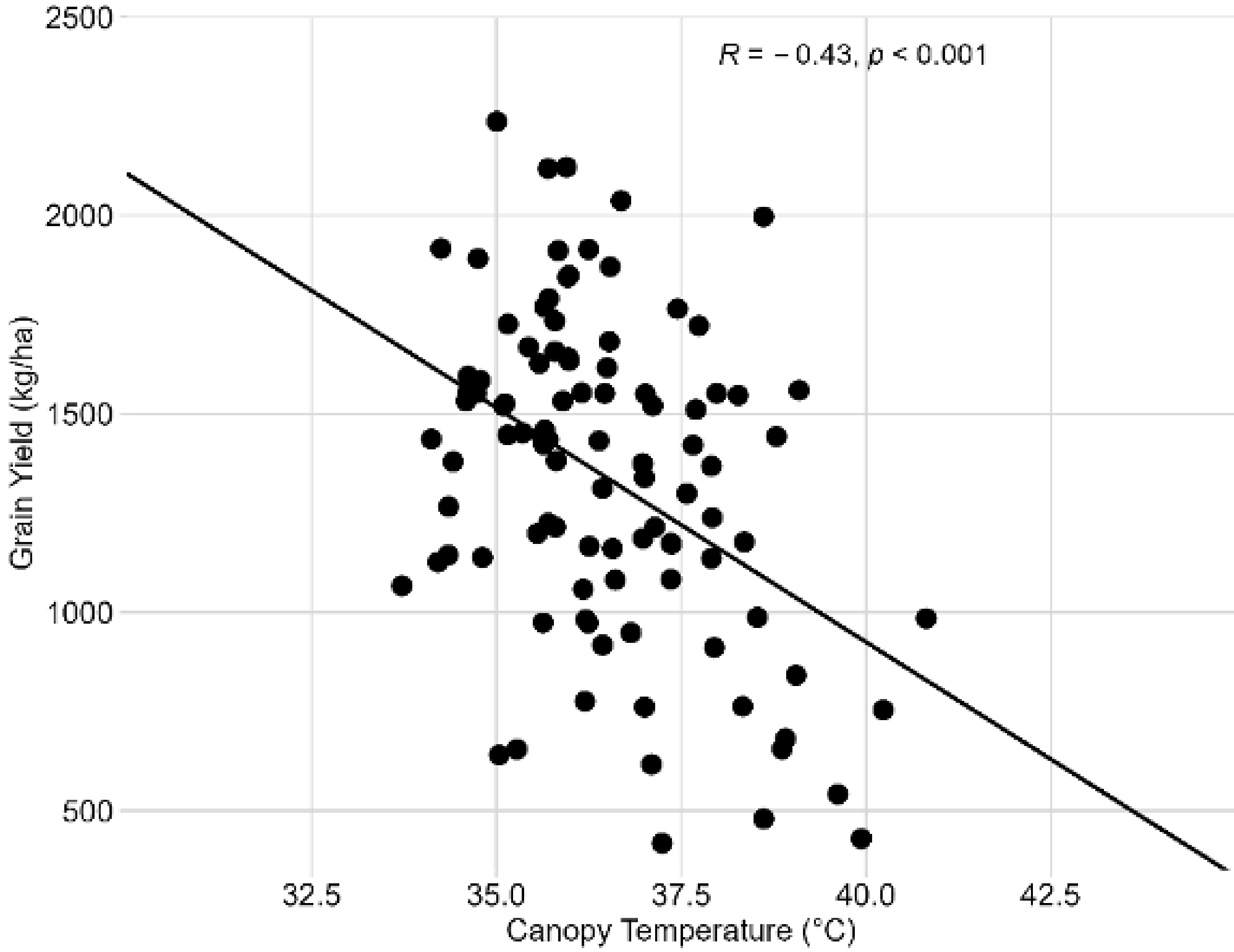

Figure 2. Relationship between canopy temperature and grain yield of field pea accessions evaluated under dryland conditions.

Results

A combined analysis of variance across the two growing seasons revealed significant variation in the performance of field pea accessions among the measured traits (Figure 1). Based on the correlation analysis, all the measured traits showed significant associations with grain yield. However, canopy temperature (CT) showed the strongest correlation (r = -0.43), with a negative association with grain yield (Figure 2). Additionally, PI 193590 showed the highest grain yield (2236.24 kg/ha) and had a relatively cooler canopy temperature (35°C). This information could be used for breeding drought-tolerant field pea.

Research

Using Drone Based Canopy Temperature to Predict Dry Bean Yield

Clement Kwarteng Nyam, Price Akiina, Donna Harris

Introduction

Researchers are increasingly interested in canopy temperature, a trait linked to plant stress. A cooler canopy often signals better water status and higher yield potential, while a hotter canopy suggests stress and reduced productivity. However, collecting these measurements manually is slow and impractical especially when done over a large scale. Dronebased thermal imaging offers a new way to measure canopy temperature quickly, accurately, and across large fields. This study explores whether canopy temperature can reliably predict yield in dry beans, helping breeders identify promising varieties more efficiently.

Methods

In 2025, we carried out a canopy temperature phenotyping study at the Sheridan Research and Extension Center's Adams Ranch field site, evaluating 12 dry bean genotypes. A thermal camera drone was flown approximately every 7 to 10 days from 21 days after planting (DAP) through 80 DAP. Each flight generated high resolution thermal imagery of the entire field. For every plot, the average relative canopy temperature was calculated. These relative canopy temperatures were normalized within each flight day to make them comparable across time. Yield was collected on a plot basis at harvest. Plot yield was then converted to a pound per acre estimate for easier interpretation. Using the temperature dataset and yield values, we evaluated whether canopy temperature could serve as a reliable predictor of yield across the 12 genotypes.

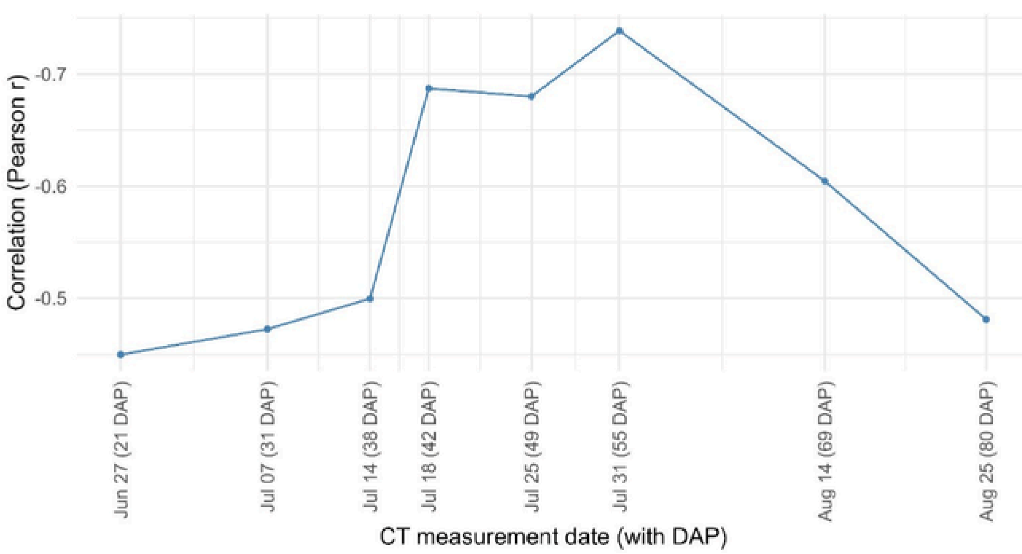

Figure 1. Correlation of yield and canopy temperature (CT) over time. A significant negative correlation was observed for all CT measurements ($p < 0.05$) with the highest at 55 DAP and lowest at 21 DAP.

Results

The analysis revealed a significant negative association between yield and canopy temperature (Figure 1). This suggests that plots with cooler canopies were associated with higher yields. However, plots with warmer canopies were associated with lower yields. Therefore, drone-based canopy temperature data captured real differences in how genotypes responded to field conditions.

1. These results agree with the expected physiological pattern where cooler plants typically maintain better water use and stress regulation, while warmer plants may be experiencing drought or heat stress. Ultimately, this project aims to provide breeders and researchers with a simple, fast tool for screening for better yielding dry bean genotypes.

Using Drone Based Canopy Temperature to Predict Dry Bean Yield

Clement Kwarteng Nyam, Price Akiina, Donna Harris

Introduction

Drought is one of the most damaging environmental stresses affecting global agriculture. In soybeans, a major protein and oil crop in the world, drought leads to lower photosynthesis, oxidative stress, cell-damage, and can cause over 50% yield loss. Soybean varieties differ widely in how they respond to drought because of differences in canopy wilting traits. Some wilt quickly, while others maintain canopy turgidity for longer periods under drought stress. However, the genetic mechanisms underlying these differences are still poorly understood. Understanding these mechanisms is crucial for developing more drought-resilient soybean cultivars, an increasingly important goal with climate uncertainties.

Methods

Data were analyzed from a field-based rain-out shelter experiment conducted at the University of Georgia Iron Horse Plant Sciences Farm near Athens, GA. The objective was to investigate gene expression differences between slow and fast canopy wilting genotypes of soybean. For this, six soybean genotypes were selected, with contrasting drought-response traits (Table 1). Plants were grown under rain-fed (control) and rain-out shelter (drought). At flowering (R3), leaf samples were collected for RNA extraction, library preparation, Illumina sequencing, and differential gene expression analysis. This approach allowed the identification of genes and biological pathways associated with drought tolerance in soybeans.

Results

There were significant differences in gene activity under drought, and gene expression changed dramatically when plants were exposed to drought. Many more genes were significantly up- or down-regulated (adjusted $p \leq 0.05$) in tolerant (slow-wilting) genotypes than in susceptible (fast-wilting) genotypes (Figure 1). Slow-wilting genotypes activated more genes related to vascular development, structural remodeling, and controlled stress responses. However, fast-wilting genotypes activated fewer genes, mostly associated with reactive oxygen species response, emergency stress signaling, and impaired ABA signaling.

What does this mean biologically? This means slow-wilting (tolerant) genotypes showed a proactive response to drought related to structural adjustments such as vascular development and efficient stress-signaling pathways. On the other hand, fast-wilting (susceptible) genotypes showed a more reactive, emergency-driven response related to inefficient signaling, especially in ABA-related pathways and higher oxidative stress. These patterns suggest that drought-tolerant soybeans survive better because they prepare earlier and remodel their tissues adaptively, while susceptible types respond too late and too strongly.

Table 1. Soybean Genotypes used in Athens, GA Field Study

Genotype	Type	Canopy Wilting Trait
PI 603535	Parent	Slow Wilting (Drought Tolerant)
Benning	Parent	Fast Wilting (Drought Susceptible)
G212318	RIL	Slow Wilting
G212322	RIL	Slow Wilting
G212245	RIL	Fast Wilting
G212334	RIL	Fast Wilting

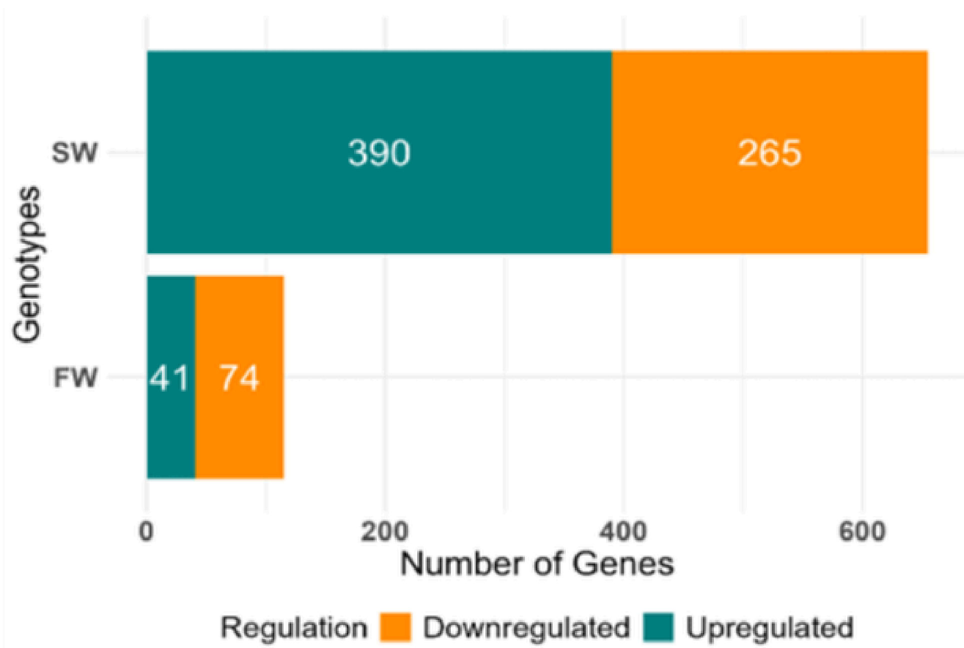

Figure 2. Differentially expressed genes (DEGs) in drought susceptible (FW) and tolerant (SW) genotypes. Significant DEGs were identified using adjusted p <= 0.05 and absolute (Log2FC) >= 2.

Future Work

Building on the analysis, the next steps include expanding the study to controlled-environment experiments to compare drought responses at finer scales, identifying specific candidate genes involved in drought tolerance, validating these genes in greenhouse and field trials, and contributing to the development of marker-assisted selection tools for breeding programs. This research will help accelerate the development of more resilient soybean cultivars, benefiting producers facing increasing drought pressure.

Research

SNP DISCOVERY AND QTL MAPPING IN POPPING BEAN

Price P. A. Akiina, Ilyas Ahmad, Donna K. Harris

Introduction

Popping beans (Phaseolus vulgaris L.) are a class of common bean native to the highlands of South America and belong to the Andean gene pool. When heated, the beans expand while creating a "pop" sound similar to popcorn (Zimmerer, 1986). The toasted, soft-texture beans have the potential of being a healthy snack. Identifying the genetic control of the popping trait is valuable in developing cultivars adapted to dry bean regions in the United States. The objective of this study was to identify and characterize quantitative trait loci (QTLs) associated with the popping trait in a bi-parental population.

Materials and Methods

PI 316019 (popping bean) was crossed with W6 33807 (black bean) and advanced via single seed descent (SSD) to the F4 generation in a greenhouse during the winter months (October 2023 to May 2024) with no supplemental light. The average temperature was 25±2 °C with humidity between 60 - 70%. After harvest, three sets of ten seeds were toasted with sand in a cast iron skillet for 90 s. An infrared thermometer was used to measure the sand's temperature before popping and it ranged from 213 °C to 286 °C. Genotyping by sequencing (GBS) was used to sequence DNA extracted from leaf tissue of 142 F4 lines to obtain single nucleotide polymorphic (SNP) molecular markers. Tassel version 5 was used for SNP calling, and linkage map construction was performed with Joinmap version 4.1. QTL analysis was performed using composite interval mapping and trait-marker associations were identified in WIN QTL-cartographer.

Table 1. QTL effects detected for popping ability in an F4 population of a cross between PI 316019 (popping bean) and W6 33807 (black bean).

Chr.	Marker	Pos.	LOD Score	Additive	Dominance	R2	TR2	S	QTL Name
2	112	91.3	3.87	-1.67	0	10.71	28.52	2.6	Pop-02-a
2	123	99.1	5.16	-1.63	0	13.89	31.71	2.5	Pop-02-b
3	118	77	4.6	-1.43	0	12.36	32.1	2.45	Pop-03-a
11	24	107.7	3.23	1.46	0	8.95	32.88	2.63	Pop-11-a

Results and Discussion

A total of 1286 markers were mapped onto the 11 linkage groups of dry bean spanning 2247.1 cM. The average distance between markers was 0.59 cM/locus. Four QTL detected by composite interval mapping explained 8.95-13.89% of the phenotypic variation individually and combined explained 32.88%. A positive additive effect on chromosome 11 showed favorable allele contribution from PI 316019 for popping performance. A negative additive effect was found on chromosomes 2 and 3 indicating loci where the favorable allele was contributed by W6 33807. A similar pattern has been reported by Yuste-Lisbona et al. (2012) where the non-popping parent contributed favorable alleles at specific loci and through epistatic interactions. Yuste-Lisbona et al. (2012) also found QTLs for popping dimension index and expansion coefficient on chromosome 3.

Figure 1. Popped beans in sand

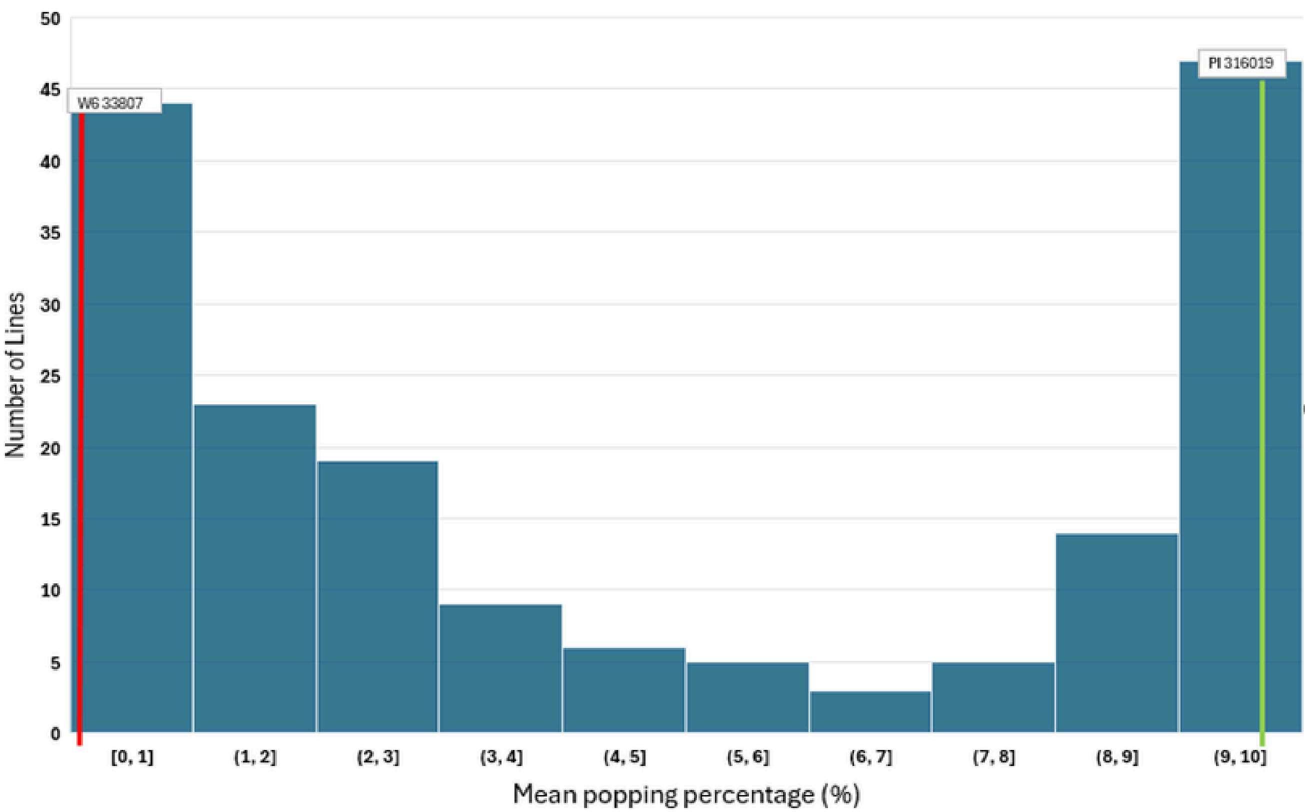

Figure 2. Distribution of mean popping percentage across parents and F_4 population

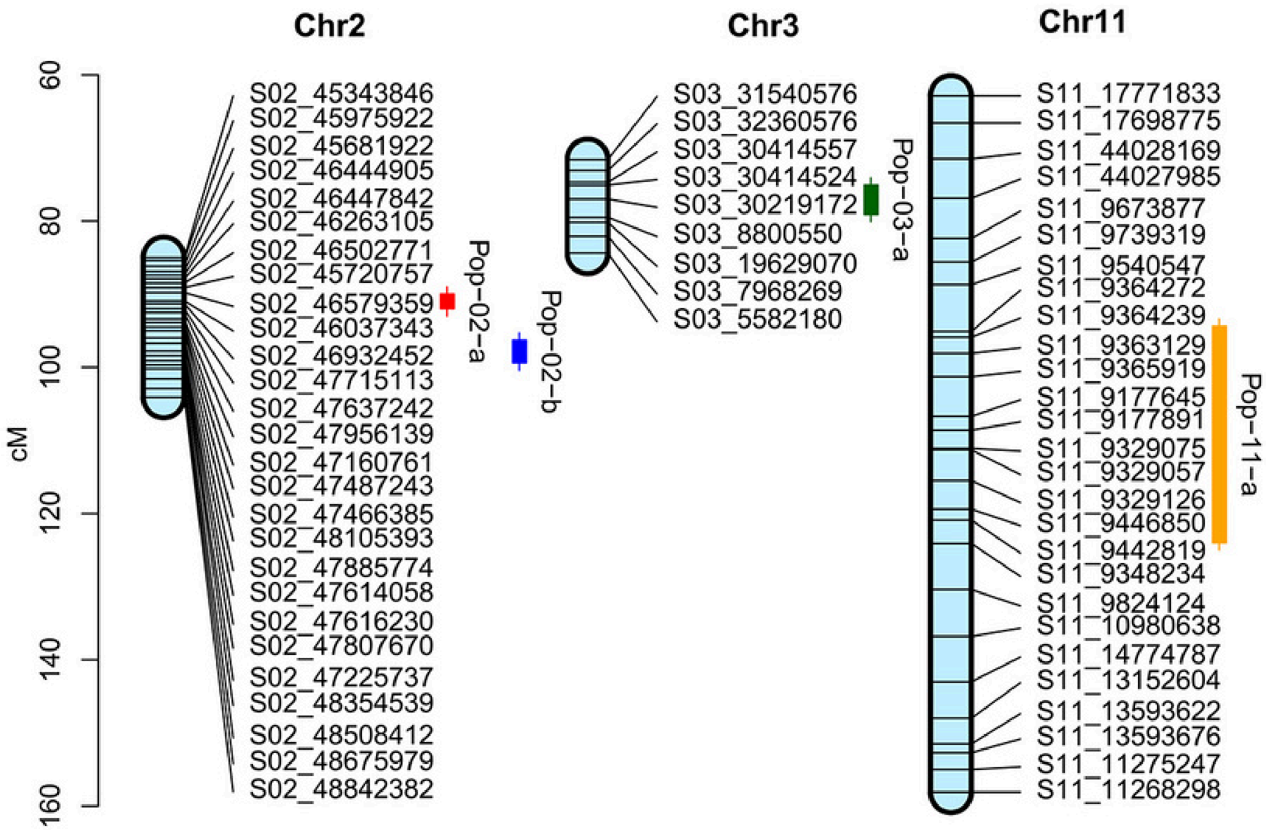

Figure 3. Linkage groups with identified QTL positions

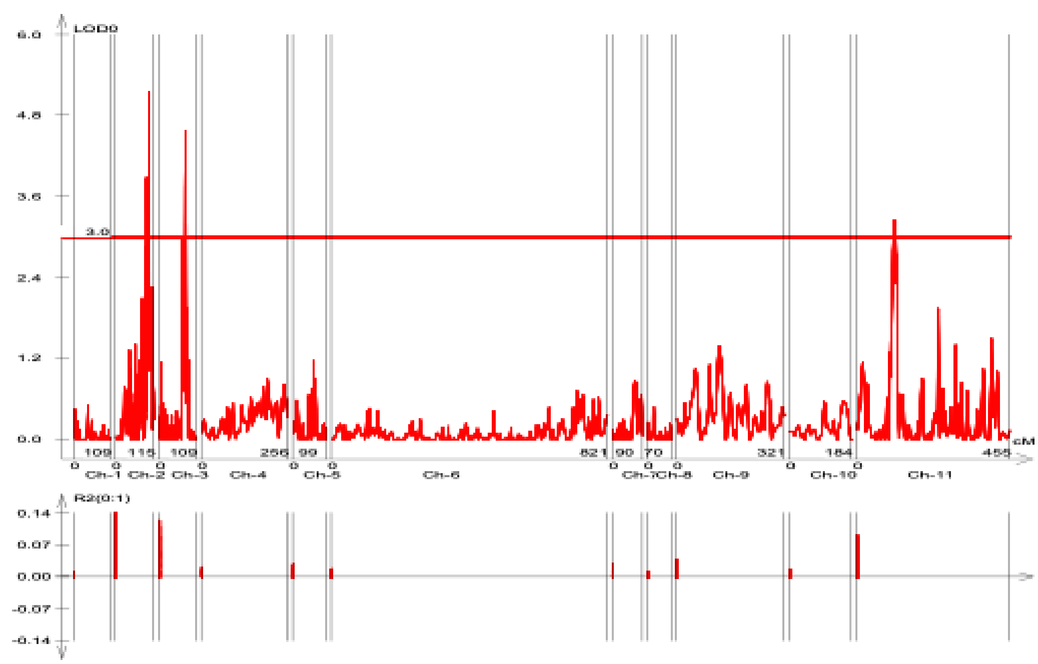

Figure 4. QTLs across all linkage groups

Research

Breeding for Alfalfa Weevil Resistance

Heidi Schueler, Donna Harris

Introduction

Alfalfa (Medicago sativa L.) is an economically important crop in the Western United States; however, in recent years, insecticide resistance has become a major threat to the production of alfalfa. ShREC is exploring the development of new tactics, such as breeding alfalfa for resistance to alfalfa weevil.

Methods

In 2023, a diverse set of 368 genotypes from the USDA germplasm was selected based on USDA comments regarding insect resistance; susceptible genotypes were also included within the germplasm. In 2024, these genotypes were screened using a no-choice detached leaf-feeding bioassay to measure trifoliate consumption by alfalfa weevil. A threshold of 25% or less consumption was used for several screening tests throughout the 2024 field season. Testing concluded with five genotypes of interest consistently rated at or below 25% consumption. During the 2025 field season, alfalfa weevil damage was observed in the hill plots, preventing replication of the 2024 no-choice bioassay. An in-field choice rating was performed to estimate damage on alfalfa hill plots. The field screening was conducted by the same three people, who rated individual replications. Data were collected on a rating scale from 0 to 10, where 0 = no weevil damage and 10 = complete skeletonization of the plot. Each field rating would begin with all individuals participating in a group calibration, during which ratings were collected to estimate scores ranging from 0 to 10. This was performed to ensure that all individuals' ratings were rated similarly across replications. Field ratings were taken twice throughout the summer.

Results

After conducting the field screening, nine genotypes were identified with an average weevil damage rating of 2. This experiment will be repeated in the 2026 growing season.

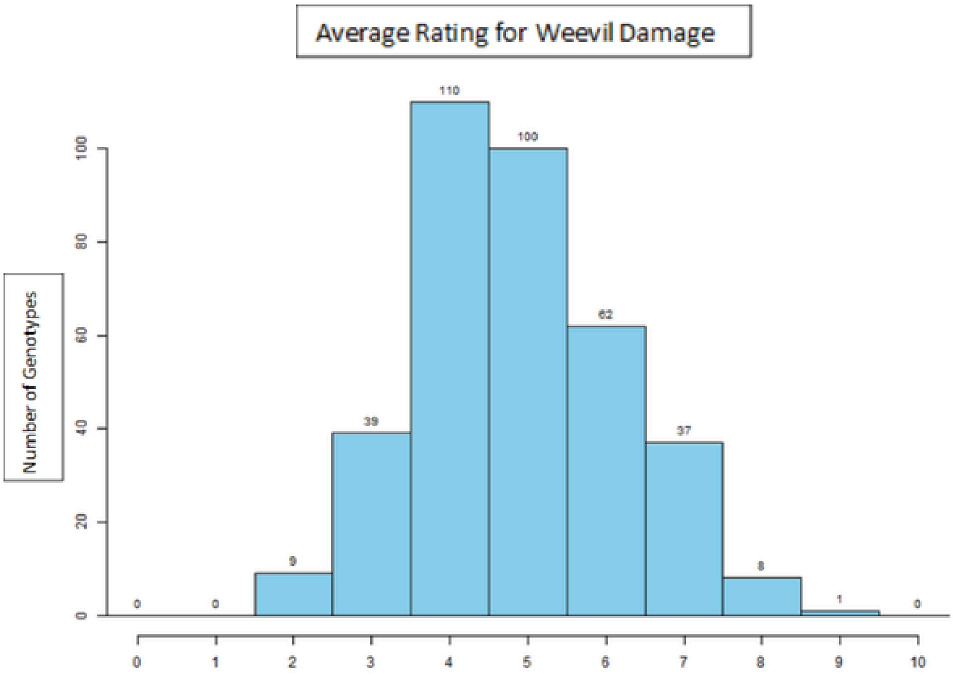

Figure 1. Average weevil damage rating per genotype with 1 = no damage and 10 = complete damage

Research

Screening of Pepper (Capsicum) Germplasm for Cold Tolerance

Ilyas Ahmad, Donna Harris

Introduction

Peppers (Capsicum spp.) are an important vegetable and specialty crop grown worldwide, with five cultivated species showing wide diversity in fruit size, color, flavor, and pungency. Although this genetic diversity is extensive, peppers share one major production challenge: a strong sensitivity to temperatures. Optimal growth occurs between 25–35 °C, and temperatures below 20 °C can slow germination, reduce vigor, and ultimately decrease yield. Wyoming's short growing season, combined with late spring and early fall cold events, makes it difficult to grow peppers successfully. Therefore, this project aims to identify cold -tolerant germplasm from the USDA Capsicum collection to improve pepper production under these conditions.

Figure 1. USDA pepper accessions growing in the greenhouse at the University of Wyoming, Sheridan Research & Extension Center.

Results

We screened 298 pepper accessions representing all five species to evaluate cold tolerance during both germination and early seedling development. Seeds were surface sterilized and germinated on Murashige and Skoog (MS) agar under controlled conditions. At 4 °C, none of the accessions germinated, demonstrating how severe extreme chilling can be. When the temperature increased to 10 °C, 160 accessions produced at least one germinated seed. Among these, 30 accessions reached 100% germination, while others showed partial germination at 80%, 60%, 40%, or 20%. This wide distribution highlights substantial natural variation in cold germination ability.

A repeated screening at 4 °C identified 11 accessions capable of germinating even under this extreme stress and are potential candidates for breeding and genetic programs. Seedling cold tolerance was tested by growing plants to the 2–3 leaf stage and exposing them to 0 °C or 4 °C for four weeks. At 0 °C, most seedlings experienced severe injury, including browning, wilting, or complete mortality. At 4 °C, however, differences among accessions became more distinct: 46 seedlings remained dark green and healthy (Fig 1B), 94 were light green, and others showed varying degrees of yellowing or browning, with six accessions dying completely after 4 weeks of cold stress. These results indicate that while freezing temperatures are highly damaging, many accessions possess moderate tolerance to prolonged chilling.

Promising accessions will be advanced to field trials in 2026 at the Sheridan Research & Extension Center. Early May plantings will help assess real world responses to Wyoming's cold nights and rapid temperature swings. Phenotypic data from these trials will also support genetic analyses, including genome wide association studies (GWAS), to identify genomic regions associated with cold tolerance. Ultimately, this work will help develop pepper varieties specifically adapted to Wyoming's climate, expanding production opportunities for growers across the state.

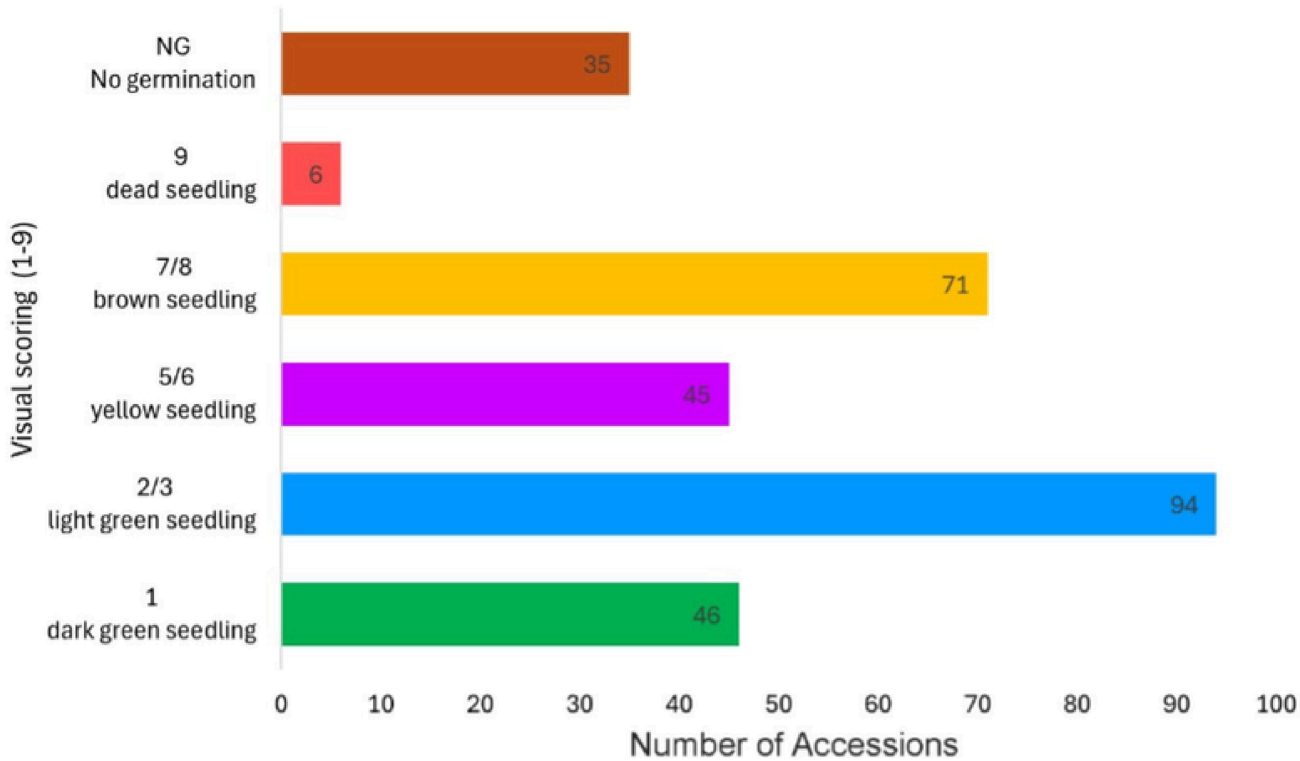

Figure 2. Visual scoring on a 1 – 9 scale (1 = dark green color and 9 = dead) of pepper seedlings (2-3 leaf stage) after 4 weeks at 4 °C (39.2 °F) in growth chamber.

Research

Developing Winter Hardy Field Pea and Chickpea Breeding Programs

Shae M. Milne, Donna K. Harris

Introduction

Grain legumes, such as field pea (Pisum sativum.) and chickpea (Cicer arietinum L.) 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.

Methods

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.

Results

This screening has revealed 31 chickpea and 32 field pea lines with improved or similar in-field survival in USDA cold hardiness zone 4b as compared to commercially grown varieties (**Figure 1**). We plan to use these lines for further testing across multiple locations in Wyoming and at the same time begin to concurrently develop cold hardiness breeding research programs for field pea and chickpea.

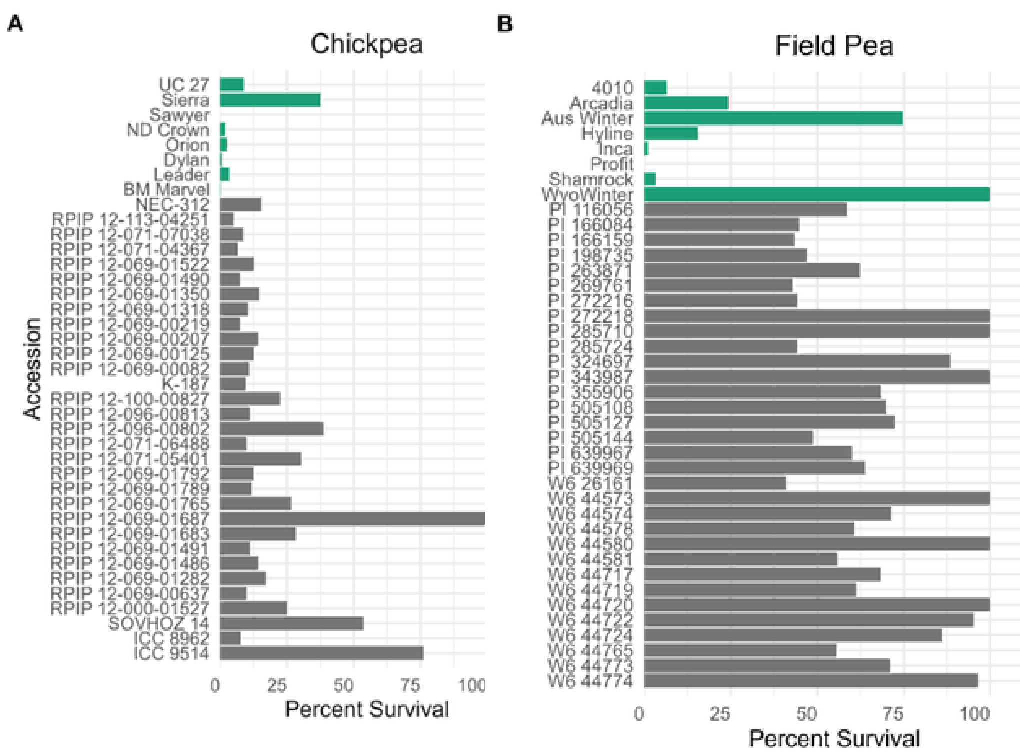

Figure 1. Displays commercially grown varieties (green) and USDA core germplasm accessions showing promising overwinter survival rates (grey) for both chickpea (A) and dry pea (B).

Research

Evaluation of Chickpea (Cicer arietinum) Genotypes for Drought Stability Under Full and Water-Stressed Conditions

Dipanjoli Baral Dola, Jim Heitholt, Donna K. Harris

Introduction

Chickpea production is highly sensitive to water availability, particularly in regions prone to drought stress. Variability in water supply can significantly reduce growth and yield, making it essential to identify genotypes that maintain stable performance under both optimal and water-limited conditions. However, limited information is available on the comparative stability of chickpea varieties across contrasting water regimes. Therefore, this study aims to evaluate the performance and stability of different chickpea genotypes under full irrigation and drought stress conditions to identify drought-resilient varieties suitable for consistent yield production.

Methods

My research aims to evaluate the stability and drought tolerance of chickpea genotypes under contrasting water conditions. A greenhouse study was conducted at ShREC using 15-liter pots to assess the performance of 20 chickpea accessions, including 11 kabuli and 9 desi market classes, under two soil water content levels: full irrigation (70% container capacity) and drought stress (30% container capacity). Pots were weighed and watered three times per week to maintain the designated moisture levels. Data were collected on plant height, biomass, normalized difference vegetation index (NDVI), soil and plant analyzer development (SPAD) readings, relative water content, water saturation deficit, leaf water potential, water use efficiency, stomatal density, maturity, and yield to evaluate the effects of water stress on chickpea growth and stability. The greenhouse environment at ShREC provided a controlled setting to systematically assess chickpea responses to varying water availability, enabling precise data collection and analysis.

Results

Across all accessions, yield was reduced by approximately 32% under drought stress compared to full irrigation. Most measured traits, including plant height, biomass, NDVI, SPAD, and water use efficiency, showed better performance under full irrigation conditions. However, certain genotypes demonstrated greater stability under stress. Orion and PI 451623 exhibited relatively better drought tolerance, maintaining improved performance compared to other accessions under stress conditions.

Differences between market classes were also observed. The desi market class showed higher yield and water use efficiency compared to kabuli under stress conditions. Stomatal density did not differ significantly between water treatments, indicating limited response of this trait to water stress in this study. Relative water content decreased under drought stress, while leaf water potential became more negative, reflecting reduced plant water status under limited water conditions.

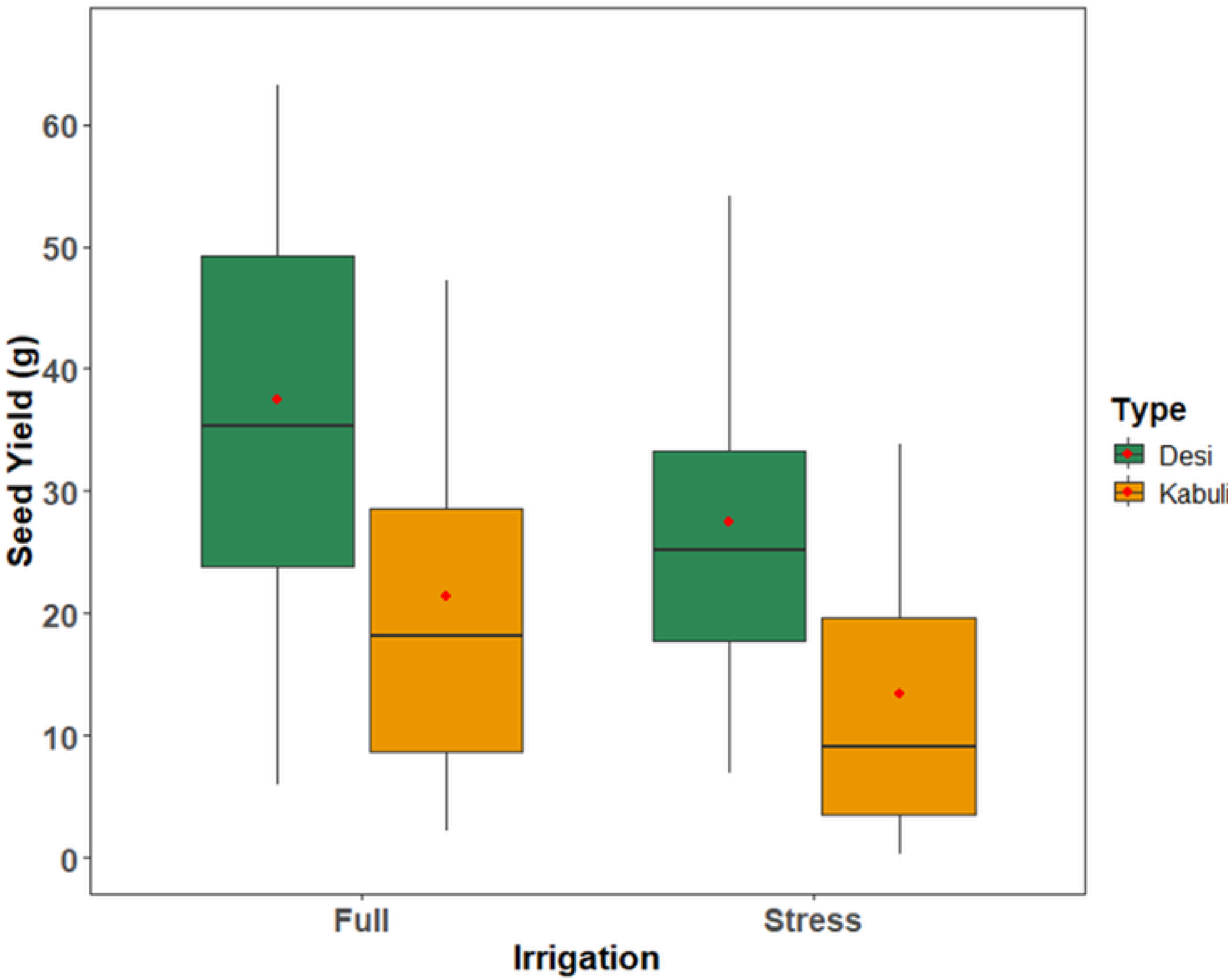

Figure 2. Seed yield among two different market classes (desi and kabuli) of chickpea under full and stressed water conditions. Data averaged across 20 genotypes.

Research

Effect of indoxacarb insecticide application on pest and beneficial insects in alfalfa

Kason Stateler, Kai Forbis, Cassie Roberts, Grace Cann, and Randa Jabbour

Introduction

Alfalfa weevil (Hypera postica) is a problematic insect pest in alfalfa. As part of the Sheridan R & E Center alfalfa weevil IPM program, the insecticide Steward (an indoxacarb) was applied to several fields across the center. Steward is labeled for use against alfalfa weevil in alfalfa and is often discussed as a "softer" chemistry with a mode of action that is less harmful to beneficial insects.

Objective: Determine effects of Steward application on both pest and beneficial insects in alfalfa production fields.

Methods

Steward was applied to 4 fields at Wyarno and 4 fields at Adams locations on June 1, 2025. On June 10, we collected sweep net samples to describe the insects present 9 days post-application and prior to first cutting of the hay. We also collected samples from one untreated field in Wyarno and two untreated fields at Adams for comparison. We collected 20 sweeps at each of three locations in each field. Contents of the samples were frozen until we could sort and identify insects. We counted insects in common alfalfa pest and beneficial insect groupings, as specified in the results. All numbers reported here are per 20 sweeps, averaged across field samples.

Results & Discussion:

As expected, alfalfa weevil larvae were reduced in fields where Steward was applied (132 larvae*) as compared to untreated control fields (1116 larvae*).

Weevil density varied by fields – most treated fields were under 150 weevils*, but one treated field had over 400 weevils*. In addition, fields treated with Steward had 385 aphids*, compared to 28 aphids* in untreated fields. Steward is not effective against aphids. More aphids in the treated fields could reflect a secondary pest outbreak – controlling the weevils freed up alfalfa for the aphids to eat. Lady beetles and minute pirate bugs were more abundant in treated plots, likely in response to the high densities of aphids – their prey food source. Other beneficial insects – wasps and spiders were similar between treated and untreated fields.
*all numbers reported are per 20 sweeps

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