Hyslop Farm Field Day

May 25, 2022

Acknowledgements

Thank you to our 2022 planning committee. Without their hard work, we would not have been able to put on this successful event.

- Navneet Kaur
- Betsy Verhoeven
- Hannah Rivedal
- Seth Dorman
- Josh Price
- Rachel Swindon
- Jolene Bunce
- Tom Chastain

Thank you to Corvallis Feed & Seed for generously sponsoring lunch.

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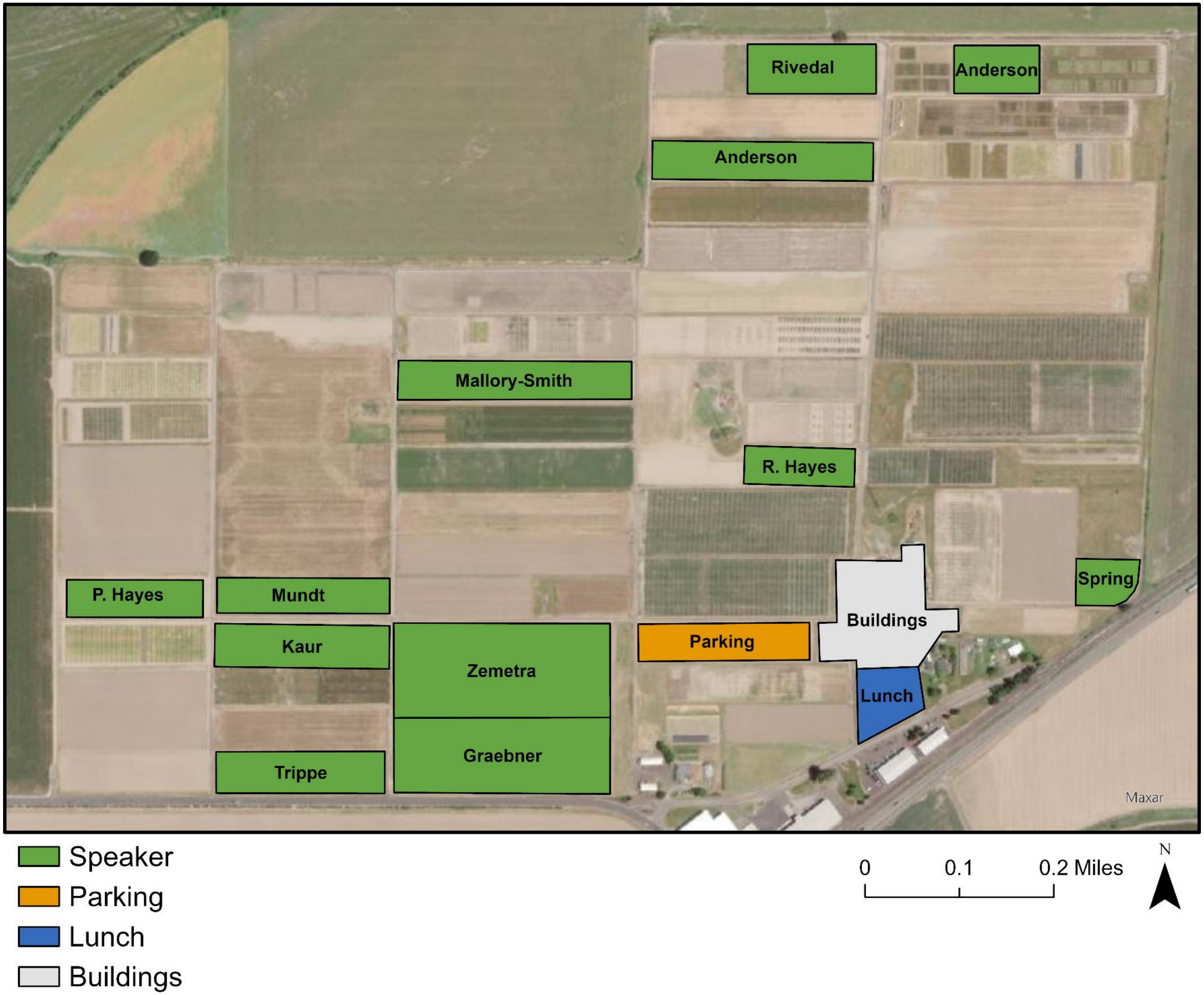
2022
Hyslop Field Day Handout



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Mallory-Smith
R. Hayes
Spring
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P. Hayes
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The Ever-Evolving OSU Wheat Breeding Program

Robert Zemetra[1], Mark Larson, Adam Heesacker, and Nathalia Moretti
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The OSU wheat breeding program has had to grow and change over the past ten years to meet the needs of Oregon wheat producers due to new challenges in weed management, evolving diseases, and increasing climate variability while improving agronomic performance, disease resistance and end-use quality. This has been accomplished by working as a team with Dr. Chris Mundt and Dr. Andrew Ross. The breeding program is now breeding four market classes of wheat to provide Oregon wheat producers a choice when considering what wheat to grow when facing increasing climate variability, weed pressure and disease severity.

Climate Variability: Climate variability, specifically drought, can cause a reduction in both yield and quality of the wheat grown in Oregon. To address this issue the breeding program has worked to produce varieties with drought avoidance and/or drought tolerance. Drought avoidance can be achieved by selecting breeding lines with an earlier flowering time, allowing seed to develop before severe water or heat stress occurs. This can be seen in the recent SWW release Appleby CL+ and the advanced breeding lines OR2190025 CL+ and OR2190027 CL+. Drought tolerance indicates the wheat can produce plump kernels even under stress conditions. Lines such as OR2130755 that maintain a high test weight across multiple sites and years is an example of a wheat with drought tolerance. A third approach is to switch market classes to one that is better suited to drought conditions such as winter club wheat or changing to a hard wheat such as hard red winter or hard white winter wheat since higher percent protein is a benefit not a detriment for end-use quality.

Weed Pressure: Competition from grassy weeds such as cheatgrass and jointed goatgrass reduces the yield in producers' fields and impacts end-use quality. To address this need, the breeding program has developed herbicide resistant wheat with tolerance to either Beyond herbicide (Clearfield) or Aggressor herbicide (CoAxium). Starting with only F_2 populations in 2011, the breeding program now has a complete multi-generation 2-gene Clearfield breeding program and has released two Clearfield lines, OR2X2 CL+ and Appleby CL+, and has two lines, OR2190025 CL+ and OR2190027 CL+, in advanced testing. To address evolving resistance of cheatgrass to Beyond herbicide and address the soil residual issue with Beyond, the breeding program started introgressing resistance to Aggressor into the program's breeding lines in 2018.

Diseases: Pressure from diseases can greatly reduce yield and end-use quality of wheat if unchecked. Control of diseases with fungicides, when possible, can reduce the yield loss but also leads to reduced profitability due to the cost of the fungicides and application costs. The best approach is to use disease resistant varieties. The breeding program has made a concerted effort to have a high level of resistance to stripe rust, a perennial disease problem in both western and eastern Oregon. Other diseases may be more regional such as Septoria leaf blotch and Sharp eyespot that are found in western Oregon or crown and root diseases such as Cephalosporium stripe, Fusarium crown rot and Strawbreaker foot rot that are more prevalent in the drier areas of eastern Oregon. Varieties such as Bobtail, Norwest Tandem, Norwest Duet, Nixon, OR2X2 CL+, Appleby CL+ and the new release OR2130755 have maintained their level of resistance to stripe rust while other varieties such as Rosalyn have experienced a reduction of resistance with the evolution of new races of stripe rust, especially in western Oregon. Rosalyn, Bobtail, OR2X2 CL+, OR2130755 and the advanced Clearfield lines OR2190025 CL+ and OR2190027 CL+ all carry one to two genes for Strawbreaker foot rot resistance.

Summary: Through the efforts of the faculty and staff associated with the wheat breeding program, the breeding program is in position to meet the needs of the Oregon wheat producers now and into the future, regardless of climate changes and the evolution of diseases and weeds to overcome current control methods.

Acknowledgements: The OSU breeding program would not be able to function without the financial support of the Oregon Wheat Commission, the Warren E. Kronstad Wheat Research Endowment, and the OSU College of Agricultural Sciences – OSU Agricultural Experiment Station.

Wheat Variety Testing in the Willamette Valley

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Research Summary

The OSU Cereal Variety Trials provide growers with performance information on commonly grown and newly released wheat and barley varieties from the public and private breeding programs. These varieties are grown in seventeen winter wheat testing locations and eight spring cereal testing locations, spanning the major growing regions in Oregon.

In the Willamette Valley, we test soft white winter wheat varieties in two trials: one at the Hyslop Field Lab and one at an on-farm site near Forest Grove. Hard and soft spring wheat varieties are tested at an additional on-farm site near Forest Grove. We work to ensure that each of these locations reflect local growing conditions, and apply fungicides as needed to control stripe rust and Septoria tritici blotch infection in the plots. This work is complimented by disease evaluations from Dr. Chris Mundt, which rate each variety for stripe rust, Septoria tritici blotch, and a range of other pathogens.

After harvest, samples from our trials are sent to the OSU Cereal Quality Laboratory in Corvallis and the Western Wheat Quality Laboratory in Pullman for a comprehensive evaluation of end-use quality. These evaluations help to ensure that the Pacific Northwest maintains its reputation for high-quality wheat on the global market.

Technical reports for these trials can be found on our website (https://cropandsoil.oregonstate.edu/wheat/osu-wheat-variety-trials). Alternatively, I am always happy to talk about wheat variety performance in different growing conditions, and can be reached on the phone, by e-mail, or by text.

Acknowledgements

We would like to thank Dr. Bob Zemetra and Dr. Nicole Anderson for the tremendous logistical support they provide for our trials in the Willamette Valley, and the wheat growers who have hosted on-farm trials. We would also like to thank the Oregon Wheat Commission, which provides funding for these trials.

Screening for Resistance to Major Wheat Diseases in Oregon

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Research Summary

A combination of locations, production practices, and inoculation techniques are being used to provide high levels of disease pressure in trials of stripe rust, Cephalosporium stripe, Fusarium crown rot, strawbreaker foot rot, and Septoria tritici blotch. Inoculated trials for sharp eyespot are underway for a subset of nurseries, and barley yellow dwarf data will be taken in any nurseries where it occurs naturally. Resistance levels of entries in statewide yield trials will be determined to evaluate potential new varietal releases for levels of disease resistance and to allow growers to make the best varietal decisions when new varieties are first available to them. Resistance levels of entries in elite and advanced yield trials from the OSU Wheat Breeding Program will be used to determine which lines to advance in the program towards potential release. We will continue evaluating data from mapping populations to evaluate the genetics of inheritance and identify genetic markers that can be used to screen for resistance to disease more efficiently in a breeding program. The studies described above are crucial to continued progress in the OSU Wheat Breeding Program, increased profitability for Oregon wheat growers, and ability to adopt conservation tillage practices.

At the Hyslop Farm, we will observe plots designed to evaluate resistance to Septoria tritici blotch. In addition to the standard extension and breeding nurseries, we are also evaluating 78 F_5 lines from crosses designed to combine Septoria resistance from multiple sources while maintaining stripe rust resistance and agronomic performance. Another set of studies is evaluating the potential for control of stripe rust by eliminating genes for stripe rust susceptibility and the impact that this approach may have on Septoria disease. Finally, a naturally occurring barley yellow dwarf virus epidemic will allow us to evaluate wheat lines for resistance to that disease.

Acknowledgements

This work is made possible by contributions from the Oregon Wheat Commission, the Oregon Agricultural Experiment, Oregon Wheat Variety Royalty Funds, and the National Science Foundation.

Covered and Naked Barley Updates

Patrick Hayes[1], *Brigid Meints*
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Research Summary

Barley research at OSU is a multi-faceted activity. In this presentation we will briefly outline the goals, and recent milestones in the covered malting barley program and the naked multi-use barley for organic systems projects.

Our winter and facultative doubled haploid 2-row covered malting barley varieties will provide an abundant supply of high-quality malting barley meeting the quality specifications of growers, maltsters, and brewers.

The multi-use naked barley program focuses on selecting lines with excellent threshability, resistance to diseases (including loose and covered smut), quality suitable for food, feed, and malt end-uses, yield, and weed competitive ability.

Our work is conducted within a larger framework of helping to address the challenges of climate change. During the presentation we will take a trip through increase blocks of current and potential varieties.

Covered malting varieties and selections

Selection/Variety	Pedigree	Insights
DH142010	04-028-36/Maris Otter	Oregon Otter?
DH150115	04-028-36/Maris Otter	Maris Beaver?
DH141222	10.1044/Violetta	AMBA Year 2
DH141225	10.1044/04-028-36	AMBA Year 1
DH141917	04-028-36/Thunder	AMBA Year 1
DH150683	04-028-36/DH131772	AMBA Year 2
DH162310	DH130939/Calypso	AMBA Year/GN 0
DH170472	DH130939/Calypso	AMBA Year/GN 0
Lightning	TC6W265)/HERZ 29494/2991	Released; AMBA -
Thunder	Wintmalt/Charles	Released; AMBA +

Naked varieties and selections

Name	Pedigree	Notes
Buck	Strider/Doyce	Released variety
DH180670	DH120304/1-4	New and interesting
DH180677	DH120304/DH140322	New and interesting
MTV-color-98	1-6/PI 151807	Black seedcoat
10.1151	Fridericus x Maja/Legacy//Maja/3/Doyce	Excellent yields
DH140494	2Ab09-X05W048-378HL/DZ100289	Good lodging tolerance
DZ100325	-	Good winter survival
Purple Prince	Tibet violet 1/3/Luca/Merlin//Luca	Purple seedcoat
DH140284	SH98076/10.1151	Potential smut tolerance
White Queen	Tibet violet 1/3/Luca/Merlin//Luca	Good threshability

Acknowledgments

American Malting Barley Association, Great Western Malting, Oregon Agricultural Experiment Station, Oregon Wheat Commission, USDA-ARS, USDA-NIFA-OREI

Interactive Exhibits

11:15-Noon

Please wander, chat, and learn at your leisure and interest.

Slugs!
Dr. Rory Mc Donnell's lab will have pest slug specimens, novel attractants, and slug-killing nematodes on display.

Using Drone Aerial Imagery to Track Vole Damage
Extension Agronomist, Dr. Christy Tanner will have her drone on hand to show and talk through the process of collecting and analyzing images.

Cereal Quality Demonstrations
Dr. Andrew Ross, cereal quality specialist, will demonstrate aspects of flour and starch quality analysis.

Examine Deep Soil Cores
The USDA-ARS soils team will have a couple of meter deep soils cores on display to demonstrate how soil changes throughout the profile.

Agronomic Soil Testing in Oregon
The Moore Soil Fertility Lab will provide information on the upcoming "Agronomic Soil Testing in Oregon" course, which is a 6-week online self-paced course for crop advisors and agronomists serving Oregon

Entomology Table
Dr. Navneet Kaur's extension entomology group will have insect display boxes with many locally collected pest specimens and examples of insect pathogenic nematode cultures.

Developing Climate Data Tools to Help Willamette Valley Farmers
Dr. Kelsey Emard is leading a project to help develop better climate data tools for local farmers and they are looking for input and participants to help guide the development process.

Developments at OSU Seed Certification Laboratory
Dr. Sabry Elias will present information on new seed testing services and policies at OSU's Seed Certification Laboratory.

Essential Oils for Potato Sprout Control
Jena Thoma, graduate student in Dr. Valtcho Jeliazkov's group will be presenting information on the Graduate Certificate in Organic Ag and on her research using essential oils as sprout control agents in potato during storage.

Efficacy of Common Non-Crop Herbicides for Wild Carrot Control

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Research Summary

Wild carrot is a common and often difficult to control weed in non-crop areas. Existing OSU control recommendations are based on research that was conducted ten-plus years ago, and did not include several widely used herbicides that have been introduced since that time. The objective of this study is to provide weed managers with a side-by-side comparison of the efficacy of a suite of currently available non-cropland herbicides for control of wild carrot in pasture, rangeland, grass right-of-way, forestry, and other wildland settings in Oregon.

Field trials comparing a number of herbicide active ingredients (Table 1) were established at two sites in western Oregon in late March 2022, when wild carrot was actively growing but still in the rosette stage. One site is located at the Hyslop Crop Science Field Research Laboratory, and a second with a cooperator near Marion, OR. Evaluation of these trials will continue through quantification of viable seed production by treated plants in the fall of 2022. A second set of trials evaluating the influence of application timing (i.e., applications made to rosettes, bolted, or flowering wild carrot plants) for several herbicides commonly used for noxious weed control (aminopyralid (Milestone), 2,4-D, and metsulfuron (Escort), plus hand-hoeing/pulling) are included at each site, but are not detailed here.

Table 1. Experimental herbicide treatments and preliminary ratings of wild carrot control at 4 weeks after application. Applications made post-emergence and evaluate only post-emerge activity. Control on a percent scale from no control at 0 to complete plant death at 100.

Trt.	Active Ingredient	Example Product	Product Rate (oz /ac)	% Wild Carrot Control, Hyslop	% Wild Carrot Control, Site 2
1	*nontreated control*	*na*	*na*	0	0
2	metsulfuron	Escort XP	1	**87**	**90**
3	chlorsulfuron	Telar XP	0.5	*74*	*75*
4	sulfometuron	Oust XP	4	**89**	**92**
5	imazapic	Plateau, Panoramic	6	54	46
6	imazapyr	Habitat, others	48	*73*	*78*
7	penoxsulam	Sapphire	16	61	23
8	aminopyralid	Milestone, Whetstone	7	**84**	50
9	clopyralid	Transline, many others	21	**80**	39
10	triclopyr	Garlon, many others	64	30	30
11	fluroxypyr	Vista, many others	21	34	55
12	aminocyclopyrachlor	Method	7.5	**91**	**87**
13	2,4-D	many	1.0 lb ae	31	*71*
14	florpyrauxifen	SiteVue [+Milestone=Duracor]	21	**80**	**95**
15	glyphosate	Rodeo, many others	1.0 lb ae	**95**	**93**
16	flumioxazin	Sureguard SC, others	12	33	64

Acknowledgements

This work is funded by the ODA Oregon Specialty Crop Block Grant Program. Thanks to Tom Miller (Pratum Co-op), Nicole Anderson and Betsy Verhoeven (OSU) for assistance in locating trial sites, and Perry Grinz for hosting a field trial site.

Does Tile Drainage Improve Soil Carbon?

Kristin Trippe[1], Soil Microbiologist, Jennifer Moore[1], Soil Scientist, Lauren Breza[1], Soil Ecologist (Post Doctoral)
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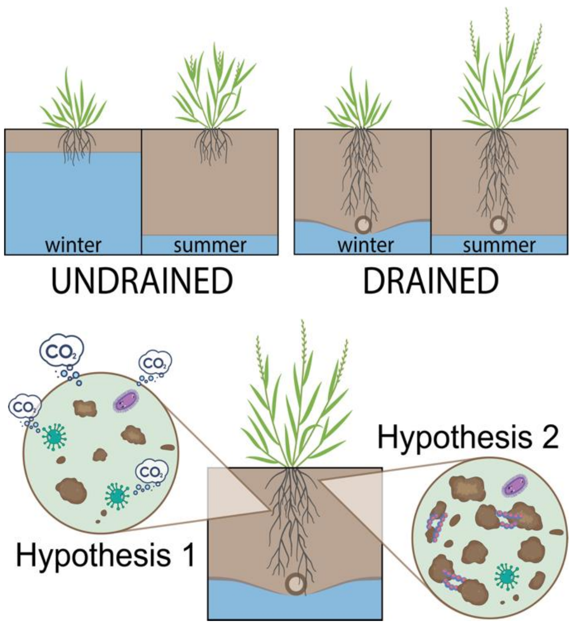
Kristin.Trippe@usda.gov | Jennifer.Moore2@usda.gov | Lauren.Breza@usda.gov

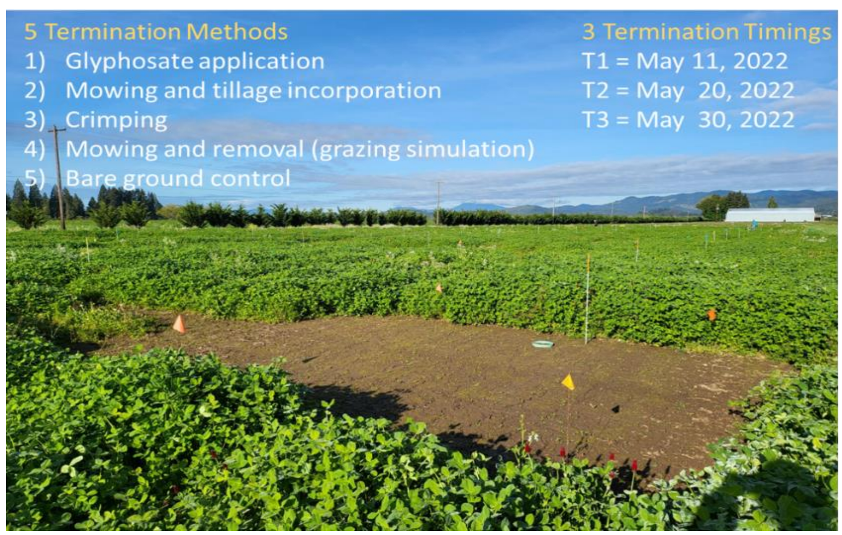


The Willamette Valley in Oregon, known for grass seed production, has poorly drained soils. To cope with this issue, farmers in the region rely on tile drainage systems to lower the water table and increase crop rooting zone depth. During the rainy season soils become waterlogged, creating nearly impossible farming conditions. Subsurface drainage allows farmers to expand crop choices, have timely access to fields, extend the growing season, and maximize yields. However, little is known about the consequences of drainage on carbon (C) storage in agricultural soils. Our objective is to assess the fate of soil C in response to tile drainage.

Hypothesis 1: Drainage decreases soil C by creating aerobic conditions and increasing microbial mineralization of existing soil carbon.

Hypothesis 2: Drained fields will support increased crop root growth and stabilization of microbial byproducts, resulting in a net increase of soil C.

Cover Crop Termination Trial (in collaboration with Shannon Cappellazzi, GoSeed)



Farmers need guidance to know how specific cover crops influence nitrogen (N) dynamics and C sequestration. The answer varies depending on termination method and timing, plant biomass, the plant C:N ratio, soil type, climate, and vigor of the existing biological system. This complexity decreases a farmer's ability to confidently reduce N fertilizer use.

Using FIXatioN balansa clover, we are evaluating how five termination methods and three termination times (see photo right) affect N mineralization and fluxes of carbon dioxide and nitrous oxide, two important greenhouse gases. Following termination, sweet corn will be drilled into the unfertilized plots. Measurements include total aboveground clover biomass, clover C and N, N mineralization potential, soil C and N, soil pH, and corn yield and nutrient content.

The primary deliverable will be supplementary guidance for N fertilizer reduction potential and timing when using balansa clover under various management conditions. Additionally, we will provide a GHG accounting for growth and termination conditions for balansa clover.

Symphylan Control in Seed Crops

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Research Summary

The garden symphylan, *Scutigerella immaculata* Newport, is a serious soil insect pest whose root-feeding affects yield potential and survival of several high-value crops in Western Oregon during crop establishment. The broad host range includes grass grown for seed, vegetable seed crops, and other specialty crops such as peppermint and strawberries. Previously, symphylans have primarily been managed using Lorsban (chlorpyrifos) as pre-plant incorporation (PPI). Now that chlorpyrifos is being phased out, growers will have limited chemical control options (pyrethroids only) as no clear path for registration exists for alternate chemistries (e.g., Mocap and Ethoprop). In this study, we aimed to evaluate the efficacy of new and existing insecticides and to identify potential options to support the product registration process. One pre-existing symphylan infested area was identified at OSU's Hyslop Research Farm to conduct an efficacy trial in tall fescue grown for seed. A replicated field trial (plot size - 30 feet long x 12 feet wide) experiment in a randomized complete block design was set up with four replications. Plots were treated using a CO_2 pressurized backpack sprayer at a spray volume of 20 gal/acre at 22 psi through AM11002 nozzles using treatments listed in Table 1 on April 8, 2022. Upon soil application, treatments were incorporated with tillage into the top 2 inches of soil using a tractor-mounted rototiller. Tall fescue (var. 'Titanium G-LS') was planted at a 9 lb/acre seeding rate with a 13-inch row spacing. Seeding depth was approximately 0.5 inches. Data was recorded on symphylan abundance using the potato bait method by deploying two bait stations per plot at 10, 14, and 25 days after treatment (DAT). Data were analyzed using ANOVA, and means were separated using Fisher's protected LSD ($P \leq 0.05$).

At 10 DAT, both Torac and Capture LFR had no detection of symphylans, indicating a significant suppression compared to control plots (an average of 9.25 symphylans) and Vantacor treated plots (an average of 4.25 symphylans), followed by BAS4007I and A21377X having an average of 0.75 and 2.5 symphylans, respectively. At 14 DAT, a similar trend existed for Capture LFR and A21377X with no symphylans present and had significant suppression compared to Vantacor (an average of 3 symphylans). At 25 DAT, none of the insecticide treatments were significantly different than the untreated control. Data collection is still in progress, and results on stand count and plant vigor will be available at future OSU extension meetings.

Table 1. Treatments used for pre-plant incorporation trial and mean number of symphylans per plot per sampling date.

Trade Name (Active Ingredient)	Rate (fl oz/acre)	IRAC Classification	10 DAT	14DAT	25 DAT
Torac (Tolfenpyrad)	21	Group 21	0b	0.25ab	3a
Vantacor (Chlorantraniliprole)	2.5	Group 28	4.25ab	3a	5.5a
Capture LFR (Bifenthrin)	6.5	Group 3A	0b	0b	0.5a
BAS4007I (Broflanilide)	2.4	Group 30	0.75b	0.7ab	5.75a
A21377X (Isocycloseram)	10.27	Group 30	2.5ab	0b	2.25a
Untreated Control	_	_	9.25a	0.25ab	4.25a
P-value			0.0058	0.0314	0.5448

Acknowledgments

We thank OSU Agricultural Research Foundation, Specialty Seed Growers Association of Western Oregon, Oregon Seed Council, and Oregon Department of Agriculture Specialty Crop Block Grant Program for funding. We are thankful to Josh Price, Farm Manager at Hyslop Research Farm, for his help with trial preparation and equipment use. The technical assistance from Dave Maliszewski and Brian Donovan is also highly appreciated.

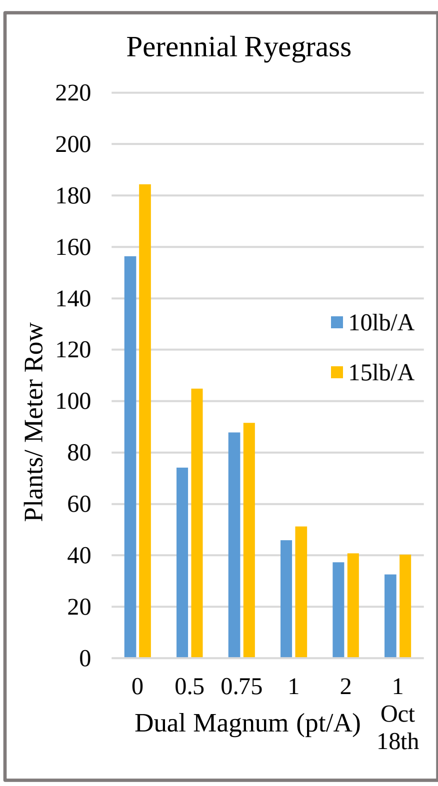
Herbicide Safener Plus Dual Magnum For Grass Seed Establishment

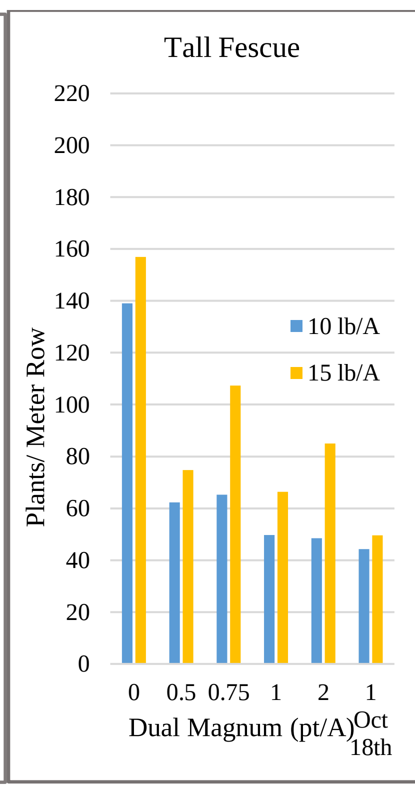
Carol Mallory-Smith[1], *Stephen Erickson, Caio Brunharo*
[1]Department of Crop and Soil Science, Oregon State University

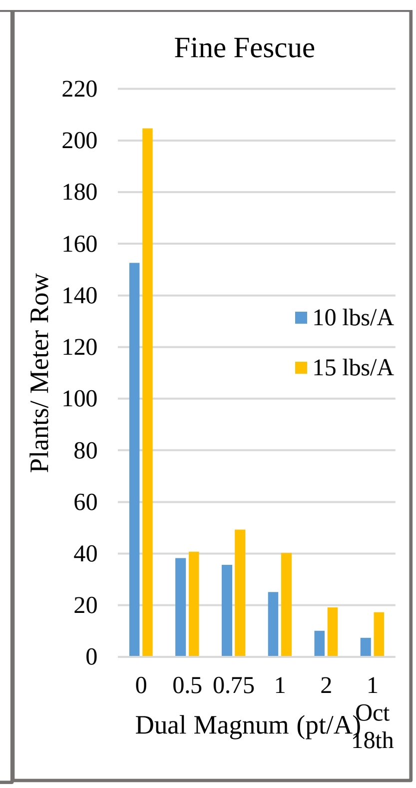
The objective of this trial was to determine if treating grass seed with a herbicide safener could provide an opportunity to replace carbon seeding. Herbicide safeners are chemical compounds that increase the tolerance of crops to the herbicide. There are many advantages to herbicide safeners which include: (1) increasing herbicide selectivity with non-selective herbicides; (2) reducing pre-plant intervals for soil-applied herbicides; (3) controlling weeds that are biologically similar to the crop; or (4) increasing the number of herbicide options. Herbicide safeners may be included in herbicide formulations. For example, Dual II Magnum contains a safener in its formulation, while Dual Magnum does not. Safeners also can be applied as a seed treatment.

Three grasses species were used in the study: 'Dynamite LS' tall fescue; 'Rushmore' fine fescue; 'Crave' perennial ryegrass. Seeds of each species were treated with the safener, Concep III, plus a polymer, and enough water to coat the seeds. The trial was planted October 8, 2021. Two seeding rates, 10 and 15 lbs/A, were used. Four rates of Dual Magnum were included 0.5, 0.75, 1, and 2 pts/A. The first applications were made on October 9. One treatment at 1 pt/A was applied on October 18. Broadleaf weeds were controlled with Huskie, Aim, and MCPA.

Evaluations included visual injury ratings, plant height, and plants per meter of row. Plant count data taken on January 27, 2022, 100 days after treatment, are presented below. The safener did not provide adequate protection from Dual Magnum injury. The higher seeding rate did not compensate for the stand reduction.







Seed Yield of Advanced Breeding Lines of Hairy Vetch and Crimson Clover

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Project Description

Hairy vetch and crimson clover are important species for use in cover cropping across the U.S. Breeding regionally adapted cultivars of these species is ongoing and aims to advance the adoption of cover cropping. New cultivars with high seed yield are important for production of sufficient seed to meet market demands and for the eventual industry adoption of new cultivars. We are evaluating advanced breeding lines of hairy vetch and crimson clover developed in five states for seed yield at the Hyslop Field Lab.

What We've Done

Seed yield experiments were conducted in 2019, 2020, and 2021. Thirty-seven hairy vetch entries have been evaluated. Hairy Vetch check cultivars tested in different years include 'Purple Bounty', 'AU Merit', 'AU Early Cover', and 'Hungvillosa'. Seventeen crimson clover populations have been evaluated; check cultivars were 'Dixie' and 'Linkarus'. Fields were treated pre-plant with pre-emergent herbicide (Eptam 7E @ 4.5 pts/acre + T-PA-Maxx) and fertilizer (Borosol 10 @ 2 lbs B/acre and Potassium thiosulfate @ 20 lb S/acre). Seeds were sown ¾ inch deep with a cone seeder into plots that are 20 feet long x 30 inches wide at rates of ~20 lbs/acre for hairy vetch and ~10 lbs/acre for crimson clover. Mustang Max was applied during hairy vetch pod fill (0.02 lbs a.i./acre) to control Bruchid beetle. Honeybee hives were placed near the plots in the spring for pollination.

What We've Learned

<u>Hairy Vetch</u>

Seed yields vary considerably from year to year. The mean yield of checks cultivars have ranged from 4 lbs/plot (2021) to 18 lbs/plot (2019). The ranking of cultivars by yield is generally consistent over years. Advanced breeding lines have generally had competitive yields, ranging from 80% to 150% of 'Purple Bounty'.

<u>Crimson Clover</u>

Average yields in 2019 and 2020 ranged from 174 to 822 grams per plot. Yields in 2022 were lower, with yields ranging from 72 to 260 grams. The advanced breeding lines yielded less seed than 'Dixie' and 'Linkarus'. For example, in 2019 advanced breeding lines yielded 30-56% less than Dixie, in 2020 breeding lines yielded 27-56% less than Dixie, and in 2021 breeding lines yielded 15-64% less than Dixie except for two lines which yielded about the same. High yield in Dixie and Linkarus can be attributed to heavier seeds and higher seed numbers. These results demonstrate the need to improve seed yield in crimson clover.

We are studying seed yield components in crimson clover to determine which traits to target for breeding to increase seed yield. Total seed yield can be partitioned into plant-stand density, stems per plant, inflorescences per stem, flowers per inflorescence, seeds per legume, and individual seed weight. These components are being measured in six populations of crimson clover that differ for seed yield. Sixty transplants of each population were established at Hyslop farm in the Fall of 2021. Data was collected on vigor, date of first bloom, and canopy height. Data collection will continue through 2022 and will be analyzed. In 2023, these populations will be retested in breeding nurseries in other U.S. regions to determine if the results in these locations are similar to those observed at Hyslop farm.

Acknowledgments

Partial funding for this research was provided by a grant from the National Institute of Food and Agriculture, Organic Agriculture Research and Extension Initiative (award #2021-51300-34899). The authors wish to thank Scott Culver, Lori Evans-Marks, Vicky Hollenbeck, Becca Misho and the Hyslop field lab staff for assistance.

Are Higher Seed Yields Possible in Annual Ryegrass Crops?

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Research Summary
Like other cool-season grasses, annual ryegrass only produces 15 to 33% of its potential seed yield. Lodging of the crop during flowering is one of the major factors limiting seed yield. Making better use of management practices that reduce stem length and decrease lodging is one area that should be further explored to address seed yield losses. Plant growth regulators (PGRs), including trinexapac-ethyl (Palisade), have been widely used on grass seed crops to shorten stem length and reduce lodging by inhibiting the biosynthesis of gibberellic acid (GA). Chlormequat chloride (Adjust) is another GA inhibiting PGR that inhibits cyclase activities in the early stages of GA biosynthesis, whereas trinexapac-ethyl works in the late stages of GA biosynthesis. The aim of this study was to determine the effects of chlormequat chloride with and without spring defoliation in 'Gulf' annual ryegrass. This two-year study was initiated in 2020 and results from the first year can be found in Table 1.

Table 1. Effects of chlormequat chloride (Adjust) plant growth regulator on seed yield and yield component measurements in 'Gulf' annual ryegrass with and without spring defoliation.

Treatment	Yield	Seed Weight	Seed Number	Tiller Height
	lbs acre^{-1}	mg seed^{-1}	no m^{-2}	cm
No Mow				
Untreated Control	1371 a	2.966	51968 a	152.5
Palisade @ 2.8 pints/acre	2141 bcd	2.843	84936 bcdef	115.1
Adjust @ 1.3 lbs/a	1366 a	3.091	50000 a	155.6
Adjust @ 2.6 lbs/a	1269 a	3.132	45751 a	152.8
Adjust @ 3.9 lbs/ a	1158 a	3.024	43038 a	150.8
Adjust @ 1.3 lbs/a + Palisade @ 2.8 pts/a	2268 cdefg	2.777	92050 defg	101.0
Adjust @ 2.6 lbs/a + Palisade @ 2.8 pts/a	2189 cde	2.744	89395 cdef	96.6
Adjust @ 3.9 lbs/a + Palisade @ 2.8 pts/a	2205 cdef	2.636	94343 efg	93.7
Adjust @ 2.6 lbs/a + Adjust @ 1.3 lbs /a	1462 a	3.136	52295 a	151.3
Mow				
Untreated Control	1490 ab	2.953	56698 ab	127.6
Palisade @ 2.8 pints/acre	2627 defg	2.676	109908 fg	104.3
Adjust @ 1.3 lbs/a	1656 abc	2.932	63639 abcde	162.6
Adjust @ 2.6 lbs/a	1396 a	2.925	53748 ab	120.4
Adjust @ 3.9 lbs/ a	1603 abc	2.981	60261 abc	126.8
Adjust @ 1.3 lbs/a + Palisade @ 2.8 pts/a	2881 efg	2.617	123392 gh	85.9
Adjust @ 2.6 lbs/a + Palisade @ 2.8 pts/a	2898 fg	2.570	126645 h	78.9
Adjust @ 3.9 lbs/a + Palisade @ 2.8 pts/a	2929 g	2.559	128693 h	77.1
Adjust @ 2.6 lbs/a + Adjust @ 1.3 lbs /a	1609 abc	2.892	62312 abcd	127.9
	P = 0.0294	0.2319	0.0066	0.3995

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Evaluating Yellow Dwarf Virus Management in Grass Seed Production

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Research Summary

Understanding the composition and prevalence of yellow dwarf viruses (YDV) and their aphid vectors in Oregon perennial ryegrass (PRG) and tall fescue (TF) seed production will help determine aphid-virus interactions responsible for disease outbreaks in grass seed crops. Field surveys of 20 PRG and TF fields across the Willamette Valley were initiated in fall 2021 (Fig. 1). Yellow sticky traps were collected weekly for winged aphid adults. Leaf samples from 40 points in each field were collected approximately two weeks after peak flight. Plant samples collected from TF and PRG fields were 61.9 and 37.7 percent infected, respectively. Moreover, weekly aphid counts in TF and PRG fields averaged 25.6 and 20.1 per sticky card, respectively. Preliminary data suggests no signification correlation between aphid abundance and increased risk of YDV infection. Future work will determine crop composition effects of the surrounding farmscape on YDV infection risk and aphid abundance.

Management strategies for YDV are limited due to the perennial nature of the cropping system and multiple aphid flights per year (fall and spring). Foliar insecticide applications, nitrogen rates, and varied genetic backgrounds may affect virus incidence. A field trial at Hyslop Research Farm was established in fall 2021 to evaluate 1) variety selection and host resistance, 2) nitrogen rate, and 3) insecticide timing on aphid abundance, disease incidence, and seed yield. Aphids are monitored weekly, and plant samples are collected four times throughout the year. Preliminary results indicate potential variety and nitrogen effects, which agree with previous research findings suggesting high nitrogen rates can increase aphid populations (Fig. 2A). The percentage of plants infected after the fall 2021 aphid flight (and before the spring 2022 flight) suggests a foliar insecticide targeting aphids in first-year PRG may have some utility in a management program (Fig. 2B). Final results from year one will be shared at future grower meetings and Seed Production Research reports.

Figures

Figure 1. YDV-aphid survey of 20 commercial PRG and tall fescue fields in fall 2021.

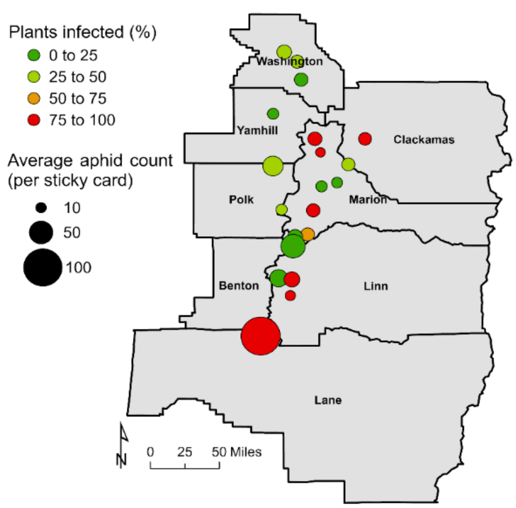
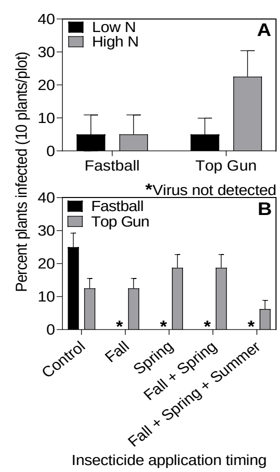


Figure 2. Plant virus (YDV) assessment between fall 2021 and spring 2022 aphid flights for PRG trial.



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Should Stand Age and Irrigation Practices Influence Red Clover Defoliation Timing?

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Research Summary

In the continual effort to increase red clover seed yields, questions about optimal timing for irrigation and spring defoliation in first- and second-year crops remain. The aim of this 3-year project is to determine the effects of irrigation, spring defoliation timings, and their potential interaction, on seed yield and yield components in first-and second-year red clover crops. Results will be used to develop new recommendations that will better equip growers with information to choose irrigation and defoliation timings that will further maximize seed yield.

In Year 1, there were significant interactions between irrigation and spring defoliation for seed yield, seed weight, and seed number (Table 1). Overall, seed yields were lower than expected due a prolonged drought and extreme heat. The highest yielding treatments included no defoliation with no irrigation or early irrigation (6/10); early defoliation (5/1) with no irrigation or late irrigation (7/1); mid defoliation (5/20) with late irrigation; and late defoliation (6/5) with late irrigation. Seed weight was the highest with a combination of either no defoliation and late irrigation or early defoliation and late irrigation. Seed number was highest in treatments that included no defoliation with no irrigation or early irrigation; and early- mid- and late-defoliation with late irrigation. There were no differences between treatments for inflorescence or floret number.

Table 1. Seed yield and yield component measurements in first-year red clover following four defoliation treatments in irrigated and non-irrigated environments.

Treatment	Yield	Seed Weight	Seed Number	Inflorescence	Floret
	lbs acre^{-1}	mg seed^{-1}	no m^{-2}	no m^{-2}	no inflor^{-1}
No Irrigation					
No Defoliation	329 cdef	1.845 d	20016 de	569	88
Early Defoliation	311 cdef	1.831 d	18997 cd	319	82
Mid Defoliation	198 ab	1.759 c	12633 ab	475	85
Late Defoliation	118 a	1.699 ab	7814 a	269	92
Early Irrigation (6/10)					
No Defoliation	399 ef	2.023 g	22104 de	582	84
Early Defoliation	280 bcd	1.855 de	16928 bcd	257	73
Mid Defoliation	269 bc	1.768 c	16999 bcd	471	93
Late Defoliation	206 ab	1.732 bc	13367 abc	588	101
Late Irrigation (7/1)					
No Defoliation	305 cde	1.903 ef	17963 bcd	566	79
Early Defoliation	369 def	1.926 f	21519 de	415	78
Mid Defoliation	406 f	1.746 bc	25855 e	418	99
Late Defoliation	343 cdef	1.672 a	22907 de	597	115
P=	0.0004	0.0001	0.0003	0.0993	0.0820

Acknowledgements

This work is funded by the Oregon Clover Commission and the Agricultural Research Foundation.

The Cover Crop Breeding Network – Performance of Advanced Breeding Lines

Winter Pea (prepared by Lais Bastos Martins, North Carolina State University)

Table 1. Performance of experimental lines in comparison with the best performing commercial check (WyoWinter) across all sites. The current best line, Entry 30, has performed better than the best commercial check in 20 out of 23 environments. As this line has only been tested during the 2021 season, we look forward to another year of data to verify its superior performance in 2022. We notice that entries selected in the Midwest by farmers in the participatory breeding tend to do well because they survived harsh winter conditions.

Entry	Rank	Biomass of best check	# Years trialed	Source
30	1	121.3	1	Selected by farmer Theresa Podoll in 2018. Second best in WI 21
35	2	111.2	1	Selected by farmer Theresa Podoll in 2017. Best in WI in 2021
Romack	3	110.8	3	Check, but not commercially available. USDA PI line Selected by
5b	4	109.8	2	farmer Mark Doudlah
33	5	106.4	1	Selected by farmer Theresa Podoll in 2018
4c	6	106.0	3	Selected by USDA Maryland
29	7	103.5	1	Selected in 2018 by Cornell-NY
WyoWinter	12	100.0	2	Best commercial check

Hairy Vetch (prepared by Lisa Kissing Kucek, USDA-ARS US Dairy Forage Research Center)

Table 2. Performance of 17NC-Early and 18MD experimental lines compared to commercially available checks across 50 environments. Traits include the percent of environments in which the entry performed in the top 20% for biomass yield; biomass yield (% of best check); fall vigor (% of best check); and seed yield (% of best check). The best check variety in calculations was Hungvillosa in 2019 and AU Merit in 2020-2021. 17NC-Early has produced more biomass than any commercially available varieties at 34 of 50 environments across the U.S.

Hairy vetch entry	Environments where top ranking for biomass	Biomass	Fall vigor	Seed yield	Release priority
	------ % ------	-------------- % of best check -------------			
17NC-Early	**68**	**103**	**101**	**119**	**1**
18MD	32	98	94	123	2
Albert Lea Organic VNS	0	76	92	86	Check
AU Early Cover	0	79	89	88	Check
AU Merit	25	100	100	100	Check
Hungvillosa	14	95	82	110	Check
Purple Bounty	6	81	81	98	Check

Crimson Clover (prepared by Jenyne Loarca, Cornell University)

Table 3. Performance of 17 experimental lines compared to commercially available checks across 16 environments. Traits include biomass yield (% of best check); fall vigor (% of best check); and spring vigor (% of best check). Breeding lines are not yet beating best check variety, Dixie.

Crimson Clover entry	Biomass	Fall Vigor	Spring Vigor
	-------------- % of best check -------------		
Dixie (check)	100	100	100
18NCCC-EarlyGiant	84	81	82
19NCCC-Early	80	84	83
Linkarus (check)	73	83	83
20NCCC-Early	68	72	78
19MDCC	65	71	73

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