Research Bulletin 205
February 2022

2021 Small Grains Report

Southcentral and Southeast Idaho Cereals Research & Extension Program

Juliet Marshall, Belayneh A. Yimer, Tod Shelman, Linda Jones, Justin Hatch, Margaret Moll, and Sarah Windes

University of Idaho
College of Agricultural and Life Sciences

Southcentral and Southeastern Idaho Cereals Research and Extension Program

www.uidaho.edu/extension/cereals/scseidaho

Cover Image

FHB infected wheat head from a 2021 EVT plot in Aberdeen, ID. Photo credit: Belayneh A. Yimer

Published and distributed by the Idaho Agricultural Experiment Station, Mark McGuire, Director. University of Idaho College of Agricultural and Life Sciences, Moscow, Idaho 83844-2337.

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ACKNOWLEDGEMENTS

Idaho wheat and barley producers, through cooperative research and extension grants from the Idaho Wheat and Barley Commissions, provided partial funding for these small grain performance evaluations. Support was also provided by the University of Idaho Cooperative Extension System, the Idaho Agricultural Experiment Station, US Wheat and Barley Scab Initiative and by fees paid by plant breeding companies. This report represents the collective efforts of many individuals. University of Idaho Extension County Educators coordinated many of the off-station nurseries and field days. Grower-cooperators provided their time, land, and other inputs for management of these trials and appreciation is expressed to them for their support. The UI Wheat Quality Laboratory at Aberdeen analyzed the quality for harvested wheat samples. Appreciation is also expressed to the numerous support personnel who assisted with trial establishment, maintenance, harvest, grain processing, and data analysis. Finally, cereal breeders throughout the Northwest are recognized for their contributions since the nurseries would not be possible without their entries. The authors wish to thank all who have contributed to the success of this project.

Grower Cooperators:
Kyle Wangemann and Scott Brown – Soda Springs
Gilbert and Carl Hofmeister – Rockland
Trevor Davey – Ririe
Clark Hamilton – Ririe
Luke Adams, Duane Grant and Taylor Grant – Rupert
Alan Baum – Ashton
Marc Thiel – Idaho Falls

Cereals Research and Extension Employees
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Lyona Anderson Ericka Ziebarth Mary Corbridge
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Reed Findlay - Bannock and Bingham Counties
Jason Thomas - Minidoka County
Ron Patterson - Bonneville County
Bracken Henderson - Franklin County
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Justin Hatch – Caribou County

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Disclaimer Statement

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2021 Small Grains Report for Southcentral and Southeastern Idaho

Juliet Marshall, Belayneh A. Yimer, Tod Shelman, Linda Jones, Justin Hatch, Margaret Moll and Sarah Windes

Additions and Changes:

The winter trials in Soda Springs were abandoned due to heavy winter damage. Hence, dryland winter trials were conducted only in two locations: Rockland and Ririe.

Introduction

The objective of the University of Idaho Small Grain Performance Trials is to provide an unbiased appraisal and evaluation of currently available varieties and advanced experimental lines over multiple locations and years. This information will assist Idaho producers in comparing and selecting varieties best suited to their area and growing conditions. Variety selection is an important part of the economic viability of Idaho crops, and crop enterprise budgets are available at the Department of Agricultural Economics and Rural Sociology website https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets.

Varietal development programs strive not only for greater yield potential, but also for improved end-use quality, better disease and insect resistance, yield stabilization through improved winter hardiness, better straw strength, and other agronomic traits. Bringing a new variety to the marketplace is a cooperative effort by many individuals and organizations.

Varieties are best evaluated by comparing performance over several locations and preferably over more than one year. Varietal performance can change in response to both environmental and cultural/management conditions. This report summarizes yield and agronomic data of small grain (wheat and barley) trials conducted throughout Southcentral and Southeastern Idaho that were harvested in 2021, milling and baking data from trials harvested in 2020, as well as disease data when available from Aberdeen (stripe rust and Fusarium head blight (FHB) also called Head Scab), and Kimberly (FHB).

Materials & Methods

Locations

Cereal trials were established at seven winter and five spring locations throughout SC and SE Idaho during the fall of 2020 and the spring of 2021. For location details, please see the descriptions on pages 6 to 11. The Rockland winter & Soda Springs spring trials were grown under dryland conditions. At Ririe there were both dryland and irrigated trials. All other trials were grown under irrigation. The trials at Aberdeen and Kimberly were grown at UI Research and Extension Centers, and the remaining trials were grown in producers' fields.

Agronomic Practices

Treated seed was planted at the following rates:

- Irrigated Wheat: 1,000,000 seeds per acre or approximately 95 pounds per acre.
- Irrigated Barley: 800,000 seeds per acre or approximately 80 pounds per acre.
- Dryland Wheat: 700,000 seeds per acre or approximately 65 pounds per acre.
- Dryland Barley: 600,000 seeds per acre or approximately 60 pounds per acre.

Thousand kernel weights and planting rates in pounds per acre for each variety are reported in Table 1. Row spacing was set at 7-inch using double disk openers for all irrigated locations and the Soda Springs winter and spring dryland locations. The

Ririe dryland location used a 7-inch row spacing and double disk openers and the Rockland dryland location used a 12-inch row spacing with shanks preceding double disk openers. Plots at all winter locations except for Aberdeen were planted 5 feet wide by 14 feet long then reduced back to 10 feet long using glyphosate herbicide or tillage. Aberdeen plots were planted 5 feet wide by 13.3 feet long then sprayed back to 9.3 feet long. Spring locations were planted 5 feet wide by 20 feet long then sprayed or tilled back to 16 feet. All entries were replicated 4 times at each location in a randomized complete block design. Except for planting and harvest operations, nitrogen fertilization, and miscellaneous maintenance, trials established in producers' fields received the same "grower management" or cultural operations as applied to the surrounding commercial wheat or barley field.

Nitrogen fertilizer in irrigated locations was managed according to the following methodology: Yield goals (bu/A) were set for each class at each location using historical yield data. These yield goals were used to calculate optimal fertility amounts according to the following methods: Soft white winter wheat, soft white spring wheat, and winter barley; lbs/acre nitrogen needed = 2 times yield goal. Hard winter and hard spring wheat; lbs/acre nitrogen needed = 2.5 times yield goal, plus 40 lbs nitrogen/acre topdressed at flowering. Spring 2 row barley: lbs/acre nitrogen needed = 1.7 times the yield goal. Hard wheat nurseries received the remaining balance of nitrogen as urea (46-0-0) topdressed at heading using hand broadcast spreaders. Fertilizers and pesticides applied are listed on pages 6 to 11. Planting and harvesting operations by university personnel were timed to approximately coincide with corresponding cooperator operations. All nurseries were harvested with Wintersteiger Classic small plot combines, and data were recorded using Harvestmaster 800 Classic GrainGage systems and Mirus software.

Evaluation for Diseases

FHB: The winter FHB nursery was established in one location (Kimberly) while spring FHB nurseries were established in two locations (Aberdeen and Kimberly). Each entry was planted in two head-rows in two replications. Corn spawn was spread in the field when plants were at the tillering growth stage in the spring. Additional inoculation of the trials was conducted by spraying the conidial suspension (100,000 spores/ml) at early anthesis. A sprinkler system was installed across the experimental plot to create conducive environment for disease infection and development. FHB rating (measured as FHB incidence and severity from 30 randomly chosen heads per entry) was done at the soft dough growth stage.

Stripe Rust: Entries planted in the EVT in Aberdeen were evaluated for their reaction to stripe rust under natural infection. Stripe rust was rated at the flag leaf stage as infection type (1 – 9 scale), and severity was measured based on modified Cobb scale (0 – 100%).

Description of Agronomic Data

Each entry at each location was measured for grain yield, test weight, plant height, heading date, and lodging (when present).

- Yield is calculated at 60 pounds per bushel for wheat, and 48 pounds per bushel for barley.
- Test weight is reported in pounds per standard bushel.
- Plant height is reported in inches from the soil surface to the tip of the heads, awns excluded.
- Heading date is reported as the date when 50 percent of heads are fully emerged from the boot.
- Lodging is reported as the percent of the plot area that was not standing straight prior to harvest.

Description of End-use Quality Data

Grain protein for each variety was analyzed with a Foss 6500 NIR grain analyzer. Protein data are found in conjunction with the agronomic data noted above in tables 4 to 64. These protein values are best utilized in comparisons between varieties within a nursery.

Due to the time necessary to complete milling and baking evaluations, test results from the Idaho Wheat Quality Laboratory are not available for the 2021 harvest in this report. Data are given for these characteristics from the 2020 harvest and are found in tables 65-78.

Milling and baking tests and plump seed evaluations use standardized testing methods and are described below:

- Flour protein: this is the flour protein content, measured on a fixed 14 percent moisture basis. Lower numbers are better for soft wheat; higher numbers are preferred for hard wheat.
- Break flour yield: represents ease of milling or kernel softness; higher numbers are preferred.
- Flour yield: the percent of flour obtained from a sample of wheat; higher percentages are better.
- Whole grain protein percent: protein content of the whole grain on a 12 percent moisture basis. Lower percentages are preferred for soft wheat; higher percentages are preferred for hard wheat.
- Hardness value: a measure of kernel hardness; generally soft white wheats are below 45, hard wheats are above 45.
- SRC (Solvent Retention Capacity): a measure of the flour performance in absorbing water and flour quality.

Additional evaluations include the following:

Hard Wheats

Bake volume: This is the volume of an experimental loaf of bread measured in cubic centimeters and reflects protein quality per unit of protein; higher volume is preferred.

Soft Wheats

Cookie diameter: Diameter of a cookie in centimeters; larger numbers are better.

Barley

- Plumps: Percent plump is the percent of a sample that stayed on top of a 5.5/64" x ¾" slotted screen after shaking and consists of the 6/64" and 5.5/64" percentages combined. Both screen percentages are included in the report for increased precision.
- Thins: the percent of a sample that passed through a 5.5/64" x ¾" screen after shaking.

Statistical Analyses

Data from each nursery were analyzed using SAS 9.4 software with the PROC GLM procedure. Fisher's protected LSD (α=.05) was used for mean comparisons. Three years pooled analyses, and data combined from locations in the growing season were analyzed using PROC Mixed Plots of SAS 9.4.

Statistical Interpretation

Most tables have a least significant difference (LSD) statistic at the bottom of the table. This statistic is given at the 5 percent error level and is an aid in comparing varieties. If the measured values of any two varieties within a table differ by the LSD value or more, they may be considered different with a confidence level of 95 percent. If the measured values are less than the LSD value, the differences may be due to random error rather than real differences. Coefficient of variation (CV percent) statistic is a general measurement of the precision of each experiment. Lower CV values indicate less experimental variation and greater

precision. Most tables that do not have the LSD and CV statistic are averages over locations or years where specific statistical analyses were not run on the combined data or are from data obtained from only one replication or are from a composite sample of all replications (e.g. quality data). Most tables from individual locations also contain yield data from two previous years. The average, LSD, and CV for these data represent the original data set, not just the selected varieties presented in these tables. The Pr>F value shows the validity of the LSD value above it; if the Pr>F value is equal to or greater than .05 (e.g. 0.1504; 0.6250), then the LSD value is void. This does not mean there are not differences between the varieties, it simply means differences cannot be determined at the 95% confidence level. Since the three year summaries were computed from data obtained from various trials conducted over three years and in different locations, instead of LSD standard error (SE) of the trials is presented.

Varieties Tested

A list of released varieties tested in 2020-2021 is given in Table 1. Included in this table are seed weight (thousand kernel weight), number of seeds per pound and the adjusted seeding rate. Information is also given on the year of release and the releasing agency or company. A short description of selected varieties is given in Table 2. Additional information is available from the releasing agency or company.

Seasonal average measurements of several plant growth characteristics from the variety trials are shown in Table 3 for the time period of 2011-2021.

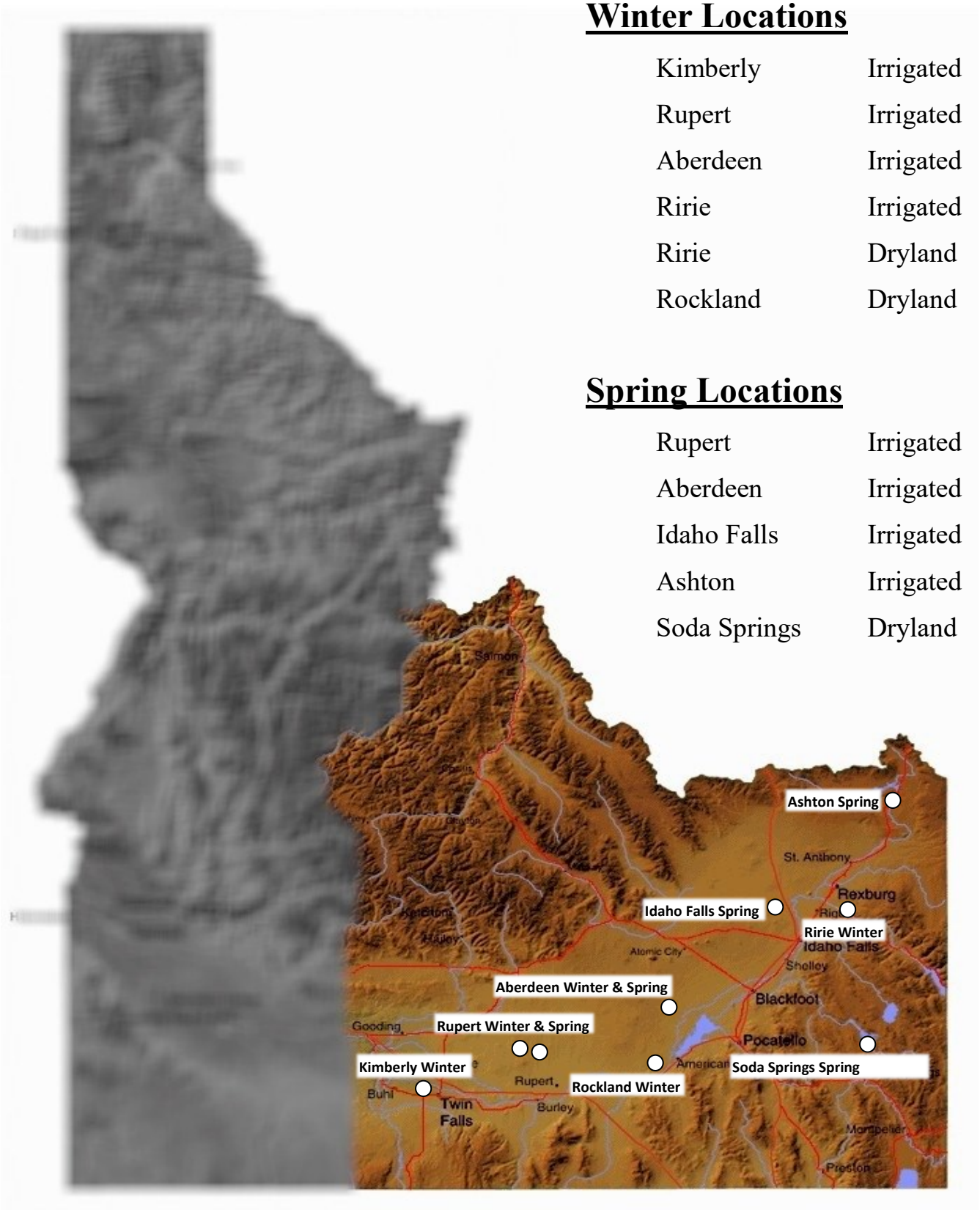
Southcentral & Southeast Idaho Cereal Variety Trial Locations

Winter Locations

Kimberly	Irrigated
Rupert	Irrigated
Aberdeen	Irrigated
Ririe	Irrigated
Ririe	Dryland
Rockland	Dryland

Spring Locations

Rupert	Irrigated
Aberdeen	Irrigated
Idaho Falls	Irrigated
Ashton	Irrigated
Soda Springs	Dryland



Location Descriptions

Kimberly Winter Irrigated:

Kimberly Research & Extension Center
3825 N. 3600 E. Kimberly, ID

Coordinates: 42°55'11.49"N 114°34'15.94”W
Elevation: 3897 ft.
Soil Type: #10 Bahem silt loam, 1-4% slopes
Previous Crop: Summer Fallow
Planting Date: October 7, 2020
Harvest Date: August 11 & 13 2021
Chemicals applied: Huskie 15 oz./A, Axial 16 oz./A, Starane Ultra 6 oz./A

Fertility:

	Organic Matter %	pH	Free Lime %	Hard winter wheat N#/A	Soft white winter wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.8	7.9	2.0	191	191	25 ppm	463 ppm	45 ppm
Fertilizer applied (lbs/A)				389	169	60#	20#	60# SO_4
Total	1.8	7.9	2.0	580	360		20#	60# SO_4

Rupert Winter Irrigated:

Cooperator: Luke Adams
Located at 900 N. 400 E. Rupert, Idaho

Coordinates: 42°45’02.68” N 113°35'25.29"W
Elevation: 4209 ft.
Soil Type: #26 Power silt loam, 1-4% slopes
Previous Crop: Sugar Beet
Planting Date: October 1, 2020
Harvest Dates: August 4 & 5, 2021
Chemicals applied: Huskie 15 oz./A, Axial XL 16 oz./A, Starane Ultra 6 oz./A

Fertility:

	Organic Matter %	pH	Free Lime %	Hard winter wheat N#/A	Soft white winter wheat & winter barley N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.5	7.4	<1.0	173	173	46 ppm	385 ppm	39 ppm
Fertilizer applied (lbs/A)				207	167		66#	
Total	1.5	7.4	<1.0	380	340		66#	

Location Descriptions

Aberdeen Winter Irrigated:

Aberdeen Research & Extension Center
1693 S. 2700 W. Aberdeen, ID

Coordinates: 42°57'34.46"N, 112°49'18.49"W
Elevation: 4405 ft.
Soil Type: DeA Declo loam, 0-2%slopes
Previous Crop: Green Manure Oats
Planting Date: September 28, 2020
Harvest Dates: August 16 & 17, 2021
Chemicals applied: Brox – M 1pint/A, Starane Ultra 6 oz./A,

Fertility:

	Organic Matter %	pH	Free Lime %	Hard winter wheat N#/A	Soft white winter wheat & winter barley N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.1	8.0	5.2	130	130	20 ppm	361 ppm	58 ppm
Fertilizer applied (lbs/A)				165	125	60#	20#	100#elemental Sulfur 20# S
Total	1.1	8.0	5.2	295	255	60#	20#	20# S

Ririe Winter Irrigated:

Cooperator: Clark Hamilton
Located at HWY 26 and 175 E, ¼ mile south of highway.

Coordinates: 43°36'46.48"N, 111°41'25.70"W
Elevation: 5030 ft.
Soil Type: #7 Bock Loam Soil
Previous Crop: Peas
Planting Date: September 30, 2020
Harvest Date: August 9, 2021
Chemicals applied: MCPA 12 oz, Affinity Broadspec 8 oz, AxialStar 16 oz./A

Fertility:

	Organic Matter %	pH	Free Lime %	Hard winter wheat N#/A	Soft white winter wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.8	7.6	<1.0	59	59	14 ppm	239 ppm	28 ppm
Fertilizer applied (lbs/A)				280	240			
Total	**1.8**	**7.6**	**<1.0**	**339**	**299**			

Location Descriptions

Ririe Winter Dryland:

Cooperator: Trevor Davey

5 3/4 3 miles south of Hwy. 1 mile south of Power line, Ririe, ID

Coordinates: 43°33'34.51"N 111°43'07.01"W
Elevation: 5537 ft.
Soil Type: #42 Ririe silt loam, 4-12% slopes
Previous Crop: Wheat Hay (Brundage)
Planting Date: October 6, 2020
Harvest Date: September 8, 2021
Chemicals applied: Huskie 15 oz./A, Axial XL 16 oz./A, Starane Ultra 6 oz./A

Fertility:

	Organic Matter %	pH	Free Lime %	Hard winter wheat N#/A	Soft white winter wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.4	6.8	<1.0	45#	45#	29 ppm	310 ppm	13 ppm
Fertilizer applied (lbs/A)				4	4	20 #		
Total	**1.4**	**6.8**	**<1.0**	**49**	**49**	**20#**		

Rockland Winter Dryland:

Cooperators: Gilbert and Carl Hofmeister

1.5 mile west of Rock Creek Rd on Deeg Rd, Rockland, ID

Coordinates: 42°39'42.98"N, 112°57'29.42"W
Elevation: 4640 ft.
Soil Type: #51 Newdale silt loam, 4-12% slopes
Previous Crop: Fallow
Planting Date: September 24, 2020
Harvest Date: July 23, 2021
Chemicals applied: Banvel 2oz/A, LV6 16oz/A
Fertility:

	Organic Matter %	pH	Free Lime %	Winter wheat N#/A	P	K	S
Fertilizer applied (lbs/A)				50			25#

Location Descriptions

Rupert Spring Irrigated:

Cooperator: Taylor Grant, Grant 4-D Farms
900 N 600 E., Rupert, ID

Coordinates: 42°44'57.74"N, 113°33'04.72"W
Elevation: 4241 ft.
Soil Type: #36 Sluka silt loam, 1-4% slopes
Previous Crop: Sugar Beets
Planting Date: April 1, 2021
Harvest Dates: August 24&25, 2021
Chemicals applied: Huskie 15 oz/A, Axial XL 1 p./A, Starane 6 oz./A

Fertility:

	Organic Matter%	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat & spring barley N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.7	7.8	9.6	254	254	36 ppm	395 ppm	83 ppm
Fertilizer applied (lbs/A)				210	170		65	40#
Total	**1.7**	**7.8**	**9.6**	**464**	**424**		**65**	**40#**

Aberdeen Spring Irrigated:

Aberdeen Research & Extension Center
1693 S. 2700 W., Aberdeen, ID

Coordinates: 42°57'31.84"N, 112°49'17.02"W
Elevation: 4405 ft.
Soil Type: DeA Declo loam, 0-2% slopes
Previous Crop: Green Manure Oats
Planting Date: April 2, 2021
Harvest Date: August 31 & Sept 1, 2021
Chemicals applied: Huskie 15 oz./A, Starane Ultra 6 oz./A,

Fertility:

	Organic Matter%	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat & spring barley N #/A	P	K	S
12" soil test results (N & S= 0-24")	0.9	8.2	10.4	196	196	20 ppm	359 ppm	68 ppm
Fertilizer applied (lbs/A)				170	60	95	20	40# SO_4
Total	**0.9**	**8.2**	**10.4**	**366**	**256**	**95**	**20**	**40#SO_4**

Location Descriptions

Idaho Falls Spring Irrigated:

Cooperator: Marc Thiel
Approximately 25 S. on 45th West Idaho Falls, ID

Coordinates: 43°28'30.70"N, 112°7'20.14"W
Elevation: 4684 ft.
Soil Type: #22 Pancheri silt loam, 0-2% slopes
Previous Crop: Barley and Alfalfa
Planting Date: April 16, 2021
Harvest Date: August 26 & 27, 2021
Chemicals applied: Huskie 15 oz/A, Starane Ultra 6 oz/A

Fertility: Wheat Field

	Organic Matter%	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")	2.0	7.9	1.5	208	208	27 ppm	215 ppm	103 ppm
Fertilizer applied (lbs/A)				190	150	30#		
Total	**2.0**	**7.9**	**1.5**	**398**	**358**	**30#**		

Fertility: Barley Field

	Organic Matter%	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")	1.8	8.0	5.8	180	180	28 ppm	236 ppm	63 ppm
Fertilizer applied (lbs/A)				70	70	30#		
Total	**1.8**	**8.0**	**5.8**	**250**	**250**	**30#**		

Ashton Spring Irrigated:

Cooperator: Alan Baum
3849 E. 1350 N. Ashton, ID

Coordinates: 44°04'43.26"N, 111°22'52.68"W
Elevation: 5423 ft.
Soil Type: #24 Greentimber, Marystown, Robinlee, silt loam 1–4% slopes
Previous Crop: Potatoes
Planting Date: May 3, 2021
Harvest Date: September 2 & 3, 2021
Chemical applied: Huskie 15 oz/A, Axial XL 1 pint/A, Starane Ultra 6 oz/A

Fertility:

	Organic Matter	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat & spring barley N #/A	P	K	S
12" soil test results (N & S= 0-24")	2.2	6.2	<1.0	176	176	35 ppm	169 ppm	35 ppm
Fertilizer applied (lbs/A)				160	120	30#	40#	40#
Total	**2.2**	**6.2**	**<1.0**	**336**	**296**	**30#**	**40#**	**40#**

Location Descriptions

Soda Springs Spring Dryland:

Cooperators: Kyle Wangemann and Scott Brown
11 miles north of Hooper Springs on Government Dam Road, and China Hat Road.

Coordinates: **42°46'47.99"N 111°38'19.88"W**
Elevation: **6143 ft.**
Soil Type: **#485AA–Foundem-Rexburg very deep complex, 1 to 4 % slopes**
Previous Crop: **Spring Barley**
Planting Date: **May 4, 2021**
Harvest Date: **September 7, 2021**
Chemicals applied: **Huskie 12 oz/A, Axial Bold 15oz/A, Starane Ultra 6 oz./A**

Fertility:

	Organic Matter	pH	Free Lime %	Hard Spring wheat N#/A	Soft white spring wheat N #/A	P	K	S
12" soil test results (N & S= 0-24")				NA	NA			
Fertilizer applied (lbs/A)	5.5# Zn			50	50	77#		10#
Total				**50**	**50**	**77#**		**10#**

Temperature and irrigation/precipitation totals for some locations, recorded with on-site weather stations provided with financial support from the Idaho Wheat commission.

Variety Trial Site	Dates of station recording range	Maximum temperature °F	Minimum temperature °F	# of days above 90°F	# of days below 50°F	# of days below 40°F	Spring & Summer Precipitation and Irrigation
Aberdeen Spring	May 19 – September 9, 2021	104.2	30.4	42	67	19	14.65
Aberdeen Winter	May 19 – August 20, 2021	105.8	31.8	46	47	9	13.45
Kimberly	May 5 – August 19, 2021	107.9	35.6	46	34	10	15.31
Rupert Winter	May 26 – August 19, 2021	117.9	31.2	41	38	8	12.22
Rupert Spring	May 26 – September 9, 2021	109.6	31.3	51	49	8	20.68
Ririe Dryland	June 7 – September 9, 2021	104.6	33.0	33	50	5	4.16
Idaho Falls	June 6 – September 9, 2021	104.4	31.9	36	51	3	10.28
Ashton	June 7 – September 9, 2021	114.1	32.6	16	52	6	9.78

Table 1. Released varieties tested in 2020-2021 with seed size and adjusted seeding rate.

Variety	Exp. No.	1000 Kernel Weight (g)	Seeds per Pound	Adjusted Seeding Rate[1] (lb/A)	Year Released	Developer(s)/Distributor of variety
Soft White Winter Wheat						
AP Dynamic		49	9257	108	2020	AgriPro /Syngenta Cereals
AP Exceed	11PN039#20	55	8,247	121	2020	AgriPro /Syngenta Cereals
AP Iliad	11PN044#84	50	9,072	110	2020	AgriPro /Syngenta Cereals
Brundage	ID86-14502B	44	10,428	96	1996	Idaho AES
Devote	WA8271	39	11,631	86	2019	Washington AES, USDA
Eltan	WA7431	36	12,600	79	1990	Washington AES, USDA
LCS Artdeco	NSA06-2153A	47	9,651	104	2011	Limagrain Cereal Seeds, LLC
LCS Blackjack	LWW15-71945	39	11,782	85	2019	Limagrain Cereal Seeds, LLC
LCS Hulk	LWW14-73163	48	9,549	105	2017	Limagrain Cereal Seeds, LLC
M-Press		50	9,072	110	2019	McGregor
Nixon	OR2121086	44	10,309	97	2019	Oregon State AES
Norwest Duet	LOR-092	43	10,673	94	2015	OSU /Limagrain Cereal Seeds, LLC
Norwest Tandem	LOR-334	43	10,673	94	2016	OSU /Limagrain Cereal Seeds, LLC
OR2X2CL+	ORI2150031Cl+	35	13,148	76	2019	Oregon State AES
Otto	WA008092	49	9,353	107	2011	Washington AES, USDA
Piranha CL+	WA8305	33	13,745	73	2020	Washington AES, USDA
Stephens	OR65-116	44	10,309	97	1977	Oregon AES
Stingray CL+	WA8275CL+	46	9,861	101	2019	Washington AES, USDA
Sockeye CL+	WA8306	46	9,969	100	2020	Washington AES, USDA
SY Assure	04PN096-2	52	8,723	115	2016	AgriPro /Syngenta Cereals
SY Ovation	03PN108#21	59	7,688	130	2011	AgriPro /Syngenta Cereals
SY Raptor	04PN046#16	58	7,821	128	2017	AgriPro /Syngenta Cereals
UI Magic CL+	IDN 09-DH11	37	12,259	82	2015	Idaho AES / Limagrain Cereal Seeds
UI Sparrow	IDO1108DH	35	13,148	76	2016	Idaho AES
VI Frost	UIL09-15702A	45	10,080	99	2020	Idaho AES / Limagrain Cereal Seeds, LLC
VI Presto CL+	UIL17-6451CL+	47	9,651	104	2020	Idaho AES / Limagrain Cereal Seeds, LLC
VI Shock	UIL15-72223	39	11,631	86	2020	Idaho AES / Limagrain Cereal Seeds, LLC
VI Voodoo CL+	UIL17-6268CL+	43	10,549	95	2020	Idaho AES / Limagrain Cereal Seeds, LLC
WB456	BU6W99-456	42	10,800	93	2009	Bayer Crop Science / WestBred
WB1376CLP	BZ6WM09-1030CLP	43	10,549	95	2014	Bayer Crop Science / WestBred
WB1529	BZ6W07-436	41	11,063	90	2013	Bayer Crop Science / WestBred
WB1783	BZ6W09-471	47	9,651	104	2016	Bayer Crop Science / WestBred
YSC-201		43	10,549	95	2020	Yield Star Cereals
YSC-215		39	11,631	86	2020	Yield Star Cereals
YSC-268		51	8,894	112	2020	Yield Star Cereals
Hard Red and White (W) Winter Wheat						
Balance	WA8248	38	11,937	84	2020	Nutrien Ag
Flathead		42	10,800	93	2019	Montana AES
FourOSix	MT1462	41	11,063	90	2018	Montana AES
Golden Spike (W)	UT1944-158	36	12,600	79	1999	Utah AES, USDA
Irv (W)	OR2110679	39	11,631	86	2018	Oregon AES
Juniper	IDO 575	39	11,631	86	2005	Idaho AES, USDA
Kairos		36	12,600	79	2020	Highland Specialty Grains
Keldin	ACS55017	45	10,080	99	2011	Bayer Crop Science / WestBred
LCS Jet	NSA 7208	38	11,937	84	2015	Limagrain Cereal Seeds, LLC
LCS Rocket	NSA10-2196	47	9,651	104	2018	Limagrain Cereal Seeds, LLC
LCS Yeti (W)	LCI13DH-2222	47	9,651	104	2018	Limagrain Cereal Seeds, LLC
LCS Zoom	LWH14-73915	42	10,800	93	2019	Limagrain Cereal Seeds, LLC
Milestone	ACS14132-412	53	8,558	117	2020	Nutrien Ag
Millie (W)	OR2130118H	39	11,631	86	2021	Oregon State AES
Promontory	UT1567-51	37	12,259	82	1990	Utah AES, USDA
Scorpio	WA8268	39	11,631	86	2019	Washington AES, USDA
Sequoia	WA8180	39	11,631	86	2015	Washington AES, USDA
UI Bronze Jade (W)	IDO1706	43	10,549	95	2019	Idaho AES
UI Silver (W)	IDO658B	36	12,600	79	2011	Idaho AES, USDA
UI SRG	IDO656	43	10,549	95	2012	Idaho AES, USDA
Utah 100	UT1650-150	38	11,937	84	1997	Utah AES, USDA
WB4401		47	9,651	104	2019	Bayer Crop Science / WestBred
WB4510CLP	XD4201	44	10,309	97	2017	Bayer Crop Science / WestBred
WB4623CLP	BZ9WM09-1663	35	12,960	77	2014	Bayer Crop Science / WestBred
WB4792	XB4711	38	11,937	84	2018	Bayer Crop Science / WestBred
Yellowstone	MT00159	35	12,960	77	2005	Montana AES

[1]Adjusted to plant 1 million seeds per acre under irrigation according to the number of seeds per pound for each variety.

Table 1 (cont'd). Released varieties tested in 2020-2021 with seed size and adjusted seeding rate.

Variety	Exp. No.	1000 Kernel Weight (g)	Seeds per Pound	Adjusted Seeding Rate[1] (lb/A)	Released	Developer(s)/Distributor of variety
Soft White Spring Wheat						
Alturas	IDO526	43	10,549	95	2002	Idaho AES, USDA
AP Coachman	08PN2001-07	55	8,247	121	2020	AgriPro / Syngenta Cereals
Hedge CL+ (club wheat)		40	11,340	88	2020	Washington AES, USDA
Louise	WA7921	50	9,072	110	2004	Washington AES, USDA
Melba (club wheat)	WA8193	37	12,259	82	2016	Washington AES, USDA
Ryan	WA8214	47	9,651	104	2016	Washington AES, USDA
Seahawk	WA8162	45	10,080	99	2015	Washington AES, USDA
Tekoa	WA8189	46	9,861	101	2016	Washington AES, USDA
TMC2021		46	9,861	101		McGregor Company
UI Cookie	IDO1405S	42	10,800	93	2019	Idaho AES, USDA
UI Pettit	IDO632	40	11,340	88	2006	Idaho AES, USDA
UI Stone	IDO599	36	12,600	79	2012	Idaho AES / Limagrain Cereal Seeds
WB-1035CL+		40	11,340	88	2011	Bayer Crop Science / WestBred
WB6211CLP	XD6305	46	9,861	101		Bayer Crop Science / WestBred
WB6430	BZ608-125	39	11,631	86	2013	Bayer Crop Science / WestBred
YSC-603		43	10,549	95		Yield Star Cereals
Hard Red Spring Wheat						
Alum	WA8166	46	9,861	101	2015	Washington AES, USDA
AP Renegade	06PN3017-9	42	10,800	93	2018	AgriPro / Syngenta Cereals
Choteau	MT9920	34	13,341	75	2003	Montana AES
Dagmar	MT1621	38	11,937	84	2019	Montana AES
Duclair	MT0832	37	12,259	82	2011	Montana AES
Expresso	DA984-034SRR	37	12,259	82	2006	Bayer Crop Science / WestBred
Glee	WA8074	51	8,894	112	2012	Washington AES, USDA
Jefferson HF	IDO462	47	9,651	104	2020	Idaho AES, USDA
MT Sidney	MT1716	39	11,631	86	2021	Montana AES
Net CL+	WA8280 CL+	42	10,800	93	2019	Washington AES, USDA
Rocker	BZ917-277	36	12,600	79	2022	Nutrien Ag
SY Gunsight	06PN3015-08	44	10,309	97	2017	AgriPro / Syngenta Cereals
WB9668	BZ908-552	35	12,960	77	2013	Bayer Crop Science / WestBred
WB9707	XC9304	55	8,247	121	2019	Bayer Crop Science / WestBred
WB9879CLP	IMICHT79	39	11,631	86	2011	Montana AES / Bayer Crop Science / WestBred
Hard White Spring Wheat						
Dayn	WA8123	43	10,549	95	2012	Washington AES / AgriPro /Syngenta Cereals
SY Teton	SY10136	50	9,072	110	2015	AgriPro / Syngenta Cereals
UI Platinum	IDO694C	45	10,080	99	2014	Idaho AES, Anderson Group
WB7202CLP	XA7320	43	10,549	95	2017	Bayer Crop Science / WestBred
WB7313	XD9201	46	9,861	101	2020	Bayer Crop Science / WestBred
WB7328	BZ9S09-0133W	42	10,800	93	2014	Bayer Crop Science / WestBred
WB7589	BZ9S09-0735W	50	9,072	110	2014	Bayer Crop Science / WestBred
WB7696	XB9512	41	11,063	90	2018	Bayer Crop Science / WestBred
Winter Barley - malt						
Avalon		35	12,960	77		Virginia Tech
Charles	94Ab1274	53	8,558	93	2005	USDA-ARS, Aberdeen
Endeavor	95Ab2299	43	10,549	76	2008	Idaho AES, USDA
Flavia		43	10,549	76		Ackermann
Hirondella		36	12,600	63		Ackermann
KWS Donau		45	10,080	79		KWS Cereals
KWS Faro		51	8,894	90		KWS Cereals
KWS Joyau		40	11,340	71		KWS Cereals
KWS Scala	GW2895	52	8,723	92	2012	KWS Cereals
KWS Somerset	GW3479	47	9,651	83	2017	KWS Cereals
LCS Calypso		51	8,894	90	2017	Limagrain Cereal Seeds, LLC
Lightning	DH130910	59	7,688	104	2020	Oregon AES, USDA
Thunder	10.0777	46	9,861	81	2016	Oregon AES, USDA
Wintmalt		52	8,723	92	2014	KWS Lochow
Winter Barley - feed and food						
Eight-Twelve	79Ab812	47	9,651	83	1988	Idaho AES, USDA
Sunstar Pride	SDM204-B	56	8,100	99	1995	Sunderman Breeding, Twin Falls, ID
Upspring[2]	05ARS748-270	31	14,632	55	2018	Idaho AES, USDA

[1]Adjusted to plant 1 million seeds per acre for wheat (800,000 for barley) under irrigation according to the number of seeds per pound for each variety.

[2] Hulless

Table 1 (cont'd). Released varieties tested in 2021 with seed size and adjusted seeding rate.

Usage:	Variety	Exp. No.	1000 Kernel Weight (g)	Seeds per Pound	Adjusted Seeding Rate[1] (lb/A)	Year Released	Developer(s)/Distributor of variety
	Two-Row Spring Barley						
Feed	Altorado	BZ509-601	45	10,080	79	2016	Highland Specialty Grains
Feed	Champion	YU501-385	42	10,930	73	2007	Highland Specialty Grains
Feed	Claymore	BZ509-216	41	11,063	72	2015	Highland Specialty Grains
Feed	Diamondback (SB6)		46	9,861	81	2020	Highland Specialty Grains
Feed	FeedMor	Moravian 169	45	10,193	78	pending	Molson Coors Beverage Company
Feed	Idagold II	C32	44	10,428	77	2002	Molson Coors Beverage Company
Feed	Oreana	BZ509-448	44	10,428	77	2015	Highland Specialty Grains
Feed	Xena	BZ594-19	42	10,930	73	2000	Highland Specialty Grains
Food	Goldenhart[2]	2Ab09-X06F058HL-31	43	10,673	75	2018	Idaho AES, USDA
Food	Julie[2]	03AH6561-94	40	11,484	70	2010	Idaho AES, USDA
Food	Kardia	2Ab09-X06F084-51	44	10,309	78	2016	Idaho AES, USDA
Food	Transit[2]	03AH3054-51	45	10,080	79	2010	Idaho AES, USDA
Malt/Feed	Moravian 180	Pop10-022-030	46	9,969	80	pending	Molson Coors Beverage Company
Malt/Feed	Bill Coors 100	Moravian 150	51	8,894	90	2015	Molson Coors Beverage Company
Malt	AAC Connect	TR04282	43	10,673	75	2016	Agriculture Canada / Canterra Seeds
Malt	AAC Synergy	TR09208	42	10,800	74	2015	Agriculture Canada / Syngenta
Malt	ABI Eagle	2B11-4949	39	11,631	69	2018	Busch Agricultural Resources, LLC, Ft. Collins, CO
Malt	ABI Voyager	B3719	44	10,428	77	2011	Busch Agricultural Resources, LLC, Ft. Collins, CO
Malt	AC Metcalfe	TR232	44	10,428	77	1994	Agriculture Canada
Malt	BC Ellinor		50	9,072	88		Limagrain Cereal Seeds, LLC
Malt	BC Leandra		54	8,400	95		Limagrain Cereal Seeds, LLC
Malt	BC Lexy		50	9,072	88		Limagrain Cereal Seeds, LLC
Malt	CDC Copeland	TR150	36	12,600	63	1999	CDC University of Saskatchewan/ SeCan
Malt	Conrad	B5057	40	11,340	71	2004	Busch Agricultural Resources, LLC, Ft. Collins, CO
Malt	Esma		49	9,257	86		Ackermann Saatzucht GmbH & Co. KG
Malt	Explorer		43	10,673	75		Secobra Recherches
Malt	GemCraft	2Ab08-X05M010-65	43	10,549	76	2018	USDA ARS, Idaho AES
Malt	KWS Amadora		50	9,164	87	2015	KWS Lochow
Malt	KWS Fantex		45	10,193	78		KWS Lochow
Malt	KWS Jessie		52	8,808	91	2019	KWS Lochow
Malt	KWS Thalis		52	8,723	92		KWS Lochow
malt	LCS Genie		44	10,309	78	2011	Limagrain Cereal Seeds, LLC
Malt	LCS Odyssey	NSL08-4556-A	43	10,673	75	2015	Limagrain Cereal Seeds, LLC
Malt	LCS Opera		46	9,861	81		Limagrain Cereal Seeds, LLC
Malt	Merit 57	2B99-2657	37	12,259	65	2009	Busch Agricultural Resources, LLC, Ft. Collins, CO
Malt	Moravian 164	Pop09-051-007	46	9,969	80	2019	Molson Coors Beverage Company
Malt	Moravian 179	C10-116-201	46	9,969	80	2019	Molson Coors Beverage Company
Malt	Moravian 69	C69	38	11,937	67	2005	Molson Coors Beverage Company

[1]Adjusted to plant 800,000 seeds per acre under irrigation according to the number of seeds per pound for each variety.

[2] Hulless

RESULTS AND DISCUSSION

Planting Conditions

The fall of 2020 was dry and like most years, had to be irrigated prior to or after planting for seed to germinate and emerge. Ririe winter dryland plots germinated but did not emerge from the ground until the following spring. There were good conditions for early to mid-season planting of winter grain at irrigated locations but subsoil moisture at all locations was very low. At Aberdeen, September precipitation was much lower than average (see Chart 1), followed by a very dry winter.

Spring planting conditions were good for stand establishment, and moisture was average to very good depending on location.

Weather Conditions

Winter conditions did not result in winter damaged grain in irrigated fields unless the soil moistures were low. Spring conditions were average until May, when temperatures exceeded average and continued higher than normal through the summer. The accumulation of growing degree days exceeded the average of the previous 31 years starting in April and met then surpassed the hottest year of 2015 starting in early June. Heading dates of winter wheat were a little later than the 10-yr average, while spring wheat was 3 days earlier than average (Table 3). Spring barley heading dates were at the average for the previous 10 years.

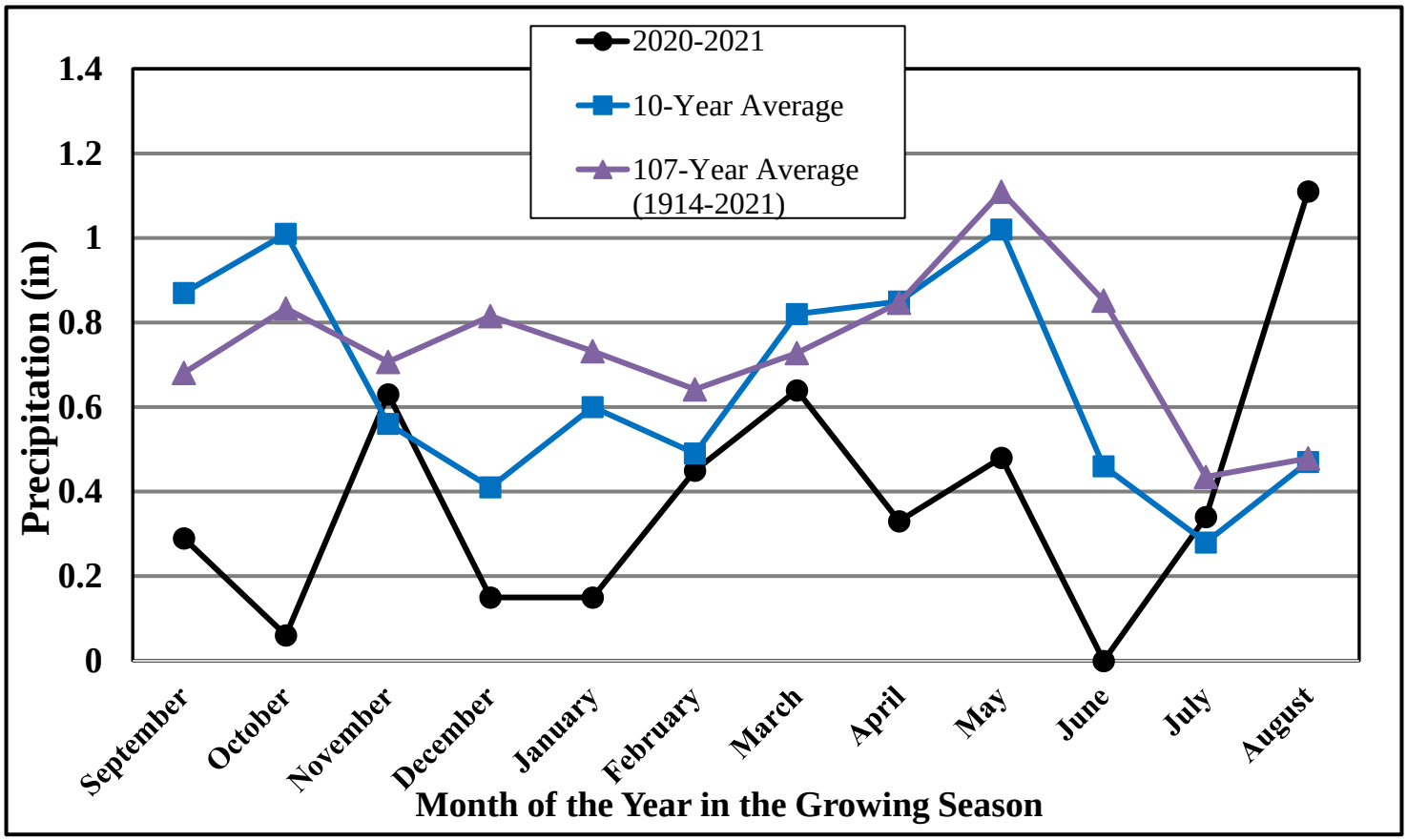


Chart 1. 2020-2021 growing year precipitation record at Aberdeen, ID, versus 10-year and 107-year averages. Source: NWS & Agrimet data.

High temperatures during the growing season resulted in heat damage during flowering for some spring grains. Natural precipitation was below the 10-year and 107-previous year averages in almost every month until July and August, when late rain resulted in sprout damage at several locations (Chart 1). The results of falling number tests can be found on our website.

Over all locations (Table 3), yields were much lower than average for spring wheat and barley, and slightly below average for winter wheat. Plant heights were less than average for winter and for spring barley average for spring wheat. Lodging was higher than average for wheat and at average for spring barley. Due to the excessive heat and dry subsoil conditions, test weights were low for all crops, with excessive heat damaging the spring crops far more than the winter grain.

Crop quality was considered fair to good with very little damage from Fusarium head blight (FHB) and very low vomitoxin levels detected overall. There were several fields of wheat planted after corn that had very high levels of DON (vomitoxin associated with FHB infection), but overall due to the heat and dry conditions, disease levels were minimized.

Disease and Insect Problems

Overall, major insect and disease issues were limited to wireworms in the very early part of the season and cereal leaf beetles. There was no stripe rust reported, but some incidences of bacterial leaf streak (Xanthomonas) were reported. Physiological leaf spot (PLS) was not a problem in 2021.

There were not significant snow accumulations and very little winter wheat was damaged by snow mold. Overall, foliar diseases were low as compared to previous years when black chaff and bacterial streak were widespread. Infection with *Xanthomonas* often occurs earlier in the season facilitated by hail events, then develops rapidly as the temperature increases and is then spread via irrigation. There is very little that can be done to prevent or reduce the disease as fungicides are completely ineffective on bacteria. Reducing frequency of irrigation and increasing amount of irrigation is supposed to reduce how fast the disease spreads. Clean seed is also supposed to reduce likelihood of transmission to additional fields; however, the bacteria are everywhere, and hail events are unpredictable and uncontrollable. Effective measures to reduce the disease are often not practical or possible when environmental conditions are conducive for infection and spread.

Wireworms (of various species) were damaging in only a few areas across the region, reducing stand and yield of spring wheat and barley in dryland production, but damage was not severe as in previous years. As the soils quickly became dry and warm early in the season, damage stopped as the wireworms buried deeper into the soil. In general, winter grain could be used to avoid wireworm damage as wireworms are less active in warmer, drier soils when winter wheat would be planted. However, seedling emergence in dry soils is problematic, and winter kill increases under dry conditions. Insecticides applied as seed treatments reduce but do not control wireworms and the resultant feeding damage. Newer insecticides offer better protection.

Wheat Stem Sawfly (*Cephus cinctus* Norton) was not damaging in dryland spring grain as in previous years. The discovery of Hessian fly (*Mayetiola destructor* Say) in southern Idaho in 2015 raised a great deal of concern, as many of our currently grown

varieties are not Hessian Fly resistant. The Hessian fly larvae were discovered in late-planted spring wheat in the Parma area, and also can damage spring barley. There was a second report of Hessian fly in 2021 occurring in volunteer wheat near Parma.

Volunteer grain continues to contribute to some green bridge conditions. Usually, early planted winter wheat and barley suffer from barley yellow dwarf (BYD) and wheat streak mosaic virus (WSMV) infections, but many producers have the equipment necessary to avoid having to plant too early to get all their acreage planted.

Stripe rust (*Puccinia striiformis* f.sp. *tritici*) Stripe rust did not infect susceptible varieties of fall-planted wheat, preventing disease carryover to the spring. Susceptible spring wheat never became infected even late in the season. Actively scouting fields of susceptible varieties is highly recommended in order to identify infection as early as possible. Fungicides can then be applied to prevent yield loss especially should stripe rust infect wheat plants prior to flowering. Susceptible varieties, such as Brundage, may need two fungicide applications to control stripe rust in high pressure years. Two-rowed barleys tend to have greater levels of resistance to stripe rust than do the six-rowed varieties, and no barley stripe rust was found in 2021.

Barley scald (*Rhynchosporium secalis*) did not reach the damaging levels and was seen at low levels in Ashton. In most years, low levels of early season scald infection do little to affect the barley crop and yield and can be ignored. Previous years (2009-2011) were not by any means typical, and scald ran rampant in fields in 2009 where application of fungicides would have prevented significant crop loss. This will be a disease to watch in future years, especially as production of winter barley increases the chances of high levels of disease developing which then may affect early development in spring barley. Barley scald will also increase in minimum and no-till situations where the fungus may reside in residue.

Snow mold *(Typhula spp.)* occurs during long periods of snow cover when snow falls on unfrozen soil. Stands of winter wheat in upper elevation areas were not significantly affected in 2020 or 2021, as in 2019 when stands were reduced 75-100% in production fields around Ashton. Those fields were replanted with spring grain.

Strawbreaker foot rot (formerly *Pseudocercosporella herpotrichoides* now *Ocumacula yallundae* and *O. acuformis*) is a stem-based disease usually found in winter wheat and barley, but in some years can be found in spring grains. Strawbreaker, also called eyespot, occurred throughout the production region in 2019 and 2020, and in 2020 was as prevalent in spring grain as in in winter grain. Infection occurs from residue-borne fungi when there is excess moisture, humidity and cool temperatures through the winter and spring. Characteristic elliptical lesions form at the lower nodes of the stem, weakening the tiller and increasing lodging. This disease is exacerbated by rainy spring conditions and successive years of grain production. High rates of nitrogen also promote the disease, especially when applied alone without other 'balancing' nutrients. The most effective means of reducing this disease is through crop rotation. However, if detected early in the spring, this disease is reduced with the application of benomyl fungicides like Benlate, Topsin M, or Mertect.

***Fusarium* spp.** causing foot rot, some ***Rhizoctonia* spp.** and **Take-all** (*Gaeumannomyces graminis* var. *tritici*) occurs frequently in grain following grain. Fusarium occurs where deficit moisture

conditions early to mid-season which predisposes crops to infection and occurs where irrigation was not increased to compensate for moisture deficits. Due to the dry conditions in the winter and spring of 2021, there were very few incidences of take-all. However, there were several spring wheat fields with Pythium and Rhizoctonia infections that occurred when volunteer plants were killed with herbicide immediately prior to planting. It is highly recommended to eliminate volunteer grain in the fall prior to winter setting in, or at least two to *three* weeks prior to spring sowing. Later planting reduces spring yield and quality, but substantial and greater yield reductions occur with soil-borne diseases in grain following grain. Diseases that spread from dying grain can cause a great deal of damage to the developing roots and seedlings of the newly planted crop, reducing tillering, water and nutrient uptake.

Rhizoctonia infections occurred in many production fields where winter wheat followed winter wheat. Symptoms were more severe with heavier wheat straw residue leading to reduced stands in affected areas, with the cool wet spring exacerbating the severity. Symptoms include stunting and yellowing of plants, fewer tillers and leaves with yellow stripes that resembled nutrient deficiencies. Best management practices include crop rotation and even distribution of straw at harvest with combine choppers / spreaders.

Pythium was not damaging to winter wheat and early planted spring wheat and barley fields. Pythium can be very damaging to early planted spring grain when rains and cool temperatures followed planting, which was definitely an issue in 2019 but less so in 2020 and 2021. Seed treatments with metalaxyl, mefenoxam and / or ethaboxam are important for preventing infection of vulnerable seedlings. There are strains of Pythium with resistance to metalaxyl / mefenoxam, that do not show resistance to ethaboxam fungicide.

Luckily, growing conditions in 2021 were not conducive to widespread grain infections of **Fusarium head blight (FHB)** (also called Head Scab, causal organisms *Fusarium graminearum* and other *Fusarium* spp.). Hot and dry conditions at flowering were not favorable for infection. High levels of DON (>10 ppm) occurred in seed grain that was planted in a field following corn. A significant problem in 2015, FHB reduced yields and contaminated grain with toxins over multiple years - in 2011, 2012, 2014 and 2015. In 2015, *Fusarium graminearum* was widespread but **was not** restricted to where wheat follows corn production. Spores formed on corn residue can travel many miles in the wind. This disease was also severe where spring barley followed corn, as the fungus reproduces extensively on corn residue. Rejectable levels of deoxynivalenol toxin, (abbreviated as DON and also called VOM, short for vomitoxin), which is a by-product of the fungal infection process, contaminated 2015 malt barley and many acres of spring barley in the Rupert production region. It is highly recommended that irrigated spring grain be treated with an appropriate fungicide at flowering to reduce infection, especially when a hard white or hard red spring wheat or barley follows corn production. Even in 2019 where conditions did not favor FHB, low levels of DON (less than 2 PPM) were found in barley following corn. In 2020, there were very few reported cases of FHB or DON being problematic in spring wheat or spring barley. It is essential that a **triazole** fungicide be utilized, as strobilurin fungicides are ineffective in reducing the accumulation of toxins. (See Addendum 3a-3d and 4a-4c for 2020 data of spring wheat reaction to FHB infection, and Addendum 6a-6c and 7a-7c for spring barley.)

The **"Spot Form of Net Blotch**" (SFNB) of barley *Pyrenophora teres* f.sp. *maculata* was first diagnosed in a few fields near Blackfoot in 2013. In 2014, SFNB became severe in many areas throughout Idaho and Montana. This disease occurs widely in North Dakota and the upper Mid-West, reducing yields by up to 50% and grain weight by 20%. SFNB was still problematic in 2019, especially in no-till situations, but was not as severe as in 2015. Areas that have reduced tillage and low crop diversity are at increased risk as this disease survives in barley stubble. Some varieties are more susceptible than others. Crop rotation and fungicide applications significantly reduce the impact of this disease. Fields that had been sprayed with fungicides at herbicide timing have been observed to have significantly less disease. Additional testing to develop control recommendations in our environment is required.

Cereal cyst nematode (*Heterodera avenae*) (CCN) commonly damages spring wheat and spring barley fields in the northern Snake River Plain, with visible damage in crops from Rexburg, Plano, and St. Anthony through the Ashton area. CCN affects all grassy crop species and can even infect grassy weeds. Research conducted in St. Anthony with Dr. Richard Smiley (Professor Emeritus, Oregon State University) identified resistant and tolerant varieties of spring wheat and barley and was published in 2015. However, dry soil conditions in spring 2021 reduced root invasions, and the CCN screening trials conducted in a heavily infested field west of Rexburg resulted in very low disease pressure and unsuccessful screening. Crop rotation to broadleaf crops will substantially reduce CCN populations in the soil.

Green Bridge

A "green bridge" is generally defined as the overlap of different cropping cycles (or crop generations) within a year. This means there is a constant availability of living, green host material of a given crop. This occurs in many locations in southern and southeast Idaho for several reasons: 1) late maturing tillers (as occurred in 2010) of winter wheat stay green and growing even after harvest; 2) windy conditions causes shattering of spring grains (as in 2010) prior to complete maturity of the crop; 3) hail storms induce shattering of grains prior to crop maturity. Shattered grain germinates and results in the continuous presence of living host material, which means there is a constant supply of host plant material for disease-causing organisms and insects; 4) In most years, volunteer grain blown out of the combine at harvest germinates and provides a green bridge, increasing the likelihood and risk of higher disease and insect problems for the next growing season. Many growers use the volunteer growth as feed or forage for livestock, but that can result in extensive carryover of pathogenic organisms from year-to-year. In years like 2019 and 2020 where conditions are very dry in July, August and September, green bridge situations are less of a problem as there is little moisture for germination, unless irrigation is applied to stimulate germination of residual seed.

Other green bridge examples include heavy, unusual rains in August of 2014 prior to harvest, which resulted in extensive losses due to sprout but also set up green bridge conditions when grain shattered and germinated before harvesting could occur. Because of the green bridge, aphids and certain disease-causing organisms can jump to the emerging winter crop, causing direct damage and / or transmitting viruses. In 2015, many growers irrigated the volunteer for forage. With an early harvest and a long warm fall of 2015, the volunteer from the spring crop was in grain fill prior to a killing frost in November. The green bridge

situation resulted in extensive BYD and stripe rust infection in the fall volunteer.

In the fall of 2014, 2015 and 2016, high populations of aphids moved into the earliest emerging winter wheat and barley, contributing to a widespread occurrence of BYD in southern Idaho. Corn is a 'silent' host of barley yellow dwarf virus, hosting high concentrations of the virus without symptoms or damage to corn. Late in the fall season, aphids (especially English grain aphids and Bird-cherry oat aphids) move from corn to winter cereals, landing on the newly emerged grain and transmitting the virus to the new crop. Aphid populations may build up before a killing frost occurs. Severe stunting and yellowing of grain in the spring becomes apparent, resulting in yield reductions of over 50% in the most severely affected fields. However, in the spring of 2017, 2018, 2019 and 2020, lower levels of fall transmission occurred due to dry summers, delayed fall planting, use of insecticidal seed treatments and excellent growing conditions, preventing widespread losses from BYD.

2021 Report: Discussion of Location Conditions and Results

NASS within the USDA reports Idaho 2021 wheat yields at 68 bu/A over all categories (irrigated and dryland, winter and spring), down substantially from 2020. Out of 1.227 million acres planted, 1.132 acres were harvested. For spring wheat, 485,000 acres were harvested of the 510,000 acres planted resulting in an average of 63 bu/A. For winter wheat, 640,000 acres were harvested of the 710,000 acres planted with an average yield of 71 bu/A. Overall, quality was reported as good but heat stress reduced yield and test weight, resulting in high protein grain.

For barley, 490,000 of 520,000 acres planted in 2021 were harvested (NASS) for a total harvest of 43.6 million bushels. The average yield in the state was reported as 89 bu/A.

https://www.nass.usda.gov/Statistics_by_State/Idaho/index.php

It is best to consider three year or multiple year, multiple site averages when choosing varieties for your specific location. Conditions vary tremendously from year to year, and one-year results can often be misleading. Yield stability and disease reactions often require many years and/or locations of evaluations. Balance selections based on yield, good test weight, protein levels appropriate to market class (low protein for soft wheats, high proteins for hard wheats) as well as disease resistance specific to your production zone. While the multiple location/three-year average data presented in the Tables provide more accurate information, new varieties will have limited performance information, which may not be a good reflection of long-term performance.

Protein Targets

Hard Red Winter Wheat = 12.5% minimum
Hard Red Spring = 14.5% minimum
Soft White Winter = 10.5% (9-12%)
Soft White Spring = 10.5% (9-12%)
Club wheat <10%
Malt Barley = 9.5-12.5%

Keldin + 11-52-0 – In-furrow fertilizer was added to one variety in the hard winter group to test the effect of starter fertilizer on yield. (Monoammonium phosphate or 11-52-0 at 20 lbs phosphate per acre was included in-furrow.) In Table 4, Keldin was 1 bu/A greater than Keldin +11-52-0 with the starter fertilizer which is not considered statistically significant (SE = 2 bu/A at Pr = .01). Table 4 included three years of data over multiple irrigated sites. Other

agronomic traits were very similar indicating no effect of starter fertilizer. Under dryland conditions (Table 5), Keldin + 11-52-0 was 3 bu/A greater than Keldin, with the standard error of 1.5 bu/A. The impact of starter fertilizer is usually greater in dryland conditions where there is usually not a lot of excess nutrients left from the previous crop.

Winter Wheat 3-Year Averaged Data

Three-year averages of hard winter wheat over all irrigated locations (Table 4, 11 site-years) put LCS Jet, WB4792, Keldin, Yellowstone, Keldin + 11-20-0, and LCS Rocket at the top with 155, 154, 152, 151, 151 and 151bu/A, respectively. Test weights were good, averaging 60.3 lbs/bu. Protein targets for hard red winter wheat is 12.5%, and these trials resulted in lower than needed average protein. Lower yielding varieties had enough soil and applied nitrogen to meet protein goals, but higher yielding varieties required additional protein to hit desired targets. **Averaged over all 2021 irrigated locations**, the highest yielding **hard winter wheat** varieties (Table 6) were Keldin (152 bu/A) and WB4401 (147 bu/A), both with higher than average test weight. Test weight in 2021 was very low due to hot and dry conditions. Keldin headed three days later than WB4401, was one inch shorter and had 0.7% higher protein. UI Bronze Jade was the highest yielding hard white winter variety, but poor quality will limit marketability of UI Bronze Jade.

Average 3-year dryland yields for hard red and white winter (Table 5) were 35 bu/A, where the top yielding varieties included Sequoia (40 bu/A), UI Silver (39 bu/A), Utah 100 (38 bu/A), Keldin (with 11-52-0 at 37 bu/A), Yellowstone (37 bu/A) and UI SRG (36 bu/A). Protein average for these trials was 12.6%, and test weight averages were low to good, with 59.4 lbs/bu average. **2021 combined dryland yields** for **hard** red and white **winter wheat** (Table 7) averaged 15 bu/A, with the highest yielding variety at 19 bu/A due to severe drought conditions.

The top yielding **soft white winter varieties over the last three years** over all **irrigated** locations (Table 15) are LCS Hulk (159 bu/A) VI Shock and LCS Blackjack (both at 158 bu/A), WB1783 (155 bu/A), SY Raptor, IDO1708, SY Ovation and VI Voodoo CL+ (all at 152 bu/A). All test weights were below 60 lbs/bu except for WB1783, WB1376CLP, WB456, WB1529 and SY Assure. Proteins for the trials were within the soft white winter protein targets between 9–12% except for LCS Blackjack which was a bit on the high side at 12.3% grain protein. **Averaged over all 2021 irrigated locations**, the highest yielding **soft white winter wheat** named varieties (Table 17) were AP Exceed (156 bu/A) and VI Shock (150 bu/A). Heading date averaged June 7, and average test weights were very low at 56.3 lbs/bu.

Average 3-year dryland yields for soft white winter (Ririe, Rockland and Soda Springs) (Table 16) were 34 bu/A, where the top yielding varieties included LCS Hulk (40 bu/A) and UI Sparrow (39 bu/A). Eltan 11-52-0 and Otto yielded 38 bu/A, while Norwest Duet yielded 37 bu/A. Eltan and VI Voodoo CL+ yielded 36 bu/A. All had test weight less than 60 lbs/bu and UI Sparrow, Eltan 11-52-0, and Otto had protein over 12%. There were several varieties having high protein, mostly due to the drought conditions of 2021 biasing the protein upwards. One-year combined dryland locations for 2021 (Table 18) averaged 15 bu/A, with the highest yielding varieties at 19 bu/A (WB1783 and VI Presto CL+). Due to the severe drought, test weights averaged 52.9 lbs/bu and grain protein averaged 14%.

Winter Barley 3-Year Averaged Data

Three-year, multiple location averages for winter barley are presented in Table 26. Top yielding released varieties include KWS Donau (163 bu/A), DH140963 (162 bu/A), Sunstar Pride and KWS Somerset (both at 157 bu/A), LCS Calypso and Thunder (both at 156 bu/A). There are malt, feed (Sunstar Pride, Eight-Twelve) and food lines in this trial, with Upspring being a hulless food line with very high test weight (comparable to winter wheat) but having reduced spring stands. Proteins were in the target range for malt specs except for the food line Upspring, which averaged 14.6% grain protein, and KWS Scala and Lightning. High protein and low test weights of 2021 reduced overall 3-year averages. Plumps of Charles and Endeavor were low and lodging was high compared to the other winter malt varieties. KWS Donau, LCS Calypso and Upspring also had lower lodging. For the one-year **irrigated averages in 2021** (Table 27), the top yielding lines and varieties are 13 ARS537-13 (164 bu/A) 13ARS537-25, 13ARS537-19, and KWS Somerset (all at 152 bu/A), LCS Calypso (150 bu/A0) and Hirondella and Thunder (both at 146 bu/A). Test weights averaged 49.9 lbs/bu and grain proteins below 11.5%, except for the hulless food barley Upspring (12.7% protein with test weight at 58.2lbs/bu), LCS Calypso (11.9% protein), Flavia (11.6%), KWS Scala (11.8%), Lightning (11.8%), 05ARS849-15 (12.4%), VA16M-84 (12.5%), and Charles (11.7% grain protein).

Spring Wheat 3-Year Averaged Data

Over **three years over all locations**, averaging over twelve site-years, the highest yielding hard spring varieties under irrigation (Table 31) were Dayn (hard white spring wheat at 121 bu/A), SY Teton (hard white at 111 bu/A), and AP Renegade (109 bu/A). The hard reds with the best combinations of test weight and high protein include Alum and WB9668. The average 3-year test weight was 60.6 lbs/bu, and the average grain protein was 13.9%. High protein lines were WB9668 (15.2%), Alum (14.7%), WB9879CLP (14.6%) and the hard white WB7328 (14.5%). The **2021 combined irrigated average** (four locations) for hard spring wheat (Table 33) was 104 bu/A. IDO1804S and Dayn averaged 115 bu/A, and IDO2105S 113 bu/A, all with protein less than 14%. High protein red lines were WA 8357 (15.2%), Dagmar (15.0%), and Alum (14.8%).

There is only one **dryland location** for spring wheat (Soda Springs), and the three-year average data is in Table 32. Highest yielding hard spring varieties include Dagmar at 55 bu/A, Dayn (W) at 54 bu/A, Jefferson at 53 bu/A, and SY-Teton (W), Net CL+, and WB7202CL+ (W) all at 52 bu/A. Test weights were above 60 lbs/bu. Grain protein was less than 12% indicating higher fertilization is required to bring the hard spring wheat up to preferred levels of grain protein. WB 9668 and Dagmar showed high test weight and high grain protein.

Three-year averages for soft white spring wheat over all locations (Table 40) put WB6430 at the highest yield (120 bu/A), followed by Melba and UI Cookie (115 bu/A), Tekoa (111 bu/A), and Alturas, Seahawk, and UI Stone (all at 110 bu/A). The **2021 combined irrigated average** for soft white spring wheat (Table 42) was 108 bu/A. IDO1902S yielded 121 bu/A, WA 8327 yielded 119 bu/A, WB6430 118 bu/A, and Seakhawk115 bu/A. Test weight was 57.6 lbs/bu for the average, and grain protein 10.9%, which was good. Yields were lower than expected in 2021, and test weights were low due to high heat conditions during grain fill.

There is only one **dryland location** for soft white spring wheat (Soda Springs), three-year average data for which is in Table 41. AP Coachman was the highest yielding variety at 60 bu/A, followed by Melba club wheat at 59 bu/A, Tekoa and Ryan at 58 bu/A and Seahawk and IDO1405S both at 57 bu/A. Test weight average was 60.0 lbs/bu, and protein was 10.3%.

Spring Barley 3-Year Averaged Data

Spring malt varieties and feed/food lines are reported in separate tables.

Three-year averages (12 site-years) for the malt varieties (Table 49) puts LCS Odyssey, 10ARS191-3, ABI Eagle, 2IM14-8212, and Explorer at the top (145, 138, 132, 139, 128 bu/A, respectively), all with excellent test weight and protein. Looking at **combined irrigated averages** for 2021 (Table 50), KWS Jessie, LCS Odyssey, Esma and KWS Thalis yielded 149, 145, 145, and 142 bu/A respectively, all with good test weight, protein and plumps.

For the feed and food varieties, over three years (12 site-years), Altorado, Oreana, Claymore, Champion, and Xena were the highest yielding feed varieties (Table 57) at 136, 135, 132, 127 and 125 bu/A, respectively. Kardia (hulled) was the highest yielding food barley, followed by Julie, Transit and Goldenhart (all are hulless, as reflected in the very high-test weights). In the **combined 2021 irrigated trials** (Table 58), the top yielding named varieties were HO516-429 (145 bu/A), Oreana (141 bu/A) and Claymore (140 bu/A. Kardia was the highest yielding food barley (127 bu/A) but is hulled in comparison to the other hulless food barleys.

Winter Grain Locations

Kimberly Research and Extension Center, Winter Grain

Winter wheat nurseries were planted following summer fallow on October 7, 2020 – and were planted into drier than optimal conditions. Irrigation helped provide conditions for uniform germination. The crop suffered no winter damage and was planted late enough to avoid BYDV infection. Stripe rust was absent. Plots were harvested August 11th and 13th. Soft white winter wheat yields averaged 22 bu/A less than 2020, and 42 bu/A less than 2019, with high yields at 164 bu/A, reflecting the dryer soil conditions than in previous years (Table 20). Hard winter wheat yields were 50 bu/A less than 2020 yields and about 56 bu/A less than 2019.

The hard winter wheat group (Table 9) yield ranged from 98 to 154 bu/A. The highest yielding variety was LCS Jet at 154 bu/A. Kairos, Keldin, LCS Rocket, WB4510CLP, and WB4401 were the next highest yielding varieties, yielding 152, 145, 137, 136, and 134 bu/A, respectively. Site average for yield of the hard winter group was 122 bu/A, 50 bushels lower than 2020, and 56 bushels lower than 2019. Test weight average was 54.2 lbs/bu, very poor for winter wheat due to heat and late season rain, and grain protein average for the location was 13.3%. The plots were fertilized for expected yield that was higher than the highest yielding varieties, resulting in high grain protein. Total N available was 580 lbs N/acre. Optimal grain protein for hard red winter wheat should be 12.5% or greater. The ratio of applied N to (122 average) bu/A yield was 4.8, greater than the 3.0 to 3.5 ratio needed for optimal protein in hard winter wheat.

In the soft white winter group (Table 20), 2021 irrigated yield varied from 118 to 164

bu/A with lower CVs for the location than in 2020, but a little higher than 2019. AP Exceed (164 bu/A), SY Raptor (155 bu/A), WB1783 (152 bu/A), SY Assure (150 bu/A0 and AP Iliad (149 bu/A) were the highest yielding varieties, not statistically different from the highest yielding group in bold (Table 20). Test weight averaged a very low 53.7 lbs/bu due to heat at grain fill and late season rain, and grain protein average for the location was at 11.6%. With a total of 360 lbs available N in the nursery (see site description on page 6) and average yield for soft white winter wheat nursery at 137 bu/A, the lbs of N to yield calculates to 2.6 lbs of nitrogen per bushel of yield.

Rupert, Luke Adams, Winter Grain

Plots were planted October 1, 2020 in silt loam soil following sugar beets into good soil moisture and seedbed conditions. Spring stands of the winter wheat nurseries were good, without the damage that occurred in 2017 from excessive snow, ponding water and freeze-thaw cycles. There were no visual symptoms of BYD occurring at this site. Plots were within a winter barley field, which matured prior to the winter wheat resulting in less irrigation than optimal for winter wheat yield. Plots were harvested August 4th and 5th.

Winter barley plots averaged 154 bu/A (Table 29). In 2020 the average yield was 98 bu/A and in 2019 plots averaged 124 bu/A. Yields ranged from 111 (VA16M-84) to 177 bu/A (13ARS537-13 and Hirondella). The ratio of available and applied N (340 lbs N/A) to average bushel yield (154) was 2.2 lbs N/bu. Proteins were not high considering the average was biased up by three high protein food barley lines.

Average yield for the hard winter wheat trial (Table 10) was 156 bu/A, 27 bu/A more than 2020 and 10 bushels more than 2019. Yield ranged from 121 (IDO1906) to 174 bu/A for WB4401. Test weight averaged 59.9 lbs/bu, and protein averaged 11.3%. The ratio of average yield to total N was 380 / 156 = 2.4, below the 3.0-3.5 recommended to obtain high protein (12.5% or greater) hard red winter wheat. WB4401, Yellowstone, Keldin, MT1642, Balance, and Flathead were the highest yielding named lines at 174, 169, 168, 168, 168 and 167 bu/A, respectively.

The soft white winter group (Table 21) ranged in yield from 137 to 175 bu/A, averaging 21 bu/A greater than 2020. The highest yielding varieties were VI Shock (175 bu/A), AP Exceed (172 bu/A), LCS Hulk (171 bu/A), and WA8293 (170 bu/A). Test weights averaged low at 58.0 lbs/bu. The ratio of available and applied N (340 lbs N/A) to average bushel yield (155) was 2.2 N/bu. The proteins were optimal with the trial average at 10.1%. Lodging averaged 10% with one variety averaging 40% lodging.

Aberdeen Research and Extension Center, Winter Grain

The winter trials in Aberdeen were planted September 28th in a Declo loam soil into good seedbed conditions and soil moisture, and harvested August 16, and 17th. The preceding crop was green manure oats. Neither BYD nor stripe rust was observed in the winter grain.

Winter barley yields were as high as 151 bu/A with an overall average of 119 bu/A (Table 28), 59 bu/A less than in 2019 and 36 bu/A less than in 2020. High yielding lines and varieties included 13ARS537-13 (151 bu/A), 13ARS537-19 (144 bu/A), Thunder (139 bu/A), Sunstar Pride (138 bu/A), and 13ARS537-25 (136 bu/A). Spring stands were reduced of some varieties, especially in the hulless food lines like Upspring. If winter kill is a problem, the hulless or naked food lines and Charles and Endeavor (older

malt barley lines) are often are the most susceptible and are the first to show damage. Test weight averaged 49.5 lbs/bu, with an average of 22% lodging, and 11.8% grain protein. The ratio of applied N to average bushel yield was 2.1 lbs N/bu (255 lbs N/119 bu/A). With the relatively high N, grain protein in some malt lines were higher than optimum.

The CV for this trial is good (10.3%). The LSD at 17 bu/A indicates that yield differences have to be greater than 17 bu/A to be considered statistically significantly different.

The hard winter wheat survival (Table 8) averaged 100%. Overall yields were slightly less than 2020 by 5 bushels and less than 2019 by 24 bu/A. Lodging was very low and averaged 1%. Stripe rust was not present in the winter wheat and did not impact yield. The highest yielding lines were WB4792 (151 bu/A), Flathead (146 bu/A), Keldin (144 bu/A), WB4510CLP (143 bu/A), MT1642 (140 bu/A), and Yellowstone (140 bu/A). The CV of 9.1% for yield was good. Heading date for this group at Aberdeen was two days later than last year. Test weights were low at 58.2 lbs/bu for the overall average. There was relatively low lodging in the trial, with only one variety (LCS Rocket) showing moderate lodging at 13%. Grain protein averaged 12.6%. The ratio of applied N to average bushel yield was low at 2.2 lbs N/bu (295 lbs N/133 bu/A). Additional N is recommended for the upper yielding varieties to meet requirements for yield and target protein of 12.5%. The hard red winter wheat Flathead had excellent protein, test weight and yield.

The overall yield average in the Aberdeen soft white winter trial (Table 19) was 137 bu/A, 13 bu/A less than 2020, 28 bu/A less than 2019, ranging from the low of 122 bu/A (WB456) to a high of 153 bu/A. The highest yielding named varieties were SY Raptor (151 bu/A), WB1783 (150 bu/A) and LCS Hulk (148 bu/A). Heading date for this group at Aberdeen was three days later than last year. The test weights averaged very low at 56.4 lbs/bu and the overall grain protein was 11.4%. The ratio of applied N (255 lbs N) to average bushel yield (137 bu/A) was 1.9 lbs N/bu. There was very low lodging with one variety, Sockeye CL+ showing 34%lodging.

Ririe Irrigated, Clark Hamilton, Winter Wheat

Located near the village of Ririe, this irrigated location was added in 2019 on Hamilton Farm about 600 feet lower in elevation than the dryland plots on the Church farm. The plots were planted September 30th, into loam soil following Austrian peas, and harvested August 19.

Spring stand of the hard winter wheat trial was excellent (Table 11), and the average yield was 134 bu/A, varying from 111 (OR2150168H) to 150 bu/A (Keldin). The high yielding lines included Keldin, LCS Rocket (146 bu/a), Flathead (145 bu/A), Balance (145 bu/A) and Milestone (144 bu/A). Test weight averaged 59.4 lbs/bu. Grain proteins were 12.5%, with 2.5 lbs N per bushel (339 total N available /134 bu average yield), indicating less than optimum levels of N to meet yield and protein.

For the soft white winter wheat trial (Table 22), the yield varied from 114 bu/A to 148 bu/A (OR2X2 CL+ and UIL15-028024). Test weights averaged 56.9 lbs/bu. Grain protein averaged 11.1%. The ratio of lbs N to bushel yield was 2.3 (299 total N available /131 bu average yield), indicating less than optimum levels of N to meet yield and protein for the highest yielding varieties, but adequate for medium to lower yielding varieties. The high-yielding lines and varieties included UIL15-028024 (148

bu/A), UIL13-046145A (147 bu/A), AP Exceed (144 bu/A) LCS Hulk (142 bu/A), VI Shock (140 bu/A), and WB1783 (140 bu/A).

Ririe Dryland, LDS Church Farm, Trevor Davey, Winter Wheat

This is a high elevation location (5600 ft.) and is our main location to test grain for winter hardiness under dryland conditions. Soil moisture was very dry to two feet, therefore grain was planted late for this location October 6th following wheat hay. Seed germinated but did not emerge prior to the onset of winter. The trials were harvested September 8th.

The hard winter wheat group (Table 12) had average yields of 16 bu/A, 19 bu/A less than 2020, and 5 bu less than 2019. Previous yields were 2018 at 50 bu/A, 2017 at 31 bu/A, 2016 at 42 bu/A, 2015 at 45 bu/A, 2014 at 21 bu/A, 2013 at 15.5 bu/A, and 2012 at 18 bu/A. The 2021 yield range went from a low of 12 bu/A (LCS Zoom) to a high of 20 bu/A (MT1745). Overall site conditions were extremely stressful, and the CV for yield was a little high (12.8%). MT1745, IDO2006, UI SRG, Yellowstone, Keldin + 11-52-0, and UI Silver were in the top yielding group. Average grain protein was low at 14.3%, reflecting excess nitrogen levels to meet yield and protein. The ratio of available N to bu yield (49 lbs N/ 16) was 3.0. Test weights were low, averaging 55.9 lbs/bu. There was no lodging. The comparison of Keldin at 17 bu/A with Keldin with in-furrow fertilizer of 11-52-0 at 18 bu/A was not significantly different in this trial.

The soft white winter wheat (Table 23) averaged 16 bu/A at this location, ranging from 7 (VI Frost) to 21 bu/A (WB1783). Yields were 23 bu/A less than 2020, and 7 bu/A less than 2019. Overall site conditions were poor, as indicated above. The ratio of available N to average bushel yield (49 lbs N/ 16) was 3.1. Average proteins were very high for this soft group at 14.3%, and test weights were very low and averaged 52.3 lbs/bu. The top-yielding varieties were WB1783, Eltan, Piranha CL+, Eltan 11+52+0, and VI Presto CL+ (21, 19, 19, 19, and 19 bu/A, respectively). Average heading date was 6/23, one day later than 2020 (6/22) and two days earlier than 2019 (6/25). Average plant height was only 18 inches.

Rockland, Gilbert and Carl Hofmeister, Hard and Soft White Winter Wheat

The hard red and white winter wheat trial at the Hofmeisters' was planted following fallow on September 24th and harvested July 23rd. Snow mold diseases were not a significant problem, and spring stands were low for hard winter wheat (75% in Table 13) and soft winter wheat (76% in Table 24). Dwarf bunt (*Tilletia controversa* Kuhn) was not a problem this year, but all winter varieties were included in dwarf bunt testing in Logan, UT, by Dr. David Hole, Utah State University professor and wheat breeder. When using varieties that are susceptible to dwarf bunt, it is highly recommended that an appropriate seed treatment is used to prevent dwarf bunt infection.

The hard winter wheat yield average was 13 bu/A, 27 bu/A less than 2020, and 20bu/A less than the 2019 average. The 2021 yield ranged from 9 to 18 bu/A with a yield CV at 23.4%. The top yielding varieties this year were UI SRG (18 bu/A), Juniper, MT1745, UT-10926-1, and Yellowstone (all at 17 bu/A), and Keldin and Keldin + 11-52-0 (both at 16 bu/A). Heading date was two days later than 2020 (6/6) and one day earlier than in 2019. Grain proteins were13.9%.

The soft white winter nursery included at this location reflects the number of growers in the area that are producing soft white winter wheat, although the area is also well-suited for hard winter wheat production. The soft white winter varieties WB1783, SY Ovation, Sockeye CL+, Norwest Duet, Piranha CL+, and OR2130755 averaged 17, 16, 15, 14, 14, and 14, respectively (Table 24). The test weights averaged 54.7 lbs/bu. Grain protein averaged 13.8%, too high for soft white wheat targets. Heading date was four days later than 2020 (6/6) and one day later than in 2019. There was no lodging. Eltan planted with an application of monoammonium phosphate at 20 lbs phosphate per acre 11-52-0 in furrow did not yield differently than without the preplant fertilizer, but under the high stress conditions of 2021, that is not surprising.

Spring Grain Locations

Rupert, Duane Grant 4-D Farms, Spring Grain

The variety trials in Rupert were planted April 1st in silt loam soils (7 days later than in 2020) with good soil moisture and harvested August 24th and 25th. The preceding crop was sugar beets. There were no major weather-related problems.

There was no lodging for the **hard spring wheat** nursery (Table 37). Average yield was 109 bu/A, compared to 114 in 2020 and 131 bu/A in 2019. Test weight average was 59.1 lbs/bu, and average protein was at 13.9%. The top yielding lines and named varieties were IDO1804S (128 bu/A and 13.3% protein), WB7313 (125 bu/A and 14.2% protein), WB9707(120 bu/A and 14.2% protein) and BZ917-221 (120 bu/A and 13.9% protein). The ratio of available and applied N (464 lbs N/A) to average bushel yield (109) was 4.3 lbs N/bu. The average grain protein for this trial was lower than expected at 13.9% with the very high levels of available N. All hard red and white spring plots were topdressed at flowering with 40 units of N/A. Heading date for this location was seven days later than for 2020.

The **soft white spring wheat** yield (Table 46) average was 128 bu/A. In 2020, it was 117 bu/A, and in 2019 it was 140 bu/A. In 2021, WB6430 yielded 145 bu/A at 10.0% grain protein, UI Cookie yielded 143 bu/A at 10.6% protein, Seahawk yielded 140 bu/A at 10.0% protein. Grain protein average was at 10.6%. The ratio of available and applied N (424 lbs N/A) to average bushel yield (128) was 3.3 lbs N/bu. The yield CV was also good at 11.5%, indicating the variability in this trial was higher than in the previous years.

The **spring malt barley** trial at Rupert (Table 54) had average yields of 131 bu/A, about 23 bushels less than 2020, and 13 bu/A more than 2019, with a yield range from 98 (AC Metcalfe) to 151 bu/A (LCS Odyssey). The ratio of available and applied N (424 lbs N/A) to average bushel yield (131) was 3.2 lbs N/bu. Lodging averaged 48% overall, and grain protein averaged 10.7%, lower than would be expected for the available nitrogen. LCS Odyssey was the top yielding malt barley (151 bu/A), followed by KWS Jessie (150 bu/A), AAC Connect+base+root2 (147 bu/A), Esma (145 bu/A), ABI Eagle (1144 bu/A) and LCS Genie (142 bu/A). Test weights averaged 48.8 lbs/bu, and percent plumps were 91.8%. Heading date for this trial was 6/12, six days later than 2021.

The average yield for two-rowed feed barley in Rupert for 2021 (Table 62) was 140 bu/A, 16 bu/A less than 2020, and 1 bu/A less than 2019. The high yielding two-rowed feed varieties were Altorado (166 bu/A), HO516-429 (156 bu/A), Oreana (155 bu/A), Claymore (148 bu/A), Moravian 180 (142

bu/A), Diamondback (SB6) (140 bu/A). Average test weight for this trial was 50.3 lbs/bu for the feed barleys, and 54.3 lbs/bu for hulless and hulled (Kardia) food barleys. The hulless, high beta-glucan food barleys Julie, Transit, and Goldenhart yielded 109, 94, and 90 bu/A but also had high test weights (58.6, 55.0 and 55.3 lbs/bu, respectively). For this trial, the ratio of available and applied N (424 lbs N/A) to average bushel yield (140) was 3.0 lbs N/bu with an average site grain protein of 10.7% for the hulled, and 10.9% for the hulless.

Aberdeen Research and Extension Center, Spring Grain

Spring variety trials were planted April 2nd, seven days earlier than in 2020, in Declo loam soils with good soil moisture and were harvested August 31st and September 1. The preceding crop was green manure oats. Stripe rust of wheat was not present and overall disease pressure was very low.

The CV's for the Aberdeen spring trials were higher than desired, with the CV for the hard spring wheat nursery at 11.1% for yield (Table 34). Hard spring wheat yield varied from 98 bu/A (ISO2105S) to 126 bu/A (WB7696). The top five named varieties for yield in the hard red and white trial were the hard white springs WB7696 (126 bu/A with 12.9% protein), AP Renegade with specific seed treatment (123 bu/A and 14.1% protein) Dayn (121 bu/A and 13.4% protein), SY Teton (114 bu/A and 13.8% protein) and AP Renegade with our standard seed treatment (116 bu/A and 12.7% protein). The highest yielding hard reds were AP Renegade+base+root2 (123 bu/A with 14.1% protein), WB9707 (118 bu/A and 14.5% protein) and AP Renegade (116 bu/A with 12.7% protein), and SY Gunsight (116 bu/A with 13.4% protein). Test weights for the hard spring wheats averaged 58.3 lbs/bu, low due to the excessive heat and dry conditions of the summer. There was some lodging of three varieties (WA8330, MT2075, and MT Sidney) and the grain protein average was 14.2%. (All hard spring wheat trials are top-dressed at flowering with 40 units of N to promote higher protein hard spring wheat.) The ratio of available and applied N (366 lbs N/A) to average bushel yield (109) was 3.4 lbs N/bu with an average site grain protein of 14.2%. Yields were 22 bu/A greater than in 2020, where plots were planted in a very poor soil location.

The soft white spring wheat yields at Aberdeen (Table 43) averaged 114 bu/A with a range from 103 (WA 8321) to 129 bu/A. The average yield was 31 bu/A higher than 2020 and 18 bu/A higher than 2019. Highest yields of lines and named varieties were obtained from IDO1902S (129 bu/A), Seahawk (124 bu/A), Alturas (123 bu/A), IDO1702S (122 bu/A), and Melba (club wheat, 120 bu/A). The heading date of 6/15 was one day earlier than in 2020. There was some lodging with varieties Louise, WA8325, Hedge CL+, and WA 8321 and test weights averaged 57.4 lbs/bu, very low in comparison to most years. The ratio of available and applied N (256 lbs N/A) to average bushel yield (114 bu) was 2.2 lbs N/bu with an average site grain protein of 10.0%.

Two-rowed malt barley lines yield average was reduced 5 bu/A from 145 bu/A in 2020 to 140 bu/A in 2021.(Table 51). Yield ranged from 115 bu/A (MS-21B1) to 171 bu/A (Esma). The top yielding lines were Esma (171 bu/A), KWS Jessie (167 bu/A), BC Leandra (161 bu/A) and KWS Thalis (161 bu/). The average heading date was 6/15 eight days earlier than 2020, and lodging averaged 32%. The ratio of available and applied N (256 lbs N/A) to average bushel yield (140 bu/A) was 1.8 lbs N/bu with an average site grain protein of 9.7%.

The average yield for two-rowed feed barley in Aberdeen for 2021 (Table 59) was 142 bu/A, 40 bu/A higher than 2020. The high yielding two-rowed feed varieties were HO516-429 (163 bu/A), Altorado (155 bu/A) and Claymore (152 bu/A). Average test weight for this trial was 49.5 lbs/bu. The hulless, high beta-glucan food barleys Goldenhart, Transit, and Julie yielded 101, 95 and 92 bu/A but also had high test weights (55.0, 53.9 and 56.1 lbs/bu, respectively). Kardia is hulled with lower test weight than the hulless lines. The heading date for this trial was 6/17, eight days earlier than in 2020. Lodging averaged about 29%. For this trial, the ratio of available and applied N (247 lbs N/A) to average bushel yield (142 bu/A) was 1.7 lbs N/bu with an average site grain protein of 11.2%.

Idaho Falls, Marc Thiel, Spring Grain
The Idaho Falls locations followed barley (wheat plot site) and alfalfa (barley plot site) and was planted April 29th in silt loam soils with good soil moisture and harvested August 16th. The surrounding field was in wheat.

Average grain yield for the hard spring wheat (Table 36) was 123 bu/A, which was 8 bushels more than 2020 and 7 bushels more than the average in 2019. Hard spring wheat ranged in yield from 106 (MT Sidney) to 140 bu/A (IDO2105S). Average grain protein was at 13.9%, and test weight was at 58.6 lbs/bu. The five highest yielding named varieties were Dayn hard white (136 bu/A and 13.2% protein), WB7313 hard white (133 bu/A and 13.5% protein) and Dagmar hard red (126 bu/A and 14.8% protein). Some varieties had high degree of lodging (MT2075, WB9879CLP, WA 8357, MT2063, and MT Sidney).

The high protein lines include MT Sydney at 15.6%, Alum at 15.5%, Dagmar at 14.8%, and Net CL+ at 14.5%. Test weight was low overall, averaging 58.6 lbs/bu. The ratio of available and applied N (398 lbs N/A) to average bushel yield (123) was 3.2 lbs N/bu, resulting in good to excellent protein levels.

IDO1902S, WA 8327, WB6430 and UI Cookie topped the yield chart (Table 45) for the soft white spring wheat varieties at Idaho Falls at 143, 138, 138 and 137 bu/A, respectively, with an overall average of 128 bu/A, 3 bu/A more than 2020 and 8 bu/A greater than 2019. Yields ranged from 107 bu/A (Louise) to 143 bu/A. Test weight averages were poor at 57.0 lbs/bu, and grain proteins were at 11.3%. The ratio of available and applied N (358 lbs N/A) to average bushel yield (128) was 2.8 lbs N/bu, adequate for the higher yielding varieties, but too high for lower yielding varieties, as indicated in variety response of grain protein.

Two-rowed malt barley yields (Table 53) averaged 118 bu/A, about 25 bu/A less than 2020 and 10 bu/A greater than in 2019. The yield ranged from 77 (LCS Opera) to the highest yielding variety Esma which hit 139 bu/A. Other top yielding named varieties included AAC Connect (138 bu/A), KWS Jessie (134 bu/A) and LCS Odyssey (132 bu/A). Test weight average was low at 47.7 lbs/bu, protein average was 9.1% and lodging was moderate to high at 28%. The ratio of available and applied N (250 lbs N/A) to average bushel yield (118) was 2.1 lbs N/bu, indicating the amount of available N was not excessive enough to raise barley grain protein levels into an unacceptably high range.

Two-rowed feed barley trial (Table 61) averaged 104 bu/A, with the top yielding lines averaging 141 bu/A (Oreana) with 49.8 lb test weight. HO516-429 yielded 130 bu/A, Claymore yielded 129 bu/A and Champion 117 bu/A. The test weight

average for the feed lines was 48.5 lbs/bu and protein average was only 9%. The presence of hulless food barleys in the trial would bias the test weight averages higher so they were averaged separately. Test weight of the hulless lines averaged lower than usual at 54.3 bu/A (with hulled Kardia, average at 49.0 lbs/bu) and the protein was at 16.2%.

Ashton, Alan Baum, Spring Grain

The Ashton location was planted May 3rd in silt loam soil into good soil moisture following potatoes. Plots were harvested September 2nd and 3rd. This location had very heavy weed pressure from wild oats which substantially affected yield. The oats at this location are being tested for herbicide resistance.

Two factors are important in plant health and reducing yield potential (above stripe rust impacting crop) in this area. Soil pH can be low, sometimes below 6 which can contribute to high micro-nutrient accumulations (magnesium, manganese, iron and boron). This location was higher in pH than last year at 6.2, while last year (2020) was lower at pH 5.9. Fields in the area may demonstrate symptoms of leaf necrosis (browning) as the pH varies from 4.5 to 6.0. In addition, high levels of nematode damage were found in 2020 throughout the region, from Ashton through St. Anthony, to Rexburg and Plano, but due to dry soil conditions in 2021, it's likely nematode hatch was reduced. Both factors can contribute to general unthriftiness, stunting, reduced tillering and yellowing of wheat and barley. Soil amendments such as lime should help reduce the toxic accumulation of micronutrients, but crop rotation to broadleaves is the only way the reduce the impact of cereal cyst nematodes (CCN). There are different levels of resistance and tolerance in our spring wheat and barley varieties. The results from screening trials conducted in St. Anthony are provided in 2016 Small Grains Report available online http://www.uidaho.edu/extension/cereals/scseidaho/sgr.

The average yield for the hard spring wheat (Table 35) was 73 bu/A, compared to 2020 at 128 bu/A, 2019 at 74. Heading dates were 11 days earlier than 2020. The range in yield varied from 59 bu/A (WB7328) to 91 bu/A (Dayn, hard white). Test weights were average at 58.9 lbs/A, and protein averaged 14.1%. The high yielding named varieties were Dayn (91 bu/A), Net CL+ (80 bu/A), Jefferson (78 bu/A) and SY Gunsight (78 bu/A). The highest proteins were seen in WB9879CLP (15.8%), WA 8357 (15.5%) and MT2075 and Dagmar (both at 15.3%). The ratio of available and applied N (336 lbs N/A) to average bushel yield (73) was 4.6 lbs N/bu. The average protein levels for hard spring wheat was 14.1%. Proteins are high due to the lower than expected yields – the field was fertilized for higher yields but yields were depressed by wild oat infestations.

In the soft spring wheat trial (Table 44), the high yielding named varieties were Tekoa (83 bu/A), Seahawk (73 bu/A) and WB6430 (71 bu/A). The average yield for the soft white spring trial was 65 bu/A, lower than 2020 by 64 bu/A, lower than 2019 by 14 bu/A, and ranged from a low of 49 bu/A to a high of 86 bu/A (WA 8327). Heading dates averaged 6/28, eleven days earlier than 2020. The test weight average was low at 57.7 lbs/A, with lodging occurring in some varieties (Tekoa and UI Pettit). Grain protein averaged 11.2%. Despite the high ratio of 4.5 lbs N/bu it is surprising the grain protein wasn't higher in the soft nursery.

Two-rowed malt barley yields (Table 52) were much higher for than the wheat yields in the face of high wild oat pressure, and

ranged from 105 bu/A (Merit 57) to 146 bu/A. The average was 123 bu/A, 17 bu less than 2020, and 27 bu/A greater than in 2019. The highest yielding named lines were LCS Odyssey (146 bu/A), BC Leandra and KWS Jessie (both at 144 bu/A), and KWS Thalis and KWS Fantex (both at 139 bu/A). Lodging averaged 1%. Overall test weight was high at 50.1 lbs/bu, protein averages were 10.9% and plumps were 97.7%. The N: bu ratio calculates as 2.4 lbs N/bu.

The feed lines averaged 113 bu/A with Champion (133 bu/A), Claymore and HO516-429 (both at 131 bu/A) and Bill Coors 100 and Altorado (both at 125 bu/A) as the top yielding varieties (Table 60). The food barleys yielded an average of 98 bu/A. Kardia is a hulled, high beta-glucan food line. The hulled lines had a test weight of 51.3 lbs/bu and hulless lines had a test weight of 57.4 lbs/bu. Proteins of the feed lines averaged 10.9%, with a N:bu ratio of 2.6 lbs N/bu, while the food barley lines averaged 13% protein.

Soda Springs, Kyle Wangemann and Scott Brown, Spring Grain

The only spring dryland extension trials were in Soda Springs. The nursery was planted May 4th and harvested September 7th. The previous crop was spring barley. Drought severely affected this location, with little to no precipitation after planting.

Yield averages for the hard red and hard white spring nursery (Table 38) were only 18 bu/A, 36 bu/A less than 2020, and 49 bu/a less than 2019 due to poor moisture. The range in yield went from 11 to 23 bu/A. The five highest yielding named varieties were the hard red Duclair (23 bu/A), hard red Alum (22 bu/A), hard white Dayn (22 bu/A), hard red MT Sidney (21 bu/A), and hard red Dagmar (20 bu/A). The heading dates at this location were 10 days earlier than in 2020. Test weights averaged 60.2 lbs/bu, but proteins were low, averaging 10.8%.

For the soft white spring wheat (Table 47), the nursery averaged 23 bu/A, 39 bu/A less than 2020, and 60 bu/A less than 2019. The yield ranged from 17 (TMC2021) to 29 bu/A (Louise). Louise, Melba (club), Ryan, WA 8327, and Seahawk were the five top yielding varieties at 29, 27, 26, 26 and 26 bu/A, respectively. Test weight average was poor at 58.8 lbs/bu, and proteins were at 9.9%.

Replicated dryland barley trials were added to Soda Springs trials in 2018. Two-rowed malt barley yields (Table 55) ranged from 20 bu/A (Conrad) to 30 bu/A (10ARS191-3). The average was 24 bu/A. The highest yielding named lines were AAC Connect +base (29 bu/A), and LCS Odyssey (27 bu/A). There was no lodging, overall test weight was 47.9 lbs/bu and plumps were 93%. Protein averages were an acceptable 10.6%

The feed lines averaged 20 bu/A with Altorado (28 bu/A), Xena (27 bu/A), HO516-429 (27 bu/A) and Champion (26 bu/A) as the top yielding lines and varieties (Table 63). The food barleys yielded an average of 14 bu/A. Kardia is a hulled, high beta-glucan food line. The hulled lines had a test weight of 50.4 lbs/bu and hulless lines had a test weight of 49.3 lbs/bu, which is exactly the opposite of what you would expect. Drought conditions affected the test weight of the hulless lines to a greater extent than that of the hulled lines. Proteins of the feed lines averaged 13%.

Table 2. Variety Descriptions

SPRING BARLEY - Malt

AAC Connect (TR04282) – released in 2016 by Agriculture and AgriFood in Manitoba, Canada, AAC Connect is marketed in the U.S. by Meridian Seeds and has been in the trials for four years (Table 49). AAC Connect has malt quality similar to AC Metcalfe with higher extract and lower beta glucan. It is a mid-maturity, two-rowed variety with moderate resistance to stem rust, spot blotch, spot form of net blotch (SFNB), and FHB. Under Idaho growing conditions, AAC Connect was 2-4 inches taller than average with average lodging, test weight and percent plumps. AAC Connect had a little higher protein in the trials and a little lower average yield. Lodging was high in the irrigated trials. In 2021, average yields were at 99% over all locations (Table 56), but at 117% of average at Idaho Falls. AAC Connect was moderately resistant to FHB (Addendum 6a).

AAC Synergy – released in 2015 by Agriculture and AgriFood Canada, AAC Synergy is a two-rowed malt barley marketed by AgriPro in the PNW. AAC Synergy has high plumps, average protein, and low beta-glucan levels. Overall yield was slightly below average (Table 49), similar to Moravian 69, with average or better test weight and plumps. Height of Synergy is 4 inches less than Copeland and 2 inches shorter than Metcalfe with similar tendencies for high lodging under irrigation. In FHB screening trials, AAC Synergy was moderately resistant for FHB (disease indices) and had average levels of DON on the seed. AAC Synergy has high levels of resistance to foliar pathogens.

ABI Eagle (2B11-4949) – a newer release by Busch Agricultural Resources (2018), Eagle is a two-rowed barley that has been tested in the variety trials for five years. Yield and test weight were comparable to ABI Voyager with the previous 3-yr average yield 6 bu/a greater than ABI Voyager (Table 49). ABI Eagle should replace Merit 57, having mid-level protein, with heading date two days later than Voyager, 3-4 inches shorter, with lower plumps. Lodging was a little less than Voyager, but protein was higher (Table 49). FHB reaction has been similar to more resistant than ABI Voyager. In 2021, ABI Eagle performed well in Aberdeen, Idaho Falls and Rupert (Table 56).

ABI Voyager (B3719) – a 2011 release from Busch Agricultural Resources, Voyager consistently out yields many other two-rowed malt varieties in the barley production area. Three-year average yields (Table 49) were below LCS Odyssey and similar to Moravian 69, with higher test weight and plumps, with similar percent lodging. ABI Voyager is similar to Conrad in test weight, has a little earlier heading date (2 d), lower protein, but is taller (2-4 inches). ABI Voyager is susceptible to cereal cyst nematode (CCN), MR to MS to FHB and shows average levels of DON.

AC Metcalfe (TR232) – two-rowed malting barley released in 1994 by Agriculture and Agri-Food Canada with excellent quality, lower yield potential than average (86% of trial average, Table 56 and Chart 7), and 2-4 inches taller with similar test weight and lodging to Conrad. It is widely adapted to western US and Canadian conditions, but as it is tall, it may lodge under higher production conditions. It is MR-MS to FHB with average DON accumulation. Malting quality and extract are excellent.

BC Ellinor – an older two-rowed spring malt and feed variety under testing in Idaho with Limagrain Cereal Seeds. Ellinor was developed in Germany by Breun Craft, targeted for the German all-malt style beers. Ellinor averaged 108% of trial average for yield across all locations in 2020 trials and 104% of average in 2021 (Table 56). BC Ellinor was 1.8 lbs lower than average for test weight, 3 in shorter, and a little later maturing than average with average proteins and plumps.

BC Leandra – a two-rowed European malt variety under testing in Idaho with Limagrain Cereal Seeds. Like Ellinor, BC Leandra was developed in Germany by Breun Craft, targeted for the German all-malt style beers. BC Leandra averaged 110% of trial average for yield across all locations in 2020 trials, and 106% of average in 2021 (Table 56). Test weight and plumps were at average (Table 50). Yields were 14 bu/A greater than ABI Voyager, with 4 d later maturity and 7-8 inches shorter. Initial FHB testing showed BC Leandra to be MR to R for FHB (Addendum 6a).

BC Lexy - a two-rowed European malt variety under the first year of testing in Idaho with Limagrain Cereal Seeds. BC Lexy yields were 100% of trial averages (Table 56). BC Lexy is short with lower test weight, lower grain protein and higher plumps in comparison to trial averages. Lodging was less than average and heading date was slightly later than average (Table 50).

CDC Copeland (TR150) – a two-rowed malt variety developed by the Crop Development Centre, University of Saskatchewan and released in 1999, Copeland has been in the trials since 2009 in southern Idaho. Copeland yields are similar to Conrad and AC Metcalfe (Table 49). Copeland was 3-5 inches taller than average with greater lodging, and was average for grain protein and plumps, with good test weight. In FHB screening trials, CDC Copeland is MR-MS for FHB infection and had low-to-average DON levels in the grain.

Conrad (B5057) – two-rowed spring malt barley released by Busch Agricultural Resources in 2005. Conrad has below average yields and good test weight and end use quality. Conrad is average in height (2-4 inches shorter than ABI Voyager, is average for lodging and protein. Conrad has yielded well in the dry land upper elevation areas. Conrad has low disease measures for FHB (moderately resistant) and medium seed-levels of DON.

Esma – entered into the trials in 2018 by Ackermann Saatzucht GmbH & Co. KG, Esma was the highest yielding two-rowed malt variety in 2018, averaging 170 bu/A. In eastern Idaho in 2020, Esma had 107 percent of average yield in Idaho Falls and 122% of average in 2021 in Aberdeen at 171 bu/A. Esma had very good test weight, average heading date, was 3-4 inches shorter with lower lodging than average (Table 50). Esma has good malt quality with low beta-glucan, high extract, and good FAN potential. Esma is MS to S to FHB. Like many of the European malt types, Esma is suited for the craft beer market.

Explorer – a newer introduction from Secobra Recherches, Explorer is a two-rowed malting barley in the fifth year in these trials. In the 3-year summary, Explorer was greater than average in grain yield (Table 49), similar to ABI Voyager with lower test weight. Heading date, protein, plumps and test weight were at trial averages. Explorer is shorter than average (4-5 inches) and lower than average for

lodging. Explorer has good resistance to leaf diseases and is widely adapted but is susceptible to FHB. Explorer is a French maltsters preferred variety with excellent malting and brewing, and is good for distilling (whiskey). It also is currently favored by ABInBev in Europe for brewing.

GemCraft (2Ab08-X05M010-65) – released by the USDA-ARS and Idaho AES in 2018, GemCraft is a PVP 2-row malt barley released for the craft industry and favored by the Brewers Association due to its good taste profile. Yield over the previous three years were average, similar to ABI Voyager and Moravian 69. Test weight was below trial averages. Height, heading date and grain protein were similar to Conrad, with lower plumps. Lodging tends to be greater under irrigated production systems.

KWS Amadora – a German two-rowed malt variety registered in 2015, bred by KWS Lochow, introduced into the US through KWS in Illinois and entered into the trials in 2020. Irrigated yield, plant height and grain protein of KWS Amadora was similar to LCS Genie with better test weight (Table 50). Heading date was similar to trial average and 2-3 days earlier than LCS Odyssey and Genie. Yield of KWS Amadora averaged 102 percent of trial average (Table 56), with low protein and high plumps. KWS Amadora was resistant to PNW races of barley stripe rust in WSU trials.

KWS Fantex – German two-rowed malt line bred by KWS and introduced into the US through KWS in Illinois and entered into the trial in 2020. Yield of KWS Fantex averaged 103 percent of trial average (Table 56), doing particularly well in Ashton where it yielded 113% of trial average. Fantex headed 2-3 days later than average and the other KWS varieties. Percent plumps were a little lower than average (Table 50). KWS Fantex was resistant to PNW races of barley stripe rust in WSU trials.

KWS Jessie – French malt line released in 2019 through KWS Momont, introduced into the US through KWS in Illinois and entered into the trial in 2020. KWS Jessie is a two-rowed malt with excellent quality, very high yield potential and proteins similar to LCS Odyssey (Table 50). Overall yield was 114% of average, doing very well in Aberdeen with 167 bu/A. KWS Jessie has very good test weight and is very short with average lodging. KWS Jessie was moderately susceptible to moderately resistant to PNW races of barley stripe rust.

KWS Thalis – in the first year of trials in eastern Idaho, the two-rowed malt variety KWS Thalis yielded 108% of average, performing best under irrigated locations. Irrigated average yields were similar to Esma and ABI Eagle (Table 50) with average test weight and heading date. While higher than average for lodging, KWS Thallis was 3 in shorter than average, with low protein, and good percent plumps.

LCS Genie – a European malt barley released in the U.S. through Limagrain Cereal Seeds, Genie is a short-statured two-rowed malt variety with yields greater and test weight similar to ABI Voyager. Protein and plumps of Genie were c lose to trial averages (Table 50). LCS Genie is about 3-5 inches shorter than average with average lodging. Genie is susceptible to FHB and had high levels of DON in seed in the FHB disease nurseries. Genie has excellent malt quality and can also be used in distilling.

LCS Odyssey (NSL08-4556-A) – LCS Odyssey is a European two-rowed malt barley released and distributed through

Limagrain Cereal Seeds. In 2020, LCS Odyssey yields were 107% of trial averages, and in 2021, Odyssey yielded 113% of trial average (Table 56). In three years of testing, LCS Odyssey was the highest yielding variety, greater than ABI Eagle and Explorer (Table 49). Test weights were lower than average with average lodging, even as LCS Odyssey is 3-5 inches shorter than the trial average. Heading date is 1-3 days later than average with average proteins and good plumps. LCS Odyssey is more susceptible than current U.S. malt varieties for FHB and had higher levels of DON accumulation. LCS Odyssey has excellent resistance to cereal cyst nematode (CCN) and is resistant to PNW races of barley stripe rust. Odyssey has excellent malt quality for all-malt brewing with dual usage in distilling (a low GN or glycosidic nitrile variety).

LCS Opera – tested in Idaho from 2018 to 2021, LCS Opera is a very high yielding two-rowed, dual purpose barley for malt and feed. In 2020, irrigated average yields of LCS Opera were 110% of trial average, consistently at or above trial averages at all locations. While the best zone of adaptation is in eastern / northern Washington, irrigated average yield of LCS Opera was 92% of trial average, not doing well in a year of high heat (2021). LCS Opera had low test weight and 2-3 days later in maturity, and was 3 in shorter in height than average (Table 50). LCS Opera has very good resistance to PNW races of barley stripe rust.

Merit 57 (2B99-2657) – considered one of the industry standards for malt quality, Merit 57 was released in 2009 by Busch Agricultural Resources. Merit 57 is a later maturity two-rowed malt variety with small seed, lower yields, lower test weight and higher lodging than average. Merit 57 has good plumps and protein. In 2021, irrigated average yield of Merit 57 was at 93% (Table 56) of trial average. Merit 57 is moderately susceptible to FHB and DON accumulation is at average (Addendum 6a).

Moravian 69 (C69) - two-rowed spring malt barley released by Molson Coors Beverage Co. in 2005. Moravian 69 has very high yield potential, especially in the Magic Valley area where it is widely grown, with 3-year yield over all locations similar to ABI Voyager and higher than Copeland and Conrad (Table 49). M69 is short (2-4 inches below average) but may still be susceptible to lodging. Protein is at average in these trials, while test weight and plumps were below average. Moravian 69 is considered more susceptible to FHB with higher-than-average accumulation of DON in the seed.

Moravian 179 – Moravian 179 is a newer released two-rowed malt line from Molson Coors adapted to the higher production conditions of southern Idaho. Yields of Moravian 179 were similar to LCS Genie averaged over 2021 irrigated locations; however, Moravian 179 was not included at the Ashton location so the average is skewed higher and was not reported in the three-year averages (Table 49). Moravian 179 had very high plumps, low test weight and average lodging in 2021. Proteins were at trial average, with plant height similar to Moravian 69 and 2-4 inches shorter than trial average. Molson Coors lines are under Title V and PVP.

SPRING BARLEY – Food

Goldenhart (2Ab09-X06F058HL-31) – Released by the USDA-ARS in Aberdeen in 2018, Goldenhart is a spring two-rowed hulless food barley with beta-glucan content similar to Transit (9-10%) released for significantly increased yield potential, especially under dry land conditions.

However, three-year averages for irrigated production conditions put Goldenhart lower in yield than Transit (Table 57). In 2021, yields were significantly greater than Transit at all locations except Rupert (Table 64). Goldenhart has very high test weight and protein (Table 57) as expected for a hulless line. Goldenhart and the hulless barleys are MS to S to FHB and DON accumulation. Goldenhart was submitted for PVP.

Julie (03AH6561-94) – a two-rowed hulless barley released by the USDA-ARS and the University of Idaho AES in 2010 for high-beta-glucan content and intended for human consumption. Julie has high test weight (due to the hulless characteristic) and protein, similar to other food barleys, with greater percentage of seed beta-glucan (averaging 7%) than previous industry standards such as CDC McGwire. Julie is the highest yielding hulless waxy barley currently in the trials (Table 57). Lodging of Julie is less than average and heading date 4-5 days later than Champion. Julie and the hulless barleys are MS to S to FHB and DON accumulation (Addendum 7b). Careful handling of all hulless barleys prior to planting reduces germ damage and protects seedling stand establishment.

Kardia (2Ab09-X06F084-51) – Kardia is a two-rowed, hulled food barley line released in 2016 by the USDA-ARS in Aberdeen and the University of Idaho AES as a replacement for Salute, with yield improvement of 4-5% over Salute. Yield (3-years, Table 57) of Kardia was greater than Julie, Transit and Goldenhart (all hulless). The beta-glucan level of Kardia is 7- 8.5% compared to 6.5% in Salute. Kardia is MS to S to FHB (Addendum 7b) and has lower test weight than the hulless food barley lines due to its hulled characteristic. Yields in 2021 in Ashton were excellent in a cool, high-elevation environment.

Transit (03AH3054-51) – a two-rowed hulless variety released by the USDA-ARS and the University of Idaho AES in 2010 for high-beta glucan content (waxy) and intended for human consumption. Seed beta-glucan content (9-10%) is higher than other previous industry standards such as CDC Fibar and CDC McGwire. Transit yields are lower or similar to Julie but the percent beta-glucan is higher than Julie. As a hulless line, test weights are high for barley. Transit and the hulless barleys are susceptible to FHB and DON accumulation.

SPRING BARLEY – Feed

Altorado (BZ509-601) – Altorado is a 2016 release from Highland Specialty Grains. Altorado is a two-rowed feed barley with high yield potential. Average irrigated 3-yr average yield was greater than Champion and both with high test weight (Table 57). Altorado is similar to Champion in disease resistance, test weight, plant height, and lodging with lower in grain protein. Altorado averaged two earlier than average for in heading and in 2021 yields were 123% of trial average (Table 64 and Chart 8).

Champion (YU501-385) – a 2007 release from WestBred, LLC, now handled by Highland Specialty Grain. Champion is a very high yielding two-rowed spring feed barley. Combined over locations and years, Champion yields were above trial average, comparable to Xena. Champion has slightly greater than average height, less than average protein, and heads 1-3 days earlier than trial average. Champion is MR to MS to FHB (Addendum 7b).

Claymore (BZ509-216) – two-rowed feed developed through WestBred, Claymore is carried by Highland Specialty Grains. In three-year averages, Claymore consistently is in the top yielding group of feed lines,

comparable to Altorado and Oreana. Claymore is tall and similar in height to Champion (Table 57) with good straw strength, is 2-3 days later in heading, with lower test weight. In 2021, yields of Claymore were 117% of trial averages (Table 64), yielding very well in the Idaho Falls trials. Claymore has good FHB tolerance (MR to MS).

Diamondback – a new six-rowed barley line released in 2021 from Highland Speciality Grain, Diamondback yielded well in Aberdeen and Rupert, but poorly in Idaho Falls and Ashton in 2021 (Table 64). It was earlier than average for heading, short and had poor test weight, possibly due to excessive heat stress during flowering.

FeedMor (Moravian 169) – Molson Coors released FeedMor as a two-rowed feed line in 2020 for its high yield potential and good test weight. FeedMor is very short, similar to Moravian 69 and Bill Coors 100, with similar yield to Idagold II in 2021 (Table 58). Heading date and lodging was at trial average, with high percent plumps kernels. In 2021 trials, FeedMor yielded 97% of trial averages (Table 64).

Idagold II (C32) – a two-rowed spring feed and malt line developed by Molson Coors Beverage Company in Burley and released in 2002. Idagold II is a short line with lower-than-average lodging and high test weight. Protein is average for a malt variety with average plumps. Idagold II is susceptible to FHB and showed higher levels of DON accumulated in the seed. Idagold II is used in these trials for fill plots and for its short stature. Idagold II is MS to S to FHB and DON accumulation (Addendum 7b).

Moravian 164 – a two-rowed feed barley line originally released by Molson Coors for production in dry land environments, Moravian 164 yields (location combined data summary, Table 58) were below average under irrigation. Test weight was good (above 48 lbs/bu and below trial average as the trial included hulless barley lines), heading date was 4-5 days after Champion, and M164 was 7-9 inches shorter than Champion, similar to FeedMor.

Oreana (BZ509-448) – a short, two-rowed feed barley originally developed through WestBred, Oreana is carried by Highland Specialty Grains. In three-year data averages (Table 59), Oreana had good test weight, excellent yields similar to Altorado and Claymore, and was 4-5 inches shorter than average, an unusal combination of yield and plant height. Oreana showed moderate susceptibility to PNW races of stripe rust, very susceptible reaction to FHB (Addendum 7b) and showed higher levels of DON accumulated in the seed. Oreana yields in 2021 were 116% of trial average, performing well in Rupert and Idaho Falls (Table 64 and Chart 8).

Xena (BZ594-19) – a two-rowed spring feed barley released by Western Plant Breeders that is now handled by Highland Specialty Grain. Xena has had very high yields over the locations tested from 2010-2021, similar to or greater than Champion. Xena is of average height and straw strength, similar to Champion. Test weight tends to be slightly higher than average, but less than Champion. Xena yields in 2021 were 111% of trial average, doing well in Aberdeen (Table 64). Xena has shown a MS reaction to FHB disease and lower DON levels (Addendum 7b).

WINTER BARLEY – Malt, Feed, Food

Avalon – a winter two-rowed malting variety released in 2020 from Virginia Tech. It is VA Tech's first two-rowed winter malt

barley and first tested in Idaho's program in 2021. Despite good spring stands, Avalon's yield performance was at 82% of location average (Table 30), and similar to the hulless food barley Upspring (Table 27). Avalon's test weight was excellent (52.2 lbs/bu), plumps were excellent, headed two days earlier than average, and despite being very tall, had good lodging resistance.

Charles (94Ab1274) – Charles is the first AMBA approved two-rowed winter malt variety released by the USDA-ARS and the IAES in 2005. Charles' average yields and test weights are lower than the winter variety average (Table 26), yielding 98% of trial average in 2021 (Table 30 and Chart 4). Charles is shorter than the average, earlier maturing and has a tendency to lodge. Charles has good plumps and yields very well in the Twin Falls area, even when harsh winter conditions reduce stand as in 2020 near Rupert. Both Charles and Endeavor can suffer significant stand losses under cold, dry winter conditions. For improved winter survival, Charles and Endeavor do best when protected from cold dry winter winds and with good soil moisture prior to entering winter conditions.

Eight-Twelve – a six-rowed winter feed barley released by the USDA-ARS and the Idaho AES in 1991. Eight-Twelve yields averaged 128 bu/A under irrigation in 2019-2021 (Table 26), only 92% of trial average (Table 30). Usually a high yielding variety, Eight-Twelve did not perform well in the higher temperatures in 2021. Eight-Twelve has good winter survival but may lodge under high production conditions.

Endeavor (95Ab2299) – Endeavor is the second two-rowed winter malt variety released by the USDA-ARS and the Idaho AES approved by AMBA for malt quality. Released in 2008, Endeavor has improved test weight, malt quality and yield over Charles, especially in the Magic Valley area where winter kill is less of a problem than in eastern Idaho (Table 30, Chart 4) for 2021. Endeavor has good test weight and protein but had relatively low plumps for malt (Table 27). For improved winter survival, Endeavor and Charles do best when protected from cold dry winter winds and with good soil moisture prior to entering winter conditions.

Flavia – developed in Germany by Ackerman Saatzucht and carried through Virginia Tech, Flavia was first tested in 2020-21 trials. Flavia is a two-rowed winter malt that is 4-5 days earlier that Wintmalt and 2 days earlier than Charles. Yields were comparable to Thunder and Wintmalt, with higher test weight and plumps (Table 27). Lodging resistance was excellent and proteins were slightly higher than trial average.

Hirondella – also developed in Germany by Ackerman Saatzucht and carried through Virginia Tech, Hirondella was tested in 2020-21 trials. Yields in the first year of testing were 104% of location averages, doing very well in Rupert at 115% of trial average (Table 30). Yields were similar to Thunder, Flavia and Wintmalt, with lower test weight. Like Flavia, Hirondella is 4-5 days earlier that Wintmalt and 2 days earlier than Charles. It has resistance to loose smut, stem rust, net blotch, leaf rust, spot blotch, powdery mildew, BSMV, and BYDV. Hirondella had lower test weight, protein and plumps than Flavia (Table 27).

KWS Donau –The variety KWS Donau is a two-rowed winter malt barley produced and released through KWS Lochow in Germany and marketed through KWS Cereals in the U.S. KWS Donau had very high yields, test weight and plumps in the three-year average

results (Table 27), doing very well in 2019 and 2020, but not as well in the hotter production year of 2021 (Chart 4). In Aberdeen in 2019, yields hit 199 bu/A. Lodging was below average even though it was the yield leader. Winter survival of the was good, maturity was 2 d earlier than average, and proteins were at 11.4%, compared to the trial averages of 11.5% (Table 26). For end use quality, extract content for Donau is at the level of 81.4% with a low level of proteolytic and cytolytic modification, which is preferred in the craft brewing industry.

KWS Faro – a 2-rowed winter malting variety from KWS Lochow, marketed in the U.S. through KWS Cereals. In the first two years in the trials, yield of Faro was at or above trial average but in 2020 had reduced stand due to winter conditions in Rupert. Winter survival of KWS Faro was better than the trial averages (Table 27). Test weights were slightly above average (and better than the 48 lb/bu required for No. 1 barley). KWS Faro had a 507 day earlier-than-average heading date, good protein and high plumps.

KWS Scala (GW2895) – 2-rowed winter malting variety from KWS Lochow, marketed in the U.S. through KWS Cereals. KWS Scala yielded above 3-year trial averages (Table 26) similar to Thunder but with lower lodging. Test weight was low in comparison to other varieties, but still above the 48 lbs/bu needed for No.1 barley (average 51.5 lbs/bu), with good protein and plumps. In 2019 in Aberdeen, yields hit 200 bu/A. In 2021, yields of KWS Scala were 103% of trial average (Table 30 and Chart 4) Scala was 1-2 days earlier in heading date and was 2 inches shorter than trial average. Testing in the Logan, UT area in 2012 and 2013 indicated good winter survival.

KWS Somerset (GW3479) – 2-rowed winter malting variety from KWS Lochow, marketed in the U.S. through KWS Cereals. In the 3-year summary of testing in southern Idaho, Somerset yields were comparable to feed variety Sunstar Pride with very good test weight, winter survival and plumps (Table 26). Heading dates, plant height and grain protein were at trial averages and lodging was less than trial average (19% versus 30%). Under stressful conditions in the 2020 Rupert trials, Somerset had the highest percent winter survival and the highest yield.

LCS Calypso – a two-rowed winter malt barley brought in by Limagrain Cereal Seeds in 2016-17 from Europe, and currently handled through Scoular Grain. Calypso is in the sixth year of testing in southeastern Idaho, and has shown excellent yield potential in southern Idaho, similar or greater to the winter feed line Sunstar Pride, with 156 bu/A and 52.1 lb/bu test weight over the last three years of testing (Table 26, Chart 4). In Aberdeen in 2018, Calypso yielded 212 bu/A with little to no lodging. In 2019, yields in Aberdeen were 196 bu/A, however 2020 conditions were not favorable for high yield of Calypso, which yielded 89% of trial averages. 2021 yields were better than in 2020, at 109% of trial averages. Calypso was earlier in heading (3-4 days) and 2-4 inches taller than average with excellent percent plumps and low lodging.

Lightning (DH130910) – Lightning is a true facultative winter malt barley developed through the doubled haploid program at Oregon State University under Pat Hayes. Lighting was in both the winter and spring trials in 2020, but in some locations did poorly in the spring trials. Winter conditions in Rupert for 2020 were poor, resulting in low spring stands, and yields were below

trial average. In 2021, Lightning performed better than average in Rupert, and overall did 99% of trial averages (Table 30). Over the previous three years, yield was a little below average, test weight and plumps were very good, protein and heading date were average (Table 27.)

Sunstar Pride (SDM204-B) – winter six-rowed feed barley released by Sunderman Breeding in 1995. Sunstar Pride consistently has been one of the highest yielding varieties in the trials, similar to the high-yielding European malt lines (Table 26). Test weight, protein, lodging and plant height is below average. Heading date is up to a week to ten days later than average, with low plumps.

Thunder (10.0777) – Thunder is a two-rowed winter malt release from Oregon State University (2016) with excellent yield potential and better winter survival than Charles and Endeavor. Thunder averaged 156 bu/A over the three-year summary (Table 26) with good test weight and spring stand. In 2020, poor winter conditions reduced significantly spring stand, but in 2021, Thunder yielded 108% of trial averages (Table 30). Heading date is three to five days earlier than the trial average and plant height is 2-5 inches less. Plumps were very good although lodging was greater than trial averages (Table 26), but better than Endeavor and Charles. Thunder yields were comparable to KWS Scala and better than Wintmalt, with a greater tendency to lodge.

Upspring (05ARS748-270) – Upspring is a hulless, high beta-glucan (7% BG) winter barley variety and the latest two-rowed food barley released from USDA-ARS breeding program in conjunction with the University of Idaho AES. Upspring was released as an alternative to Buck. While agronomically similar to Buck, Upspring had slightly higher yields. Upspring headed 3 days later than the trial average, and had a poor spring stand compared to the hulled varieties. As a hulless barley, test weight approaches that of winter barley, at 59.4 lbs/bu averaged over 3 years (Table 26). Grain protein was 3% than average. Seed germination may be low under dry land conditions, and winter survival was poor in 2020 in both locations (Aberdeen and Rupert). Overall winter survival (measured as spring stand) was 79% in 2021. Upspring was released under PVP.

Wintmalt – a shorter, two-rowed winter malt developed by KWS Lochow (Germany) and imported from Europe. Wintmalt is being produced in the PNW, has good foliar disease resistance, and is an AMBA approved malt variety. In the location combined summary (Table 27), Wintmalt's yield was similar to Flavia and Sunstar Pride. Plant height, lodging, and protein were at trial average. Wintmalt test weight was below average (which included the hulless lines, but at 49.0 lbs/bu is very good), heading was 3 days later than average, and plumps were excellent.

SPRING WHEAT – Soft White

Alturas (IDO526) – a low-protein soft white spring wheat released by Idaho AES and USDA-ARS in 2002. Alturas has a partial waxy endosperm which may make it vulnerable to low falling numbers. Alturas is adapted to both irrigated and dry land conditions, is average in irrigated yield (Table 40), with average test weight, heading date and height. Alturas is susceptible to the current races of stripe rust and to FHB (Addendum 3c and 4c).

AP Coachman (08PN2001-07) – a dryland soft white spring from AgriPro / Syngenta Cereals was released in 2020. AP Coachman

was tested in the dryland location (Soda Springs, Table 41) and yielded very well from 2019-2021 (60 bu/A) competing with Tekoa and Seahawk. AP Coachman is slightly taller than average, with later maturity, average protein and lower test weight. AP Coachman has resistance to current races of stripe rust, Hessian fly, and is susceptible to FHB (Addendum 3c and 4c).

Hedge CL+ - is a club wheat released in 2020 by WSU and USDA-ARS in Pullman as a replacement for JD with two-gene tolerance to Beyond (imazamox) herbicide. Clearfield wheats have resistance to imazamox herbicides such as to Beyond® herbicide for hard-to-control grassy weeds. Clearfield spring wheats are mostly used behind winter wheat production where imazamox has been applied to reduce potential carryover damage from soil residual. Designed for low rainfall production areas, Hedge CL+ was tested for the first time this year in eastern Idaho EVTs. Irrigated yield and test weights were similar to WB1035CL+ (Table 42), and yield averaged 94% of trial averages (Table 48) whereas Melba club averaged 105% of 2021 trial averages. Heading of Hedge CL+ was 5 days later than WB1035CL+, and it was 5 in taller. Hedge CL+ is susceptible to lodging under irrigated production. End use quality of Hedge CL+ is excellent. Stripe rust resistance is excellent, it has intermediate tolerance to high-acid, Aluminum soils, but Hedge CL+ is susceptible to Hessian Fly. (PVP pending)

Louise (WA7921) – soft white spring wheat released in 2004 from Washington State University's spring wheat breeding program and used as a long-term quality check for soft white spring wheat. Louise is a later maturity, tall wheat with below average yields and high lodging potential under irrigated conditions. Louise performed below average for yield under irrigated conditions over the three previous years (Table 40). Louise is susceptible to stripe rust and very susceptible to FHB.

Melba (WA8193) – Melba is a spring club wheat developed by USDA-ARS in Pullman and released in conjunction with the Washington AES in 2016. Melba is one of the first club wheats with good yield performance in southeast Idaho, similar to UI Cookie (Table 40, 48). Melba performed particularly well in 2020, and in 2021 yields were 105% of trial averages (Chart 6). Melba is average in height, five days later in heading than UI Stone and UI Cookie, with low protein. Melba is resistant to stripe rust and very susceptible to FHB.

Ryan (WA8214) – Ryan is a partial waxy soft white spring wheat released from Washington State University, AES and USDA in 2016. Over three years, Ryan yields were below trial average, similar to Louise over four irrigated locations (Table 40). Under dry land conditions, yield was similar to Tekoa and Seahawk (Table 41), showing similar yield as Seahawk. Ryan has Hessian fly resistance, tolerance to low acid / high aluminum soils, and HTAP (high temperature adult plant) resistance to stripe rust. Ryan was early to heading, a little later than UI Pettit, was 1 in taller than average, had good test weight and may lodge a little under higher input.

Seahawk (WA8162) – a soft white spring wheat released from Washington State University's spring wheat breeding program in 2014 adapted to dry land and irrigated production areas. Seahawk has resistance to Hessian fly, is very resistant to stripe rust, and susceptible to FHB. Seahawk has tolerance to high aluminum, low pH soils. Yield is similar to UI Stone under irrigation

(Table 40) and dryland production (Table 41) with better test weight. Plant height is a little above average and heading 4-5 days later than UI Stone. Seahawk may have a tendency to lodge under high production practices. Seahawk yielded 108% of trial average in 2021 (Table 48).

Tekoa (WA8189) – a Washington State University 2016 release, Tekoa is a soft white spring wheat released for higher rainfall areas and will do well under irrigated conditions (Table 40). Tekoa did not yield as well in areas where irrigation was restricted at the end of the growing season. In 3-year summaries, Tekoa yields were slightly above trial average, and in 2021 yields averaged 99% of trial averages. Tekoa is adapted to low pH soils where aluminum toxicity can occur. Tekoa has very good test weight, is 5 days later in maturity (heading date) than UI Stone and 2 in higher than average for plant height. Tekoa is resistant to stripe rust, Hessian fly, and susceptible to FHB, similar to Seahawk.

UI Cookie (IDO1405S) – a soft white spring wheat released in 2019 by the University of Idaho Ag Experiment Station. Three-year irrigated averages (Table 40) show UI Cookie above trial average for yield, about 5 bu/A greater than UI Stone, lower for test weight and higher for grain protein and agronomically very similar to UI Stone. Performance under dryland conditions is at trial average (Table 41). UI Cookie has acceptable end use quality, similar or better resistance to FHB than UI Stone, better resistance to stripe rust and improved threshability.

UI Pettit (IDO632) – is a soft white spring wheat released in 2006 through the Idaho AES. Yields and test weight are lower than average under irrigation (Table 40) and yield is below average under dryland conditions. UI Pettit is short and heads 3-5 days earlierthan Alturas. UI Pettit is very susceptible to current races of stripe rust and to FHB.

UI Stone (IDO599) - a soft white spring wheat released by Idaho AES in 2012, UI Stone has higher yield potential, consistently greater than UI Pettit and similar to Alturas (Table 40). The 3-yr average for yield was at trial average for irrigated and dryland trials. UI Stone was selected for good end use quality and reduced FHB susceptibility (carries the Fhb1 resistance gene). In 2020, UI Stone yielded similar to UI Cookie and about 10 bu/A below WB6340 (Table 42). The FHB reaction in UI Stone is similar to Seahawk. UI Stone also has tolerance (not resistance) to cereal cyst nematode and is susceptible to the current races of stripe rust. Test weight, height and lodging are average, heading is 2 days earlier than UI Pettit.

WB-1035CL+ – a 2-gene Clearfield soft white spring wheat released in 2011 by WestBred (a unit of Bayer Crop Science). Clearfield wheats have resistance to imazamox herbicides such as to Beyond® herbicide for hard-to-control grassy weeds. Clearfield spring wheats are mostly used behind winter wheat production where imazamox has been applied to reduce potential carryover damage from soil residual. Overall yields of WB-1035 CL+ are low and it is very susceptible to stripe rust, but WB3035CL+ yielded very well in Soda Springs in 2020. WB-1035CL+ has good test weight (Table 40), is shorter and has earlier heading date than average, with relatively high protein.

WB6211CLP - a soft white spring wheat intended for a replacement to WB-1035CL+, WB6211CLP is a Clearfield® Plus Variety from WestBred, with two-gene tolerance to Beyond (imazamox) herbicide.

Clearfield wheats have resistance to imazamox herbicides such as to Beyond® for hard-to-control grassy weeds. WB6211CLP has resistance to Hessian fly and good resistance to yellow (stripe) rust. In the first year in the trials, WB6211CLP yields were below WB-1035CL+ (Table 42) and overall, below average, yielding 91% of trial averages. The earlier heading varieties like WB6211CLP had lower test weight. Height of WB6211CLP is similar to WB-1035CL+.

WB6430 (BZ608-125) – a soft white spring wheat released by WestBred (a unit of Bayer Crop Science) in 2014. WB6430 is a UI Pettit-type of soft white spring wheat with consistently high yield potential, good test weight, and resistance to stripe rust. Maturity is slightly earlier than average, but 2-3 days later than UI Pettit. WB6430 is also 2-3 inches shorter than average and has good straw strength (Table 40). WB6430 is moderately resistant to stripe rust and susceptible to FHB. FHB reaction is more susceptible than Seahawk, which is moderately resistant, and has high levels of DON accumulation in the grain.

YSC-603 (10C-58) – soft white spring wheat developed by Yield Star Cereal Sciences. Tested in three irrigated spring locations, YMC-603 averaged 86% of trial average (Table 48), similar to another club wheat (Hedge CL+). Heading date and grain protein was similar to Hedge CL+, while 3 inches shorter and lower in test weight.

SPRING WHEAT – Hard White and Red

Alum (WA8166) – hard red spring wheat released in 2015 by Washington State University's Ag Experiment Station for tolerance to aluminum in low pH soils. Over the three years in the trials, Alum has had yields similar Jefferson for yield and test weight, but higher in protein (Table 31). Alum heads about 2-4 days later than, is four to five inches taller than average, and may lodge under high input production conditions. Alum is MR to MS to stripe rust and has moderate resistance to Hessian fly. Alum would be suited for the Ashton area where acidic soils are problematic, and it did well in dry land conditions in 2020.

AP Renegade (06PN3017-9) – a hard red spring released in 2018 from Agripro / Syngenta, AP Renegade is widely adapted across moisture zones with medium height and maturity in the Washington / Northern Idaho region showing quick germination and emergence. AP Renegade has shown higher than average yields (Table 31) under irrigation, later maturity (4 days) and higher plant height (4 inches) than average in testing in the Snake River Plain with good lodging resistance, lower than average test weight and average protein. Additional N should be applied at heading to meet protein goals. AP Renegade has resistance to Hessian fly, with good HTAP stripe rust resistance and FHB tolerance.

Choteau – is a semidwarf hard red spring wheat released by Montana State University in 2003. Choteau has the solid-stem characteristic, which contributes to resistance to the stem sawfly. Choteau yields were below average and similar to WB9668 under dryland conditions in Soda Springs (Table 32). Choteau is 1-2 inches taller and 3 days later in maturity than WB9668.

Choteau had good test weight and protein and has acceptable end use quality.

Dagmar (MTS1588) – the dryland hard red spring wheat Dagmar is a 2019 release from Montana State University and in the first year of testing in 2019 UI trials was the top yielding variety in Soda Springs. In 2020, Dagmar was included in the irrigated trials and yielded well in Ashton and Soda Springs. In 2021, Dagmar yields were 106% of trial average (Table 39 and Chart 5). Dagmar had good test weight, high protein, early to medium maturity and was three inches taller than the irrigated trial average (Table 33). Dagmar is PVP Title V (pending) and seed was available 2021.

Dayn (WA8123) – Dayn is a hard white spring wheat released in 2012 by Washington AES and the USDA-ARS. Dayn is being handled in southern Idaho through Syngenta Cereals. Dayn was the highest yielding hard white spring wheat over the past six years of the irrigated trials, yielding 114% of trial averages in 2021 (Table 39). Test weight is above average and heading date was at average. Protein was a little below average. Dayn was 2-3 inches taller than average but has good lodging resistance. End use quality is acceptable. Dayn is resistant to stripe rust and among the "least susceptible" hard white spring wheat for FHB.

Duclair – a hard red spring developed and released by Montana AES, with solid stem characteristic that reduces impact from wheat stem sawfly. It is currently under testing for adaptability to southeast Idaho conditions for areas where wheat stem sawfly is a problem. Duclair is an awned semi-dwarf variety, similar to Choteau, but heading 1-3 days earlier and about 1-3 inches taller, depending on the year. Yield of Duclair in Soda Springs was very good, comparable to Alum (Table 32), with average test weight and protein. Duclair is PVP protected.

Expresso (DA984-034SRR) – a hard red spring wheat bred and released in 2006 by WestBred (Bayer CropScience) with good resistance to stripe rust. Expresso was included due to its susceptibility to low falling number (FN). Yield performance was similar toWB9668 (Table 33), with similar test weight and later maturity, heading 1 day after Jefferson. Expresso has high grain protein and medium plant height.

Glee (WA8074) – hard red spring wheat released in 2012 through Washington State University with desirable end use quality and resistance to stripe rust. Glee is included in the trial as a quality check. Yield of Glee is average in the dry land trials (Table 32) and similar to WB9668 under irrigation (Table 31). Glee has good test weight, is taller than average (4-5 inches taller than WB9668) and is average for percent seed protein.

Jefferson HF (IDO462) – hard red spring wheat released by Idaho AES and USDA-ARS in 1998. Jefferson is primarily intended as a dryland variety due to it being taller than average (about 4 inches taller under irrigation) and susceptible to lodging. Irrigated and dryland yields have been at or above nursery averages (Table 31, 32). Jefferson has good quality when there is adequate soil nitrogen and sulfur, when it has a minimum of 13% grain protein. Jefferson HF was developed from Jefferson but specifically selected for Hessian fly resistance for which it was segregating. Jefferson (HF) is susceptible to the current races of stripe rust and very susceptible to FHB, but resistant to Hessian Fly.

Net CL+ (WA8280 CL+) – a 2019 release from Washington State University, Net CL+ is a hard red spring, two-gene Clearfield variety (having Als1 and Als2). Net CL+ has good end use quality and is intended for dryland production. Under irrigation in the 3-yr summary (Table 31), Net CL+ yields were below trial average and similar to WB9668. Net CL+ headed 4 days later and is 4 inches taller than average with good grain protein. Net CL+ may have a tendency to lodge under higher production conditions. Proteins were above average under irrigation, with excellent test weight in both irrigated and dryland conditions.

Rocker (BZ917-277) – a hard red spring wheat being released in 2022 by Nutrien Ag Solutions with very high test weight even under very droughty conditions in Soda Springs (Table 38). Yield was greater than average, heading date was 3 d later than average and similar to Duclair and Alum with higher protein. Plant height is about 2 inches greater than the trial average. Rocker was selected for tolerance to wheat stem sawfly.

SY Gunsight (06PN3015-08) – Syngenta released this hard red spring in 2016. Average three-year yields were similar to SY Teton and Alum (Table 31). Test weight and grain protein of SY Gunsight are average, with similar heading dates to Jefferson. It is moderately 'resistant' to FHB under lower disease pressure and stripe rust, and susceptible to Hessian fly. Grain protein is slightly below average, requiring top dress nitrogen at flowering to hit hard red spring protein targets.

SY Teton (SY10136) – Syngenta Cereals released this hard white spring wheat in 2015. In the past three years, SY Teton was one of the highest averaging for yield of the hard white and hard red spring wheat group (Table 31). SY Teton was 3 bu/A less than Dayn for yield, with lower test weight and three inches shorter but with better end-use quality. Heading date is average, and grain protein is less than average. Reaction to head blight was similar to Dayn, which was less susceptible than the majority of hard white spring wheat varieties. SY Teton is moderately susceptible to stripe rust and may lodge at higher seeding rates.

UI Platinum (IDO694C) – a University of Idaho and IAES hard white spring wheat, UI Platinum is an average yielding hard white spring wheat with good end use quality, good test weight and good lodging resistance. Over the last three years, yield has been comparable to Alum and WB9879CLP, and less than Dayn (W) and SY Teton (W) (Table 31). In some environments, UI Platinum will show dark chaff discoloration similar to black chaff infection, which is not a disease but a genetic trait called melanism. UI Platinum is susceptible to stripe rust and very susceptible to FHB.

WB7202CLP (XA7320) – a hard white spring wheat released by Westbred (a unit of Bayer Crop Science) in 2017. In the three-year summary, the irrigated yield average of WB7202CLP was similar to WB7696, UI Platinum and Jefferson and was at 102% of trial average in 2021 (Table 39). Test weight was slightly higher than the average, heading date was 2 days earlier than trial average, and it was 2-3 inches shorter. WB7202CLP is a two-gene Clearfield wheat with tolerance to imazamox herbicide Beyond®. Additional use of spring Clearfield tolerant wheat includes planting following beans where imazamox may have a residual presence in the soil, or to reduce wheat red volunteer in white spring wheat production. The FHB reaction of

WB7202CLP was susceptible, similar to Snow Crest and UI Stone.

WB7313 (XD9201) - the most recently released hard white spring wheat from WestBred, WB7313 has greater yield potential than WB7328, WB7589 and WB7696. While only tested in one year in these trials, yield of WB7313 exceeded that of all other hard white spring wheats except Dayn across irrigated locations in 2021 (Table 33). Grain protein and test weight were at trial averages, and WB7313 headed two days earlier than Dayn, was 4 in shorter and had higher grain protein. WB7313 has good end use quality and resistance to stripe rust.

WB7328 (BZS09-0133W) – most similar to Snow Crest, WB7328 is a hard white spring wheat with similar agronomic characteristics as Snow Crest but is a little shorter. Released in 2015 by WestBred (a unit of Bayer Crop Science) as a Snow Crest replacement, WB7328 has better resistance to stripe rust and higher yield potential. In 2016, a year with high stripe rust pressure, WB7328 showed some susceptibility to stripe rust. Like almost all hard white spring wheat, WB7328 is susceptible to FHB. Yield has been below average (Table 31, 32) it is 4 in shorter than average and has high grain protein.

WB7589 (BZ9S09-0735W) – a short-statured, hard white spring wheat most similar to Klasic in agronomic and end use quality. WB7589 was released in 2015 by WestBred (a unit of Bayer Crop Science) as a replacement for Klasic, having better resistance to stripe rust and higher yield potential. WB7589 yields a little less than UI Platinum (Table 31). Under heavy disease pressure, WB7589 was moderately resistant to stripe rust in 2016. Like all hard white spring wheat, WB7589 is susceptible to FHB.

WB7696 () – a hard white spring wheat released in 2018 by WestBred (Bayer Crop Science), WB7696 was first tested in these trials in 2019, with yields and test weights similar to WB7202CLP and SY Gunsight (Table 31). WB7696 has good test weight, is mid-maturity with lower than average protein. Three-year yields were 6 bu/A greater than WB7589. WB7696 yields were similar to UI Platinum under dry land conditions with lower test weight and greater protein.

WB9668 (BZ908-552) – a hard red spring wheat, WB9668 has been tested in the trials since 2014. Three-year data shows WB9668 to be lower than average for yield with excellent test weight and grain protein (Table 31) but yields very well under typical production conditions. WB9668 is 2 inches shorter than average, has lower lodging and an average heading date. WB9668 is very resistant to the current races of stripe rust and moderately susceptible to susceptible to FHB. WB9668 is also among the most resistant hard red spring wheats for cereal cyst nematodes (CCN).

WB9707 (XC9304) – in the second year of trial testing, WB9707 is a hard red spring wheat released by Westbred / Bayer Crop Science in 2020. Results for 2021 put WB9707 at 103% of trial average yield, similar to Dagmar with slightly better test weight (Table 39). WB9707 has excellent test weight and even in a hot year where test weight averaged 58.7, test weight of WB9707 was 60 lbs/bu with 14.2% grain protein in irrigated trials. Heading was 2 days earlier than Jefferson. Under dry land conditions in 2020, yield was greater than WB9668. WB9707 has resistance to stripe rust.

WB9879CLP – developed by Montana State University and carried by WestBred /Bayer Crop Science, WB9879CLP is a hard red spring wheat with the solid stem characteristic that reduces impact from wheat stem sawfly. WB9879CLP is a two-gene Clearfield wheat with tolerance to imazamox herbicide Beyond®. Additional use of spring Clearfield tolerant wheat includes planting following beans where imazamox may have a residual presence in the soil, or to reduce wheat red volunteer in white spring wheat production. In 3-year summaries under irrigated conditions, yields were below average and comparable to WB9668 with slightly lower test weight, protein, and 4-5 inches taller in plant height. WB9879CLP headed 6 days later than WB9668 (Table 31). Under dryland, yields were similar to slightly greater than Choteau (Table 32), but was 1 inch taller and 2 days later in heading.

WINTER WHEAT – Soft White Winter

AP Dynamic – a soft white winter wheat released in 2020 by Agripro / Syngenta for low to intermediate rainfall zone in the PNW, AP Dynamic has good winter hardiness and quick emergence. AP Dynamic was tested in one dryland location in 2021, performing at 101% of the Ririe location average yield. 2021 dryland yields were significantly affected by drought, and Ririe yield averaged only 16 bu/A, and AP Dynamic yielded 17 bu/A.

AP Exceed (11PN039#20) – a soft white winter wheat is primarily adapted to intermediate to high rainfall and irrigated production in Eastern Washington and Eastern Oregon, and has done very well in southern Idaho, yielding 156 bu/A or 111% of irrigated trial averages in 2021 (Table 17). AP Exceed is earlier and shorter than the average of the trials, and had good test weight (in a very bad year for test weight in 2021, see Table 17 and Chart 3).

AP Iliad (11PN044#84) – soft white winter released in 2020 by Agripro Syngenta adapted to intermediate to high-moisture rainfall and irrigated conditions with good straw strength. AP Iliad has resistance to stripe rust, strawbreaker foot rot, physiolgical leaf spot (PLS), soil-borne mosaic virus (SBMV). In 2020 trials, AP Iliad averaged 103% of trial averages, doing particularly well at the 2020 Kimberly site at 180 bu/A and in 2021 at the irrigated Ririe site yield was 103% of average (Table 25 and Chart 3). At 2 inches shorter and 2d earlier flowering than average, AP Iliad also had higher test weight (57.1 lbs/bu) than the average of 2021 trials.

Brundage (ID86-14502B) – a soft white winter wheat released in 1996 by the Idaho AES. Irrigated yield potential of Brundage is below trial averages, with good test weight and end use quality. Yields in the last three years have been about 90-95% of average as Brundage is very susceptible to several diseases, including stripe rust, dwarf bunt and Cephalosporium stripe. In 2016, stripe rust reduced Brundage yield significantly – by as much as 50% or greater of expected. In 2021, (Table 25) Brundage yielded 95% of trial average.

Devote (WA8271) – a soft white winter wheat released in 2019 by the Washington State Ag Experiment Station and USDA-ARS, intended for rainfed production in areas of <12 inches of precipitation. In Washington, yields exceed Otto and has stripe rust resistance, good eyespot resistance, Fusarium crown rot resistance (FCR or dry land foot rot) resistance and has cold and snow mold tolerance. In Idaho, Devote performs agronomically similar to UI Sparrow and Eltan and has excellent

emergence when deep planted, yielding 112% of trial average in 2020. Heading date was a little earlier than Eltan and Otto. Test weight was very good and plant height was about an inch less than Eltan. Devote has good FCR, strawbreaker (eyespot), snow mold and stripe rust resistance. End use quality is better than Eltan.

Eltan (WA7163) – soft white winter wheat released in 1990 by the Washington AES. Eltan has wide adaptability in the dry land production areas with good snow mold tolerance. Yields are still consistently good in dryland trials (Table 16). Eltan will lodge under irrigation and is one of the latest varieties for heading date but is still a good choice for dryland production areas. Under heavy stripe rust pressure, Eltan was susceptible to stripe rust, and is moderately resistant to moderately susceptible to dwarf bunt, so difenoconazole seed treatment is recommended.

LCS Artdeco (NSA06-2153A) – Limagrain Cereal Seeds introduced several European lines into the US in 2011, including LCS Artdeco, a soft white winter wheat. In the three-year averages (Table 15), LCS Artdeco yields were 101% of trial average and in the hot and dry year of 2021, LCS Artdeco yield was 100% of trial average (Table 25). LCS Artdeco has low test weight and very low protein. Plant height was 3-6 inches shorter than UI Sparrow with 3-4 days earlier heading. LCS Artdeco is moderately resistant to stripe rust, and very susceptible to dwarf bunt. LCS Artdeco is early maturing, daylength insensitive and can be a little winter tender.

LCS Blackjack (LWW15-71945) – Blackjack is a 2019 release from the Limagrain Cereal Seeds program; it is an awnless soft white winter derived from a Bobtail/Rosalyn cross with excellent yields in the 3-year averages (Table 15), similar to WB1783 and VI Shock. In 2020 yields were 106% of trial averages, but in the hotter year of 2021, LCS Blackjack yields were 104% of average (Table 25). Blackjack was 2-3 inches shorter than WB1783 with similar heading date but with lower test weight. Straw strength was good, and LCS Blackjack is resistant to stripe rust, has good stress resistance and good disease resistance to stem based diseases.

LCS Hulk (LWW14-73163) – a soft white winter with released in 2018 by Limagrain Cereal Seeds for its wide adaptation in the PNW and high yield potential. Three-year average yields were greater than WB1783 with lower test weight (Table 15). In 2021, average yield of LCS Hulk was 107% of trial average (Table 25). Under dry land conditions, LCS Hulk yielded similarly to UI Sparrow (Table 16), although it was not included in the driest location of Rockland. LCS Hulk has high adaptability, excellent standing power, good resistance to stem based diseases. Height is above to average under irrigated and dry land conditions, and heading date is 1 d later than trial average. LCS Hulk has good test weight and low to average protein. LCS Hulk is susceptible to dwarf bunt and resistant to stripe rust.

M-PRESS – a soft white winter wheat marketed through McGregor and in its second year in southern Idaho trials, M-PRESS yields were 1-2 bu/A less than SY Ovation at irrigated locations (Table 17), overall yielding at 101% across all trials (Table 25). Test weight was greater than average with similar heading date to WB1783 and 1 inch taller. M-PRESS is resistant to stripe rust.

Nixon (OR2121086) – Soft white winter released from OSU in 2019, was released as 'Nixon' after a couple who both served as

chairs of the Oregon Wheat Commission, Bob and Jean Nixon. Nixon has an intermediate heading date, is stripe rust resistant and carries Pch1 for foot rot resistance. Nixon had good straw strength, good yield potential in intermediate rainfall areas, good test weight and excellent end use quality. Irrigated average yield over the past three years (Table 15) was 151 bu/A, comparable to LCS Artdeco with better test weight. Nixon has lower than average test weight, later heading date, average grain protein and was 2-3 inches taller than average.

Norwest Duet (LOR-092) – Norwest Duet was released in 2015 by Oregon State University jointly with Limagrain Cereal Seeds. Norwest Duet is a very tall soft white winter wheat that in the irrigated locations performed at trial average for yield and average for test weight over the previous 3 years (Table 15). Norwest Duet will have higher lodging under high production irrigated conditions. In three-year dryland averages, yield was comparable to Otto, but with lower test weight. Heading date was average in dryland trials (Table 16), 4 days earlier than Otto, and grain protein was less than average and less than Otto. Norwest Duet is moderately susceptible to dwarf bunt and is resistant to stripe rust. Norwest Duet has desirable end use quality, better than Norwest Tandem.

Norwest Tandem (LOR-334) – a soft white winter wheat that was released in 2016 by Oregon State University jointly with Limagrain Cereal Seeds, LLC. Norwest Tandem yields were at average in 2019-2021 combined irrigated data, similar to LCS Artdeco and SY Assure (Table 15). Tandem has earlier to mid-maturity, stiff straw, and is best under irrigation. Tandem had average test weight, acceptable end use quality, and is susceptible to dwarf bunt, with good resistance to stripe rust.

OR2X2 CL+ (ORI2150031CL+) – ORI2150031CL+ was released as 'OR2X2 CL+' in 2019. Its name is based on the line having two genes for herbicide resistance and two genes (Pch1 and Pch2) for foot rot resistance. Clearfield wheats have resistance to imazamox herbicides such as to Beyond® herbicide for hard-to-control grassy weeds. In southeastern Idaho, compared to UI Magic CL+, OR2X2 CL+ soft white winter has a 2 day later heading date, (see Table 15), lower test weight, similar straw strength and better stripe rust resistance. OR2X2 CL+ has acceptable end use quality, similar to Madsen.

Otto (WA008092) – a dryland (<12" rainfall production zone) soft white winter released September 2011 by Washington AES, Otto is similar agronomically to Eltan and both are 2-5 days later in heading than trial average (Table 16). Otto has similar yield potential to UI Sparrow, often better than Eltan, with test weight similar to Eltan. Otto has good emergence from deep plantings in the dry land areas with good cold tolerance and straw strength. Otto has resistance to eyespot foot rot and will have similar snow mold tolerance as Eltan, better stripe rust resistance and also is moderately resistant to dwarf bunt. End use quality was better than Eltan.

Piranha CL+ (WA8305CL+) – Piranha CL+ is a Clearfield soft white winter wheat released in 2020 by WSU AES and the USDA-ARS in Pullman. Clearfield wheats have 2-gene resistance to imazamox herbicides such as to Beyond® herbicide for hard-to-control grassy weeds in winter wheat production. In three years of testing, Piranha CL+ has done very well under irrigation and dryland conditions, with

yields at 107% of average in 2021. Irrigated yields were above average in 2021, but test weights were low due to extreme heat during flowering (Table 17). Piranha CL+ emerges well after deep-planting in the dryland production areas and while yielded very well, Piranha CL+ may lodge under irrigated higher production areas.

Sockeye CL+ (WA8306CL+) – another 2020 release from the Washington State University, Sockeye CL+ is a soft white winter wheat with 2-gene resistance to imazamox herbicide. Sockeye CL+ also has very high yield potential and broad adaptability across productions regions. It is recommended for production in the intermediate and high rainfall areas of the PNW and has performed similarly to Norwest Tandem and WB1376CLP for yield in these trials. Sockeye CL+ has a taller plant height and may lodge under irrigation. Yields were less than Eltan, UI Sparrow and Otto under dryland conditions, had average test weight and had a heading date 3-5 days earlier than Eltan and Otto.

Stephens (OR65-116) – a 1977 soft white winter release from Oregon AES, Stephens is kept for long-term check in Idaho EVTs. Yield and test weight under irrigation are below average (Table 15, and Table 16). Stephens heading date and protein are at average. End use quality is poor. Stephens is moderately susceptible to dwarf bunt, and does not have good resistance to BYDV, snow mold or stripe rust.

Stingray CL+ (WA8275CL+) – a soft white winter wheat officially released in 2019 through WSU as Stingray CL+, WA8275 CL+ was the top yielding soft white winter 2-gene Clearfield line in Washington, Northern Idaho and Oregon. Stingray CL+ is broadly adapted and has very good stripe rust resistance, eyespot foot rot (strawbreaker) resistance, and very good end use quality. Stingray CL+ has higher falling number values and good test weight. In 2021 irrigated locations, Stingray CL+ yields were similar to WB1529, and in 2020 yields were similar to UI Magic CL+, below irrigated averages. Overall, Stingray CL+ yields were at 100% of all location averages in 2021, with average heading, lower test weight and slightly taller than average (Table 17).

SY Assure (SY96-2) – a soft white winter wheat released in 2016 by Syngenta Cereals, yield in 2019-2021 irrigated trials was comparable to Norwest Tandem and greater than UI Magic CL+ and Stephens (Table 15) with very good test weight. SY Assure is broadly adapted with earlier heading than the trial average by 3-4 days and is 1-3 inches shorter than average. SY Assure is moderately resistant to moderately susceptible to dwarf bunt, and resistant to stripe rust.

SY Ovation (03PN108#21) – a soft white winter wheat released by Syngenta Cereals in 2011 for higher rainfall and irrigated production. SY Ovation has had excellent yields over the past seven years with good test weight. Heading date, height, test weight and grain protein were average (see Table 15). SY Ovation is resistant to soil-borne mosaic virus, moderately susceptible to current races of stripe rust and susceptible to dwarf bunt. SY Ovation has good end use quality and threshability.

SY Raptor (04PN046#16) – Released in 2017 through Agripro/Syngenta Cereals, SY Raptor is a low protein soft white winter with excellent yield potential, similar to SY Ovation (Table 15). Agronomically similar to SY Ovation with similar yield potential, slightly less test weight and better stripe rust resistance. SY Raptor has good HTAP

resistance to current races of stripe rust, moderate tolerance to Cephalosporium stripe, and short to medium height with good straw strength under irrigation. SY Raptor is a widely adapted medium maturity variety with good threshability and test weight slightly below average. SY Raptor may have lower FN in some years.

UI Magic CL+ (IDN 09-DH11) – UI Magic CL+ is a soft white winter wheat and is a two-gene Clearfield line. Clearfield wheats have resistance to imazamox herbicides such as to Beyond® herbicide for hard-to-control grassy weeds. UI Magic CL+ was released in 2015 as a joint release from the Idaho AES and LCS seeds. Yields in 2019-2021 were slightly less than the trial average (Table 15) and similar to UI Sparrow with much better test weight. Heading date is at trial averages, and it is 1-2 inches shorter than average and SY Ovation. UI Magic CL+ is widely adapted, susceptible to dwarf bunt and very susceptible to stripe rust.

UI Sparrow (IDO1108) – a 2016 release from the University of Idaho, UI Sparrow is a soft white winter wheat with high yield potential in irrigated and dry land production. While adapted to both, UI Sparrow has a higher tendency to lodge under irrigated production. Three-year irrigated yield was slightly below average and similar to Northwest Duet and UI Magic CL+ (Table 15). UI Sparrow has low test weight (58.5 lbs/bu) and is 3 days later in heading date than average under irrigation. Under dry land conditions, UI Sparrow was a top yielding variety over the past 3-6 years (Table 16). UI Sparrow is very resistant to dwarf bunt, which is a huge benefit under organic production systems. It was susceptible to current 2019 races of stripe rust, a low disease pressure year.

VI Frost (UIL09-15702A) – VI (Varsity Idaho) Frost soft white winter was released through the UI/LCS joint venture in 2020, and was tested under dryland production conditions only in Ririe under exceedingly poor conditions. Intended for dryland production regions with excellent winter hardiness and snow mold tolerance, VI Frost has excellent end-use quality and good stripe rust resistance. Test weight is better than Otto with 5-8 days earlier in heading.

VI Presto CL+ (UIL17-6451CL+) – newly released through the UI/LCS joint venture in 2020, VI Presto CL+ is a soft white winter Clearfield line tested under irrigated and dry land conditions, targeted for low to intermediate rainfall areas. VI Presto CL+ has better emergence properties than Norwest Duet, and in 2021 yielded at trial average for irrigated trials (Table 17). Yield was similar to Piranha CL+ with better test weight, slightly earlier heading and similar in plant height. VI Presto CL+ has resistance to stripe rust, tolerance to Cephalosporium stripe and is photoperiod insensitive.

VI Shock (UIL15-72223DH) – a soft white winter wheat released for irrigation through the UI/LCS joint venture in 2020, VI Shock yields were greater than WB1783 and close to LCS Hulk over the previous three years (Table 15). In 2021, yield was similar to LCS Hulk and close to AP Exceed (Table 17). Three-year average yields irrigated were excellent, although with low test weight at 58.3 lbs/bu compared with 60.9 lbs/bu of WB1783. VI Shock has medium maturity, average protein and plant height (Table 15).

VI Voodoo CL+ (UIL17-6268CL+) – A soft white winter released through the UI/LCS joint venture in 2020, VI Voodoo CL+ is a two-gene Clearfield line with yield similar to SY Ovation over the irrigated

three-year averages (Table 15). Test weight, plant height, and protein were below trial averages (Table 15), and heading date was 1 day later than SY Ovation. VI Voodoo CL+ is agronomically similar to UI Magic CL+ with stripe rust resistance and higher yield potential.

WB456 (BU6W99-456) – a soft white winter wheat from WestBred (a unit of Bayer Crop Science). WB456 was released as an improvement over WB470 and as a replacement for WB528. WB456 yielded less than Stephens and Brundage in the past three years (Table 15) but has excellent test weight. 2021 yields were below average, about 95% of trial entries (Table 25). WB456 is shorter than Stephens but at trial average with improved lodging resistance. WB456 has an early heading date, 3-5 days earlier than average, and is moderately susceptible to stripe rust. WB456 is susceptible to dwarf bunt.

WB1376CLP (WB-1038CL) – soft white winter wheat released by WestBred (a unit of Bayer Crop Science) in 2015. WB1376CLP is an imi-tolerant, soft white winter wheat, containing two genes for tolerance to BASF's grass herbicide Beyond®. Irrigated yields were below average at 90% of average (Table 15) and less than WB 456 but with excellent test weights (Table 16). Dryland yields were below the trial averages, similar to Stephens (Table 16). Height is average and 1-2 inches taller than WB 456. WB1376CLP is susceptible to dwarf bunt, and moderately resistant to moderately susceptible to stripe rust.

WB1529 (BZ6W07-436) – soft white winter wheat released in 2014 by WestBred (a unit of Bayer Crop Science). Yields of WB1529 under irrigation are similar to Brundage over three years 2019-2021 (Table 15), with much higher test weight and good straw strength. Grain protein was at nursery averages. Dry land yields of WB1529 were similar to WB1783 (Table 17). Compared to WB1783, WB1529 is 2 days earlier in heading date and 3 inches shorter. WB1529 has good milling and baking quality. WB1529 is resistant to current races of stripe rust and resistant to dwarf bunt.

WB1783 (BZ6W09-471) – a high yielding soft white winter wheat released in 2016 by WestBred (a unit of Bayer Crop Science). Irrigated yield of WB1783 greater than SY Ovation and less than LCS Hulk (Table 15), with very good test weight and good straw strength. Irrigated yield in 2021 was very good (Table 17 and Chart 3), higher than SY Ovation and UI Sparrow. Dry land yields are also excellent. WB1783 is very resistant to stripe rust and very susceptible to dwarf bunt. WB1783 tends to be a late variety and should not be planted late in the fall.

YSC-201 – a soft white winter wheat variety carried by Wagner Seed, YS 201 was included at two irrigated locations, Aberdeen (Table 19) and Ririe (Table 22). Yields in both locations were below average, below LCS Shark in Ririe, and with average test weight. Protein was below and plant height was above site average in Aberdeen, with an average heading date.

YSC-215 – A Yield Star soft white winter wheat variety included at two irrigated locations, Aberdeen and Ririe. YSC-215 yields were close to WB456 and UI Magic CL+ in Aberdeen, with below average test weight and higher protein, later heading date, and was 3-4 inches taller. YSC-215 is available through Wagner Seed.

YSC-268 –Another Yellow Star/Wagner Seed soft white winter wheat entered only at the Aberdeen location in 2021, YSC-268

yields were comparable to AP Exceed and better than Stephens. Test weight was greater than average, heading date was 1 day after Stephens and it was 3 inches taller (Table 19). Grain protein was high.

WINTER WHEAT– Hard Red and White

Hard White Winter Wheat

Golden Spike (UT1944-158) – a 1999 release from Utah AES for dry land production, Golden Spike is a hard white winter wheat with a partial waxy endosperm. Golden Spike will lodge under irrigation. Under dry land conditions, Golden Spike's test weight is below average, with yield at 96% of average (Table 14) and average grain protein. Plant height was 2 inches less than Juniper (Table 5). Golden Spike is very resistant to dwarf bunt but is susceptible to stripe rust.

Irv (OR2110679) – a hard white winter wheat released from Oregon State University in 2018 for moderate rainfall production conditions, Irv had low yield average under irrigated and dry land conditions (Table 5, 6). In 2020, Irv yields were 103% of trial averages, doing particularly well under dry land trials in Ririe and Rockland, but in 2021 Irv yields were 92% of trial averages (Table 14). Irv had average spring stand, heading date and plant height, and was below average test weight. Irv has good end use quality, slightly higher than average protein and is moderately resistant to stripe rust.

LCS Yeti (LCI13DH-2222) – LCS Yeti is a hard white winter wheat released in 2018 by Limagrain Cereal Seeds. LCS Yeti yields under dry land production in the past three years were below trial average, but with very good test weight. LCS Yeti yields were 86% of dryland trial averages in 2020. LCS Yeti has very good protein, headed 3-4 days earlier than average and was 1 inch shorter. LCS Yeti is susceptible to dwarf bunt (DB) and needs seed treatment if grown in areas prone to DB disease. LCS Yeti is moderately susceptible to stripe rust and resistant to soil-borne mosaic virus.

Millie (OR2130118H) (W) – a hard white winter released the fall of 2020, named 'Millie' after Millie Rouch, wife of Chris Rouch, a dry land wheat farm family in eastern Oregon who have been long time supporters of the OSU wheat breeding program. Millie has good straw strength under irrigation, good stripe rust resistance, excellent yield potential across low rainfall zones irrigated. Yields of Millie were slightly higher than average under irrigation (Table 4) similar to Utah 100 with higher test weight, and is 5-8 inches shorter. Millie has acceptable to good quality which depends on hitting protein targets.

UI Bronze Jade (W) (IDO1706) – this hard white winter wheat released by IAES in 2019 has been in the trials for 4 years, and has demonstrated good yield, but very low test weight, overall poor quality and should be grown only with a specific contract market in mind. This dryland variety will lodge under irrigation and is 2 inches taller than average. Under dryland conditions, UI Bronze Jade was slightly below average for yield, average heading date and plant height, and low for test weight. UI Bronze Jade was susceptible to stripe rust in 2019.

UI Silver (IDO658B) – a hard white winter wheat released in 2011 by the University of Idaho AES. UI Silver yields very well under dry land conditions with excellent test weight (Table 5). UI Silver has good end use quality for both bread and Asian noodles. UI Silver has resistance to stripe rust (high temperature adult plant or HTAP), dwarf

bunt, and carries the SrTmp gene for resistance to stem rust. It is susceptible to black chaff and lodging, which can be a problem under irrigation. Like Golden Spike, UI Silver is a partial waxy winter wheat. UI Silver is very resistant to dwarf bunt and moderately resistant to stripe rust.

Hard Red Winter Wheat

Balance (WA8248) – a hard red winter wheat tested in 2021, developed by Nutrien Ag and released in 2020. Average irrigated yield was similar to LCS Rocket and 2 bu/A less than LCS Jet (Table 6). Under dryland conditions in 2021, yields were poor for all varieties. Balance had very good protein, higher than average test weight, was 1 inch taller than average and did show some lodging under high production conditions, similar to LCS Rocket but lower than trial average.

Flathead – A hard red winter wheat released through Montana State University (MAES) in 2018, Flathead has a Yellowstone background with enhanced stripe rust resistance (two genes for resistance), shorter stature and early maturity. 2020 yield of Flathead was 96% of trial average but it did very well in Aberdeen (107%) and Rupert (110% of trial average). In 2021, Flathead performed at 105% of trial average yield. Test weight and grain protein of Flathead is excellent. Flathead had higher lodging and lower protein than Balance (Table 6).

FourOsix (MT1462) – a hard red winter released in 2018 by Montana State University as a replacement to Yellowstone, well-known for its high yield, with improved milling and baking qualities. FourOsix has shown high loaf volume, water absorption and mixing characteristics. In the three-year trial averages, FourOsix had comparable yield and better grain protein than LCS Rocket, with higher test weight (>2.5 lbs/bu), and was 4 in taller. FourOsix has better resistance to stripe rust than Yellowstone with less lodging.

Juniper (IDO 575) – hard red winter wheat released in 2005 by the Idaho AES for dry land production areas. Juniper has moderate yield potential under dryland production, yielding less than the average for the trials (Table 5). Juniper is extremely tall and will lodge under irrigation. Juniper has good test weight and high protein. yielding similar to Golden Spike and LCS Yeti, is very resistant to dwarf bunt and moderately resistant to stripe rust.

Kairos – a hard red winter first in these trials in 2020, Kairos is handled by McKay Seed in Moses Lake, WA. In the first year of testing, Kairos yielded 94% of irrigated averages, similarly to Keldin, but in 2021, yielded just below LCS Jet and similar to Balance (Table 6). Kairos had below average test weight in 2021, headed early, was 4 inches shorter than average and had lower protein.

Keldin (ACS55017) – a hard red winter wheat distributed by WestBred (a unit of Bayer Crop Science) for irrigated production, Keldin has consistently been a high yielding hard red winter wheat tested in these trials (Table 4). 2021 yields were at 152 bu/A, the highest in the irrigated trials (Table 6) under irrigated conditions (Table 4, 5), yielding 112% of trial average yield (Table 14). Keldin is a little shorter than average for height, has very high test weight, and is a little below average for grain protein. Keldin is susceptible to dwarf bunt and in 2016 and 2018 was moderately susceptible to current races of stripe rust.

Keldin + 11-52-0 – In-furrow fertilizer was added to one variety in the hard winter and soft winter group to test the effect of starter fertilizer on yield. (Monoammonium phosphate or 11-52-0 at 20 lbs phosphate per acre was included in-furrow.) In Table 4 (3-year irrigated averages), Keldin and Keldin +11-52-0 were within 1 bushel of each other (S.E. = 2 bu/A), indicating no effect of starter fertilizer on yield, stand or other agronomic traits. Under dryland conditions, Keldin + 11-52-0 was 4 bu/A greater than Keldin, with the S.E. of 1.5 bu/A, which is a statistically significant difference between the two for yield. In 2020, dryland yield was improved by 6 bu/A with the addition of starter fertilizer (11-52-0), resulting in yield at 107% of trial average, as compared to Keldin without starter fertilizer which yielded 93% of trial average.

LCS Jet (NSA 7208) – a hard red winter with released in 2015 by Limagrain Cereal Seeds. LCS Jet has excellent yield potential (Table 4) and has been a top yielding hard red winter for the previous seven years of irrigated testing. In 2021, LCS Jet yielded 104% of irrigated mean (Table 14 and Chart 2), doing particularly well in Kimberly (Table 9). Test weight, grain protein and lodging has been below average, and LCS Jet has been 3 inches shorter than average. LCS Jet is very susceptible to dwarf bunt. In 2019, LCS Jet showed an increase stripe rust susceptibility with a susceptible infection type. LCS Jet has good end use quality.

LCS Rocket (NSA10-2196) – is a hard red winter wheat released from Limagrain Cereal Seeds in 2018, demonstrating high yield potential in Northern Idaho and the Palouse area in high rainfall zones. Three-year irrigated average yield comparable to Yellowstone and Keldin, with low test weight and lower grain protein. Yields in 2020 under irrigation were 95% of trial average, while in 2021 yields were 107% (Table 14). Heading date is similar to Keldin (Table 4), 2 days earlier than trial average, and LCS Rocket is shorter than Keldin (3 inches) and Yellowstone (7 inches). LCS Rocket has good resistance to stripe rust and is susceptible to dwarf bunt.

LCS Zoom (LWW14-73915) – a Limagrain Cereal Seeds hard red winter released in 2019 with good yield potential in the intermediate to low rainfall areas of OR and WA. LCS Zoom can emerge from deep furrows with a long coleoptile. LCS Zoom was comparable to LCS Jet and WB4792 for yield in 3-yr average dry land trials (Table 5), but lower in test weight. LCS Zoom was 3 days earlier in heading and 3-5 inches shorter than Yellowstone. LCS Zoom had excellent stripe rust resistance.

Milestone (ACS14132-412) – a new hard red winter wheat released through Nutrien Ag Solutions in Bozeman, MT. Milestone was tested in irrigated trials in 2021, yielding overall irrigated trials 104% of trial averages. Yield was 4 bu/A greater than Yellowstone, with similar lodging and grain protein, but with lower test weight. Milestone headed 2 days earlier than Yellowstone and was 5 inches shorter.

Promontory (UT1567-51) – a hard red winter wheat released by Utah AES in 1990. Promontory is a dry land variety with excellent test weight. Yield under irrigation has been above average, but it will lodge and was not included in the irrigated trials. Promontory has short coleoptiles and may have trouble emerging when planted deep in dry soils. Over the past three years of testing (Table 5), Promontory yields were below average. Promontory is resistant to dwarf bunt and moderately susceptible to stripe

rust. Promontory is taller than average with good grain protein.

Scorpio (WA8268) – a broadly adapted hard red winter wheat released in 2019 by Agricultural Research Center of Washington State University, Scorpio is mid-maturity with short stiff straw well adapted across the >15″ rainfall zones of the Pacific Northwest. Scorpio has high yield potential similar to LCS Jet and Keldin, and 3-year irrigated averages yields were 150 bu/A (Table 4) with lower (no) lodging than LCS Jet and Yellowstone. Test weight and grain protein was less than average. Scorpio should be well-adapted to no-till situations with low pH soils and has Al tolerance. In dryland trials, Scorpio yields were average, similar to UI Bronze Jade. Scorpio had moderately susceptible reaction to stripe rust in 2019 and has tolerance to Hessian fly. Scorpio has good end use quality.

Sequoia (WA8180) – a hard red winter wheat developed and released in 2015 by the Agricultural Research Center of Washington State University. Sequoia has very good (desirable) end use quality and emerges quickly in deep-planted situations. Sequoia yields under dryland conditions were greater than UI Silver and Utah 100 over the three previous years (Table 5). Test weight was greater than average, grain protein averaged 12.8% (higher than average) and heading was 4 days later than Utah 100. Sequoia has cold tolerance, adult plant resistance to stripe rust, and good straw strength.

UI SRG (IDO656B) – a hard red winter wheat released in 2012 by the Idaho AES for the dry land conditions of southern Idaho and northern Utah. SRG will lodge under irrigation without the use of growth regulators. Yields in the past three years have consistently been well above dry land average, comparable to Yellowstone with lower test weight (Table 5). UI SRG is very resistant to dwarf bunt and resistant to stripe rust and is a good choice for dryland production in southern Idaho.

Utah 100 (UT1650-150) – a hard red winter wheat released in 1997 by the Utah AES. Utah 100 has consistently done well under both irrigated (Table 4) and dryland (Table 5) conditions for yield. As a dryland variety, Utah 100 may lodge under irrigated conditions where yields are at trial average. Yield averaged 98% of average under irrigation and 106% of average under dryland conditions. Utah 100 is very resistant to dwarf bunt and is susceptible to current races of stripe rust.

WB4401 – a hard red winter wheat developed by WestBred (Bayer Crop Science) for the central and southern plains, WB4401 can be used for forage and grain yield. Tested only in Kimberly and Aberdeen, 2020 yields were 110% of trial average, and in 2021 irrigated yields were 108% of average. Yields were comparable to Keldin and LCS Jet with very good test weight (Table 6). WB4401 was 1 inch taller than Keldin and 3 days earlier in heading. WB4401 is moderately resistant to stripe rust.

WB4510CLP (XD4201) – a Clearfield Plus variety, WB4510CLP is a hard red winter wheat released by WestBred (a unit of Bayer Crop Science) in 2017. WB4510CLP is an imi-tolerant, soft white winter wheat, containing two genes for tolerance to BASF's grass herbicide Beyond®. In the first year of testing, WB4510CLP yielded the same as LCS Jet and LCS Rocket (Table 6) about 10 bu/A greater than average, but with much better test weight and higher grain protein. WB4510CLP has good winter hardiness, has medium maturity and was a little taller than average.

WB4623CLP (BZ9WM09-1663) – a hard red winter wheat released by WestBred (a unit of Bayer Crop Science), WB4623CLP is another two-gene Clearfield wheat. WB4623CLP had below average yields under irrigation but with excellent test weight and protein (Table 4). In the dryland trials yields were at trial average, similar to Promontory, FourOsix and Keldin (Table 5). Heading date was a little early to average, and plant height was one inch taller than average under irrigation and 3 inches less in dry land. WB4623CLP is susceptible to dwarf bunt and resistant to stripe rust.

WB4792 – a hard red winter wheat released in 2018 by WestBred/Bayer Crop Science, WB4792 is in the third year of testing in these trials. First and second year results show very high yield potential with excellent test weights (Table 4). Yields were similar to LCS Jet and greater than Keldin. WB4792 was 1 inch taller than trial average and had some lodging under irrigation, and proteins were low. Additional nitrogen would need to be applied to meet N requirements for yield and protein. Under dryland conditions, yields were similar to Yellowstone. WB4792 showed susceptibility to 2019 races of stripe rust.

Yellowstone (MT00159) – a hard red winter wheat with excellent yield potential in both irrigated (Table 4, Chart 2) and dryland conditions (Table 5) of southeast Idaho. Yellowstone was released by Montana State University and the AES in 2005 and has above average test weight and height, and average grain protein. End use quality is average, with good loaf volume. Under very high production inputs, Yellowstone will lodge under irrigation. It is moderately resistant to dwarf bunt and susceptible to stripe rust.

Table 3. Ten year averages of selected agronomic characteristics, 2011-2020 compared to 2021.

NOTE: "Average" values are for years 2011 to 2020

Winter Wheat (all market classes and locations)

YIELD			TEST WEIGHT			PLANT HEIGHT			HEADING DATE				LODGING		
	# of			# of			# of			# of		Days		# of	
Year	Loc.	bu/A	Year	Loc.	lb/bu	Year	Loc.	in.	Year	Loc.	date	fr. Jan.1	Year	Loc.	%
2018	7	104	2017	6	60.8	2015	6	35	2011	5	6/19	171	2014	5	25
2015	6	103	2018	6	60.3	2016	6	35	2019	6	6/12	164	2021*	6	11
2012	5	102	2011	5	60.2	2019	6	33	2021	6	6/9	161	2016	6	11
2020	7	102	2020	7	60.2	2018	7	33	2020	7	6/8	160	2011	5	9
2014	4	101	2019	6	60.0	2011	5	32	2017	6	6/7	159	2013	5	8
2019	6	99	2012	5	59.7	**Avg.**	---	**32**	**Avg.**	---	**6/6**	**158**	**Avg.**	---	**7**
Avg.	---	**96**	**Avg.**	---	**59.4**	2014	5	32	2013	5	6/6	158	2012	5	5
2021	6	95	2016	6	59.4	2021	6	31	2014	5	6/5	157	2015	6	4
2016	6	94	2013	5	59.4	2013	5	31	2018	7	6/5	157	2019	6	3
2017	6	91	2015	6	58.1	2020	7	30	2012	5	6/4	156	2018	7	1
2011	5	86	2021	6	56.4	2012	5	30	2016	6	5/31	152	2020	7	0.4
2013	5	79	2014	4	56.1	2017	6	29	2015	6	5/31	152	2017	6	0

Spring Wheat (all market classes and locations)

YIELD			TEST WEIGHT			PLANT HEIGHT			HEADING DATE				LODGING		
	# of			# of			# of			# of		Days		# of	
Year	Loc.	bu/A	Year	Loc.	lb/bu	Year	Loc.	in.	Year	Loc.	date	fr. Jan.1	Year	Loc.	%
2014	5	107	2016	5	61.9	2014	4	34	2011	5	7/10	192	2014	4	16
2018	5	106	2020	5	61.6	2019	5	34	2019	4	6/28	180	2021*	5	5
2020	5	101	2017	5	61.6	2020	5	34	2020	5	6/25	177	2019	5	4
2019	5	100	2013	5	61.4	2011	5	32	2012	5	6/25	177	**Avg.**	---	**3**
2017	5	98	2012	5	61.4	2021	5	31	2017	5	6/24	176	2011	5	3
2015	5	97	2015	5	61.0	2018	5	31	**Avg.**	---	**6/23**	**175**	2016	5	3
Avg.	---	**97**	2018	5	61.0	**Avg.**	---	**31**	2013	5	6/23	175	2015	5	2
2011	5	96	2019	5	60.8	2016	5	31	2016	5	6/21	173	2013	5	2
2016	5	91	**Avg.**	---	**60.4**	2015	5	30	2021	5	6/20	172	2017	5	1
2012	5	90	2011	5	59.2	2012	5	30	2018	5	6/20	172	2012	5	0.4
2021	5	89	2021	5	58.4	2017	5	28	2015	5	6/18	170	2018	5	0.3
2013	5	86	2014	5	56.5	2013	5	28	2014	5	6/18	170	2020	5	0.2

Spring Barley (all market classes and locations)

YIELD			TEST WEIGHT			PLANT HEIGHT			HEADING DATE				LODGING		
	# of			# of			# of			# of		Days		# of	
Year	Loc.	bu/A	Year	Loc.	lb/bu	Year	Loc.	in.	Year	Loc.	date	fr. Jan.1	Year	Loc.	%
2016	5	129	2016	5	53.6	2014	4	36	2011	5	7/9	191	2014	4	56
2012	4	129	2020	5	53.5	2019	5	35	2019	4	6/30	182	2013	4	33
2017	4	128	2013	4	51.6	2018	5	34	2020	5	6/28	180	2019	5	31
2014	4	127	2011	5	51.6	2020	5	33	2021	5	6/25	177	2011	5	26
2015	4	124	**Avg.**	---	**51.5**	2011	5	33	2012	4	6/25	177	2015	4	24
2013	4	122	2019	5	51.5	**Avg.**	---	**33**	**Avg.**	---	**6/25**	**177**	**Avg.**	---	**21**
Avg.	---	**122**	2017	4	51.4	2013	4	33	2017	4	6/24	176	2021	5	18
2020	5	119	2012	4	51.4	2015	4	33	2014	4	6/24	176	2017	4	17
2018	5	117	2018	5	51.4	2017	4	31	2018	5	6/24	176	2016	5	11
2011	5	112	2015	4	50.6	2016	5	31	2013	4	6/21	173	2018	5	10
2019	5	111	2021	5	50.1	2021	5	31	2016	5	6/20	172	2020	5	1
2021	5	100	2014	4	48.8	2012	4	30	2015	4	6/16	168	2012	4	0.4

* The field in Kimberly was flooded just before harvest, and most plots lodged because of that

Table 4. Hard Winter Wheat Irrigated Nurseries, 3-Year Averages (2019-2021; 11 site-years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
LCS Jet	155	58.9	100	6/2	35	1	11.3
WB4792	154	62.3	99	6/2	38	10	11.0
Keldin	152	61.2	99	6/2	37	15	11.7
Yellowstone	151	61.0	100	6/3	41	14	11.6
Keldin + 11-52-0	151	61.2	99	6/1	37	17	11.6
LCS Rocket	151	58.2	99	6/1	34	6	11.2
Scorpio	150	58.6	100	6/4	35	0	11.6
UI Bronze Jade (W)	150	58.2	100	6/3	39	15	11.8
FourOsix	149	60.9	99	6/3	37	8	11.6
Millie (W)	148	61.5	100	6/3	35	6	11.8
Utah 100	146	59.4	100	6/5	44	5	12.0
Irv (W)	142	59.5	99	6/3	38	7	12.1
IDO1806 (W)	134	61.8	100	6/2	34	13	12.4
WB4623CL	131	61.8	100	6/3	38	13	13.1
Average	**147**	**60.3**	**100**	**6/3**	**37**	**9**	**11.8**
SE	**2**	**0.2**	**0.3**	**0.20**	**0.3**	**1.8**	
Pr >F (variety)	**<0.0001**	**<0.0001**	**0.7107**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*year)	**<0.0001**	**<0.0001**	**0.6761**	**<0.0001**	**0.0543**	**<0.0001**	
Pr > F (variety*location)	**<0.0001**	**0.0004**	**0.8572**	**<0.0001**	**0.4456**	**0.0003**	
Pr > F (year*location)	**<0.0001**	**<0.0001**	**0.0777**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*year*location)	**<0.0001**	**0.0107**	**0.7327**	**<0.0001**	**0.0008**	**<0.0001**	

(W) = White

Table 5. Hard Winter Wheat Dryland Nurseries 3-Year Averages (2019-2021; 8 site-years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Sequoia	40	59.8	90	6/22	30	0	12.8
UI Silver (W)	39	60.5	92	6/19	35	0	13.0
Utah 100	38	59.5	94	6/18	28	0	13
Keldin + 11-52-0	37	59.7	95	6/17	24	0	12.5
Yellowstone	37	59.7	93	6/19	25	0	12.1
UI SRG	36	57.4	96	6/17	29	0	12.3
WB4792	35	60.8	92	6/16	24	0	11.6
LCS Zoom	35	57.0	90	6/16	22	0	11.7
LCS Jet	35	57.5	93	6/18	21	0	12
Millie (W)	34	60.2	90	6/19	23	0	12.9
IDO1806 (W)	34	58.1	94	6/18	21	0	12.7
Keldin	34	59.7	95	6/18	24	0	12.7
FourOsix	34	59.5	94	6/16	24	0	12.3
UI Bronze Jade (W)	34	59.2	93	6/19	25	0	12.3
WB4623CLP	34	59.9	90	6/18	22	0	13
Promontory	33	60.4	95	6/17	28	0	13.0
Scorpio	33	58.9	90	6/19	22	0	12.2
Golden Spike (W)	32	59.5	91	6/20	27	0	12.7
Juniper	32	59.8	93	6/18	29	0	13.5
Irv (W)	32	58.4	90	6/19	23	0	13.0
LCS Yeti (W)	31	60.2	92	6/15	23	0	13.4
Average	**35**	**59.3**	**92**	**6/18**	**25**	**0**	**12.6**
SE	**1.5**	**0.8**	**1**	**0.30**	**2.4**	**.**	
Pr >F (variety)	**0.0002**	**0.0184**	**<0.0001**	**<0.0001**	**0.0002**	**.**	
Pr > F (variety*year)	**0.3749**	**0.9341**	**<0.0001**	**<0.0001**	**0.9715**	**.**	
Pr > F (variety*location)	**0.0141**	**0.3839**	**0.0008**	**<0.0001**	**0.2695**	**.**	
Pr > F (year*location)	**<0.0001**	**0.2633**	**<0.0001**	**<0.0001**	**0.5888**	**.**	
Pr > F (variety*year*location)	**0.0003**	**0.9194**	**<0.0001**	**<0.0001**	**0.8889**	**.**	

(W) = White

Table 6. Irrigated Hard Winter Wheat Data Combined from Aberdeen, Kimberly, Rupert and Ririe, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Keldin	152	59.3	99	6/4	37	25	12.2
WB4401	147	58.2	100	6/1	38	27	11.5
LCS Jet	146	56.7	100	6/6	35	2	12.3
LCS Rocket	145	55.9	100	6/4	34	13	11.9
WB4510CLP	145	60.5	100	6/4	38	17	12.6
Kairos	145	57.2	100	6/2	32	8	12.1
Balance	144	58.6	100	6/3	38	14	12.8
Flathead	144	60.0	100	6/1	39	33	12.2
WB4792	143	60.5	100	6/5	38	19	11.3
MT1745	142	59.1	100	6/6	40	21	12.1
Keldin + 11-52-0	142	59.4	100	6/4	38	24	12.3
Milestone	142	57.0	100	6/4	36	26	12.3
MT1642	138	57.7	100	6/8	39	18	13.2
Yellowstone	138	59.4	100	6/6	41	22	12.3
FourOsix	137	58.4	100	6/5	37	20	12.2
UI Bronze Jade (W)	135	55.7	100	6/7	39	27	12.7
Utah 100	134	57.3	100	6/7	44	13	12.2
UT-10926-1	134	58.7	100	6/6	41	34	12.3
Millie (W)	133	59.2	100	6/8	34	14	12.4
OR216011R	133	56.8	100	6/6	36	22	11.9
IDO2006 (W)	131	58.0	100	6/8	37	21	12.3
Scorpio	131	56.1	100	6/8	34	1	12.5
Irv (W)	130	57.8	100	6/5	38	18	12.9
WA 8309	128	54.1	100	6/9	30	0	12.2
IDO1806 (W)	125	59.4	100	6/5	33	29	13.3
OR2150168H (W)	121	56.4	100	6/8	35	7	12.7
WB4623CLP	119	59.9	100	6/5	38	26	13.4
IDO1906 (W)	113	55.4	100	6/3	35	1	13.6
Average	**136**	**58.0**	**100**	**6/5**	**37**	**18**	**12.4**
SE	**3.5**	**0.4**	**0.1**	**0.40**	**0.4**	**3.6**	
Pr > F (variety)	**<0.0001**	**<0.0001**	**0.4784**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (location)	**0.001**	**<0.0001**	**0.4245**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*location)	**<0.0001**	**<0.0001**	**0.4463**	**<0.0001**	**<0.0001**	**<0.0001**	

(W) = White

Table 7. Dryland Hard Winter Wheat Data Combined from Ririe and Rockland, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
MT1745	19	57.3	90	6/14	19	0	13.1
UI SRG	18	57.2	93	6/14	24	0	14.6
Yellowstone	17	56.6	90	6/14	21	0	13.4
Keldin + 11-52-0	17	55.5	89	6/13	21	0	14.1
UT-10926-1	17	56.1	94	6/15	21	0	13.6
Juniper	17	57.5	94	6/14	24	0	14.5
Keldin	16	56.3	90	6/14	19	0	14.0
WB4510CLP	16	58.1	91	6/12	20	0	13.5
LCS Yeti (W)	16	56.9	86	6/11	19	0	14.3
WB4623CLP	16	57.0	86	6/14	18	0	14.4
FourOsix	16	56.6	89	6/13	19	0	13.6
Utah 100	16	56.8	86	6/15	22	0	13.9
Promontory	16	57.7	92	6/14	24	0	14.4
UI Silver (W)	16	58.2	92	6/14	22	0	14.0
MT1642	15	55.1	88	6/16	22	0	14.2
Flathead	15	56.9	94	6/12	21	0	13.8
IDO2006 (W)	15	56.4	84	6/18	19	0	14.1
OR216011R	14	54.8	84	6/16	18	0	14.1
WB4792	14	59.0	86	6/14	20	0	13.2
WB4401	14	56.4	87	6/12	19	0	13.2
Golden Spike (W)	14	57.1	87	6/15	24	0	14.5
LCS Jet	14	54.7	86	6/16	15	0	14.3
Sequoia	14	57.2	87	6/18	22	0	13.9
Millie (W)	14	56.9	80	6/17	18	0	14.4
OR2160065H (W)	13	55.2	80	6/16	19	0	14.9
IDO1806 (W)	13	57.5	89	6/15	17	0	14.2
Irv (W)	13	55.2	81	6/16	18	0	14.9
Scorpio	13	56.1	81	6/17	18	0	14.3
OR2150168H (W)	12	55.5	82	6/18	17	0	14.3
WA8309	12	55.0	79	6/16	15	0	14.0
UI Bronze Jade (W)	12	56.8	90	6/16	20	0	14.3
LCS Zoom	11	54.1	84	6/14	18	0	13.5
Balance	11	56.8	74	6/8	21	0	14.4*
IDO1906 (W)	10	53.4	78	6/13	18	0	15.1
Average	**15**	**56.4**	**87**	**6/14**	**20**	**0**	**14.1**
SE	**1**	**0.5**	**2**	**0.4**	**0.5**	**.**	
Pr > F (variety)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	
Pr > F (location)	**0.0117**	**0.0191**	**<0.0001**	**<0.0001**	**0.0001**	**.**	
Pr > F (variety*location)	**0.0109**	**0.1541**	**<0.0001**	**<0.0001**	**0.0018**	**.**	

(W) = White

* Data from single location

Table 8. Agronomic Data for Hard Winter Wheat at Aberdeen, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB4792	---	147	**151**	61.4	100	6/4	35	0	11.0
Flathead	---	147	**146**	61.3	100	5/30	40	0	12.3
Keldin	147	141	**144**	59.8	100	6/5	41	0	12.6
WB4510CLP	---	---	**143**	61.9	100	6/5	34	0	12.4
MT1642	---	137	**140**	58.5	100	6/2	39	1	13.0
Yellowstone	156	161	**140**	60.2	100	6/2	35	0	12.5
WB4401	---	145	**139**	59.4	100	6/5	35	0	12.3
Kairos	---	120	**139**	57.5	100	5/30	33	0	12.2
MT1745	---	---	**138**	59.6	100	6/7	46	0	12.3
UI Bronze Jade (W)	169	140	**138**	56.5	100	6/3	39	0	13.3
LCS Rocket	171	128	**137**	55.5	100	6/3	42	13	12.2
UT-10926-1	---	---	**136**	59.6	100	6/3	36	0	12.5
Milestone	---	---	**136**	56.6	100	6/2	38	0	12.3
OR216011R	---	---	**136**	56.9	100	6/6	38	0	11.7
Keldin + 11-52-0	158	142	**134**	58.8	100	6/4	38	0	12.4
Utah 100	126	143	**134**	57.3	100	6/4	38	0	12.7
Balance	---	---	133	58.5	100	6/3	40	0	13.4
IDO2006 (W)	---	---	133	58.1	100	6/5	43	5	12.5
WA8309	---	129	131	53.9	99	6/5	34	0	12.2
FourOsix	169	143	130	58.9	100	6/2	39	0	12.1
LCS Jet	182	143	130	55.8	100	6/3	36	0	12.8
Irv (W)	161	132	128	58.2	100	5/30	39	0	12.6
Scorpio	176	150	127	56.9	100	6/6	30	0	13.3
Millie (W)	174	145	126	59.1	100	6/5	37	0	12.5
OR2150168H (W)	---	140	124	57.0	100	6/1	39	0	12.4
WB4623CLP	144	136	121	60.1	100	6/3	39	0	13.7
IDO1806 (W)	155	123	114	59.1	100	6/2	40	0	13.8
IDO1906 (W)	---	120	107	54.3	100	6/6	39	0	13.9
Average	**157**	**138**	**133**	**58.2**	**100**	**6/3**	**38**	**1**	**12.6**
LSD (α=.05)	**17**	**16**	**17**	**1.7**	**1**	**1**	**2**	**5**	
CV %	**7.7**	**8.3**	**9.1**	**2.1**	**0.4**	**0.60**	**3.8**	**504.0**	
Pr > F	**<0.0001**	**<0.0001**	**0.0015**	**<0.0001**	**0.5679**	**<0.0001**	**<0.0001**	**0.0033**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

(W) = White

Table 9. Agronomic Data for Hard Winter Wheat at Kimberly, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging** (%)	Protein (%)
LCS Jet	185	189	**154**	54.7	100	5/30	37	6	13.0
Kairos	---	169	**152**	54.6	100	5/31	35	33	12.5
Keldin	187	184	**145**	56.0	100	6/2	37	76	12.9
LCS Rocket	188	184	**137**	52.9	100	6/2	36	53	13.0
WB4510CLP	---	---	**136**	54.8	100	6/2	41	66	13.7
WB4401	---	196	**134**	51.0	100	5/28	40	78	12.2
Balance	---	---	132	54.4	100	6/1	39	49	13.6
Milestone	---	---	130	52.8	100	6/3	36	83	13.4
Millie (W)	182	171	129	55.1	100	5/28	37	58	12.9
FourOsix	172	173	129	53.8	100	5/30	38	71	13.3
Keldin + 11-52-0	187	187	125	56.7	100	6/1	38	73	12.7
MT1745	---	---	125	56.0	100	6/3	40	63	13.3
Scorpio	182	183	123	51.1	100	5/31	37	3	13.1
Flathead	---	165	118	54.9	100	5/27	39	88	12.9
WA8309	---	169	118	51.8	100	6/1	31	0	13.2
IDO2006 (W)	---	131	116	54.9	100	5/27	39	78	13.2
MT1642	---	188	114	52.0	100	6/4	40	74	15.0
OR216011R	---	---	114	53.3	100	6/1	37	75	13.2
Irv (W)	171	176	112	55.3	100	5/29	39	73	13.8
Utah 100	188	185	112	53.8	100	6/4	45	48	13.0
WB4792	193	183	112	57.2	100	6/1	39	61	12.2
OR2150168H (W)	---	---	110	53.3	100	6/4	38	28	13.7
UI Bronze Jade (W)	190	187	109	52.1	100	6/3	40	81	13.8
IDO1906 (W)	163	160	108	54.8	100	5/31	37	4	13.7
UT-10926-1	---	---	106	54.5	100	6/2	41	83	13.4
Yellowstone	185	174	106	55.7	100	6/2	43	64	13.2
IDO1806 (W)	171	167	105	55.5	100	5/29	35	81	14.6
WB4623CLP	155	153	98	55.5	100	6/2	38	85	15.0
AVERAGE	**178**	**172**	**122**	**54.2**	**100**	**5/31**	**38**	**58**	**13.3**
LSD (0.05)	**13**	**13**	**21**	**3.4**	**.**	**2**	**2**	**25**	
CV (%)	**5.3**	**5.4**	**12.3**	**4.4**	**.**	**0.70**	**4.3**	**30.4**	
P>F	**<0.0001**	**<0.0001**	**<0.0001**	**0.0173**	**.**	**<0.0001**	**<0.0001**	**<0.0001**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

** The field was flooded just before harvest, and most plots lodged because of that

(W) = White

Table 10. Agronomic Data for Hard Winter Wheat at Rupert, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB4401	---	---	**174**	60.8	100	6/2	41	28	10.3
Yellowstone	155	150	**169**	60.9	100	6/5	44	18	11.1
Keldin	134	134	**168**	61.0	98	6/1	39	13	11.2
MT1642	---	151	**168**	61.1	100	6/6	41	0	11.6
Balance	---	---	**168**	61.5	100	5/31	40	0	11.7
Flathead	---	143	**167**	62.0	100	6/1	42	16	11.3
WB4792	154	146	**165**	61.0	100	6/5	42	15	10.9
MT1745	---	---	**164**	60.9	100	6/5	43	20	11.2
Keldin + 11-52-0	143	140	**162**	61.6	100	6/2	39	14	11.4
Utah100	139	147	**162**	59.4	100	6/5	47	5	11.2
LCS Rocket	150	116	**162**	57.9	100	6/4	35	0	10.6
UT-10926-1			160	60.5	100	6/5	43	34	10.8
UI Bronze Jade (W)	148	135	159	57.4	100	6/5	40	13	11.0
LCS Jet	167	114	159	58.4	100	6/5	37	0	11.2
WB4510CLP	---	---	159	62.9	100	6/5	39	1	12.2
FourOsix	145	140	157	61.5	100	6/4	39	0	11.2
Milestone	---	---	156	59.8	100	6/2	37	3	11.0
IDO2006 (W)	---	---	155	60.1	100	6/6	40	0	10.8
Kairos	---	125	151	59.0	100	6/2	33	0	11.7
IDO1806 (W)	131	118	150	62.2	100	6/3	34	0	11.7
Scorpio	164	128	149	58.5	100	6/6	35	0	11.2
Millie (W)	158	131	149	61.9	100	6/6	34	0	10.9
OR216011R	---	---	147	59.2	100	6/5	37	13	11.0
Irv (W)	136	130	146	58.3	100	6/4	41	0	12.1
WA8309	---	124	142	54.3	100	6/6	31	0	11.6
WB4623CLP	125	134	142	62.6	100	6/3	40	14	10.3
OR2150168H (W)	---	136	137	58.0	100	6/7	36	0	11.9
IDO1906 (W)	---	101	121	55.8	100	6/3	35	0	13.0
Average	**146**	**129**	**156**	**59.9**	**100**	**6/4**	**39**	**7**	**11.3**
LSD (α=.05)	**20**	**13**	**13**	**1.3**	**1**	**2**	**2**	**25**	
CV (%)	**9.7**	**7.1**	**5.9**	**1.5**	**0.9**	**0.8**	**3.4**	**245**	
Pr > F	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.479**	**<0.0001**	**<0.0001**	**0.2848**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

(W) = White

Table 11. Agronomic Data for Hard Winter Wheat at Ririe, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Keldin	---	136	**150**	60.6	100	6/13	33	10	12.0
Keldin + 11-52-0	---	137	**148**	60.6	100	6/12	33	8	12.7
LCS Rocket	---	141	**146**	57.3	99	6/14	29	0	11.8
Flathead	---	126	**145**	61.7	100	6/9	34	26	12.3
Milestone	---	---	**145**	58.7	100	6/12	32	19	12.6
Balance	---	---	**144**	60.1	100	6/12	32	9	12.5
WB4792	---	136	**144**	62.4	100	6/11	33	0	11.2
MT1745	---	---	**143**	59.9	100	6/14	34	1	11.5
WB4401	---	---	**142**	61.7	100	6/7	33	3	11.1
WB4510CLP	---	---	**142**	62.5	100	6/12	33	0	12.0
LCS Jet	---	145	**141**	57.7	100	6/15	33	0	12.2
Yellowstone	---	133	139	60.7	100	6/14	36	0	12.3
Kairos	---	130	138	57.9	100	6/10	29	0	12.0
UI Bronze Jade (W)	---	139	136	56.7	100	6/17	37	15	12.9
OR216011R	---	---	134	58.2	100	6/15	33	0	11.8
Irv (W)	---	136	132	59.4	100	6/14	34	0	13.0
FourOsix	---	148	132	59.4	100	6/13	33	8	12.4
UT-10926-1	---	---	132	60.2	100	6/13	37	6	12.6
MT1642	---	155	130	59.4	100	6/17	36	0	13.1
IDO1806 (W)	---	128	130	61.0	100	6/13	30	35	13.1
Millie (W)	---	132	129	60.6	100	6/17	32	0	13.4
Utah 100	---	144	129	58.8	100	6/14	38	1	11.9
Scorpio	---	142	126	57.9	99	6/17	32	0	12.5
IDO2006 (W)	---	---	122	59.0	100	6/18	33	8	12.6
WA8309	---	142	121	56.6	100	6/19	29	0	12.0
IDO1906 (W)	---	121	115	56.8	100	6/11	33	0	13.7
WB4623CLP	---	118	115	61.3	100	6/14	34	4	14.5
OR2150168H (W)	---	131	111	57.5	100	6/18	32	1	12.9
Average	---	**135**	**134**	**59.4**	**100**	**6/14**	**33**	**5**	**12.5**
LSD (α=.05)	---	**13**	**9**	**1**	**1**	**2**	**3**	**18**	
CV (%)	---	**7.1**	**5.0**	**1.1**	**0.5**	**0.8**	**7.2**	**232.0**	
Pr > F	---	**<0.0001**	**<0.0001**	**<0.0001**	**0.3587**	**<0.0001**	**<0.0001**	**0.0136**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

(W) = White

Table 12. Agronomic Data for Hard Winter Wheat at Ririe, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
MT1745	---	---	**20**	56.3	100	6/22	18	0	13.4
IDO2006 (W)	---	---	**19**	56.1	100	6/25	20	0	14.8
UI SRG	21	38	**18**	56.1	99	6/19	24	0	15.2
Yellowstone	24	39	**18**	56.3	100	6/21	20	0	13.0
Keldin + 11-52-0	18	41	**18**	55.7	96	6/20	19	0	14.0
UI Silver (W)	25	46	**18**	57.5	99	6/21	22	0	14.0
LCS Yeti (W)	18	28	**17**	56.7	99	6/19	18	0	15.1
Utah 100	21	39	**17**	56.5	98	6/21	22	0	14.5
WB4623CLP	21	25	**17**	56.8	100	6/20	17	0	15.5
Juniper	19	34	**17**	57.2	99	6/20	24	0	14.7
MT1642	28	41	**17**	54.3	99	6/23	20	0	14.2
Promontory	21	40	**17**	57.1	100	6/20	24	0	14.8
UT-10926-1	---	---	**17**	55.9	100	6/21	20	0	14.4
WB4401	---	---	**17**	56.0	100	6/19	16	0	12.9
Keldin	22	33	**17**	55.9	98	6/21	17	0	14.3
WB4510CLP	---	---	**17**	58.1	100	6/20	19	0	14.1
FourOsix	23	38	**17**	55.9	100	6/20	18	0	13.9
Sequoia	23	47	**17**	56.2	99	6/25	23	0	14.4
WB4792	21	37	**17**	58.7	99	6/19	19	0	13.7
Irv (W)	22	40	16	55.5	99	6/22	18	0	14.6
OR216011R	---	---	16	53.8	100	6/23	17	0	14.2
OR2160065H (W)	---	36	16	54.6	94	6/23	19	0	15.2
LCS Jet	23	31	16	53.1	100	6/22	14	0	14.2
Scorpio	21	39	16	55.2	98	6/24	17	0	14.4
Golden Spike (W)	19	29	15	55.8	99	6/21	22	0	14.8
Flathead	---	30	15	56.7	100	6/19	19	0	13.7
Millie (W)	19	40	15	56.5	91	6/24	17	0	14.6
IDO1806 (W)	26	37	14	57.5	100	6/22	16	0	14.0
OR2150168H (W)	---	31	14	55.0**	90	6/25	16	0	14.6
WA8309	---	36	14	54.1**	98	6/23	14	0	14.4
IDO1906 (W)	---	34	12	54.4**	96	6/19	16	0	15.2
UI Bronze Jade (W)	20	37	12	---	100	6/23	19	0	14.1
LCS Zoom	20	35	12	52.4**	99	6/20	17	0	13.2
Average	**21**	**35**	**16**	**55.9**	**98**	**6/21**	**19**	**0**	**14.3**
LSD (α=.05)	**5**	**9**	**3**	**0.9**	**6**	**1**	**2**	**.**	
CV (%)	**16.5**	**12.8**	**12.8**	**1.0**	**4.0**	**0.4**	**7**	**.**	
Pr > F	**0.0012**	**0.0035**	**<0.0001**	**<0.0001**	**0.0538**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Data from single replication

(W) = White

Table 13. Agronomic Data for Hard Winter Wheat at Rockland, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
UI SRG	33	40	**18**	56.3	75	6/11	22	0	12.9
Juniper	35	40	**17**	57.8	89	6/4	23	0	14.4
MT1745	---	---	**17**	58.3	75	6/9	25	0	12.8
UT-10926-1	---	---	**17**	58.3	74	6/11	19	0	13.9
Yellowstone	37	40	**17**	56.9	60	6/6	20	0	13.8
Keldin	39	41	**16**	56.7	78	6/6	21	0	13.7
Keldin + 11-52-0	38	47	**16**	55.4	74	6/4	20	0	14.2
WB4510CLP	---	---	**15**	58.2	66	6/10	19	0	13.0
Flathead	---	38	**15**	57.2	89	6/9	25	0	14.0
FourOsix	38	44	**15**	57.2	80	6/7	21	0	13.3
LCS Yeti (W)	35	32	**15**	57.1	84	6/8	25	0	13.5
WB4623CLP	34	38	**15**	57.2	64	6/11	18	0	13.3
Promontory	25	43	**14**	58.4	79	6/8	18	0	14.1
Utah 100	32	44	**14**	57.1	69	6/8	20	0	13.3
MT1642	---	42	**14**	56.0	85	6/7	22	0	14.2
UI Silver (W)	27	51	**14**	58.8	74	6/8	21	0	14.1
Golden Spike (W)	22	39	13	58.4	89	6/9	22	0	14.1
LCS Jet	44	40	12	56.3	71	6/8	19	0	14.3
Millie (W)	38	38	12	57.4	78	6/8	23	0	14.1
OR216011R			12	55.8	69	6/8	19	0	13.9
IDO1806 (W)	32	38	12	57.5	80	6/6	22	0	14.4
UI Bronze Jade (W)	28	41	12	56.8	74	6/4	21	0	14.5
WB4792	28	42	12	59.4	64	6/11	18	0	12.8
WB4401	---	---	12	56.7	68	6/12	19	0	13.6
Balance	---	---	11	56.8	86	6/8	24	0	14.4
OR2150168H (W)	---	41	11	56.0	73	6/10	17	0	14.1
Sequoia	30	46	11	58.2	73	6/9	22	0	13.5
LCS Zoom	36	42	11	55.8	75	6/9	23	0	13.7
WA8309	---	41	10	55.9	61	6/10	16	0	13.6
IDO2006 (W)	---	---	10	56.7	81	6/6	23	0	13.5
OR2160065H (W)	---	37	10	55.8	69	6/10	20	0	14.7
Scorpio	39	41	10	57.1	80	6/9	21	0	14.3
Irv (W)	28	44	9	54.9	83	6/5	21	0	15.2
IDO1906 (W)	---	36	9	52.3	83	6/6	22	0	15.0
Average	**33**	**40**	**13**	**56.9**	**75**	**6/8**	**21**	**0**	**13.9**
LSD (α=.05)	**5**	**6**	**4**	**2.3**	**9**	**2**	**2**	**.**	
CV (%)	**10.3**	**11.2**	**23.4**	**2.8**	**8.4**	**0.9**	**7.9**	**.**	
Pr >F	**<0.0001**	**<0.0001**	**<0.0001**	**0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

(W) = White

Table 14. Hard Winter Wheat Yield Percentage of Location Averages, 2021.

Variety or Selection	Aberdeen	Kimberly	Rupert	Ririe Irrigated	Ririe Dryland	Rockland	Variety Average
UI SRG	---	---	---	---	113	138	**126**
Juniper	---	---	---	---	105	130	**118**
Keldin	108	120	108	112	104	123	**112**
MT1745	104	102	105	107	124	130	**112**
LCS Yeti (W)	---	---	---	---	107	113	**110**
Keldin + 11-52-0	100	103	104	110	110	123	**108**
WB4510CLP	107	111	102	106	104	117	**108**
LCS Rocket	103	113	104	109	---	---	**107**
Kairos	104	125	97	103	---	---	**107**
Yellowstone	105	87	108	103	112	127	**107**
Promontory	---	---	---	---	105	107	**106**
UI Silver (W)	---	---	---	---	109	104	**106**
Flathead	110	97	107	108	93	115	**105**
WB4401	104	110	112	106	105	89	**104**
UT-10926-1	102	87	103	98	105	130	**104**
Milestone	102	107	100	108	---	---	**104**
LCS Jet	97	127	102	105	100	92	**104**
FourOsix	98	106	101	98	102	113	**103**
MT1642	105	94	108	97	105	104	**102**
WB4792	113	92	106	107	102	90	**102**
Balance	100	109	107	107	---	84	**102**
Utah100	100	92	104	96	107	105	**101**
OR216011R	102	94	94	100	101	92	**97**
IDO2006 (W)	100	95	99	91	118	79	**97**
Golden Spike (W)	---	---	---	---	95	98	**96**
Millie (W)	94	106	96	96	91	94	**96**
WB4623CLP	91	80	91	86	107	111	**94**
UI Bronze Jade (W)	103	89	102	101	74	90	**93**
Scorpio	95	101	96	94	96	73	**93**
Sequoia	---	---	---	---	102	82	**92**
Irv (W)	96	92	94	99	101	69	**92**
IDO1806 (W)	85	87	96	96	87	90	**90**
WA8309	98	97	91	90	84	79	**90**
OR2160065H (W)	---	---	---	---	99	77	**88**
OR2150168H (W)	93	90	88	83	85	82	**87**
IDO1906 (W)	80	88	78	86	76	65	**79**
LCS Zoom	---	---	---	---	73	81	**77**
Location Average (bu/A)	**133**	**122**	**156**	**133**	**16**	**13**	

(W) = White

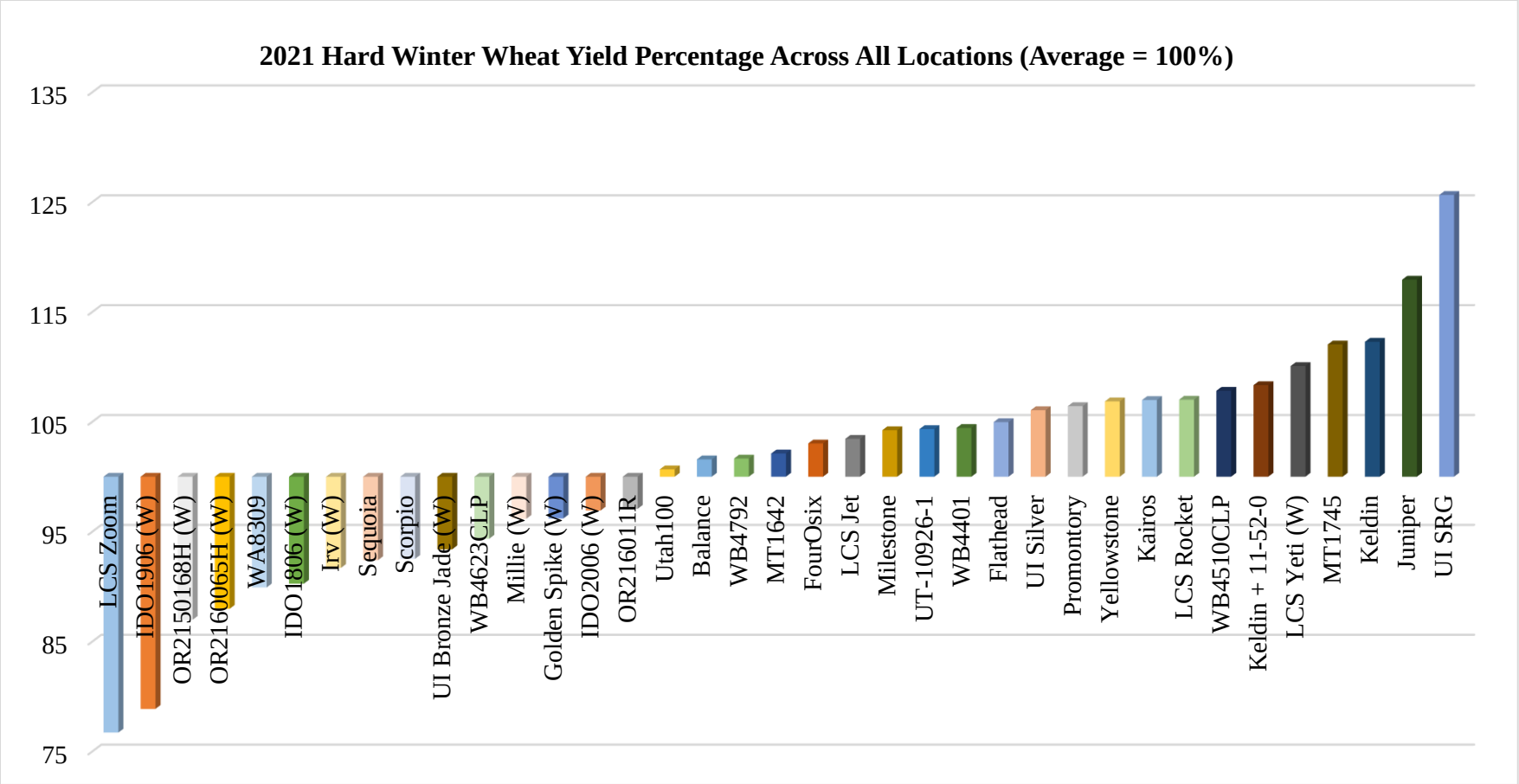


Chart 2. Hard Winter Wheat Yield Percentage Across All Locations.

(W) White

Table 15. Soft White Winter Wheat Irrigated Nurseries, 3 Year Averages (2019 - 2021; 11 site-years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
LCS Hulk	159	59.8	97	6/4	38	5	10.2
VI Shock	158	58.3	99	6/4	37	6	9.9
LCS Blackjack	158	57.9	99	6/3	36	0	12.3
WB1783	155	60.9	98	6/4	38	4	10.3
SY Raptor	152	58.4	99	6/2	37	4	9.7
IDO1708	152	57.7	99	6/2	37	13	9.7
SY Ovation	152	59.5	99	6/3	37	5	10.0
VI Voodoo CL+	152	58.3	99	6/4	36	3	9.7
Nixon	151	58.4	98	6/5	40	3	10.1
LCS Artdeco	149	57.5	98	6/2	34	5	9.5
Norwest Tandem	149	58.9	99	6/3	35	0	10.0
SY Assure	149	60.0	99	6/1	36	3	10.4
Norwest Duet	148	59.1	97	6/4	40	8	10.3
UI Sparrow	147	57.1	99	6/6	42	9	10.2
UI Magic CL+	147	59.5	99	6/2	35	7	10.3
Stephens	145	58.1	96	6/3	38	10	10.1
Brundage	145	59.6	98	6/1	39	5	10.3
WB1529	142	60.6	98	6/3	36	4	10.3
WB456	139	60.5	99	6/1	37	6	11.0
OR2X2CL+	136	58.6	99	6/4	39	5	10.9
WB1376CLP	133	61.3	99	6/3	38	0	11.0
Average	**148**	**59.0**	**98**	**6/3**	**37**	**5**	**10.3**
SE	**2.1**	**0.14**	**1**	**0.2**	**0.3**	**1.8**	
Pr >F (variety)	**<0.0001**	**<0.0001**	**0.9358**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*year)	**<0.0001**	**<0.0001**	**0.3423**	**<0.0001**	**<0.0001**	**0.0059**	
Pr > F (variety*location)	**0.0039**	**<0.0001**	**0.9806**	**<0.0001**	**<0.0001**	**0.1107**	
Pr > F (year*location)	**<0.0001**	**<0.0001**	**0.5078**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*year*location)	**<0.0001**	**<0.0001**	**0.8378**	**<0.0001**	**0.0016**	**0.0685**	

Table 16. Soft White Winter Wheat Dryland Nurseries, 3 Year Averages (2019 - 2021; 8 site years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
LCS Hulk	40	58.2	97	6/20	24	0	11.0
UI Sparrow	39	56.9	93	6/23	27	0	12.8
Eltan 11-52-0	38	58.0	94	6/23	25	0	12.2
Otto	38	58.0	96	6/24	25	0	12.5
Norwest Duet	37	57.0	95	6/20	25	0	11.7
Eltan	36	57.6	94	6/23	25	0	11.9
VI Voodoo CL+	36	57.7	94	6/22	22	0	11.9
IDO1708	35	56.9	97	6/21	23	0	11.6
SY Ovation	35	57.8	95	6/19	24	0	12.2
UI Magic CL+	32	57.5	92	6/18	23	0	11.6
WB1529	32	58.2	91	6/19	21	0	12.1
WB1783	32	58.9	94	6/21	23	0	12.9
SY Assure	30	57.4	93	6/18	29	0	12.3
Brundage	29	57.6	92	6/13	23	0	11.7
Stephens	29	56.8	91	6/20	23	0	12.2
WB1376CLP	28	56.6	89	6/23	23	0	13.7
Average	**34**	**57.6**	**94**	**6/20**	**24**	**0**	**12.1**
SE	**1.5**	**0.2**	**1.3**	**0.2**	**0.3**	**.**	
Pr >F (variety)	**<0.0001**	**<0.0001**	**0.0002**	**<0.0001**	**<0.0001**	**.**	
Pr >F (variety*year)	**0.1630**	**<0.0001**	**0.5047**	**<0.0001**	**0.0131**	**.**	
Pr >F (variety*location)	**0.0004**	**0.1551**	**0.8505**	**<0.0001**	**0.0005**	**.**	
Pr > F (year*Location)	**0.0036**	**<0.0001**	**<0.0001**	**0.0043**	**<0.0001**	**.**	
Pr > F (variety*year*location)	**0.7898**	**0.0018**	**0.3427**	**<0.0001**	**0.0644**	**.**	

Table 17. Irrigated Soft White Winter Wheat Data Combined from Aberdeen, Kimberly, Ririe and Rupert, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
AP Exceed	156	57.5	100	6/4	36	4	10.6
VI Shock	150	55.0	100	6/7	39	9	10.5
LCS Hulk	149	56.9	100	6/7	38	13	11.0
UIL13-046145A	149	55.8	100	6/6	38	17	10.3
WB1783	149	57.4	100	6/8	38	11	11.0
SY Raptor	148	56.2	100	6/5	38	8	10.6
UIL13-587007A	147	56.5	99	6/8	38	18	10.7
SY Assure	146	57.6	100	6/7	38	13	11.1
UIL15-028024	146	57.7	100	6/8	39	28	10.7
SY Ovation	146	57.5	100	6/2	35	8	10.7
AP Iliad	146	57.1	100	6/5	36	10	11.4
LCS Blackjack	145	55.7	100	6/7	37	1	10.8
WA 8293	144	55.4	100	6/8	41	7	10.9
M-Press	144	57.1	99	6/8	39	3	10.6
OR2160264	143	55.9	100	6/5	36	3	11.3
Piranha CL+	143	55.7	100	6/7	41	24	10.6
VI Presto CL+	141	57.7	100	6/6	41	17	11.8
Nixon	140	55.1	100	6/8	39	9	10.8
LCS Artdeco	140	54.2	100	6/5	35	13	10.4
OR2160243	140	55.5	100	6/6	37	11	11.1
Stingray CL+	140	54.5	100	6/7	37	14	11.5
UI Magic CL+	139	57.1	100	6/6	36	18	11.0
WB1529	139	59.2	100	6/7	35	10	11.0
YSC-268	139	57.3	100	6/5	42	0	12.3
Brundage	138	57.1	100	6/5	40	13	11.4
Stephens	137	55.7	100	6/6	38	23	10.6
LWW17-8185	136	54.4	100	6/7	37	30	10.3
Norwest Duet	136	56.4	100	6/9	44	21	11.1
Norwest Tandem	136	56.3	99	6/6	35	0	10.9
Sockeye CL+	136	55.3	100	6/7	41	43	10.9
WB1376CLP	136	58.1	100	6/6	38	0	11.6
M-Press with Root2	135	56.8	99	6/8	40	7	10.6
IDO1708	135	54.8	100	6/3	37	27	11.2
VI Voodoo CL+	135	55.3	100	6/8	35	17	10.7
YSC-215	134	56.2	100	6/12	39	1	11.5
IDO2008	133	54.8	100	6/8	39	18	11.5
UIL13-553051A	133	54.7	100	6/7	36	38	11.6
UI Sparrow	133	54.6	100	6/9	42	22	11.4
UIL17-7706A CL+	132	56.3	100	6/7	38	16	10.9
WB456	132	58.8	100	6/3	38	15	12.1
ORI2190027 CL+	126	57.3	100	6/6	36	20	11.9
OR2X2CL+	125	55.8	100	6/6	39	14	11.8
YSC-201	125	56.2	100	6/10	38	0	11.1
Average	**140**	**56.3**	**100**	**6/7**	**38**	**14**	**11.1**
SE	**3.2**	**0.3**	**0.3**	**0.4**	**0.5**	**4.5**	
Pr > F (variety)	**<0.0001**	**<0.0001**	**0.5926**	**<0.0001**	**<0.0001**	**0.004**	
Pr > F (location)	**0.0021**	**<0.0001**	**0.3342**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (variety*location)	**0.0005**	**0.0012**	**0.1284**	**<0.0001**	**0.0005**	**0.0001**	

Table 18. Dryland Soft White Winter Wheat Data Combined from Ririe and Rockland, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB1783	19	56.4	89	6/15	21	0	14.4
UIL13-046145A	19	52.7	100	6/22	18	0	13.3
UIL15-028024	19	54.0	100	6/24	19	0	13.9
VI Presto CL+	19	54.0	99	6/20	18	0	13.4
LCS Hulk	18	52.7	100	6/21	18	0	14.3
LWW17-8185	17	51.7	100	6/23	16	0	12.7
Sockeye CL+	17	53.6	89	6/17	22	0	13.5
AP Dynamic	17	48.9	98	6/25	19	0	14.8
Piranha CL+	17	54.1	87	6/17	20	0	13.3
SY Ovation	16	54.6	92	6/16	19	0	13.7
IDO1810	16	51.5	100	6/24	19	0	14.4
IDO2008	16	51.5	99	6/23	19	0	16.1
UIL13-553051A	16	51.6	100	6/25	17	0	14.3
WA 8290	16	54.2	88	6/17	20	0	13.7
M-Press with Root2	15	53.4	88	6/18	19	0	13.2
AP Iliad	15	51.9	100	6/21	18	0	13.6
Norwest Duet	15	52.4	88	6/17	19	0	13.3
Eltan	15	53.2	89	6/19	19	0	13.8
IDO1708	15	50.1	100	6/21	17	0	13.7
VI Voodoo CL+	15	51.8	99	6/25	16	0	14.9
Eltan 11-52-0	15	54.1	87	6/18	21	0	14.2
M-Press	15	53.6	89	6/18	19	0	14.2
Otto	15	53.7	90	6/19	20	0	14.4
OR2130755	14	53.3	88	6/14	19	0	14.1
UIL17-7706A CL+	14	50.5	100	6/26	17	0	14.6
SY Assure	14	53.9	89	6/14	17	0	13.7
UI Sparrow	14	52.9	86	6/19	22	0	14.0
WB1376CLP	14	52.7	83	6/14	20	0	15.2
WB456	14	52.5	86	6/14	19	0	14.7
Devote	13	55.7	87	6/18	20	0	13.2
UI Magic CL+	13	53.3	84	6/17	18	0	14.8
UIL13-587007A	13	53.1	99	6/26	16	0	13.6
WB1529	13	54.6	83	6/15	18	0	13.8
Brundage	12	52.7	87	6/14	19	0	13.6
Stephens	12	52.1	86	6/16	19	0	14.8
VI Frost	7	---	100	6/22	18	0	18.6
Average	**15**	**52.9**	**92**	**6/19**	**19**	**0**	**14**
SE	**1.1**	**0.3**	**2.2**	**0.4**	**0.6**	**.**	
Pr>F (variety)	**<0.0001**	**<0.0001**	**0.5037**	**<0.0001**	**<0.0001**	**.**	
Pr>F (location)	**0.0129**	**0.0002**	**<0.0001**	**<0.0001**	**0.0051**	**.**	
Pr >F (variety*location)	**0.0001**	**<0.0001**	**0.5268**	**<0.0001**	**0.4066**	**.**	

Table 19. Agronomic Data for Soft White Winter Wheat at Aberdeen, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
UIL13-046145A	---	---	**153**	56.9	100	6/3	40	0	11.1
SY Raptor	178	151	**151**	56.4	100	6/2	41	0	10.4
WB1783	165	140	**150**	59.4	100	6/5	40	0	11.5
UIL13-587007A	---	---	**149**	56.7	100	6/5	39	0	11.2
WA8293	---	159	**149**	57.2	100	6/7	42	0	10.7
LCS Hulk	175	169	**148**	57.1	100	6/5	39	0	10.6
SY Ovation	174	138	**147**	57.8	100	6/4	41	1	10.5
AP Iliad	---	144	**143**	57.2	100	6/3	39	0	11.0
SY Assure	157	157	**143**	57.6	100	6/1	39	0	11.7
Piranha CL+	---	157	**143**	55.8	100	6/5	41	6	11.2
M-Press	---	145	**143**	57.2	100	6/6	40	0	10.7
VI Shock	167	136	**143**	57.7	100	6/5	41	6	11.2
OR2160264	---	---	**142**	56.3	100	6/3	39	0	11.2
AP Exceed	---	---	**140**	57.0	100	6/2	38	0	9.8
UIL15-028024	---	---	**140**	57.6	100	6/5	41	6	10.4
YSC-268	---	---	**139**	57.3	100	6/5	42	0	12.3
Nixon	174	153	**137**	55.0	100	6/6	41	0	10.7
VI Voodoo CL+	162	177	**137**	54.8	100	6/5	36	0	11.2
VI Presto CL+	---	---	**137**	56.1	100	6/4	43	6	12.0
Stephens	156	152	**136**	56.5	100	6/4	39	3	10.8
Stingray CL+	171	157	**136**	54.2	100	6/6	37	0	11.8
WB1529	157	169	**136**	58.6	100	6/3	39	0	11.8
Norwest Duet	177	146	**136**	56.5	100	6/6	46	0	11.5
WB1376CLP	141	148	135	58.2	100	6/3	39	0	12.1
Sockeye CL+	---	137	135	54.8	100	6/5	43	34	11.6
LCS Blackjack	187	157	135	55.5	100	6/4	38	0	11.6
Norwest Tandem	160	137	134	56.0	100	6/3	35	0	11.5
LWW17-8185	---	---	134	54.0	100	6/5	39	0	11.7
UIL13-553051A	---	---	133	54.5	100	6/7	38	14	11.9
YSC-215	---	144	133	56.3	100	6/6	40	0	11.7
LCS Artdeco	178	150	133	54.4	100	6/4	36	0	10.7
OR2160243	---	---	132	55.3	100	6/3	37	0	12.0
UI Sparrow	148	141	132	54.9	100	6/6	42	0	12.5
M-Press with SSR	---	---	132	56.6	100	6/6	40	0	10.4
UI Magic CL+	160	153	132	57.5	100	6/3	36	0	12.1
UIL17-7706ACL+	---	---	131	56.5	100	6/4	39	0	11.1
Brundage	143	139	131	57.3	100	6/3	40	0	11.3
OR2X2CL+	154	161	129	56.1	100	6/4	40	0	12.0
IDO1708	169	156	129	54.6	100	6/3	39	8	11.1
ORI2190027CL+	---	---	128	57.6	100	6/4	38	0	12.6
IDO2008	---	---	127	54.6	100	6/4	39	0	11.9
YSC-201	---	178	127	56.6	100	6/4	40	0	10.7
WB456	152	134	122	57.0	100	6/2	38	0	13.0
Average	**165**	**150**	**137**	**56.4**	**100**	**6/4**	**39**	**2**	**11.4**
LSD (α=.05)	**13**	**16**	**17**	**1.6**	**.**	**2**	**2.3**	**9.5**	
CV (%)	**5.5**	**7.5**	**8.9**	**2**	**.**	**0.7**	**4.3**	**351**	
Pr > F	**<0.0001**	**<0.0001**	**0.0568**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**<0.0001**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 20. Agronomic Data for Soft White Winter Wheat at Kimberly, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging** (%)	Protein (%)
AP Exceed	---	---	**164**	56.1	100	5/29	38	3	11.4
OR2160264	---	---	**155**	54.1	100	5/30	37	14	11.8
SY Raptor	171	165	**155**	55.3	100	1/15	39	21	11.0
UIL13-587007A	---	---	**153**	52.0	100	6/2	38	66	11.6
WB1783	189	145	**152**	57.3	100	6/2	39	43	11.4
SY Assure	180	151	**150**	56.6	100	5/27	37	33	11.5
AP Iliad	---	180	**149**	55.5	100	5/31	37	29	11.7
OR2160243	---	---	147	53.9	100	6/1	38	27	11.8
LCS Blackjack	190	177	146	53.5	100	6/2	39	3	11.1
SY Ovation	188	155	146	55.8	100	6/2	40	48	11.9
VI Shock	---	---	145	55.6	100	6/3	40	31	11.0
UIL13-046145A	---	---	142	54.9	100	5/31	38	54	11.2
Brundage	180	162	141	54.7	100	5/31	40	49	12.2
WB1529	166	116	140	56.1	100	5/31	34	36	11.2
UI Magic CL+	172	155	140	51.9	100	5/30	35	54	11.1
Nixon	189	171	139	51.9	100	6/5	41	35	11.3
Stephens	181	154	139	53.2	100	5/31	39	71	11.0
Stingray CL+	---	157	138	51.3	100	6/2	39	55	12.7
VI Presto CL+	---	---	137	53.6	100	6/1	43	58	12.6
M-Press	---	162	137	55.1	100	6/3	40	13	10.7
LCS Hulk	177	173	137	54.1	100	6/3	39	51	12.1
LCS Artdeco	184	152	136	50.8	100	5/31	37	46	10.5
UIL13-553051A	---	---	136	55.3	100	6/1	38	76	12.3
UIL15-028024	---	---	134	51.0	100	6/4	39	64	12.5
WB1376CLP	162	103	133	57.0	100	5/31	39	2	11.7
Norwest Tandem	171	157	132	54.2	100	6/1	37	1	10.9
Piranha CL+	---	151	132	53.6	100	6/2	42	50	11.2
VI Voodoo CL+	---	---	132	53.4	100	6/3	35	53	10.6
WB 456	171	150	129	54.2	100	5/29	40	61	12.7
IDO2008	---	---	129	51.9	100	6/4	40	53	12.1
IDO1708	192	175	127	53.0	100	5/30	39	71	11.2
LWW17-8185	---	---	126	50.2	100	6/1	39	76	10.3
WA8293	---	175	126	50.6	100	6/5	43	29	12.2
UIL17-7706A CL+	---	---	125	51.5	100	6/2	37	64	11.9
Norwest Duet	181	182	122	53.9	100	6/5	46	43	11.7
UI Sparrow	190	158	122	51.7	100	6/5	43	46	12.3
OR2X2CL+	146	152	121	53.4	100	6/1	40	50	11.9
ORI2190027CL+	---	---	121	54.3	100	5/30	37	75	12.4
M-Press with SSR	---	---	120	54.7	100	6/4	42	26	11.6
Sockeye CL+	---	166	118	53.2	100	6/2	40	64	11.9
Average	**179**	**159**	**137**	**53.7**	**100**	**6/1**	**39**	**44**	**11.6**
LSD (α=.05)	**16**	**23**	**15**	**1.8**	**0**	**3**	**2**	**35**	
CV (%)	**6.5**	**9.9**	**7.7**	**2.4**	**.**	**4.90**	**0.7**	**57.4**	
Pr > F	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.2848**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
** The field was flooded just before harvest, and most plots lodged because of that

Table 21. Agronomic Data for Soft White Winter Wheat at Rupert, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**
VI Shock	167	158	**175**	57.5	100	6/6	41	0	9.1
AP Exceed	---	---	**172**	58.6	100	6/5	40	13	10.7
LCS Hulk	160	138	**171**	58.4	100	6/4	40	3	10.5
WA8293	---	152	**170**	57.5	100	6/2	41	1	9.7
Piranha CL+	---	153	**168**	58.0	100	6/4	43	13	9.3
UIL15-028024	---	---	**163**	58.8	100	6/5	41	40	9.2
LCS Blackjack	165	128	**162**	57.4	100	6/4	37	0	9.9
SY Ovation	147	147	**160**	59.1	100	6/8	40	0	10.1
Sockeye CL+	---	158	**160**	57.4	100	6/5	42	35	9.7
SY Raptor	147	120	**160**	57.3	100	6/4	39	10	9.8
M-Press	---	146	159	58.4	98	6/6	41	1	9.9
VI Presto CL+	---	---	159	59.7	100	6/4	42	2	10.6
Nixon	146	130	157	58.0	100	6/6	40	0	9.9
OR2160243	---	---	157	56.7	100	6/4	39	15	9.8
Stingray CL+	---	123	157	57.1	100	6/3	39	0	10
Norwest Duet	153	151	157	57.0	100	6/6	46	41	10.6
AP Iliad	---	130	156	58.5	100	6/5	38	13	11.1
SY Assure	155	120	155	58.2	100	5/31	36	1	9.9
UI Magic CL+	159	129	155	59.1	100	6/6	38	19	10.1
UIL13-587007A	---	---	154	57.5	100	6/6	39	4	9.5
LCS Artdeco	156	121	154	56.4	100	6/1	35	6	9.9
UI Sparrow	144	137	154	56.9	100	6/6	44	21	9.6
M-Press with Root 2	---	---	154	58.1	95	6/3	40	0	10.1
UIL13-046145A	---	---	153	58.3	100	6/7	41	13	9.6
WB1783	169	133	153	60.8	100	6/8	40	1	9.6
Brundage	154	125	153	58.9	100	6/3	41	4	10.8
UIL17-7706A CL+	---	---	153	58.4	100	6/3	39	1	9.6
OR2160264	---	---	152	57.5	100	6/3	37	0	10.7
Stephens	142	123	151	57.3	100	6/2	41	20	10.2
VI Voodoo CL+	152	137	150	57.7	100	6/6	37	0	9.7
LWW17-8185	---	---	149	57.0	100	6/4	39	33	9.5
IDO2008	---	---	149	57.5	100	6/7	41	20	9.9
IDO1708	141	151	148	55.4	100	6/2	40	28	11.5
WB1529	133	139	148	59.3	100	6/7	38	5	10.3
WB456	135	130	148	59.2	100	6/1	39	1	10.9
Norwest Tandem	160	137	146	58.0	100	6/6	35	0	9.9
WB1376CLP	127	128	146	61.1	100	6/8	40	0	10.3
ORI2190027 CL+	---	---	139	58.5	100	6/6	38	6	10.6
UIL13-553051A	---	---	139	56.8	100	6/3	39	21	10.5
OR2X2 CL+	138	126	137	57.0	100	6/6	41	5	11.4
Average	**150**	**134**	**155**	**58**	**100**	**6/5**	**39**	**10**	**10.1**
LSD (α=.05)	**18**	**18**	**15**	**1.6**	**2.5**	**2**	**2.4**	**29.3**	
CV (%)	**8.6**	**9.4**	**7**	**1.9**	**1.8**	**0.8**	**4.4**	**214**	
Pr > F	**0.0011**	**<0.0001**	**0.0001**	**<0.0001**	**0.4826**	**<0.0001**	**<0.0001**	**0.1189**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 22. Agronomic Data for Soft White Winter Wheat at Ririe, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
UIL15-028024	---	---	**148**	56.4	100	6/17	36	0	10.7
UIL13-046145A	---	---	**147**	57.0	100	6/15	34	1	9.5
AP Exceed	---	---	**144**	58.1	100	6/13	31	0	10.7
LCS Hulk	---	158	**142**	58.0	100	6/17	33	0	11.0
VI Shock	---	164	**140**	58.2	100	6/16	34	0	10.6
WB1783	---	144	**140**	59.4	100	6/16	33	0	11.6
LCS Blackjack	---	164	138	56.5	100	6/17	33	0	10.5
LCS Artdeco	---	152	137	55.5	100	6/14	31	0	10.5
IDO1708	---	151	136	56.2	99	6/12	32	0	10.8
SY Assure	---	140	136	58.2	100	6/10	30	0	10.8
AP Iliad	---	132	136	57.4	100	6/15	31	0	11.8
M-Press with Root2	---	---	136	57.9	100	6/19	36	0	10.4
LWW17-8185	---	---	135	56.3	100	6/17	33	10	9.9
M-Press	---	147	135	57.5	100	6/18	36	0	11.3
SY Ovation	---	141	133	57.4	100	6/15	32	4	11.0
WA8293	---	158	133	56.4	100	6/18	38	0	10.9
UIL13-587007A	---	---	131	55.8	98	6/18	34	0	10.5
WB1529	---	134	131	58.2	98	6/16	30	0	10.7
Norwest Tandem	---	147	130	56.9	98	6/16	32	0	11.3
Norwest Duet	---	148	130	58.2	100	6/19	38	1	10.7
IDO2008	---	---	129	55.2	99	6/18	37	0	12.0
Sockeye CL+	---	154	129	56.0	100	6/16	38	39	10.5
WB456	---	131	129	59.4	100	6/12	34	0	11.7
UI Magic CL+	---	139	129	56.3	100	6/16	34	0	10.7
YSC-215	---	158	129	56.1	100	6/19	38	3	11.4
VI Presto CL+	---	---	129	57.0	100	6/15	35	1	12.0
Piranha CL+	---	160	129	55.5	100	6/16	37	25	10.7
WB1376CLP	---	134	128	58.9	100	6/14	32	0	12.5
Brundage	---	149	127	57.5	99	6/13	37	1	11.2
SY Raptor	---	137	127	56.0	100	6/14	31	0	11.1
Stingray CL+	---	146	127	55.3	100	6/19	34	0	11.4
Nixon	---	154	126	55.6	100	6/17	34	1	11.3
UIL13-553051A	---	---	125	59.2	99	6/17	32	39	11.5
OR2160264	---	---	123	55.5	100	6/15	31	0	11.5
Stephens	---	140	123	55.9	100	6/17	33	0	10.5
OR2160243	---	---	123	56.1	99	6/16	33	0	11.0
UI Sparrow	---	162	123	55.8	100	6/18	39	20	11.2
YSC-201	---	129	123	55.8	100	6/16	37	0	11.5
VI Voodoo CL+	---	148	120	55.1	99	6/18	33	15	11.3
UIL17-7706A CL+	---	---	119	57.9	100	6/18	36	0	11.0
ORI2190027 CL+	---	---	116	58.7	100	6/16	32	0	11.9
OR2X2 CL+	---	139	114	56.8	100	6/15	34	0	11.7
Average	---	**145**	**131**	**56.9**	**100**	**6/16**	**34**	**4**	**11.1**
LSD (α=.05)	---	**13**	**9**	**0.9**	**2**	**2**	**2**	**17**	
CV (%)	---	**6.3**	**5.0**	**1.2**	**1.2**	**0.9**	**4.8**	**318.0**	
Pr > F	---	**<0.0001**	**<0.0001**	**<0.0001**	**0.114**	**<0.0001**	**<0.0001**	**<0.0001**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 23. Agronomic Data for Soft White Winter Wheat at Ririe, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020*	2021**	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB1783	22	41	**21**	55.2	100	6/22	20	0	14.5
WA8290	---	---	**20**	53.0	99	6/24	20	0	13.9
Eltan	25	43	**19**	52.4	99	6/26	19	0	14.5
Piranha CL+	---	43	**19**	52.7	99	6/24	20	0	13.5
UIL13-046145A	---	---	**19**	52.7	100	6/22	18	0	13.3
UIL15-028024	---	---	**19**	54.0	100	6/24	19	0	13.9
Eltan 11 + 52 + 0	23	47	**19**	52.5	98	6/26	20	0	14.6
VI Presto CL+	25	33	**19**	54.0	99	6/20	18	0	13.4
M-Press with Root2			**18**	52.8	100	6/25	18	0	13.7
Otto	24	46	**18**	52.2	100	6/26	19	0	15.0
Sockeye CL+	---	43	**18**	51.7	98	6/24	21	0	13.7
LCS Hulk	25	37	**18**	52.7	100	6/21	18	0	14.3
UI Sparrow	24	48	**18**	52.7	99	6/26	21	0	14.0
SY Ovation	26	42	17	53.4	100	6/22	17	0	14.3
UI Magic CL+	19	34	17	51.7	94	6/24	18	0	14.4
LWW17-8185	---	---	17	51.7	100	6/23	16	0	12.7
M-Press	---	41	17	53.1	100	6/25	17	0	14.6
AP Dynamic	---	---	17	48.9	98	6/25	19	0	14.8
Devote	25	47	17	53.8	99	6/26	19	0	13.9
IDO1810	28	39	16	51.5	100	6/24	19	0	14.4
Norwest Duet	27	40	16	51.9	100	6/24	18	0	13.4
SY Assure	22	34	16	53.4	100	6/20	17	0	13.1
IDO2008	---	---	16	51.5	99	6/23	19	0	16.1
UIL13-553051A	---	---	16	51.6	100	6/25	17	0	14.3
AP Iliad	---	---	15	51.9	100	6/21	18	0	13.6
IDO1708	20	35	15	50.1	100	6/21	17	0	13.7
OR2130755	---	39	15	51.9	99	6/19	17	0	14.3
VI Voodoo CL+	21	32	15	51.8	99	6/25	16	0	14.9
WB1376CLP	24	36	15	52.0	96	6/21	20	0	15.7
WB1529	22	36	15	53.5	99	6/22	17	0	14.4
WB456	---	40	15	52.0	99	6/21	18	0	14.9
UIL17-7706A CL+	---	---	14	50.5	100	6/26	17	0	14.6
Brundage	19	34	14	52.3	100	6/19	19	0	13.6
UIL13-587007A	---	---	13	53.0	99	6/26	16	0	13.6
Stephens	21	34	13	51.6	99	6/22	18	0	14.2
VI Frost	---	---	7	---	100	6/22	18	0	18.6
Average	**23**	**39**	**16**	**52.3**	**99**	**6/23**	**18**	**0**	**14.3**
LSD (α=.05)	**5**	**6**	**3**	**1**	**4**	**1**	**2**	**0**	
CV (%)	**16.1**	**8.2**	**11.9**	**<0.0001**	**2.7**	**0.5**	**8**	**0.0**	
Pr > F	**0.0037**	**<0.0001**	**<0.0001**	**0.2807**	**0.3432**	**<0.0001**	**<0.0001**	**.**	

* This is the result of only two replications. Two replications were damaged by high winds.
** Varieties or selections in bold are not statistically different from the top yielding variety.

Table 24. Agronomic Data for Soft White Winter Wheat at Rockland, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB1783	---	---	**17**	57.7	78	6/8	22	0	14.3
SY Ovation	29	46	**16**	55.7	84	6/9	20	0	13.1
Sockeye CL+	---	48	**15**	55.5	80	6/10	23	0	13.3
Norwest Duet	33	49	**14**	53.0	76	6/10	20	0	13.2
Piranha CL+	---	---	**14**	55.5	75	6/10	21	0	13.1
OR2130755	---	42	**14**	54.7	78	6/9	21	0	13.8
M-Press with Root2	---	---	13	54.1	75	6/11	20	0	12.6
WB1376 CLP	---	---	13	53.5	70	6/8	21	0	14.7
M-Press	---	48	12	54.1	79	6/10	20	0	13.8
WB456	---	38	12	53.1	74	6/7	20	0	14.6
Stephens	---	41	12	52.5	74	6/10	21	0	15.3
SY Assure	---	34	12	54.3	78	6/7	18	0	14.4
Eltan	27	50	11	54.0	79	6/12	20	0	13.1
WA8290	---	---	11	55.4	76	6/10	21	0	13.5
Eltan 11-52-0	23	51	11	55.7	76	6/11	22	0	13.9
Brundage	26	40	11	52.9	74	6/8	19	0	13.5
Otto	29	55	11	55.1	80	6/12	22	0	13.8
WB1529	---	38	11	55.6	68	6/9	19	0	13.3
Devote	---	51	10	57.6	75	6/10	21	0	12.6
UI Sparrow	15	49	10	53.0	73	6/12	23	0	14.0
UI Magic CL+	20	40	10	55.0	74	6/10	19	0	15.2
Average	**26**	**44**	**12**	**54.7**	**76**	**6/10**	**20**	**0**	**13.8**
LSD (α=.05)	**4**	**6**	**3**	**1**	**10**	**1**	**2**	**0**	
CV (%)	**9.8**	**10.2**	**17.3**	**1.4**	**9.6**	**0.6**	**7.6**	**.**	
Pr > F	**<.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.5028**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 25. Soft White Winter Wheat Yield Percentage of Location Averages, 2021.

	(100% = Average)						Variety
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrigated**	**Ririe Dryland**	**Rockland**	**Average**
WB1783	109	111	99	107	130	142	**116**
AP Exceed	102	120	111	110	---	---	**111**
WA8290	---	---	---	---	125	94	**110**
SY Ovation	107	106	103	102	106	131	**109**
UIL13-046145A	112	103	99	112	117	---	**109**
VI Shock	104	106	113	107	---	---	**107**
Piranha CL+	105	97	108	98	119	117	**107**
UIL15-028024	102	98	105	113	117	---	**107**
LCS Hulk	108	100	110	108	109	---	**107**
Eltan	---	---	---	---	119	94	**106**
SY Raptor	110	113	103	97	---	---	**106**
Sockeye CL+	99	86	103	99	114	127	**105**
OR2130755	---	---	---	---	94	115	**105**
LCS Blackjack	98	106	104	106	---	---	**104**
Eltan 11 + 52 + 0	---	---	---	---	116	92	**104**
VI Presto CL+	100	100	103	98	116	---	**103**
AP Dynamic	---	---	---	---	103	---	**103**
WA8293	109	92	110	102	---	---	**103**
M-Press	104	100	103	103	105	102	**103**
SY Assure	105	109	100	104	102	96	**103**
AP Iliad	105	109	100	103	95	---	**102**
OR2160264	104	113	98	94	---	---	**102**
Otto	---	---	---	---	114	90	**102**
IDO1810	---	---	---	---	102	---	**102**
Norwest Duet	99	89	101	99	102	119	**101**
YSC-268	101	---	---	---	---	---	**101**
M-Press with SSR	96	88	99	103	114	104	**101**
UIL13-587007A	109	112	100	100	83	---	**101**
LCS Artdeco	97	99	99	105	---	---	**100**
Nixon	100	101	101	96	---	---	**100**
OR2160243	97	107	101	94	---	---	**100**
Stingray CL+	99	101	101	97	---	---	**100**
LWW17-8185	97	92	96	103	105	---	**99**
YSC-215	97	---	---	98	---	---	**98**
WB1376CLP	99	97	94	98	94	104	**98**
UI Magic CL+	96	102	100	98	106	79	**97**
Norwest Tandem	98	97	94	99	---	---	**97**
WB1529	99	102	96	100	94	88	**97**
IDO2008	93	94	96	99	100	---	**96**
UIL13-553051A	97	99	89	95	100	---	**96**
IDO1708	94	92	96	104	94	---	**96**
VI Voodoo CL+	100	96	97	92	94	---	**96**
UI Sparrow	97	89	99	94	109	85	**95**
Brundage	95	103	99	97	88	90	**95**
WB456	89	94	95	99	92	102	**95**
Stephens	99	101	98	94	80	96	**95**
Devote	---	---	---	---	103	85	**94**
UIL17-7706A CL+	96	91	98	91	89	---	**93**
YSC-201	92	---	---	94	---	---	**93**
ORI2190027CL+	93	88	90	88	---	---	**90**
OR2X2CL+	94	88	88	87	---	---	**89**
VI Frost	---	---	---	---	44	---	**44**
Location Average (bu/A)	**137**	**137**	**155**	**131**	**16**	**12**	

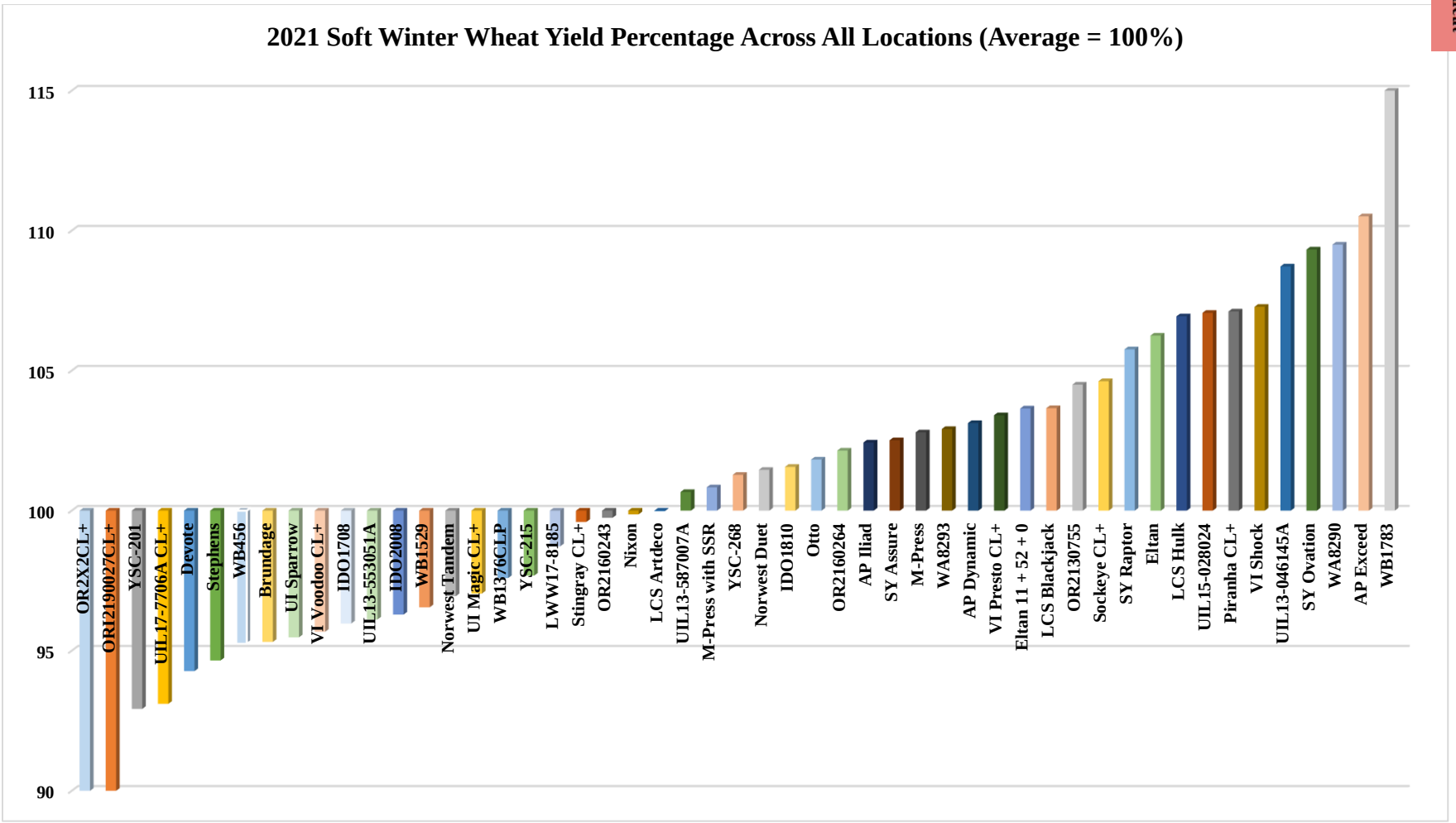


Chart 3. Soft Winter Wheat Yield Percentage Across All Locations.

Table 26. Winter Barley Irrigated Nurseries, 3-Year Averages (2019-2021; 5 site-years*).

Variety or Selection	Yield (bu/A)	Test Wt (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plumps (>6/64)	Plumps (>5.5/64)	% thin
KWS Donau	163	51.2	98	5/27	41	10	11.3	96.9	1.8	1.3
DH140963	162	49.9	98	5/29	42	25	11.2	95.3	3.1	1.6
Sunstar Pride	157	47.8	99	6/5	37	21	10.0	59.2	20.1	20.7
KWS Somerset	157	51.1	96	5/29	42	19	11.4	96.8	2.0	1.2
LCS Calypso	156	52.1	100	5/26	43	12	11.6	96.3	2.6	1.1
Thunder	156	50.4	99	5/26	39	46	11.4	93.9	3.8	2.3
KWS Scala	154	49.6	98	5/27	39	36	11.7	94.8	3.3	1.9
2WI15-8688	150	50.5	99	5/28	40	31	11.2	89.3	6.5	4.2
2WI14-7577	147	50.0	98	5/26	40	28	11.7	94.4	3.7	1.9
WintMalt	144	50.1	99	5/30	41	24	11.2	91.4	5.4	3.2
Lightning	140	51.9	99	5/29	41	17	11.7	95.7	2.7	1.6
Charles	133	48.4	95	5/28	39	53	11.5	89.5	6.4	4.1
Endeavor	131	50.8	93	5/30	42	53	11.3	82.6	10.5	6.9
05ARS849-15	130	50.5	98	5/28	43	45	11.7	95.3	3.1	1.6
Eight-Twelve	128	48.0	94	5/30	39	45	11.0	62.4	21.4	16.2
Upspring**	121	59.4	72	6/2	42	10	14.6	80.7	13.8	5.5
Average	**146**	**50.7**	**96**	**5/29**	**41**	**30**	**11.5**	**88.4**	**6.9**	**4.7**
SE	**4**	**0.3**	**2**	**0.6**	**0.6**	**5**				
Pr >F (variety)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**				
Pr > F (variety*year)	**<0.0001**	**0.0014**	**<0.0001**	**0.0187**	**<0.0001**	**0.1467**				
Pr > F (variety*location)	**0.0677**	**0.0039**	**0.9938**	**0.0078**	**0.3211**	**<0.0001**				
Pr > F (year*location)	**<0.0001**	**<0.0001**	**0.2562**	**0.5845**	**0.0046**	**0.2368**				
Pr > F (variety*year*location)	**0.0542**	**0.0009**	**0.0026**	**0.3222**	**0.0011**	**0.0310**				

* The 2020 winter plots in Rupert were significantly damaged by winter, hence agronomic data for that specific year and location was not included (only 5 site-year was used for the analyses).
** Hulless variety

Table 27. Irrigated Winter Barley Data Combined from Rupert and Aberdeen, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	Plump (>5.5/64)	% Thin
13ARS537-13	164	52.0	99	5/24	34	28	10.5	93.5	4.0	2.5
13ARS537-25	152	51.2	100	5/24	35	56	10.8	94.4	3.9	1.7
13ARS537-19	152	51.3	96	5/22	36	54	10.6	94.1	3.5	2.4
KWS Somerset	152	49.9	97	5/29	41	31	11.3	97.4	1.6	1.0
LCS Calypso	150	50.9	99	5/27	43	23	11.9	95.7	3.3	1.0
Hirondella	146	46.8	100	5/26	39	15	10.8	91.5	6.1	2.4
Thunder	146	48.5	100	5/27	34	70	11.4	91.3	5.6	3.1
Flavia	145	50.3	99	5/26	37	4	11.6	97.3	1.9	0.8
WintMalt	144	49.0	98	5/31	39	33	10.5	92.6	5.4	2.0
DH140963	142	48.2	96	5/30	42	50	10.9	94.3	3.7	2.0
Sunstar Pride	142	45.5	100	6/5	35	46	9.4	48.9	22.6	28.5
KWS Scala	141	48.7	97	5/27	38	54	11.8	95.0	3.2	1.8
KWS Donau	140	49.9	98	5/27	41	11	11.1	96.8	1.8	1.4
KWS Faro	139	50.4	100	5/23	38	23	10.1	94.4	3.6	2.0
2WI15-8688	136	49.0	98	5/29	39	41	10.6	88.2	7.4	4.4
Lightning	135	51.2	100	5/27	41	22	11.8	96.3	2.1	1.6
Endeavor	134	49.5	97	5/30	40	68	11.0	82.0	11.1	6.9
Charles	133	47.3	100	5/28	38	74	11.7	87.4	7.9	4.7
KSW Joyau	132	49.7	100	5/23	36	1	10.8	96.2	2.4	1.4
2WI14-7577	130	48.5	98	5/28	39	43	11.6	93.7	4.1	2.2
DH141225	129	50.7	100	5/27	41	12	10.9	95.2	3.1	1.7
DH141222	128	51.8	100	5/29	42	2	11.6	97.8	1.4	0.8
Eight-Twelve	126	45.9	98	5/29	37	64	11.0	50.2	26.5	23.3
05ARS849-15	121	49.8	94	5/29	43	52	12.4	95.8	2.9	1.3
Upspring*	116	58.2	79	6/4	41	20	12.7	71.9	21.5	6.6
Avalon	111	52.1	100	5/26	44	18	11.7	97.0	2.1	0.9
VA16M-84	95	51.8	98	5/29	44	24	12.5	95.6	3.3	1.1
Average	**136**	**49.9**	**98**	**5/28**	**39**	**35**	**11.2**	**89.8**	**6.1**	**4.1**
SE	**4.8**	**0.6**	**2**	**0.8**	**0.8**	**9.5**				
Pr > F (variety)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**				
Pr > F (location)	**0.0002**	**0.2577**	**0.2028**	**0.0108**	**0.1270**	**0.0053**				
Pr > F (variety*location)	**0.0116**	**0.0115**	**<0.0001**	**0.2545**	**0.2430**	**0.0084**				

* Hulless variety

Table 28. Agronomic Data for Winter Barley at Aberdeen, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
13ARS537-13	---	---	**151**	52.0	98	5/25	33	13	11.3	93.0	4.2	2.8
13ARS537-19	---	---	**144**	51.5	92	5/23	35	25	11.2	93.5	3.7	2.8
Thunder	194	156	**139**	47.8	99	5/28	34	73	12.0	91.2	5.8	3.0
Sunstar Pride	180	174	**138**	45.5	100	6/5	36	24	10.3	56.6	24.1	19.3
13ARS537-25	172	164	**136**	51.4	100	5/24	34	25	11.5	95.0	3.1	1.9
WintMalt	167	154	131	48.5	96	6/1	38	28	11.4	91.0	6.7	2.3
Flavia	---	---	128	48.5	100	5/27	37	4	12.4	96.1	2.7	1.2
KWS Faro	---	154	125	50.1	100	5/23	37	10	10.5	94.4	3.4	2.2
LCS Calypso	196	135	124	50.9	99	5/28	43	18	12.4	95.2	3.6	1.2
KWS Somerset	193	163	123	50.0	94	5/30	41	18	12.0	96.5	2.4	1.1
KWS Donau	199	164	122	48.5	96	5/28	42	3.5	12.0	95.1	2.8	2.1
KWS Scala	200	149	121	47.9	100	5/29	39	41	12.9	92.8	4.5	2.7
2WI15-8688	196	155	120	48.5	97	5/29	38	14	11.3	88.1	7.8	4.1
KSW Joyau	---	---	119	49.5	100	5/25	36	2	11.3	96.9	2.1	1.0
Charles	165	165	118	47.8	100	5/28	39	56	12.2	87.3	8.4	4.3
DH140963	214	154	117	48.1	93	6/1	42	43	10.9	95.0	2.8	2.2
2WI14-7577	188	163	116	49.3	95	5/28	37	5	12.1	94.1	3.8	2.1
Lightning	184	149	113	51.6	100	5/28	41	11	12.3	95.3	2.8	1.9
Endeavor	158	144	112	48.3	94	6/1	40	49	11.8	79.2	12.4	8.4
DH141225	---	---	111	49.5	100	5/29	40	19	11.7	92.1	5.4	2.5
Hirondella	---	---	110	44.9	99	5/29	38	3	11.3	87.2	9.1	3.7
DH141222	---	---	107	51.0	100	5/30	42	4	12.6	97.2	1.7	1.1
Eight-Twelve	126	184	105	44.0	95	5/31	36	44	12.1	38.4	30.1	31.5
05ARS849-15	165	159	100	50.0	89	5/29	40	20	12.7	95.5	3.1	1.4
Avalon	---	---	100	52.7	100	5/25	43	20	10.1	97.9	1.2	0.9
Upspring**	171	133	97	57.9	66	6/5	41	21	13.4	71.6	19.2	9.2
VA16M-84	---	---	79	52.0	96	5/29	43	1	13.3	95.3	3.5	1.2
Average	**178**	**155**	**119**	**49.5**	**96**	**5/29**	**39**	**22**	**11.8**	**88.9**	**6.7**	**4.4**
LSD (α=.05)	**20**	**22**	**17**	**2.1**	**8.6**	**4**	**3.4**	**38**				
CV (%)	**7.8**	**8.7**	**10.3**	**3**	**6.2**	**1.7**	**6.2**	**120**				
Pr > F	**0.0011**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0331**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Hulless variety

Table 29. Agronomic Data for Winter Barley at Rupert, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	(>5.5/64)	% Thin
13ARS537-13	---	---	**177**	52.0	100	5/24	35	44	9.7	94.0	3.8	2.2
Hirondella	---	---	**177**	48.4	100	5/25	39	25	10.2	95.7	3.1	1.2
LCS Calypso	151	87	**176**	51.0	100	5/26	42	29	11.4	96.1	3.1	0.8
KWS Somerset	146	157	**175**	50.3	100	5/29	41	28	10.5	98.2	1.0	0.8
13ARS537-25	118	77	**169**	51.0	100	5/23	37	88	10.0	93.8	4.7	1.5
DH140963	161	127	**166**	48.3	100	5/28	43	58	10.9	93.5	4.7	1.8
Flavia	---	---	**165**	50.8	98	5/24	37	3	10.8	98.4	1.1	0.5
KWS Scala	137	126	**162**	49.5	94	5/25	38	68	10.7	97.1	2.0	0.9
13ARS537-19	---	---	159	51.2	100	5/22	36	83	9.9	94.6	3.3	2.1
KWS Donau	173	136	158	51.4	100	5/27	40	18	10.1	98.5	0.8	0.7
WintMalt	109	130	158	49.4	99	5/31	40	39	9.5	94.1	4.1	1.8
Lightning	109	101	158	50.8	100	5/27	41	33	11.2	97.2	1.5	1.3
Endeavor	109	82	156	50.6	100	5/29	40	88	10.2	84.8	9.7	5.5
Thunder	136	91	154	49.2	100	5/25	35	68	10.7	91.4	5.5	3.1
KWS Faro	---	95	153	50.7	100	5/24	39	35	9.6	94.4	3.8	1.8
2WI15-8688	125	83	152	49.5	100	5/30	40	69	9.9	88.3	6.9	4.8
DH141225	---	---	148	51.8	100	5/24	42	3	10.1	98.3	0.8	0.9
DH141222	---	---	148	52.6	100	5/27	43	1	10.6	98.4	1.1	0.5
Eight-Twelve	105	92	148	47.8	100	5/28	38	85	9.9	62.0	22.9	15.1
Charles	88	105	148	46.8	100	5/29	38	93	11.2	87.5	7.4	5.1
KSW Joyau	---	---	146	50.0	100	5/22	37	0	10.3	95.5	2.6	1.9
Sunstar Pride	149	105	145	45.5	100	6/5	35	69	8.5	41.1	21.1	37.8
2WI14-7577	126	73	144	47.8	100	5/27	40	80	11.0	93.2	4.4	2.4
05ARS849-15	97	78	141	49.6	100	5/30	46	84	12.0	96.0	2.7	1.3
Upspring**	98	75	135	58.5	93	6/3	41	20	12.0	72.2	23.7	4.1
Avalon	---	---	122	51.5	100	5/26	45	16	13.2	96.1	3.1	0.8
VA16M-84	---	---	111	51.7	100	5/30	46	46	11.7	95.8	3.2	1.0
Average	**124**	**98**	**154**	**50.3**	**99**	**5/27**	**40**	**47**	**10.6**	**90.6**	**5.6**	**3.8**
LSD (α=.05)	**21**	**44**	**17**	**2.0**	**3.7**	**3.0**	**3.0**	**36**				
CV (%)	**11.6**	**31.2**	**8.1**	**2.7**	**2.7**	**1.4**	**5.4**	**54.4**				
Pr > F	**0.0011**	**0.0013**	**<0.0001**	**<0.0001**	**0.0131**	**<0.0001**	**<0.0001**	**<0.0001**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Hulless variety

Table 30. Winter Barley Yield Percentage of Location Averages, 2021.

	(100% = Average)		
Variety or Selection	**Aberdeen**	**Rupert**	**Variety Average**
13ARS537-13	127	115	**121**
13ARS537-19	121	104	**113**
13ARS537-25	115	110	**112**
LCS Calypso	104	115	**109**
KWS Somerset	104	114	**109**
Thunder	117	100	**108**
Flavia	108	107	**107**
WintMalt	110	103	**107**
Sunstar Pride	116	95	**105**
Hirondella	93	115	**104**
KWS Scala	102	105	**103**
DH140963	99	108	**103**
KWS Donau	103	103	**103**
KWS Faro	105	100	**102**
2WI15-8688	101	99	**100**
Lightning	96	103	**99**
Endeavor	94	102	**98**
Charles	99	96	**98**
KSW Joyau	100	95	**98**
2WI14-7577	98	94	**96**
DH141225	93	96	**95**
DH141222	90	96	**93**
Eight-Twelve	88	96	**92**
05ARS849-15	85	92	**88**
Upspring*	81	88	**84**
Avalon	84	80	**82**
VA16M-84	67	72	**69**
Location Average (bu/A)	**119**	**154**	

* Hulless variety

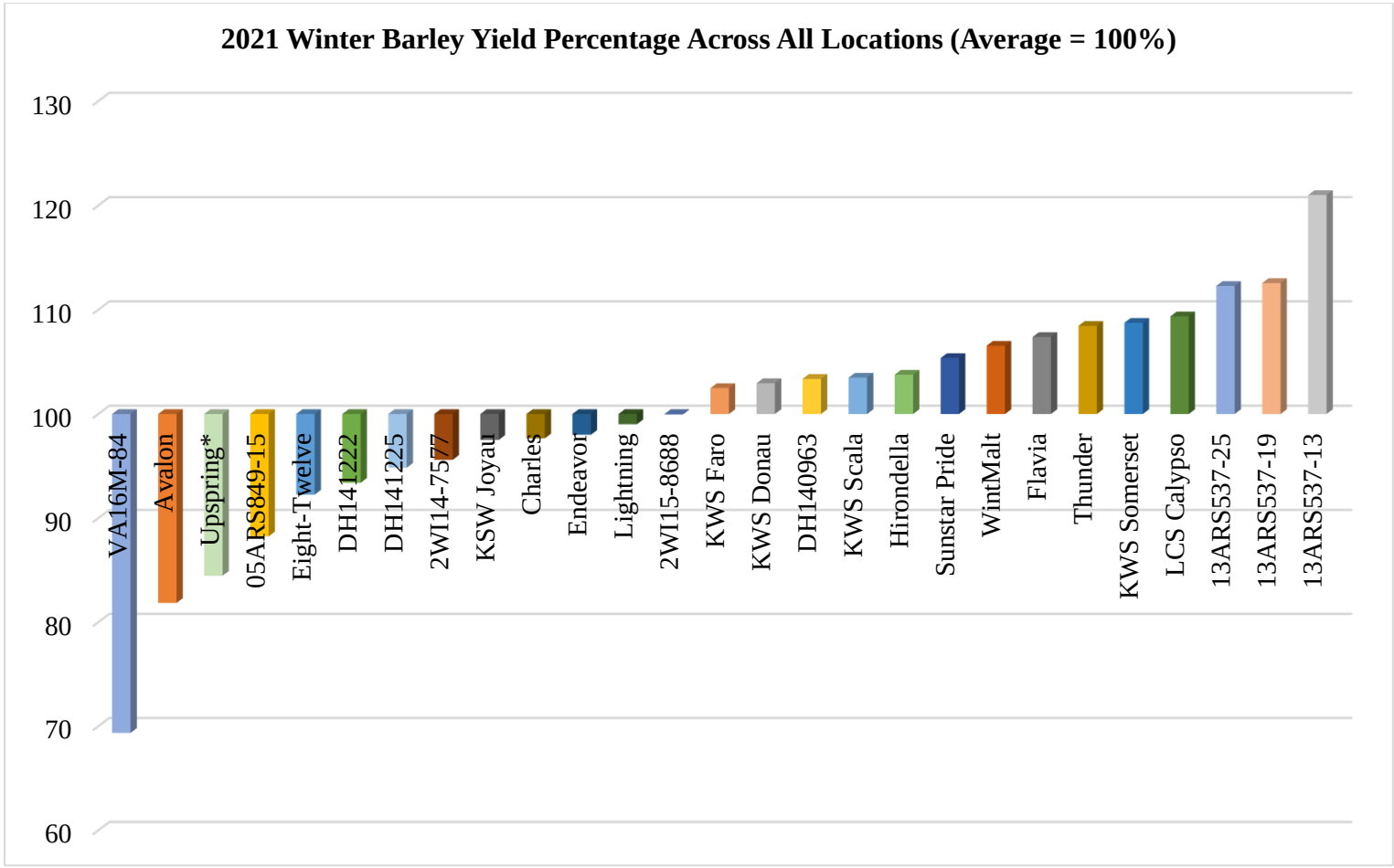


Chart 4. Winter Barley Yield Percentage Across All Locations.

Table 31. Hard Spring Wheat Irrigated Nurseries, 3 Year Averages (2019 - 2021; 12 site-years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Dayn (W)	121	61.0	99	6/19	34	0	13.5
SY-Teton (W)	111	59.2	100	6/18	31	2	13.2
AP Renegade	109	59.9	99	6/22	34	0	13.5
SY Gunsight	108	59.8	100	6/21	31	2	13.7
WB7696 (W)	107	60.8	99	6/19	30	0	13.3
WB7202CLP (W)	107	60.9	100	6/17	29	0	13.3
Jefferson	105	61.0	99	6/20	35	6	14.1
Alum	105	61.1	99	6/21	36	4	14.7
UI Platinum (W)	104	60.7	100	6/17	30	0	13.2
WB9879CLP	103	60.3	99	6/23	36	3	14.6
Glee	103	60.7	100	6/18	34	8	13.8
Net CL+	102	61.3	99	6/23	36	5	14.3
WB9668	102	61.0	100	6/19	30	1	15.2
WB7589 (W)	101	60.6	99	6/19	27	0	13.9
WB7328 (W)	96	60.7	99	6/17	28	1	14.5
Average	**106**	**60.6**	**99**	**6/19**	**32**	**2**	**13.9**
SE	**2**	**0.1**	**0.4**	**0.2**	**0.3**	**1.2**	
Pr>F (variety)	**<0.0001**	**<0.0001**	**0.9359**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr>F (variety*year)	**<0.0001**	**<0.0001**	**0.9619**	**<0.0001**	**0.0009**	**0.0001**	
Pr>F (variety*location)	**<0.0001**	**0.1**	**0.9899**	**0.0223**	**0.8299**	**0.0072**	
Pr>F (year*location)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0475**	
Pr>F (variety*year*location)	**0.0054**	**<0.0001**	**0.9895**	**0.1165**	**0.0414**	**0.1639**	

(W) = White

Table 32. Hard Spring Wheat Dryland Nurseries, 3 Year Averages (2019 - 2021; 3 site-years).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Dagmar	55	61.6	100	7/8	30	0	12.6
Dayn (W)	54	61.0	97	7/7	31	0	11.2
Jefferson	53	61.6	100	7/8	30	0	11.7
SY-Teton (W)	52	60.1	99	7/7	28	0	10.4
Net CL+	52	61.7	100	7/11	30	0	11.8
WB7202CLP (W)	52	61.8	100	7/5	27	0	10.3
Duclair	49	60.7	100	7/8	29	0	11.4
Glee	49	61.6	100	7/8	30	0	10.9
Alum	49	61.9	99	7/11	30	0	11.3
WB7589 (W)	48	61.2	99	7/6	24	0	11.4
UI Platinum (W)	47	61.8	99	7/5	27	0	10.6
WB7696 (W)	45	60.9	100	7/7	26	0	11.1
WB9879CLP	45	60.7	100	7/11	28	0	12.1
WB9668	44	61.9	100	7/6	26	0	13.0
WB7328 (W)	42	61.3	95	7/4	24	0	11.6
Choteau	42	60.9	100	7/9	27	0	11.8
Average	**49**	**61.3**	**99**	**7/8**	**28**	**0**	**11.5**
SE	**2.1**	**0.2**	**1.3**	**0.5**	**0.4**	**.**	
Pr>F (variety)	**<0.0001**	**<0.001**	**0.4849**	**<0.0001**	**<0.0001**	**.**	
Pr>F (variety*year)	**<0.0001**	**<0.001**	**0.0582**	**<0.0001**	**<0.0001**	**.**	

(W) = White

Table 33. Irrigated Hard Spring Wheat Data Combined from Aberdeen, Ashton, Idaho Falls and Rupert, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
IDO1804S (W)	115	58.9	100	6/20	34	0	13.4
Dayn (W)	115	58.8	100	6/17	32	0	13.5
IDO2105S	113	59.1	100	6/17	32	1	13.5
BZ917-221	109	60.1	100	6/17	31	0	14.2
WB7313 (W)	108	58.6	100	6/15	28	5	14.1
WB9707	108	60.0	100	6/16	32	1	14.2
MT2075	107	58.8	100	6/21	37	8	14.7
Dagmar	107	59.1	100	6/16	34	3	15.0
IDO1904S (W)	106	58.6	100	6/20	30	0	13.9
WA 8356	106	59.2	100	6/15	33	0	13.8
WB7696 (W)	106	58.3	100	6/17	28	0	13.2
MT2063	105	58.8	100	6/19	34	9	14.0
WB7202CLP (W)	105	58.7	100	6/15	28	0	13.7
AP Renegade + base + root2	105	57.3	100	6/19	32	0	13.4
SY-Teton (W)	105	57.1	100	6/16	29	6	13.4
A16028S-IMI-1CL2	105	59.1	100	6/17	34	3	14.2
Jefferson HF	104	59.9	100	6/18	33	2	14.0
A15047S-1CL2	104	57.8	100	6/15	33	0	13.5
WA 8355	104	59.1	100	6/19	33	0	13.9
SY Gunsight	103	56.5	100	6/19	30	7	13.7
IDO2002 (W)	103	58.0	100	6/18	30	0	13.7
AP Renegade + base	103	57.7	100	6/19	32	0	13.5
AP Renegade	103	57.5	100	6/20	32	0	13.3
WA 8357	102	61.4	100	6/17	38	9	15.2
WB9879CLP	101	58.0	100	6/20	34	5	14.5
Glee	100	58.5	100	6/16	32	11	13.9
Alum	100	59.9	100	6/19	32	1	14.8
UI Platinum (W)	100	58.0	100	6/15	29	0	13.0
WB7589 (W)	99	58.4	100	6/17	26	0	14.0
Net CL+	99	60.6	100	6/21	34	4	14.3
WA 8330 (W)	98	58.5	100	6/15	31	15	14.4
Expresso	98	59.0	100	6/19	32	0	14.6
MT Sidney (MT1716)	98	58.5	100	6/18	34	23	14.7
BZ919-059	97	59.8	100	6/17	27	4	13.7
WB9668	95	58.5	100	6/17	29	4	14.7
WB7328 (W)	93	58.3	100	6/15	27	4	14.2
Average	**104**	**58.7**	**100**	**6/18**	**31**	**4.0**	**14.0**
SE	**2.8**	**0.2**	**0.1**	**0.3**	**0.7**	**2.6**	
Pr > F (variety)	**<0.0001**	**<0.0001**	**0.7123**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (location)	**<0.0001**	**0.0395**	**0.0102**	**<0.0001**	**0.0008**	**0.0024**	
Pr > F (variety*location)	**<0.0001**	**<0.0001**	**0.8418**	**<0.0001**	**0.2247**	**<0.0001**	

(W) = White

Table 34. Agronomic Data for Hard Spring Wheat at Aberdeen, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB7696 (W)	95	94	**126**	58.4	100	6/12	30	0	12.9
AP Renegade + base + root2	---	101	**123**	58.0	100	6/14	34	0	14.1
Dayn (W)	114	102	**121**	58.2	100	6/15	33	0	13.4
BZ917-221	---	---	**118**	59.9	100	6/14	34	0	14.9
WB9707	---	87	**118**	59.5	100	6/13	33	0	14.5
AP Renegade	105	97	**116**	57.3	100	6/15	36	0	12.7
SY Gunsight	104	93	**116**	56.3	100	6/15	33	0	13.4
WB7202CLP	111	86	**116**	58.4	100	6/12	30	0	13.4
WA8356	---	---	**114**	59.3	100	6/13	32	0	13.9
SY-Teton (W)	112	90	**114**	57.5	100	6/12	30	0	13.8
IDO1804S	---	90	**113**	58.4	100	6/19	36	0	13.6
MT2063	---	---	**113**	58.2	100	6/16	37	3	14.3
Glee	94	89	**110**	57.5	100	6/12	33	0	14.0
IDO2002 (W)	---	92	**110**	57.6	100	6/15	32	0	14.3
Dagmar	---	81	**110**	58.6	100	6/11	32	0	15.0
AP Renegade + base	---	84	**109**	57.2	100	6/14	34	0	14.4
Jefferson	83	88	**109**	59.4	100	6/15	35	1	14.2
WB7589 (W)	104	83	**109**	57.4	100	6/12	28	0	14.1
WB7313 (W)	---	---	**108**	58.2	100	6/11	30	0	14.5
WA8357	---	---	107	61.1	100	6/13	40	0	15.8
WB9668	101	81	106	58.5	100	6/14	33	0	15.1
UI Platinum	106	78	106	57.5	100	6/11	32	0	12.8
A15047S-1CL2	---	---	106	57.3	100	6/12	36	0	13.9
A16028S-IMI-1CL2	---	---	106	59.0	100	6/13	38	0	14.6
WA8330 (W)	---	---	105	58.2	100	6/11	34	13	14.4
WA8355	---	---	105	58.5	100	6/15	33	0	14.3
MT2075	---	---	105	56.8	100	6/20	40	13	15.3
MT Sidney (MT1716)	---	89	104	58.1	100	6/16	37	19	14.6
WB7328 (W)	97	70	103	58.4	100	6/11	28	0	14.5
IDO1904S	---	91	102	57.5	100	6/18	30	0	14.3
Expresso	---	71	102	58.1	100	6/13	33	0	14.7
Alum	83	95	101	59.5	100	6/16	34	0	14.7
BZ919-059	---	---	100	59.1	100	6/12	28	0	13.6
Net CL+	90	80	100	59.7	100	6/18	36	5	13.9
WB9879CLP	76	85	100	57.4	100	6/18	32	1	14.8
IDO2105S	---	---	98	58.2	100	6/13	34	0	14.2
Average	**96**	**87**	**109**	**58.3**	**100**	**6/14**	**33**	**1.5**	**14.2**
LSD (α=.05)	**10**	**16**	**18**	**1.3**	**0**	**3**	**4**	**9.9**	
CV (%)	**7.5**	**13.1**	**11.1**	**1.5**	**.**	**1.1**	**8.2**	**469**	
Pr > F	**<0.0001**	**0.0002**	**0.2446**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.0902**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
(W) = White

Table 35. Agronomic Data for Hard Spring Wheat at Ashton, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Dayn (W)	---	154	**91**	59.5	100	6/26	31	0	13.9
IDO2105S	---	---	**90**	59.6	100	6/26	29	0	13.6
MT2075	---	---	**88**	61.5	100	7/1	34	0	15.3
MT2063	---	---	**87**	60.4	100	6/28	31	0	14.6
WA 8357	---	---	**85**	61.8	100	6/28	33	10	15.5
IDO1804S	---	150	**84**	60.1	100	6/30	31	0	13.8
IDO1904S	---	137	**80**	59.3	100	6/29	29	0	13.8
Net CL+	67	127	**80**	62.0	100	6/30	31	0	14.3
WA 8355	---	---	**79**	59.1	100	6/28	31	0	13.7
Jefferson	76	125	**78**	60.1	100	6/28	31	0	14.3
A16028S-IMI-1CL2	---	---	**78**	59.8	100	6/26	30	0	14.3
SY Gunsight	82	121	**78**	56.9	100	6/29	28	24	13.4
Alum	73	129	76	60.6	100	6/29	32	0	14.5
Dagmar	---	133	75	59.9	100	6/26	31	0	15.3
MT Sidney (MT1716)	---	131	75	59.5	100	6/27	30	8	14.7
Expresso	---	132	74	59.7	100	6/29	30	0	15.0
Glee	71	130	74	59.1	100	6/26	30	33	13.7
WB7589 (W)	67	113	73	58.3	100	6/27	23	0	14.0
AP Renegade + base	---	128	71	56.8	100	6/30	31	0	12.7
A15047S-1CL2	---	---	71	57.3	100	6/23	29	0	13.1
BZ917-221	---	---	71	60.1	100	6/26	28	0	14.0
IDO2002 (W)	---	137	70	57.7	100	6/28	28	0	13.4
WB9707	---	138	70	59.9	100	6/24	29	5	13.7
AP Renegade +base + root2	---	128	69	57.0	100	6/30	29	0	13.0
BZ919-059	---	---	69	59.2	100	6/27	24	18	14.2
WA 8356	---	---	68	59.2	100	6/24	29	0	13.4
WB7313 (W)	---	---	67	57.6	100	6/23	24	20	14.3
WB9879CLP	80	124	67	58.4	100	6/30	31	0	15.8
SY-Teton (W)	83	130	66	56.4	100	6/26	27	23	13.0
AP Renegade	78	130	66	57.6	100	6/30	28	0	13.4
WB7202CLP	69	126	65	58.3	100	6/24	25	0	13.8
UI Platinum	82	114	64	57.3	100	6/23	26	0	13.3
WB7696 (W)	73	137	62	58.4	100	6/28	26	0	13.7
WB9668	81	127	61	57.9	100	6/27	25	13	14.9
WA 8330 (W)	---	---	60	57.5	100	6/26	28	48	14.1
WB7328 (W)	64	108	59	56.8	100	6/23	25	18	14.4
Average	**74**	**128**	**73**	**58.9**	**100**	**6/27**	**29**	**6**	**14.1**
LSD (α=.05)	**17**	**14**	**14**	**1.3**	**0**	**1**	**2.4**	**26**	
CV (%)	**14.2**	**7.6**	**13.5**	**1.5**	**.**	**0.4**	**6**	**305**	
Pr > F	**0.2034**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.0575**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
(W) = White

Table 36. Agronomic Data for Hard Spring Wheat, Idaho Falls, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
IDO2105S	---	---	**140**	58.7	100	6/18	32	5	13.2
Dayn (W)	139	143	**136**	58.8	100	6/18	32	0	13.2
IDO1804S	---	132	**136**	58.6	100	6/20	33	0	13.1
WB7313 (W)	---	---	**133**	59.0	100	6/16	28	0	13.5
WA 8355	---	---	**133**	59.4	100	6/19	34	0	14.5
A15047S-1CL2	---	---	**131**	57.8	100	6/16	33	0	14.1
WA 8356	---	---	**129**	59.6	100	6/16	34	0	13.2
A16028S-IMI-1CL2	---	---	**128**	58.4	100	6/19	34	14	13.9
IDO1904S (W)	---	129	127	59.0	100	6/21	31	0	14.2
BZ917-221	---	---	127	60.2	100	6/17	31	0	14.1
WB7202CLP (W)	112	121	127	58.4	100	6/16	28	0	14.4
Dagmar	---	113	126	58.8	100	6/18	36	11	14.8
WB7696 (W)	109	117	126	58.4	100	6/19	28	0	13.2
IDO2002 (W)	---	107	125	58.7	100	6/20	29	0	13.9
AP Renegade + base	---	118	123	57.2	100	6/21	32	0	13.2
SY-Teton (W)	123	119	123	57.2	100	6/18	29	0	13.9
WB7589 (W)	115	107	123	59.0	100	6/19	26	0	13.5
WB9707	---	115	123	60.3	100	6/17	32	0	14.4
AP Renegade +base + root2	---	114	123	56.5	100	6/21	32	1	13.3
UI Platinum	114	105	123	58.4	100	6/16	28	0	13.1
SY Gunsight	122	114	122	56.5	100	6/21	30	5	14.0
Jefferson	116	122	121	59.5	100	6/18	33	6	13.8
AP Renegade	124	124	120	57.5	100	6/22	32	0	13.6
MT2075	---	---	120	58.0	100	6/22	37	19	14.5
WB9879CLP	114	121	119	57.7	100	6/21	35	18	13.8
BZ919-059	---	---	118	60.3	100	6/18	26	0	13.6
Glee	105	111	118	58.5	100	6/18	34	13	14.1
WA8330 (W)	---	---	118	61.1	100	6/16	31	0	14.2
Net CL+	116	113	116	60.1	100	6/21	32	10	14.5
WA 8357	---	---	116	59.0	100	6/18	40	28	14.1
WB9668	112	115	115	58.7	100	6/19	28	3	13.7
Alum	125	129	115	59.3	100	6/20	31	5	15.5
MT2063	---	---	115	57.5	100	6/20	35	35	13.5
WB7328 (W)	112	112	114	58.9	100	6/17	26	0	13.9
Expresso	---	101	113	59.2	100	6/21	32	0	14.0
MT Sidney (MT1716)	---	106	106	57.1	100	6/18	34	64	15.6
Average	**116**	**115**	**123**	**58.6**	**100**	**6/19**	**32**	**6.5**	**13.9**
LSD (α=.05)	**9**	**14**	**12**	**0.8**	**0**	**1**	**3**	**10**	
CV (%)	**5.8**	**8.9**	**6.8**	**1.0**	**.**	**0.5**	**7.2**	**111**	
Pr > F	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**<0.0001**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
(W) = White

Table 37. Agronomic Data for Hard Spring Wheat at Rupert, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in)	Lodging (%)	Protein (%)
IDO1804S (W)	---	140	**128**	58.7	100	6/12	34	0	13.3
WB7313 (W)	---	---	**125**	59.7	100	6/9	31	0	14.2
WB9707	---	121	**120**	60.5	100	6/9	34	0	14.2
BZ917-221	---	---	**120**	60.2	100	6/10	33	0	13.9
IDO2105S	---	---	**119**	59.8	100	6/12	34	0	13.1
WB9879CLP	128	117	**118**	58.6	99	6/13	37	0	13.8
MT2075	---	---	**118**	58.7	100	6/14	38	0	13.9
Dagmar	---	107	**117**	59.1	99	6/10	36	0	15.1
SY-Teton (W)	151	120	**116**	57.2	100	6/9	31	0	13.1
IDO1904S (W)	---	123	**116**	58.7	99	6/14	30	0	13.5
WA 8356	---	---	**114**	59.4	100	6/7	35	0	13.7
Dayn (W)	145	126	113	58.8	100	6/11	31	0	13.5
WB7202CLP (W)	129	115	112	59.6	100	6/9	30	0	13.3
AP Renegade + base	---	119	111	58.4	100	6/13	31	0	13.7
Alum	121	114	110	60.3	99	6/13	32	0	14.6
AP Renegade	131	118	109	58.5	100	6/13	32	0	13.4
WA 8330 (W)	---	---	109	58.9	100	6/9	32	0	14.5
WB7696 (W)	139	110	109	58.3	100	6/10	29	0	13.0
A15047S-1CL21	---	---	109	58.8	100	6/8	33	0	13.0
Jefferson	125	116	109	60.8	100	6/10	34	0	13.8
IDO2002 (W)	---	120	108	58.0	100	6/11	30	0	13.3
A16028S-IMI-1CL2	---	---	107	59.1	100	6/12	34	0	13.9
MT2063	---	---	107	59.0	100	6/10	34	0	13.7
UI Platinum	144	113	106	58.9	100	6/9	31	0	12.8
MT Sidney (MT1716)	---	96	106	59.1	100	6/10	35	0	14.1
AP Renegade + base + root2	---	120	106	58.1	100	6/13	34	0	13.1
Expresso	---	106	105	59.2	100	6/13	32	0	14.6
BZ919-059	---	---	104	60.8	100	6/12	28	0	13.3
WA8357	---	---	102	61.5	100	6/12	40	0	15.3
Glee	128	117	101	58.9	100	6/9	32	0	13.8
Net CL+	123	117	99	60.7	100	6/14	35	0	14.4
SY Gunsight	137	125	99	56.6	100	6/13	30	0	14.1
WA8355	---	---	98	59.4	100	6/12	35	0	14.6
WB7328 (W)	123	100	98	59.0	100	6/8	30	0	14.2
WB9668	129	112	98	58.8	100	6/10	29	0	15.1
WB7589 (W)	123	110	91	58.7	100	6/10	28	0	14.3
Average	**131**	**114**	**109**	**59.1**	**100**	**6/11**	**32**	**0**	**13.9**
LSD (α=.05)	**11**	**12**	**14**	**1**	**1**	**2**	**4**	**.**	
CV (%)	**5.7**	**7.3**	**9.0**	**1.2**	**0.90**	**0.7**	**8.1**	**.**	
Pr > F	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.7311**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
(W) = White

Table 38. Agronomic Data for Hard Spring Wheat at Soda Springs, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Duclair	72	53	**23**	60.5	99	7/4	23	0	10.9
Alum	64	61	**22**	61.5	99	7/4	25	0	10.5
Dayn (W)	76	60	**22**	60.0	93	6/30	25	0	10.5
MT Sidney (MT1716)	---	51	**21**	60.3	100	7/1	25	0	10.6
Dagmar	80	57	**20**	60.8	100	7/3	24	0	11.0
Jefferson	76	62	**20**	61.2	99	7/1	24	0	10.9
Net CL+	73	56	**20**	62.1	100	7/3	25	0	10.7
WA 8357	---	---	**20**	62.2	100	7/1	28	0	11.8
Glee	66	57	**20**	60.9	100	7/1	24	0	11.0
Rocker	---	---	**20**	61.9	100	7/4	25	0	11.2
WB7202CLP (W)	74	62	**19**	59.8	99	6/27	23	0	10.1
SY-Teton (W)	78	60	**19**	59.1	98	6/30	24	0	10.3
WA 8355	---	---	**19**	60.0	99	7/1	27	0	10.5
IDO1904S (W)	---	52	18	60.7	100	7/1	22	0	11.6
MT2063	---	---	18	60.4	100	7/3	22	0	10.9
IDO2105S	---	---	18	60.3	100	6/29	24	0	10.0
WA 8356	---	---	18	59.0	100	6/29	26	0	10.3
MT2075	---	---	18	60.4	99	7/5	25	0	11.8
IDO1804S (W)	---	61	17	60.9	98	7/4	23	0	11.4
UI Platinum (W)	68	57	17	60.1	98	6/28	22	0	9.7
WB9707	---	53	17	61.3	98	6/29	25	0	11.0
WB9879CLP	63	48	17	59.9	100	7/7	23	0	11.8
A15047S-1CL2	---	---	17	59.4	99	6/29	24	0	9.9
BZ917-221	---	---	17	61.6	100	6/29	23	0	10.7
Choteau	---	---	17	59.8	99	7/5	23	0	10.3
IDO2002 (W)	---	57	17	60.6	99	7/1	22	0	10.1
WB7589 (W)	71	58	16	59.6	98	6/28	21	0	10.6
AP Renegade + base	---	59	16	58.0	98	7/4	24	0	10.3
WA 8330 (W)	---	---	16	60.1	98	6/29	24	0	11.2
WB7313 (W)	---	---	16	59.4	100	6/28	20	0	10.2
AP Renegade + base + root2	---	62	15	57.7	100	7/4	23	0	10.3
A16028S-IMI-1CL2	---	---	15	59.9	100	6/29	23	0	10.2
AP Renegade	---	50	14	58.1	99	7/5	23	0	10.9
WB9668	63	50	13	60.2	99	6/29	21	0	12.9
WB7328 (W)	62	53	12	59.5	86	6/28	22	0	11.5
WB7696 (W)	67	56	12	58.8	99	6/29	21	0	10.3
Expresso	---	55	11	60.3	97	7/4	22	0	12.0
Average	**67**	**54**	**18**	**60.2**	**99**	**7/1**	**23**	**0**	**10.8**
LSD (α=.05)	**10**	**9**	**4**	**0.7**	**7**	**2**	**2**	**.**	
CV (%)	**10.5**	**11.5**	**14.3**	**0.8**	**5.2**	**1**	**5.1**	**.**	
Pr > F	**< 0.0001**	**0.0001**	**<0.0001**	**<0.0001**	**0.6116**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
(W) = White

Table 39. Hard Spring Wheat Yield Percentage of Location Averages, 2021.

	(100% = Average)					
Variety or Selection	**Aberdeen**	**Ashton**	**Idaho Falls**	**Rupert**	**Soda Springs**	**Variety Average**
Duclair	---	---	---	---	131	**131**
Dayn (W)	111	124	111	103	123	**114**
Rocker	---	---	---	---	112	**112**
IDO1804S	104	115	111	117	100	**109**
IDO2105S	90	123	114	109	102	**107**
Dagmar	100	102	103	107	116	**106**
MT2075	96	120	98	107	100	**104**
Jefferson HF	100	107	98	100	116	**104**
WA8357	98	115	94	94	116	**104**
IDO1904S	94	109	104	106	105	**103**
MT2063	103	118	93	98	103	**103**
BZ917-221	108	96	103	110	98	**103**
Alum	92	103	93	100	125	**103**
WB9707	108	96	100	110	99	**103**
WB7202CLP	107	89	103	103	109	**102**
SY-Teton (W)	104	90	100	106	108	**102**
WA8355	96	108	108	90	106	**102**
WA8356	105	92	105	104	102	**102**
Net CL+	92	109	94	91	116	**100**
SY Gunsight	107	106	99	90	---	**100**
Glee	101	100	96	93	112	**100**
WB7313 (W)	99	91	108	115	89	**100**
MT Sidney (MT1716)	95	102	86	97	118	**100**
A15047S-1CL2	97	97	106	100	98	**99**
IDO2002 (W)	101	96	102	99	95	**98**
AP Renegade + base	100	97	100	101	92	**98**
AP Renegade + base + root2	113	94	100	96	86	**98**
A16028S-IMI-1CL2	97	106	104	98	84	**98**
Choteau	---	---	---	---	98	**98**
WB9879CLP	92	91	97	108	99	**97**
UI Platinum	97	88	100	97	99	**96**
WB7589 (W)	99	100	100	83	94	**95**
AP Renegade	107	90	98	100	82	**95**
WB7696 (W)	116	85	102	100	69	**94**
BZ919-059	92	94	96	95	---	**94**
WA8330 (W)	97	82	96	100	90	**93**
Expresso	93	101	92	96	63	**89**
WB9668	97	83	94	89	77	**88**
WB7328 (W)	94	80	93	90	69	**85**
Location Average (bu/A)	**109**	**73**	**123**	**109**	**17**	

(W) = White

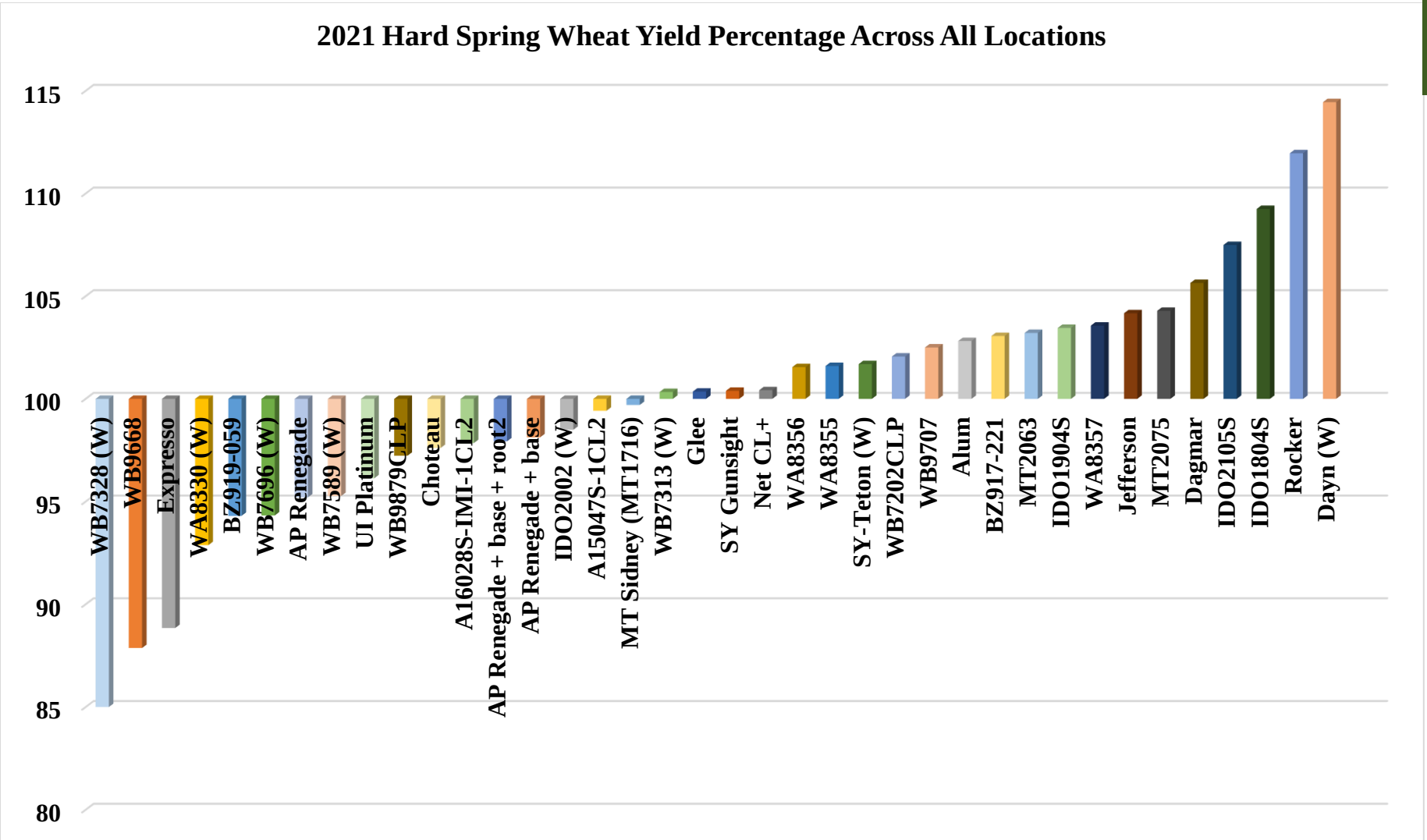


Chart 5. Hard Spring Wheat Yield Percentage Across All Locations.

(W) = White

Table 40. Soft White Spring Wheat Irrigated Nurseries, 3 Year Averages (2019 - 2021; 12 site-years*).

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB6430	120	59.7	100	6/19	33	1	9.9
Melba**	115	59.9	99	6/24	35	2	9.9
UI Cookie	115	59.0	99	6/19	36	0	10.6
Tekoa	111	60.8	99	6/24	37	7	10.2
Alturas	110	59.6	99	6/22	36	1	9.9
Seahawk	110	60.5	99	6/24	37	5	10.3
UI Stone	110	59.8	99	6/19	35	2	10.0
UI Pettit	109	59.4	99	6/17	33	4	10.4
Louise	106	59.5	99	6/24	38	20	10.6
Ryan	105	59.2	99	6/18	34	5	10.2
WB-1035CL+	101	60.1	100	6/18	34	0	11.4
Average	**110**	**59.8**	**99**	**6/20**	**35**	**4**	**10.3**
SE	**2.5**	**0.1**	**0.4**	**0.2**	**0.3**	**1.6**	
Pr>F (variety)	**<0.0001**	**<0.0001**	**0.9821**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr>F (variety*year)	**0.0467**	**<0.0001**	**0.9889**	**0.0005**	**<0.0001**	**<0.0001**	
Pr>F (variety*location)	**0.0008**	**0.0071**	**0.9969**	**<0.0001**	**0.0041**	**<0.0001**	
Pr>F (year*location)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0147**	
Pr>F (variety*year*location)	**0.0014**	**<0.0001**	**0.9995**	**0.0002**	**0.0429**	**<0.0001**	

* Spring stand and heading date are from 11 site-years.
** Club wheat variety

Table 41. Soft White Spring Wheat Dryland Nurseries, 3-Year Averages (2019-2021; 3 site-years).

Variety or Selection	Yield (bu/A)	Test Wt (lb/bu)	Spring Stand %	Heading Date	Height (in.)	Lodging (%)	Protein (%)
AP Coachman	60	59.0	100	7/12	30	0	10.2
Melba*	59	59.4	100	7/14	29	0	9.7
Tekoa	58	61.4	100	7/12	31	0	10.0
Ryan	58	59.8	100	7/9	30	0	10.1
Seahawk	57	60.1	100	7/11	28	0	10.3
IDO1405S	57	59.6	99	7/10	29	0	10.9
UI Stone	56	60.7	100	7/9	28	0	10.1
WB-1035CL+	55	60.6	100	7/10	28	0	11.4
Louise	54	60.4	99	7/12	30	0	10.4
WB6430	54	60.5	100	7/8	26	0	10.2
UI Cookie	53	59.2	99	7/9	29	0	11.0
UI Pettit	52	60.4	100	7/7	27	0	10.3
Alturas	52	59.3	100	7/11	28	0	9.9
Average	**56**	**60.0**	**100**	**7/10**	**29**	**0**	**10.3**
SE	**2.5**	**0.3**	**0.3**	**0.6**	**0.5**	**.**	
Pr>F (variety)	**0.3991**	**<0.0001**	**0.0122**	**<0.0001**	**<0.0001**	**.**	
Pr>F (variety*year)	**<0.0001**	**<0.0001**	**0.6025**	**<0.0001**	**<0.0001**	**.**	

* Club wheat variety

Table 42. Irrigated Soft White Spring Wheat Data Combined from Aberdeen, Ashton, Idaho Falls and Rupert, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
IDO1902S	121	59.6	100	6/18	34	1	11.0
WA 8327	119	58.0	100	6/19	35	3	10.7
WB6430	118	57.7	100	6/16	30	3	10.3
Seahawk	115	58.8	100	6/21	35	2	10.7
Alturas	114	57.5	100	6/19	35	1	10.5
UI Cookie	112	56.6	100	6/17	35	0	11.3
Melba*	112	57.5	100	6/21	34	1	10.2
WA 8351	111	58.9	100	6/18	33	17	10.4
IDO1702S	110	57.6	100	6/15	32	0	10.8
IDO1404S	108	57.6	100	6/20	34	1	10.8
Ryan	108	56.7	100	6/15	33	5	11.0
UI Stone	108	57.7	100	6/16	33	2	10.4
UI Pettit	107	57.5	100	6/14	30	8	10.6
Tekoa	106	58.4	100	6/21	35	15	10.7
WA 8321	105	56.1	100	6/18	33	31	10.4
Louise	104	57.4	100	6/20	36	35	11.0
WB-1035CL+	104	57.9	100	6/16	32	0	12.1
Hedge CL+*	100	58.0	100	6/21	37	31	11.6
WA 8325	100	57.3	100	6/17	35	28	10.5
WB6211CLP	97	55.7	100	6/17	32	0	11.7
YSC-603**	89	57.0	100	6/21	33	0	11.5
Average	**108**	**57.6**	**100**	**6/18**	**34**	**9.0**	**10.9**
SE	**3.0**	**0.2**	**0.1**	**0.3**	**0.5**	**3.9**	
Pr > F (variety)	**<0.0001**	**<0.0001**	**0.2301**	**<0.0001**	**<0.0001**	**<0.0001**	
Pr > F (location)	**<0.0001**	**0.0036**	**0.4665**	**<0.0001**	**<0.0001**	**0.0045**	
Pr > F (variety*location)	**<0.0001**	**<0.0001**	**0.6470**	**0.0011**	**0.0162**	**<0.0001**	

* Club wheat variety

** Data from three locations (Aberdeen, Ashton and Idaho Falls

Table 43. Agronomic Data for Soft White Spring Wheat at Aberdeen, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
IDO1902S	---	95	**129**	59.5	100	6/16	38	0	10.2
Seahawk	108	91	**124**	58.4	100	6/18	37	0	10.1
Alturas	80	85	**123**	57.3	100	6/16	37	0	11
IDO1702S	---	80	**122**	57.6	100	6/12	35	0	11
Melba**	101	86	**120**	57.2	100	6/19	36	0	9.0
IDO1404S	---	84	**117**	57.1	100	6/17	37	0	10
WB6430	103	80	**117**	57.7	100	6/13	33	1	9.8
UI Stone	91	71	**116**	57.8	100	6/14	37	5	10.1
Louise	87	95	**116**	57.4	100	6/17	39	25	10.4
WA 8351	---	---	**114**	58.8	100	6/15	37	3	9.6
Ryan	100	79	**114**	56.8	100	6/12	34	0	11.0
WA8327	---	90	**114**	57.6	100	6/15	38	0	10.1
WB-1035CL+	---	---	**113**	57.7	100	6/13	36	0	11.6
WA8325	---	---	110	57.2	100	6/13	39	36	10.3
UI Cookie	106	79	110	56.3	100	6/13	36	0	10.9
UI Pettit	71	89	109	56.9	100	6/11	33	8	10.2
WB6211CLP	---	---	109	55.4	100	6/13	37	0	10.8
Tekoa	104	80	107	58.3	100	6/20	38	0	10.3
Hedge CL+**	---	---	105	57.5	100	6/19	42	33	12
YSC-603	---	---	105	57.3	99	6/15	35	0	10.9
WA 8321	---	---	103	55.6	100	6/14	35	40	9.9
Average	**96**	**83**	**114**	**57.4**	**100**	**6/15**	**36**	**7**	**10.0**
LSD (α=.05)	**11**	**18**	**16**	**0.6**	**1**	**2**	**2**	**23**	
CV (%)	**7.9**	**15.1**	**9.7**	**0.8**	**0.6**	**0.6**	**4.5**	**227**	
Pr > F	**<.0001**	**0.4289**	**0.1555**	**<0.0001**	**0.4756**	**<0.0001**	**<0.0001**	**0.0013**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

* Club wheat variety

Table 44. Agronomic Data for Soft White Spring Wheat at Ashton, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WA 8327	---	135	**86**	58.2	100	6/29	30	0	10.8
Tekoa	79	131	**83**	59.2	100	7/1	32	21	10.8
IDO1902S	---	136	**81**	60.0	100	6/28	30	0	11.3
Seahawk	81	116	73	59.9	100	7/1	32	0	11.0
WB6430	84	147	71	57.7	100	6/27	26	3	10.9
IDO1404S	74	132	70	58.4	100	6/30	30	0	10.9
WA 8325	---	---	70	57.1	100	6/27	30	14	10.6
WA 8351	---	---	70	59.1	100	6/28	30	0	10.5
Hedge CL+**	---	---	69	58.7	100	7/1	31	1	11.7
Alturas	71	128	69	57.4	100	6/29	31	0	10.6
Melba**	75	138	64	58.5	100	7/1	28	0	11.2
Louise	72	130	61	58.4	100	6/30	32	10	11.2
WA 8321	---	---	60	56.0	100	6/29	30	0	10.3
UI Cookie	81	132	58	56.9	100	6/28	31	0	11.8
Ryan	79	114	57	56.3	100	6/25	31	0	10.9
IDO1702S	---	122	56	57.1	100	6/25	26	0	10.8
WB6211CLP	---	---	56	55.0	100	6/28	29	0	12.7
WB-1035 CL+	---	---	54	57.4	100	6/26	27	0	12.8
UI Stone	94	129	52	57.2	100	6/27	29	1	10.7
UI Pettit	74	129	51	57.5	100	6/24	28	20	11.0
YSC-603	---	---	49	56.5	100	6/29	31	0	12.0
Average	**79**	**129**	**65**	**57.7**	**100**	**6/28**	**30**	**3**	**11.2**
LSD (α=.05)	**15**	**15**	**12**	**1.3**	**0**	**1**	**3**	**21**	
CV (%)	**13.1**	**7.7**	**12.6**	**1.5**	**.**	**0.4**	**6.9**	**452**	
Pr > F	**0.1940**	**0.002**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**0.0001**	**0.6725**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

**= Club wheat variety

Table 45. Agronomic Data for Soft White Spring Wheat, Idaho Falls, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
IDO1902S	---	132	**143**	58.8	100	6/18	33	5	11.3
WA 8327	---	133	**138**	57.5	100	6/20	35	10	11.1
WB6430	143	141	**138**	57.3	100	6/17	31	6	10.6
UI Cookie	127	132	**137**	56.6	100	6/18	34	0	11.9
UI Stone	125	137	**136**	57.3	100	6/17	32	1	10.9
UI Pettit	117	129	**135**	57.0	100	6/15	29	0	11.2
Alturas	131	128	**135**	57.2	100	6/19	34	4	10.8
IDO1404S	130	123	**134**	57.7	100	6/21	33	0	11.3
Melba**	133	124	131	56.2	100	6/22	35	3	10.6
WA 8351	---	---	131	58.3	100	6/18	32	61	11.2
Ryan	97	120	130	56.7	100	6/17	31	6	11.3
IDO1702S	---	121	126	57.6	100	6/15	32	0	11.1
WA 8321	---	---	126	56.3	100	6/19	31	50	10.8
WB-1035CL+	---	---	125	57.7	100	6/18	33	0	11.7
Seahawk	108	133	123	57.4	100	6/21	34	9	11.6
WB6211CLP	---	---	122	55.8	100	6/18	31	0	12.5
Tekoa	114	121	121	57.5	100	6/21	34	38	11.5
YSC-603	---	---	116	57.1	100	6/19	33	0	11.6
Hedge CL+**	---	---	114	56.6	100	6/22	35	65	12.1
WA 8325	---	---	112	56.2	100	6/18	33	46	10.8
Louise	102	119	107	55.4	100	6/21	34	91	11.7
Average	**120**	**125**	**128**	**57.0**	**100**	**6/19**	**33**	**19**	**11.3**
LSD (α=.05)	**18**	**13**	**10**	**1.1**	**0**	**1**	**2.2**	**20**	
CV (%)	**10.3**	**7.4**	**5.5**	**1.3**	**.**	**0.4**	**4.8**	**77**	
Pr > F	**0.0001**	**0.0017**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**<0.0001**	

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Club wheat variety

Table 46. Agronomic Data for Soft White Spring Wheat at Rupert, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
WB6430	150	121	**145**	58.2	100	6/7	31	0	10.0
UI Cookie	147	121	**143**	56.7	100	6/10	38	0	10.6
Seahawk	141	119	**140**	59.6	100	6/13	37	0	10.0
WA 8327	---	123	**140**	58.5	100	6/12	37	0	10.6
IDO1702S	---	120	**135**	58.3	100	6/6	34	0	10.7
Ryan	121	108	**134**	57.2	100	6/7	35	13	10.9
Louise	127	115	**133**	58.6	100	6/13	39	15	10.7
Melba**	142	115	**133**	58.3	100	6/14	35	0	9.9
IDO1902S	---	126	**132**	60.0	100	6/10	36	0	11.0
WA 8321	---	---	**131**	56.4	100	6/11	36	34	10.6
Alturas	142	110	**131**	58.1	100	6/11	36	0	10.1
UI Pettit	142	127	**131**	58.5	100	6/6	33	5	10.1
WA 8351	---	---	**130**	59.4	100	6/11	35	3	10.3
UI Stone	138	122	**127**	58.5	100	6/7	34	1	10.0
WB-1035CL+	---	---	123	58.8	100	6/6	34	0	11.7
Hedge CL+ **	---	---	111	59.4	100	6/13	39	26	11.1
IDO1404S	150	117	111	57.1	100	6/13	35	3	10.7
Tekoa	150	119	111	58.7	100	6/13	36	0	10.2
WA 8325	---	---	106	58.9	100	6/9	37	18	10.4
WB6211CLP	---	---	104	56.7	100	6/9	33	1	11.4
Average	**140**	**117**	**128**	**58.3**	**100**	**6/10**	**35**	**6**	**10.6**
LSD (α=.05)	**18**	**11**	**21**	**0.8**	**0**	**2**	**3**	**20**	
CV (%)	**8.8**	**6.8**	**11.5**	**0.9**	**.**	**0.80**	**4.9**	**240.0**	
Pr > F	**0.0780**	**0.0032**	**0.0019**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.0317**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
** Club wheat variety

Table 47. Agronomic Data for Soft White Spring Wheat at Soda Springs, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)
Louise	79	58	**29**	59.9	99	7/7	26	0	10.4
Melba **	86	70	**27**	59.5	100	7/8	22	0	10.0
Ryan	85	69	**26**	58.0	100	7/1	24	0	9.8
WA 8327	---	53	**26**	59.8	100	7/4	25	0	9.3
Seahawk	87	54	**26**	59.6	100	7/4	22	0	9.9
WA 8325	---	---	**26**	58.3	99	7/1	24	0	9.2
IDO1902S	---	64	**26**	60.6	100	7/3	25	0	10.1
WA 8351	---	---	**26**	59.6	100	7/3	23	0	8.8
Alturas	80	57	24	57.5	100	7/3	22	0	9.4
AP Coachman	90	67	24	57.8	100	7/6	23	0	9.2
WB-1035CL+	75	77	24	59.9	100	7/4	21	0	11.5
UI Pettit	74	58	24	58.9	100	7/1	21	0	10.3
UI Stone	83	65	24	58.1	100	7/3	23	0	9.4
WA 8321	---	---	23	56.8	100	7/3	21	0	8.7
WB6211CLP	---	---	23	58.5	99	7/3	24	0	10.8
Hedge CL+ **	---	---	22	59.3	100	7/7	22	0	11.0
IDO1702S	---	67	21	58.4	100	6/30	20	0	9.3
Tekoa	89	60	21	60.4	100	7/6	24	0	9.6
WB6430	84	56	21	59.1	100	7/3	21	0	9.4
IDO1404S	81	69	20	58.8	100	7/4	23	0	9.8
UI Cookie	83	66	18	56.7	99	7/1	24	0	11.6
TMC2021	---	---	17	57.8	100	7/1	21	0	9.8
Average	**83**	**62**	**23**	**58.8**	**100**	**7/3**	**23**	**0**	**9.9**
LSD (α=0.05)	**13**	**11**	**4**	**0.9**	**1**	**3**	**2**	**.**	
CV (%)	**10.1**	**10.5**	**12.6**	**1.1**	**0.8**	**1.10**	**6.1**	**.**	
Pr > F	**0**	**0**	**<0.0001**	**<0.0001**	**0.3124**	**<0.0001**	**<0.0001**	**.**	

* Varieties or selections in bold are not statistically different from the top yielding variety.
** Club wheat variety

Table 48. Soft White Spring Wheat Yield Percentage of Location Averages, 2021.

	(100% = Average)					
Variety or Selection	**Aberdeen**	**Ashton**	**Idaho Falls**	**Rupert**	**Soda Springs**	**Variety Average**
IDO1902S	113	125	112	103	110	**113**
WA 8327	100	133	108	110	110	**112**
Seahawk	109	112	96	110	110	**108**
Melba*	105	99	103	104	115	**105**
Alturas	108	106	106	103	102	**105**
WA 8351	100	107	103	102	110	**105**
WB6430	102	109	108	114	89	**104**
AP Coachman	---	---	---	---	102	**102**
WB-1035CL+	---	---	---	---	102	**102**
Louise	101	94	84	104	123	**101**
Ryan	100	88	102	105	110	**101**
Tekoa	94	129	95	87	89	**99**
UI Stone	102	80	107	100	102	**98**
IDO1702S	107	87	99	106	89	**98**
IDO1404S	102	108	105	87	85	**97**
WA 8325	97	108	88	83	110	**97**
UI Pettit	96	79	106	103	102	**97**
UI Cookie	97	90	107	112	76	**96**
WA 8321	90	93	99	103	98	**96**
WB1035CLP	99	84	98	96	---	**94**
Hedge CL+*	92	107	89	87	93	**94**
WB6211CLP	95	86	96	82	98	**91**
YSC-603	92	76	91	---	---	**86**
TMC2021	---	---	---	---	72	**72**
Location Average (bu/A)	**114**	**65**	**128**	**128**	**24**	

* Club wheat variety

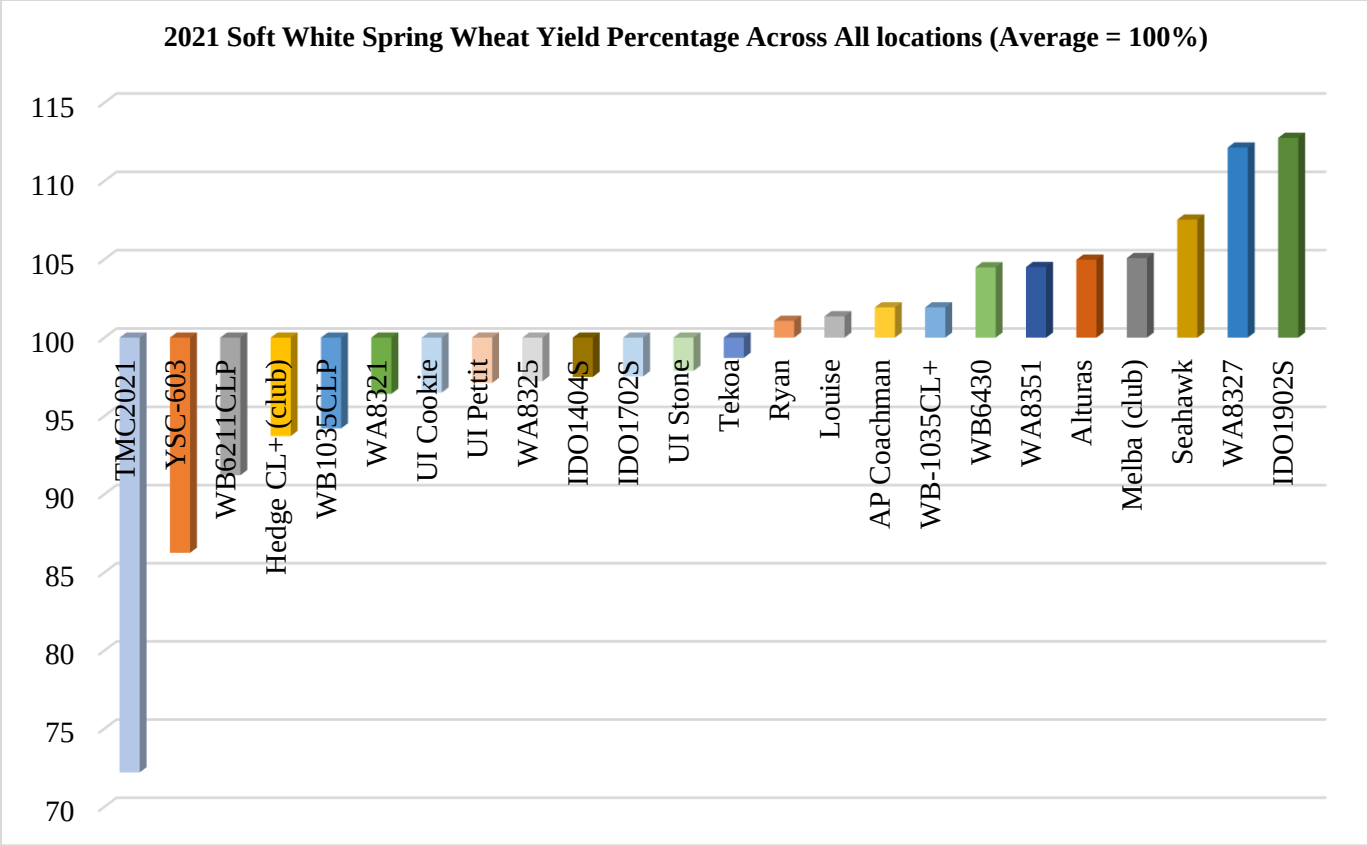


Chart 6. Soft White Spring Wheat Yield Percentage Across All Locations.

Table 49. Two-row Spring Malt Barley Irrigated Nurseries, 3-Year Averages (2019-2021; 12 site-years).

Variety or Selection	Yield (bu/A)	Test Wt (lb/bu)	Spring Stand %	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64	Plump (>5.5/64	% Thin
LCS Odyssey	145	50.2	100	6/26	31	16	10.6	93.1	4.4	2.5
10ARS191-3	138	52.1	100	6/23	37	23	10.6	90.2	6.1	3.7
ABI Eagle	132	51.5	100	6/24	34	14	11	90.9	5.7	3.4
2IM14-8212	130	50.7	100	6/22	35	18	10.5	93.5	3.8	2.7
Explorer	128	50.9	100	6/24	30	11	10.6	92.1	4.6	3.3
ABI Voyager	126	51.6	100	6/22	37	27	10.6	95.7	2.6	1.7
GemCraft	126	50.1	100	6/24	34	32	10.4	88.3	7.2	4.5
Moravian 69	124	50.1	100	6/21	32	34	10.4	86.2	8.6	5.2
AAC Synergy	124	51.5	100	6/23	37	24	10.7	94.2	3.3	2.5
Conrad	122	52.0	100	6/24	35	23	10.8	95.1	3.1	1.8
Merit 57	121	50.0	98	6/25	37	21	10.8	86.2	8.3	5.5
AAC Connect	119	51.6	100	6/23	37	18	10.9	93.9	3.8	2.3
CDC Copeland	118	50.8	100	6/25	40	30	10.8	90.1	5.8	4.1
AC Metcalfe	116	51.7	100	6/22	39	22	10.9	92.7	4.4	2.9
Average	**126**	**51.1**	**100**	**6/23**	**35**	**22**	**10.7**	**91.6**	**5.1**	**3.3**
SE	**2.3**	**0.2**	**0.1**	**0.2**	**0.4**	**3.4**				
Pr>F (variety)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**				
Pr>F (variety*year)	**<0.0001**	**0.0**	**<0.0001**	**<0.0001**	**0.0283**	**0.0035**				
Pr>F (variety*location)	**0.0041**	**0.0954**	**0.7052**	**<0.0001**	**0.3036**	**0.0010**				
Pr>F (year*location)	**0.0008**	**0.0141**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0002**				
Pr>F (variety*year*location)	**0.0454**	**<0.0001**	**<0.0001**	**<0.0001**	**0.0053**	**0.4142**				

Table 50. Two-row Irrigated Spring Malt Barley Data Combined from Aberdeen, Ashton, Idaho Falls and Rupert, 2021.

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	(>6/64)	Plump (>5.5/64)	% Thin
KWS Jessie	149	49.3	100	6/22	28	23	9.2	98.1	1.2	0.7
LCS Odyssey	145	48.6	100	6/24	31	21	9.7	97.1	2.0	0.9
Esma	145	48.6	100	6/21	31	26	10.1	92.1	5.2	2.7
KWS Thalis	142	48.2	100	6/22	31	33	9.6	94.1	3.6	2.3
ABI Eagle	137	49.8	100	6/22	34	13	10.7	96.1	2.4	1.5
BC Leandra	136	48.2	100	6/24	29	24	9.6	94.0	4.1	1.9
KWS Fantex	135	48.4	100	6/24	29	25	10.0	90.8	5.7	3.5
KWS Amadora	135	50.4	100	6/22	28	22	9.7	96.2	2.5	1.3
Moravian 179 *	134	47.8	100	6/19	32	28	10.3	91.6	5.3	3.1
LCS Genie	133	48.9	100	6/24	31	26	9.6	94.1	3.9	2.0
BC Ellinor	133	47.0	100	6/23	31	33	9.7	95.3	3.1	1.6
AAC Connect + base + root2	132	49.4	100	6/22	36	16	10.4	92.5	4.1	3.4
2IM16-0141	130	49.5	100	6/21	34	29	10.4	92.8	4.3	2.9
10ARS191-3	130	49.9	100	6/22	38	34	10.4	92.9	4.6	2.5
GemCraft	129	47.9	100	6/23	34	38	9.8	89.6	6.2	4.2
AAC Synergy	129	49.4	100	6/21	37	32	10.3	95.1	3.0	1.9
BC Lexy	129	47.6	100	6/23	30	16	9.4	95.2	3.1	1.7
AAC Connect	127	49.7	100	6/21	36	11	10.3	96.5	2.1	1.4
11ARS183-9	126	50.1	99	6/21	37	30	10.6	97.0	1.7	1.3
2IM15-9456	124	48.9	100	6/20	36	34	10.3	93.7	3.8	2.5
ABI Voyager	122	48.9	100	6/20	37	41	10.5	95.2	2.9	1.9
Explorer	122	48.8	100	6/22	31	17	9.9	94.2	3.5	2.3
AAC Connect + base	122	49.3	100	6/22	36	36	10.3	94.3	3.5	2.2
11ARS162-4	121	48.7	100	6/21	36	28	10.5	94.4	3.5	2.1
Conrad	120	50.1	100	6/22	34	24	10.8	96.1	2.4	1.5
CDC Copeland	119	48.9	100	6/23	37	37	10.2	91.9	5.1	3.0
2IM14-8212	118	48.4	100	6/21	36	17	9.9	95.4	2.7	1.9
Merit 57	118	47.6	99	6/23	37	30	10.5	88.2	6.9	4.9
LCS Opera	114	45.8	100	6/25	30	31	9.5	81.9	9.7	8.4
Moravian 69 *	112	47.0	100	6/20	31	38	9.5	88.6	7.4	4.0
MS-21B1	112	50.1	100	6/21	36	31	10.4	95.4	2.5	2.1
AC Metcalfe	109	50.2	100	6/21	38	39	10.6	94.2	3.2	2.6
Average	**128**	**48.8**	**100**	**6/22**	**34**	**28**	**10.1**	**93.6**	**3.9**	**2.5**
SE	**4.9**	**0.5**	**0.2**	**0.4**	**0.6**	**7.8**				
Pr > F (variety)	**<0.0001**	**<0.0001**	**0.4167**	**<0.0001**	**<0.0001**	**0.1227**				
Pr > F (location)	**0.0585**	**0.0250**	**0.0007**	**<0.0001**	**<0.0001**	**0.0069**				
Pr > F (variety*location)	**0.0338**	**<0.0001**	**0.3646**	**<0.0001**	**<0.0001**	**0.2600**				

* Only in three locations (Aberdeen, Rupert and Idaho Falls)

Table 51. Agronomic Data for Two-row Spring Malt Barley, Aberdeen, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
Esma	131	156	**171**	48.6	100	6/13	35	31	10.1	95.4	3.3	1.3
KWS Jessie	---	133	**167**	48.0	100	6/14	32	25	8.9	97.7	1.6	0.7
BC Leandra	---	144	**161**	48.1	100	6/15	33	28	8.9	96.6	2.4	1
KWS Thalis	---	---	**161**	48.2	100	6/13	35	35	8.8	97.5	1.7	0.8
KWS Fantex	---	132	**157**	48.2	100	6/16	33	22	9.1	96.2	2.5	1.3
Moravian 179	---	146	**155**	48.6	100	6/18	34	23	10.2	96.8	2.2	1
ABI Eagle	108	159	**152**	49.8	99	6/14	41	29	10.2	95.1	2.8	2.1
LCS Odyssey	132	136	**151**	47.0	100	6/17	34	16	9.2	96.1	2.9	1
2IM16-0141	---	---	149	50.9	100	6/13	40	44	9.8	97.5	1.8	0.7
BC Lexy	---	---	147	47.7	100	6/16	33	9	8.4	97.3	1.9	0.8
KWS Amadora	---	143	147	50.0	100	6/13	33	13	8.8	98.2	1.2	0.6
BC Ellinor	---	150	144	45.2	99	6/16	34	9	9.0	95.6	3.2	1.2
LCS Genie	---	---	144	48.2	100	6/17	34	18	9.0	95.3	3.4	1.3
GemCraft	---	150	141	48.9	100	6/15	39	46	9.9	94.2	3.8	2
AAC Synergy	103	170	140	49.4	100	6/14	43	24	10.4	96.6	2.1	1.3
10ARS191-3	137	118	139	50.7	100	6/14	43	68	10.2	95.7	2.8	1.5
AAC Connect + base + root2	---	---	139	49.6	100	6/17	41	26	10.6	96.3	2.3	1.4
2IM15-9456	---	147	136	50.4	100	6/12	41	26	9.8	97.8	1.5	0.7
11ARS183-9	---	142	135	49.7	98	6/14	45	60	10.0	96.9	1.9	1.2
ABI Voyager	114	122	134	49.7	100	6/13	43	44	10.4	95.3	3.2	1.5
Merit 57	98	145	134	49.0	98	6/18	41	19	10.0	92.3	4.7	3
AAC Connect	100	160	133	49.6	100	6/14	42	11	10.0	96.3	2.1	1.6
2IM14-8212	128	134	132	49.6	100	6/13	40	5	9.5	97.5	1.4	1.1
Conrad	113	162	131	49.8	100	6/14	41	44	10.9	95.1	3.1	1.8
LCS Opera	---	146	130	44.9	100	6/19	32	23	9.1	86.7	8.6	4.7
11ARS162-4	---	136	126	48.4	100	6/14	44	40	10.5	92.8	4.6	2.6
Explorer	119	156	125	46.5	100	6/15	34	39	9.2	94.3	3.6	2.1
AAC Connect + base	---	---	124	50.0	100	6/15	40	29	9.6	98.2	1.1	0.6
AC Metcalfe	101	137	122	49.3	100	6/14	43	66	10.5	93.3	4.2	2.5
CDC Copeland	97	164	119	49.0	100	6/15	41	59	9.9	93.9	3.8	2.3
Moravian 69	112	123	118	46.3	100	6/20	35	49	9.7	91.8	6.1	2.1
MS-21B1	---	---	115	50.9	100	6/14	41	33	9.9	98.3	1.1	0.6
Average	**114**	**145**	**140**	**48.7**	**100**	**6/15**	**38**	**32**	**9.7**	**95.6**	**2.9**	**1.5**
LSD (α=.05)	**15**	**20**	**20**	**1.3**	**1.7**	**1**	**2.9**	**37**				
CV %	**9**	**9.7**	**9.9**	**1.9**	**1.2**	**0.6**	**5.4**	**83**				
Pr > F	**<.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.417**	**<0.0001**	**<0.0001**	**0.0421**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 52. Agronomic Data for Two-row Spring Malt Barley at Ashton, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	(>5.5/64)	% Thin
LCS Odyssey	105	155	**146**	50.5	100	7/11	31	10	10.7	98.9	0.6	0.5
BC Leandra	---	157	**144**	50.7	100	7/11	28	0	10.2	98.6	0.8	0.6
KWS Jessie	---	147	**144**	51.2	100	7/8	26	0	10.2	99.2	0.3	0.5
KWS Thalis	---	---	**139**	51.3	100	7/7	29	0	10.3	98	0.9	1.1
KWS Fantex	---	179	**139**	51.1	100	7/10	28	0	11.0	97.8	0.8	1.4
BC Ellinor	---	161	**135**	50.0	100	7/11	29	0	10.3	98.3	0.9	0.8
LCS Genie	---	---	**134**	50.6	100	7/9	30	10	10.5	97.9	0.8	1.3
LCS Opera	---	140	**133**	50.3	100	7/10	28	0	9.9	98.5	1	0.5
GemCraft	107	145	**133**	50.2	100	7/9	32	0	10.5	97.8	1.4	0.8
10ARS191-3	99	163	**129**	50.9	100	7/7	35	0	10.7	97.9	1.3	0.8
CDC Copeland	97	125	127	49.4	100	7/9	31	0	10.7	95.1	3.3	1.6
11ARS183-9	---	135	125	50.4	100	7/4	34	0	11.5	98.7	0.5	0.8
ABI Eagle	107	148	125	49.4	100	7/7	31	0	11.8	96.9	2.1	1
2IM16-0141	---	---	124	49.8	100	7/7	32	0	11.0	97.8	1	1.2
Esma	---	---	124	50.4	100	7/7	28	0	10.6	98.1	1.1	0.8
KWS Amadora	---	147	122	52.0	100	7/8	26	0	10.8	98	0.9	1.1
BC Lexy	---	---	119	49.3	100	7/9	29	0	10.4	98.1	1.2	0.7
AAC Synergy	77	133	116	50.1	100	7/6	33	0	11.4	96.6	1.5	1.9
Conrad	104	124	115	50.6	100	7/8	31	0	12.1	98.4	0.8	0.8
AAC Connect	99	113	114	48.6	100	7/8	31	0	11.1	96.1	1.9	2
ABI Voyager	102	132	114	49.2	100	7/5	34	0	11.3	98.1	0.4	1.5
AAC Connect + base + root2	---	---	113	49.3	100	7/9	33	0	10.9	97.4	1.4	1.2
Explorer	83	125	113	50.5	100	7/8	28	0	10.8	97.1	1.6	1.3
MS-21B1	---	---	112	49.9	100	7/7	31	0	11.1	97.7	0.7	1.6
2IM15-9456	---	139	109	48.9	100	7/3	33	0	11.2	97.3	1	1.7
AAC Connect + base	---	---	109	49.4	100	7/9	32	0	10.9	97.8	1.1	1.1
AC Metcalfe	91	132	108	51.7	100	7/5	35	0	11.2	98	0.9	1.1
2IM14-8212	85	146	107	48.5	100	7/7	33	0	11.1	97.7	0.7	1.6
11ARS162-4	---	122	106	49.4	100	7/7	33	0	11.1	96.5	2.3	1.2
Merit 57	96	131	105	48.7	100	7/8	34	0	10.7	97	2	1
Average	**96**	**140**	**123**	**50.1**	**100**	**7/7**	**31**	**1**	**10.9**	**97.7**	**1.2**	**1.1**
LSD (α=.05)	**15**	**17**	**18**	**1.0**	**0**	**2**	**2**	**7**				
CV (%)	**10.4**	**8.5**	**10.2**	**1.4**	**.**	**0.9**	**5.1**	**761**				
Pr > F	**<.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.4798**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 53. Agronomic Data for Two-row Spring Malt Barley at Idaho Falls, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
Esma	---	152	**139**	46.3	100	6/25	30	28	8.9	83.3	11.4	5.9
AAC Connect	103	132	**138**	49.8	100	6/22	30	1	9.4	97.3	2.4	0.9
KWS Jessie	---	172	**134**	48.4	100	6/24	24	43	8.7	97.6	1.5	0.9
LCS Odyssey	---	156	**132**	47.2	100	6/26	28	46	9.3	95.8	2.6	1.2
AAC Synergy	106	136	**131**	48.2	100	6/23	35	48	8.5	93.1	4.8	2.6
KWS Amadora	---	163	**128**	49.6	100	6/25	24	34	9.4	92.5	5.4	2.5
AAC Connect + base + root2	---	---	**128**	47.6	100	6/23	32	7	9.5	80	10.7	9.8
2IM15-9456	---	134	**127**	48.0	100	6/22	31	44	9.0	85.5	7.3	3.8
ABI Eagle	117	137	**127**	49.6	100	6/24	27	6	10.0	96.9	2.2	1.4
KWS Thalis	---	---	**126**	47.4	100	6/25	26	41	8.6	92.2	4.9	2.4
11ARS162-4	---	127	**126**	47.2	100	6/24	30	22	9.2	92.8	4.6	2.8
AAC Connect + base	---	---	**126**	48.4	100	6/24	33	28	9.5	87.3	8.4	4.5
ABI Voyager	126	141	**126**	47.8	100	6/22	34	56	9.2	94.8	3.5	2.5
BC Ellinor	---	158	**123**	46.4	100	6/25	29	60	9.5	97.1	2.4	1.5
Explorer	114	145	**122**	48.6	100	6/24	27	9	9.4	92.5	4.8	3.6
LCS Genie	---	---	**121**	48.9	100	6/26	28	46	8.8	91	5.5	3.2
10ARS191-3	129	150	**118**	47.0	100	6/24	31	31	9.2	83.3	11.4	6
2IM14-8212	126	137	**117**	46.6	100	6/23	33	20	8.3	88.2	5.6	3.1
BC Lexy	---	---	**117**	46.6	100	6/25	26	23	8.8	95	3.8	2.3
Conrad	104	130	**115**	50.1	100	6/25	28	10	8.5	97.1	2.4	1.3
11ARS183-9	---	138	**112**	49.8	100	6/24	30	12	9.8	98.4	1.3	0.8
Moravian 179	112	150	**112**	45.6	100	6/25	29	26	9.6	83.9	9.6	6.2
MS-21B1	---	---	**111**	49.7	100	6/24	34	22	9.5	93.6	4.1	2.2
2IM16-0141	---	---	110	47.5	100	6/24	28	23	9.9	82.1	10.6	7.2
Merit 57	130	136	109	44.8	100	6/25	33	49	9.8	76.4	13.2	9.7
GemCraft	82	134	109	46.6	100	6/25	26	38	8.4	83.3	10.4	7.2
KWS Fantex	---	161	109	47.9	100	6/26	24	11	9.4	85.9	9	4.2
BC Leandra	---	166	106	47.6	100	6/26	24	1	8.6	91.5	6.3	3.5
AC Metcalfe	---	---	106	50.6	100	6/24	33	23	8.8	98.1	1.7	1.2
CDC Copeland	96	122	100	47.4	100	6/25	33	24	9.0	88.2	8.3	4.4
Moravian 69	105	131	98	47.6	100	6/26	28	23	8.3	91.1	4.8	4.2
LCS Opera	---	167	77	43.3	100	6/26	27	43	9.1	65.2	18.8	15.1
Average	**108**	**143**	**118**	**47.7**	**100**	**6/24**	**29**	**28**	**9.1**	**89.7**	**6.3**	**4.0**
LSD (0.05)	**19.1**	**14**	**28**	**3.1**	**0**	**2**	**4.8**	**47**				
CV (%)	**11.5**	**7.5**	**15.7**	**4.6**	**.**	**0.7**	**11.9**	**121**				
Pr > F	**<.0001**	**<0.0001**	**0.0283**	**0.0039**	**.**	**<0.0001**	**<0.0001**	**<0.0001**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 54. Agronomic Data for Two-rowed Spring Malt Barley at Rupert, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	(>5.5/64)	% Thin
LCS Odyssey	164	168	**151**	49.9	100	6/13	31	13	9.8	97.4	1.7	0.9
KWS Jessie	---	173	**150**	49.7	100	6/13	30	24	9.0	98.0	1.3	0.7
AAC Connect + base + root2	---	---	**147**	51.3	100	6/11	39	31	10.8	97.2	1.7	1.1
Esma	---	---	**145**	49.0	100	6/11	33	45	10.8	91.7	5.3	3.0
ABI Eagle	142	145	**144**	50.5	100	6/12	37	16	10.8	96.0	2.8	1.2
LCS Genie	---	---	**142**	48.6	100	6/13	32	30	9.9	91.4	6.3	2.3
KWS Thalis	---	---	**140**	46.0	100	6/12	35	58	10.6	87.9	7.8	4.3
KWS Amadora	---	170	**140**	49.9	100	6/11	29	43	10.0	95.4	3.2	1.4
2IM16-0141	---	---	**138**	50.1	100	6/11	37	50	10.9	93.8	3.9	2.3
Moravian 179	169	159	**138**	49.1	100	6/15	35	36	11.2	93.9	3.9	2.2
11ARS183-9	---	151	**137**	49.8	100	6/12	41	48	11.1	93.7	3.7	2.6
KWS Fantex	---	161	**136**	46.5	100	6/14	31	68	10.5	82.4	10.8	6.8
GemCraft	135	162	**134**	45.8	100	6/13	37	69	10.6	83.0	9.7	7.3
10ARS191-3	165	160	**134**	51.2	100	6/12	41	38	11.3	95.4	2.9	1.7
AAC Synergy	145	142	**133**	49.9	100	6/11	39	56	10.9	95.0	3.0	2.0
11ARS162-4	---	161	**132**	50.0	100	6/11	39	50	11.1	95.8	2.5	1.7
BC Leandra	---	172	**131**	46.6	100	6/14	31	69	10.7	89.7	7.5	2.8
BC Ellinor	---	162	**131**	46.4	100	6/13	34	63	10.2	91.5	5.9	2.6
BC Lexy	---	---	**131**	46.9	100	6/12	33	31	10.0	91.2	5.4	3.4
CDC Copeland	123	160	**130**	50.0	100	6/12	43	66	11.3	90.4	5.1	4.5
Explorer	159	160	**128**	49.4	100	6/12	34	20	10.2	93.7	4.0	2.3
AAC Connect + base	---	---	**127**	49.5	100	6/12	41	87	11.2	94.7	3.0	2.3
Moravian 69	149	142	**127**	47.1	100	6/14	31	44	10.4	83.5	11.0	5.5
Merit 57	115	163	**126**	48.1	100	6/12	40	53	11.4	87.7	7.0	5.3
AAC Connect	150	128	125	50.8	100	6/11	41	31	10.7	96.9	2.0	1.1
2IM15-9456	---	146	122	48.6	100	6/12	41	65	11.1	91.1	5.3	3.6
Conrad	132	145	118	50.1	100	6/12	36	43	11.8	92.7	4.3	3.0
ABI Voyager	140	146	117	49.1	100	6/10	39	66	11.2	94.1	4.1	1.8
2IM14-8212	153	158	116	49.1	100	6/12	37	43	10.7	95.6	3.1	1.3
LCS Opera	---	178	114	44.6	100	6/15	34	61	10.0	76.6	10.3	13.1
MS-21B1	---	---	110	49.9	100	6/11	38	70	11.2	92.2	4.2	3.6
AC Metcalfe	135	137	98	49.1	100	6/11	40	66	11.8	88.4	6.3	5.3
Average	**144**	**154**	**131**	**48.8**	**100**	**6/12**	**36**	**48**	**10.7**	**91.8**	**5.0**	**3.2**
LSD (α=.05)	**19**	**15**	**25**	**3.2**	**0**	**2**	**3**	**48**				
CV (%)	**9.4**	**6.7**	**13.5**	**4.7**	**.**	**0.80**	**6.4**	**71.0**				
Pr > F	**<.0001**	**<0.0001**	**0.0169**	**0.0017**	**.**	**<0.0001**	**<0.0001**	**0.3278**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

Table 55. Agronomic Data for Two-row Spring Malt Barley at Soda Springs, Dryland, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	Plump (>5.5/64)	% Thin
10ARS191-3	125	55	**30**	47.4	97	7/11	21	0	11.0	86.7	9.9	3.4
AAC Connect + base	---	---	**29**	47.4	100	7/11	20	0	10.6	92.7	5.1	2.2
LCS Odyssey	108	52	**27**	48.2	97	7/9	20	0	10.8	95.5	3.3	1.2
AAC Connect + base + root2	---	---	**26**	45.3	100	7/10	20	0	10.4	92.6	5.3	2.1
LCS Genie	---	---	**26**	47.7	100	7/12	20	0	10.7	96.6	2.1	1.3
Moravian 69	122**	51	**26**	49.1	99	7/6	20	0	10.9	90.8	6.8	2.4
LCS Opera	---	53	**26**	46.8	100	7/6	19	0	10.7	97.2	2.0	0.8
KWS Jessie	---	47	**26**	47.8	99	7/6	19	0	10.0	97.0	1.7	1.3
11ARS162-4	---	45	25	48.2	99	7/9	22	0	11.4	88.5	7.9	3.6
GemCraft	117	46	25	48.0	99	7/8	20	0	9.4	89.6	7.7	2.7
AAC Synergy	101	37	24	49.3	98	7/13	22	0	10.2	93.1	5.1	1.8
KWS Thalis	---	---	24	47.7	98	7/9	20	0	10.2	97.3	1.9	0.8
Explorer	80**	43	24	48.0	99	7/8	20	0	10.9	94.6	3.3	2.1
AAC Connect	110	37	23	49.1	99	7/6	20	0	11.1	91.1	6.2	2.7
MS-21B1	---	---	23	47.0	98	7/11	22	0	11.0	92.0	5.7	2.3
CDC Copeland	113	46	23	48.4	98	7/9	21	0	10.6	95.4	3.2	1.4
Esma	---	---	23	47.7	100	7/6	20	0	10.3	90.4	7.4	2.2
Merit 57	107	48	23	48.0	99	7/6	20	0	10.7	87.4	8.7	3.9
KWS Fantex	---	52	22	48.7	99	7/12	18	0	11.0	93.8	3.9	2.3
ABI Voyager	101	38	22	49.1	99	7/6	22	0	10.7	96.7	1.7	1.6
KWS Amadora	---	48	22	47.3	100	7/7	18	0	10.2	91.0	6.6	2.4
AC Metcalfe	100	38	21	46.5	98	7/10	21	0	10.5	94.4	4.2	1.4
11ARS183-9	---	46	21	48.4	100	7/12	21	0	10.2	94.7	3.7	1.6
Conrad	95	40	20	48.6	99	7/9	20	0	10.8	92.5	5.7	1.8
AVERAGE	**108**	**45**	**24**	**47.9**	**99**	**7/9**	**20**	**0**	**10.6**	**93.0**	**5.0**	**2.0**
LSD	**13**	**7**	**4**	**1.5**	**2**	**3**	**2**	**.**				
CV	**8**	**10.7**	**12.4**	**2.2**	**2**	**1.3**	**7.1**	**.**				
P>F	**0.0002**	**<0.0001**	**0.0013**	**0.0002**	**0.1819**	**<0.0001**	**0.0056**	**.**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** 1-rep demonstration plots

Table 56. Two-row Spring Malt Barley Yield Percentage of Location Averages, 2021.

	(100% = Average)					
Variety or Selection	**Aberdeen**	**Ashton**	**Idaho Falls**	**Rupert**	**Soda Springs**	**Variety Average**
KWS Jessie	120	117	113	115	106	**114**
LCS Odyssey	108	119	112	115	114	**113**
Esma	122	101	118	111	94	**109**
KWS Thalis	115	113	107	107	98	**108**
ABI Eagle	108	102	107	110	---	**107**
LCS Genie	103	109	103	108	108	**106**
10ARS191-3	99	105	100	103	124	**106**
BC Leandra	115	117	90	100	---	**106**
BC Ellinor	103	110	104	100	---	**104**
AAC Connect + base + root2	99	92	108	112	109	**104**
Moravian 179	111	---	95	105	---	**104**
KWS Fantex	112	113	92	104	93	**103**
KWS Amadora	105	100	109	107	91	**102**
2IM16-0141	106	101	93	105	---	**101**
AAC Synergy	100	95	111	101	100	**101**
GemCraft	101	108	92	103	102	**101**
AAC Connect + base	89	88	107	97	120	**100**
BC Lexy	105	97	99	100	---	**100**
AAC Connect	95	93	117	95	96	**99**
11ARS162-4	90	86	107	100	103	**97**
2IM15-9456	97	89	108	93	---	**97**
11ARS183-9	97	102	95	105	85	**97**
Explorer	90	92	103	97	98	**96**
ABI Voyager	95	93	107	89	91	**95**
CDC Copeland	85	103	85	99	94	**93**
Moravian 69	84	---	83	97	108	**93**
Merit 57	95	85	92	96	94	**93**
2IM14-8212	94	87	99	88	---	**92**
LCS Opera	93	109	65	87	107	**92**
Conrad	94	94	97	90	83	**92**
MS-21B1	82	91	94	84	96	**89**
AC Metcalfe	87	88	89	75	88	**86**
Location Average (bu/A)	**140**	**123**	**118**	**131**	**24**	

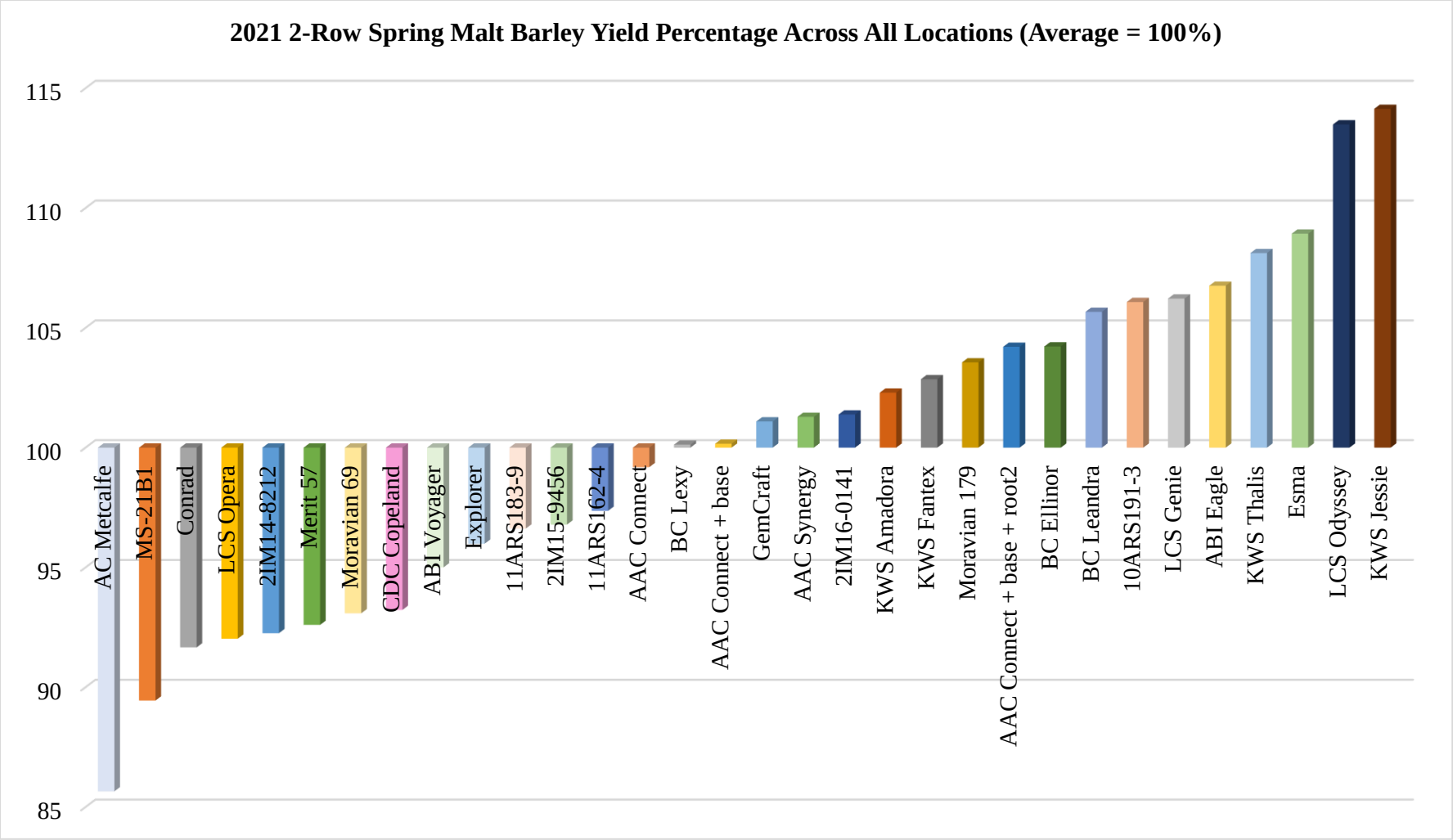


Chart 7. 2-Row Spring Malt Barley Yield Percentage Across All Locations.

Table 57. Two-row Spring Feed and Food Barley Irrigated Nurseries, 3-Year Averages (2019-2021; 12 site-years)

Variety or Selection	Yield (bu/A)	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	(> 6/64)	Plump (5.5/64)	% Thin
Altorado	136	52.6	100	6/22	35	15	10.4	89.9	6.3	3.8
Oreana	135	51.7	99	6/25	31	24	10.5	86.1	8.6	5.3
Claymore	132	51.1	100	6/23	37	25	10.3	88.4	6.9	4.7
Champion	127	52.9	100	6/21	36	24	10.8	90.4	5.6	4.0
Xena	125	52.0	100	6/22	37	18	10.6	90.2	6.0	3.8
Kardia	120	50.2	100	6/26	37	29	10.2	84.2	9.4	6.4
Idagold II	119	51.9	100	6/22	35	24	10.6	89.4	6.5	4.1
Julie *	103	57.5	98	6/26	36	11	13.5	88.2	7.6	4.2
Transit *	93	55.3	98	6/24	38	17	13.2	82.3	12.4	5.3
Goldenhart *	91	57.7	97	6/24	36	29	14.4	85.2	9.1	5.7
Average	**118**	**53.7**	**99**	**6/24**	**36**	**22**				
SE	**2.7**	**0.2**	**0.4**	**0.2**	**0.4**	**2.8**				
Pr>F (variety)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**				
Pr>F (variety*year)	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.2120**	**0.1326**				
Pr>F (variety*location)	**0.0027**	**0.0675**	**<0.0001**	**<0.0001**	**0.0762**	**<0.0001**				
Pr>F (year*location)	**0.0009**	**0.0009**	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**				
Pr>F (variety*year*location)	**0.2096**	**0.0213**	**<0.0001**	**<0.0001**	**0.0237**	**0.0002**				

* Hulless variety

Table 58. Irrigated Two-row Spring Feed and Food Barley Data Combined from Aberdeen, Ashton, Idaho Falls and Rupert, 2021.

Variety or Selection	Yield (bu/A)	Test Wt (lb/bu)	Spring Stand (%)	Heading Date	Height (in)	Lodging (%)	Protein (%)	Plumps (>6/64)	Plumps (>5.5/64)	% Thin
HO516-429	145	50.8	100	6/22	38	23	10.2	95.0	3.0	2.0
Oreana	141	50.0	100	6/23	31	25	9.6	92.8	4.9	2.3
Claymore	140	50.3	100	6/22	37	19	9.7	95.5	2.9	1.6
Altorado	138	51.3	100	6/21	35	9	10.1	96.1	2.5	1.4
Champion	130	51.5	100	6/20	37	22	10.4	95.5	2.7	1.8
Kardia	127	49.5	100	6/24	37	22	8.5	93.0	4.3	2.7
Bill Coors 100	123	48.7	100	6/24	30	19	10.2	94.6	3.0	2.4
Moravian 179	123	49.5	100	6/23	31	7	10.3	96.1	2.3	1.6
Idagold II	122	50.0	100	6/21	35	25	10.3	91.2	5.3	3.5
FeedMor	121	50.2	100	6/22	31	3	10.5	96.6	1.7	1.7
Xena	120	50.3	100	6/21	37	12	10.2	93.1	4.2	2.7
Moravian 164	114	48.3	100	6/25	28	20	10.0	95.1	3.0	1.9
Moravian 180	111	47.4	100	6/19	28	12	10.4	94.2	3.1	2.7
14ARS235-5 *	98	53.4	100	6/23	37	20	13.8	85.2	9.3	5.5
Diamondback (SB6)	96	45.0	100	6/19	26	6	10.6	91.5	6.2	2.3
Julie *	96	57.8	99	6/26	36	4	14.3	91.0	6.6	2.4
Goldenhart *	91	55.5	100	6/21	36	31	14.0	87.2	7.4	5.4
Transit *	84	55.1	100	6/23	39	10	14.8	77.3	16.6	6.1
Average	**118**	**50.8**	**100**	**6/22**	**34**	**16**	**11.0**	**92.3**	**4.9**	**2.8**
SE	**5**	**0.4**	**0.3**	**0.4**	**0.7**	**6.0**				
Pr>F (variety)	**<0.0001**	**<0.0001**	**0.5359**	**<0.0001**	**<0.0001**	**0.0025**				
Pr>F (location)	**0.0014**	**0.0666**	**0.2296**	**<0.0001**	**<0.0001**	**0.1287**				
Pr > F (variety*location)	**0.0002**	**<0.0001**	**0.6047**	**<0.0001**	**0.0137**	**0.0003**				

* Hulless variety

Table 59. Agronomic Data for Two-row Spring Feed and Food Barley, Aberdeen, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein		Plump	
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
2-Row Spring Feed Barley												
HO516-429	---	78	**163**	50.3	100	6/15	44	56	10.5	95.1	2.7	2.2
Altorado	128	111	**155**	51.1	100	6/13	39	23	10.5	96.4	2.4	1.2
Claymore	116	115	**152**	49.9	100	6/15	43	70	10.2	94.4	3.5	2.1
Xena	121	112	**149**	51.0	100	6/13	42	23	10.0	97.6	1.4	1.0
Oreana	123	118	**147**	49.3	100	6/18	34	35	9.2	91.1	6.2	2.7
Moravian 179	---	---	**142**	48.9	100	6/19	32	3	9.7	97.7	1.4	0.9
Champion	129	120	**140**	52.0	100	6/13	42	47	10.7	96.1	2.1	1.8
FeedMor	---	75	**140**	51.1	99	6/16	33	4	10.0	98.6	0.8	0.6
Diamondback (SB6)	---	---	138	45.1	99	6/12	28	0	10.5	94.2	4.3	1.5
Bill Coors 100	---	122	137	48.9	100	6/18	32	1	10.1	96.8	2.2	1
Idagold II	110	97	134	50.5	100	6/14	39	20	10.5	96.7	2.2	1.1
Moravian 180	---	---	129	47.4	100	6/13	32	25	10.6	96.5	2.4	1.1
Moravian 164	---	72	124	48.1	100	6/20	31	35	9.8	96.4	2.3	1.3
Feed Average	**121**	**102**	**142**	**49.5**	**100**	**6/15**	**36**	**26**	**10.2**	**96.0**	**2.6**	**1.4**
2-Row Spring Food Barley												
Kardia	87	63	128	48.7	100	6/20	39	41	11.3	92.5	4.4	3.1
Goldenhart **	71	112	101	55.0	99	6/17	39	58	12.7	91.3	5.8	2.9
Transit **	108	115	95	53.9	99	6/19	45	14	13.0	81.2	15.2	3.6
14ARS235-5 **	---	---	95	48.0	100	6/18	40	32	11.4	86.2	8.7	5.1
Julie **	97	108	92	56.1	96	6/21	40	16	12.6	89.1	8.5	2.4
Food Average	**102**	**111**	**102**	**52.3**	**99**	**6/19**	**41**	**32**	**12.2**	**88.1**	**8.5**	**3.4**
LSD	**22**	**23**	**23**	**1.4**	**3**	**3**	**2**	**36**				
CV	**11**	**15.2**	**10.3**	**2.0**	**2**	**6.2**	**1**	**91**				
P>F	**<.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**0.5422**	**<0.0001**	**0.5041**	**0.0035**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Hulless variety

SB6 = six row barley

Table 60. Agronomic Data for Two-row Spring Feed and Food Barley at Ashton, Irrigated, 2021.

Variety or Selection	Yield (bu/A) 2019	2020	2021*	Test Wt. (lb/bu)	Spring Stand (%)	Heading Date	Height (in.)	Lodging (%)	Protein (%)	Plump (>6/64)	Plump (>5.5/64)	% Thin
2-Row Spring Feed Barley												
Champion	92	124	**133**	52.5	100	6/30	36	0	10.6	96.6	1.7	1.7
Claymore	98	117	**131**	50.5	100	7/8	36	0	10.5	96.3	2.2	1.5
HO516-429	---	111	**131**	51.2	100	7/7	37	0	10.7	97.2	1.7	1.1
Bill Coors 100	---	120	**125**	48.8	100	7/9	28	25	10.6	96.9	1.4	1.7
Altorado	95	134	**125**	52.5	100	7/5	34	0	10.3	96.9	1.9	1.2
Oreana	90	120	**119**	50.2	100	7/6	31	5	10.2	96.1	2.3	1.6
Moravian 179	---	---	**119**	49.3	100	7/5	33	25	10.8	95.7	2.1	2.2
Idagold II	93	119	**114**	51.1	100	7/4	34	1	11.0	96.2	1.9	1.9
FeedMor	---	115	106	49.4	100	7/6	30	0	11.6	96.6	0.5	2.9
Xena	94	137	105	51.0	100	7/5	36	16	11.3	98.5	0.7	0.8
Moravian 164	---	105	102	48.9	100	7/8	27	24	11.3	97.5	0.9	1.6
Moravian 180	---	---	86	45.9	100	7/1	27	23	10.4	96.6	1.3	2.1
Diamondback (SB6)	---	---	69	45.5	100	6/30	25	24	12.1	92.6	5.5	1.9
Feed Average	**90**	**120**	**113**	**49.7**	**100**	**7/5**	**32**	**11**	**10.9**	**96.4**	**1.9**	**1.7**
2-Row Spring Food Barley												
Kardia	94	138	**132**	51.3	100	7/7	37	0	11.1	95.3	2.9	1.8
14ARS235-5 **	---	---	104	57.9	100	7/6	37	9	12.5	95.3	2.6	2.1
Goldenhart **	86	99	91	56.1	100	7/3	36	26	13.5	89.0	5.7	5.3
Julie **	95	98	86	58.8	100	7/7	33	0	13.3	93.0	4.9	2.1
Transit **	86	83	79	56.8	100	7/7	39	0	14.5	91.6	6.3	2.1
Food Average	**90**	**101**	**98**	**56.2**	**100**	**7/7**	**36**	**7**	**13.0**	**92.8**	**4.5**	**2.7**
LSD (α=.05)	**13**	**16**	**21**	**1.9**	**0**	**2**	**3**	**29**				
CV %	**10.0**	**9.6**	**12.7**	**2.5**	**.**	**0.8**	**6.4**	**207**				
Pr > F	**0.0937**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.2683**				

* Varieties or selections in bold are not statistically different from the top yielding variety.
** Hulless variety
SB6 = six row barley

Table 61. Agronomic Data for Two-row Spring Feed and Food Barley at Idaho Falls, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
2-Row Spring Feed Barley												
Oreana	137	150	**141**	49.8	100	6/25	27	24	8.9	92.2	5.2	2.6
HO516-429	---	182	**130**	50.1	100	6/25	32	16	8.7	93.2	4.1	2.7
Claymore	116	159	**129**	49.5	100	6/25	33	0	7.8	95.4	3.2	1.4
Champion	105	146	**117**	50.6	100	6/24	32	14	9.3	95.9	2.7	1.4
Altorado	146	163	107	50.4	100	6/25	29	0	8.5	95.4	3.2	1.4
Xena	97	153	107	49.0	100	6/25	31	5	8.5	82.5	11.4	6.1
FeedMor	---	148	105	48.6	100	6/25	27	0	9.7	93.6	4.1	2.3
Moravian 164	---	131	103	46.4	100	6/26	24	19	8.7	88.6	7.2	4.2
Idagold II	116	141	100	48.6	100	6/25	29	10	8.6	84.4	9.6	6.0
Moravian 179	---	---	97	48.8	100	6/26	26	0	10.1	92.1	5.0	2.9
Bill Coors 100	---	154	93	47.2	100	6/26	25	17	9.3	89.0	6.0	5.0
Moravian 180	---	---	89	46.9	100	6/24	22	0	10.2	88.0	6.2	5.8
Diamondback (SB6)	---	---	37	44.4	100	6/23	23	1	9.0	87.4	8.5	4.1
Feed Average	**119**	**153**	**104**	**48.5**	**100**	**6/25**	**28**	**8**	**9.0**	**90.6**	**5.9**	**3.5**
2-Row Spring Food Barley												
Kardia	96	145	**115**	49.0	100	6/25	33	6	9.6	95.0	3.5	1.5
Julie **	114	111	95	57.7	100	6/27	33	0	18.4	86.2	9.6	4.2
14ARS235-5 **	---	---	91	54.5	100	6/25	35	20	18.4	69.9	18.7	11.4
Goldenhart **	70	108	86	55.5	100	6/23	32	11	16.6	79.2	11.3	9.5
Transit **	94	106	71	54.8	100	6/26	33	20	17.9	57.2	30.2	12.6
Food Average	**93**	**118**	**92**	**54.3**	**100**	**6/25**	**33**	**11**	**16.2**	**77.5**	**14.7**	**7.8**
LSD (α=.05)	**19**	**17**	**28**	**3.4**	**0**	**1**	**4**	**29**				
CV (%)	**10.9**	**8.4**	**19.7**	**4.7**	**.**	**0.5**	**8.9**	**230**				
Pr > F	**<0.0001**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**<0.0001**				

* Variety or selection in bold is not statistically different from the top yielding variety.

** Hulless variety

SB6 = six row barley

Table 62. Agronomic Data for Two-row Spring Feed and Food Barley at Rupert, Irrigated, 2021.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
2-Row Spring Feed Barley												
Altorado	146	142	**166**	51.2	100	6/11	39	14	11.1	95.4	2.9	1.7
HO516-429	---	173	**156**	51.6	100	6/11	41	18	10.8	94.7	3.1	2.2
Oreana	155	161	**155**	50.7	100	6/13	33	35	10.1	92.2	5.8	2.0
Claymore	134	170	**148**	51.5	100	6/11	37	8	10.3	96.2	2.7	1.1
Moravian 180	---	---	**142**	49.5	100	6/9	29	0	10.4	95.7	2.4	1.9
Diamondback (SB6)	---	---	**140**	45.7	100	6/11	30	0	10.9	92.9	5.8	1.3
Bill Coors 100	---	155	137	50.1	100	6/14	35	34	10.7	96.4	2.3	1.3
Moravian 179	---	---	136	51.2	100	6/14	31	0	10.6	98.5	0.9	0.6
Idagold II	126	153	133	49.9	100	6/10	37	70	11.1	87.6	7.4	5.0
FeedMor	---	149	133	51.7	100	6/12	34	6	10.6	97.8	1.3	0.9
Champion	142	146	131	50.9	100	6/12	37	26	11.2	93.2	4.7	2.1
Moravian 164	---	150	125	49.8	100	6/14	30	1	10.2	97.7	1.6	0.7
Xena	143	159	121	50.3	100	6/11	38	5	10.9	92.8	3.9	3.3
Feed Average	**141**	**156**	**140**	**50.3**	**100**	**6/11**	**35**	**17**	**10.7**	**94.7**	**3.4**	**1.9**
2-Row Spring Food Barley												
Kardia	116	155	132	49.2	100	6/11	39	39	1.9	88.7	6.7	4.6
Julie **	137	125	109	58.6	100	6/18	38	0	12.8	95.5	3.4	1.1
14ARS235-5 **	---	---	105	53.3	100	6/12	38	19	12.8	89.0	7.2	3.8
Transit **	128	115	94	55.0	100	6/12	40	6	13.8	79.6	15.1	5.3
Goldenhart **	108	119	90	55.3	100	6/12	36	30	13.2	89.8	5.9	4.3
Food Average	**122**	**128**	**106**	**54.3**	**100**	**6/13**	**38**	**19**	**10.9**	**88.5**	**7.7**	**3.8**
LSD (α=.05)	**21**	**16**	**26**	**1.5**	**0**	**2**	**3**	**28**				
CV (%)	**11.1**	**7.6**	**13.2**	**2.1**	**.**	**0.80**	**5.2**	**112.0**				
Pr > F	**0.0004**	**<0.0001**	**<0.0001**	**<0.0001**	**.**	**<0.0001**	**<0.0001**	**0.0001**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Hulless variety

SB6 = six row barley

Table 63. Agronomic Data for Two-row Feed and Food Spring Barley at Soda Springs, Dryland, 2020.

	Yield (bu/A)			Test Wt.	Spring	Heading	Height	Lodging	Protein	Plump		
Variety or Selection	**2019**	**2020**	**2021***	**(lb/bu)**	**Stand (%)**	**Date**	**(in.)**	**(%)**	**(%)**	**(>6/64)**	**(>5.5/64)**	**% Thin**
2-Row Spring Feed Barley												
Altorado	101	53	**28**	47.9	100	7/8	21	0	9.8	85.3	11.0	3.7
Xena	94	53	**27**	50.3	98	7/7	21	0	9.2	87.0	10.3	2.7
HO516-429	---	55	**27**	50.1	99	7/5	20	0	9.8	89.5	7.5	3.0
Champion	97	51	**26**	51.5	99	7/11	19	0	10.6	87.6	9.0	3.4
Idagold II	93	49	**25**	51.0	100	7/7	18	0	10.1	93.2	4.8	2.0
Claymore	96	61	20	50.8	96	7/8	20	0	9.9	91.7	6.5	1.8
Oreana	72	55	19	51.5	97	7/11	17	0	10.3	88.0	7.6	4.4
Bill Coors 100	---	50	17	49.6	100	7/9	18	0	9.9	90.2	7.4	2.4
Moravian 179	---	---	16	48.8	100	7/11	18	0	10.6	92.8	4.6	2.6
FeedMor	---	51	14	51.1	99	7/6	17	0	10.3	95.1	1.5	3.4
Moravian 180	---	---	14	48.9	96	6/30	17	0	9.8	94.4	2.5	3.1
Moravian 164	72	48	13	53.7	98	7/11	16	0	9.9	95.9	2.1	2.0
Feed Average	**97**	**52**	**20**	**50.4**	**98**	**7/8**	**18**	**0**	**10**	**90.9**	**6.2**	**2.9**
2-Row Spring Food Barley												
Kardia	79	41	18	50.4	97	7/13	19	0	11.5	93.4	5.0	1.6
14ARS235-5 **	---	---	18	48.9	92	7/12	20	0	11.2	55.2	31.5	13.3
Goldenhart **	72	43	14	47.7	84	7/12	18	0	13	67.7	24.0	8.3
Julie **	99	40	11	49.5	95	7/16	18	0	13.6	84.5	11.8	3.7
Transit **	92	36	11	51.2	96	7/12	22	0	13.7	74.7	21.0	4.3
Food Average	**85**	**40**	**14**	**49.5**	**93**	**7/13**	**19**	**0**	**13**	**75.1**	**18.7**	**6.2**
LSD (α=.05)	**9**	**7**	**5**	**5.3**	**4**	**3**	**2.4**	**.**				
CV %	**6.5**	**9.6**	**19.1**	**7.4**	**2.9**	**1**	**8.8**	**.**				
Pr > F	**< 0.0001**	**<0.0001**	**<0.0001**	**0.8248**	**<0.0001**	**<0.0001**	**0.0002**	**.**				

* Varieties or selections in bold are not statistically different from the top yielding variety.

** Hulless variety

Table 64. Two-row Spring Feed and Food Barley Yield Percentage of Location Averages, 2021.

	(100% = Average)					
Variety or Selection	**Aberdeen**	**Ashton**	**Idaho Falls**	**Rupert**	**Soda Springs**	**Variety average**
Feed Barley						
HO516-429	125	120	129	119	143	**127**
Altorado	118	115	106	127	147	**123**
Claymore	116	120	128	113	108	**117**
Champion	107	122	116	100	139	**117**
Oreana	112	110	140	119	100	**116**
Xena	113	97	106	92	146	**111**
Idagold II	102	105	99	102	132	**108**
Bill Coors 100	105	115	93	105	91	**102**
Moravian 179	108	110	96	104	87	**101**
FeedMor	107	98	104	102	75	**97**
Moravian 164	94	94	102	96	71	**92**
Moravian 180	98	79	88	109	74	**90**
Diamondback (SB6)	105	63	37	107	---	**78**
Food Barley						
Kardia	98	122	114	101	96	**106**
14ARS235-5 *	73	96	90	80	96	**87**
Goldenhart *	77	84	85	69	75	**78**
Julie *	70	79	94	83	59	**77**
Transit *	72	73	71	72	59	**69**
Location Average (bu/A)	**131**	**109**	**101**	**131**	**19**	

SB6 = six row barley
* Hulless variety

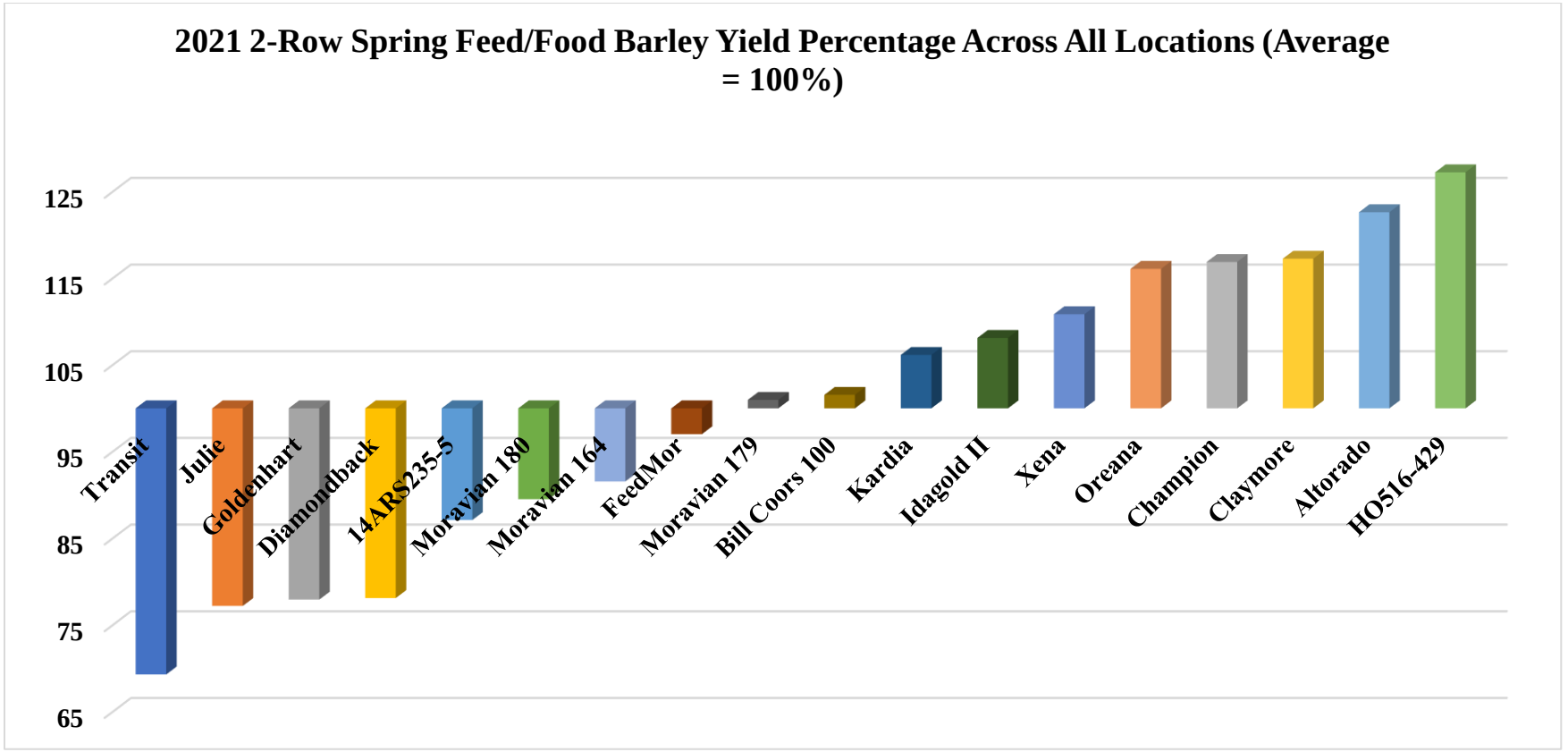


Chart 8. 2-Row Spring Feed/Food Barley Yield Percentage Across All Locations.

Table 65. Grain Protein & Kernel Hardness of Hard Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2019-20.

	----------Grain Protein %----------							----------Kernel Hardness 0-100----------						
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Rockland**	**Soda Springs**	**Average**	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Rockland**	**Soda Springs**	**Average**
AP Redeye	11.9	11.6	11.3	9.5	---	11.3	**11.1**	80	80	88	81	---	78	**81.4**
Flathead	12.7	11.6	11.6	9.6	12.0	11.4	**11.5**	89	89	87	79	82	87	**85.5**
FourOsix	11.6	11.3	12.7	9.8	11.4	11.1	**11.3**	78	78	84	77	81	77	**79.2**
IDO1906 (W)	12.8	12.7	12.7	10.4	11.1	12.1	**12.0**	83	83	84	84	75	75	**80.7**
IDO1607	12.2	11.6	11.8	9.8	10.7	11.4	**11.3**	80	80	76	81	75	74	**77.7**
IDO1806 (W)	12.4	12.0	12.3	10.4	10.8	11.0	**11.5**	80	80	83	81	75	77	**79.3**
Irv (W)	12.5	11.8	11.7	10.8	11.2	11.4	**11.6**	91	91	89	89	84	83	**87.8**
Kairos	12.2	11.1	11.2	10.0	---	---	**11.1**	67	67	77	74	---	---	**71.3**
Keldin	12.5	11.1	11.5	9.6	11.2	12.2	**11.4**	72	72	86	76	68	75	**74.8**
Keldin + 11-52-0	12.4	11.4	11.5	9.7	11.0	11.1	**11.2**	74	74	78	76	76	76	**75.7**
LCS Jet	12.2	11.2	11.9	9.3	10.4	10.7	**11.0**	81	81	73	74	76	83	**78.0**
LCS Rocket	11.9	11.0	11.5	9.4	10.8	10.4	**10.8**	83	83	83	78	85	74	**81.0**
Millie (W)	12.1	11.1	11.5	9.4	11.9	11.5	**11.3**	72	72	89	77	80	79	**78.2**
Nugrain (W)	13	12.4	12.2	10.8	---	---	**12.1**	85	85	87	81	---	---	**84.5**
OR2150168H (W)	11.7	10.5	11.1	9.9	10.6	10.8	**10.8**	43	43	37	36	43	39	**40.2**
OR2150169R	11.3	10.5	11.5	9.5	10.2	10.0	**10.5**	70	70	78	60	66	62	**67.7**
OR2160065H (W)	12.5	11.8	11.8	10.4	11.6	12.0	**11.7**	78	78	88	81	60	77	**77.0**
Sequoia	12.7	12.3	12.1	10.4	9.9	11.9	**11.6**	76	76	88	78	84	74	**79.3**
Scorpio	12.5	11.7	11.4	9.5	10.5	11.1	**11.1**	82	82	81	69	79	76	**78.2**
MT1642	12.5	12.0	11.3	10.3	11.6	11.7	**11.6**	82	82	85	82	79	80	**81.7**
UI Bronze Jade (W)	12.2	11.5	11.8	9.6	10.7	10.7	**11.1**	89	89	92	70	92	76	**84.7**
Utah 100	12.4	11.6	11.7	10.1	11.2	12.7	**11.6**	91	91	95	89	96	91	**92.2**
WA8289	11.1	10.5	11.4	9.3	9.6	9.2	**10.2**	73	73	76	69	69	61	**70.2**
WA8309	12.3	76.0	12.1	9.4	10.5	11.1	**21.9**	11.4	11.4	75	64	73	69	**50.6**
WB4311	13.1	12	11.9	10.6	11.4	11.9	**11.8**	82	82	84	93	84	82	**84.5**
WB4401	11.4	11.0	---	---	---	12.8	**11.7**	92	92	---	---	---	97	**93.7**
Juniper	---	---	10.7	9.3	12.0	11.0	**10.8**	---	---	94	86	92	91	**90.8**
WB4623CLP	13.7	12.3	12.3	11.1	12.1	12.5	**12.3**	77	77	89	83	75	76	**79.5**
WB4792	11.6	10.8	11.4	8.9	10.7	10.2	**10.6**	89	89	85	76	91	81	**85.2**
Yellowstone	12.2	11.1	11.6	9.4	11.8	10.5	**11.1**	79	79	90	74	84	80	**81.0**
Golden Spike (W)	---	---	---	---	11.5	11.6	**11.6**	---	---	---	---	83	79	**81.0**
LCS Yeti (W)	---	---	---	---	13.1	12.7	**12.9**	---	---	---	---	76	77	**76.5**
LCS Zoom	---	---	---	---	10.6	11.3	**11.0**	---	---	---	---	81	82	**81.5**
Promontory	---	---	---	---	12.2	12.8	**12.5**	---	---	---	---	91	97	**94.0**
UI Silver (W)	---	---	---	---	10.5	11.1	**10.8**	---	---	---	---	100	86	**93.0**
UI SRG	---	---	---	---	11.5	11.5	**11.5**	---	---	---	---	90	91	**90.5**
IDO1608	---	---	---	---	10.7	12.3	**11.5**	---	---	---	---	76	80	**78.0**
OR2150100R	---	---	---	---	12.1	11.5	**11.8**	---	---	---	---	86	83	**84.5**
Location Average	**12.3**	**13.7**	**11.7**	**9.9**	**11.2**	**11.4**	**11.7**	**76.9**	**76.9**	**82.8**	**76.5**	**79.6**	**78.5**	**78.5**

(W) = Hard White Winter

Table 66. Percent Flour Protein and Flour Yield of Hard Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2019-20.

	Flour Protein (14% mb)							Flour Yield (%)						
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Rockland**	**Soda Springs**	**Average**	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Rockland**	**Soda Springs**	**Average**
Hard Red Winter Wheat														
AP Redeye	10.8	10.3	10.7	8.7	---	10.7	**10.2**	72.1	74.2	74.6	75.2	---	71.1	**73.5**
Flathead	13	11.8	11.1	9.2	11.7	11.2	**11.3**	76.1	79.6	77.1	77.4	74.3	74.3	**76.5**
FourOsix	11.5	11.2	11.5	9.4	11.1	11.2	**11.0**	74.8	78.4	75.8	78.0	74.7	74.0	**75.9**
IDO1607	12	11.1	11.3	8.7	10.4	10.9	**10.7**	73.5	76.9	73.8	73.9	71.9	71.6	**73.6**
IDO1608	---	---	---	---	10.7	12.1	**11.4**	---	---	---	---	74.6	73.7	**74.1**
Jefferson	---	---	---	---	---	13.9	**13.9**	---	---	---	---	---	74.5	**74.5**
Juniper	---	---	10	8.5	11	11.2	**10.2**	---	---	68.8	72.2	72.4	69.5	**70.7**
Kairos	12.4	11.3	11.4	9.4	---	---	**11.1**	73.0	75.1	74.5	76.3	---	---	**74.7**
Keldin	12.4	11.1	11.5	8.8	10.8	12.1	**11.1**	74.0	75.5	75.2	76.7	72.9	71.8	**74.4**
Keldin + 11-52-0	12.3	11.3	10.9	9.1	11	10.8	**10.9**	74.1	75.6	74.9	76.5	72.9	71.6	**74.2**
LCS Jet	11.4	10.8	11.5	8	9.9	10.5	**10.4**	73.5	74.8	73.0	75.1	71.9	72.4	**73.4**
LCS Rocket	11.1	10.3	10.9	8.4	9.6	9.9	**10.0**	72.6	74.7	72.5	75.1	72.5	72.9	**73.4**
LCS Zoom	---	---	---	---	9.9	10.7	**10.3**	---	---	---	---	71.1	72.2	**71.7**
MT1642	12.5	11.6	10.8	9.7	11.6	12.3	**11.4**	72.3	74.5	73.0	75.1	72.8	70.6	**73.1**
OR2150100R	---	---	---	---	11.4	11.1	**11.3**	---	---	---	---	71.9	70.8	**71.4**
OR2150169R	10.5	10.3	11	8.6	9.7	9.9	**10.0**	73.3	75.4	72.8	75.4	73.6	71.8	**73.7**
Promontory	---	---	---	---	11.9	12.0	**12.0**	---	---	---	---	71.7	71.3	**71.5**
Scorpio	11.7	11.4	11.1	8.7	9.5	10.9	**10.6**	71.4	72.7	71.9	73.9	72.3	70.5	**72.1**
Sequoia	12.1	12.2	11.7	9.3	9.1	11.8	**11.0**	74.5	74.8	75.5	76.7	74.1	72.4	**74.7**
UI SRG	---	---	---	---	11.8	10.3	**11.1**	---	---	---	---	75.6	72.2	**73.9**
UI Stone	---	---	---	---	---	10.3	**10.3**	---	---	---	---	---	78.2	**78.2**
Utah 100	11.6	11.1	10.7	9.2	11	12.2	**11.0**	73.7	73.5	73.1	74.0	74.1	70.6	**73.2**
WA8289	10	10	10.5	8.3	9.1	8.9	**9.5**	75.5	74.2	71.7	75.5	75.4	72.9	**74.2**
WA8309	11.6	10.8	11.4	8.5	9.9	11.0	**10.5**	73.8	72.7	70.6	73.9	72.2	70.2	**72.2**
WB4311	2.4	11.8	11.4	9.9	11.3	11.7	**9.8**	75.5	74.9	72.6	74.5	73.2	69.6	**73.4**
WB4401	10.4	10.3	---	---	---	---	**10.4**	72.4	70.9	---	---	---	---	**71.7**
WB4623CLP	13.5	12.7	12.2	10.4	12.6	13.1	**12.4**	73.2	71.0	71.4	71.7	71.4	68.9	**71.3**
WB4792	10.6	10.3	10.3	8.1	10.4	9.8	**9.9**	76.1	73.5	72.4	73.6	72.6	69.0	**72.9**
Yellowstone	11.6	11.4	11.1	8.7	11.8	10.5	**10.9**	75.5	75.1	74.1	75.2	73.4	70.8	**74.0**
Location Average	**11.2**	**11.1**	**11.1**	**8.9**	**10.7**	**11.2**	**10.7**	**73.8**	**74.7**	**73.3**	**75.0**	**73.1**	**71.8**	**73.6**
Hard White Winter Wheat														
Golden Spike	---	---	---	---	10.1	11.7	**10.9**	---	---	---	---	74.9	72.5	**73.7**
IDO 1906	13.2	12.8	12.2	9.3	11.9	11.6	**11.8**	72.2	73.9	71.7	72.9	71.9	71.8	**72.4**
IDO1806	12.3	12.1	12.4	10	10.5	10.9	**11.4**	75.1	76.8	74.2	75.4	73.3	72.3	**74.5**
Irv	11.8	11.4	10.9	9.4	10.6	10.7	**10.8**	73.6	73.8	74.2	74.5	74.1	71.1	**73.6**
LCS Yeti	---	---	---	---	13.8	13.1	**13.5**	---	---	---	---	72.7	72.7	**72.7**
Millie	11.5	10.7	11.2	8.5	12.2	11.1	**10.9**	72.7	72.7	72.8	72.8	71.3	70.6	**72.2**
Nugrain	12.9	11.9	12.1	10.3	---	---	**11.8**	74.7	75.0	74.2	75.6	---	---	**74.9**
OR2150168H	11.6	10.9	11.2	9.6	10.8	10.9	**10.8**	70.0	71.9	71.2	72.8	71.3	68.9	**71.0**
OR2160065H	12.1	11.7	11.2	9.7	11.3	12.0	**11.3**	72.8	73.1	72.9	73.9	72.2	70.2	**72.5**
UI Bronze Jade	11.9	11.4	11.3	8.8	10.4	10.5	**10.7**	74.1	75.4	74.0	76.6	74.3	73.3	**74.6**
UI Silver	---	---	---	---	10.5	10.7	**10.6**	---	---	---	---	76.0	72.0	**74.0**
Location Average	**12.2**	**11.6**	**11.6**	**9.5**	**11.2**	**11.3**	**11.2**	**73.2**	**74.1**	**73.1**	**74.3**	**73.2**	**71.5**	**73.2**

mb = moisture basis

Table 67. Bake Volume of Hard Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2019-20.

Variety or Selection	Bake Volume (cc) Aberdeen	Kimberly	Rupert	Ririe Irrig	Rockland	Soda Springs	Average
Hard Red Winter Wheat							
AP Redeye	775	775	750	600	950	625	**746**
Flathead	1000	975	850	825	925	675	**875**
FourOsix	950	950	875	875	---	675	**865**
IDO1607	975	850	925	750	975	900	**896**
IDO1608	---	---	---	---	900	725	**813**
Juniper	---	---	600	600	850	675	**681**
Kairos	900	900	900	800	---	---	**875**
Keldin	975	825	850	725	825	900	**850**
Keldin + 11-52-0	975	825	800	750	850	825	**838**
LCS Jet	925	800	925	625	800	725	**800**
LCS Rocket	800	800	725	700	825	800	**775**
LCS Zoom	---	---	---	---	800	725	**763**
MT1432	825	725	750	725	875	675	**763**
MT1642	1075	825	825	875	1100	750	**908**
OR2150100R	---	---	---	---	950	750	**850**
OR2150169R	650	675	700	675	850	900	**742**
Promontory	---	---	---	---	950	850	**900**
Scorpio	875	825	850	750	825	875	**833**
Sequoia	900	825	825	825	825	775	**829**
UI SRG	---	---	---	---	925	850	**888**
Utah 100	825	825	775	775	875	650	**788**
WA8289	800	800	825	725	850	750	**792**
WA8309	825	850	925	725	925	700	**825**
WB4311	900	875	800	750	900	---	**845**
WB4401	600	650	---	---	---	---	**625**
WB4623CLP	1025	925	875	850	1000	825	**917**
WB4792	600	650	675	600	825	600	**658**
Yellowstone	950	975	825	800	1000	800	**892**
Location Average	**869**	**824**	**811**	**742**	**895**	**760**	**817**
Hard White Winter Wheat							
Golden Spike	---	---	---	---	850	775	**813**
IDO 1906	1025	1000	950	875	1000	950	**967**
IDO1806	900	950	1000	875	975	825	**921**
Irv	1000	875	850	750	775	850	**850**
LCS Yeti	---	---	---	---	1075	975	**1025**
Millie	825	825	775	725	925	775	**808**
Nugrain	975	925	825	850	---	650	**845**
OR2150168H	600	600	600	600	825	675	**650**
OR2160065H	850	750	825	800	975	800	**833**
UI Bronze Jade	875	775	850	750	900	850	**833**
UI Silver	---	---	---	---	925	825	**875**
Location Average	**881**	**838**	**834**	**778**	**923**	**814**	**845**

Table 68. Grain Protein & Kernel Hardness of Soft White Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2019-20.

	--------Grain Protein %--------							--------Kernel Hardness 0-100--------						
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**
AP Illiad	12.2	10.9	10.9	9.6	10.8	---	**10.9**	44.0	33.0	32.0	37	30	---	**35**
Appleby CL+	12.1	9.2	10.7	10.2	10.9	11.6	**10.8**	42	29	40	38	40.0	39	**38**
Brundage	10.8	8.8	10.2	9.6	10.4	10.7	**10.1**	39	26	40	32	32	34	**34**
Devote	---	---	---	---	11.0	11.0	**11.0**	---	---	---	---	33	34	**34**
Eltan	---	---	---	---	10.9	10.3	**10.6**	---	---	---	---	31	32	**32**
Eltan 11-52-0	---	---	---	---	10.2	10.6	**10.4**	---	---	---	---	25	31	**28**
IDO1708	10.7	8.5	9.8	8.9	9.7	---	**9.5**	36.0	18.0	29.0	29	29	---	**28**
IDO1808	---	---	---	---	10.1	10.5	**10.3**	---	---	---	---	34.0	31	**33**
IDO1810	---	---	---	---	10.6	---	**10.6**	---	---	---	---	23	---	**23**
Jasper	11.4	9.6	10.5	8.8	9.9	11.1	**10.2**	36.0	27.0	25.0	31	29	33	**30**
LCS Artdeco	10.5	8.8	9.3	8.9	---	---	**9.4**	32.0	22.0	22.0	31	---	---	**27**
LCS Blackjack	10.4	8.7	9.3	9.1	---	---	**9.4**	28.0	23.0	25.0	26	---	---	**26**
LCS Drive	11.2	8.6	9.7	9.4	---	---	**9.7**	35.0	24.0	29.0	33	---	---	**30**
LCS Ghost	9.5	7.6	9.2	8.1	---	---	**8.6**	29	15	25	22	---	---	**23**
LCS Hulk	11.4	8.1	9.8	8.9	10.4	11.0	**9.9**	38	24	30	34	31	30	**31**
LCS Shark	10.9	9.1	10.0	9.3	---	---	**9.8**	36.0	24.0	30.0	34	---	---	**31**
LCS Shine	---	---	---	---	9.3	9.8	**9.6**	---	---	---	---	30	35	**33**
LCS Sonic	---	---	---	---	10.5	10.9	**10.7**	---	---	---	---	26	29	**28**
LWW16-71088	10.5	7.4	8.9	8.5	10.0	10.2	**9.3**	34.0	23.0	26.0	33	31	32	**30**
M-Idas	10.4	8.9	9.4	8.6	9.0	10.2	**9.4**	41	32	31	33	35.0	42	**36**
M-Idas with SSR	10.5	8.1	9.3	8.5	9.1	10.4	**9.3**	42	30	35	35	35	41	**36**
M-Press	11.6	8.6	10.0	8.6	10.2	10.4	**9.9**	38.0	28.0	33.0	32	36	38	**34**
Nixon	11.2	9.3	9.3	9.8	10.4	11.5	**10.3**	37.0	31.0	36.0	39	33	33	**35**
Norwest Duet	11.9	10.1	9.8	9.3	9.9	10.7	**10.3**	43.0	39.0	40.0	47	40	39	**41**
Norwest Tandem	11.1	9.2	9.5	9.6	10.3	10.8	**10.1**	46.0	36.0	40.0	42	34	35	**39**
OR2130755	---	---	---	---	9.5	11.7	**10.6**	---	---	---	---	25.0	30	**28**
OR2X2CL+	12.2	10.5	10.2	10.0	10.6	11.3	**10.8**	34	28	29	37	34	34	**33**
Otto	---	---	---	---	10.5	11.2	**10.9**	---	---	---	---	32	34	**33**
Purl	11.4	9.2	9.7	9.3	10.1	11.2	**10.2**	48.0	33.0	40.0	42	38	41	**40**
Rosalyn	10.4	8.2	9.3	9.2	10.0	9.9	**9.5**	37.0	24.0	34.0	35	33	37	**33**
Stephens	11.6	8.2	10.6	9.5	9.9	10.8	**10.1**	45.0	23.0	36.0	36	32	38	**35**
Stingray CL+	10.6	9.0	10.1	9.4	10.8	11.2	**10.2**	32	27	30	35	32.0	37	**32**
SY Ovation	11.1	8.5	9.6	9.4	9.8	10.7	**9.8**	41	26	31	37	29	38	**34**
SY Assure	11.6	9.8	10.2	10.2	10.4	11.7	**10.7**	39.0	28.0	30.0	37	28	36	**33**
SY Raptor	10.5	9.1	9.8	9.5	10.1	10.8	**10.0**	42.0	34.0	34.0	39	37	40	**38**
UI Castle CL+	12.7	9.7	10.5	9.9	10.3	12.6	**10.9**	41.0	31.0	33.0	34	32	40	**35**
UI Magic CL+	11.9	9.0	9.4	9.9	10.7	11.8	**10.5**	42.0	27.0	33.0	37	32	40	**35**
UI Sparrow	11.6	8.8	10.2	9.4	10.0	10.0	**10.0**	44	33	36	39	31.0	38	**37**
UIL 17-6268 CL+	11.1	8.8	9.5	9.9	10.8	11.2	**10.2**	36	23	23	34	30	36	**30**
UIL 17-6451 CL+	---	---	---	---	10.4	11.3	**10.9**	---	---	---	---	33	36	**35**
UIL15-72223	11.1	8.1	9.0	8.6	---	---	**9.2**	33.0	25.0	29.0	27	---	---	**29**
UIL17-6834 CL+	---	---	---	---	11.0	12.3	**11.6**	---	---	---	---	35	42	**39**
VI Bulldog	10.8	9.3	10.5	9.0	---	---	**9.9**	37.0	26.0	28.0	29	---	---	**30**
WA8293	11.5	9.2	9.8	9.4	9.6	11.0	**10.1**	38	30	32	36	35.0	33	**34**
WA8305 CL+	11.3	8.7	9.3	9.1	---	---	**9.6**	35	21	31	30	---	---	**29**
WA8306 CL+	11.1	8.9	9.6	8.4	9.4	10.4	**9.6**	39.0	22.0	32.0	21	25	35	**29**
WA8307	11.9	10.8	10.4	9.4	9.7	10.4	**10.4**	42.0	34.0	32.0	37	25	32	**34**
WB 456	12.2	10.5	10.6	10.2	10.6	11.9	**11.0**	48.0	39.0	40.0	46	35	37	**41**
WB1376CLP	12.1	9.9	10.9	10.6	11.1	---	**10.9**	40.0	33.0	39.0	41	34	---	**37**
WB1529	11.2	8.4	10.1	10.0	10.8	11.3	**10.3**	37	26	32	42	31.0	35	**34**
WB1783	11.2	8.9	10.3	9.6	11.2	12.3	**10.6**	52	34	41	43	46	53	**45**
YSC-201	11.0	---	---	9.9	---	---	**10.5**	36.0	---	---	32	---	---	**34**
YSC-215	11.0	---	---	9.0	---	---	**10.0**	42.0	---	---	35	---	---	**39**
Average	**11.2**	**9.0**	**9.9**	**9.3**	**10.3**	**11.0**	**10.1**	**39**	**28**	**32**	**35**	**32**	**36**	**34**

Table 69. Percent Flour Protein and Flour Yield of Soft White Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2019-20.

	Flour Protein (%)							Flour Yield (%)						
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**
AP Illiad	10.54	10.8	10.5	8.8	9.8	9.3	**10.0**	75.0	76.9	73.1	77.4	73.1	74.2	**74.9**
Appleby CL+	10.4	8.72	10.6	10.8	9.8	9.8	**10.0**	75.0	76.0	77.6	78.1	74.7	74.3	**75.9**
Brundage	9.4	8.38	9.4	9.31	9	9.4	**9.1**	75.8	76.9	75.7	75.9	74.1	73.8	**75.4**
Devote	---	---	---	---	9.95	9.7	**9.8**	---	---	---	---	73.2	71.5	**72.4**
Eltan	---	---	---	---	10.17	8.8	**9.5**	---	---	---	---	73.4	73.1	**73.2**
Eltan 11-52-0	---	---	---	---	9.41	9.5	**9.5**	---	---	---	---	73.7	72.6	**73.1**
IDO1708	9.3	7.93	9.4	7.8	8.9	9.2	**8.8**	75.2	76.0	75.5	76.6	73.0	72.4	**74.8**
IDO1808	---	---	---	---	9.41	---	**9.4**	---	---	---	---	73.9	---	**73.9**
IDO1810	---	---	---	---	10.04	---	**10.0**	---	---	---	---	74.0	---	**74.0**
Jasper	10.3	9.2	9.5	8.21	9	9.3	**9.3**	75.7	77.6	72.541	77.0	74.9	73.5	**75.2**
LCS Artdeco	9.2	8.11	8.5	8.11	---	---	**8.5**	74.1	75.1	73.317	75.5	---	---	**74.5**
LCS Blackjack	9.1	8.22	8.4	8.2	---	---	**8.5**	78.1	78.6	77.651	78.2	---	---	**78.1**
LCS Drive	9.6	7.9	8.3	8.65	---	---	**8.6**	74.3	74.3	72.592	74.6	---	---	**73.9**
LCS Ghost	8	7.39	8.2	7.53	---	---	**7.8**	76.5	76.2	75.2	76.1	---	---	**76.0**
LCS Hulk	9.7	7.61	8.8	8.07	9	9.3	**8.7**	76.8	77.1	75.8	76.8	74.3	71.9	**75.4**
LCS Shark	9.5	8.73	8.9	8.46	---	---	**8.9**	76.6	76.8	74.63	76.3	---	---	**76.1**
LCS Shine	---	---	---	---	8.53	8.1	**8.3**	---	---	---	---	74.4	74.4	**74.4**
LCS Sonic	---	---	---	---	9.55	9.2	**9.4**	---	---	---	---	73.9	72.5	**73.2**
LWW16-71088	8.9	6.88	8.3	7.3	8.3	8.8	**8.1**	77.5	77.8	76.3	78.9	76.5	76.7	**77.3**
M-Idas	9	8.3	8.6	8.01	8	8.6	**8.4**	78.3	79.9	77.5	79.0	77.8	77.1	**78.3**
M-Idas with SSR	8.9	7.2	8.5	7.88	7.8	9	**8.2**	78.6	81.0	77.5	79.0	77.4	77.7	**78.5**
M-Press	10.1	7.89	8.8	7.81	9	8.6	**8.7**	77.5	77.4	76.762	77.8	75.7	76.1	**76.9**
Nixon	9.3	8.2	8.4	8.36	8.8	10	**8.8**	76.8	79.0	76.563	78.0	75.6	74.9	**76.8**
Norwest Duet	10.1	9	8.5	7.81	8.4	8.6	**8.7**	75.6	78.1	76.918	77.8	75.5	76.0	**76.7**
Norwest Tandem	9.5	8.1	8.2	8.17	8.7	9.3	**8.7**	75.1	76.2	74.436	75.1	73.4	73.7	**74.7**
OR2130755	---	---	---	---	8.65	10	**9.3**	---	---	---	---	75.0	76.8	**75.9**
OR2X2CL+	11.1	9.5	9.3	8.6	9.2	9.5	**9.5**	77.2	78.1	76.3	79.6	75.8	76.4	**77.2**
Otto	---	---	---	---	9.41	9.8	**9.6**	---	---	---	---	72.6	73.9	**73.3**
Purl	9.6	8	8.6	8.3	8.7	9.4	**8.8**	77.0	78.2	75.4	78.7	74.4	74.2	**76.3**
Rosalyn	9.7	7.4	8.4	8.2	8.6	8.3	**8.4**	76.1	77.9	75.876	78.4	73.8	74.2	**76.1**
Stephens	10.2	7.6	9.5	8.3	8.5	8.9	**8.8**	76.7	77.9	74.752	79.0	74.9	75.2	**76.4**
Stingray CL+	9.8	8.3	9.1	8.3	9.4	9.1	**9.0**	75.2	77.1	74.3	77.8	73.2	73.2	**75.1**
SY Ovation	9.9	7.7	8.9	8.1	9	9	**8.8**	77.0	77.6	76.4	79.3	74.7	74.5	**76.6**
SY Assure	10.8	8.8	9.3	9.2	9.1	9.9	**9.5**	75.9	77.2	73.633	77.8	73.1	73.9	**75.3**
SY Raptor	9.2	7.8	9.1	7.6	8.8	9.2	**8.6**	76.4	77.5	73.818	77.8	74.0	74.8	**75.7**
UI Castle CL+	11.6	9.2	9.8	8.8	8.9	11.5	**10.0**	78.2	79.8	78.74	80.7	77.4	77.2	**78.7**
UI Magic CL+	10.9	8.4	8.4	8.5	9.4	10.3	**9.3**	75.6	77.2	74.794	77.5	73.2	73.7	**75.3**
UI Sparrow	10	7.2	8.9	7.7	8.8	8.5	**8.5**	76.1	77.6	74.7	78.0	75.3	75.3	**76.2**
UIL 17-6268 (CL+)	9.9	7.7	9.4	8.8	9.5	9.8	**9.2**	76.6	77.6	75.8	77.9	74.5	74.7	**76.2**
UIL 17-6451 (CL+)	---	---	---	---	9.62	9.9	**9.8**	---	---	---	---	73.8	75.9	**74.9**
UIL15-72223	10.1	7.3	8.8	7.9	---	---	**8.5**	77.5	77.9	76.9	79.0	---	---	**77.8**
UIL17-6834 CL+	---	---	---	---	9.89	10.7	**10.3**	---	---	---	---	70.5	71.9	**71.2**
VI Bulldog	9.7	8.6	9.6	7.9	---	---	**9.0**	77.0	78.6	75.6	78.8	---	---	**77.5**
WA8293	10.5	8.5	9.2	7.8	8.3	9.8	**9.0**	76.8	78.1	76.7	79.0	75.3	76.1	**77.0**
WA8305 CL+	10.1	7.8	8.9	7.4	---	---	**8.6**	75.2	77.0	75.2	77.4	---	---	**76.2**
WA8306 CL+	9.6	8.1	9	7.5	8	---	**8.4**	76.5	77.7	75.825	77.7	74.5	---	**76.4**
WA8307	10.4	9.2	9.7	8	8.1	9	**9.1**	72.6	74.8	73.776	75.8	72.0	73.8	**73.8**
WB 456	10.44	9.4	10	8.9	9.5	10.3	**9.8**	77.7	77.4	76.871	78.2	73.8	74.2	**76.4**
WB1376CLP	10.56	8.3	9.9	9.3	9.6	---	**9.5**	75.5	75.4	75.308	76.6	72.5	---	**75.1**
WB1529	10.21	8.1	9.8	8.7	10.19	9.6	**9.4**	75.6	75.0	75.4	76.6	73.4	72.6	**74.8**
WB1783	9.35	8.1	9.4	8.3	9.33	10.4	**9.1**	76.6	76.9	75.0	77.8	75.6	74.2	**76.0**
YSC-201	9.71	---	---	8.7	---	---	**9.2**	76.3	---	---	77.1	---	---	**76.7**
YSC-215	9.5	---	---	7.8	---	---	**8.7**	78.1	---	---	79.3	---	---	**78.7**
Average	**9.9**	**8.2**	**9.1**	**8.3**	**9.1**	**9.4**	**9.0**	**76.3**	**77.3**	**75.5**	**77.7**	**74.3**	**74.4**	**75.9**

Table 70. Percent Break Flour Yield and Cookie Diameter of Soft White Winter Varieties and Selections Grown in Southeast Idaho, 2019-20.

	Break Flour Yield (%)							Cookie Diameter (cm)						
Variety or Selection	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**	**Aberdeen**	**Kimberly**	**Rupert**	**Ririe Irrig**	**Soda Springs**	**Rockland**	**Average**
AP Illiad	42.8	45.6	45.1	45.6	44.6	44.3	**44.7**	8.9	8.8	8.7	8.9	9.1	9.2	**8.9**
Appleby CL+	42.0	45.2	49.2	43.7	43.4	42.1	**44.3**	8.9	9.1	9.0	8.8	9.2	9.0	**9.0**
Brundage	45.4	48.4	42.9	46.8	47.1	46.5	**46.2**	9.1	9.2	9.2	9.2	9.4	9.2	**9.2**
Devote	---	---	---	---	44.6	44.1	**44.4**	---	---	---	---	8.9	8.8	**8.8**
Eltan	---	---	---	---	45.2	45.6	**45.4**	---	---	---	---	8.8	9.0	**8.9**
Eltan 11-52-0	---	---	---	---	45.0	44.6	**44.8**	---	---	---	---	8.9	9.0	**9.0**
IDO1708	45.1	48.1	47.5	48.4	45.4	44.1	**46.4**	9.1	9.3	9.1	9.2	9.0	9.1	**9.1**
IDO1808	---	---	---	---	44.7	---	**44.7**	---	---	---	---	9.2	---	**9.2**
IDO1810	---	---	---	---	46.3	---	**46.3**	---	---	---	---	9.2	---	**9.2**
Jasper	48.1	49.9	47.0	48.9	48.8	47.7	**48.4**	8.8	9.0	9.0	9.4	8.9	9.2	**9.1**
LCS Artdeco	43.2	46.5	44.0	44.7	---	---	**44.6**	9.1	9.2	8.6	8.8	---	---	**8.9**
LCS Blackjack	45.8	49.6	46.6	47.9	---	---	**47.5**	9.2	9.2	9.1	9.1	---	---	**9.1**
LCS Drive	43.0	46.8	43.0	43.9	---	---	**44.2**	9.1	9.2	9.1	9.1	---	---	**9.1**
LCS Ghost	48.7	51.9	49.3	50.1	---	---	**50.0**	9.1	9.1	8.9	9.2	---	---	**9.1**
LCS Hulk	44.2	47.7	44.4	45.3	43.9	43.7	**44.9**	8.8	9.0	8.9	9.0	9.0	8.9	**8.9**
LCS Shark	43.7	48.5	44.3	46.1	---	---	**45.6**	9.1	9.3	8.9	8.9	---	---	**9.1**
LCS Shine	---	---	---	---	48.5	48.2	**48.3**	---	---	---	---	9.0	9.0	**9.0**
LCS Sonic	---	---	---	---	44.8	44.6	**44.7**	---	---	---	---	9.0	9.1	**9.1**
LWW16-71088	48.2	51.5	49.5	49.9	48.8	50.1	**49.7**	9.5	9.6	9.0	9.4	9.3	9.3	**9.4**
M-Idas	46.3	49.7	45.9	47.4	47.6	47.8	**47.5**	9.1	8.9	9.1	9.0	9.2	9.2	**9.1**
M-Idas with SSR	45.9	51.8	45.6	47.3	48.0	48.4	**47.8**	9.2	9.0	9.1	9.1	8.9	8.9	**9.0**
M-Press	45.3	47.8	44.9	46.9	45.1	46.2	**46.0**	8.9	9.0	8.9	8.9	9.1	9.2	**9.0**
Nixon	45.2	49.9	42.4	46.8	46.1	45.6	**46.0**	9.4	9.3	8.9	9.0	9.2	9.2	**9.2**
Norwest Duet	44.8	48.5	44.5	45.1	46.6	46.3	**46.0**	8.6	8.7	8.9	9.0	9.0	8.7	**8.8**
Norwest Tandem	43.8	48.0	42.9	44.9	44.8	45.6	**45.0**	8.8	8.9	9.0	9.0	9.0	9.1	**9.0**
OR2130755	---	---	---	---	47.9	48.8	**48.4**	---	---	---	---	9.3	8.7	**9.0**
OR2X2CL+	48.1	50.3	46.5	49.7	45.9	46.6	**47.9**	9.0	9.1	9.0	9.1	8.9	9.1	**9.0**
Otto	---	---	---	---	43.8	46.5	**45.1**	---	---	---	---	8.8	9.0	**8.9**
Purl	43.5	47.3	42.9	47.1	42.8	42.8	**44.4**	9.0	9.1	8.9	9.0	9.0	9.0	**9.0**
Rosalyn	46.7	49.6	44.0	48.6	43.7	45.7	**46.4**	9.0	9.0	8.9	9.1	9.2	9.2	**9.1**
Stephens	43.9	47.0	42.1	47.5	44.3	43.8	**44.8**	8.9	9.0	9.1	8.9	9.0	9.0	**9.0**
Stingray CL+	45.3	48.2	43.3	47.3	44.6	44.6	**45.5**	9.3	9.0	9.0	9.0	9.2	9.2	**9.1**
SY Assure	45.7	48.5	45.2	47.8	45.2	44.0	**46.1**	9.2	9.1	8.9	9.0	9.3	9.0	**9.1**
SY Ovation	46.4	48.1	45.3	48.8	45.5	43.8	**46.3**	9.2	9.1	8.6	8.9	9.2	9.1	**9.0**
SY Raptor	45.3	46.8	42.5	45.9	43.9	43.0	**44.6**	9.0	9.1	9.0	9.3	9.2	9.1	**9.1**
UI Castle CL+	50.4	51.2	48.6	51.4	47.7	45.7	**49.2**	9.1	9.1	9.1	9.1	8.9	9.1	**9.1**
UI Magic CL+	45.4	48.5	44.9	47.2	44.5	42.6	**45.5**	9.2	9.1	8.7	8.8	9.0	8.9	**8.9**
UI Sparrow	43.4	47.1	43.0	45.7	44.7	44.4	**44.7**	8.8	8.8	8.9	9.1	9.2	9.2	**9.0**
UIL 17-6268 CL+	48.0	49.9	49.1	48.4	45.8	46.1	**47.9**	9.3	9.3	9.0	9.1	9.1	8.8	**9.1**
UIL 17-6451 CL+	---	---	---	---	42.5	43.3	**42.9**	---	---	---	---	9.2	9.0	**9.1**
UIL15-72223	49.8	50.0	49.0	49.9	---	---	**49.7**	9.2	9.3	9.2	9.1	---	---	**9.2**
UIL17-6834 CL+	---	---	---	---	40.8	41.7	**41.3**	---	---	---	---	8.6	8.6	**8.6**
VI Bulldog	47.4	48.2	45.9	48.0	---	---	**47.4**	9.3	8.9	9.1	9.3	---	---	**9.1**
WA8293	46.5	46.5	47.0	47.2	45.3	45.5	**46.3**	8.9	8.8	8.9	9.1	8.8	9.0	**8.9**
WA8305 CL+	44.5	47.6	45.7	47.7	---	---	**46.4**	9.0	8.9	9.1	9.3	---	---	**9.1**
WA8306 CL+	46.8	50.0	47.2	49.2	47.5	47.7	**48.1**	9.3	9.1	9.3	9.4	9.3	9.3	**9.3**
WA8307	39.8	42.6	43.4	43.6	43.8	45.6	**43.1**	8.9	8.5	8.8	8.9	9.0	8.8	**8.8**
WB 456	45.9	45.7	46.1	45.0	43.3	43.9	**45.0**	9.2	9.0	8.8	8.9	8.9	9.0	**9.0**
WB1376CLP	43.6	44.0	42.9	42.8	41.6	---	**43.0**	8.9	8.9	9.1	9.1	9.1	---	**9.0**
WB1529	44.6	47.2	44.8	45.7	45.4	43.9	**45.3**	9.2	9.1	9.0	9.0	8.9	9.0	**9.0**
WB1783	43.3	45.0	43.1	45.1	43.6	41.3	**43.6**	8.5	8.7	8.6	8.6	8.8	8.7	**8.6**
YSC-201	48.3	---	---	48.7	---	---	**48.5**	9.3	---	---	9.3	---	---	**9.3**
YSC-215	48.2	---	---	49.2	---	---	**48.7**	9.3	---	---	9.2	---	---	**9.3**
Location average	**45.5**	**48.1**	**45.3**	**47.1**	**45.2**	**45.2**	**46.1**	**9.1**	**9.0**	**9.0**	**9.1**	**9.1**	**9.0**	**9.0**

Table 71. Solvent Retention Capacity data for Soft White Winter Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Aberdeen				Kimberly				Rupert				Ririe Irrigated				Rockland				Soda Springs			
Variety or Selection	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**
AP Illiad	52.6	92.3	71.8	67.5	51.4	93.9	63.8	65.6	53.0	96.4	71.6	71.2	52.6	92.3	71.8	67.5	53.9	96.3	74.6	65.5	51.5	91.8	63.9	79
Appleby CL+	49.3	89.5	61.5	58.4	50.9	88.7	63.7	59.5	50.9	92.3	65.5	62.7	49.3	89.5	61.5	58.4	50.8	88.1	66.4	66.0	51.1	91.2	66.5	64
Brundage	51.1	91.3	83.0	61.3	52.2	89.0	68.8	64.2	50.8	92.7	67.6	66.5	51.1	91.3	83.0	61.3	49.7	91.5	68.5	77.9	50.2	89.1	69.5	70.4
Devote	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	51.9	99.2	72.0	89.5	54	97.3	65.6	87.4
Eltan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	52.6	99.2	74.1	97.9	52.2	93.3	63.1	104.6
Eltan 11-52-0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	51.1	98.7	72.5	103.9	51.6	94.3	64.6	103.6
IDO1708	52.4	93.4	72.1	74.7	52.1	91.5	64.3	67.8	52.3	94.0	73.7	81.4	52.4	93.4	72.1	74.7	50.9	95.7	71.7	88.1	50.6	94.7	68.5	85.6
IDO1808	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	50.4	88.9	62.8	86.8
IDO1810	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	49.7	91.8	60.1	100.3
Jasper	50.6	87.1	41.6	65.0	50.0	88.9	64.3	69.6	49.7	95.0	67.3	75.8	50.6	87.1	41.6	65.0	48.6	91.8	67.7	84.1	49.6	89	62.9	78.5
LCS Artdeco	53.6	95.6	64.5	86.2	52.0	95.7	66.2	79.1	52.6	98.8	69.0	91.4	53.6	95.6	64.5	86.2	---	---	---	---	---	---	---	---
LCS Blackjack	51.9	86.9	59.8	68.2	50.8	86.0	64.2	64.0	50.9	87.9	66.4	69.6	51.9	86.9	59.8	68.2	---	---	---	---	---	---	---	---
LCS Drive	50.7	92.2	63.4	94.9	51.4	89.4	68.5	83.7	50.8	92.6	67.7	88.0	50.7	92.2	63.4	94.9	---	---	---	---	---	---	---	---
LCS Ghost	49.8	89.9	61.9	76.0	50.5	87.9	64.7	73.2	50.6	93.0	67.2	79.0	49.8	89.9	61.9	76.0	---	---	---	---	---	---	---	---
LCS Hulk	52.1	91.0	65.5	68.5	58.1	89.2	61.5	63.9	54.8	93.2	68.2	67.3	52.1	91.0	65.5	68.5	51.4	96.6	70.2	81.7	50.7	92.5	64.7	78.4
LCS Shark	49.4	87.2	58.9	76.6	50.2	88.3	60.8	75.0	51.0	92.1	66.3	80.8	49.4	87.2	58.9	76.6	---	---	---	---	---	---	---	---
LCS Shine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	50.7	91.8	72.1	81.1	50.4	91	63.9	81.3
LCS Sonic	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	50.8	93.7	66.8	93.6	51.1	90.5	62	98.8
LWW16-71088	52.2	87.2	70.0	58.4	49.3	84.4	63.3	57.7	50.1	88.0	69.6	61.5	52.2	87.2	70.0	58.4	49.5	87.2	70.1	72.9	48.9	87	64.1	65.8
Mitus	51.5	89.2	63.1	66.4	50.6	84.7	64.4	62.9	51.9	89.1	68.5	67.9	51.5	89.2	63.1	66.4	51.3	90.2	69.0	79.5	50.8	86.7	64.3	77.6
Mitus with SSR	51.9	87.2	64.2	64.9	50.7	84.4	61.9	61.7	51.7	87.9	66.4	70.5	51.9	87.2	64.2	64.9	51.4	90.3	69.4	80.9	51.8	86.3	64.9	73
M-Press	51.5	88.1	62.6	77.9	51.8	87.8	65.1	69.4	52.1	91.4	66.7	78.9	51.5	88.1	62.6	77.9	51.8	89.8	67.8	75.8	52.3	89.1	64.1	82.8
Nixon	49.9	88.9	62.9	57.4	50.5	86.9	64.2	55.4	52.4	90.7	67.5	58.3	49.9	88.9	62.9	57.4	49.4	92.2	67.9	70.3	49.7	89	63.2	67.6
Norwest Duet	51.7	89.4	67.7	69.3	52.2	89.0	66.4	74.1	53.3	92.2	71.7	71.1	51.7	89.4	67.7	69.3	51.6	93.5	69.6	80.1	51.3	90.6	66.8	84.3
Norwest Tandem	53.6	91.9	69.3	78.4	53.6	91.5	67.5	69.0	55.2	94.6	71.0	70.6	53.6	91.9	69.3	78.4	53.7	94.5	69.5	89.2	51.4	92	63.8	90.8
OR2130755	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	49.5	96.9	72.4	78.7	49.8	91.7	63.6	76.5
OR2X2 CL+	48.5	89.6	62.6	58.9	49.0	87.2	62.4	65.6	51.0	92.5	67.9	69.6	48.5	89.6	62.6	58.9	50.5	94.8	70.7	77.0	53.4	91.3	67	74.4
Otto	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	51.6	96.4	74.4	105.9	54.9	94.9	68.5	100.3
Piranha CL+	50.8	92.6	70.6	63.5	49.0	90.0	62.5	63.0	51.1	92.7	68.8	65.5	50.8	92.6	70.6	63.5	---	---	---	---	---	---	---	---
Purl	52.3	90.4	65.8	61.0	50.3	87.2	64.8	55.9	53.0	92.9	68.8	63.7	52.3	90.4	65.8	61.0	53.1	90.1	72.8	74.0	53	90.4	65.8	72.8
Rosalyn	52.2	92.6	73.7	62.9	50.8	88.2	64.1	63.1	52.9	92.9	70.8	62.0	52.2	92.6	73.7	62.9	53.6	91.0	76.4	73.1	51.3	92.2	66.6	70.8
Sockeye CL+	49.7	89.1	68.1	64.1	49.2	89.2	62.4	70.8	50.1	91.1	67.8	65.3	49.7	89.1	68.1	64.1	49.7	91.1	66.2	79.2	49.7	89.8	61.4	81.9
Stephens	52.0	90.1	71.8	59.3	49.9	86.4	62.9	54.4	52.5	93.3	67.5	65.6	52.0	90.1	71.8	59.3	51.3	86.9	65.5	69.9	49.6	88.4	62.5	64
Stingray CL+	51.8	90.8	73.8	57.3	48.2	88.5	62.2	56.7	50.3	89.7	67.3	60.6	51.8	90.8	73.8	57.3	50.1	89.6	68.0	66.1	50.2	90.4	61.8	67.3
SY Assure	52.3	94.1	74.2	67.6	50.3	90.7	63.9	64.7	51.0	93.1	68.5	64.8	52.3	94.1	74.2	67.6	52.5	94.5	75.0	70.0	50.6	93.2	64.4	73.8
SY Ovation	51.4	90.0	68.9	63.8	49.0	84.8	61.5	60.4	50.7	87.0	64.7	66.6	51.4	90.0	68.9	63.8	51.3	86.3	67.7	70.1	50	87.2	61.8	71.9
SY Raptor	51.0	88.0	68.8	55.5	48.4	86.7	62.3	52.5	50.6	88.8	67.2	54.2	51.0	88.0	68.8	55.5	50.9	87.5	68.9	58.6	49.5	86.7	61.5	61.7
UI Castle CL+	49.7	89.6	67.2	81.8	49.0	86.7	60.9	82.0	51.1	88.1	66.1	80.3	49.7	89.6	67.2	81.8	51.3	89.0	68.9	96.0	50.7	88.1	59.7	85.7
UI Magic CL+	51.2	90.0	66.8	78.7	49.0	87.3	61.7	77.9	51.0	88.7	65.2	81.1	51.2	90.0	66.8	78.7	51.7	88.8	67.3	91.3	51.4	89.7	61.7	93.1
UI Sparrow	54.6	90.9	77.7	73.6	55.5	88.9	67.0	77.3	54.2	92.1	73.2	76.5	54.6	90.9	77.7	73.6	53.6	87.8	74.7	83.3	52.1	88.8	64.6	98.1
UIL17-6834 CL+	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	54.7	103.2	73.0	91.0	56.2	97.9	68.4	87.4
VI Bulldog	51.7	90.1	69.7	60.8	48.0	86.3	61.1	58.0	49.8	91.9	69.1	65.0	51.7	90.1	69.7	60.8	---	---	---	---	---	---	---	---
VI Presto CL+	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	50.5	89.4	68.1	66.2	50.7	85.8	60.3	68.8
VI Shock	51.2	90.9	69.2	71.7	49.5	87.7	62.3	70.3	50.5	90.4	67.6	70.3	51.2	90.9	69.2	71.7	---	---	---	---	---	---	---	---
VI Voodoo CL+	52.8	91.6	71.3	86.8	49.9	88.5	60.4	85.6	52.4	91.7	70.1	92.2	52.8	91.6	71.3	86.8	50.2	90.4	65.5	101.6	51	92.2	61	105.7
WA8293	54.3	91.8	74.1	69.5	52.2	91.8	66.1	65.3	51.7	92.9	70.6	68.7	54.3	91.8	74.1	69.5	52.4	93.0	71.2	76.7	52.1	89.4	63.2	76.8
WA8307	55.1	95.0	75.2	79.0	53.8	95.1	67.8	85.7	54.8	96.5	73.0	80.0	55.1	95.0	75.2	79.0	54.1	98.0	76.4	87.5	53.1	96.1	68.6	87.9
WB 456	54.9	91.5	75.9	64.5	51.9	89.3	63.7	58.8	52.3	89.5	69.6	63.0	54.9	91.5	75.9	64.5	52.1	90.9	68.5	71.2	51.5	89.9	62	73.9
WB1376CLP	54.8	95.2	75.4	66.0	52.5	91.9	65.8	62.1	53.1	93.3	69.8	58.2	54.8	95.2	75.4	66.0	---	---	---	---	51.7	90.9	63.2	75.6
WB1529	53.1	91.8	72.8	81.1	50.1	92.4	62.8	78.3	53.1	94.5	69.8	81.7	53.1	91.8	72.8	81.1	53.5	96.1	78.3	94.3	53	98	66	104.5
WB1783	57.3	101.2	84.0	74.6	55.9	103.1	70.2	74.5	57.5	103.6	79.2	76.2	57.3	101.2	84.0	74.6	57.1	98.5	77.2	83.2	57.7	100.3	71.5	79.4
YSC-201	49.5	88.9	68.8	61.0	---	---	---	---	---	---	---	---	49.5	88.9	68.8	61.0	---	---	---	---	---	---	---	---
YSC-215	51.1	86.9	68.7	63.8	---	---	---	---	---	---	---	---	51.1	86.9	68.7	63.8	---	---	---	---	---	---	---	---
Location average	**51.9**	**90.7**	**68.5**	**69.0**	**51.0**	**89.1**	**64.1**	**67.5**	**52.0**	**92.2**	**68.9**	**71.1**	**51.9**	**90.7**	**68.5**	**69.0**	**51.7**	**92.8**	**70.7**	**81.1**	**51.5**	**91.1**	**64.3**	**81.7**

Table 72. Grain Protein & Kernel Hardness of Hard Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	----------Grain Protein %----------						----------Kernel Hardness 0-100----------					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Hard Red Spring												
09W821030-32	13.5	12.8	13.1	12.9	---	**13.1**	75	77	80	74	---	**77**
Alum	13.3	12.7	13.7	13.2	9.9	**12.6**	88	92	94	80	80	**87**
AP Octane	12.4	13.8	12.7	---	---	**13.0**	73	74	79	---	---	**75**
AP Renegade	13.3	12.6	12.7	12.9	10.2	**12.3**	89	94	96	88	81.0	**90**
AP Renegade + base	13.0	12.0	12.9	12.4	10.5	**12.2**	86	90	96	91	87	**90**
AP Renegade + base + root	13.4	12.7	12.6	12.1	10.1	**12.2**	88	94	93	96	85	**91**
AP Venom	12.2	12.8	12.4	---	---	**12.5**	72	69	77	---	---	**73**
BZ917-099	14.5	14.4	14.0	13.9	10.5	**13.5**	76	78	77	76	---	**77**
Choteau	---	---	---	---	10.9	**10.9**	---	---	---	---	84.0	**84**
CP3066	13.8	13.3	13.2	13.0	10.0	**12.7**	81	78	85	78	78.0	**80**
Dagmar	14.0	13.7	14.9	14.1	11.3	**13.6**	99	98	103	99	94	**99**
Dayn (W)	13.8	12.4	13.2	12.9	10.6	**12.6**	90	94	102	92	88	**93**
DuClair	---	---	---	---	9.9	**9.9**	---	---	---	---	88.0	**88**
Expresso	14.5	13.1	14.5	13.5	11.4	**13.4**	94	86	98	95	87	**92**
Glee	13.4	12.7	12.4	12.4	9.8	**12.1**	82	85	92	85.0	79.0	**85**
IDO1603S	13.5	13.0	13.4	13.4	9.9	**12.6**	77	79	84	79	73.0	**78**
IDO1701S	14.4	12.9	14.1	13.7	11.3	**13.3**	76	81	79	72	82	**78**
IDO1804S (W)	12.7	12.2	13.3	12.7	10.0	**12.2**	97	98	104	100	88	**97**
IDO1805S	12.8	12.7	13.0	13.4	10.4	**12.5**	81	90	90	86	79.0	**85**
IDO1904S	13.5	12.3	13.0	12.6	10.5	**12.4**	93	95	95	86	84	**91**
IDO2002	12.9	11.9	12.6	12.5	9.6	**11.9**	79	77	84	79.0	77.0	**79**
IDO2004	13.4	11.3	12.6	12.1	9.3	**11.7**	96	95	101	95	93.0	**96**
Jefferson	13.2	12.4	13.3	12.9	10.3	**12.4**	86	89	94	85	86	**88**
Klasic (W)	12.5	13.0	12.5	13.1	9.2	**12.1**	61	75	72	63	63	**67**
Lanning	13.6	14.4	14.8	14.0	10.7	**13.5**	85	92	95	89	89.0	**90**
LAR17-0125	13.5	13.0	13.9	12.9	9.9	**12.6**	94	96	108	99	83	**96**
MT1673	---	---	---	---	10.9	**10.9**	---	---	---	---	75.0	**75**
MT1716	13.3	14.0	14.0	13.2	9.8	**12.9**	84	90	97	94	89.0	**91**
MT1775	14.0	13.1	14.4	13.4	10.7	**13.1**	105	106	105	101	91	**102**
Net CL+	13.3	12.6	13.8	12.9	10.0	**12.5**	89	99	94	93	86	**92**
SY Gunsight	13.5	12.7	12.9	12.3	---	**12.8**	82	85	83	82	---	**83**
SY-Teton (W)	12.2	11.9	12.3	12.5	8.6	**11.5**	73	77	79	67	70	**73**
UI Platinum (W)	12.7	13.0	12.3	12.9	9.0	**12.0**	73	81	77	70.0	65.0	**73**
WB7202CLP (W)	12.5	12.8	12.5	12.7	8.9	**11.9**	81	91	90	81	82.0	**85**
WB7328 (W)	13.9	13.8	13.1	12.9	10.0	**12.7**	66	70	73	65	65	**68**
WB7589 (W)	13.7	13.5	13.8	12.7	10.0	**12.7**	81	86	88	83	76	**83**
WB7696	12.2	12.3	13.2	12.0	9.4	**11.8**	77	81	80	78	73.0	**78**
WB9303	14.7	13.5	14.5	14.2	10.8	**13.5**	90	89	83	86	84	**86**
WB9590	13.6	14.0	13.9	13.5	10.7	**13.1**	89	94	102	90.0	92.0	**93**
WB9668	14.1	13.8	14.1	13.5	11.2	**13.3**	86	88	92	88	89.0	**89**
WB9707	13.0	13.2	14.3	13.8	10.8	**13.0**	84	89	93	86	86	**88**
WB9879CLP	13.7	12.9	14.0	13.9	11.0	**13.1**	85	89	94	90	88	**89**
Location Average	**13.4**	**13.0**	**13.4**	**13.1**	**10.2**	**12.6**	**84**	**87**	**90**	**85**	**82**	**86**

(W) = White

Table 73. Percent Flour Protein and Flour Yield of Hard Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Flour Protein (14% mb)						Flour Yield (%)					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Hard Red Spring												
09W821030-32	13.5	12.9	13.5	12.86	---	**13.2**	74.5	69.1	73.3	73.1	---	**72.5**
Alum	12.8	13	14.2	12.6	10	**12.5**	73.5	74.5	75.2	76.0	71.9	**74.2**
AP Octane	12.9	14.2	12.3	---	---	**13.1**	72.2	68.2	73.4	---	---	**71.3**
AP Renegade	12.2	12.8	12.6	12.37	9.8	**12.0**	72.5	73.9	73.7	74.1	68.7	**72.6**
AP Renegade + base	12.5	11.8	12.3	11.59	9.5	**11.5**	72.7	73.4	73.2	74.1	69.2	**72.5**
AP Renegade + base + root	13.2	12.5	12	11.38	9.3	**11.7**	72.9	73.7	74.6	73.7	68.8	**72.7**
AP Venom	11.9	13.2	12.5	---	---	**12.5**	71.9	68.7	---	---	---	**70.3**
BZ917-099	14.7	15.2	14.7	12.7	10.2	**13.5**	74.0	71.3	73.5	74.9	69.3	**72.6**
CP3066	13.8	13.5	13.3	13.2	9.6	**12.7**	75.7	71.8	76.6	74.7	69.9	**73.8**
Dagmar	14.1	13.8	14.9	14.2	10.8	**13.6**	70.8	70.0	72.6	73.6	67.2	**70.8**
Expresso	14.4	13.8	15	13.62	11.1	**13.6**	71.2	68.9	73.7	73.3	67.3	**70.9**
Glee	13.6	13.4	12.4	12.1	9.2	**12.1**	73.9	72.8	75.3	76.0	71.6	**73.9**
IDO1603S	12.9	13.2	14	13.1	9.4	**12.5**	73.1	71.8	72.9	74.8	67.6	**72.1**
IDO1701S	14.4	13.9	14.6	14.2	10.6	**13.5**	72.3	71.2	71.5	74.2	67.5	**71.3**
IDO1805S	12.9	12.7	13.3	12.9	10.0	**12.4**	74.4	72.0	73.7	74.2	68.5	**72.5**
Jefferson	12.5	12.8	13.7	12.9	9.3	**12.2**	74.4	73.7	74.9	75.6	70.3	**73.8**
Lanning	13.8	15.1	14.5	13.36	9.9	**13.3**	69.6	68.5	70.0	72.1	65.6	**69.2**
MT1716	13.1	14.7	13.8	12.9	9.2	**12.7**	74.5	69.8	73.2	75.2	69.2	**72.4**
MT1775	13.5	13.7	14.9	12	10.1	**12.8**	73.8	73.6	75.3	74.3	68.8	**73.1**
Net CL+	12.9	12.7	14.1	12.47	9.7	**12.4**	73.6	71.4	72.4	74.2	68.7	**72.1**
SY Gunsight	13.1	12.9	12.6	11.8	---	**12.6**	73.0	72.0	73.7	74.0	---	**73.2**
WB9303	13.8	14.2	15.1	14.06	10.4	**13.5**	71.2	71.1	70.8	72.8	68.7	**70.9**
WB9590	13.9	14	14.2	13.41	10.4	**13.2**	71.4	70.6	72.2	73.0	66.8	**70.8**
WB9668	13.6	14.3	15	13.71	10.8	**13.5**	73.5	69.4	71.7	73.0	67.9	**71.1**
WB9707	12.9	14.1	15.3	13.57	10.6	**13.3**	74.8	69.9	73.4	74.7	69.8	**72.5**
WB9879CLP	13.5	12.8	14.8	13.15	10.8	**13.0**	71.4	69.3	70.8	71.7	67.1	**70.1**
Location Average	**13.3**	**13.5**	**13.8**	**12.9**	**10.0**	**12.7**	**73.0**	**71.2**	**73.3**	**74.0**	**68.7**	**72.0**
Hard White Spring												
Choteau	---	---	---	---	10.2	**10.2**	---	---	---	---	68.5	**68.5**
Dayn	13.2	12.4	13.4	12.4	10.1	**12.3**	73.8	71.4	75.2	74.6	69.0	**72.8**
DuClair	---	---	---	---	9.3	**9.3**	---	---	---	---	68.3	**68.3**
IDO1804S	12.1	11.9	12.1	12.1	9.6	**11.6**	72.1	71.5	74.6	74.3	69.6	**72.4**
IDO1904S	13.7	12.1	13.7	11.4	9.7	**12.1**	71.8	71.0	74.4	73.9	67.5	**71.7**
IDO2002	12.3	11.7	12.4	11.4	8.8	**11.3**	73.0	71.3	73.5	75.3	69.9	**72.6**
IDO2004	13.4	10.7	13.1	11	8.5	**11.3**	72.4	71.7	74.2	74.8	69.2	**72.5**
Klasic	13.2	13	12.5	12.9	8.7	**12.1**	74.2	72.4	76.5	75.8	70.2	**73.8**
LAR17-0125	13.4	12.9	14.3	11.9	9.6	**12.4**	70.1	70.5	74.7	73.9	67.7	**71.4**
MT1673	---	---	---	---	10.4	**10.4**	---	---	---	---	68.7	**68.7**
MT1865	---	---	---	---	9.8	**9.8**	---	---	---	---	69.1	**69.1**
SY-Teton	11.6	12.3	11.6	12.8	7.9	**11.2**	72.2	70.4	73.4	74.0	68.4	**71.7**
UI Platinum	12.6	12.9	12.1	12.5	8.8	**11.8**	74.8	74.5	75.5	76.5	72.7	**74.8**
WB7202CLP	12.3	12.6	11.4	12	8.1	**11.3**	71.2	70.9	72.2	72.1	68.4	**71.0**
WB7328	14.6	14.1	12.5	13.2	9.6	**12.8**	71.2	71.2	73.9	73.7	70.2	**72.0**
WB7589	13.6	14.2	14.5	11.7	9.9	**12.8**	71.9	70.4	73.0	74.9	69.1	**71.9**
WB7696	12.3	12.3	12.9	12	9.5	**11.8**	73.5	73.3	73.8	76.4	72.2	**73.8**
Location Average	**12.9**	**12.5**	**12.8**	**12.1**	**9.3**	**11.9**	**72.5**	**71.6**	**75.3**	**74.6**	**69.3**	**72.7**

mb = moisture basis

Table 74. Bake Volume of Hard Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Bake Volume (cc)					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Hard Red Spring Wheat						
09W821030-32	1000	950	1000	925	---	**969**
Alum	975	1100	1125	1025	700	**985**
AP Octane	875	1225	925	---	---	**1008**
AP Renegade	925	1025	925	950	600	**885**
AP Renegade + base	750	900	950	925	600	**825**
AP Renegade + base + root	900	875	750	900	600	**805**
AP Venom	900	1025	950	---	---	**958**
BZ917-099	1025	1025	1100	900	650	**940**
CP3066	1025	1025	925	875	700	**910**
Dagmar	1100	1125	1125	1050	875	**1055**
Expresso	1100	1075	925	975	825	**980**
Glee	1125	1200	850	925	850	**990**
IDO1603S	975	1025	1100	1050	725	**975**
IDO1701S	1025	1150	1400	1100	750	**1085**
IDO1805S	950	975	950	975	725	**915**
Jefferson	900	1025	825	725	800	**855**
Lanning	875	1125	925	900	700	**905**
MT1716	950	1050	1100	950	600	**930**
MT1775	875	875	900	825	700	**835**
Net CL+	875	1125	900	975	800	**935**
SY Gunsight	950	950	875	825	---	**900**
WB9303	975	1200	950	900	775	**960**
WB9590	1100	1075	1000	900	700	**955**
WB9668	1000	1150	1050	1000	725	**985**
WB9707	1000	1050	1000	1000	675	**945**
WB9879CLP	875	1025	825	800	700	**845**
Location Average	**963**	**1052**	**1050**	**932**	**717**	**943**
Hard White Spring Wheat						
Choteau	---	---	---	---	750	**750**
Dayn	1025	975	900	850	800	**910**
DuClair	---	---	---	---	650	**650**
IDO1804S	800	900	1075	---	675	**863**
IDO1904S	1050	1000	975	---	750	**944**
IDO2002	925	925	1100	---	650	**900**
IDO2004	1025	925	950	---	700	**900**
Klasic	1025	1075	925	1025	700	**950**
LAR17-0125	950	1025	1050	---	725	**938**
MT 1865	---	---	---	---	775	**775**
MT1673	---	---	---	---	875	**875**
SY-Teton	900	925	925	925	650	**865**
UI Platinum	950	900	875	---	650	**844**
WB7202CLP	875	1000	950	---	600	**856**
WB7328	925	1175	1000	---	750	**963**
WB7589	825	1000	1050	---	750	**906**
WB7696	925	975	1175	---	800	**969**
Location Average	**938**	**985**	**996**	**933**	**721**	**915**

Table 75.Grain Protein & Kernel Hardness of Soft White Spring Wheat Varieties and Selections Grown in Southeast Idaho , 2020.

	--------Grain Protein %--------						--------Kernel Hardness 0-100--------					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Alturas	8.7	10.1	9.5	9.5	9.0	**9.4**	28	33	32	36	27	**31.2**
AP Coachman	8.6	9.4	9.7	9.3	9.1	**9.2**	40	41	40	40	32	**38.6**
Louise	10.0	9.5	9.5	9.6	8.6	**9.4**	36	37	38	39	32	**36.4**
Melba (club)	7.9	9.4	8.0	9.0	7.8	**8.4**	31	35	35	40	26	**33.4**
Ryan	9.8	10.3	9.0	9.9	8.4	**9.5**	34	32	35	42	31	**34.8**
Seahawk	8.1	9.3	9.8	8.9	8.4	**8.9**	39	37	37	35	31	**35.8**
Tekoa	8.1	9.8	9.3	9.6	8.4	**9.0**	34	34	34	39	27	**33.6**
UI Cookie	9.2	9.4	9.7	9.9	8.5	**9.3**	24	25	24	27	25	**25.0**
UI Pettit	9.9	9.5	9.3	9.7	8.3	**9.3**	37	26	31	37	28	**31.8**
UI Stone	8.1	9.3	9.3	9.6	8.1	**8.9**	22	25	23	28	16	**22.8**
WA 8326	9.0	9.0	9.2	9.1	7.4	**8.7**	35	34	37	32	28	**33.2**
WA 8327	8.0	9.6	9.0	9.4	8.1	**8.8**	33	35	35	39	27	**33.8**
WA 8328	9.0	10.2	9.0	9.3	8.3	**9.2**	31	34	35	39	30	**33.8**
WB-1035CL+	10.5	10.9	10.8	11.0	9.2	**10.5**	43	47	45	45	40	**44.0**
WB6430	8.4	9.7	9.4	9.5	8.1	**9.0**	27	29	32	43	27	**31.6**
IDO1404S	9.7	9.4	9.5	8.7	8.1	**9.1**	37	36	37	27	27	**32.8**
IDO1702S	9.5	10.0	8.9	10.1	8.7	**9.4**	31	33	29	34	25	**30.4**
IDO1902S	9.6	9.7	9.5	10.0	8.9	**9.5**	34	35	35	38	30.0	**34.4**
Location Average	**9.0**	**9.7**	**9.4**	**9.6**	**8.4**	**9.2**	**33.1**	**33.8**	**34.1**	**36.7**	**28.3**	**33.2**

Table 76. Percent Flour Protein and Flour Yield of Soft White Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Flour Protein (14% mb)						Flour Yield (%)					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Alturas	7.3	8.5	8.2	7.9	8.2	**8.0**	76	75	78	77	76	**76**
AP Coachman	6.7	7.4	7.9	7.5	7.4	**7.4**	74	76	76	75	72	**75**
Louise	7.8	7.9	8.2	7.8	7	**7.7**	75	76	77	76	75	**76**
Melba (club)	7.1	7.9	6.9	7.3	7	**7.2**	77	77	79	78	76	**77**
Ryan	8.5	8.7	7.7	8.1	7	**8.0**	76	74	77	76	76	**76**
Seahawk	6.6	7.6	8.9	7.7	6.9	**7.5**	76	76	78	78	75	**77**
Tekoa	6.7	8.3	8.2	7.6	7.5	**7.7**	77	76	78	79	77	**78**
UI Cookie	7.5	8	8.4	8.3	7.2	**7.9**	73	71	75	75	74	**73**
UI Pettit	8.3	8	8.3	7.7	7.2	**7.9**	77	76	78	78	75	**77**
UI Stone	6.7	8	8.2	7.9	7.1	**7.6**	76	76	78	78	76	**77**
WA 8326	7.8	7.4	7.8	7.6	6.2	**7.4**	77	76	77	78	75	**77**
WA 8327	6.5	7.8	7.7	7.2	6.7	**7.2**	76	75	77	77	75	**76**
WA 8328	7.7	8.4	7.8	7.6	7	**7.7**	76	77	78	78	75	**77**
WB-1035CL+	8.8	9.1	9.3	9.4	8.1	**8.9**	72	72	73	75	72	**73**
WB6430	7.2	7.9	8.1	7.5	7.2	**7.6**	75	76	77	76	75	**76**
IDO1404S	8.1	7.8	7.9	7.6	7	**7.7**	75	76	76	76	74	**75**
IDO1702S	8.1	8.6	8	8.5	7.8	**8.2**	74	74	76	77	75	**75**
IDO1902S	7.7	8.3	8.1	8.1	7.3	**7.9**	75	76	77	77	75	**76**
Location Average	**7.5**	**8.1**	**8.1**	**7.9**	**7.2**	**7.7**	**75**	**75**	**77**	**77**	**75**	**76**

mb = Moisture basis

Table 77. Percent Break Flour and Cookie Diameter of Soft White Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Break Flour (%)						Cookie Diameter (cm)					
Variety or Selection	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**	**Aberdeen**	**Rupert**	**Idaho Falls**	**Ashton**	**Soda Springs**	**Average**
Alturas	48	44	47	47	50	**47**	9.2	9.1	9.2	9.0	---	**9.1**
AP Coachman	46	44	46	45	46	**45**	9.3	9.1	8.9	9.1	8.9	**9.1**
Louise	48	46	49	47	49	**48**	9.4	9.1	9.1	9.2	9.2	**9.2**
Melba (club)	51	49	52	51	52	**51**	9.3	9.4	9.4	9.1	9.3	**9.3**
Ryan	48	45	49	46	49	**47**	9.1	9.2	9.0	8.9	9.2	**9.1**
Seahawk	49	46	48	50	49	**48**	9.2	9.3	9.1	9.1	9.0	**9.1**
Tekoa	51	47	50	51	51	**50**	9.4	9.1	9.0	9.2	9.1	**9.2**
UI Cookie	47	45	47	50	51	**48**	9.3	9.3	9.3	9.2	9.3	**9.3**
UI Pettit	49	47	50	51	48	**49**	9.1	9.4	9.3	9.1	9.4	**9.3**
UI Stone	52	49	51	54	51	**51**	9.5	9.2	9.1	9.3	9.1	**9.2**
WA 8326	50	48	50	52	51	**50**	9.6	9.6	9.5	9.6	9.3	**9.5**
WA 8327	51	47	50	52	50	**50**	9.3	9.3	9.3	9.4	9.6	**9.4**
WA 8328	47	45	48	49	47	**47**	9.1	9.0	9.1	9.1	9.4	**9.1**
WB-1035CL+	41	39	41	42	42	**41**	8.8	8.7	8.7	8.6	8.8	**8.7**
WB6430	49	49	49	49	48	**49**	9.6	9.2	9.2	9.6	8.6	**9.2**
IDO1404S	47	47	47	47	47	**47**	9.2	9.4	9.2	9.2	9.7	**9.3**
IDO1702S	46	44	46	47	46	**46**	9.1	9.0	9.1	9.0	9.3	**9.1**
IDO1902S	48	47	48	48	48	**48**	9.3	9.2	9.2	9.1	9.1	**9.2**
Location Average	**48**	**46**	**48**	**49**	**49**	**48**	**9.3**	**9.2**	**9.2**	**9.2**	**9.2**	**9.2**

Table 78. Solvent Retention Capacity data for Soft White Spring Wheat Varieties and Selections Grown in Southeast Idaho, 2020.

	Rupert				Aberdeen				Idaho Falls			
Variety or Selection	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**
Alturas	53.4	94.5	67.9	85.0	50.0	90.6	66.4	77.3	54.2	91.8	68.6	74.5
AP Coachman	54.6	97.5	72.2	73.6	52.3	94.6	68.2	70.3	54.6	97.0	72.6	67.8
Louise	51.0	90.1	66.7	79.2	50.4	87.3	64.8	72.7	52.5	89.5	69.5	74.1
Melba (club)	50.5	84.7	65.2	57.6	50.6	84.4	64.8	63.1	52.1	84.4	70.1	55.1
Ryan	53.6	94.3	68.2	76.2	52.5	90.3	67.2	71.0	53.7	91.1	69.6	62.7
Seahawk	51.4	92.4	71.8	66.8	51.2	90.5	68.6	65.3	52.0	89.5	67.7	59.9
Tekoa	49.5	89.1	63.0	76.0	49.6	85.6	62.2	66.7	50.0	86.6	63.5	71.0
UI Cookie	50.1	94.2	65.8	76.3	50.2	92.0	65.8	82.3	50.4	92.1	66.8	71.9
UI Pettit	50.4	88.4	64.3	62.9	50.5	85.9	64.4	67.0	50.7	86.0	65.0	60.7
UI Stone	48.9	89.3	63.3	77.4	47.7	86.7	62.5	72.5	50.0	87.4	63.9	74.2
WA 8326	47.8	83.5	61.2	66.1	48.9	82.7	62.4	68.7	49.1	81.8	63.2	63.3
WA 8327	52.0	90.4	66.5	78.2	52.3	87.7	69.1	72.7	54.0	89.1	68.6	71.4
WA 8328	53.6	96.4	73.7	76.1	50.8	91.9	69.0	73.4	53.7	91.5	74.2	66.8
WB-1035CL+	58.2	104.4	79.1	84.1	56.2	104.9	77.7	86.9	58.0	100.7	74.8	72.9
WB6430	50.5	88.4	67.5	55.9	50.2	85.4	62.3	60.0	49.8	85.5	62.8	55.5
IDO1404S	50.4	88.2	63.5	60.6	51.0	86.6	65.4	62.4	51.5	89.4	65.8	63.3
IDO1702S	55.0	102.9	78.1	82.3	52.5	100.5	70.2	88.9	53.3	98.4	72.1	77.7
IDO1902S	51.5	89.9	67.8	79.3	50.7	88.2	64.6	83.8	51.3	88.0	63.3	77.2
Location average	**51.8**	**92.1**	**68.1**	**73.0**	**51.0**	**89.8**	**66.4**	**72.5**	**52.3**	**90.0**	**67.9**	**67.8**

	Ashton				Soda Springs			
Variety or Selection	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**	**Water**	**Sucrose**	**Na2CO3**	**LacticAcid**
Alturas	52.6	93.1	68.8	87.4	52.6	95.0	68.1	93.4
AP Coachman	53.8	97.1	69.5	72.6	54.5	96.0	67.5	73.3
Louise	52.1	89.6	70.3	84.0	54.7	90.2	68.2	79.4
Melba (club)	51.7	86.4	69.3	62.9	54.8	84.2	66.0	60.5
Ryan	53.3	92.4	71.4	77.0	55.3	91.7	68.9	69.0
Seahawk	51.8	93.5	71.7	71.2	53.5	93.7	68.2	73.8
Tekoa	50.4	90.1	64.8	79.6	52.3	89.4	67.3	75.8
UI Cookie	54.6	98.1	72.8	95.8	51.9	87.4	65.9	68.8
UI Pettit	50.6	88.9	65.5	67.3	52.8	88.4	65.4	64.6
UI Stone	49.2	91.0	65.5	89.3	50.8	89.5	64.4	81.5
WA 8326	51.5	83.2	65.1	75.3	51.6	83.1	61.1	70.4
WA 8327	52.3	90.3	70.7	81.5	53.8	88.8	66.0	80.6
WA 8328	52.5	93.5	71.7	75.6	53.1	94.8	70.5	78.7
WB-1035CL+	57.0	102.9	78.5	89.9	57.1	104.3	79.0	87.5
WB6430	49.7	84.9	64.6	59.7	51.2	87.6	67.0	59.6
IDO1404S	51.2	89.5	67.5	66.0	50.0	88.2	63.5	63.4
IDO1702S	53.0	97.8	72.7	85.8	52.1	98.7	67.9	85.3
IDO1902S	53.7	88.6	67.9	87.3	51.8	90.3	69.5	85.3
Location average	**52.3**	**91.7**	**69.4**	**78.2**	**53.0**	**91.2**	**67.5**	**75.1**

Addendum 1. Stripe rust (*Puccinia striiformis* f. sp. *tritici*) ratings for 2019 winter wheat. Stripe rust was not severe in 2020 and 2021 in southeast Idaho. Ratings were based on an index of percent tissue affected by stripe rust multiplied by infection type.

Table 1. Reaction of hard winter wheat varieties and selections to stripe rust under naturally occuring infection, Aberdeen, 2019.

Variety or Selection	Stripe Rust Infection Type (IT)	Percent Leaf Area Infected (PLAI)	IT x PLAI %	Stripe Rust Rating
AP Nugrain (W)	6.0	40	2.40	S
Bobcat	0.0	0	0.00	R
FourOsix	6.0	1	0.06	R
Greenville	6.0	45	2.40	VS
IDO1506 (W)	6.0	20	1.20	S
IDO1607	6.0	70	4.20	VS
IDO1806 (W)	6.0	50	3.00	VS
Irv (W)	0.0	0	0.00	R
Keldin	6.0	40	2.40	S
Keldin + 11-52-0	6.0	40	2.40	S
LCS Jet	7.0	20	1.40	S
LCS Rocket	0.0	0	0.00	R
LCS Yeti (W)	7.0	20	1.40	S
LCS Zoom	0.0	0	0.00	R
Millie (W)	0.0	0	0.00	R
Norwest 553*	0/7	0/60	0/2.4	R/S
Ray	5.0	20	1.00	S
Scorpio	7.0	5	0.35	MR
Sequoia	7.0	60	4.20	VS
UI Bronze Jade (W)	7.0	50	3.50	VS
Utah 100	6.0	60	3.60	VS
WA8252 (W)	6.0	20	1.20	S
WA8289	6.0	30	1.80	S
WB4311	0.0	0	0.00	R
WB4623CLP	0.0	0	0.00	R
WB4792	6.0	40	2.40	S
Whetstone	7.0	70	4.90	VS
Yellowstone	6.0	40	2.40	S
Average	**4.7**	**28**	**1.80**	

* Mixture

(W) = White

Infecton Type: on a scale of 0 to 9, where 0 is immune,

1 is resistant, and 8 to 9 is very susceptible.

Table 2. Reaction of soft white winter wheat varieties and selections to stripe rust under naturally occuring infection, Aberdeen, 2019.

Variety or Selection	Stripe Rust Infection Type (IT)	Percent Leaf Area Infected (PLAI)	IT x PLAI %	Stripe Rust Rating
Appleby CL+	6.0	2	0.12	R
Brundage	8.0	80	6.40	VS
Bruneau	6.0	10	0.60	MS
IDO1708	7.0	1	0.07	MR
Jasper	7.0	1	0.07	MR
LCS Artdeco	0.0	0	0.00	R
LCS Blackjack	0.0	0	0.00	R
LCS Drive	0.0	0	0.00	R
LCS Ghost	6.0	1	0.06	R
LCS Hulk	0.0	0	0.00	R
LCS Shark	0.0	0	0.00	R
Nixon	0.0	0	0.00	R
Norwest Duet	0.0	0	0.00	R
Norwest Tandem	0.0	0	0.00	R
OR2X2CL+	0.0	0	0.00	R
Purl	6.0	2	0.12	R
Rosalyn	6.0	5	0.30	MR
Stephens	6.0	40	2.40	S
Stingray CL+	0.0	0	0.00	R
SY Ovation	8.0	10	0.80	MS
SY Assure	0.0	0	0.00	R
SY Raptor	0.0	0	0.00	R
UI Castle CL+	6.0	5	0.30	MR
UI Magic CL+	6.0	50	3.00	VS
UI Sparrow	7.0	50	3.50	VS
UIL 11-456031A	0.0	0	0.00	R
UIL 17-6333 (CL+)	0.0	0	0.00	R
UIL 17-6546 (CL+)	0.0	0	0.00	R
UIL 17-6834 (CL+)	0.0	0	0.00	R
VI Bulldog	0.0	0	0.00	R
VI Shock	0.0	0	0.00	R
VI Voodoo CL+	6.0	1	0.06	R
WB 456	6.0	10	0.60	MS
WB1376CLP	7.0	10	0.70	MS
WB1529	0.0	0	0.00	R
WB1783	7.0	2	0.14	MR
Average	**3.1**	**8**	**0.53**	

TIPS:

R to MR - should not need fungicides

R to MR - should not need fungicides unless disease pressure becomes high

MR to MS - consider spraying with protective fungicides under medium to high disease pressure

S = will need protective fungicide application when stripe rust is present

VS = will need fungicdes in the presence of stripe rust, at times up to three applicatons in severe years

Addendum 2. Stripe rust (*Puccinia striiformis* f. sp. *tritici*) ratings for 2019 spring wheat. Stripe rust was not severe in 2020 and 2021 in southeast Idaho. Ratings were based on an index of percent tissue affected by stripe rust multiplied by infection type.

Table 1. Reaction of hard spring wheat varities and selections to stripe rust under naturally occuring infection, Aberdeen, 2019.

Variety or Selection	Stripe Rust Infection Type (IT)	Percent Leaf Area Infected (PLAI)	IT x PLAI (%)	Stripe Rust Rating
12SB0224 (W)	0	0	0.0	R
Alum	0	0	0.0	R
Alzada (D)	6	1	0.1	R
AP Octane	0	0	0.0	R
AP Venom	6	5	0.3	MR
AP Renegade	0	0	0.0	R
Cabernet	6	1	0.1	R
CPX36619	0	0	0.0	R
Dayn (W)	0	0	0.0	R
Glee	0	0	0.0	R
IDO1603S	6	2	0.1	R
IDO1701S	0	0	0.0	R
IDO1702S	6	1	0.1	R
IDO1805S	0	0	0.0	R
Imperial (D)	3	5	0.2	R
Jefferson	7	30	2.1	S
Klasic (W)	6	30	1.8	S
SY Coho	6	10	0.6	MS
SY Gunsight	0	0	0.0	R
SY-Teton (W)	6	10	0.6	MS
UI Platinum (W)	5	20	1.0	S
WA8280 CL+	6	1	0.1	R
WB7202 CLP	0	0	0.0	R
WB7328 (W)	6	20	1.2	S
WB7589 (W)	6	1	0.1	R
WB7696	6	30	1.8	S
WB9411	0	0	0.0	R
WB9590	6	40	2.4	S
WB9668	0	0	0.0	R
WB9879CLP	7	30	2.1	S
Average	**3.5**	**9.2**	**0.55**	

(W) = White
(D) = Durum
(CLP) = 2-gene Clearfield

Table 2. Reaction of soft white spring wheat varieties and selections to stripe rust under naturally occuring infection, Aberdeen, 2019.

Variety or Selection	Stripe Rust Infection Type (IT)	Percent Leaf Area Infected (PLAI)	IT x PLAI (%)	Stripe Rust Rating
Alturas	6	40	2.4	S
IDO1401S	6	60	3.6	VS
Louise	4	5	0.2	R
Melba	0	0	0.0	R
Ryan	6	2	0.1	R
Seahawk	0	0	0.0	R
SY Saltese	6	1	0.1	R
Tekoa	6	1	0.1	R
UI Cookie	4	40	1.6	S
UI Pettit	7	50	3.5	VS
UI Stone	6	40	2.4	S
WA 8297 CL+	0	0	0.0	R
WA 8303	0	0	0.0	R
WB 6121	0	0	0.0	R
WB 6430	0	0	0.0	R
WB-1035CL+	7	50	3.5	VS
Average	**3.6**	**18.3**	**1.1**	

Infecton Type: on a scale of 0 to 9, where 0 is immune, 1 is resistant, and 8 to 9 is very susceptible.

TIPS:

*** R to MR** - should not need fungicides

*** MR** - should not need fungicides unless disease pressure becomes high

*** MR to MS** - consider spraying with protective fungicides under medium to high disease pressure

*** S** = will need protective fungiicde application when stripe rust is present

*** VS** = will need fungicdes in the presence of stripe rust, at times up to three applicatons in severe years consider spraying at herbicide timing to prevent infection in S and VS varieties.

Addendum 3a. Results from the 2020 FHB spring wheat screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of hard red spring wheat varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
MT Sidney (MT1716)	MS	15.5	LM	1.3	FG	2.3	IJ
Rollag	MS	13.5	M	2.5	FG	2.8	IJ
Dagmar	S	35.0	F-J	1.5	FG	6.8	F-J
Glee	S	37.5	F-J	3.0	FG	6.1	F-J
IDO1603S	S	33.0	G-K	2.0	FG	4.4	G-J
IDO1701S	S	37.0	F-J	1.0	G	4.6	G-J
IDO1805S	S	38.5	E-J	0.5	G	3.7	HIJ
Lanning	S	20.0	KLM	1.5	FG	8.8	E-J
MT1775	S	42.0	D-J	2.0	FG	6.0	F-J
SY Gunsight	S	32.0	H-K	3.5	FG	4.2	G-J
WB9303	S	25.9	J-M	0.5	G	6.7	F-J
WB9411	S	29.5	I-L	0.5	G	4.6	G-J
WB9590	S	27.0	J-M	3.3	FG	4.4	G-J
WB9707	S	37.0	F-J	2.5	FG	6.4	F-J
WB9879CLP	S	43.0	D-J	0.5	G	3.8	HIJ
09W821030-32	VS	63.0	A	14.0	CDE	17.6	BCD
Alum	VS	52.5	A-E	10.0	DEF	11.2	D-H
AP Octane	VS	61.5	A	25.0	B	12.5	D-G
AP Renegade + base	VS	53.0	A-D	2.5	FG	5.2	G-J
AP Renegade + base + root2	VS	58.0	ABC	6.5	EFG	5.0	G-J
AP Renegade	VS	52.0	A-E	2.0	FG	5.1	G-J
AP Venom	VS	60.0	AB	20.0	BC	22.5	BC
BZ917-099	VS	51.1	A-F	7.5	EFG	6.0	F-J
Cabernet	VS	46.5	B-G	7.0	EFG	8.1	E-J
CP3066	VS	54.5	A-D	4.0	FG	10.3	D-I
Expresso	VS	52.5	A-E	11.0	DEF	25.0	B
HRS3419	VS	53.0	A-D	3.0	FG	1.7	J
Jefferson	VS	49.0	A-F	9.0	DEF	15.7	CDE
Kelse	VS	53.0	A-D	7.5	EFG	8.4	E-J
LCS Iron	VS	51.0	A-F	15.5	CD	11.7	D-H
Net CL+	VS	50.5	A-F	7.5	EFG	8.7	E-J
SY Basalt	VS	61.0	A	15.5	CD	21.5	BC
SY Coho	VS	59.5	ABC	8.0	D-G	14.4	C-F
WB9668	VS	36.5	F-J	2.5	FG	15.8	CDE
P (α=0.05)		<0.0001	**	<0.0001	**	<0.0001	**

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 3b. Results from the 2020 FHB spring wheat screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 2. Reaction of hard white spring wheat varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Dayn	S	36.0	EFG	3.5	C	6.3	F
IDO2004	S	39.0	D-G	2.0	C	7.6	EF
LAR17-0125	S	33.5	FGH	0.0	C	2.4	F
Snow Crest	S	21.0	H	1.5	C	7.4	EF
SY Selway	S	45.5	B-E	1.5	C	7.8	EF
WB7328	S	27.5	GH	3.0	C	11.4	DEF
WB-Paloma	S	41.5	C-F	8.0	BC	4.6	F
IDO1202S	VS	54.0	A-D	4.0	C	8.9	DEF
IDO1203A	VS	38.5	D-G	7.0	BC	11.0	DEF
IDO1602S	VS	43.5	C-E	7.5	BC	8.0	EF
IDO1804S	VS	54.5	ABC	12.5	BC	11.5	DEF
IDO1904S	VS	53.5	A-D	19.5	B	28.3	BC
IDO2002	VS	59.5	AB	17.5	B	30.6	B
Klasic	VS	56.0	AB	9.0	BC	19.7	B-e
LCS Star	VS	59.5	AB	69.5	A	36.2	A
SY-Teton	VS	47.5	B-E	13.0	BC	21.5	BCD
UI Platinum	VS	65.0	A	7.0	BC	12.0	DEF
WB7202CLP	VS	37.5	EFG	8.5	BC	15.4	C-F
WB7589	VS	64.5	A	18.5	B	22.0	BCD
WB7696	VS	61.5	A	11.0	BC	29.6	B
P (α=0.05)		<0.0001	**	0.0002	**	0.0038	**

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 3c. Results from the 2020 FHB spring wheat screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 3. Reaction of soft white spring wheat varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
IDO1403S	S	38.0	C-I	5.5	CD	7.6	CD
IDO1404S	S	45.0	A-F	1.0	D	3.2	D
IDO1702S	S	25.5	I	2.5	D	3.7	D
IDO1902S	S	46.5	A-E	3.0	CD	5.0	CD
Seahawk	S	33.5	E-I	7.5	CD	5.5	CD
UI Pettit	S	28.5	HI	8.5	BCD	8.1	CD
WA8326	S	30.0	GHI	9.0	BCD	6.4	CD
WB-1035CL+	S	34.5	D-I	5.5	CD	11.6	BCD
Alturas	VS	53.5	AB	9.5	BCD	5.9	CD
AP Coachman	VS	59.0	A	26.5	A	23.3	A
Louise	VS	55.0	AB	16.5	B	10.9	BCD
Melba (club)	VS	31.0	F-I	27.0	A	16.8	AB
Ryan	VS	46.5	A-E	9.5	BCD	8.7	BCD
Tekoa	VS	44.0	B-G	11.5	BC	8.6	BCD
UI Cookie	VS	42.0	B-H	9.5	BCD	6.7	CD
UI Stone	VS	42.5	B-H	8.0	BCD	5.5	CD
WA8327	VS	54.5	AB	7.0	CD	7.1	CD
WA8328	VS	48.5	A-D	2.5	D	4.2	D
WB6430	VS	37.5	D-I	4.5	CD	13.0	BC
P (α=0.05)		0.0022	**	0.0003	**	0.0122	*

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 3d. Results from the 2020 FHB spring wheat screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 3. Reaction of durum wheat varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Sedici	VS	79.5	A	57.0	A	41.9	AB
Soft Havasu	VS	71.5	AB	16.0	B	23.2	AB
Soft Alzada	VS	73.0	AB	24.5	AB	46.7	A
SveVo	VS	59.0	B	3.0	B	8.9	B
Soft SveVo	VS	61.7	B	5.3	B	10.5	B
Salzburg	VS	67.0	AB	10.5	B	22.1	AB
Alzada	VS	64.5	B	18.0	B	35.7	AB
Havasu	VS	63.0	B	23.0	AB	27.6	AB
P (α=0.05)		0.1452	ns	0.1638	ns	0.1291	ns

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 4a. Results from the 2020 FHB spring wheat screening nursery, Kimbrly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of hard red spring wheat varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Rollag	MR	3.8	J	2.5	L	6.8	K
HRS3419	MS	6.4	IJ	3.0	L	10.5	JK
MT1716	S	10.7	HIJ	9.0	KL	16.8	IJK
09W821030-32	VS	88.3	A	39.0	B-F	51.2	ABC
Alum	VS	27.5	F-J	20.0	H-K	35.3	EFG
Alzada	VS	86.5	abc	33.0	C-I	45.4	A-F
AP Octane	VS	54.5	C-F	40.5	A-E	48.3	A-E
AP Renegade	VS	40.6	D-G	24.5	G-K	27.3	F-I
AP Venom	VS	34.4	FGH	33.0	C-H	53.6	AB
BZ917-099	VS	66.4	ABC	56.0	A	40.2	B-F
Cabernet	VS	66.6	ABC	48.0	ABC	48.4	A-E
CP3066	VS	63.9	BCD	46.5	A-D	49.1	A-E
Dagmar	VS	34.5	FGH	16.5	I-L	31.9	FGH
Expresso	VS	39.3	EFG	29.5	E-J	59.9	A
Glee	VS	46.0	C-F	18.5	IJK	31.7	FGH
IDO1602S	VS	30.5	FGH	14.5	JKL	26.8	F-J
IDO1603S	VS	58.9	B-E	47.5	A-D	42.9	B-F
IDO1701S	VS	60.5	B-E	45.5	A-D	39.4	C-G
IDO1805S	VS	38.4	EFG	16.0	I-L	29.0	F-I
Jefferson	VS	56.2	C-F	32.0	C-I	52.2	ABC
Kelse	VS	65.8	ABC	36.0	C-G	53.4	AB
Lanning	VS	30.8	FGH	10.0	KL	28.3	F-I
LCS Iron	VS	28.3	F-I	36.0	C-G	37.2	D-G
LCS Star	VS	51.6	C-F	29.0	E-J	50.1	A-D
MT1775	VS	34.1	FGH	35.0	C-G	48.7	A-E
Net CL+	VS	44.0	C-G	26.5	E-J	40.0	B-F
SY Basalt	VS	56.2	C-F	31.0	C-J	61.9	A
SY Coho	VS	58.4	B-E	52.5	AB	44.3	B-F
SY Gunsight	VS	29.4	F-I	26.5	E-J	25.9	G-J
SY Selway	VS	58.9	B-E	30.0	E-J	50.3	A-D
WB7696	VS	56.3	B-F	26.0	E-K	45.7	A-F
WB9303	VS	44.2	C-G	23.5	G-K	31.6	FGH
WB9411	VS	50.7	C-F	30.0	D-J	19.4	H-K
WB9590	VS	21.5	G-J	24.0	G-K	28.3	F-I
WB9668	VS	59.3	B-E	31.0	C-I	31.3	FGH
WB9707	VS	50.0	C-F	25.5	F-K	35.4	EFG
WB9879CLP	VS	52.7	C-F	30.5	D-J	42.9	B-F
P (α=0.05)		<0.0001	**	<0.0001	**	<0.0001	**

* FHB Index = (% Severity x % Incidence)/100
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 4b. Results from the 2020 FHB spring wheat screening nursery, Kimbrly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 2. Reaction of hard white spring wheat varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
LNR-0175	MS	8.4	I	3.5	D	11.1	F
Dayn	VS	26.9	HI	9.0	CD	27.6	DE
IDO1202S	VS	39.5	GH	13.5	CD	29.4	CDE
IDO1203-A	VS	68.6	B-E	25.5	B	38.3	BCD
IDO1804S	VS	66.6	B-E	28.0	B	43.9	B
IDO1904S	VS	61.3	C-F	27.0	B	59.7	A
IDO2002	VS	70.5	A-D	17.5	BC	48.7	AB
IDO2004	VS	42.2	FGH	27.5	B	39.8	BCD
Klasic	VS	89.3	A	14.5	C	40.1	BCD
Snow Crest	VS	69.8	A-E	22.5	BC	40.7	BC
UI Platinum	VS	83.3	AB	22.5	C	38.0	BCD
WB7202CLP	VS	50.4	EFG	22.0	BC	38.5	BCD
WB7328	VS	66.8	B-E	26.5	B	36.9	B-E
WB7589	VS	80.5	ABC	28.0	B	46.8	AB
WB-Paloma	VS	27.9	HI	39.0	A	24.1	E
SY-Teton	---	63.3	CDE	---		---	
P (α=0.05)		<0.0001	**	0.0015	**	0.0003	**

* FHB Index = (% Severity x % Incidence)/100
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 4c. Results from the 2020 FHB spring wheat screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 3. Reaction of soft white spring wheat varieties and selections tp FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Alturas	S	21.5	FG	6.5	F	23.6	F
IDO1404S	S	20.3	FG	10.5	DE	30.5	EF
Tekoa	S	14.6	G	9.5	E	35.2	C-F
WA 8326	S	23.7	FG	7.5	EF	22.3	F
AP Coachman	VS	58.9	AB	29.5	AB	64.5	A
IDO1403S	VS	37.4	DEF	15.5	CDE	42.7	B-E
IDO1702S	VS	46.5	B-E	14.0	CDE	31.1	DEF
IDO1902S	VS	53.9	A-D	9.0	E	29.9	EF
Louise	VS	59.1	AB	18.5	C	66.0	A
Melba	VS	24.3	FG	11.5	CDE	28.9	EF
Ryan	VS	66.5	A	29.0	AB	54.1	AB
Seahawk	VS	42.0	B-E	10.5	DE	40.1	B-E
UI Cookie	VS	51.9	A-D	10.0	DE	29.4	EF
UI Pettit	VS	54.1	A-D	22.5	BC	51.9	AB
UI Stone	VS	38.5	C-F	9.0	E	22.9	F
WA 8327	VS	50.6	A-D	13.0	CDE	45.7	BCD
WA 8328	VS	56.6	ABC	8.5	E	40.5	B-E
WB-1035CL+	VS	52.6	A-D	19.0	C	42.1	B-E
WB6430	VS	49.0	A-D	33.0	A	66.0	A
P (α=0.05)		0.0003	**	0.0003	**	<0.0001	**

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 5a. Results from the 2020 FHB winter wheat screening nursery, Kimberly, ID, where Plots were inoculated with corn spawn colonized with *Fusarium graminearum*, and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of hard winter wheat varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Millie (W)	MS	3.7	K	10.5	IJ	16.4	KL
WB4623CLP	MS	5.8	JK	6.5	J	11.8	L
Sequoia	S	10.7	G-K	15.5	HIJ	19.9	JKL
WB4401	S	9.7	H-K	8.0	J	11.8	L
AP Illiad	VS	37.5	A-F	35.5	D-J	64.1	B-F
AP Redeye	VS	52.4	A	61.0	A-E	72.5	BCD
Flathead	VS	48.0	AB	51.5	A-F	41.2	E-L
FourOsix	VS	29.2	A-J	31.0	F-J	38.5	E-L
IDO1607	VS	9.0	IJK	38.0	D-I	46.3	D-K
IDO1806 (W)	VS	37.3	A-F	46.0	A-G	57.8	B-H
IDO1906 (W)	VS	45.5	A-D	45.5	A-G	40.9	E-L
Irv (W)	VS	21.5	E-K	39.5	D-I	39.0	E-L
Kairos	VS	15.1	F-K	32.5	E-J	29.0	H-L
Keldin	VS	14.4	F-K	17.0	G-J	32.2	H-L
Keldin + 11-52-0	VS	29.8	A-I	27.5	F-J	25.8	I-L
LCS Jet	VS	40.4	A-E	70.0	ABC	53.7	B-I
LCS Rocket	VS	41.4	A-E	43.0	B-H	42.7	D-L
MT1642	VS	10.0	H-K	44.0	B-H	62.1	B-H
Nugrain (W)	VS	32.4	A-H	28.0	F-J	28.9	H-L
OR2150168H (W)	VS	21.5	E-K	42.5	C-H	66.5	B-E
OR2150169R	VS	23.4	D-K	74.1	A	96.6	A
OR2160065H (W)	VS	10.2	G-K	34.0	D-J	33.1	F-L
Scorpio	VS	11.1	G-K	42.0	C-H	53.5	B-I
UI Bronze Jade	VS	29.8	A-I	56.5	A-F	81.5	B
Utah 100	VS	15.0	F-K	32.5	E-J	49.6	C-J
WA8289	VS	25.6	B-K	73.5	A	58.7	B-H
WA8309	VS	33.5	A-G	72.0	AB	79.0	BC
WB4311	VS	24.5	C-K	28.5	F-J	38.1	F-L
WB4792	VS	47.7	ABC	62.0	A-D	69.6	B-E
Yellowstone	VS	23.7	D-K	45.0	A-G	58.7	B-H
P (α=0.05)		0.0014	**	0.0012	**	0.0006	**

* FHB Index = (% Severity x % Incidence)/100
W = white winter wheat
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 5b. Results from the 2020 FHB winter wheat screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum,* and sprayed with *F. graminearum* conidia. Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 2. Reaction of soft winter wheat varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		FDK (%)		DON (ppm)	
Stingray	MS	3.3	M	5.8	GHI	19.3	P-S
WA8293	MS	5.5	KLM	3.0	HI	14.9	RS
YSC-201	MS	8.1	I-M	8.5	I	12.7	S
YSC-215	MS	4.1	LM	4.0	HI	25.7	O-S
Appleby CL+	S	10.4	F-M	7.5	GHI	24.5	O-S
Brundage	S	23.3	C-I	8.0	GHI	16.7	QRS
Caledonia	S	26.6	C-G	1.2	HI	21.5	P-S
Jasper	S	9.9	G-M	4.5	HI	26.4	N-S
LCS Hulk	S	23.8	C-I	6.5	GHI	20.3	P-S
LWW16-71088	S	26.5	C-G	4.0	HI	13.1	S
OR2X2CL+	S	17.0	E-M	4.5	HI	19.1	P-S
UI Castle CL+	S	20.3	D-L	4.0	HI	24.8	O-S
UI Sparrow	S	15.9	E-M	11.5	F-I	31.3	M-S
VI Bulldog	S	12.9	F-M	10.5	F-I	22.8	P-S
WA8305CLP	S	16.2	E-M	9.5	GHI	25.3	O-S
WA8306CLP	S	13.6	E-M	6.0	GHI	30.1	M-S
WB1376CLP	S	12.9	F-M	8.0	GHI	34.0	K-R
WB456	S	9.4	H-M	10.5	F-I	24.8	O-S
IDO1708	VS	25.5	C-H	22.0	E-H	53.0	F-K
LCS Artdeco	VS	30.1	CDE	32.5	CDE	53.3	F-K
LCS Blackjack	VS	26.7	C-F	20.0	E-H	57.8	E-I
LCS Drive	VS	55.8	A	49.5	BC	52.1	G-L
LCS Ghost	VS	55.0	A	65.5	AB	73.1	C-F
LCS Shark	VS	54.2	A	70.5	A	95.1	A
Mitus	VS	47.5	AB	28.0	DEF	59.6	E-H
Mitus with SSR	VS	34.2	BCD	22.5	EFG	49.2	G-M
M-Press	VS	34.3	BCD	46.0	C	82.1	A-D
MT1432	VS	19.9	D-M	13.0	F-I	43.8	H-O
Nixon	VS	17.3	E-M	16.0	E-I	36.8	J-P
Norwest Duet	VS	21.1	D-K	10.5	F-I	38.9	I-P
Norwest Tandem	VS	17.3	E-M	12.0	F-I	46.5	G-N
Purl	VS	21.1	D-K	6.5	GHI	38.4	I-P
Rosalyn	VS	19.7	D-M	24.0	EFG	60.2	E-H
Stephens	VS	19.7	D-M	20.5	E-H	55.3	E-J
SY Assure	VS	25.3	C-G	17.5	E-I	65.0	D-G
SY Ovation	VS	26.8	C-F	21.0	E-H	63.9	D-H
SY Raptor	VS	22.7	C-J	15.0	F-I	52.8	G-K
UIL15-72223	VS	29.7	CDE	9.5	GHI	32.3	L-S
UIL17-6268 (CL+)	VS	35.4	BCD	19.0	E-I	62.4	D-H
UI Magic CL+	VS	19.6	D-M	13.0	F-I	35.1	K-Q
WA8307	VS	6.2	J-M	41.5	CD	74.1	B-E
WB1529	VS	39.3	ABC	31.2	C-F	85.4	ABC
WB1783	VS	21.5	D-K	70.8	A	93.6	AB
P (α=0.05)		<0.0001	**	<.0001	**	<0.0001	**

* FHB Index = (% Severity x % Incidence)/100
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DISK = (0.3DON + 0.2 Incidence + 0.2 Severity + 0.3 FDK)

Resistance Rating	DISK
MR	0 - 10
MS	10.1 - 18
S	18.1 - 30
VS	> 30

Addendum 6a. Results from the 2020 FHB Spring Barley Screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based onone year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of two-rowed malt barley varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance rating	FHB Index*	DON (ppm)
11ARS183-9	R	0.7	1.4
2IM14-8212	R	0.3	2.1
2IM15-9386	R	0.5	2.3
ABI Eagle	R	0.6	1.5
BC Leandra	R	0.2	3.8
ICB 11180	R	0.2	1.65
Lightning	R	0.1	4.2
2IM15-9456	MR	1.8	1.5
AAC Connect	MR	2.0	4.0
AAC Synergy	MR	0.5	3.7
ABI Balster	MR	1.7	4.2
ABI Growler	MR	0.6	3.25
ABI Voyager	MR	1.7	3.1
Accordine	MR	1.8	4.8
AC Metcalfe	MR	1.5	3.3
CDC Copeland	MR	0.9	1.7
Conrad	MR	0.9	4.4
DH120285	MR	1.5	6.5942
Harrington	MR	1.8	3.6
Moravian 180	MR	0.9	5.0
ND Genesis	MR	0.7	4.3
10ARS191-3	MS	3.1	5.2
11ARS162-4	MS	4.1	3.6
BC Ellinor	MS	4.1	5.7
CDC Meredith	MS	2.7	8.1
Clho 4196	MS	2.7	7.3
Conlon	MS	39.8	3.2
Esma	MS	6.0	9.1
Explorer	MS	3.4	6.9
Far15-52A	MS	2.3	3.9
Golden Promise	MS	3.9	12.5
Golf	MS	3.3	4.3
Hockett	MS	2.5	5.7
Klages	MS	3.3	4.7
KWS Chrissie	MS	2.4	6.7
KWS Fantex	MS	1.4	8.3
KWS Jessie	MS	2.5	7.0
LCS Genie	MS	2.8	6.1
LCS Odyssey	MS	2.5	5.1
LCS Opera	MS	4.8	7.8
LG Diablo	MS	5.0	8.0
Merem	MS	7.9	5.15
Merit 57	MS	2.5	10.5
Moravian 179	MS	3.7	7.0
Moravian 69	MS	2.8	6.4
GemCraft	S	8.4	6.6
KWS Amadora	S	35.9	12.1
P (α=0.05)		0.6789 ns	0.1578 ns

ns = non significant
* FHB Index = (% Severity x % Incidence)/100
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 6b. Results from the 2020 FHB Spring Barley Screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based onone year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 2. Reaction of two-rowed feed barley varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance rating	FHB Index*	DON (ppm)
ICB 11180**	R	0.2	1.7
UTSB10905-72	R	0.7	2.2
Xena	R	0.3	3.7
Champion	MR	1.7	5.7
Charger	MR	0.5	3.2
Claymore	MR	1.7	3.3
Clearwater	MR	0.4	9.2
Goldenhart	MR	0.8	3.5
HO516-429	MR	1.0	2.7
Julie (hulless)	MR	0.7	4.8
Lenetah	MR	1.3	3.3
Millenium	MR	0.6	5.4
Otis	MR	1.1	4.4
Transit (hulless)	MR	1.0	3.4
12ARS358-5	MS	4.7	7.0
Altorado	MS	2.7	4.2
Bill Coors 100	MS	6.0	7.9
Clho 4196	MS	2.7	7.3
FeedMor	MS	2.7	7.4
HO516-579	MS	3.2	6.2
Idagold II	MS	3.4	8.5
Kardia (hulless)	MS	4.6	3.9
Moravian 164	MS	2.3	7.5
Oreana	MS	2.7	9.8
P (α=0.05)		0.6047 ns	0.3773 ns

ns = non significant

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

** ICB 11180 is a susceptible variety, but its resistance in this test may be an escape or needs further investigation

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 6c. Results from the 2020 FHB Spring Barley Screening nursery, Aberdeen, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based on one year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 3. Reaction of six-rowed barley varieties and selections to FHB, Aberdeen, 2020

Variety or Selection	Resistance rating	FHB Index*	DON (ppm)
Chevron	MR	1.2	2.6
PI 383933	MR	1.4	2.3
Quest	MR	1.9	3.0
Stander	MR	0.6	3.5
Tradition	MR	0.6	3.0
YU510-510	MR	0.6	3.2
Goldeneye	MS	1.6	6.3
P (α=0.05)		0.4005 ns	0.2404 ns

ns = non significant

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 7a. Results from the 2020 FHB Spring Barley Screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based onone year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of two-rowed malt barley varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance rating	FHB Index*	DON (ppm)	
CDC Copeland	MR	4.6	5.5	K-O
Clho 4196	MR	1.2	8.3	G-O
Far15-52A	MR	1.6	4.1	NO
GemCraft	MR	1.2	5.7	J-O
Harrington	MR	1.4	6.9	I-O
Hockett	MR	1.8	9.7	F-O
Klages	MR	2.4	6.4	J-O
Merit 57	MR	2.6	4.7	L-O
10ARS191-3	MS	8.6	8.7	G-O
11ARS162-4	MS	6.8	7.5	I-O
11ARS183-9	MS	7.0	5.2	L-O
2IM14-8212	MS	10.0	10.8	E-O
2IM15-9456	MS	5.6	6.9	I-O
AAC Connect	MS	3.4	7.6	H-O
AAC Synergy	MS	3.0	7.4	I-O
ABI Balster	MS	5.6	7.1	I-O
ABI Eagle	MS	7.2	8.7	G-O
ABI Growler	MS	6.0	7.2	I-O
ABI Voyager	MS	4.8	8.0	H-O
Accordine	MS	9.2	14.9	D-J
AC Metcalfe	MS	9.0	10.3	F-O
Conrad	MS	8.0	12.1	D-O
DH120285	MS	8.4	17.0	D-H
Explorer	MS	8.4	13.2	D-N
Golden Promise	MS	6.1	4.6	MNO
Golf	MS	8.6	12.0	D-O
KWS Chrissie	MS	10.4	13.6	D-M
LCS Genie	MS	9.4	16.1	D-I
Merem	MS	2.0	2.9	O
Moravian 180	MS	14.2	12.5	D-N
2IM15-9386	S	8.8	11.0	E-O
BC Leandra	S	7.7	14.8	D-K
CDC Meredith	S	8.1	11.7	E-O
Conlon	S	11.5	6.3	J-O
Esma	S	13.2	14.8	D-K
KWS Amadora	S	7.4	18.4	C-F
KWS Jessie	S	11.2	14.7	D-K
LCS Odyssey	S	8.5	16.0	D-I
LCS Opera	S	11.4	20.0	CDE
Millenium	S	16.8	14.1	D-L
Moravian 69	S	7.3	17.5	D-G
ND Genesis	S	6.3	10.5	F-O
BC Ellinor	VS	19.7	27.2	ABC
DH 130910	VS	13.8	30.0	AB
ICB 11180	VS	8.1	31.2	A
KWS Fantex	VS	12.6	21.4	BCD
LG Diablo	VS	19.9	34.8	A
Moravian 179	VS	14.2	20.0	CDE
P (α=0.05)		0.7032 ns	<0.0001	**

ns = non significant

*FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 7b. Results from the 2020 FHB Spring Barley Screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based onone year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 2. Reaction of two-rowed feed/food barley varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*	DON (ppm)	
Altorado	MR	1.8	7.4	DEF
Champion	MR	1.0	8.0	DEF
Charger	MR	2.4	3.1	F
Clearwater	MR	3.8	4.7	DEF
Clho 4196	MR	1.2	8.3	C-F
12ARS358-5	MS	3.9	4.7	DEF
Claymore	MS	2.5	6.4	DEF
FeedMor	MS	7.0	13.7	BCD
Goldenhart	MS	9.4	3.9	EF
HO516-429	MS	8.0	13.9	BCD
Idagold II	MS	4.6	11.6	B-F
Julie (hulless)	MS	3.2	2.3	F
Lenetah	MS	3.8	8.0	DEF
Otis	MS	0.4	8.2	C-F
Transit (hulless)	MS	3.9	7.1	DEF
UTSB10905-72	MS	7.5	11.3	B-F
Xena	MS	6.0	6.1	DEF
Bill Coors 100	S	6.5	13.0	B-E
HO516-579	S	14.6	17.9	BC
Kardia (hulless)	S	6.7	5.3	DEF
Moravian 164	S	9.8	13.7	BCD
ICB 11180	VS	8.1	31.2	A
Oreana	VS	7.8	20.9	B
P (α=0.05)		0.5738 ns	0.0011	**

ns = non significant

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 7c. Results from the 2020 FHB Spring Barley Screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* . Results are based onone year's data. Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 3. Reaction of six-rowed barley varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		DON (ppm)	
Chevron	MR	1.1	D	3.5	E
Quest	MR	0.4	D	6.3	DE
Stander	MR	0.9	D	8.2	DE
Tradition	MS	4.6	CD	10.1	CD
Goldeneye	S	18.4	C	13.3	C
PI 383933	VS	68.1	A	26.9	B
YU510-510	VS	44.6	B	44.2	A
P (α=0.05)		0.0271	*	<0.0001	**

* FHB Index = (% Severity x % Incidence)/100

Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 4.9
MR	5 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Addendum 8. Results from the 2020 FHB winter barley screening nursery, Kimberly, ID, where plots were inoculated with corn spawn colonized with *Fusarium graminearum* , and sprayed with *F. graminearum* conidia. Results are based on one year's data.Rankings may change from year to year and with high disease pressure. Lines with the same letter in a column are not significantly different.

Table 1. Reaction of winter barley varieties and selections to FHB, Kimberly, 2020

Variety or Selection	Resistance Rating	FHB Index*		DON (ppm)	
KWS Scala	R	0.1	B	6.5	C
05ARS849-15	MR	0.7	B	7.4	BC
DH140963	MR	0.4	B	6.4	C
Endeavor	MR	0.1	B	9.9	BC
KWS Donau	MR	0.5	B	8.9	BC
KWS Somerset	MR	0.2	B	6.7	BC
LCS Calypso	MR	0.3	B	7.3	BC
Thunder	MR	0.5	B	10.9	BC
Upspring	MR	0.4	B	6.3	C
WintMalt	MR	0.0	B	10.3	BC
13ARS537-19	MS	5.0	B	11.1	BC
13ARS537-25	MS	2.1	B	8.0	BC
2WI14-7577	MS	1.6	B	9.2	BC
2WI15-8688	MS	2.4	B	12.9	BC
Charles	MS	6.6	B	11.1	BC
Eight-Twelve	MS	6.4	B	10.5	BC
Buck	S	6.9	B	18.8	ABC
Lightning	S	4.1	B	25.2	AB
KWS Faro	S	3.0	B	31.9	A
Sunstar Pride	S	5.0	B	22.9	ABC
10.1492	VS	21.1	A	19.7	ABC
UT10201	VS	26.3	A	18.5	ABC
P (α=0.05)		<.0001	**	<.0001	**

* FHB Index = (% Severity x % Incidence)/100
Data analyzed using PROC GLYMMIX in SAS

Resistance rating was calculated using the formula: DIS = (0.6DON + 0.2 Incidence + 0.2 Severity)

Resistance Rating	DIS
R	0 - 5
MR	5.1 - 10
MS	10.1 - 20
S	20.1 - 30
VS	> 30

Web Resources for Southcentral and Southeast Idaho Grain Production

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