2021-22 Regional Common Wheat & Triticale, Durum Wheat, and Barley Performance Tests in California

Authors: Micah Levinson, Taylor Nelsen, Mark Lundy

Contributions: J. Hegarty, S. Tamagno, L. Reynoso, M. Shydlowski-Besmer, M. Swintek, V. Wong, M. Leinfelder-Miles, B. Marsh, N. Clark, K. Mathesius, R. Wilson, D. Culp.

1. INTRODUCTION

This report summarizes the results of small grains variety tests conducted by University of California Cooperative Extension during the 2021-22 season. It also includes multi-year summaries of trials conducted between the 2019-20 and 2021-22 growing seasons. In addition to measuring grain productivity, the 2021-22 small grains variety tests included a forage trial for the first time in recent years. The forage trial measured biomass yield and quality at the boot and soft dough stages of growth. The 2021-22 experiments had the following objectives: 1) Measure crop productivity, quality, disease resistance, and agronomic characteristics for commercially available small grain varieties and advanced breeding lines across a range of environmental and management conditions that represent Californian agro-ecosystems; 2) Study the magnitude of management effects on variety performance by directly manipulating crop water and nitrogen availability at a subset of trial locations; 3) Report results of the research and analysis on our program website, at extension meetings, and in other agricultural forums.

General Seasonal Overview

The 2021-22 California small grain crop consisted of approximately 420 thousand planted acres of wheat, triticale and barley (USDA, 2023). Approximately 28% of the planted area of wheat was harvested for grain. Total wheat production was down 1% over the previous year but total small grain acres in California were similar to the past two years. There are many reasons for the decline in grain acreage, including the relatively stronger regional market for small grain forage and decreasing availability of water due to drought and other higher value uses.

The 2021-22 season began with higher precipitation than normal, with large storms in late-October and December bringing rainfall totals to above average for most locations in the Sacramento and San Joaquin Valleys by the end of December. Subsequently, there was little measurable precipitation through the middle of March, and below average precipitation between mid-March and the end of June. Thus, for the period between October 1 and March 1, rainfall in the Sacramento and San Joaquin Valleys was 108% and 104% of normal, respectively with most rain falling near sowing and as crops were young. Meanwhile, between March 1 and June 30, totals were 31% and 46% of normal in the Sacramento and San Joaquin Valleys, respectively. In addition, there was a rainfall event in early June of 0.1-0.3 inches throughout much of the Sacramento Valley as crops were mature or close to maturity. Taken together, the abnormally dry conditions during the second half the season likely had a negative impact on grain yield and quality for locations without irrigation or with irrigation less than crop demand. In addition, the late rainfall in June is likely to have had a negative impact on falling numbers for crops in the Sacramento Valley. Fully irrigated sites, particularly those in the San Joaquin Valley are less likely to have been affected by these factors.

Grain yields were average or below average for the season. Statewide common wheat grain yields averaged 4380 lb/ac, durum wheat grain yields averaged 6600 lb/ac, and barley grain yields averaged 2640 lb/ac (USDA, 2023). Within UC small grain variety testing trials, average grain yields were 5434 lb/ac, which is approximately 94% of the 5-year average in

these trials. The average forage yields within the trial were 4075 lb/ac at the boot stage and 10983 lb/ac at the soft dough stage.

2. METHODS

2.1 UC Statewide Variety Trials

Entries & test locations

Commercially available and advanced breeding lines of common wheat, durum wheat, triticale, and barley were grown in statewide multi-environment trials between 2019-20 and 2021-22 (Table 1). Tests were conducted at University of California research stations or in fields of cooperating growers. Location details including soil type, previous crops, and planting date for the previous three years of trials can be found in Table 2.

Trial design and methods

Field methods are reported for the 2021-22 season. For methodological details regarding earlier field seasons please consult previous annual reports. A randomized complete block design with four replications was used at all five 2021-22 trial locations. In the 2021-22 season, tests were sown at seeding rates of 1 to 1.2 million seeds/ac for all grain tests (equivalent to 61 to 107 lbs/acre for common wheat, 78 to 99 lbs/acre for triticale, 75 to 140 lbs/acre for durum wheat and 77 to 113 lbs/acre for barley, depending on the variety) and 1.5 million seeds/ac for all forage tests. Each plot was six or nine drill rows wide (5 to 9-inch row spacing) and 15 to 20 feet long. Grain was harvested with a Wintersteiger Seedmaster Universal 150 plot combine. Forage harvests were conducted at boot and soft dough stage using a Carter Forage Harvester with 36in head on a flail mower at the Fresno location and a RCI 36A forage harvester with a 36in head on a flail mower at the Davis location.

Table 1a. The number of unique entries of each species tested in the statewide regional grain trials in each season at each location.

Location	Season	Fall-planted Barley	Fall-planted Common	Fall-planted Durum	Fall-planted Oat	Fall-planted Spring barley	Fall-planted Triticale	Fall-planted Winter barley	Fall-planted Winter wheat	Spring-planted Spring barley	Spring-planted Spring wheat	Spring-planted Winter wheat
Davis	2019-20	9	28	18	-	-	10	-	-	-	-	-
Davis	2020-21	18	24	16	-	-	5	-	-	-	-	-
Davis	2021-22	18	22	18	12	-	8	-	-	-	-	-
Delta	2021-22	9	22	-	-	-	8	-	-	-	-	-
Fresno	2019-20	12	28	18	-	-	10	-	-	-	-	-
Fresno	2020-21	18	24	16	-	-	5	-	-	-	-	-

Fresno	2021-22	18	22	18	12	-	8	-	-	-	-	-
Imperial	2020-21	8	-	16	-	-	-	-	-	-	-	-
Kern	2021-22	-	22	18	-	-	8	-	-	-	-	-
Kings	2020-21	-	24	16	-	-	5	-	-	-	-	-
Tulelake	2018-19	-	-	-	-	-	-	-	-	13	29	-
Tulelake	2019-20	-	-	-	-	1	-	4	25	13	32	-
Tulelake	2020-21	-	-	-	-	-	-	6	60	15	34	1
Tulelake	2021-22	-	-	-	-	-	-	9	59	20	40	-
Yolo2	2020-21	18	24	-	-	-	5	-	-	-	-	-

Table 1b. The number of unique entries of each species tested in the statewide regional forage trials in each season at each location.

Location	Season	Fall Barley	Fall Common	Forage Mix	Fall Oat	Fall Triticale
Davis	2021-22	12	9	2	12	8
Fresno	2021-22	12	8	2	12	8

Figure 1. Map depicting the California small grain regional trials and test locations conducted in the 2021-22 season.

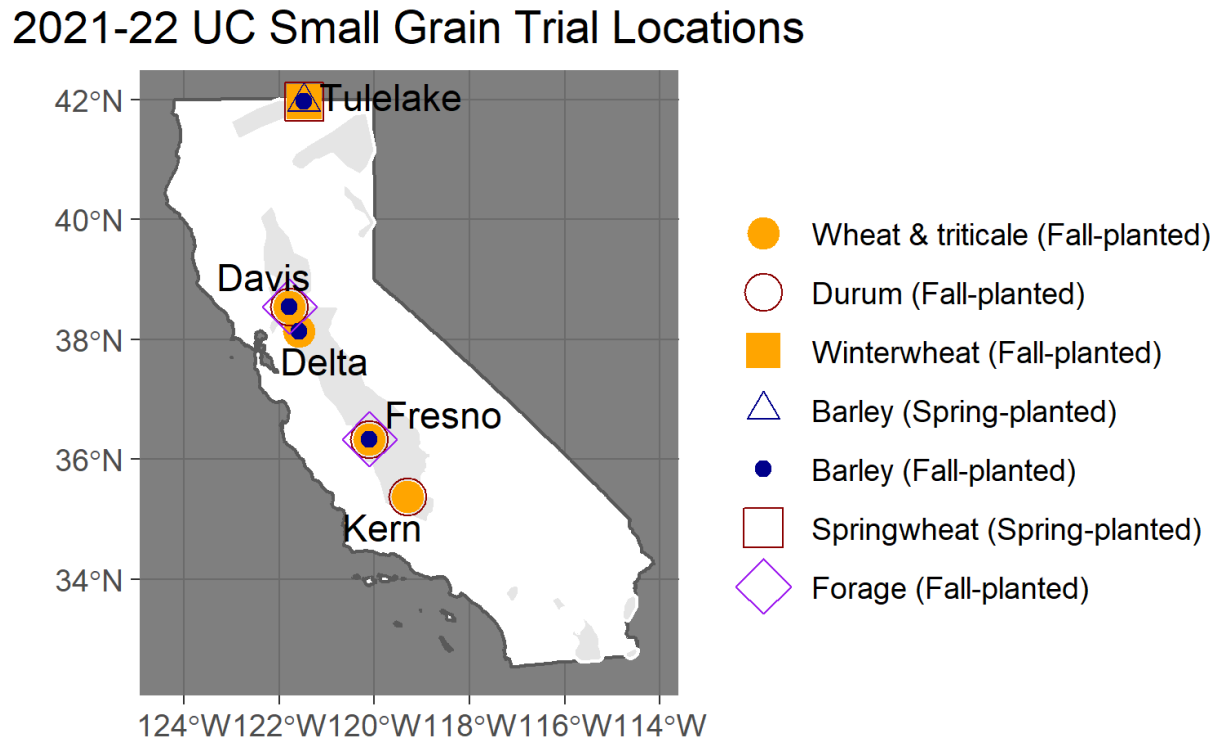


Table 2. Test locations for the statewide regional trials between the 2019-20 and 2021-22 seasons

Common name	Season	Crop Subtype	Latitude	Longitude	Soil Type	Previous Crop	Planting Date
Davis	2019_20	BARLEY, COMMON, DURUM, TRITICALE	38.5341785	-121.7716	Yolo silt loam, 0 to 2 percent slopes, MLRA 17	fallow	11/29/2019
Davis	2020_21	BARLEY, COMMON, DURUM, TRITICALE	38.5257749	-121.772343	Yolo silty clay loam, 0 to 2 percent slopes, MLRA 17		12/11/2020
Davis	2021_22	BARLEY, COMMON, DURUM, OAT, TRITICALE	38.5427658	-121.783373	Zamora loam		12/6/2021
Delta	2021_22	BARLEY, COMMON, TRITICALE	38.1360866	-121.590809	Rindge muck, 0 to 2 percent slopes, partially drained, MLRA 16		12/1/2021
Fresno	2019_20	BARLEY, COMMON, DURUM, TRITICALE	36.3395374	-120.118636	Panoche clay loam, 0 to 2 percent slopes	cotton	11/26/2019
Fresno	2020_21	BARLEY, COMMON, DURUM, TRITICALE	36.3358253	-120.108669	Cerini clay loam, 0 to 2 percent slopes		11/18/2020
Fresno	2021_22	BARLEY, COMMON, DURUM, OAT, TRITICALE	36.3367222	-120.108697	Cerini clay loam, 0 to 2 percent slopes		11/30/2021
Imperial	2020_21	BARLEY, DURUM	32.9191445	-115.330795	Holtville silty clay, wet		12/8/2020
Kern	2021_22	COMMON, DURUM, TRITICALE	35.3759297	-119.29739	Westhaven fine sandy loam		11/23/2021
Kings	2020_21	COMMON, DURUM, TRITICALE	36.0177773	-119.58541	Gepford clay, sandy substratum, partially drained		11/17/2020
Tulelake	2019_20	SPRINGBARLEY, WINTERBARLEY, WINTERWHEAT	41.9618068	-121.473628	Tulebasin mucky silty clay loam	pea	10/23/2019
Tulelake	2019_20	SPRINGWHEAT	41.9618068	-121.473628	Tulebasin mucky silty clay loam	pea	4/17/2020

Tulelake	2019_20	SPRINGBARLEY	41.9618068	-121.473628	Tulebasin mucky silty clay loam	sudan grass	4/17/2020
Tulelake	2020_21	WINTERWHEAT	41.9646163	-121.473527	Tulana silt loam, 0 to 1 percent slopes	sudan grass	10/15/2020
Tulelake	2020_21	WINTERBARLEY	41.9646163	-121.473527	Tulana silt loam, 0 to 1 percent slopes	sudan grass	10/16/2020
Tulelake	2020_21	SPRINGBARLEY, SPRINGWHEAT, WINTERWHEAT	41.9646163	-121.473527	Tulana silt loam, 0 to 1 percent slopes	sudan grass	4/16/2021
Tulelake	2021_22	WINTERBARLEY, WINTERWHEAT	41.9646163	-121.473527	Tulana silt loam, 0 to 1 percent slopes	fallow	10/12/2021
Tulelake	2021_22	SPRINGBARLEY, SPRINGWHEAT	41.9646163	-121.473527	Tulana silt loam, 0 to 1 percent slopes	pea	4/25/2022
Yolo2	2020_21	BARLEY, COMMON, TRITICALE	38.7973551	-122.051823	Corning gravelly loam, 0 to 12 percent slopes, MLRA 17		12/10/2020

Table 3a. The number of unique entries of each species tested in the statewide regional grain trials between the 2019-20 and 2021-22 season.

Region	Crop Type	2018-19	2019-20	2020-21	2021-22
IR	SPRINGBARLEY	13	13	15	20
IR	SPRINGWHEAT	29	32	34	40
IR	WINTERBARLEY	NA	4	6	9
IR	WINTERWHEAT	69	25	61	59
NonIR	BARLEY	20	12	18	18
NonIR	COMMON	38	28	24	22
NonIR	DURUM	30	18	16	18
NonIR	OAT	NA	NA	NA	18
NonIR	TRITICALE	10	10	5	8

Table 3b. The number of unique entries of each species tested in the statewide regional forage trials in the 2021-22 season.

Region	Crop Type	2021-22
NonIR	BARLEY	12
NonIR	COMMON	9
NonIR	OAT	12
NonIR	TRITICALE	8
NonIR	FORAGE MIX	2

Pre-plant soil sampling and analyses

Pre-plant soil samples were taken at depths of 0-1 ft at all locations in the 2021-22 season. Sample collection was carried out using a manual bucket-type auger system. Soil nitrate-nitrogen content was measured using the nitrate quick test method described on our program website. Other soil handling and analytical methods were developed from Schoeneberger et al. (2013). Starting soil nitrate values in the top 0-1ft of soil for the 2021-22 locations is presented in Table 4.

Table 4. Soil nitrate concentration in the top foot of soil.

Location	Trial	Soil Nitrate (ppm)
Davis	BARLEY	4.1
Davis	WHEAT	4.1
Davis	DURUM	2.2
Davis	WHEAT LOW N	2.2
Delta	BARLEY	20.2
Delta	WHEAT	20.2
Fresno	WHEAT LOW WATER	7.2
Fresno	BARLEY	11.3
Fresno	DURUM	11.3
Kern	WHEAT	10.9
Kern	DURUM	7

Nitrogen fertilization & irrigation

A range of nitrogen (N) fertilizer types and amounts were used depending on location (Table 5). At the on-farm locations, the variety trial was fertilized along with surrounding small grains crops according to the fertility management program of the cooperating grower. In general, the common and durum wheat trials received between 100 and 200 lbs of nitrogen per acre at high yield potential locations. Less fertilizer was applied to the barley trials and wheat trials located at sites with lower yield potential. For the forage trials, trials harvested at the boot stage received less fertilizer than trials harvested at the soft dough stage. Specific N fertilizer amounts applied at 2020-2021 test locations are presented in Table 5. Although the trial in Kern was fertilized in-season with mineral N, the total amount of N was not recorded. In addition, the amount of total N applied as cow manure was not measured. Therefore, the total amount of N applied at this site is unknown (Table 5).

A range of irrigation amounts were applied depending on location (Table 6). At the Davis location, the first irrigation (02/11/2022) was applied unevenly across the field due to a break in a pipe causing a few drier areas in the N-NW area of the location which included the barley and oat grain trials. At the on-farm locations, irrigation was managed by the cooperating grower. At the Kern site, total irrigation was not well-documented. Approximately 24 inches of irrigation were applied using flood irrigation over the course of the 2021-22 season.

At trial locations in the Davis and Fresno locations, the common wheat and triticale trials were replicated with contrasting nitrogen and water management to create the following management conditions:

1. *Conventional management:* Water and nitrogen fertility delivered to optimize productivity.
2. *Low nitrogen management:* No nitrogen fertilizer provided, with the objective of restricting nitrogen availability to limit crop growth. Water is not limiting.
3. *Low water management:* Irrigation is restricted such that water will limit crop growth. Nitrogen fertility is managed to avoid nitrogen deficiency.

These side-by-side trials permit quantitative differentiation of the effects of nitrogen and water limitation on the performance of common wheat and triticale in California. From these data, varieties that perform well in conditions of abundance as well as under drought and nitrogen stress can be identified. See below for analytical details on how variety-specific stress stability is estimated.

Table 5. Nitrogen fertilizer management details for the regional trial test locations in the 2021-22 season.

Common Name	Trial Description	Date	Amount (lb/ac N)	Description
Davis	Barley (grain)	2/9/2022	60	broadcast as urea ahead of sprinkler irrigation
Davis	Durum, Oat and Barley Forage, Wheat, Wheat and Triticale Forage	2/9/2022	120	broadcast as urea ahead of sprinkler irrigation
Davis	Durum, Oat and Barley Forage, Wheat, Wheat and Triticale Forage	3/18/2022	50	broadcast ammonium sulfate ahead of flood irrigation
Davis	Oat(grain)	2/9/2022	60	broadcast as urea ahead of sprinkler irrigation
Delta	Barley (grain), Wheat (grain)	2/25/2022	4	UN32 tank mix with herbicide application
Delta	Barley (grain), Wheat (grain)	2/9/2022	57	flown on as urea
Fresno	Barley (grain), Durum (grain), Oat (grain), Oat and Barley Forage, Wheat (grain), Wheat and Triticale Forage, Wheat (grain) low water	11/30/2022	22	11-52-0
Fresno	Barley (grain), Oat (grain)	1/19/2022	59	Urea, 47-0-0 before sprinkler irrigation
Fresno	Durum (grain), Oat and Barley Forage, Wheat (grain), Wheat and Triticale Forage, Wheat (grain) low water	1/19/2022	106	Urea, 47-0-0 before sprinkler irrigation
Fresno	Durum (grain), Wheat (grain), Wheat (grain) low water	2/15/2022	60	UN32
Kern	Durum (grain), Wheat (grain)	3/3/2022	unknown	Unknown amount of nitrogen applied; In previous trials with same grower, in-season N rates were 65 - 85 lb/ac N as urea
Kern	Durum (grain), Wheat (grain)	10/15/2022	manure	Pre-tillage application of 7 tons/ac cow manure. Date approximated.
Tulelake	Barley spring (grain)	4/14/2021	22	Preplant applied as 11-52-00
Tulelake	Barley spring (grain), Springwheat hard (grain), Springwheat soft (grain)	5/27/2022	30	UN32

Tulelake	Barley winter (grain)	10/12/2021	22	Preplant applied as 11-52-00
Tulelake	Barley winter (grain), Winterwheat hard (grain), Winterwheat soft (grain)	4/7/2022	30	UN32
Tulelake	Springwheat hard (grain)	7/12/2022	30	UN32
Tulelake	Springwheat hard (grain), Springwheat soft (grain)	4/25/2022	21	Preplant applied as 11-52-00
Tulelake	Springwheat hard (grain), Springwheat soft (grain)	6/24/2022	80	UN32
Tulelake	Winterwheat hard (grain)	6/24/2022	30	UN32
Tulelake	Winterwheat hard (grain), Winterwheat soft (grain)	10/12/2021	21	Preplant applied as 11-52-00
Tulelake	Winterwheat hard (grain), Winterwheat soft (grain)	5/13/2022	80	UN32

Table 6. Irrigation management details for the regional trial test locations in the 2021-22 season.

Common Name	Trial Description	Total Amount (in)	Irrigation Description
Davis	Barley (grain)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-22: 3.2 in (Flood irrigation)
Davis	Durum (grain)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-21: 3.2 in (Flood irrigation)
Davis	Oat (grain)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-22: 3.2 in (Flood irrigation)
Davis	Oat and Barley Forage (soft dough harvest)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-21: 3.2 in (Flood irrigation)
Davis	Wheat (grain)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-21: 3.2 in (Flood irrigation)
Davis	Wheat and Triticale Forage (boot harvest)	1.0	2022-02-11: 1 in (sprinkler)
Davis	Wheat and Triticale Forage (soft dough harvest)	4.2	2022-02-11: 1 in (sprinkler) 2022-03-21: 3.2 in (Flood irrigation)
Davis	Wheat low nitrogen (grain)	4.2	2022-02-11: 1 in (sprinkler), 2022-03-21: 3.2 in (Flood irrigation)
Fresno	Barley (grain)	5.2	2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler)
Fresno	Durum (grain)	13.2	2022-03-21: 4 in (sprinkler), 2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler), 2022-04-07: 4 in (sprinkler)
Fresno	Oat (grain)	5.2	2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler)
Fresno	Oat and Barley Forage (boot harvest)	5.2	2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler)
Fresno	Oat and Barley Forage (Soft dough harvest)	9.2	2022-03-18: 4 in (sprinkler), 2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler)
Fresno	Wheat (grain)	13.2	2022-03-18: 4 in (sprinkler), 2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler), 2022-04-07: 4 in (sprinkler)

Fresno	Wheat and Triticale Forage (boot)	5.2	2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in, 2022-02-15: 2.5 in (sprinkler)
Fresno	Wheat and Triticale Forage (soft dough)	9.2	2022-03-18: 4 in (sprinkler), 2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in, 2022-02-15: 2.5 in (sprinkler)
Fresno	Wheat low water (grain)	5.2	2021-12-02: 1.2 in (sprinkler), 2021-12-03: 0.5 in (sprinkler), 2022-01-20: 1 in (sprinkler), 2022-02-15: 2.5 in (sprinkler)
Kern	Durum (grain)	~24	~24 in (Flood irrigation)
Kern	Wheat (grain)	~24	~24 in (Flood irrigation)
Tulelake	Barley spring (grain)	9.9	2022-04-29: 1.9 in (sprinkler), 2022-05-13: 0.6 in (sprinkler), 2022-05-26: 2.1 in (sprinkler), 2022-06-10: 2.1 in (sprinkler), 2022-06-24: 1.7 in (sprinkler), 2022-06-30: 1.5 in (sprinkler)
Tulelake	Barley winter (grain)	10.7	2022-04-07: 2.5 in (sprinkler), 2022-04-30: 1.7 in (sprinkler), 2022-05-12: 1.9 in (sprinkler), 2022-05-25: 2.5 in (sprinkler), 2022-06-08: 2.1 in (sprinkler)
Tulelake	Spring wheat hard (grain)	15.5	2022-04-29: 1.9 in (sprinkler), 2022-05-13: 0.6 in (sprinkler), 2022-05-26: 2.1 in (sprinkler), 2022-06-09: 2.1 in (sprinkler), 2022-06-17: 2.1 in (sprinkler), 2022-06-24: 1.7 in (sprinkler), 2022-06-30: 2.5 in (sprinkler), 2022-07-12: 2.5 in (sprinkler)
Tulelake	Spring wheat soft (grain)	15.5	2022-04-29: 1.9 in (sprinkler), 2022-05-13: 0.6 in (sprinkler), 2022-05-26: 2.1 in (sprinkler), 2022-06-09: 2.1 in (sprinkler), 2022-06-17: 2.1 in (sprinkler), 2022-06-24: 1.7 in (sprinkler), 2022-06-30: 2.5 in (sprinkler), 2022-07-12: 2.5 in (sprinkler)
Tulelake	Winter wheat hard (grain)	14.6	2022-04-07: 2.5 in (sprinkler), 2022-05-01: 1.7 in (sprinkler), 2022-05-13: 2.3 in (sprinkler), 2022-05-25: 2.5 in (sprinkler), 2022-06-08: 2.1 in (sprinkler), 2022-06-17: 1.8 in (sprinkler), 2022-02-24: 1.7 in (sprinkler)
Tulelake	Winter wheat soft (grain)	14.6	2022-04-07: 2.5 in (sprinkler), 2022-05-01: 1.7 in (sprinkler), 2022-05-13: 2.3 in (sprinkler), 2022-05-25: 2.5 in (sprinkler), 2022-06-08: 2.1 in (sprinkler), 2022-06-17: 1.8 in (sprinkler), 2022-02-24: 1.7 in (sprinkler)

Disease observations

When foliar diseases and other disease-like symptoms were present at a given trial location, variety-specific ratings were recorded. Diseases during the 2021-22 season included stripe rust and smut. When present, diseases were assessed between the milk and dough stages of development. For most diseases, abundance was estimated as the percent area of a representatively-infected leaf (Table 7). Observations were made on the top two leaves of the plant. The exception to this was barley yellow dwarf virus, for which assessments represent the percentage of plants showing symptoms within a plot. Stripe rust samples were sent for race analysis by Xianming Chen, Research Plant Pathologist with the USDA-ARS at Washington State University.

The barley trial at the Delta location for the 2021-22 season experienced abnormal foliar disease and had a very high incidence of bird damage (many plots were unable to be measured, see figure 9). Because this field was so irregular, the disease ratings were not used in the multi-year disease and agronomic summaries. Table 12 does show that disease was recorded at the Delta site, and this should be taken into account when looking at site-year summaries for barley from the 2021-22 season at the Delta site.

Table 7. Rating scale used for rating/reporting the occurrence of disease symptoms in the and lodging.

Rating	Area (%)
1	0-3
2	4-14
3	15-29
4	30-49
5	50-69
6	70-84
7	85-95
8	96-100

Agronomic observations

In-season observations on the relative growth stage were recorded on a variety- and trial-specific basis at the Davis location. Relative heading and maturity dates were estimated from these observations. Heading is defined as when half the spike is visible in half of the plants in a plot. The stage of grain ripening (milk, soft dough, hard dough, hard kernel, and harvest ripe) representing the majority of plants within the plots was estimated. Both days to heading and days to maturity are calculated from January 1st. At harvest, mean plant height and percentage of plants in the plot affected by lodging were recorded on an individual plot basis. The same rating scale utilized to report disease incidence (Table 7) was used to report lodging. Locations at which agronomic traits were recorded are summarized in (Table 8).

Table 8. The locations where agronomic traits were recorded in the current season.

Common Name	Crop Subtype	Grain Yield	Grain Protein	Height	Lodging	Test Weight	Thousand Kernel	Forage Yield	Forage Protein
Davis	BARLEY	X	X	X	X	X	X	X	X
Davis	COMMON	X	X	X	X	X	X	X	X
Davis	DURUM	X	X	X	X	X	X	-	-
Davis	OAT	X	X	X	X	X	X	X	X
Davis	TRITICALE	X	X	X	X	X	X	X	X
Delta	BARLEY	X	X	X	X	X	X	-	-
Delta	COMMON	X	X	X	X	X	X	-	-
Delta	TRITICALE	X	X	X	X	X	X	-	-
Fresno	BARLEY	X	X	X	X	X	X	X	X
Fresno	COMMON	X	X	X	X	X	X	X	X
Fresno	DURUM	X	X	X	X	X	X	-	-
Fresno	OAT	X	X	X	X	X	X	X	X
Fresno	TRITICALE	X	X	X	X	X	X	X	X
Kern	COMMON	X	X	X	X	X	X	-	-
Kern	DURUM	X	X	X	X	X	X	-	-

Kern	TRITICALE	X	X	X	X	X	X	-	-
Tulelake	WINTERBARLEY	X	X	X	X	X	-	-	-
Tulelake	WINTERWHEAT	X	X	X	X	X	-	-	-
Tulelake	SPRINGBARLEY	X	X	X	X	X	-	-	-
Tulelake	SPRINGWHEAT	X	X	X	X	X	-	-	-

Harvest procedures

Grain:

Whole plots were harvested with a Wintersteiger Seedmaster Universal 150 plot combine. All seed from each plot was collected and weighed in field for the determination of plot yields at harvest moisture. A sub-sample of approximately 2.5lb was then taken from one of the four replicates and weighed in-field before returning the sample to the laboratory for additional processing.

Forage:

The forage trial consisted of two harvests, one at approximately boot stage and one at approximately soft dough stage. Because of the range of varieties and crop types within the forage trial, growth stage was also recorded at the time of harvest. For both harvests, there was a representative plant sample taken from each plot (approximately 300 grams of plant material) for moisture correction. Plots were harvested and wet weight taken using a Carter Forage Harvester with 36in head on a flail mower at the Fresno location and a RCI 36A forage harvester with a 36in head on a flail mower at the Davis location.

Post-harvest seed processing & yield estimates

Grain:

Grain yield, on a pound per acre basis, was estimated based on whole plot grain yield and plot area. The plot area for yield estimation was calculated using the measured plot length and width. Plots lengths were trimmed to avoid planting overlap among genotypes and averaged approximately 14.5ft, with the exception of the Fresno location (approximately 12ft). Plot widths were between 4.3 ft and 5 ft, depending on the grain drills used.

Grain sub-samples were stored in seed processing facilities at the University of California, Davis until reaching equilibrium moisture content. Given average conditions in the seed processing facilities, equilibrium moisture content for grain of all species is approximately 10%. Grain sub-samples were reweighed and differences from the field weight were used to correct plot yields for changes in moisture content since harvest. The sub-sample was then cleaned with an air-blower to remove any chaff or other extraneous material. Weight loss after this cleaning was used to correct estimated final grain yields.

For each entry, one replication was subsampled and the protein and moisture content of the cleaned grain was measured using a Perten Instruments Inframatic Near Infrared Reflectance (NIR) Grain Analyzer. The two-hundred-seed-weight of clean grain was measured using an Old Mill Company electronic seed counter and the value converted to a

thousand seed weight for the purpose of reporting. The test weight of clean grain was determined by weighing the mass of one dry quart of grain (AACCI Method 55-10.01).

Forage:

Forage yield, on a lb per acre basis, was estimated based on the whole plot forage yield and plot area. The plot area for yield estimation was calculated using the measured plot length and width. Plots lengths were trimmed to avoid planting overlap among genotypes and averaged approximately 14.5ft, with the exception of the Fresno location (approximately 12ft). The forage harvester header had a width of 3 ft.

Forage sub-samples were stored in drying facilities (dryers set to 50°C) at the University of California, Davis until a stable dry weight was attained. The sub-samples were then reweighed and differences from the field weight were used to correct plot yields for changes in moisture content.

The protein of the dry forage sub-samples were measured via NIRS using a FOSS DS2500 NIRS machine and calibrated via total N measured on a representative subset of samples (AOAC Official Method 972.43 & 990.03).

Climate measurements

Climate data for each location was obtained from the PRISM Climate Group (PRISM Climate Group, 2022). Cumulative precipitation and growing degree-days from sowing are estimated for each location and compared to 10-year means. Degree-days were estimated using the corrected single triangle method. Temperature thresholds of 87°F (30°C) and 44°F (7°C) were used.

Grain & flour quality analyses

Grain samples from all the conventionally managed common wheat trials at the Davis and Fresno locations, and from the durum wheat trials at the Fresno and Davis locations, were bulked by variety and analyzed for grain and flour quality by the California Wheat Commission. Grain analyses for both common and durum wheat included protein content, ash content, kernel weight, kernel diameter, kernel hardness, 1000 kernel weight, and kernel size distribution. Flour quality analyses for the common wheat included flour yield, protein content, ash content, falling number, gluten index, wet gluten, absorption, development time, stability, MTI, baking, mixing time, loaf volume, dough handling, crumb color, crumb grain, crumb texture, and bread symmetry. Flour quality analyses for the durum wheat included semolina extract, ash content, specks, protein, gluten index, falling number, alveograph values, semolina color, and the color, weight, loss and firmness of pasta (Table 9).

Table 9. The analytical procedures used by the California Wheat commission laboratory to measure grain and flour quality of common and durum wheat grain samples.

QUALITY TRAIT	METHOD
-	-
COMMON WHEAT	-
-	-
GRAIN ANALYSIS	-
Moisture	AACCI 44-15.02
Test Weight	AACCI 55-10.01
Protein	AACCI 46-30.01
Single Kernel Characterization (SKCS)	AACC 54-31.01 using Perten SKCS 4100
Ash	AACCI 08-01.01
Falling Number	AACCI 56-81.03
Sedimentation	AACC 56-63.01
Kernel Sizing	Wheat is sifted using a RoTap Sifter using U.S. No 7 and U.S. No. 10 Sieves. No. 7 Sieves (Large), No. 10 Sieves (medium), anything that passes through number 10 is small kernels.
-	-
FLOUR ANALYSIS	-
Moisture	AACCI 44-15.02
Protein	AACCI 46-30.01
Ash	AACCI 08-01.01
Wet Gluten & Gluten Index	AACCI 38-12.02
Farinograph	AACC 54-21.02
Alveograph	Modified AACC 54-30-.02
-	-
BAKING ANALYSIS	-
Puploaf baking	AACC 10-10.03
-	-
DURUM WHEAT	-
-	-
GRAIN ANALYSIS	-
Moisture	AACCI 44-15.02
Test Weight	AACCI 55-10.01
Protein	AACCI 46-30.01
Single Kernel Characterization (SKCS)	AACC 54-31.01 using Perten SKCS 4100
Ash	AACCI 08-01.01
Falling Number	AACCI 56-81.03
Sedimentation	AACC 56-63.01
Kernel Sizing	Wheat is sifted using a RoTap Sifter using U.S. No 7 and U.S. No. 10 Sieves. No. 7 Sieves (Large), No. 10 Sieves (medium), anything that passes through number 10 is small kernels.
-	-
SEMOLINA ANALYSIS	-
Moisture	AACCI 44-15.02
Protein	AACCI 46-30.01

Ash	AACCI 08-01.01
Wet Gluten & Gluten Index	AACCI 38-12.02
Farinograph	AACC 54-21.02
Alveograph	Modified AACC 54-30-.02

2.2 Data summarization & analytical procedures

Single season summaries of regional trial data

Grain and Forage:

Grain yield and protein data, corrected for chaff and moisture content, were standardized to 12% moisture content. Mean and standard deviations of the data were then derived for individual varieties and species at each trial location. Forage yield and protein estimates were estimated in the same manner. If the yield of any plot was found to be more than two standard deviations from either the variety mean or trial mean at a location, it was flagged as a potential outlier and the data checked for potential errors. Following this quality control step, the coefficient of variation for individual trials was used to assess overall data quality for that location. The "inter-variety method" for estimating coefficient of variation was used – whereby the coefficient of variation for a variety trial is calculated by averaging the coefficient of variation for individual varieties within the trial. A coefficient of variation of 16% was used as a threshold to indicate potential data quality problems with data from a specific location. Data from a location with a coefficient of variation of 16% or greater was then subject to further quality checks. Simple arithmetic means across replicates were calculated for the purpose of summarizing yield, protein content, test weights, thousand kernel weights, plant height, days to heading, and days to maturity for individual varieties at each test location. All data manipulation and analyses were conducted using the program R (R Core Team, 2022. Tables summarizing data for individual test locations in the 2021-22 season are available on the Small Grains website (http://smallgrains.ucanr.edu/Annual_Variety_Results/2022/ and http://smallgrainselection.plantsciences.ucdavis.edu/explore/), but are not presented within the body of this report.

Multi-environment summary & analysis

Grain:

To generate estimates of variety performance for grain, data were analyzed and summarized across multiple years and locations using linear mixed-effects models and least squares means. All data manipulation and analyses were conducted using the computer program R (R Core Team, 2022). For the purpose of reporting and summarizing variety trial results, the UC Small Grains program has historically divided California into different sub-regions: the Sacramento Valley, the San Joaquin Valley, and the Imperial Valley. Variety evaluations conducted in the Intermountain region generally include a different population of varieties to other regions of California, and therefore the Intermountain region has also been summarized separately. Genotype by environment

patterns in the trial data suggest that the Northern and Southern San Joaquin Valleys may require different variety recommendations. Small grain performance in California is therefore currently summarized by grouping the test locations as follows: the Sacramento Valley (Colusa, Davis, Delta, Solano, Tehama, and Yolo locations); the North Central San Joaquin Valley San Joaquin Valley (Fresno and Merced locations); the South San Joaquin Valley (Kern and Tulare locations); the Imperial Valley (Imperial location); the Intermountain region (Siskiyou County and Tulelake locations); A water limited group analysis (locations that had <35 cm of total water); and statewide group encompassing all fall-planted locations in California (with the exception of the northern Intermountain region trials, which are composed of a different genotype group). Within these groupings, variety performance for grain was modeled as a fixed effect, and replication nested within location within year was modeled as a random effect.

For the purposes of discussing trial results we used the UC Small Grain Program web tool to identify the top-performing fall-planted commercial varieties for grain in each sub-region. This tool develops least squares means from the mixed linear model. From this tool higher than average yields (95% confidence), lower than average protein (70% confidence) were determined, and further modified to select varieties with no stripe rust susceptibility. For general discussion we focus on the top five highest yielding grain varieties of each species in each location.

Forage:

Because forage data is only available from a single season multi-year variety performance cannot be calculated. Single year site results can be found here: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/ These results are not intended as variety recommendations and should not be used as such. The true performance of a variety is most reliable when based on data taken across multiple environments and seasons.

Stress Stability

In side-by-side trials where drought and N stress is imposed alongside normal N and water management, stress stability is calculated as:

$$Y = (Ai / \text{mean } A) + [(Bi - \text{mean } B) / (\text{mean } B)]$$

where A represents the unstressed trial condition, B represents the stressed trial condition and i represents an individual variety.

Variety performance is quantified according to the above equation for the 2021-22 season and the two previous seasons separately. Subsequently, a multi-year summary of stress stability for individual varieties are analyzed via mixed linear models and summarized via least squares means. Response variables for which stress stability are analyzed are yield, protein yield and grain protein content.

Summary of disease incidence & agronomic traits

For single season summaries, the disease incidences and agronomic ratings are reported as the 90th percentile of all plot-level observations for a given variety at a single location. The 90th percentile is used because it increases the likelihood of detecting susceptibility to a disease (or deleterious trait such as lodging), particularly if varieties have only been in the trial for short periods of time, but avoids potential bias from false-positives that could arise by using the maximum observed value. For the purpose of discussion, a disease rating of 3 or greater in a single season should be considered a problematic threshold.

For multi-environment summaries of disease and agronomic traits, the quartiles of the data for all 90th percentile observations of each disease and agronomic trait across all locations in the five years prior to and including 2021-22 were calculated. The four quartile values were then used to assign as thresholds for the following disease classifications: S = Susceptible; MS = Moderately Susceptible; MR = Moderately Resistant; and R = Resistant. Likewise, the same method was used to determine the following classifications for the variety-specific relative-risk of lodging and seed shatter: Low; Medium; Medium High; High.

2.3 Extension of results

Results of the analyses were published on the UC Small Grains website and announcements of the availability of newly available results were made on the UC Small Grains Blog. The web-tools available on the UC Small Grains Research and Information Center website (http://smallgrainselection.plantsciences.ucdavis.edu/; and http://smallgrainselection.plantsciences.ucdavis.edu/explore/) can be used for accessing and customizing results and assisting with variety selection in an interactive environment.

3. RESULTS

Statewide variety trials

Site conditions

The 2021-22 season started out wetter than usual (Figure 2) and with slightly below average temperatures (Figure 3). In the San Joaquin Valley and the Sacramento Valley, rainfall between October 1 and March 1 was 99% and 103% of average, respectively, and both areas experienced an unusually long 8-week period without rainfall between early January and early March. Rainfall from March 1 to June 1 was 50% and 33% of average from the San Joaquin and Sacramento Valleys, respectively (Figure 4). Temperatures were cooler than average during the period from March 1 to April 30 as well (Figure 5).

Figure 2. Historical precipitation (10-year average, left) compared to precipitation totals during the 2021-22 season (right) between 10/1/21 and 3/1/22.

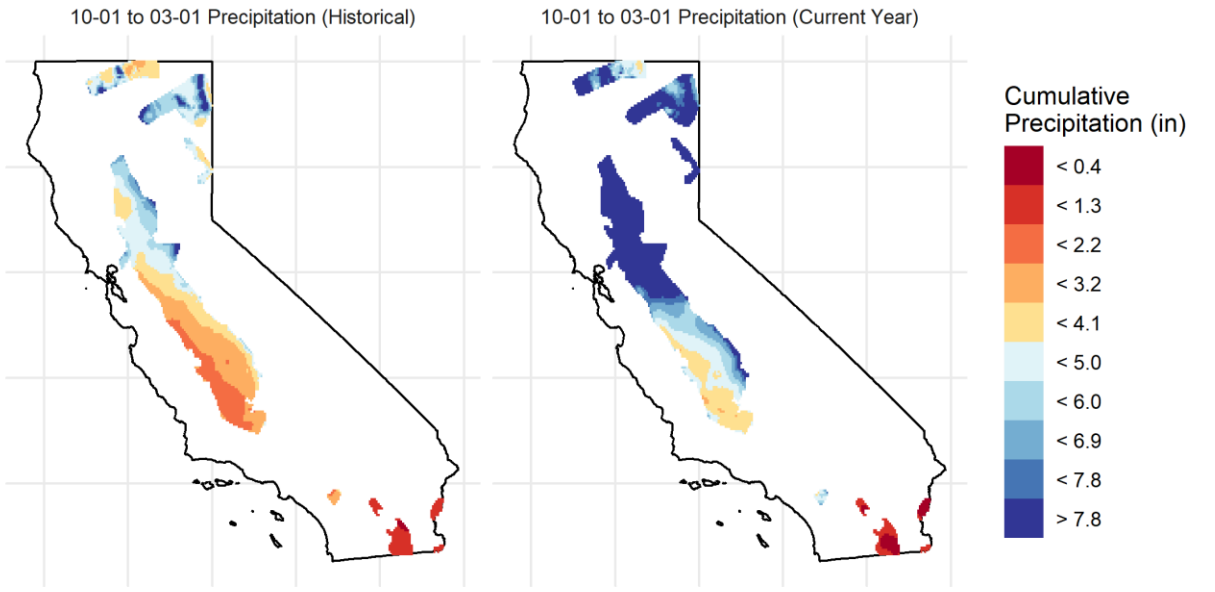


Figure 3. Historical growing degree day accumulation (GDD: 86F max, 45F min; 10-year average, left) compared to GDD totals during the 2021-22 season (right) between 11/15/21 and 3/1/22.

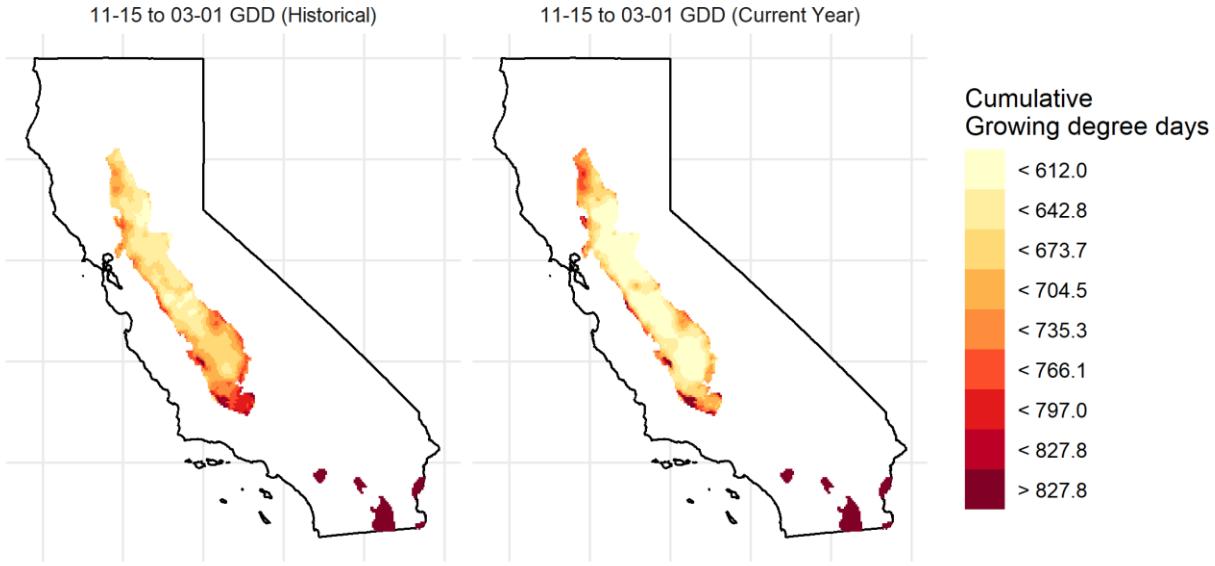


Figure 4. Historical precipitation (10-year average, left) compared to precipitation totals during the 2021-22 season (right) between 3/1/22 and 6/1/22.

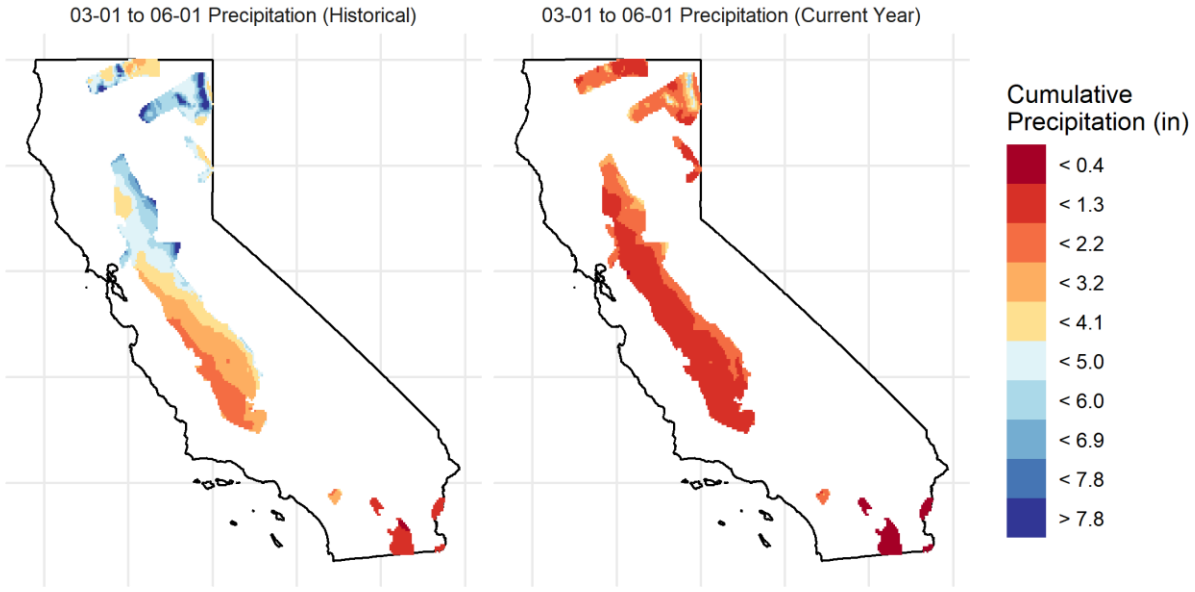
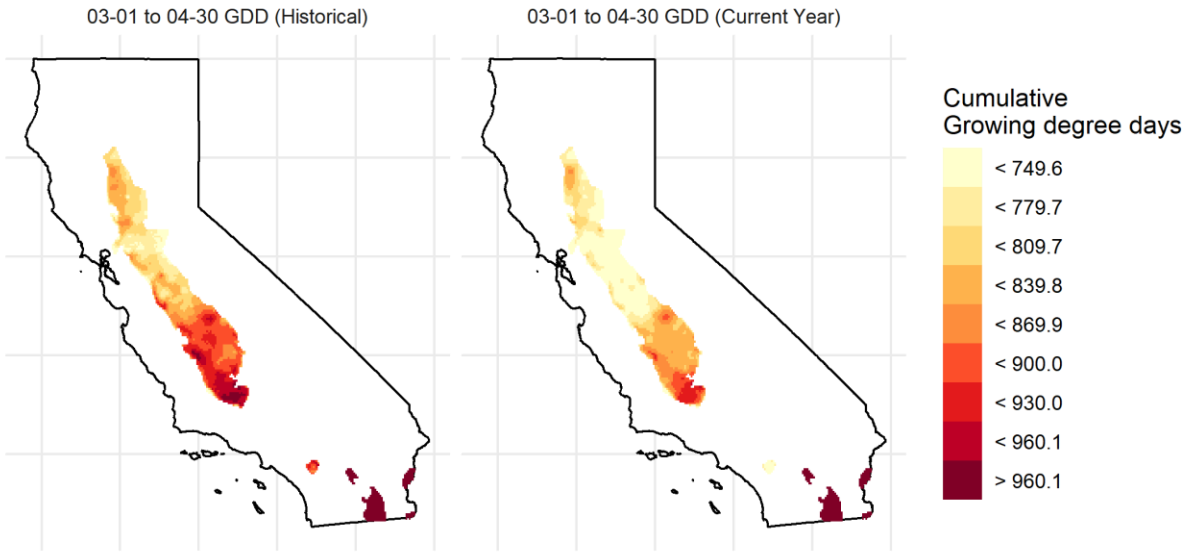


Figure 5. Historical growing degree day accumulation (GDD: 86F max, 45F min; 10-year average, left) compared to GDD totals during the 2021-22 season (right) between 3/1/22 and 4/30/22.



Performance summaries

Overall performance summary

As a gauge of overall seasonal conditions, the mean yields per location for the past five seasons are presented in Table 10. Trial grain yields in the 2021-22 season were similar to previous seasons.

Table 10. The mean yield by location in the regional trials by crop type over the past five seasons.

Crop Type	Location	2017-18 Fall	2017-18 Spring	2018-19 Fall	2018-19 Spring	2019-20 Fall	2019-20 Spring	2020-21 Fall	2020-21 Spring	2021-22 Fall	2021-22 Spring
BARLEY	Davis	7102	-	6385	-	6397	-	2057	-	4566	-
BARLEY	Fresno	5621	-	6591	-	6410	-	4699	-	4486	-
COMMON	Davis	7825	-	8322	-	6907	-	6715	-	6442	-
COMMON	Fresno	9650	-	7161	-	9230	-	6318	-	6861	-
DURUM	Davis	8951	-	6417	-	8640	-	6815	-	7529	-
DURUM	Fresno	8189	-	-	-	9816	-	7376	-	7710	-
OAT	Davis	-	-	-	-	-	-	-	-	3469	-
OAT	Fresno	-	-	-	-	-	-	-	-	3057	-
SPRINGBARLEY	Tulelake	-	8138	-	8303	6050	8323	-	9254	-	8584
SPRINGWHEAT	Tulelake (Hard)	-	10257	-	9991	-	9672	-	8403	-	7422
SPRINGWHEAT	Tulelake (Soft)	-	11106	-	10934	-	10277	-	9162	-	7829
TRITICALE	Davis	9612	-	11192	-	9720	-	6513	-	7552	-
TRITICALE	Fresno	9574	-	7651	-	9710	-	6462	-	7728	-
WINTERBARLEY	Tulelake	-	-	-	-	6854	-	8892	-	7877	-
WINTERWHEAT	Tulelake	11280	-	-	-	10457	-	-	-	-	-
WINTERWHEAT	Tulelake (Hard)	-	-	11432	-	-	-	9538	-	10494	-
WINTERWHEAT	Tulelake (Soft)	-	-	11602	-	-	-	9985	10554	10788	-

Variety Performance

Table 11 reports top-performing varieties for grain delineated by crop type and region. Top performing varieties for grain met the following criteria for common wheat and durum wheat: commercial varieties with higher than average grain yields (80% confidence), grain protein that is not below average (95% confidence), and no stripe rust susceptibility. For barley and triticale, the criteria were the same except that no grain protein parameter was included. Comprehensive variety performance is reported in the supplementary variety performance tables (24-48).

Because there is only forage data from a single season, variety performance for forage production cannot be calculated accurately. Single year site results can be found here: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/ These results are not intended as variety recommendations. The performance of a variety is most reliable when based on data taken across multiple environments and seasons.

Table 11. Top performing commercial varieties for grain yield by region from most recent three observation years

Crop Type	Observation Years	Region/Environment	Top-performing varieties
Fall-Planted Barley	2020-2022	Statewide	ISHI, LCS GENIE
Fall-Planted Barley	2020-2022	Northern Central San Joaquin Valley	ISHI, LCS GENIE, TAMALPAIS
Fall-Planted Barley	2020-2022	Sacramento Valley	No variety meets criteria
Fall-Planted Barley	2018, 2021, 2022	Water limited	OSU FULL PINT
Spring-Planted Barley	2020-2022	Intermountain Region	No variety meets criteria
Fall-Planted Common Wheat	2020-2022	Statewide	WB 9215, AP OCTANE
Fall-Planted Common Wheat	2016-2018	Imperial Valley	AP OCTANE, SY SUMMIT 515
Fall-Planted Common Wheat	2020-2022	Sacramento Valley	WB 9215, AP OCTANE
Fall-Planted Common Wheat	2020-2022	Northern Central San Joaquin Valley	No variety meets criteria
Fall-Planted Common Wheat	2018, 2019, 2022	Southern San Joaquin Valley	SY SUMMIT 515, WB 7566, SY SIENNA
Fall-Planted Common Wheat	2020-2022	Water limited	WB 9215
Fall-planted Winter wheat	2019-2021	Intermountain Region	WB 1604
Spring-Planted Spring wheat	2019-2021	Intermountain Region	UC CENTRAL RED, WB PATRON, WB 9904
Fall-Planted Durum Wheat	2020-2022	Statewide	UC MIWOK, TIBURON, UC DESERT KING
Fall-Planted Durum Wheat	2018, 2019, 2021	Imperial Valley	POWELL, AS COLOMBO
Fall-Planted Durum Wheat	2020-2022	Northern Central San Joaquin Valley	No variety meets criteria
Fall-Planted Durum Wheat	2022-2022	Sacramento Valley	AS MAESTRALE, TIBURON
Fall-Planted Durum Wheat	2018, 2019, 2022	Southern San Joaquin Valley	SY FORTISSIMO, SY VOLANTE, POWELL, AS COLOMBO, TIBURON, UC DESERT KING
Fall-planted Triticale	2020-2022	Statewide	UC BOPAK
Fall-planted Triticale	2016-2018	Imperial Valley	WB PACHECO, NS GOLD RUSH 91
Fall-planted Triticale	2020-2022	Northern Central San Joaquin Valley	No variety meets criteria
Fall-planted Triticale	2020-2022	Sacramento Valley	UC BOPAK
Fall-planted Triticale	2018, 2019, 2022	Southern San Joaquin Valley	NS GOLD RUSH 91, NS SWIFT 77, NS TRICAL 115T, UC BOPAK
Fall-planted Triticale	2020-2022	Water Limited	No variety meets criteria

Disease & agronomic summaries

The occurrence of diseases in the UC trial locations during the 2021-22 season is presented in Table 12. Overall disease incidence was low during the 2021-22 season resulting in a 90th percentile value of 1 for the entire population of stripe rust observations in common wheat recorded during the season. Variety specific disease observations compiled during 2021-22 are presented in Tables 13 – 15. The 90th percentile disease incidence ratings for individual locations in the 2021-22 season and for the previous five seasons are presented in Tables 16 and 17.

In all trials, Yecora Rojo (UC 112) was included as known stripe rust-susceptible check, and its 90th percentile value for stripe rust severity was a score of 3 (see Table 13). All other 90th percentile values for stripe rust for common wheat, durum wheat, triticale, and barley were scores of 1.

The exception to the general seasonal trend of low disease incidence was the barley trial at the Delta location. This trial had irregular bird damage (multiple plots were completely bare of grain) and high incidence of an unidentified foliar diseases. This field was not included in the multi-year agronomic and disease summaries because the disease type could not be confirmed. Of note is that some varieties withstood the high disease/bird pressure and had comparably high grain yields (relative to the 2021-22 variety trial average grain yield). These were: ISHI, UC 960, UC 933, UC 937, UC 603, and SCHALLER.

A multi-year summary of disease and agronomic observations for common wheat, durum, triticale and barley are presented in Table 18, Table 19, Table 20, and Table 21, respectively. The varieties YECORA ROJO, WB TRIPLE IV, APB 510477, WB ORITA, WB MOHAVE, UC ATREA, UC 603, UC 933, UC 969, CDC COPELAND, ACC SYNERGY, and KLAGES are considered susceptible to stripe rust based on multi-year analyses. The varieties DPG FV 2808, WB 9699, KRONOS, and APB 471400 are considered moderately susceptible to stripe rust based on multi-year analyses. The varieties PR 1404, WB TRIPLE IV, DPG FV 2808, WB 9229, APB 511829, YECORA ROJO 515 HP, UC 1885, XB T401, and OSU FULL PINT are susceptible to barley yellow dwarf virus.

Incidence of lodging was low in the 2021-22 variety trial with no incidences of lodging at the Davis site with the exception of KANOTA in the forage trial. The Kern site had the highest incidence of lodging, DESERT GOLD, DESERT KING HP, and DESERT KING RS had lodging scores 5 or above. The DESERT KING HP lodging score is consistent with the multi-year analysis, which shows medium high incidence of lodging for DESERT KING HP, however the multi-year analysis shows a medium-low lodging score for DESERT GOLD (see Table 19).

Variety-specific ratings of agronomic traits such as lodging and multi-year averages of traits such as test weight, plant height, and relative maturity can be found for the different crop types in Tables 18 – 20.

Table 12. Locations where disease and disease-like symptoms were observed and recorded in the 2021-22 season.

Common Name	Crop Subtype	Smut	Stripe Rust	Unknown Disease/Bird damage
Davis	BARLEY	-	X	X
Davis	COMMON	-	X	-
Davis	TRITICALE	-	X	-
Davis	OAT	X	-	-
Delta	BARLEY	-	-	X
Fresno	BARLEY	X	-	-
Fresno	COMMON	-	X	-
Fresno	TRITICALE	-	X	-

Table 13. 2022 common wheat disease observations by variety (90th percentile)

Crop Classification	UC Entry Number	Label	Stripe Rust
HRS	112	YECORA ROJO	3
HRS	1478	SY CAL ROJO	1
HRS	1495	UC LASSIK	1
HRS	1526	PR 1404	1
HRS	1728	WB JOAQUIN ORO	1
HRS	1730	WB 9229	1
HRS	1731	WB PATRON	1
HRS	1745	UC YUROK	1
HRS	1817	UC CENTRAL RED	1
HRS	1916	YECORA ROJO 515	1
HRS	1920	WB 9215	1
HRS	1922	WB 9990	1
HRS	1958	WB 9727	1
HRS	1959	WB 9725	1
HRS	1961	UC 1961	1
HWS	1680	UC PATWIN 515	1
HWS	1743	UC PATWIN 515 HP	1
HWS	1909	UC AMARILLO	1
HWS	1930	UC 1930	1
HWS	1932	UC CENTRAL WHITE	1
SWS	1667	BAG NEW DIRKWIN	1
-	1970	FV 2808+	1

Table 14. 2022 triticale disease observations by variety (90th percentile)

Crop Classification	UC Entry Number	Label	Stripe Rust
TRITICALE	3164	WB PACHECO	1
TRITICALE	3185	UC ATREA	1
TRITICALE	3190	UC BOPAK	1
TRITICALE	3193	UC 3193	1
TRITICALE	3194	APB T470298	1
TRITICALE	3195	APB T470308	1
TRITICALE	3196	UC 3196	1
TRITICALE	3197	UC 3197	1

Table 15. 2022 durum wheat disease observations by variety (90th percentile)

There was no incidence of disease was recorded in the durum wheat trials during the 2021-22 season.

Table 16. The 90th percentile for disease incidence across all individual test locations in the 2021-22 season.

Crop Subtype	Common Name	Stripe Rust
BARLEY	Davis	1
COMMON	Davis	1
COMMON	Fresno	1
TRITICALE	Davis	1
TRITICALE	Fresno	1

Table 17. The 90th percentile for disease incidence across all test locations within individual season between the 2017-18 season and the 2021-22 season.

Crop Subtype	Season	BYDV	Leaf Blotch	Leaf Rust	Powdery Mildew	Scald	Spot Blotch	Stripe Rust
BARLEY	2018-19	-	2.7	3.9	5	5.1	4	3
BARLEY	2019-20	-	-	-	-	-	3	-
BARLEY	2021-22	-	-	-	-	-	-	1
COMMON	2017-18	2	-	-	-	-	-	1
COMMON	2018-19	-	-	-	-	-	-	2
COMMON	2019-20	-	-	2	-	-	-	3.9
COMMON	2020-21	3	-	-	3	-	-	-
COMMON	2021-22	-	-	-	-	-	-	1
DURUM	2017-18	3	-	-	-	-	-	1
DURUM	2018-19	2	-	-	3	-	-	3
DURUM	2019-20	3	-	-	3	-	-	1
DURUM	2020-21	2	-	-	2	-	-	-
OAT	2020-21	2	-	-	-	-	-	-
SPRINGBARLEY	2019-20	-	-	-	-	-	-	3
SPRINGWHEAT	2019-20	-	-	-	-	-	-	2
TRITICALE	2017-18	1	-	-	-	-	-	1
TRITICALE	2018-19	-	-	-	-	-	-	1
TRITICALE	2019-20	-	-	-	-	-	-	5.3
TRITICALE	2020-21	1.6	-	-	3.6	-	-	-
TRITICALE	2021-22	-	-	-	-	-	-	1
WINTERBARLEY	2019-20	-	-	-	-	-	-	5
WINTERWHEAT	2019-20	-	-	-	-	-	-	1

Table 18. A summary of common wheat disease and agronomic observations taken from the 2017-18 to 2021-22 seasons.

Crop Classification	Name	UC Number	2018-2022 S. Rust rating	2018-2022 L. Rust rating	2018-2022 BYDV rating	2018-2022 Septoria rating	Test Weight (lb/bu)	Thousand Kernel Wt (g)	Days to heading (from Jan. 1, Davis)	Days to maturity (from Jan. 1, Davis)	Plant Height (in)	Lodging risk	Shatter risk	Plots observed (n)	Status
HRS	YECORA ROJO	112	S	R	R	MS	41.2	45.6	81	132	29	High	Low	93	Available
HRS	SY CAL ROJO	1478	R	R	MS	R	40	40.8	86	132	30	Low	Low	108	Available
HRS	UC LASSIK	1495	R	R	MS	MR	41.1	36.2	88	132	34	Med. High	Low	90	Available
HRS	SY REDWING	1521	MR	R	MR	R	40.1	37.4	77	125	33	Low	Low	88	Released
HWS	SY BLANCA ROYALE	1522	MR	R	MR	R	40.3	34.8	74	127	32	Low	Low	76	Released
HRS	PR 1404	1526	R	-	S	-	41	42.3	103	140	35	Low	Low	47	Released
HRS	WB TRIPLE IV	1550	S	-	S	S	41.2	41.1	90	128	35	High	Low	59	Available
HRS	DPG FV 2808	1608	MS	R	S	MR	41.6	40.3	110	156	39	Med. High	Medium	71	Available
HWS	SY BLANCA GRANDE 515	1657	R	R	MR	MS	42.3	39.8	81	129	34	Med. High	Low	88	Available
HRS	SY SUMMIT 515	1658	R	R	MS	MR	40.9	37.9	84	130	33	Low	Low	90	Available
SWS	BAG NEW DIRKWIN	1667	R	R	MS	R	38.6	37.2	89	133	37	Med. High	Low	108	Available
HWS	UC PATWIN 515	1680	R	R	MR	R	40.6	36.7	87	133	31	Low	Low	110	Available
HWS	LCS STAR	1688	R	R	MS	R	40.1	31.1	76	129	34	Med. High	Medium	74	Available
HWS	LCS ATOMO	1723	MR	R	MS	R	41.3	37.5	77	128	34	Med. High	Low	89	Released
HRS	WB JOAQUIN ORO	1728	R	R	MS	MS	41.7	41.2	81	129	33	Low	Low	106	Available
HRS	WB 9229	1730	R	R	S	R	41.7	37.9	88	133	33	Med. High	Low	103	Available
HRS	WB PATRON	1731	R	R	MS	R	40.5	39.9	86	133	35	Med. High	Low	104	Available
HWS	UC PATWIN 515 HP	1743	R	R	MR	R	40.3	35.6	85	132	31	Med. Low	Low	105	Available
HRS	UC YUROK	1745	R	MR	MS	R	41.9	38.4	89	133	35	Med. Low	Low	106	Available
HRS	WB 9112	1748	R	R	MS	R	40.8	33.7	75	129	34	Med. Low	Low	75	Available
HRS	WB 9904	1751	R	R	MS	R	40.4	40.7	87	132	36	Med. Low	Low	90	Available

SRS	SY VACA	1766	R	R	MS	MS	39.2	39.9	121	159	41	Low	Low	71	Released
HRW	ASSL TAM 204	1778	R	R	MR	R	39.6	31.6	68	114	38	Med. High	Low	91	Released
HWS	WB 7566	1802	R	R	R	R	40.8	37.6	79	128	32	Low	Low	72	Available
HWS	UC 1815	1815	MR	R	MR	R	40.3	37.6	112	150	33	Low	Low	59	Released
HRS	UC CENTRAL RED	1817	R	R	MR	R	41.5	38.5	87	132	33	Low	Low	109	Available
HRS	LCS 12SB0197	1830	R	R	MR	R	39.7	34.4	80	128	36	Med. Low	Low	59	-
HWS	LCS 12SB0224	1831	R	R	MR	R	40	35.3	77	129	34	Low	Low	58	-
HRS	SY SIENNA	1835	R	R	MR	R	41.5	42.8	85	130	33	Low	-	84	Available
HWS	UC 1839	1839	R	R	R	R	40.4	38.6	104	145	39	High	-	33	-
HRS	WB 9350	1842	R	R	R	MS	41.1	38.4	80	128	31	Low	-	53	Released
HRS	WB 9433	1847	R	MR	R	MR	41.5	36.8	82	129	31	Med. High	-	53	Released
HRS	APB 510477	1874	S	-	MS	-	40.5	36.5	76	124	34	Med. Low	-	23	-
HRS	APB 511829	1875	R	-	S	-	40.6	35	75	126	33	Med. Low	-	23	-
HRS	SY 64-1-9	1876	R	-	MR	MR	40.9	37.2	83	127	32	Med. High	-	60	-
HRS	AP VENOM	1877	R	-	MR	R	40.3	36.6	84	128	38	Med. High	-	60	Available
HRS	AP OCTANE	1878	R	-	R	MR	40.9	40.7	83	129	34	High	-	84	Available
HRS	YECORA ROJO 515 HP	1879	R	-	S	-	40.1	37.3	74	127	28	Low	-	32	-
HRS	UC 1880	1880	R	-	MS	MR	40.7	40	79	125	35	High	-	42	-
HRS	UC 1882	1882	R	-	MS	MS	40.7	39	78	125	33	Low	-	44	-
HWS	UC 1883	1883	R	-	MS	-	40.5	36.8	76	124	32	Low	-	23	-
HRS	UC 1884	1884	R	-	MS	-	41.5	39.5	77	127	34	Med. Low	-	32	-
HRS	UC 1885	1885	R	-	S	-	39.9	33.5	78	126	30	Low	-	23	-
HRS	XB 9512	1886	R	-	MR	-	41.7	35.3	76	125	32	Med. High	-	23	-
HRS	WB 9490	1887	MR	-	MS	MR	41.1	39.9	79	126	34	High	-	41	Available
HRS	WB 9699	1888	MS	-	MR	MR	42.1	41.9	84	129	34	Med. Low	-	85	Released
HRS	APB 410089	1903	R	-	-	MS	42.1	44.2	104	-	35	Med. Low	-	30	-
HRS	APB 510879	1904	R	-	-	MR	41.6	44.6	107	-	38	Med. Low	-	26	-
HRS	XC 9407	1905	R	-	-	MR	41.4	41	107	-	34	High	-	29	-
HRW	WINCAL 158-5	1906	R	-	-	MS	41.4	42.1	110	147	35	High	-	42	-
HWS	UC 1907	1907	R	-	-	MR	42.2	43.5	108	147	34	High	-	44	-
HRS	UC 1908	1908	R	-	-	R	42.2	38.4	104	-	34	High	-	25	-

HWS	UC AMARILLO	1909	R	-	-	R	41.6	37.5	105	143	33	High	-	68	-
HRS	YECORA ROJO 515	1916	R	-	R	-	40.4	43.5	94	139	28	-	-	64	-
HWS	UC 1917	1917	R	-	-	-	40.6	44.1	112	147	39	-	-	16	-
HRS	WB 9215	1920	R	-	R	-	41.2	39.6	92	138	31	-	-	48	Available
HRS	AP REDWING 204	1921	R	-	R	-	39.6	38.2	100	139	30	-	-	40	-
HRS	WB 9990	1922	R	-	R	-	39.5	37.2	102	139	35	-	-	64	-
HWS	UC 1930	1930	R	-	R	-	41.8	41.8	96	138	31	-	-	48	-
HWS	UC 1931	1931	R	-	R	-	40.5	33.2	92	134	32	-	-	24	-
HWS	UC CENTRAL WHITE	1932	R	-	R	-	41.1	44.8	96	136	33	-	-	48	-
HRS	WB 9727	1958	R	-	-	-	42.5	44.3	101	141	31	-	-	24	-
HRS	WB 9725	1959	R	-	-	-	40.4	45.2	100	141	30	-	-	24	-
HRS	UC 1961	1961	R	-	-	-	41.1	48.3	102	142	31	-	-	24	-
-	FV 2808+	1970	R	-	-	-	41.5	40.6	101	143	35	-	-	24	-

Table 19. A summary of durum wheat disease and agronomic observations taken from the 2017-18 to 2021-22 seasons.

Name	UC Number	2018-2022 S. Rust rating	2018-2022 L. Rust rating	2018-2022 BYDV rating	2018-2022 Septoria rating	Test Weight (lb/bu)	Thousand Kernel Wt (g)	Days to heading (from Jan. 1, Davis)	Days to maturity (from Jan. 1, Davis)	Plant Height (in)	Lodging risk	Shatter risk	Plots observed (n)	Status
DPG DURAKING	878	R	-	MR	-	41.4	42.5	79	125	33	Low	Low	27	Released
KRONOS	951	MS	-	MR	R	41	53.5	74	122	36	High	Low	43	Available
DPG PLATINUM	1210	R	-	MR	-	41	42.5	79	126	33	Med. Low	Low	27	Available
DPG TOPPER	1211	R	-	R	-	41.7	42.1	86	105	36	Med. Low	Low	27	Released
WB ORITA	1215	S	-	R	R	40.5	53.1	87	126	38	Med. Low	Low	43	Available
UC DESERT KING	1375	R	-	R	R	41.6	50.6	92	126	37	Low	Low	55	Available
SY FORTISSIMO	1429	R	-	R	R	41.2	46.1	88	127	36	Med. Low	Low	50	Available
SY VOLANTE	1431	R	-	R	R	41.7	53.2	87	125	35	Med. Low	Low	54	Available
WESTMORE HP	1484	R	-	R	R	40.9	40.9	78	121	34	High	Medium	47	Available

AS MAESTRALE	1582	R	-	MR	R	41.7	45.9	85	129	40	High	Medium	47	Available
AS SARAGOLLA	1583	MR	-	MS	R	42.1	46.6	83	125	38	Med. High	Low	50	Available
WB MEAD	1607	MR	-	MS	R	40.8	47.1	90	123	38	Low	Low	47	Available
UC DESERT KING HP	1627	R	-	MR	R	40.3	44.2	91	127	36	Med. High	Low	56	Available
TIBURON	1640	R	-	R	MR	41.4	57.3	82	126	35	Med. Low	Low	52	Available
WB MOHAVE	1654	S	-	MR	R	41.4	49.2	78	124	36	Med. Low	Low	47	Available
UC MIWOK	1690	MR	-	MR	R	41.8	54.8	83	127	35	Med. High	Low	77	Available
UC 1771	1771	R	-	R	-	41.5	50.3	110	-	39	Med. Low	Low	17	-
AS COLOMBO	1800	MR	-	R	R	40.8	45.3	91	124	38	Low	Low	40	Available
ALBERTO	1813	R	-	R	R	40.8	50.9	83	126	32	Med. Low	Low	54	Available
UC 1848	1848	R	-	-	R	40.3	54	104	149	34	Med. High	-	24	-
UC DESERT GOLD	1850	R	-	MR	R	41.7	49.1	93	133	38	Med. Low	-	56	Available
APB 450311	1851	MR	-	R	R	40.3	46.1	74	128	28	Med. Low	-	28	-
APB 471400	1853	MS	-	R	MR	42.4	50.2	79	128	33	Med. High	-	45	-
APB 450275	1865	R	-	MR	-	40.1	47.6	74	124	27	Low	-	12	-
APB 450333	1866	R	-	R	-	40.5	49	72	125	28	Low	-	12	-
DPG CANDURA	1867	R	-	R	-	41	43.1	80	126	35	Med. High	-	12	Released
POWELL	1868	R	-	MS	-	42.2	53.4	75	125	36	Med. High	-	20	Available
SHASTA	1869	R	-	MR	-	42.3	58.1	75	123	37	High	-	20	Available
UC 1870	1870	R	-	MR	-	41.6	48.6	87	128	37	Med. High	-	25	-
UC 1871	1871	R	-	MR	-	42.1	49.1	75	126	36	High	-	20	-
UC 1872	1872	R	-	MR	-	40.7	46.2	82	105	34	Med. High	-	12	-
UC 1873	1873	R	-	R	-	41.7	46.4	83	126	34	Med. Low	-	12	-
APB 152308	1900	MR	-	R	-	41.1	53.4	103	143	31	Med. Low	-	48	-
APB 153541	1901	R	-	MR	-	41.4	57.2	106	145	36	Med. High	-	44	-
APB 152356	1902	R	-	MR	-	41.3	47.2	104	146	32	Med. Low	-	47	-
UC 1910	1910	R	-	R	-	40.2	47.8	111	147	40	Med. Low	-	20	-
ASC 122	1912	R	-	R	-	41.6	55.8	104	-	41	High	-	12	-
ASC 123	1913	MR	-	R	-	40.6	54.7	107	-	42	Med. High	-	12	-
ASC 124	1914	MR	-	R	-	40.4	47	121	-	39	Med. Low	-	12	-
UC 1918	1918	R	-	-	-	40.8	48.7	112	147	36	-	-	8	-

UC 1919	1919	R	-	-	-	41.1	44	112	147	40	-	-	8	-
APB 471389	1924	R	-	-	-	42.8	52.3	105	146	34	Low	-	36	-
UC 1927	1927	R	-	-	-	41.9	43.5	-	-	37	Med. Low	-	16	-
UC 1928	1928	R	-	-	-	42.3	45.3	-	-	38	Low	-	16	-
UC 1949	1949	R	-	-	-	43	47.7	-	-	40	Med. Low	-	16	-
UC 1962	1962	R	-	-	-	43	59.8	98	145	35	Med. Low	-	12	-
UC 1963	1963	R	-	-	-	42.5	61.2	98	143	35	Low	-	12	-
UC 1964	1964	R	-	-	-	41.2	55.4	99	143	37	Low	-	12	-
APB D518-38	1969	R	-	-	-	42.2	61.2	97	146	34	Low	-	12	-

Table 20. A summary of triticale disease and agronomic observations taken from the 2017-18 to 2021-22 seasons.

Name	UC Number	2018-2022 S. Rust rating	2018-2022 L. Rust rating	2018-2022 BYDV rating	2018-2022 Septoria rating	Test Weight (lb/bu)	Thousand Kernel Wt (g)	Days to heading (from Jan. 1, Davis)	Days to maturity (from Jan. 1, Davis)	Plant Height (in)	Lodging risk	Shatter risk	Plots observed (n)	Status
NS TRICAL 105	3097	R	R	MS	R	39.2	42.7	78	128	38	Med. Low	Medium	106	Released
WB PACHECO	3164	R	R	R	R	38.8	40.2	84	128	37	Med. Low	Medium	98	Available
NS CAMELOT	3168	R	R	R	R	38.1	38.2	74	110	38	Med. High	Medium	107	Released
NS TRICAL 158EP	3169	R	R	R	R	38.8	37.4	83	131	35	Low	Medium	103	Available
NS TRICAL 115T	3170	R	R	MR	MR	38.9	37.5	84	132	35	Med. Low	Medium	105	Available
NS GOLD RUSH 91	3178	R	-	R	R	37.6	41.3	105	152	35	Low	Medium	47	Available
UC 3183	3183	R	-	MR	-	39.9	40.4	70	100	37	High	-	23	-
UC 3184	3184	R	-	MR	R	38.1	48.8	77	128	42	High	-	58	-
UC ATREA	3185	S	-	R	R	38	46.7	84	133	39	Med. High	-	108	Available
XB T401	3186	R	-	S	-	38	37.8	78	103	35	Low	-	23	-
NS SWIFT 77	3188	R	-	-	R	38.2	45.6	105	147	41	High	-	49	Available
NS 13T00903	3189	R	-	-	R	37.2	44.6	108	147	40	Med. Low	-	49	-

UC BOPAK	3190	MR	-	-	R	39.2	45.4	99	145	41	High	-	91	Available
UC 3191	3191	R	-	-	-	37.5	47.1	112	147	48	-	-	16	-
UC 3193	3193	R	-	-	-	37.5	42.3	96	146	39	-	-	48	-
APB T470298	3194	R	-	-	-	38.5	48.8	98	146	35	-	-	24	-
APB T470308	3195	R	-	-	-	39.1	47.1	98	146	36	-	-	24	-
UC 3196	3196	R	-	-	-	39.6	52.6	96	143	44	-	-	24	-
UC 3197	3197	R	-	-	-	37.8	55.2	97	143	39	-	-	24	-

Table 21. A summary of barley disease and agronomic observations taken from the 2017-18 to 2021-22 seasons.

Crop Type	Crop Classification	Name	UC Number	2018-2022 S. Rust rating	2018-2022 L. Rust rating	2018-2022 BYDV rating	2018-2022 Septoria rating	Test Weight (lb/bu)	Thousand Kernel Wt (g)	Days to heading (from Jan. 1, Davis)	Days to maturity (from Jan. 1, Davis)	Plant Height (in)	Lodging risk	Shatter risk	Plots observed (n)	Status
BARLEY	6RSF	UC 603	603	S	S	MS	-	33.3	38.9	94	122	32	Low	Medium	51	Released
BARLEY	6RSF	UC 933	933	S	MS	MS	-	32.9	41.8	95	130	25	Med. Low	Medium	50	Released
BARLEY	6RSN	UC 937	937	R	MR	-	-	33	42.5	98	134	26	Low	Low	43	-
BARLEY	6RSF	UC 960	960	R	MS	-	-	33.1	43.4	101	135	29	Low	-	34	-
BARLEY	6RSF	UC 969	969	S	MR	MS	-	34.3	42.2	92	131	30	Low	Low	56	Released
BARLEY	6RSF	ISHI	1047	R	R	MS	-	33.2	40.5	99	133	28	Med. High	Low	52	Available
BARLEY	6RSN	TAMALPAIS	1134	MR	R	MR	-	36.9	38.6	98	134	27	Low	Low	53	Available
BARLEY	6RSF	UC TEHAMA	1280	R	R	R	-	33.3	40.6	100	129	30	High	Low	40	Released
BARLEY	6RSF(H)	SCHALLER	1355	R	MR	R	-	31.5	43.4	107	134	36	Med. High	Low	44	Available
BARLEY	2RSM	UC BUTTA 12	1360	R	R	MS	-	36	47.9	102	131	32	Med. High	Low	58	Available
BARLEY	6RSF	UC 1385	1385	R	R	MR	-	31.6	37.2	92	127	21	Med. Low	Low	24	-
BARLEY	2RSM	UC CAPAY	1390	R	R	R	-	35.6	50.8	92	131	34	High	Low	58	Available
BARLEY	2RSM	UC TAHOE	1409	R	R	R	-	35.6	40.4	98	132	28	High	Low	57	Available
BARLEY	2RSM	OSU FULL PINT	1411	R	R	S	-	34.5	40.2	100	132	27	Med. Low	Low	46	Released

BARLEY	2RSM	UC 1412	1412	R	-	-	-	35.9	39.8	98	133	26	-	Low	26	-
BARLEY	2RSM	LCS GENIE	1414	MR	-	R	-	35.1	37.9	108	135	28	Low	Low	61	Available
BARLEY	2RSM	LCS ODYSSEY	1415	MR	-	R	-	34.8	39.7	108	141	28	Med. Low	Low	55	Available
BARLEY	2RSM	CDC COPELAND	1858	S	-	-	-	35.2	39.5	98	136	32	Med. Low	Low	57	Available
BARLEY	2RSM	ACC SYNERGY	1859	S	-	-	-	35.5	38.8	97	136	31	Low	Low	45	Available
BARLEY	2RSM	KLAGES	1860	S	-	-	-	34.6	38.2	97	134	32	High	-	24	Released
BARLEY	2RSM	UC B9K94	1861	R	-	-	-	37.6	37.4	95	134	30	Low	-	16	-
BARLEY	2RSM	UC GALLAGHER	1911	R	-	-	-	35.2	42.7	104	137	30	Low	Low	55	-
BARLEY	2RSM	UC 1915	1915	R	-	-	-	34.9	44.8	111	147	33	Med. High	-	26	-
BARLEY	6RSF(H)	BELFORD	1923	R	-	-	-	29	36.3	92	127	22	-	Low	12	-
BARLEY	2RSF	CHOWFORD	1925	R	-	-	-	35.4	44.2	88	123	27	-	Low	12	-
BARLEY	2RSF(H)	STOCKFORD	1926	R	-	-	-	35.3	43.3	92	127	27	-	Low	12	-
BARLEY	2RSM	UC 1960	1960	R	-	-	-	38.4	50.2	100	134	31	-	-	12	-

Genotype-by-environment analyses

Summaries of the grain yield data across trial environments during the 2021-22 season are provided in Figures 6-10 for common wheat, durum wheat, triticale, barley, and oat. Summaries of the forage yield data across sites and harvest timings are provided in figures 11 and 12. As illustrated in the grain yield figures, there are large changes in variety ranking among environments for certain varieties, indicating potentially important genotype-by-environment effects. However, as has been reported previously for common wheat in California (George and Lundy, 2019) genotype-by-environment effects are unstable across years. Therefore, multi-year summaries across all trial environments may best predict variety performance for a randomly chosen environment within the testing region. Tables 24-49 present multi-year grain yield and protein summaries for common wheat, durum wheat, triticale and barley across all trial environments. Since the 2021-22 was the first season with forage trials, tables 50-59 are single years summaries for forage yield and protein. Nevertheless, for locations where conditions resemble a particular trial environment (e.g. low-water and/or rainfed environments), more customized sub-groupings may more appropriately predict yield performance. For this reason, customized groupings of trial results are available at:

http://smallgrainselection.plantsciences.ucdavis.edu/explore/

Figure 6. Heatmap of common wheat yield data from the 2021-22 regional variety grain trials.

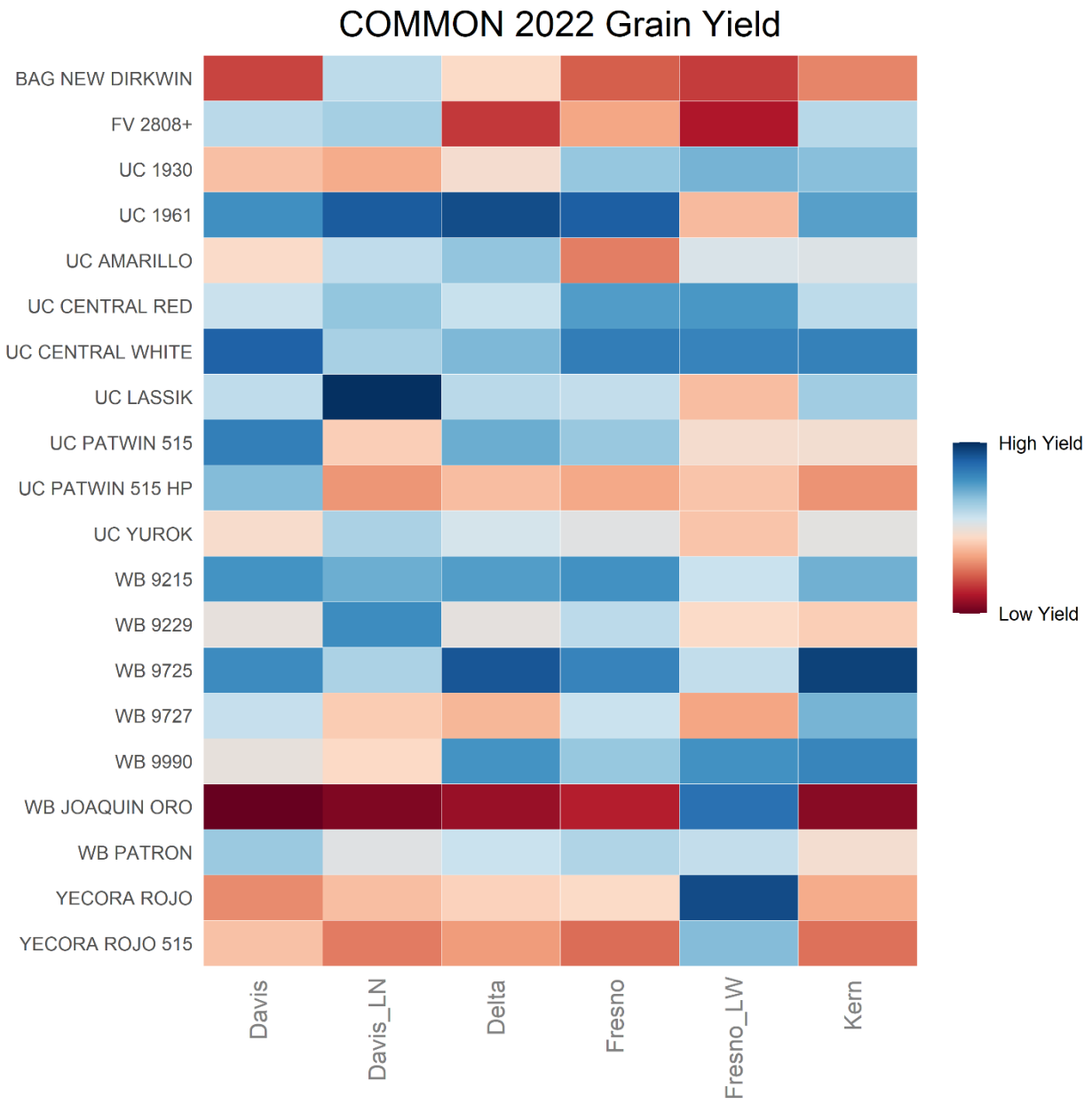


Figure 7. Heatmap of durum wheat yield data from the 2021-22 regional variety grain trials.

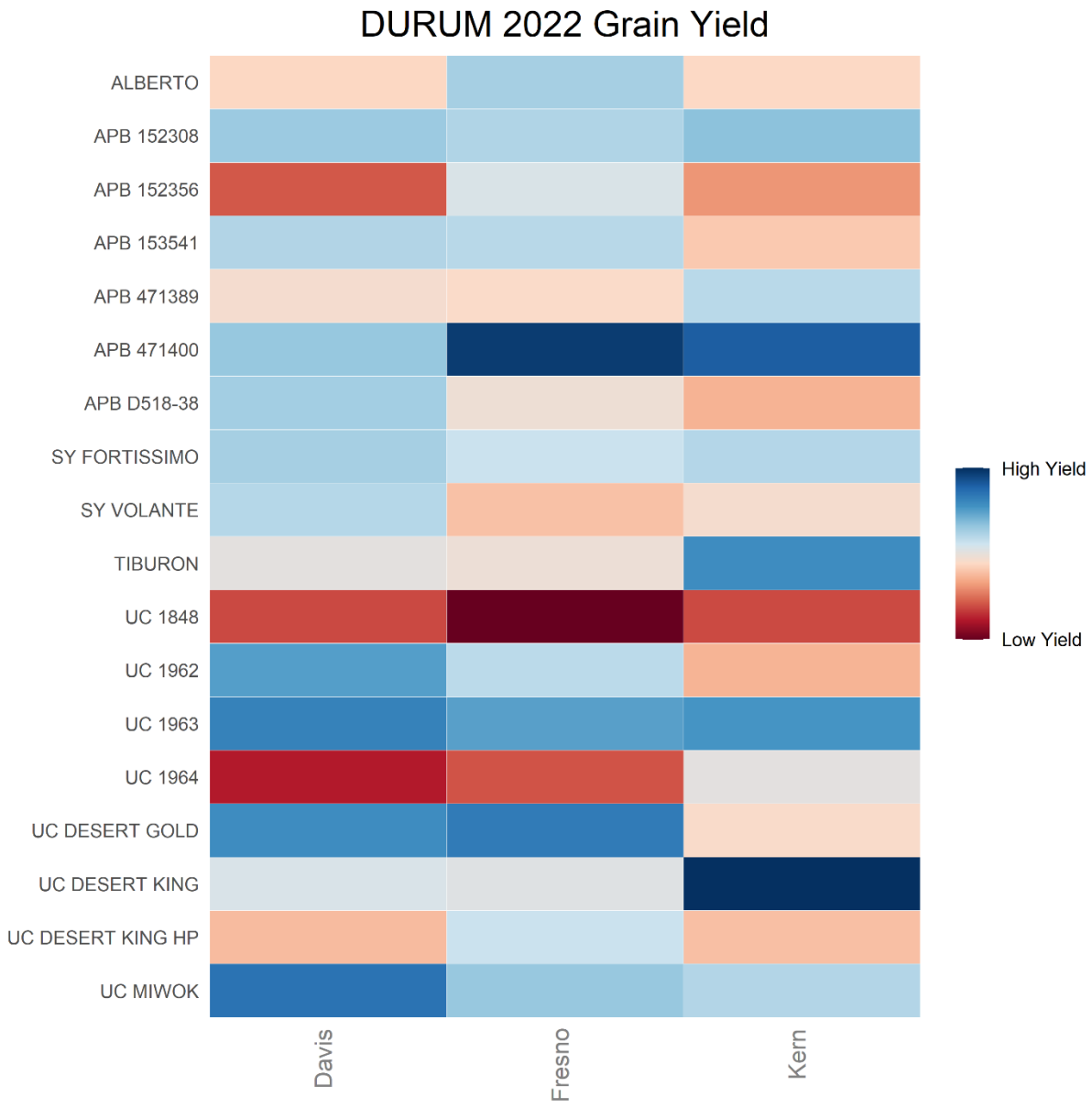


Figure 8. Heatmap of triticale yield data from the 2021-22 regional variety trials.

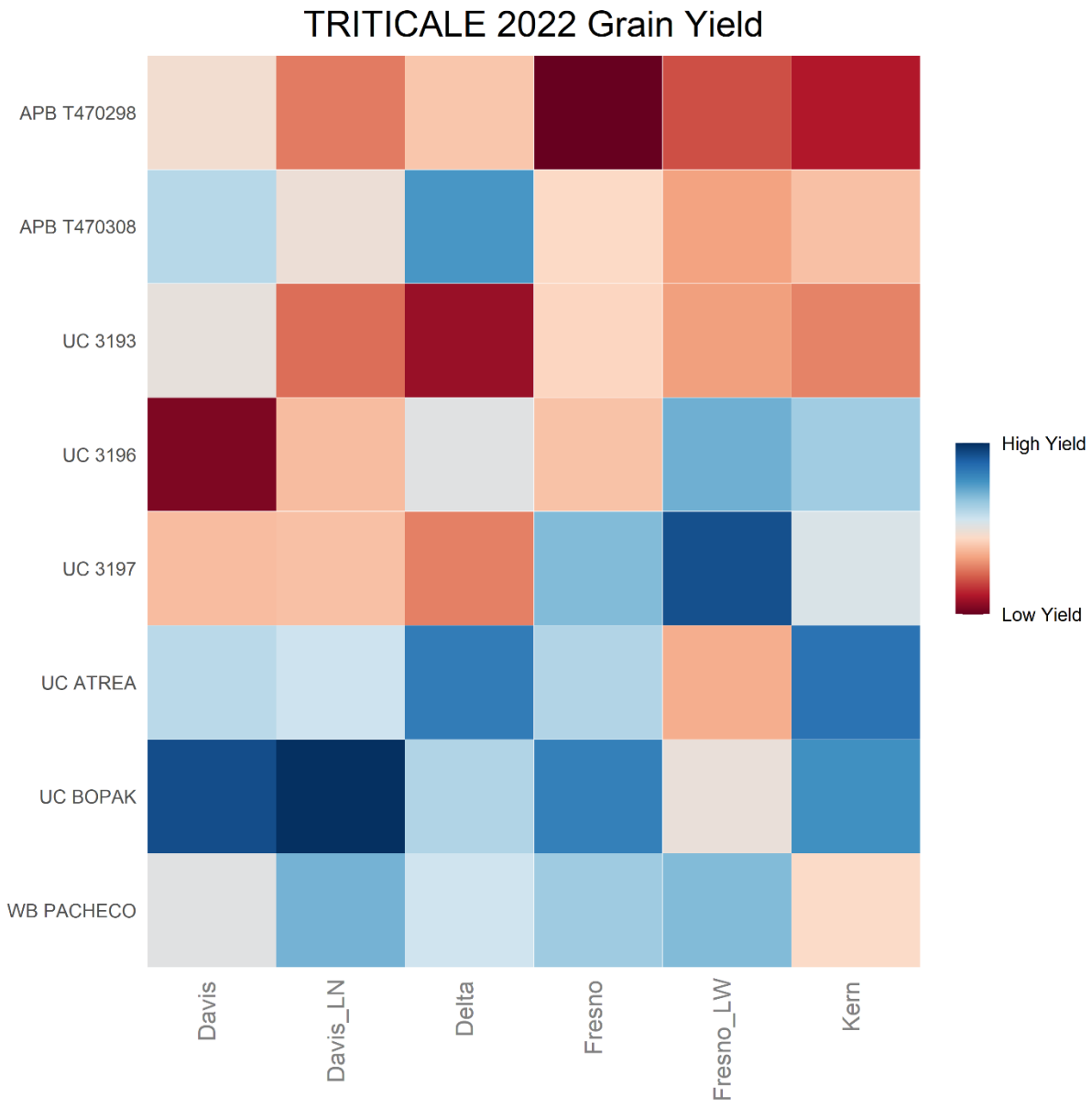


Figure 9. Heatmap of barley yield data from the 2021-22 regional variety trials. Note: missing data from Delta is due to abnormally high incidence of disease/bird damage.

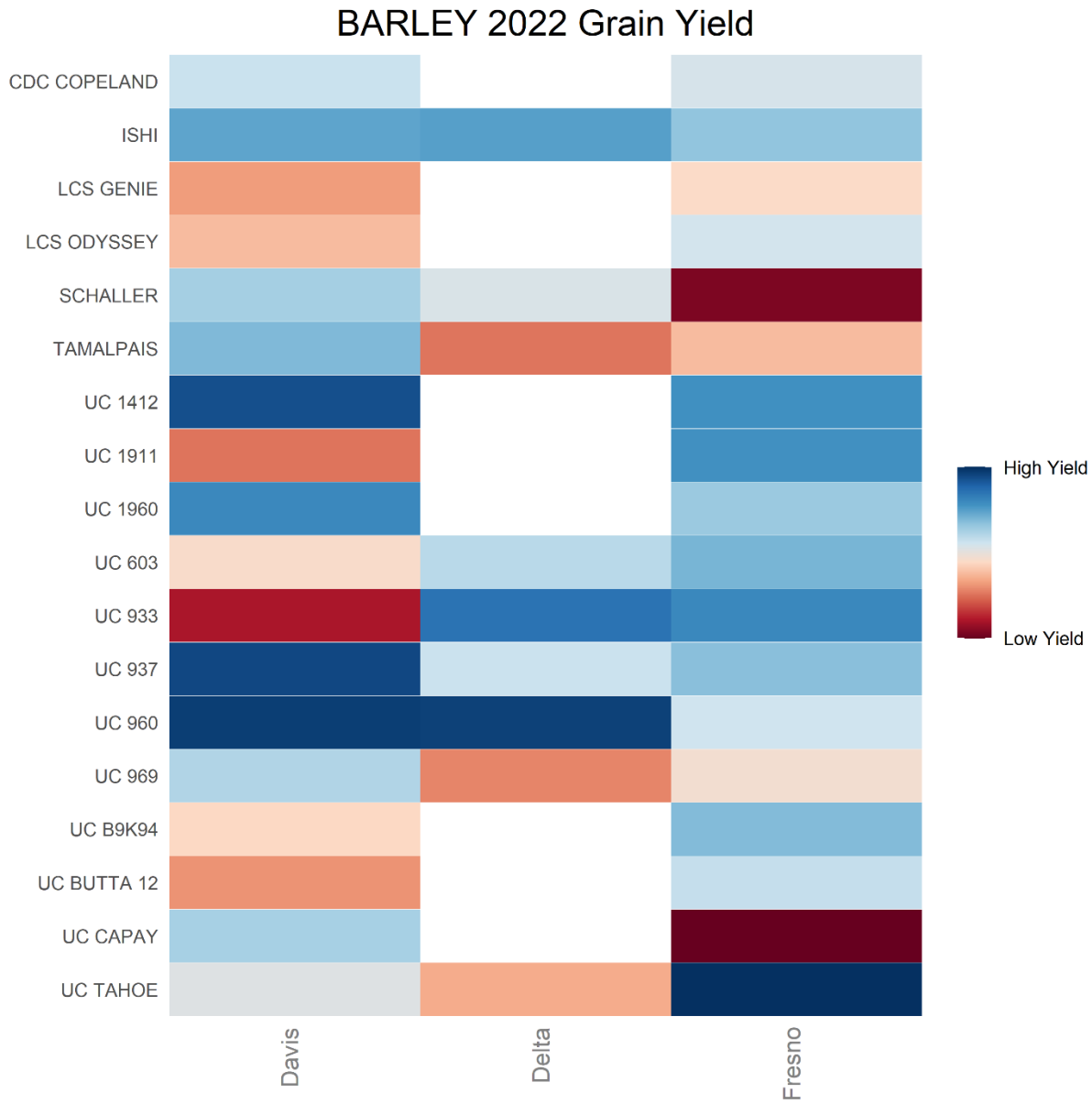


Figure 10. Heatmap of oat yield data from the 2021-22 regional variety trials. Note: missing data from Fresno reflect varieties that were not grown at that location.

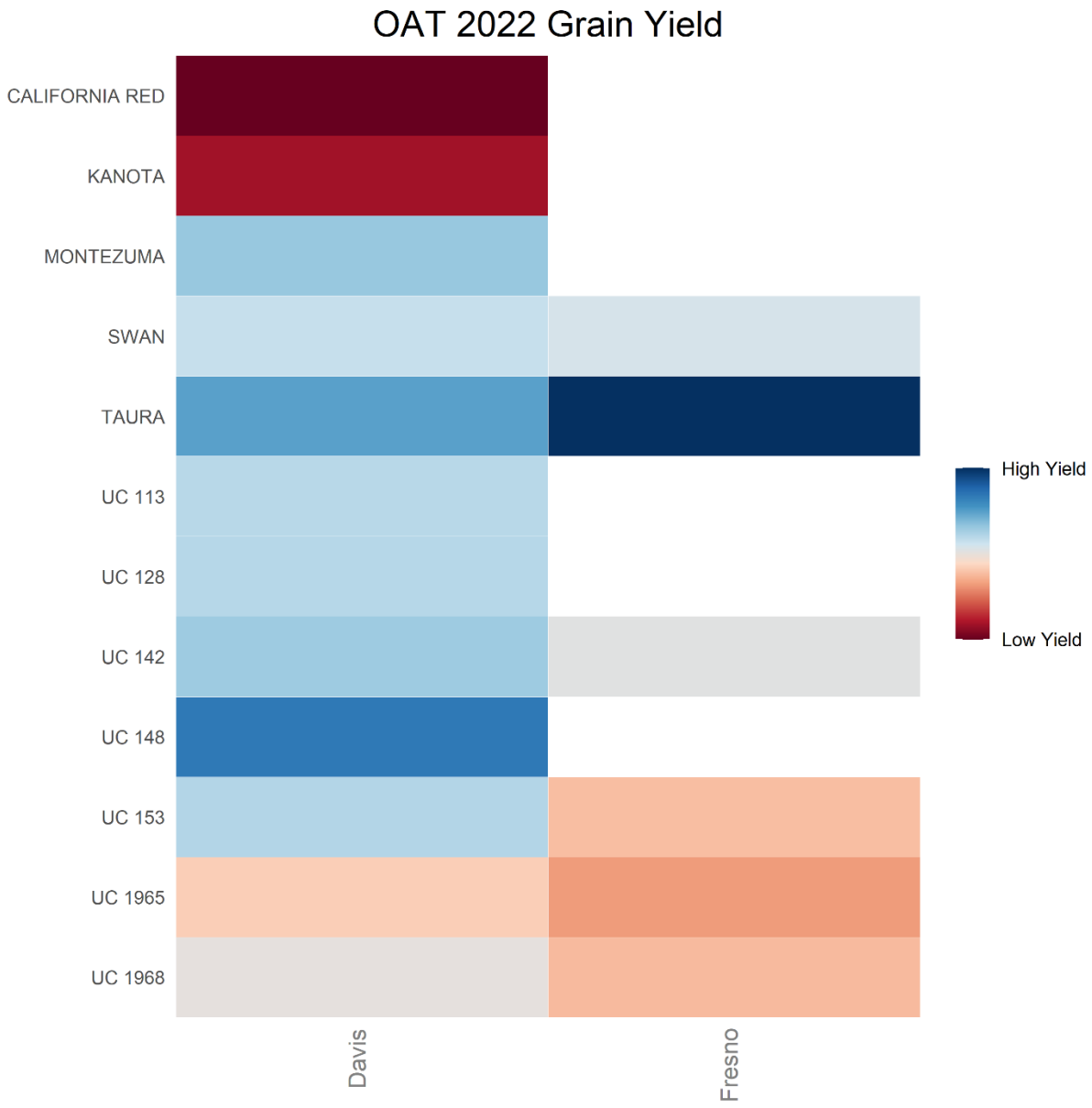


Figure 11. Heatmap of common wheat and triticale forage yield data from the 2021-22 regional variety trials with relative growth stage.

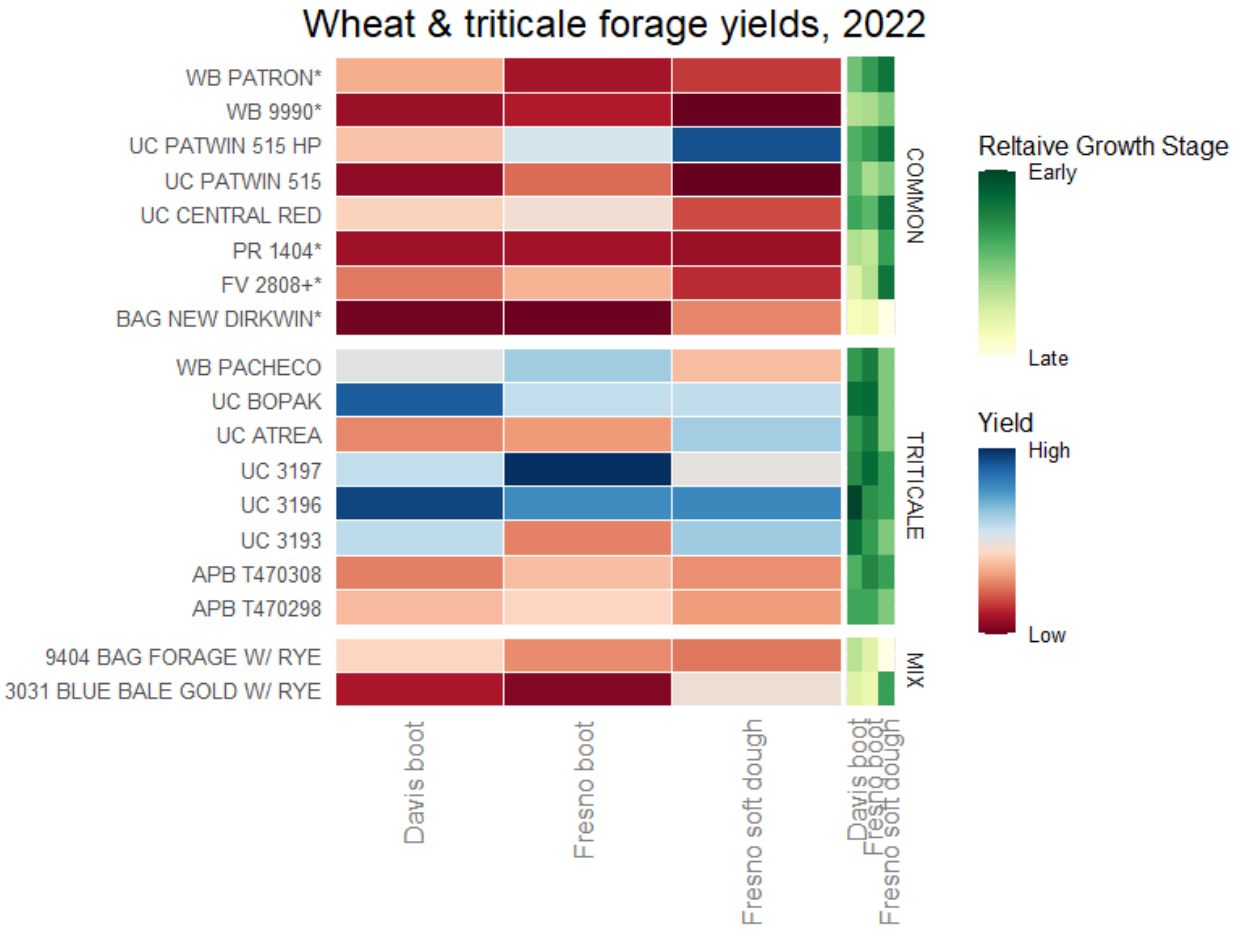


Figure 12. Heatmap of oat and barley forage yield data from the 2021-22 regional variety trials with relative growth stage.

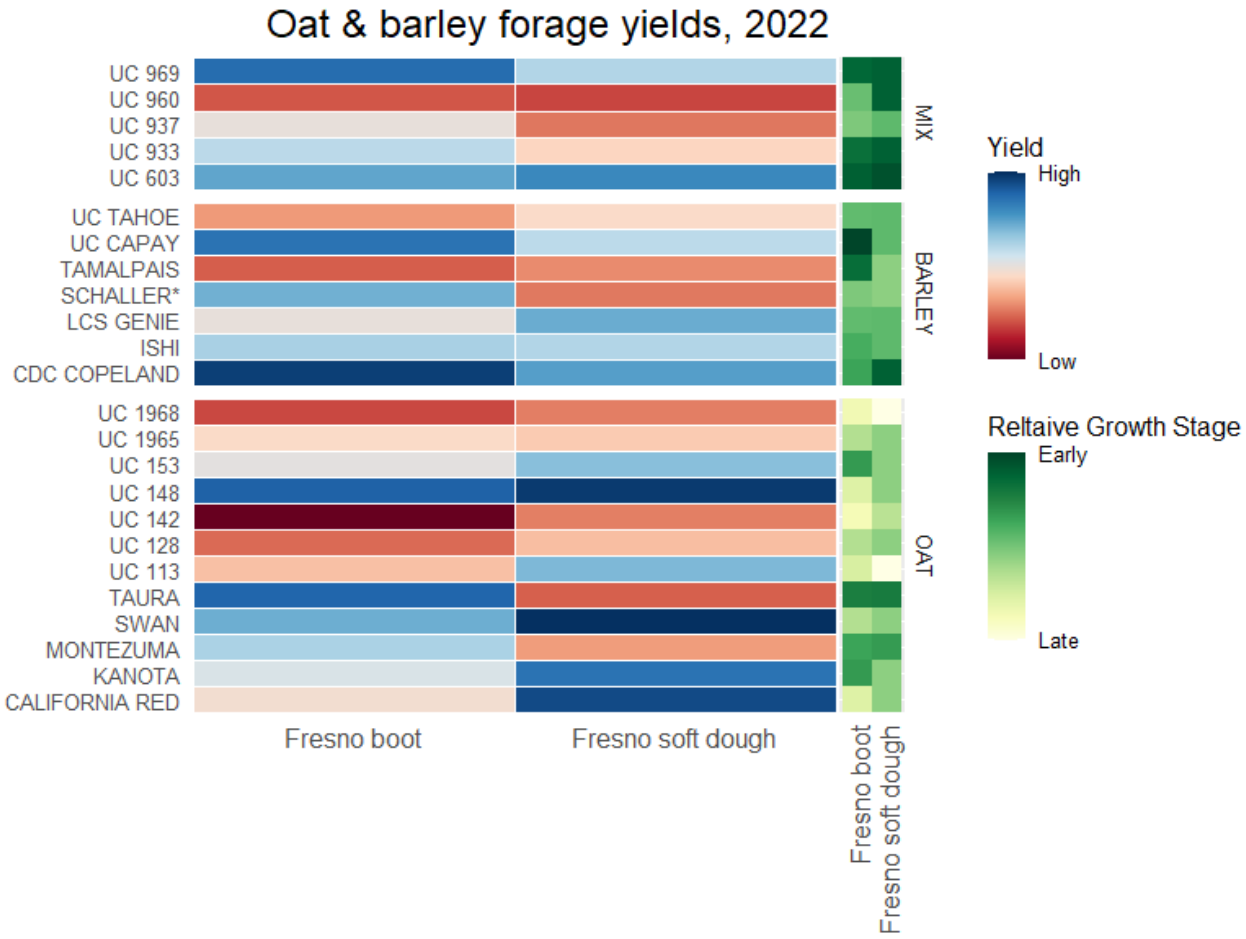
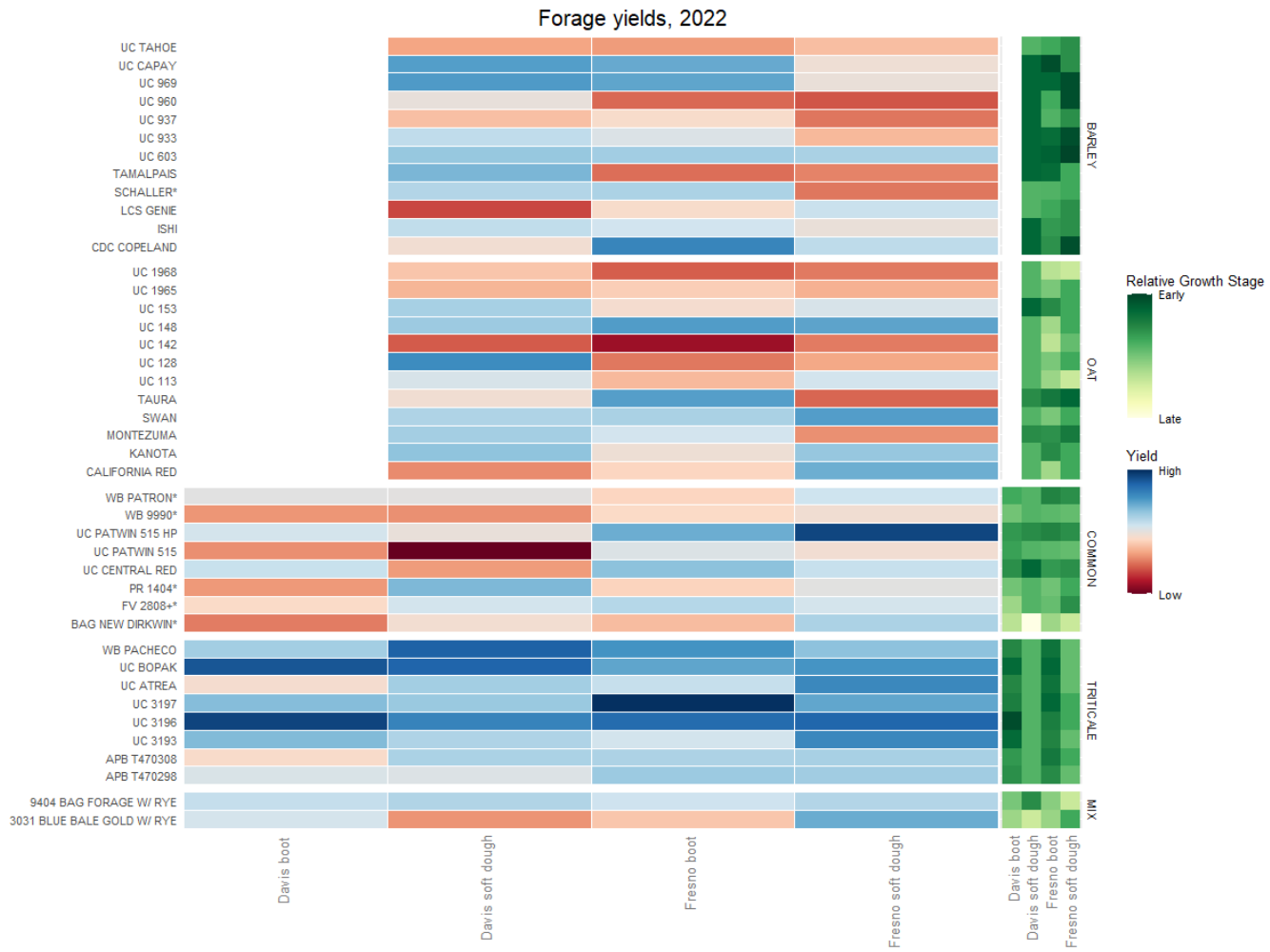


Figure 13. Heatmap of all forage yield data from the 2021-22 regional variety trials with relative growth stage.



Stress Stability

Water availability and nitrogen regulations continue to impact small grain production in the state of California, and the information developed from managed drought and nitrogen stress trials will assist in selecting varieties that are robust under uncertain and resource-limited management conditions. Yields in the 2021-2022 Davis common wheat and triticale trials where no N fertilizer was added were 54% and 55% lower than the fertilized trial, and protein was 30% and 31% lower, respectively. At the Fresno location, where a total of 8 inches of irrigation were withheld (4 inches at approximately boot stage and 4 inches at approximately at heading) wheat and triticale yields were 45 and 58% lower than where full irrigation was provided, and grain protein content was 45 and 69% higher, respectively. These observations were combined with managed stress trials conducted in the previous two seasons to develop a multi-year summary of variety-specific stress stability (see methods).

Among the common wheat varieties tested, yield stable varieties were generally protein instable and vice versa (Figure 14). However, there were notable exceptions including UC Central Red and UC Central White under drought stress. Of note as well is that varieties were not consistent in their responses to drought and N stress. Table 22 summarizes the variety-specific yield, protein yield and protein stability of individual common wheat varieties in response to drought and N stress across the 2019-20, 2020-21, and 2021-22 season. Further analysis that include triticale and additional seasons are available at http://smallgrains.ucanr.edu/Stress_Stability/.

Figure 14. Average Stress Stability, Common wheat 2020-2022

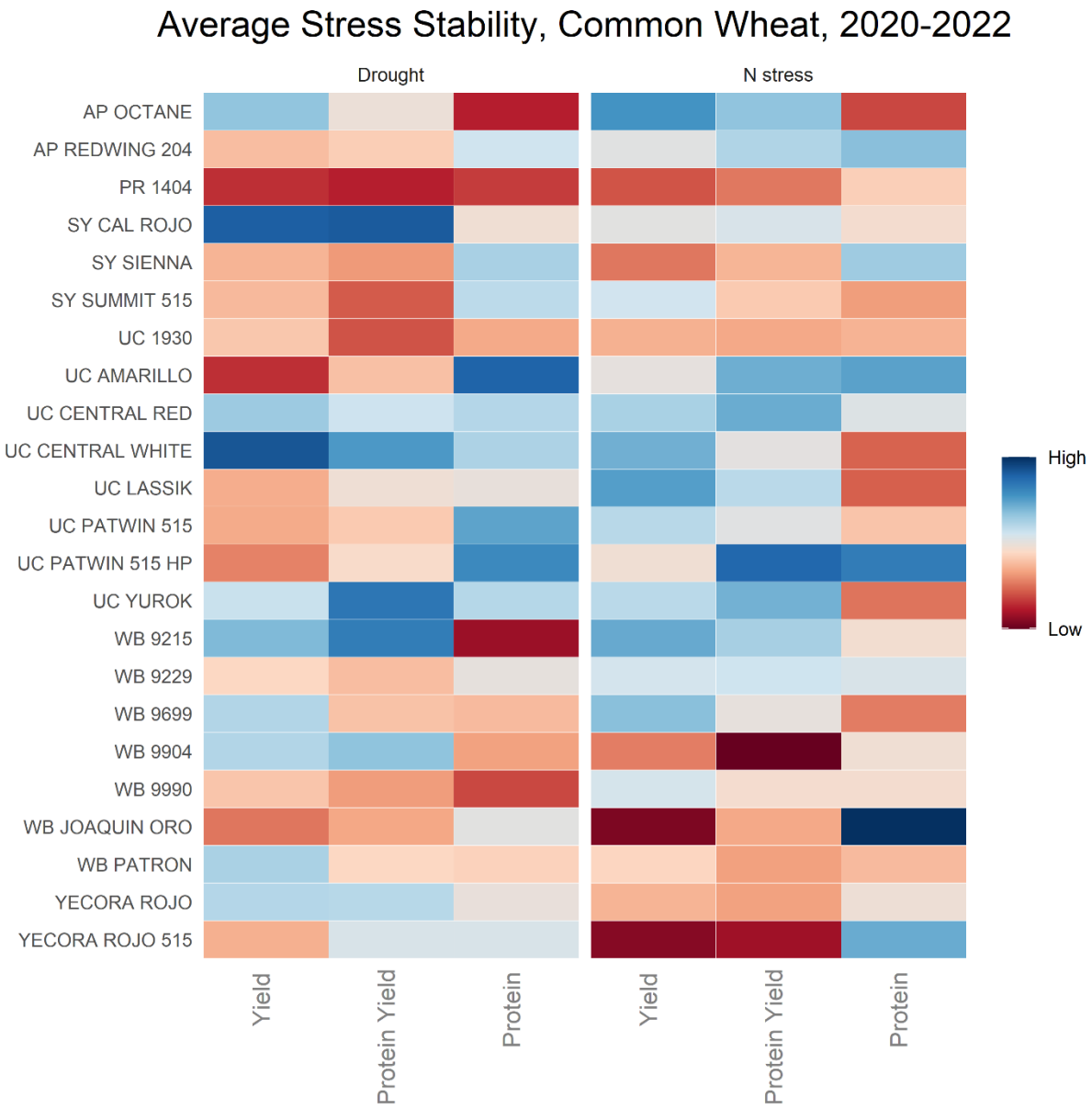


Table 22. Stress Stability summary table, common wheat 2020-2022

Summary Table: 2019-2022 Normalized Stress Response, Common Wheat. Average normalized response of hard spring common wheat varieties to terminal drought and nitrogen (N) stress in trials conducted in Yolo and Fresno Counties of California during the 2019-20, 2020-21, and 2021-22 seasons. Terminal drought and N stress responses are based on averages of 3 and 4 site years of data, respectively. The normalized stress response is calculated as (Ai / mean A) + [(Bi - mean B0 / (mean B)], where A is a fully watered/fertilized control, B is a managed stress trial grown at the same location, and i is an individual variety. Stress trials are managed identically except for the exclusion of irrigation after the vegetative growth period (terminal drought) or the exclusion of N fertilizer additions throughout the season (N stress).

	Terminal Drought Stress Response										Nitrogen Stress Response									
	Yield				Protein Yield			Protein			Yield				Protein Yield			Protein		
Variety name	Rank	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Rank	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value
AP OCTANE	4	8.9	8.7	0.31	0.4	11.9	0.972	-11.3	7.9	0.161	1	24.6	8.7	0.006	12.8	11.9	0.288	-18.4	7.9	0.024
AP REDWING 204	14	-4.7	8.7	0.586	-4	11.9	0.737	2.3	7.9	0.77	12	2.8	8.7	0.746	9	11.9	0.455	12.1	7.9	0.134
PR 1404	22	-16.2	8.7	0.067	-22.8	11.9	0.061	-9.8	7.9	0.221	21	-23.3	8.7	0.009	-15.2	11.9	0.208	-3.8	7.9	0.636
SY CAL ROJO	2	20.2	7.1	0.006	27	9.9	0.008	-0.1	6.6	0.987	13	2.6	7.1	0.713	3.7	9.8	0.705	-0.9	6.5	0.895
SY SIENNA	16	-5.7	8.7	0.513	-10.5	11.9	0.384	4.5	7.9	0.575	20	-18.6	8.7	0.035	-8	11.9	0.505	9.9	7.9	0.217
SY SUMMIT 515	15	-5.1	8.7	0.56	-16.8	11.9	0.164	3.4	7.9	0.671	9	5.8	8.7	0.502	-5	11.9	0.678	-9.9	7.9	0.217
UC 1930	12	-3.8	8.7	0.664	-17.6	16.7	0.296	-4.2	11.1	0.704	18	-10.4	8.7	0.235	-9.6	11.9	0.426	-7.5	7.9	0.351
UC AMARILLO	23	-16.2	8.7	0.066	-5.9	11.9	0.626	12.8	7.9	0.113	14	1.8	8.7	0.833	16.1	11.9	0.181	16.2	7.9	0.045
UC CENTRAL RED	5	7.9	7.1	0.271	4.9	9.9	0.622	3.8	6.6	0.561	6	11.9	7.1	0.101	16.5	9.8	0.098	2.6	6.5	0.688
UC CENTRAL WHITE	1	21.1	8.7	0.018	17.8	11.9	0.142	4.2	7.9	0.597	4	19.3	8.7	0.03	1.9	11.9	0.876	-15.8	7.9	0.052
UC LASSIK	18	-6.3	8.7	0.468	-0.1	11.9	0.995	0.5	7.9	0.952	2	22.6	8.7	0.011	7.8	11.9	0.516	-16.1	7.9	0.048
UC PATWIN 515	19	-6.5	7.1	0.363	-4.6	9.9	0.644	8.1	6.6	0.223	7	9.7	7.1	0.179	2.4	9.8	0.805	-5.2	6.5	0.434
UC PATWIN 515 HP	20	-9.8	7.1	0.172	-1.8	9.9	0.859	9.9	6.6	0.135	15	-0.3	7.1	0.972	27.5	9.8	0.007	21.7	6.5	0.002
UC YUROK	10	4.1	7.1	0.566	23	9.9	0.023	3.8	6.6	0.563	8	9.5	7.1	0.187	15.7	9.8	0.116	-14.1	6.5	0.036
WB 9215	3	10	8.7	0.25	21.9	11.9	0.072	-12.6	7.9	0.118	3	20.5	8.7	0.021	10.2	11.9	0.397	-0.7	7.9	0.931
WB 9229	11	-2	7.1	0.775	-6.1	9.9	0.536	0.6	6.6	0.922	10	5.5	7.1	0.447	5.2	9.8	0.598	3.3	6.5	0.613
WB 9699	7	6.1	8.7	0.483	-5.6	11.9	0.642	-3.2	7.9	0.687	5	16.3	8.7	0.065	1.3	11.9	0.912	-13.3	7.9	0.1
WB 9904	8	6.1	8.7	0.484	11.8	11.9	0.329	-4.8	7.9	0.55	19	-17.8	8.7	0.044	-33.2	11.9	0.007	-0.2	7.9	0.981
WB 9990	13	-4	7.1	0.579	-10.1	9.9	0.307	-9.2	6.6	0.164	11	5.1	7.1	0.477	-1.1	9.8	0.914	-0.9	6.5	0.89
WB JOAQUIN ORO	21	-10.8	7.1	0.136	-8.9	9.9	0.368	1	6.6	0.884	23	-37.5	7.1	0	-9.5	9.8	0.336	32	6.5	0
WB PATRON	6	6.8	7.1	0.343	-2.7	9.9	0.785	-1.7	6.6	0.796	16	-3.9	7.1	0.584	-10.6	9.8	0.284	-6.4	6.5	0.334
YECORA ROJO	9	5.9	8.7	0.496	7.4	16.7	0.658	0.4	7.9	0.957	17	-9.8	8.7	0.259	-10.5	11.9	0.382	0.1	7.9	0.99
YECORA ROJO 515	17	-6.1	7.1	0.4	3.4	9.9	0.734	1.7	6.6	0.802	22	-36.4	7.1	0	-27.5	9.8	0.007	14.9	6.5	0.026

Figure 15. Average Stress Stability, Common wheat & Triticale 2020-2022

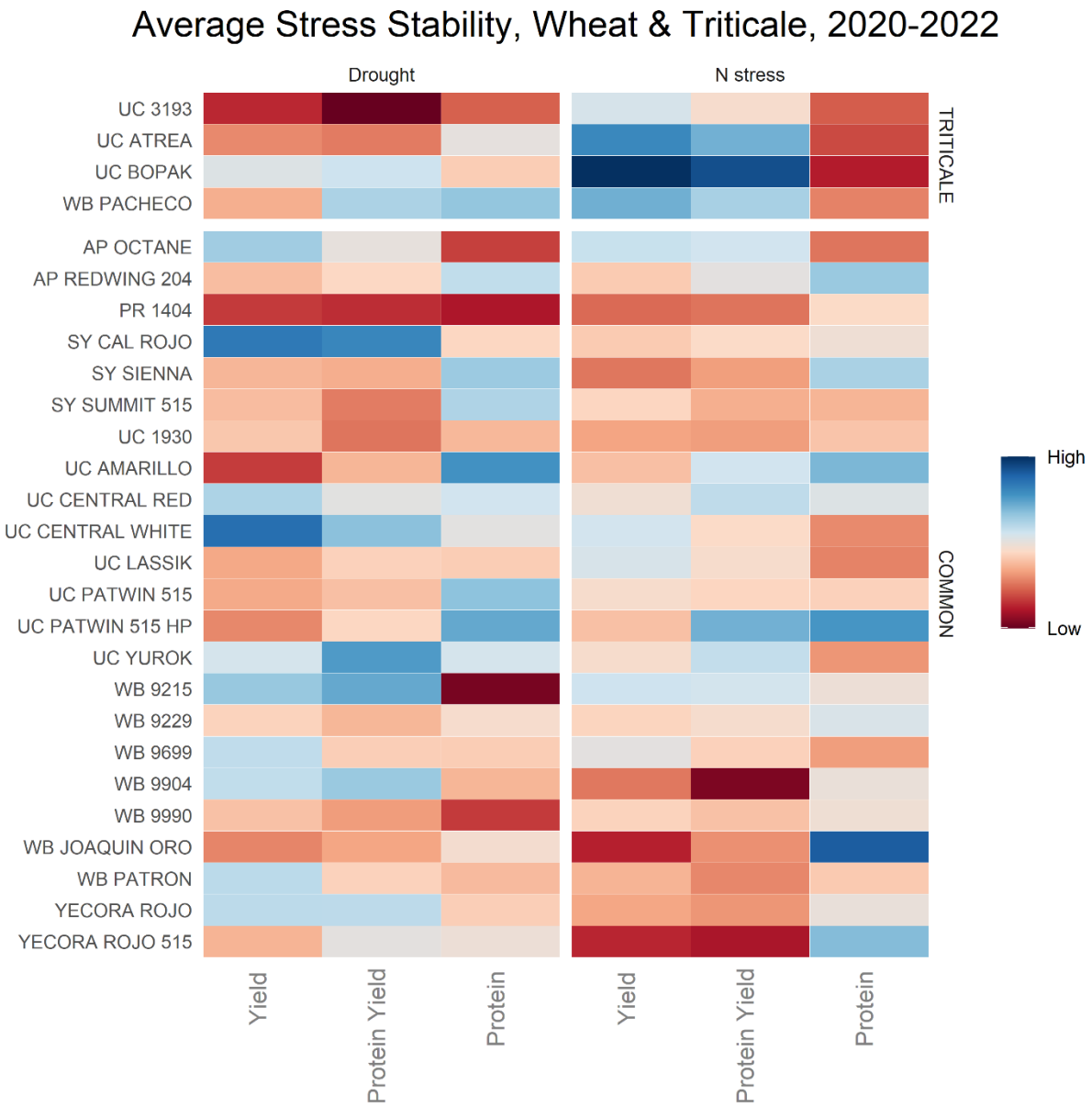


Table 23. Stress Stability summary table, Common wheat & Triticale 2020-2022

Summary Table: 2019-2022 Normalized Stress Response, Common Wheat and Triticale. Average normalized response of hard spring common wheat and triticale varieties to terminal drought and nitrogen (N) stress in trials conducted in Yolo and Fresno Counties of California during the 2019-20, 2020-21, and 2021-22 seasons. Terminal drought and N stress responses are based on averages of 3 and 4 site years of data, respectively. The normalized stress response is calculated as (Ai / mean A) + [(Bi - mean B0 / (mean B)], where A is a fully watered/fertilized control, B is a managed stress trial grown at the same location, and i is an individual variety. Stress trials are managed identically except for the exclusion of irrigation after the vegetative growth period (terminal drought) or the exclusion of N fertilizer additions throughout the season (N stress).

		Terminal Drought Stress Response										Nitrogen Stress Response									
		Yield				Protein Yield			Protein			Yield				Protein Yield			Protein		
Crop Type	Variety name	Rank	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Rank	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value	Response (%)	SE Response	P-value
TRITICALE	UC 3193	27	-17	9.8	0.087	-34.1	14.9	0.025	-7.5	9	0.406	7	12	9.8	0.226	1.1	14.9	0.944	-18.2	9	0.047
	UC ATREA	22	-8.7	8.1	0.285	-13.9	12.3	0.261	1.8	7.4	0.804	2	46.8	8.1	0	22.7	12.2	0.068	-20.5	7.4	0.007
	UC BOPAK	11	4.2	8.1	0.607	8.5	12.3	0.493	-1.1	7.4	0.881	1	72.6	8.1	0	42.2	12.2	0.001	-26.3	7.4	0.001
	WB PACHECO	19	-5.1	8.1	0.531	12.9	12.3	0.297	7.2	7.4	0.336	3	34.8	8.1	0	15.5	12.2	0.211	-13.5	7.4	0.072
COMMON	AP OCTANE	4	10.3	9.8	0.299	3.9	14.9	0.794	-9.3	9	0.307	4	16	9.8	0.109	9	14.9	0.549	-15.2	9	0.096
	AP REDWING 204	15	-3.5	9.8	0.721	-0.7	14.9	0.961	4.4	9	0.624	17	-5.1	9.8	0.606	5.3	14.9	0.724	15.9	9	0.082
	PR 1404	26	-15.5	9.8	0.119	-23.2	14.9	0.123	-11.6	9	0.203	25	-27.8	9.8	0.006	-16.9	14.9	0.26	-0.3	9	0.973
	SY CAL ROJO	2	21.2	8.1	0.01	27.2	12.3	0.03	-0.4	7.4	0.957	16	-4.9	8.1	0.544	-0.1	12.2	0.993	2.5	7.4	0.737
	SY SIENNA	17	-4.3	9.8	0.66	-7.4	14.9	0.623	6.7	9	0.462	24	-25.1	9.8	0.013	-10.9	14.9	0.466	13.7	9	0.133
	SY SUMMIT 515	16	-3.6	9.8	0.711	-13.8	14.9	0.359	5.6	9	0.54	13	-2	9.8	0.842	-8.2	14.9	0.585	-6.5	9	0.47
	UC 1930	13	-2.5	9.8	0.799	-14.6	20.9	0.486	-2.6	12.6	0.839	22	-15.2	9.8	0.126	-11	14.9	0.461	-4	9	0.655
	UC AMARILLO	25	-15.4	9.8	0.122	-6.2	14.9	0.679	11.1	9	0.223	19	-8	9.8	0.417	9	14.9	0.547	19.5	9	0.034
	UC CENTRAL RED	5	9.1	8.1	0.264	4.8	12.3	0.697	3.5	7.4	0.64	10	3.8	8.1	0.639	11.9	12.2	0.333	6	7.4	0.421
	UC CENTRAL WHITE	1	22.6	9.8	0.024	17	14.9	0.256	2.1	9	0.817	6	13.3	9.8	0.179	-0.1	14.9	0.993	-12.5	9	0.169
	UC LASSIK	21	-5.8	9.8	0.555	-1.8	14.9	0.906	-1.1	9	0.903	8	11.7	9.8	0.237	0.9	14.9	0.951	-13.4	9	0.142
	UC PATWIN 515	20	-5.7	8.1	0.486	-4.6	12.3	0.706	7.5	7.4	0.319	11	1.5	8.1	0.858	-1.3	12.2	0.917	-1.9	7.4	0.798
	UC PATWIN 515 HP	23	-8.8	8.1	0.278	-0.9	12.3	0.939	9.4	7.4	0.208	18	-7.8	8.1	0.336	22.7	12.2	0.068	25.4	7.4	0.001
	UC YUROK	10	5.2	8.1	0.52	23.6	12.3	0.058	3.2	7.4	0.669	12	1.4	8.1	0.865	11.3	12.2	0.36	-11	7.4	0.143
	WB 9215	3	11.2	9.8	0.259	21.2	14.9	0.159	-14.2	9	0.119	5	14.5	9.8	0.143	8.5	14.9	0.567	2.9	9	0.751
	WB 9229	12	-1.1	8.1	0.894	-6	12.3	0.625	0.4	7.4	0.958	14	-2.3	8.1	0.78	1.1	12.2	0.926	6.7	7.4	0.367
	WB 9699	8	7.4	9.8	0.456	-2.3	14.9	0.877	-1.1	9	0.9	9	8	9.8	0.416	-2	14.9	0.892	-10	9	0.272
	WB 9904	9	7.2	9.8	0.468	15.3	14.9	0.308	-2.7	9	0.761	23	-24.8	9.8	0.014	-36.2	14.9	0.017	3.4	9	0.705
	WB 9990	14	-3.1	8.1	0.705	-9.7	12.3	0.433	-9.6	7.4	0.202	15	-2.7	8.1	0.736	-5	12.2	0.686	2.4	7.4	0.746
	WB JOAQUIN ORO	24	-9.1	8.1	0.266	-8.6	12.3	0.486	0.6	7.4	0.934	27	-43.1	8.1	0	-12.9	12.2	0.295	35.9	7.4	0
	WB PATRON	6	7.9	8.1	0.335	-1.7	12.3	0.888	-2.4	7.4	0.752	20	-11.1	8.1	0.172	-14.2	12.2	0.251	-3.2	7.4	0.672
	YECORA ROJO	7	7.8	9.8	0.43	10.7	20.9	0.609	-1	9	0.91	21	-14.6	9.8	0.142	-12.1	14.9	0.42	3.6	9	0.689
	YECORA ROJO 515	18	-4.7	8.1	0.567	4.5	12.3	0.717	1.2	7.4	0.872	26	-41.9	8.1	0	-30.3	12.2	0.016	18.5	7.4	0.015

Crop Quality

Analyses of grain quality performed by the California Wheat Commission quality lab on common wheat and durum wheat samples grown at the Davis and Fresno locations are presented online at http://smallgrains.ucanr.edu/Grain_Quality/. Further analyses will be made available on the UC Small Grains Agronomy Research and Information Center website when they are completed. In addition, a system of quality classification was developed in cooperation with the California Wheat Commission and released in 2019. Quality results from the UC variety trials are incorporated into this quantitative quality metric and reported as the California Preferred Wheat Varieties Based on Baking Quality list (available: https://ucanr.edu/sites/small-grains/files/360354.pdf). This list is updated on a 2-year basis. Therefore, the sample from the 2021-2022 trials will be incorporated into updates to the Preferred Varieties Based on Baking Quality list in 2023.

Supplementary variety performance tables (Tables 24-49)

All data presented here can be accessed as single site data or multi-year summaries at http://smallgrainselection.plantsciences.ucdavis.edu/explore/ and http://smallgrainselection.plantsciences.ucdavis.edu/, respectively. Tables herein are also available in .pdf and .xls formats at: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/ In addition to the multi-year summary tables included here and at the above website single site data for the 2020-21 season are available .pdf and .xls formats at the following web locations: Fall planted Common Spring Wheat: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/Common_Wheat_2022_Single_Sites/

2022_Variety_Results_Single_Site/ Fall planted Durum Wheat: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/Durum_2022_Single_Site/ Fall planted Triticale: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/Triticale_2022_Single_Site/ Fall planted Barley: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/Barley_2022_Single_Site/ Winter Wheat: http://smallgrains.ucanr.edu/Variety_Results/Winter_Wheat_2022_Variety_Results_Single_Site/ Spring planted spring wheat: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/

Spring planted spring barley: https://smallgrains.ucanr.edu/Annual_Variety_Results/2022/

Common performance tables

Table 24. Sacramento Valley region, common wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
HRS	2020-2022	SY 64-1-9	1876	7078	623	1	1876	588	0	-	-	-	11.8	1.5	13	0.32	1.39	0.8	-	-	-	-
HWS	2020-2022	UC 1917	1917	6651	623	2	1450	588	0	-	-	-	10.7	1.5	35	-0.8	1.39	0.6	-	-	-	-
HWS	2020-2022	UC 1815	1815	6174	623	3	972	588	0.1	-	-	-	11.4	1.5	19	-0.1	1.39	1	-	-	-	Released
HRS	2020-2022	UC 1961	1961	5917	520	4	716	486	0.1	5935	1302	1	10.3	1.3	39	-1.2	1.15	0.3	9.88	1.1	21	-
HRS	2020-2022	AP OCTANE	1878	5830	412	5	629	374	0.1	-	-	-	10.5	1.1	38	-1	0.89	0.3	-	-	-	Available
HRS	2020-2022	WB 9725	1959	5754	520	6	552	486	0.3	5771	1302	2	10.5	1.3	37	-1	1.15	0.4	10.1	1.4	18	-
HRS	2020-2022	AP VENOM	1877	5700	623	7	498	588	0.4	-	-	-	11.6	1.5	15	0.11	1.39	0.9	-	-	-	Available
HRS	2020-2022	WB 9215	1920	5657	383	8	455	345	0.2	5647	1302	4	11.3	1	23	-0.2	0.82	0.8	10.2	1	17	Available
HRS	2020-2022	WB 9699	1888	5606	412	9	405	374	0.3	-	-	-	11.1	1.1	26	-0.4	0.89	0.6	-	-	-	Released
HRS	2020-2022	UC LASSIK	1495	5495	412	10	294	374	0.4	5457	1302	6	10.6	1.1	36	-0.9	0.89	0.3	10.3	1	16	Available
HWS	2020-2022	UC PATWIN 515	1680	5445	340	11	243	297	0.4	5502	1302	5	11.3	0.9	21	-0.2	0.7	0.8	11	1.4	8	Available
HRS	2020-2022	SY SUMMIT 515	1658	5417	412	12	215	374	0.6	-	-	-	10.9	0.9	30	-0.6	0.67	0.4	-	-	-	Available
HWS	2020-2022	UC 1907	1907	5405	623	13	204	588	0.7	-	-	-	12	1.5	8	0.54	1.39	0.7	-	-	-	-
HWS	2020-2022	UC CENTRAL WHITE	1932	5380	383	14	179	345	0.6	5657	1302	3	11.1	1	25	-0.4	0.76	0.6	9.76	1.1	22	-
HRS	2020-2022	UC CENTRAL RED	1817	5341	340	15	140	297	0.6	5233	1302	10	11.7	0.9	14	0.17	0.7	0.8	11.1	1	6	Available
HRS	2020-2022	UC YUROK	1745	5310	340	16	108	297	0.7	5078	1302	13	10.8	0.9	34	-0.7	0.7	0.3	10.4	1.1	15	Available
HWS	2020-2022	SY BLANCA GRANDE 515	1657	5292	623	17	91	588	0.9	-	-	-	11.6	1.5	16	0.09	1.39	1	-	-	-	Available
HRS	2020-2022	WB 9990	1922	5288	340	18	86	297	0.8	5246	1302	8	10.9	0.8	31	-0.6	0.55	0.3	11.5	1.7	5	-

HRS	2020-2022	AP REDWING 204	1921	5268	412	19	66	374	0.9	-	-	-	12	1.1	9	0.53	0.89	0.6	-	-	-	-
HWS	2020-2022	UC AMARILLO	1909	5221	412	20	19	374	1	5167	1302	12	12.2	1.1	6	0.66	0.89	0.5	11	1.1	9	-
HRS	2020-2022	WB 9229	1730	5182	340	21	-20	297	1	5178	1302	11	11.9	0.8	10	0.41	0.58	0.5	11.1	1.3	7	Available
HRS	2020-2022	SY CAL ROJO	1478	5165	340	22	-37	297	0.9	5398	1302	7	11.4	0.9	20	-0.1	0.7	0.9	10.1	1.1	20	Available
HWS	2020-2022	UC PATWIN 515 HP	1743	5084	340	23	-118	297	0.7	4982	1302	14	12.7	0.9	3	1.18	0.7	0.1	12.7	1.8	2	Available
HRS	2020-2022	WB PATRON	1731	5040	340	24	-161	297	0.6	5235	1302	9	10.9	0.8	32	-0.6	0.55	0.3	10.9	1.2	10	Available
HRS	2020-2022	UC 1884	1884	5018	623	25	-183	588	0.8	-	-	-	12.6	1.5	4	1.06	1.39	0.5	-	-	-	-
HRS	2020-2022	YECORA ROJO	112	5015	383	26	-187	345	0.6	4676	1302	20	12.3	0.8	5	0.82	0.52	0.1	12.1	0.3	3	Available
HWS	2020-2022	UC 1930	1930	4941	383	27	-261	345	0.5	4788	1302	18	11	1	27	-0.5	0.82	0.5	10.1	1.1	19	-
HWS	2020-2022	UC 1931	1931	4902	519	28	-300	485	0.5	-	-	-	11.3	1.3	24	-0.2	1.15	0.9	-	-	-	-
HRS	2020-2022	WB 9727	1958	4896	520	29	-305	486	0.5	4914	1302	16	10.9	1.3	29	-0.6	1.15	0.6	10.5	0.9	13	-
-	2020-2022	FV 2808+	1970	4836	520	30	-366	486	0.5	4853	1302	17	10.9	1.2	33	-0.6	1.01	0.5	10.5	1	14	-
HRS	2020-2022	PR 1404	1526	4766	383	31	-436	345	0.2	4960	1302	15	11.3	1	22	-0.2	0.82	0.8	10.8	1.4	11	Released
HRW	2020-2022	WINCAL 158-5	1906	4704	623	32	-498	588	0.4	-	-	-	11	1.5	28	-0.5	1.39	0.7	-	-	-	-
HRS	2020-2022	SY SIENNA	1835	4656	412	33	-545	374	0.2	-	-	-	12.1	1.1	7	0.62	0.89	0.5	-	-	-	Available
HRS	2020-2022	WB 9904	1751	4633	412	34	-568	374	0.1	-	-	-	11.8	1.1	12	0.33	0.89	0.7	-	-	-	Available
HRS	2020-2022	WB TRIPLE IV	1550	4373	519	35	-829	485	0.1	-	-	-	11.5	1.3	18	0	1.15	1	-	-	-	Available
HRS	2020-2022	YECORA ROJO 515	1916	4323	340	36	-878	297	0	4609	1302	21	11.9	0.8	11	0.38	0.6	0.5	11.8	1.4	4	-
HRS	2020-2022	WB JOAQUIN ORO	1728	4278	340	37	-924	297	0	3860	1302	22	13.1	0.9	2	1.61	0.7	0	14.1	1.5	1	Available
SWS	2020-2022	BAG NEW DIRKWIN	1667	4065	340	38	-1137	297	0	4692	1302	19	11.6	0.9	17	0.08	0.7	0.9	10.7	1	12	Available
HRS	2020-2022	YECORA ROJO 515 HP	1879	3757	623	39	-1445	588	0	-	-	-	13.9	1.5	1	2.45	1.39	0.1	-	-	-	-

Table 25. North Central San Joaquin Valley region, common wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
HWS	2020-2022	UC CENTRAL WHITE	1932	6298	718	1	654	570	0.25	5239	1462	2	13.76	1.42	12	0.33	1.11	0.77	12.48	2.4	7	-
HWS	2020-2022	UC 1815	1815	6242	987	2	598	868	0.49	-	-	-	13.34	1.98	24	-0.09	1.74	0.96	-	-	-	Released
HWS	2020-2022	UC 1917	1917	6225	987	3	581	868	0.5	-	-	-	13.08	1.98	29	-0.35	1.74	0.84	-	-	-	-
HWS	2020-2022	SY BLANCA GRANDE 515	1657	6175	987	4	531	868	0.54	-	-	-	13.69	1.98	15	0.26	1.74	0.88	-	-	-	Available
HRS	2020-2022	WB 9215	1920	6087	706	5	443	556	0.43	4944	1460	7	12.6	1.42	35	-0.83	1.11	0.46	10.56	2.4	22	Available
HRS	2020-2022	WB 9699	1888	6066	707	6	422	552	0.44	-	-	-	12.83	1.43	32	-0.6	1.1	0.59	-	-	-	Released
HRS	2020-2022	SY CAL ROJO	1478	6025	643	7	381	475	0.42	5474	1460	1	13.37	1.29	23	-0.06	0.94	0.95	11.4	2.4	16	Available
HRS	2020-2022	AP OCTANE	1878	5959	707	8	315	552	0.57	-	-	-	12.51	1.43	37	-0.92	1.1	0.41	-	-	-	Available
HRW	2020-2022	WINCAL 158-5	1906	5927	987	9	283	868	0.74	-	-	-	13.67	1.98	16	0.24	1.74	0.89	-	-	-	-
HWS	2020-2022	UC 1907	1907	5927	987	10	283	868	0.74	-	-	-	14.3	1.98	4	0.87	1.74	0.62	-	-	-	-
HRS	2020-2022	WB 9725	1959	5904	988	11	260	876	0.77	5073	1460	3	13.3	1.99	26	-0.13	1.76	0.94	11.62	2.4	15	-
HRS	2020-2022	UC 1961	1961	5865	988	12	221	876	0.8	5035	1460	5	14.94	1.99	1	1.52	1.76	0.39	13.26	2.4	1	-
HRS	2020-2022	UC CENTRAL RED	1817	5847	637	13	203	467	0.66	5061	1460	4	13.61	1.29	17	0.18	0.94	0.85	11.71	2.4	12	Available
HRS	2020-2022	AP REDWING 204	1921	5826	707	14	182	552	0.74	-	-	-	13.69	1.43	14	0.26	1.1	0.81	-	-	-	-
HRS	2020-2022	WB 9904	1751	5822	707	15	178	552	0.75	-	-	-	13.28	1.43	27	-0.15	1.1	0.89	-	-	-	Available
HRS	2020-2022	UC 1884	1884	5807	987	16	163	868	0.85	-	-	-	14.29	1.98	6	0.86	1.74	0.62	-	-	-	-
HRS	2020-2022	UC YUROK	1745	5799	643	17	155	475	0.74	4519	1460	14	13.7	1.29	13	0.27	0.94	0.77	12.87	2.4	2	Available
HRS	2020-2022	WB PATRON	1731	5791	643	18	147	475	0.76	4755	1460	10	13.78	1.15	11	0.35	0.74	0.64	12.46	2.4	8	Available
HRS	2020-2022	WB 9990	1922	5746	644	19	102	475	0.83	4939	1462	8	13.55	1.13	18	0.12	0.72	0.86	10.61	2.4	20	-
HRS	2020-2022	WB 9229	1730	5685	643	20	41	475	0.93	4644	1460	12	13.53	1.16	19	0.1	0.76	0.89	11.14	2.4	17	Available
HRS	2020-2022	SY 64-1-9	1876	5679	987	21	35	868	0.97	-	-	-	14.6	1.98	2	1.17	1.74	0.5	-	-	-	-
HRS	2020-2022	YECORA ROJO	112	5667	730	22	23	584	0.97	4890	1462	9	13.12	1.42	28	-0.31	1.11	0.78	10.74	2.4	19	Available
HWS	2020-2022	UC 1930	1930	5635	706	23	-9	556	0.99	4947	1460	6	12.53	1.53	36	-0.9	1.24	0.47	11.84	2.65	11	-

HWS	2020-2022	UC PATWIN 515	1680	5589	643	24	-55	475	0.91	4713	1460	11	14	1.29	8	0.58	0.94	0.54	12.79	2.4	4	Available
HRS	2020-2022	UC LASSIK	1495	5571	757	25	-73	615	0.91	4624	1460	13	13.44	1.53	20	0.01	1.23	0.99	12.16	2.4	9	Available
HWS	2020-2022	UC PATWIN 515 HP	1743	5553	643	26	-91	475	0.85	4328	1460	18	14.15	1.29	7	0.72	0.94	0.44	12.5	2.4	6	Available
HRS	2020-2022	SY SUMMIT 515	1658	5485	718	27	-159	565	0.78	-	-	-	12.93	1.18	30	-0.5	0.77	0.52	-	-	-	Available
HRS	2020-2022	YECORA ROJO 515	1916	5434	644	28	-210	475	0.66	4360	1462	17	14.29	1.18	5	0.86	0.79	0.28	12	2.4	10	-
HWS	2020-2022	UC 1931	1931	5413	846	29	-231	716	0.75	-	-	-	12.79	1.7	33	-0.64	1.43	0.65	-	-	-	-
HRS	2020-2022	AP VENOM	1877	5409	987	30	-235	868	0.79	-	-	-	13.39	1.98	21	-0.04	1.74	0.98	-	-	-	Available
HRS	2020-2022	PR 1404	1526	5341	718	31	-303	570	0.6	4220	1460	20	12.93	1.42	31	-0.5	1.11	0.65	10.75	2.4	18	Released
HRS	2020-2022	SY SIENNA	1835	5329	707	32	-315	552	0.57	-	-	-	13.79	1.43	10	0.36	1.1	0.75	-	-	-	Available
HRS	2020-2022	WB JOAQUIN ORO	1728	5297	643	33	-347	475	0.47	4446	1460	16	13.37	1.29	22	-0.06	0.94	0.95	11.62	2.4	14	Available
HRS	2020-2022	WB 9727	1958	5279	988	34	-365	876	0.68	4448	1460	15	13.33	1.99	25	-0.09	1.76	0.96	11.65	2.4	13	-
HWS	2020-2022	UC AMARILLO	1909	5156	757	35	-488	615	0.43	4230	1460	19	14.48	1.53	3	1.05	1.23	0.39	12.72	2.4	5	-
HRS	2020-2022	YECORA ROJO 515 HP	1879	5020	1041	36	-624	925	0.5	-	-	-	11.05	1.98	39	-2.37	1.74	0.17	-	-	-	-
-	2020-2022	FV 2808+	1970	4873	988	37	-771	876	0.38	4042	1460	21	12.26	1.99	38	-1.17	1.76	0.51	10.58	2.4	21	-
HRS	2020-2022	WB TRIPLE IV	1550	4856	873	38	-788	746	0.29	-	-	-	12.61	1.7	34	-0.82	1.43	0.57	-	-	-	Available
SWS	2020-2022	BAG NEW DIRKWIN	1667	4506	650	39	-1138	484	0.02	3912	1460	22	13.84	1.29	9	0.41	0.94	0.66	12.79	2.4	3	Available

Table 26. South San Joaquin Valley region, common wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
HRS	2018, 2019, 2022	WB 9725	1959	9204	914	1	1515	487	0	10694	485	1	12.19	1.01	57	-1.1	0.95	0.25	12.06	-	17	-
HWS	2018, 2019, 2022	LCS 12SB0224	1831	8916	911	2	1227	475	0.01	-	-	-	12.94	0.64	43	-0.34	0.54	0.53	-	-	-	-

HRS	2018, 2019, 2022	XB 9512	1886	8846	911	3	1157	475	0.02	-	-	-	12.6	0.75	51	-0.68	0.66	0.31	-	-	-	-
HWS	2018, 2019, 2022	UC CENTRAL WHITE	1932	8701	914	4	1012	487	0.04	10190	485	2	11.21	1.01	60	-2.08	0.95	0.03	11.08	-	22	-
HRS	2018, 2019, 2022	WB 9990	1922	8663	914	5	974	487	0.05	10153	485	3	13.84	1.01	18	0.55	0.95	0.56	13.71	-	7	-
HWS	2018, 2019, 2022	LCS ATOMO	1723	8553	845	6	864	336	0.01	-	-	-	13.25	0.58	34	-0.03	0.47	0.95	-	-	-	Released
HRS	2018, 2019, 2022	WB 9433	1847	8535	845	7	846	336	0.01	-	-	-	13.02	0.58	40	-0.26	0.47	0.59	-	-	-	Released
HRS	2018, 2019, 2022	UC 1961	1961	8440	914	8	751	487	0.12	9930	485	4	13.15	1.01	37	-0.14	0.95	0.89	13.02	-	12	-
HRS	2018, 2019, 2022	UC 1884	1884	8431	911	9	742	475	0.12	-	-	-	13.87	0.64	17	0.59	0.54	0.28	-	-	-	-
HRS	2018, 2019, 2022	WB 9350	1842	8347	845	10	658	336	0.05	-	-	-	12.92	0.58	44	-0.36	0.47	0.44	-	-	-	Released
HRS	2018, 2019, 2022	SY SIENNA	1835	8334	845	11	645	336	0.06	-	-	-	13.41	0.58	28	0.13	0.47	0.79	-	-	-	Available
HWS	2018, 2019, 2022	WB 7566	1802	8328	911	12	639	475	0.18	-	-	-	12.59	0.64	52	-0.69	0.54	0.21	-	-	-	Available
HRS	2018, 2019, 2022	WB 9215	1920	8310	914	13	621	487	0.2	9800	485	5	12.95	1.01	42	-0.34	0.95	0.72	12.82	-	13	Available
HRW	2018, 2019, 2022	ASSL TAM 204	1778	8299	845	14	610	336	0.07	-	-	-	12.81	0.58	47	-0.47	0.47	0.32	-	-	-	Released
HRS	2018, 2019, 2022	WB 9727	1958	8284	914	15	595	487	0.22	9774	485	6	15.08	1.01	2	1.79	0.95	0.06	14.95	-	2	-
HWS	2018, 2019, 2022	UC 1930	1930	8188	914	16	499	487	0.31	9678	485	7	12.72	1.01	48	-0.57	0.95	0.55	12.59	-	14	-
HRS	2018, 2019, 2022	SY SUMMIT 515	1658	8186	854	17	497	358	0.17	-	-	-	12.87	0.58	46	-0.42	0.47	0.38	-	-	-	Available
HRS	2018, 2019, 2022	APB 511829	1875	8183	951	18	494	545	0.37	-	-	-	13.11	0.75	38	-0.17	0.66	0.8	-	-	-	-
SRS	2018, 2019, 2022	SY VACA	1766	8131	911	19	442	475	0.35	-	-	-	10.89	1	62	-2.39	0.93	0.01	-	-	-	Released
HRS	2018, 2019, 2022	WB 9699	1888	8073	845	20	384	336	0.25	-	-	-	14.19	0.58	10	0.91	0.47	0.06	-	-	-	Released
HRW	2018, 2019, 2022	WINCAL 158-5	1906	8062	911	21	373	475	0.43	-	-	-	13.41	1	27	0.13	0.93	0.89	-	-	-	-
HRS	2018, 2019, 2022	XC 9407	1905	7961	911	22	272	475	0.57	-	-	-	13.46	1	26	0.18	0.93	0.85	-	-	-	-
HRS	2018, 2019, 2022	SY REDWING	1521	7929	854	23	240	358	0.5	-	-	-	13.07	0.64	39	-0.22	0.54	0.69	-	-	-	Released
HRS	2018, 2019, 2022	SY 64-1-9	1876	7917	845	24	228	336	0.5	-	-	-	14	0.58	13	0.72	0.47	0.13	-	-	-	-
-	2018, 2019, 2022	FV 2808+	1970	7910	914	25	221	487	0.65	9399	485	9	11.96	1.01	58	-1.33	0.95	0.17	11.83	-	18	-
HRS	2018, 2019, 2022	UC YUROK	1745	7890	821	26	201	275	0.46	9086	485	12	12.65	0.53	49	-0.63	0.42	0.14	12.18	-	16	Available
HRS	2018, 2019, 2022	WB 9490	1887	7887	845	27	198	336	0.56	-	-	-	12.32	0.58	55	-0.96	0.47	0.04	-	-	-	Available
HRS	2018, 2019, 2022	UC 1880	1880	7862	867	28	173	386	0.65	-	-	-	13.36	0.64	29	0.08	0.54	0.88	-	-	-	-
HRS	2018, 2019, 2022	UC CENTRAL RED	1817	7853	825	29	164	287	0.57	9365	485	10	11.49	0.53	59	-1.79	0.42	0	13.97	-	5	Available
HWS	2018, 2019, 2022	SY BLANCA GRANDE 515	1657	7806	845	30	117	336	0.73	-	-	-	13.2	0.58	35	-0.08	0.47	0.86	-	-	-	Available
HRS	2018, 2019, 2022	AP OCTANE	1878	7799	845	31	111	336	0.74	-	-	-	12.99	0.58	41	-0.29	0.47	0.54	-	-	-	Available
HRS	2018, 2019, 2022	AP VENOM	1877	7784	845	32	95	336	0.78	-	-	-	13.89	0.58	15	0.61	0.47	0.2	-	-	-	Available
HWS	2018, 2019, 2022	UC 1815	1815	7731	911	33	42	475	0.93	-	-	-	13.33	0.64	30	0.05	0.54	0.93	-	-	-	Released
HRS	2018, 2019, 2022	LCS 12SB0197	1830	7700	911	34	11	475	0.98	-	-	-	12.91	0.64	45	-0.37	0.54	0.5	-	-	-	-
HWS	2018, 2019, 2022	LCS STAR	1688	7677	911	35	-12	475	0.98	-	-	-	13.89	0.64	16	0.61	0.54	0.27	-	-	-	Available
HRS	2018, 2019, 2022	UC LASSIK	1495	7597	825	36	-92	287	0.75	9539	485	8	12.36	0.57	54	-0.92	0.47	0.05	11.54	-	19	Available

HRS	2018, 2019, 2022	APB 510879	1904	7565	911	37	-124	475	0.79	-	-	-	13.19	1	36	-0.09	0.93	0.93	-	-	-	-
HRS	2018, 2019, 2022	UC 1882	1882	7551	867	38	-138	387	0.72	-	-	-	13.63	0.64	20	0.35	0.54	0.52	-	-	-	-
HRS	2018, 2019, 2022	WB 9904	1751	7435	854	39	-254	358	0.48	-	-	-	12.61	0.58	50	-0.67	0.47	0.16	-	-	-	Available
HRS	2018, 2019, 2022	PR 1404	1526	7370	914	40	-319	487	0.51	8859	485	15	13.48	1.01	25	0.19	0.95	0.84	13.35	-	11	Released
HWS	2018, 2019, 2022	UC AMARILLO	1909	7340	844	41	-349	339	0.3	9141	485	11	14.16	0.74	11	0.88	0.66	0.19	13.83	-	6	-
HRS	2018, 2019, 2022	APB 410089	1903	7332	951	42	-357	546	0.51	-	-	-	14.43	1	5	1.14	0.93	0.22	-	-	-	-
HRS	2018, 2019, 2022	APB 510477	1874	7317	911	43	-372	475	0.43	-	-	-	13.32	0.64	31	0.04	0.54	0.94	-	-	-	-
HWS	2018, 2019, 2022	UC 1839	1839	7266	911	44	-423	475	0.37	-	-	-	14.44	1	4	1.16	0.93	0.22	-	-	-	-
HWS	2018, 2019, 2022	UC 1907	1907	7257	911	45	-432	475	0.36	-	-	-	14.94	1	3	1.66	0.93	0.08	-	-	-	-
HWS	2018, 2019, 2022	UC PATWIN 515 HP	1743	7206	821	46	-483	275	0.08	8353	485	18	14.3	0.53	9	1.02	0.42	0.02	14.07	-	4	Available
HRS	2018, 2019, 2022	SY CAL ROJO	1478	7192	821	47	-497	275	0.07	7761	485	21	12.46	0.53	53	-0.82	0.42	0.05	11.28	-	21	Available
HRS	2018, 2019, 2022	UC 1908	1908	7177	911	48	-512	475	0.28	-	-	-	14.13	1	12	0.85	0.93	0.36	-	-	-	-
HRS	2018, 2019, 2022	DPG FV 2808	1608	7174	911	49	-515	475	0.28	-	-	-	11.18	1	61	-2.1	0.93	0.03	-	-	-	Available
HRS	2018, 2019, 2022	WB 9112	1748	7120	1027	50	-569	665	0.39	-	-	-	13.27	0.75	33	-0.01	0.66	0.99	-	-	-	Available
HWS	2018, 2019, 2022	UC PATWIN 515	1680	7104	821	51	-585	275	0.03	8941	485	13	14.4	0.53	6	1.12	0.42	0.01	13.69	-	8	Available
HRS	2018, 2019, 2022	WB 9229	1730	7071	825	52	-618	287	0.03	8752	485	16	13.62	0.53	21	0.34	0.42	0.42	12.31	-	15	Available
HWS	2018, 2019, 2022	SY BLANCA ROYALE	1522	6907	1027	53	-782	665	0.24	-	-	-	13.53	0.75	24	0.25	0.66	0.7	-	-	-	Released
HWS	2018, 2019, 2022	UC 1883	1883	6883	911	54	-806	475	0.09	-	-	-	14.38	0.64	7	1.1	0.54	0.05	-	-	-	-
HRS	2018, 2019, 2022	WB PATRON	1731	6881	821	55	-808	275	0	8936	485	14	13.32	0.53	32	0.04	0.42	0.93	13.52	-	9	Available
HRS	2018, 2019, 2022	YECORA ROJO	112	6772	843	56	-917	337	0.01	8505	485	17	13.96	0.57	14	0.68	0.47	0.15	14.45	-	3	Available
HRS	2018, 2019, 2022	UC 1885	1885	6761	951	57	-928	545	0.09	-	-	-	13.59	0.64	22	0.3	0.54	0.58	-	-	-	-
HRS	2018, 2019, 2022	YECORA ROJO 515	1916	6665	914	58	-1024	487	0.04	8155	485	20	13.54	1.01	23	0.25	0.95	0.79	13.41	-	10	-
SWS	2018, 2019, 2022	BAG NEW DIRKWIN	1667	6621	821	59	-1068	275	0	8271	485	19	12.2	0.53	56	-1.08	0.42	0.01	11.51	-	20	Available
HRS	2018, 2019, 2022	YECORA ROJO 515 HP	1879	6530	911	60	-1159	475	0.02	-	-	-	15.53	0.64	1	2.25	0.54	0	-	-	-	-
HRS	2018, 2019, 2022	WB JOAQUIN ORO	1728	6507	825	61	-1182	287	0	7443	485	22	14.33	0.53	8	1.05	0.42	0.01	15.04	-	1	Available
HRS	2018, 2019, 2022	WB TRIPLE IV	1550	5395	1026	62	-2294	665	0	-	-	-	13.63	1	19	0.35	0.93	0.71	-	-	-	Available

Table 27. Imperial Valley region, common wheat yield and protein 3-year summaries.

No data from past 3 years

Table 28. Water-limited locations, common wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
HRS	2020-2022	WB 9725	1959	4661	919	1	647	528	0.22	5836	1486	2	13.69	1.72	34	-0.78	1.07	0.47	11.12	1.33	18	-
HWS	2020-2022	SY BLANCA GRANDE 515	1657	4576	1285	2	562	1023	0.58	-	-	-	14.18	2.51	25	-0.29	2.08	0.89	-	-	-	Available
HRS	2020-2022	UC 1961	1961	4506	919	3	492	528	0.35	5680	1486	3	14.32	1.72	23	-0.15	1.07	0.89	11.75	1.33	11	-
HWS	2020-2022	UC CENTRAL WHITE	1932	4452	868	4	438	440	0.32	5869	1487	1	13.94	1.57	30	-0.53	0.82	0.51	11.3	1.33	15	-
HRS	2020-2022	WB 9215	1920	4417	864	5	403	432	0.35	5596	1486	4	13.69	1.6	35	-0.79	0.88	0.37	11.03	1.33	20	Available
HWS	2020-2022	UC 1907	1907	4367	1285	6	354	1023	0.73	-	-	-	14.45	2.51	20	-0.03	2.08	0.99	-	-	-	-
HRS	2020-2022	SY SUMMIT 515	1658	4271	959	7	258	594	0.66	-	-	-	13.73	1.6	33	-0.74	0.88	0.4	-	-	-	Available
HRS	2020-2022	AP OCTANE	1878	4248	959	8	234	594	0.69	-	-	-	13.53	1.81	36	-0.94	1.21	0.44	-	-	-	Available
HRS	2020-2022	UC LASSIK	1495	4238	884	9	225	468	0.63	5468	1486	5	13.77	1.65	32	-0.7	0.95	0.46	11.17	1.33	16	Available
HRS	2020-2022	WB 9699	1888	4140	959	10	127	594	0.83	-	-	-	14.29	1.81	24	-0.18	1.21	0.88	-	-	-	Released
HWS	2020-2022	UC 1815	1815	4128	1285	11	114	1023	0.91	-	-	-	14.5	2.51	18	0.03	2.08	0.99	-	-	-	Released
HWS	2020-2022	UC 1917	1917	4116	1285	12	103	1023	0.92	-	-	-	14.17	2.51	26	-0.3	2.08	0.88	-	-	-	-
HRS	2020-2022	UC CENTRAL RED	1817	4115	846	13	102	397	0.8	5383	1486	7	14.67	1.56	15	0.2	0.81	0.8	12.18	1.33	7	Available
HRS	2020-2022	SY CAL ROJO	1478	4109	846	14	95	397	0.81	5184	1486	12	13.88	1.56	31	-0.59	0.81	0.47	10.6	1.33	21	Available

HRS	2020-2022	UC YUROK	1745	4057	846	15	43	397	0.91	5095	1486	16	14.01	1.56	28	-0.46	0.81	0.57	11.7	1.33	13	Available
HRS	2020-2022	YECORA ROJO	112	4056	868	16	43	440	0.92	4929	1487	18	13.96	1.6	29	-0.51	0.88	0.56	11.51	1.33	14	Available
HRS	2020-2022	WB PATRON	1731	4037	846	17	24	397	0.95	5216	1486	9	14.92	1.5	10	0.45	0.69	0.52	12.55	1.33	6	Available
HRS	2020-2022	WB 9727	1958	4028	919	18	14	528	0.98	5203	1486	11	14.45	1.72	19	-0.02	1.07	0.98	11.88	1.33	10	-
HWS	2020-2022	UC PATWIN 515	1680	4010	846	19	-3	397	0.99	5262	1486	8	15.17	1.56	7	0.7	0.81	0.39	12.83	1.33	3	Available
HRS	2020-2022	WB 9229	1730	4007	846	20	-6	397	0.99	5129	1486	14	14.4	1.51	22	-0.07	0.71	0.92	11.13	1.33	17	Available
HRS	2020-2022	WB 9990	1922	4007	849	21	-6	403	0.99	5442	1487	6	15.54	1.5	4	1.07	0.69	0.12	12.17	1.33	8	-
HWS	2020-2022	UC 1930	1930	4001	864	22	-13	432	0.98	5206	1486	10	13.26	1.64	37	-1.22	0.95	0.2	11.12	1.38	19	-
HRW	2020-2022	WINCAL 158-5	1906	3994	1285	23	-20	1023	0.98	-	-	-	14.87	2.51	11	0.4	2.08	0.85	-	-	-	-
HRS	2020-2022	WB TRIPLE IV	1550	3993	1053	24	-21	732	0.98	-	-	-	12.76	2.02	39	-1.71	1.49	0.25	-	-	-	Available
-	2020-2022	FV 2808+	1970	3978	919	25	-36	528	0.95	5153	1486	13	13.2	1.66	38	-1.27	0.97	0.19	10.6	1.3	22	-
HRS	2020-2022	AP REDWING 204	1921	3948	959	26	-66	594	0.91	-	-	-	14.61	1.81	17	0.14	1.21	0.91	-	-	-	-
HRS	2020-2022	SY 64-1-9	1876	3902	1285	27	-112	1023	0.91	-	-	-	16.45	2.51	1	1.98	2.08	0.34	-	-	-	-
HRS	2020-2022	YECORA ROJO 515	1916	3879	849	28	-134	403	0.74	4755	1487	19	15.01	1.5	9	0.54	0.68	0.43	12.81	1.33	4	-
HWS	2020-2022	UC AMARILLO	1909	3856	884	29	-158	468	0.74	5098	1486	15	15.44	1.65	5	0.97	0.95	0.31	12.69	1.33	5	-
HRS	2020-2022	UC 1884	1884	3808	1285	30	-205	1023	0.84	-	-	-	15.04	2.51	8	0.57	2.08	0.78	-	-	-	-
HWS	2020-2022	UC PATWIN 515 HP	1743	3803	846	31	-211	397	0.6	4968	1486	17	15.64	1.56	3	1.17	0.81	0.15	13.52	1.33	2	Available
HRS	2020-2022	AP VENOM	1877	3796	1285	32	-218	1023	0.83	-	-	-	14.78	2.51	14	0.31	2.08	0.88	-	-	-	Available
HRS	2020-2022	WB 9904	1751	3741	959	33	-272	594	0.65	-	-	-	14.63	1.81	16	0.16	1.21	0.9	-	-	-	Available
HRS	2020-2022	SY SIENNA	1835	3727	959	34	-286	594	0.63	-	-	-	14.84	1.81	12	0.37	1.21	0.76	-	-	-	Available
HRS	2020-2022	YECORA ROJO 515 HP	1879	3696	1415	35	-317	1175	0.79	-	-	-	15.95	2.51	2	1.48	2.08	0.48	-	-	-	-
HRS	2020-2022	PR 1404	1526	3582	864	36	-432	432	0.32	4730	1486	20	14.44	1.6	21	-0.03	0.88	0.97	11.71	1.33	12	Released
HWS	2020-2022	UC 1931	1931	3564	1053	37	-449	732	0.54	-	-	-	14.01	2.02	27	-0.46	1.49	0.76	-	-	-	-
HRS	2020-2022	WB JOAQUIN ORO	1728	3530	846	38	-484	397	0.22	4322	1486	22	15.38	1.56	6	0.91	0.81	0.26	13.78	1.33	1	Available

SWS	2020-2022	BAG NEW DIRKWIN	1667	3187	850	39	-827	405	0.04	4555	1486	21	14.81	1.56	13	0.34	0.81	0.68	11.99	1.33	9	Available

Table 29. Statewide common wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
HWS	2020-2022	UC 1917	1917	6874	788	1	950	351	0.01	-	-	-	11.94	1.1	35	-0.59	0.96	0.54	-	-	-	-
HRS	2020-2022	SY 64-1-9	1876	6814	788	2	890	351	0.01	-	-	-	13.27	1.1	5	0.74	0.96	0.44	-	-	-	-
HWS	2020-2022	UC 1815	1815	6644	788	3	720	351	0.04	-	-	-	12.43	1.1	21	-0.09	0.96	0.93	-	-	-	Released
HRS	2020-2022	WB 9725	1959	6589	759	4	665	291	0.02	6359	993	1	11.88	0.94	37	-0.64	0.8	0.42	10.94	0.94	17	-
HRS	2020-2022	UC 1961	1961	6531	759	5	607	291	0.04	6301	993	2	12.47	0.94	20	-0.05	0.8	0.95	11.53	1.06	13	-
HRS	2020-2022	WB 9215	1920	6431	729	6	507	206	0.01	6105	993	4	12.1	0.74	31	-0.42	0.57	0.46	10.75	0.74	19	Available
HWS	2020-2022	UC CENTRAL WHITE	1932	6408	730	7	484	208	0.02	6276	993	3	12.25	0.73	27	-0.28	0.55	0.61	10.89	1.16	18	-
HRS	2020-2022	AP OCTANE	1878	6391	736	8	467	223	0.04	-	-	-	11.56	0.79	39	-0.97	0.61	0.12	-	-	-	Available
HRS	2020-2022	WB 9699	1888	6333	736	9	409	223	0.07	-	-	-	12.02	0.79	32	-0.51	0.61	0.41	-	-	-	Released
HWS	2020-2022	SY BLANCA GRANDE 515	1657	6169	788	10	246	351	0.48	-	-	-	12.7	1.1	13	0.17	0.96	0.86	-	-	-	Available
HRS	2020-2022	UC CENTRAL RED	1817	6110	722	11	187	177	0.29	5865	993	6	12.77	0.69	10	0.25	0.49	0.61	11.78	0.78	8	Available
HWS	2020-2022	UC 1907	1907	6102	788	12	178	351	0.61	-	-	-	13.23	1.1	6	0.7	0.96	0.47	-	-	-	-
HRS	2020-2022	WB 9990	1922	6088	722	13	164	179	0.36	5963	993	5	12.23	0.61	28	-0.3	0.38	0.44	11.59	1.02	10	-
HRS	2020-2022	UC LASSIK	1495	6081	736	14	157	223	0.48	5860	993	7	11.98	0.79	34	-0.54	0.61	0.38	11.13	0.77	16	Available
HRS	2020-2022	AP REDWING 204	1921	6043	736	15	120	223	0.59	-	-	-	12.93	0.79	9	0.4	0.61	0.51	-	-	-	-
HRS	2020-2022	UC YUROK	1745	6027	722	16	103	179	0.56	5560	993	14	12.26	0.69	26	-0.26	0.49	0.59	11.54	0.94	11	Available
HWS	2020-2022	UC PATWIN 515	1680	5996	722	17	72	179	0.69	5812	993	9	12.77	0.69	11	0.24	0.49	0.62	12.06	1.23	5	Available
HRS	2020-2022	AP VENOM	1877	5990	788	18	66	351	0.85	-	-	-	12.55	1.1	19	0.03	0.96	0.98	-	-	-	Available
HRS	2020-2022	SY CAL ROJO	1478	5966	722	19	42	179	0.81	5817	993	8	12.35	0.69	23	-0.18	0.49	0.72	10.7	0.63	20	Available
HRS	2020-2022	SY SUMMIT 515	1658	5906	737	20	-18	226	0.94	-	-	-	12	0.66	33	-0.53	0.45	0.24	-	-	-	Available

HRS	2020-2022	WB 9229	1730	5892	722	21	-32	179	0.86	5596	993	12	12.76	0.63	12	0.24	0.4	0.55	11.29	0.64	14	Available
HRS	2020-2022	WB PATRON	1731	5877	722	22	-47	179	0.79	5691	993	10	12.32	0.62	24	-0.21	0.39	0.6	11.83	1.23	7	Available
HWS	2020-2022	UC 1930	1930	5874	729	23	-49	206	0.81	5656	993	11	11.93	0.76	36	-0.6	0.59	0.31	10.5	0.78	22	-
HRS	2020-2022	UC 1884	1884	5848	788	24	-76	351	0.83	-	-	-	13.48	1.1	2	0.96	0.96	0.32	-	-	-	-
HRS	2020-2022	WB 9727	1958	5799	759	25	-125	291	0.67	5569	993	13	12.59	0.94	17	0.06	0.8	0.94	11.64	0.82	9	-
HRS	2020-2022	YECORA ROJO	112	5781	731	26	-143	210	0.5	5363	993	16	12.6	0.65	16	0.07	0.45	0.87	12.09	0.3	4	Available
HWS	2020-2022	UC PATWIN 515 HP	1743	5760	722	27	-164	179	0.36	5326	993	19	13.52	0.69	1	0.99	0.49	0.04	12.84	1.2	2	Available
HRW	2020-2022	WINCAL 158-5	1906	5751	788	28	-173	351	0.62	-	-	-	12.38	1.1	22	-0.14	0.96	0.88	-	-	-	-
HWS	2020-2022	UC AMARILLO	1909	5738	736	29	-186	223	0.41	5517	993	15	13.38	0.79	4	0.86	0.61	0.16	12.05	1.13	6	-
HRS	2020-2022	WB 9904	1751	5724	736	30	-200	223	0.37	-	-	-	12.62	0.79	15	0.1	0.61	0.87	-	-	-	Available
HWS	2020-2022	UC 1931	1931	5694	759	31	-229	290	0.43	-	-	-	12.12	0.94	30	-0.41	0.8	0.61	-	-	-	-
-	2020-2022	FV 2808+	1970	5571	759	32	-353	291	0.22	5341	993	18	11.81	0.89	38	-0.72	0.74	0.34	10.69	0.65	21	-
HRS	2020-2022	PR 1404	1526	5557	730	33	-367	208	0.08	5363	993	17	12.29	0.74	25	-0.24	0.57	0.68	11.22	0.96	15	Released
HRS	2020-2022	SY SIENNA	1835	5489	736	34	-435	223	0.05	-	-	-	13.02	0.79	8	0.5	0.61	0.42	-	-	-	Available
HRS	2020-2022	YECORA ROJO 515	1916	5338	722	35	-586	179	0	5108	993	20	13.14	0.64	7	0.61	0.42	0.14	12.12	0.95	3	-
HRS	2020-2022	WB JOAQUIN ORO	1728	5184	722	36	-740	179	0	4653	993	22	13.46	0.69	3	0.93	0.49	0.06	13.44	0.93	1	Available
HRS	2020-2022	WB TRIPLE IV	1550	5074	761	37	-850	296	0	-	-	-	12.13	0.94	29	-0.39	0.8	0.62	-	-	-	Available
HRS	2020-2022	YECORA ROJO 515 HP	1879	4796	793	38	-1128	362	0	-	-	-	12.56	1.1	18	0.03	0.96	0.97	-	-	-	-
SWS	2020-2022	BAG NEW DIRKWIN	1667	4790	723	39	-1134	180	0	5029	993	21	12.67	0.69	14	0.15	0.49	0.76	11.53	1.06	12	Available

Durum performance tables

Table 30. Sacramento Valley region, durum wheat yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 1870	1870	8049	634	1	1147	438	0.01	-	-	-	11.15	1.46	26	-1.53	1.23	0.23	-	-	-	-
2020-2022	UC 1949	1949	8036	633	2	1134	442	0.01	-	-	-	12.42	1.46	17	-0.26	1.24	0.83	-	-	-	-
2020-2022	UC DESERT GOLD	1850	7644	513	3	743	253	0	7408	313	3	11.09	1.03	27	-1.59	0.71	0.04	10.51	-	18	Available
2020-2022	AS MAESTRALE	1582	7537	634	4	635	438	0.15	-	-	-	12.34	1.46	19	-0.35	1.23	0.78	-	-	-	Available
2020-2022	UC 1963	1963	7493	634	5	592	439	0.18	7482	313	2	11.96	1.46	22	-0.73	1.23	0.56	10.54	-	17	-
2020-2022	UC 1919	1919	7441	634	6	539	438	0.22	-	-	-	12.74	1.46	15	0.06	1.23	0.96	-	-	-	-
2020-2022	UC 1910	1910	7421	634	7	520	438	0.24	-	-	-	11.74	1.46	24	-0.94	1.23	0.45	-	-	-	-
2020-2022	UC 1962	1962	7306	634	8	404	439	0.36	7295	313	4	12.08	1.46	21	-0.61	1.23	0.63	10.66	-	16	-
2020-2022	TIBURON	1640	7302	513	9	400	253	0.12	6607	313	12	11.87	1.03	23	-0.81	0.71	0.27	11.58	-	8	Available
2020-2022	APB 153541	1901	7113	513	10	211	253	0.41	6893	313	9	13.05	1.03	10	0.37	0.71	0.61	11.59	-	7	-
2020-2022	UC 1928	1928	7098	633	11	196	442	0.66	-	-	-	11.65	1.46	25	-1.03	1.24	0.41	-	-	-	-
2020-2022	UC 1927	1927	7058	633	12	157	442	0.72	-	-	-	13.05	1.46	9	0.37	1.24	0.77	-	-	-	-
2020-2022	UC MIWOK	1690	6985	513	13	83	253	0.74	7580	313	1	13.21	1.03	7	0.53	0.71	0.46	10.93	-	12	Available
2020-2022	UC DESERT KING	1375	6982	513	14	80	253	0.75	6683	313	11	12.86	1.03	11	0.18	0.71	0.8	11.62	-	6	Available

2020-2022	APB D518-38	1969	6976	634	15	74	439	0.87	6965	313	7	12.33	1.46	20	-0.36	1.23	0.78	10.91	-	13	-
2020-2022	APB 471400	1853	6841	599	16	-61	391	0.88	7023	313	6	12.77	1.15	13	0.09	0.88	0.92	10.79	-	15	-
2020-2022	UC 1918	1918	6769	634	17	-133	438	0.76	-	-	-	12.77	1.46	14	0.09	1.23	0.94	-	-	-	-
2020-2022	APB 152308	1900	6745	519	18	-157	264	0.55	7111	347	5	14.17	1.03	3	1.49	0.71	0.05	12.52	-	3	-
2020-2022	APB 471389	1924	6713	513	19	-189	253	0.46	6488	313	13	13.13	1.03	8	0.45	0.71	0.54	13.16	-	1	-
2020-2022	UC DESERT KING HP	1627	6686	513	20	-215	253	0.4	6250	313	15	14.8	1.03	1	2.12	0.71	0.01	12.11	-	5	Available
2020-2022	AS SARAGOLLA	1583	6624	634	21	-278	438	0.53	-	-	-	10.68	1.46	28	-2	1.23	0.12	-	-	-	Available
2020-2022	SY FORTISSIMO	1429	6574	546	22	-328	312	0.3	6952	313	8	12.66	1.15	16	-0.02	0.88	0.99	11.33	-	10	Available
2020-2022	SY VOLANTE	1431	6479	513	23	-423	253	0.1	6878	313	10	12.36	1.03	18	-0.32	0.71	0.65	10.86	-	14	Available
2020-2022	ALBERTO	1813	6209	513	24	-693	253	0.01	6415	313	14	13.99	1.03	4	1.31	0.71	0.08	10.99	-	11	Available
2020-2022	AS COLOMBO	1800	6189	683	25	-712	501	0.16	-	-	-	12.8	1.46	12	0.12	1.23	0.92	-	-	-	Available
2020-2022	APB 152356	1902	5754	513	26	-1148	253	0	5769	313	16	13.23	1.03	6	0.55	0.71	0.45	11.51	-	9	-
2020-2022	UC 1848	1848	5717	634	27	-1185	439	0.01	5706	313	17	14.32	1.46	2	1.63	1.23	0.2	12.9	-	2	-
2020-2022	UC 1964	1964	5510	634	28	-1392	439	0	5499	313	18	13.86	1.46	5	1.17	1.23	0.35	12.44	-	4	-

Table 31. North Central San Joaquin Valley region, durum wheat yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 1870	1870	9032	1076	1	963	885	0.28	-	-	-	11.5	1.57	13	-0.04	1.28	0.97	-	-	-	-
2020-2022	APB 471400	1853	8921	858	2	851	626	0.18	8007	397	1	12.09	1.15	5	0.55	0.75	0.46	10.47	0.76	3	-

2020-2022	UC 1928	1928	8756	900	3	686	679	0.31	-	-	-	11.88	1.16	9	0.34	0.76	0.66	-	-	-	-
2020-2022	UC 1918	1918	8710	1076	4	640	885	0.47	-	-	-	11.06	1.57	19	-0.48	1.28	0.71	-	-	-	-
2020-2022	UC MIWOK	1690	8608	729	5	539	448	0.23	7162	397	4	11.35	1.01	17	-0.19	0.53	0.72	9.24	0.76	10	Available
2020-2022	UC 1963	1963	8532	1074	6	462	885	0.6	7409	397	3	10.75	1.27	24	-0.79	0.91	0.39	9.11	0.76	14	-
2020-2022	APB 153541	1901	8524	729	7	454	448	0.31	7015	397	7	11.61	1.01	12	0.07	0.53	0.9	9.14	0.76	13	-
2020-2022	UC DESERT GOLD	1850	8504	729	8	435	448	0.33	7638	397	2	10.34	1.01	27	-1.2	0.53	0.03	8.56	0.76	18	Available
2020-2022	UC 1910	1910	8472	1076	9	403	885	0.65	-	-	-	12.68	1.57	3	1.14	1.28	0.37	-	-	-	-
2020-2022	TIBURON	1640	8441	729	10	372	448	0.41	6717	397	13	10.99	1.01	21	-0.55	0.53	0.31	9.05	0.76	15	Available
2020-2022	AS SARAGOLLA	1583	8411	1076	11	341	885	0.7	-	-	-	10.81	1.57	23	-0.73	1.28	0.57	-	-	-	Available
2020-2022	UC 1949	1949	8410	868	12	341	639	0.59	-	-	-	11.82	1.16	10	0.28	0.76	0.71	-	-	-	-
2020-2022	APB 152308	1900	8310	738	13	240	461	0.6	7052	397	6	11.99	1.01	8	0.45	0.53	0.41	12.31	0.76	1	-
2020-2022	APB 471389	1924	8132	729	14	62	448	0.89	6626	397	15	11.36	1.01	16	-0.18	0.53	0.74	9.45	0.76	7	-
2020-2022	SY VOLANTE	1431	8126	729	15	57	448	0.9	6467	397	16	10.29	1.01	28	-1.25	0.53	0.02	9.28	0.76	9	Available
2020-2022	UC 1962	1962	8123	1074	16	53	885	0.95	7000	397	8	10.96	1.27	22	-0.58	0.91	0.52	9.32	0.76	8	-
2020-2022	APB 152356	1902	8085	729	17	16	448	0.97	6843	397	11	11.42	1.01	14	-0.12	0.53	0.82	9.63	0.76	6	-
2020-2022	UC 1927	1927	8066	900	18	-3	679	1	-	-	-	11.42	1.16	15	-0.12	0.76	0.87	-	-	-	-
2020-2022	UC 1919	1919	7971	1076	19	-99	885	0.91	-	-	-	12.53	1.57	4	0.99	1.28	0.44	-	-	-	-
2020-2022	SY FORTISSIMO	1429	7934	811	20	-136	565	0.81	6924	397	9	11.66	1.05	11	0.12	0.59	0.84	9.2	0.76	11	Available
2020-2022	ALBERTO	1813	7892	729	21	-178	448	0.69	7102	397	5	11.11	1.01	18	-0.43	0.53	0.43	8.86	0.76	16	Available
2020-2022	AS MAESTRALE	1582	7849	1076	22	-221	885	0.8	-	-	-	10.51	1.57	25	-1.03	1.28	0.42	-	-	-	Available
2020-2022	APB D518-38	1969	7830	1074	23	-240	885	0.79	6707	397	14	10.41	1.27	26	-1.13	0.91	0.22	8.77	0.76	17	-
2020-2022	UC DESERT KING	1375	7681	747	24	-389	475	0.41	6809	397	12	11	1.01	20	-0.54	0.53	0.32	9.16	0.76	12	Available
2020-2022	UC DESERT KING HP	1627	7594	738	25	-476	461	0.3	6924	397	10	12.97	1.01	2	1.43	0.53	0.01	11.94	0.76	2	Available
2020-2022	UC 1964	1964	7092	1074	26	-978	885	0.27	5970	397	17	12.07	1.27	6	0.53	0.91	0.56	10.43	0.76	4	-
2020-2022	UC 1848	1848	6555	1074	27	-1514	885	0.09	5433	397	18	12.04	1.27	7	0.5	0.91	0.59	10.4	0.76	5	-
2020-2022	AS COLOMBO	1800	5389	1076	28	-2681	885	0	-	-	-	14.5	1.57	1	2.96	1.28	0.02	-	-	-	Available

Table 32. South San Joaquin Valley region, durum wheat yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2018, 2019, 2022	ASC 124	1914	9258	996	1	1177	435	0.01	-	-	-	12.93	0.95	37	-0.84	0.63	0.19	-	-	-	-
2018, 2019, 2022	UC 1910	1910	8785	996	2	704	435	0.11	-	-	-	15.53	0.95	1	1.76	0.63	0.01	-	-	-	-
2018, 2019, 2022	UC 1963	1963	8776	998	3	695	445	0.12	10097	546	4	14.13	0.95	9	0.37	0.64	0.57	13.17	-	10	-
2018, 2019, 2022	UC 1870	1870	8742	962	4	660	354	0.06	-	-	-	12.9	0.79	39	-0.87	0.37	0.02	-	-	-	-
2018, 2019, 2022	UC MIWOK	1690	8688	910	5	607	185	0	9545	546	6	13.33	0.72	34	-0.43	0.18	0.02	10.75	-	18	Available
2018, 2019, 2022	DPG TOPPER	1211	8680	996	6	598	435	0.17	-	-	-	12.62	0.79	43	-1.15	0.37	0	-	-	-	Released
2018, 2019, 2022	UC DESERT KING	1375	8643	927	7	562	252	0.03	10850	546	1	14.08	0.76	12	0.32	0.32	0.32	13.46	-	5	Available
2018, 2019, 2022	POWELL	1868	8625	945	8	544	308	0.08	-	-	-	13.44	0.79	30	-0.33	0.36	0.37	-	-	-	Available
2018, 2019, 2022	WB ORITA	1215	8584	945	9	503	308	0.1	-	-	-	13.99	0.77	17	0.22	0.32	0.48	-	-	-	Available
2018, 2019, 2022	APB 471400	1853	8505	930	10	423	263	0.11	10529	546	2	12.69	0.75	42	-1.08	0.28	0	11.49	-	17	-
2018, 2019, 2022	SY FORTISSIMO	1429	8500	927	11	418	252	0.1	9533	546	7	13.88	0.76	20	0.12	0.32	0.71	13.15	-	11.5	Available
2018, 2019, 2022	DPG DURAKING	878	8493	996	12	412	435	0.34	-	-	-	12.91	0.83	38	-0.85	0.45	0.06	-	-	-	Released
2018, 2019, 2022	AS COLOMBO	1800	8489	945	13	407	308	0.19	-	-	-	13.2	0.79	35	-0.57	0.36	0.12	-	-	-	Available
2018, 2019, 2022	SY VOLANTE	1431	8486	930	14	405	262	0.12	9131	623	10	13.42	0.74	31	-0.35	0.26	0.19	12.97	-	14	Available
2018, 2019, 2022	UC 1771	1771	8478	996	15	397	435	0.36	-	-	-	13.38	0.95	33	-0.39	0.63	0.54	-	-	-	-
2018, 2019, 2022	UC 1872	1872	8470	996	16	388	435	0.37	-	-	-	13.65	0.79	23	-0.12	0.37	0.76	-	-	-	-
2018, 2019, 2022	TIBURON	1640	8450	930	17	369	263	0.16	10162	546	3	13.92	0.75	19	0.15	0.28	0.59	13.22	-	8.5	Available
2018, 2019, 2022	APB 152308	1900	8386	944	18	305	311	0.33	9760	546	5	13.39	0.83	32	-0.37	0.45	0.41	12.45	-	16	-
2018, 2019, 2022	UC DESERT GOLD	1850	8360	927	19	279	252	0.27	9027	546	11	13.48	0.75	29	-0.28	0.28	0.32	12.79	-	15	Available
2018, 2019, 2022	WB MOHAVE	1654	8334	945	20	252	308	0.41	-	-	-	14.1	0.77	11	0.33	0.32	0.3	-	-	-	Available
2018, 2019, 2022	SHASTA	1869	8317	945	21	235	308	0.45	-	-	-	13.63	0.77	24	-0.13	0.32	0.67	-	-	-	Available
2018, 2019, 2022	WB MEAD	1607	8212	945	22	131	308	0.67	-	-	-	14.06	0.79	13	0.29	0.36	0.43	-	-	-	Available

2018, 2019, 2022	APB 471389	1924	8188	998	23	107	445	0.81	9509	546	8	14.4	0.95	7	0.64	0.64	0.32	13.44	-	6	-
2018, 2019, 2022	DPG CANDURA	1867	8050	996	24	-32	435	0.94	-	-	-	13.08	0.83	36	-0.68	0.45	0.13	-	-	-	Released
2018, 2019, 2022	APB 450333	1866	8008	996	25	-74	435	0.87	-	-	-	13.8	0.79	21	0.04	0.37	0.92	-	-	-	-
2018, 2019, 2022	APB 450311	1851	7995	996	26	-87	435	0.84	-	-	-	15.38	0.94	3	1.62	0.62	0.01	-	-	-	-
2018, 2019, 2022	AS SARAGOLLA	1583	7968	945	27	-113	308	0.71	-	-	-	12.4	0.77	44	-1.37	0.32	0	-	-	-	Available
2018, 2019, 2022	ALBERTO	1813	7909	930	28	-172	263	0.51	8988	546	12	14.05	0.75	14	0.29	0.28	0.32	13.22	-	8.5	Available
2018, 2019, 2022	UC 1964	1964	7897	998	29	-184	445	0.68	9218	546	9	14.88	0.95	5	1.12	0.64	0.08	13.92	-	2	-
2018, 2019, 2022	UC 1873	1873	7753	996	30	-328	435	0.45	-	-	-	14.03	0.79	15	0.27	0.37	0.47	-	-	-	-
2018, 2019, 2022	DPG PLATINUM	1210	7726	952	31	-356	328	0.28	-	-	-	13.56	0.79	26	-0.21	0.36	0.57	-	-	-	Available
2018, 2019, 2022	AS MAESTRALE	1582	7717	952	32	-364	328	0.27	-	-	-	12.77	0.79	41	-1	0.36	0.01	-	-	-	Available
2018, 2019, 2022	ASC 123	1913	7690	996	33	-392	435	0.37	-	-	-	12.79	0.95	40	-0.98	0.63	0.12	-	-	-	-
2018, 2019, 2022	APB 450275	1865	7685	996	34	-397	435	0.36	-	-	-	14.01	0.79	16	0.24	0.37	0.52	-	-	-	-
2018, 2019, 2022	UC DESERT KING HP	1627	7581	927	35	-501	252	0.05	8813	546	14	14.81	0.75	6	1.04	0.28	0	13.56	-	3	Available
2018, 2019, 2022	UC 1871	1871	7510	961	36	-571	353	0.11	-	-	-	13.55	0.77	27	-0.22	0.32	0.5	-	-	-	-
2018, 2019, 2022	UC 1962	1962	7411	998	37	-671	445	0.13	8731	546	15	14.11	0.95	10	0.35	0.64	0.59	13.15	-	11.5	-
2018, 2019, 2022	APB D518-38	1969	7407	998	38	-675	445	0.13	8728	546	16	13.98	0.95	18	0.22	0.64	0.73	13.02	-	13	-
2018, 2019, 2022	WESTMORE HP	1484	7339	952	39	-743	328	0.02	-	-	-	14.23	0.77	8	0.46	0.32	0.15	-	-	-	Available
2018, 2019, 2022	APB 152356	1902	7252	944	40	-829	311	0.01	8550	546	17	13.78	0.83	22	0.01	0.45	0.98	13.3	-	7	-
2018, 2019, 2022	APB 153541	1901	7174	952	41	-908	332	0.01	8878	546	13	14.89	0.83	4	1.12	0.45	0.01	13.51	-	4	-
2018, 2019, 2022	ASC 122	1912	7162	1027	42	-920	500	0.07	-	-	-	13.51	0.95	28	-0.25	0.63	0.69	-	-	-	-
2018, 2019, 2022	KRONOS	951	7072	962	43	-1009	354	0	-	-	-	13.62	0.79	25	-0.15	0.36	0.69	-	-	-	Available
2018, 2019, 2022	UC 1848	1848	6828	998	44	-1253	445	0.01	8149	546	18	15.4	0.95	2	1.64	0.64	0.01	14.44	-	1	-

Table 33. Imperial Valley region, durum wheat yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2018, 2019, 2021	APB 471400	1853	7561	925	1	1114	257	0	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	POWELL	1868	7252	935	2	805	288	0.01	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	UC DESERT GOLD	1850	7137	919	3	690	237	0	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	SHASTA	1869	7097	935	4	651	288	0.02	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	AS COLOMBO	1800	6986	950	5	540	331	0.1	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	DPG DURAKING	878	6965	981	6	518	407	0.2	-	-	-	-	-	-	-	-	-	-	-	-	Released
2018, 2019, 2021	UC DESERT KING	1375	6951	919	7	504	237	0.03	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	ASC 124	1914	6943	980	8	496	407	0.22	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	SY FORTISSIMO	1429	6940	919	9	494	237	0.04	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	UC MIWOK	1690	6841	905	10	395	173	0.02	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	APB 152308	1900	6747	935	11	300	292	0.31	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1771	1771	6721	980	12	274	407	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	APB 153541	1901	6682	935	13	235	292	0.42	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	ALBERTO	1813	6664	922	14	217	246	0.38	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	KRONOS	951	6663	935	15	217	288	0.45	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	APB 450311	1851	6600	981	16	153	407	0.71	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1873	1873	6600	981	17	153	407	0.71	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	WB MEAD	1607	6567	935	18	120	288	0.68	-	-	-	-	-	-	-	-	-	-	-	-	Available

2018, 2019, 2021	APB 450275	1865	6529	981	19	82	407	0.84	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	APB 471389	1924	6502	983	20	55	420	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	TIBURON	1640	6491	919	21	44	237	0.85	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	APB 450333	1866	6456	981	22	9	407	0.98	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	AS SARAGOLLA	1583	6428	935	23	-19	288	0.95	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	ASC 123	1913	6426	980	24	-21	407	0.96	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	SY VOLANTE	1431	6425	919	25	-22	237	0.93	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	WB ORITA	1215	6399	935	26	-48	288	0.87	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	APB 152356	1902	6389	935	27	-57	292	0.84	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	ASC 122	1912	6369	980	28	-78	407	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1871	1871	6337	935	29	-110	288	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1949	1949	6271	983	30	-176	420	0.67	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1872	1872	6230	981	31	-217	407	0.59	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1910	1910	6180	980	32	-266	407	0.51	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	DPG TOPPER	1211	6137	981	33	-310	407	0.45	-	-	-	-	-	-	-	-	-	-	-	-	Released
2018, 2019, 2021	UC 1870	1870	6032	935	34	-414	288	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	WESTMORE HP	1484	5891	935	35	-556	288	0.05	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	DPG CANDURA	1867	5851	981	36	-596	407	0.14	-	-	-	-	-	-	-	-	-	-	-	-	Released
2018, 2019, 2021	DPG PLATINUM	1210	5842	935	37	-605	288	0.04	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	UC DESERT KING HP	1627	5817	919	38	-630	237	0.01	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	WB MOHAVE	1654	5751	935	39	-696	288	0.02	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	AS MAESTRALE	1582	5734	935	40	-713	288	0.01	-	-	-	-	-	-	-	-	-	-	-	-	Available
2018, 2019, 2021	UC 1927	1927	5493	983	41	-954	420	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
2018, 2019, 2021	UC 1928	1928	4870	983	42	-1577	420	0	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 34. Statewide durum wheat yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 1870	1870	8585	723	1	1062	315	0	-	-	-	11.91	1.26	25	-0.97	0.89	0.28	-	-	-	-
2020-2022	APB 471400	1853	8192	678	2	669	206	0	8519	878	1	12.85	0.98	14	-0.04	0.48	0.94	11.23	1.08	9	-
2020-2022	UC 1963	1963	8172	698	3	650	259	0.01	8330	878	2	12.31	1.07	21	-0.57	0.64	0.37	10.91	1.08	15	-
2020-2022	UC DESERT GOLD	1850	7997	662	4	474	150	0	8024	878	5	11.58	0.94	27	-1.31	0.39	0	10.53	1.08	17	Available
2020-2022	UC 1910	1910	7991	723	5	468	315	0.14	-	-	-	12.8	1.26	15	-0.08	0.89	0.93	-	-	-	-
2020-2022	UC MIWOK	1690	7867	662	6	345	150	0.02	8096	878	4	12.57	0.94	16	-0.31	0.39	0.43	10.46	1.08	18	Available
2020-2022	UC 1949	1949	7841	685	7	319	227	0.16	-	-	-	13.92	1.03	5	1.04	0.58	0.07	-	-	-	-
2020-2022	TIBURON	1640	7838	662	8	315	150	0.04	7829	878	7	12.37	0.94	20	-0.51	0.39	0.19	11.15	1.08	10	Available
2020-2022	UC 1918	1918	7784	723	9	261	315	0.41	-	-	-	12.5	1.26	18	-0.38	0.89	0.67	-	-	-	-
2020-2022	UC DESERT KING	1375	7756	663	10	233	154	0.13	8114	878	3	12.21	0.94	22	-0.68	0.39	0.08	11.27	1.08	7	Available
2020-2022	UC 1919	1919	7750	723	11	227	315	0.47	-	-	-	13.22	1.26	9	0.34	0.89	0.71	-	-	-	-
2020-2022	APB 153541	1901	7746	662	12	223	150	0.14	7595	878	10	13.08	0.94	12	0.2	0.39	0.6	11.27	1.08	8	-
2020-2022	AS MAESTRALE	1582	7737	723	13	215	315	0.5	-	-	-	12.01	1.26	24	-0.87	0.89	0.33	-	-	-	Available
2020-2022	APB 152308	1900	7659	663	14	137	154	0.38	7966	881	6	13.59	0.94	8	0.71	0.39	0.07	12.82	1.08	1	-
2020-2022	AS SARAGOLLA	1583	7562	723	15	39	315	0.9	-	-	-	11.34	1.26	28	-1.55	0.89	0.08	-	-	-	Available
2020-2022	UC 1928	1928	7545	687	16	22	234	0.92	-	-	-	13.98	1.03	4	1.1	0.58	0.06	-	-	-	-
2020-2022	UC 1962	1962	7518	698	17	-4	259	0.99	7676	878	9	12.44	1.07	19	-0.44	0.64	0.49	11.04	1.08	12	-
2020-2022	SY FORTISSIMO	1429	7492	669	18	-31	178	0.86	7803	878	8	12.52	0.96	17	-0.36	0.43	0.41	11.15	1.08	11	Available
2020-2022	APB 471389	1924	7489	662	19	-34	150	0.82	7541	878	11	13.15	0.94	11	0.27	0.39	0.49	11.8	1.08	5	-
2020-2022	UC 1927	1927	7379	687	20	-144	234	0.54	-	-	-	13.98	1.03	3	1.1	0.58	0.06	-	-	-	-
2020-2022	SY VOLANTE	1431	7333	663	21	-190	152	0.21	7499	881	13	11.9	0.94	26	-0.98	0.39	0.01	11.02	1.08	13	Available
2020-2022	APB D518-38	1969	7309	698	22	-214	259	0.41	7466	878	14	12.2	1.07	23	-0.69	0.64	0.28	10.79	1.08	16	-
2020-2022	ALBERTO	1813	7206	663	23	-316	152	0.04	7501	878	12	12.99	0.94	13	0.11	0.39	0.79	10.91	1.08	14	Available
2020-2022	UC DESERT KING HP	1627	7142	663	24	-381	152	0.01	7329	878	15	14.38	0.94	1	1.49	0.39	0	12.81	1.08	2	Available

2020-2022	APB 152356	1902	7043	662	25	-479	150	0	7054	878	16	13.18	0.94	10	0.3	0.39	0.45	11.44	1.08	6	-
2020-2022	UC 1964	1964	6738	698	26	-785	259	0	6896	878	17	13.63	1.07	7	0.75	0.64	0.24	12.23	1.08	4	-
2020-2022	UC 1848	1848	6272	698	27	-1251	259	0	6429	878	18	13.86	1.07	6	0.98	0.64	0.13	12.46	1.08	3	-
2020-2022	AS COLOMBO	1800	5691	733	28	-1832	336	0	-	-	-	14.24	1.26	2	1.36	0.89	0.13	-	-	-	Available

Triticale performance tables

Table 35. Sacramento Valley region, triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC BOPAK	3190	7119	797	1	859	357	0.02	6519	1416	1	9.88	0.63	9	-0.04	0.6	0.95	9.86	1.19	6.5	Available
2020-2022	UC 3184	3184	6963	1015	2	703	657	0.29	-	-	-	9.41	0.92	12	-0.5	0.83	0.55	-	-	-	-
2020-2022	NS 13T00903	3189	6697	1015	3	437	657	0.51	-	-	-	9.37	1.46	13	-0.54	1.34	0.69	-	-	-	-
2020-2022	UC ATREA	3185	6670	797	4	410	357	0.25	6151	1416	2	10.19	0.63	5	0.28	0.6	0.64	9.86	1.19	6.5	Available
2020-2022	APB T470308	3195	6584	929	5	324	575	0.57	6082	1416	3	9.43	1.21	11	-0.48	1.14	0.68	9.34	1.19	8	-
2020-2022	NS TRICAL 158EP	3169	6473	1015	6	213	657	0.75	-	-	-	10.07	1.46	8	0.16	1.34	0.9	-	-	-	Available
2020-2022	NS GOLD RUSH 91	3178	6430	1015	7	170	657	0.8	-	-	-	9.16	0.92	14	-0.75	0.83	0.37	-	-	-	Available
2020-2022	NS TRICAL 115T	3170	6351	1015	8	91	657	0.89	-	-	-	9.13	1.46	15	-0.78	1.34	0.56	-	-	-	Available
2020-2022	WB PACHECO	3164	6278	797	9	17	357	0.96	5943	1416	4	10.72	0.57	1	0.81	0.53	0.13	10.08	1.19	5	Available
2020-2022	APB T470298	3194	6114	929	10	-147	575	0.8	5612	1416	5	10.19	1.21	6	0.28	1.14	0.81	10.1	1.19	4	-
2020-2022	UC 3193	3193	6053	829	11	-208	438	0.64	5410	1416	7	10.12	0.68	7	0.21	0.66	0.75	10.35	1.19	2	-
2020-2022	UC 3197	3197	5989	929	12	-271	575	0.64	5487	1416	6	10.66	1.21	2	0.75	1.14	0.51	10.57	1.19	1	-
2020-2022	UC 3191	3191	5959	1015	13	-302	657	0.65	-	-	-	10.53	1.46	3	0.62	1.34	0.64	-	-	-	-
2020-2022	UC 3196	3196	5804	929	14	-456	575	0.43	5302	1416	8	10.24	1.21	4	0.33	1.14	0.78	10.14	1.19	3	-

2020-2022	NS SWIFT 77	3188	4421	1044	15	-1839	696	0.01	-	-	-	9.56	1.46	10	-0.35	1.34	0.79	-	-	-	Available

Table 36. North Central San Joaquin Valley region, triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 3184	3184	6964	1133	1	1181	1010	0.24	-	-	-	12.09	1.08	15	-1.24	1.08	0.25	-	-	-	-
2020-2022	NS GOLD RUSH 91	3178	6740	1133	2	957	1010	0.34	-	-	-	13.45	1.08	9	0.12	1.08	0.91	-	-	-	Available
2020-2022	UC BOPAK	3190	6449	654	3	665	580	0.25	5145	2077	3	13.62	0.73	4	0.29	0.79	0.72	13.55	3.71	3	Available
2020-2022	NS SWIFT 77	3188	6256	1133	4	472	1010	0.64	-	-	-	13.06	1.86	10	-0.28	1.78	0.88	-	-	-	Available
2020-2022	UC 3197	3197	5921	1126	5	137	1037	0.89	5386	2077	1	12.95	1.86	12	-0.38	1.78	0.83	12.95	3.71	5	-
2020-2022	NS 13T00903	3189	5891	1133	6	107	1010	0.92	-	-	-	13.6	1.86	5	0.26	1.78	0.88	-	-	-	-
2020-2022	UC 3191	3191	5867	1133	7	84	1010	0.93	-	-	-	14.71	1.86	1	1.38	1.78	0.44	-	-	-	-
2020-2022	UC ATREA	3185	5807	654	8	24	580	0.97	4801	2077	5	13.87	0.73	3	0.53	0.79	0.5	14.42	3.71	1	Available
2020-2022	WB PACHECO	3164	5567	654	9	-217	580	0.71	5162	2077	2	14.17	0.64	2	0.84	0.72	0.24	13.66	3.71	2	Available
2020-2022	UC 3193	3193	5438	758	10	-345	705	0.63	4590	2077	7	13.06	0.8	11	-0.28	0.84	0.74	12.77	3.71	6	-
2020-2022	UC 3196	3196	5413	1126	11	-370	1037	0.72	4879	2077	4	12.24	1.86	14	-1.1	1.78	0.54	12.23	3.71	8	-
2020-2022	NS TRICAL 158EP	3169	5393	1133	12	-390	1010	0.7	-	-	-	13.54	1.86	6	0.21	1.78	0.91	-	-	-	Available
2020-2022	NS TRICAL 115T	3170	5333	1133	13	-450	1010	0.66	-	-	-	13.52	1.86	7	0.19	1.78	0.92	-	-	-	Available
2020-2022	APB T470308	3195	5126	1126	14	-658	1037	0.53	4591	2077	6	12.65	1.86	13	-0.69	1.78	0.7	12.64	3.71	7	-
2020-2022	APB T470298	3194	4588	1126	15	-1196	1037	0.25	4053	2077	8	13.47	1.86	8	0.13	1.78	0.94	13.46	3.71	4	-

Table 37. South San Joaquin Valley region, triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2018, 2019, 2022	UC BOPAK	3190	9583	789	1	1326	345	0	10974	359	2	12.71	0.45	1	0.99	0.41	0.02	11.65	-	5	Available
2018, 2019, 2022	NS 13T00903	3189	9360	854	2	1103	466	0.02	-	-	-	10.8	0.62	17	-0.92	0.58	0.12	-	-	-	-
2018, 2019, 2022	UC ATREA	3185	9207	752	3	949	262	0	11307	359	1	11.34	0.32	12	-0.38	0.27	0.18	10.49	-	8	Available
2018, 2019, 2022	NS GOLD RUSH 91	3178	8935	854	4	677	466	0.15	-	-	-	11.86	0.62	9	0.14	0.58	0.81	-	-	-	Available
2018, 2019, 2022	UC 3196	3196	8897	868	5	640	488	0.19	10279	359	3	10.99	0.63	15	-0.73	0.59	0.22	10.79	-	7	-
2018, 2019, 2022	NS SWIFT 77	3188	8885	854	6	627	466	0.18	-	-	-	11.98	0.62	8	0.26	0.58	0.66	-	-	-	Available
2018, 2019, 2022	NS TRICAL 115T	3170	8766	783	7	508	338	0.14	-	-	-	11.08	0.36	14	-0.64	0.31	0.05	-	-	-	Available
2018, 2019, 2022	NS TRICAL 158EP	3169	8541	783	8	284	338	0.4	-	-	-	10.94	0.36	16	-0.78	0.31	0.02	-	-	-	Available
2018, 2019, 2022	WB PACHECO	3164	8531	789	9	273	347	0.43	9371	359	5	12.57	0.35	3	0.85	0.3	0.01	13.21	-	1	Available
2018, 2019, 2022	UC 3197	3197	8391	868	10	133	488	0.79	9773	359	4	12.59	0.63	2	0.87	0.59	0.15	12.39	-	2	-
2018, 2019, 2022	UC 3184	3184	8210	804	11	-48	380	0.9	-	-	-	10.61	0.36	18	-1.11	0.31	0	-	-	-	-
2018, 2019, 2022	NS CAMELOT	3168	7861	783	12	-397	338	0.24	-	-	-	12.16	0.36	7	0.44	0.31	0.17	-	-	-	Released
2018, 2019, 2022	NS TRICAL 105	3097	7819	783	13	-439	338	0.2	-	-	-	12.25	0.36	6	0.53	0.31	0.1	-	-	-	Released
2018, 2019, 2022	APB T470308	3195	7707	868	14	-551	488	0.26	9089	359	6	12.26	0.63	5	0.54	0.59	0.37	12.06	-	4	-
2018, 2019, 2022	XB T401	3186	7380	854	15	-877	470	0.07	-	-	-	11.85	0.41	10	0.13	0.36	0.73	-	-	-	-
2018, 2019, 2022	UC 3193	3193	7179	868	16	-1078	488	0.03	8561	359	7	11.45	0.63	11	-0.27	0.59	0.65	11.25	-	6	-
2018, 2019, 2022	UC 3183	3183	7011	964	17	-1246	632	0.05	-	-	-	11.27	0.62	13	-0.45	0.57	0.43	-	-	-	-
2018, 2019, 2022	APB T470298	3194	6373	868	18	-1885	488	0	7754	359	8	12.27	0.63	4	0.55	0.59	0.36	12.07	-	3	-

Table 38. Imperial Valley region, triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2021 Yield (lb/acre)	2021 St.Err.Yield (lb/acre)	2021 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2021 Protein (%)	2021 St.Err.Protein (%)	2021 Protein Rank	Status
2016-2018	UC 3184	3184	7195	375	1	613	290	0.04	7161	393	2	9.94	1.01	14	-1.09	0.43	0.01	11.72	0.78	9	-
2016-2018	WB PACHECO	3164	6987	274	2	405	169	0.02	6464	393	4	11.48	0.93	6	0.45	0.24	0.06	13.04	0.78	4	Available
2016-2018	NS GOLD RUSH 91	3178	6894	303	3	312	210	0.14	-	-	-	11.05	0.95	8	0.02	0.29	0.95	-	-	-	Available
2016-2018	UC ATREA	3185	6865	375	4	283	290	0.33	6831	393	3	12.05	1.01	1	1.02	0.43	0.02	13.84	0.78	2	Available
2016-2018	NS TRICAL 158EP	3169	6669	274	5	87	169	0.61	7349	393	1	10	0.93	13	-1.03	0.24	0	12.08	0.78	8	Available
2016-2018	NS TRICAL 105	3097	6667	274	6	84	169	0.62	6250	393	8	11.61	0.93	5	0.58	0.24	0.02	12.99	0.78	5	Released
2016-2018	AGS 230	3181	6663	374	7	81	290	0.78	-	-	-	10.31	0.98	11	-0.72	0.37	0.06	-	-	-	-
2016-2018	NS 12T01486	3180	6636	374	8	54	290	0.85	-	-	-	10.91	0.98	9	-0.12	0.37	0.75	-	-	-	-
2016-2018	UC 3183	3183	6461	375	9	-122	290	0.68	6426	393	5	11.66	1.01	4	0.63	0.43	0.14	13.44	0.78	3	-
2016-2018	XB T401	3186	6299	375	10	-283	290	0.33	6265	393	7	11.12	1.01	7	0.09	0.43	0.83	12.9	0.78	6	-
2016-2018	PRL 011TS 429	3177	6287	374	11	-296	296	0.32	-	-	-	11.88	1.01	2	0.85	0.44	0.06	-	-	-	-
2016-2018	NS TRICAL 115T	3170	6280	274	12	-303	169	0.08	6240	393	9	10.56	0.93	10	-0.47	0.24	0.05	12.21	0.78	7	Available
2016-2018	NS CAMELOT	3168	6228	274	13	-354	169	0.04	6336	393	6	11.74	0.93	3	0.71	0.24	0	14.13	0.78	1	Released
2016-2018	AGS 133	3182	6020	374	14	-562	290	0.06	-	-	-	10.09	0.98	12	-0.93	0.37	0.01	-	-	-	-

Table 39. Water-limited locations, triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 3184	3184	4698	1609	1	750	1237	0.55	-	-	-	12.87	2.08	15	-1.3	1.67	0.44	-	-	-	-
2020-2022	NS GOLD RUSH 91	3178	4514	1609	2	566	1237	0.65	-	-	-	14.76	2.08	3	0.59	1.67	0.72	-	-	-	Available
2020-2022	UC BOPAK	3190	4447	1027	3	499	562	0.38	6349	1648	1	13.78	1.43	12	-0.39	1.06	0.72	11.26	1.9	7	Available
2020-2022	UC ATREA	3185	4226	1027	4	278	562	0.62	5981	1648	2	14.51	1.43	4	0.35	1.06	0.75	12.31	1.9	2	Available
2020-2022	NS SWIFT 77	3188	4115	1609	5	167	1237	0.89	-	-	-	13.9	3.06	10	-0.26	2.67	0.92	-	-	-	Available
2020-2022	NS 13T00903	3189	4075	1609	6	127	1237	0.92	-	-	-	14.43	3.06	5	0.27	2.67	0.92	-	-	-	-
2020-2022	WB PACHECO	3164	4055	1027	7	107	562	0.85	5645	1648	3	14.34	1.36	6	0.18	0.94	0.85	11.81	1.9	6	Available
2020-2022	UC 3197	3197	4025	1145	8	77	733	0.92	5638	1648	4	13.91	1.86	9	-0.25	1.53	0.87	11.97	1.9	4	-
2020-2022	UC 3196	3196	3786	1145	9	-162	733	0.83	5399	1648	5	13.81	1.86	11	-0.35	1.53	0.82	11.87	1.9	5	-
2020-2022	APB T470308	3195	3774	1145	10	-174	733	0.81	5387	1648	6	12.9	1.86	14	-1.26	1.53	0.41	10.97	1.9	8	-
2020-2022	UC 3191	3191	3726	1609	11	-222	1237	0.86	-	-	-	16.09	3.06	1	1.92	2.67	0.47	-	-	-	-
2020-2022	UC 3193	3193	3653	1064	12	-295	640	0.65	5113	1648	7	13.62	1.48	13	-0.54	1.15	0.64	12.13	1.9	3	-
2020-2022	NS TRICAL 158EP	3169	3648	1609	13	-300	1237	0.81	-	-	-	14.29	3.06	8	0.13	2.67	0.96	-	-	-	Available
2020-2022	NS TRICAL 115T	3170	3242	1609	14	-706	1237	0.57	-	-	-	14.93	3.06	2	0.77	2.67	0.77	-	-	-	Available
2020-2022	APB T470298	3194	3236	1145	15	-712	733	0.33	4849	1648	8	14.29	1.86	7	0.13	1.53	0.93	12.36	1.9	1	-

Table 40. Statewide triticale yield and protein 3-year summaries.

Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2020-2022	UC 3184	3184	7379	924	1	863	467	0.07	-	-	-	10.97	0.91	15	-0.71	0.66	0.28	-	-	-	-
2020-2022	UC BOPAK	3190	7309	797	2	793	253	0	6803	1111	1	11.57	0.68	8	-0.11	0.47	0.81	11.39	1.29	5	Available
2020-2022	NS GOLD RUSH 91	3178	7000	924	3	484	467	0.3	-	-	-	11.53	0.91	11	-0.15	0.66	0.82	-	-	-	Available
2020-2022	UC ATREA	3185	6825	797	4	309	253	0.22	6560	1111	2	11.8	0.68	5	0.12	0.47	0.81	11.49	1.29	4	Available
2020-2022	NS 13T00903	3189	6709	924	5	193	467	0.68	-	-	-	11.71	1.25	7	0.03	1.03	0.98	-	-	-	-
2020-2022	UC 3197	3197	6536	863	6	20	409	0.96	6168	1111	4	11.89	1.05	4	0.21	0.9	0.82	11.67	1.29	2	-
2020-2022	APB T470308	3195	6454	863	7	-62	409	0.88	6086	1111	5	11.12	1.05	14	-0.56	0.9	0.53	10.9	1.29	8	-
2020-2022	WB PACHECO	3164	6402	797	8	-114	253	0.65	6254	1111	3	12.38	0.65	2	0.7	0.41	0.09	11.8	1.29	1	Available
2020-2022	UC 3196	3196	6358	863	9	-157	409	0.7	5991	1111	6	11.17	1.05	13	-0.51	0.9	0.57	10.95	1.29	7	-
2020-2022	NS TRICAL 158EP	3169	6348	924	10	-168	467	0.72	-	-	-	12.03	1.25	3	0.35	1.03	0.73	-	-	-	Available
2020-2022	UC 3191	3191	6328	924	11	-188	467	0.69	-	-	-	12.85	1.25	1	1.16	1.03	0.26	-	-	-	-
2020-2022	NS TRICAL 115T	3170	6257	924	12	-259	467	0.58	-	-	-	11.55	1.25	9	-0.13	1.03	0.9	-	-	-	Available
2020-2022	UC 3193	3193	6190	810	13	-326	312	0.3	5662	1111	7	11.35	0.7	12	-0.33	0.53	0.53	11.31	1.29	6	-
2020-2022	NS SWIFT 77	3188	5825	932	14	-691	480	0.15	-	-	-	11.53	1.25	10	-0.15	1.03	0.89	-	-	-	Available
2020-2022	APB T470298	3194	5817	863	15	-698	409	0.09	5449	1111	8	11.77	1.05	6	0.09	0.9	0.92	11.55	1.29	3	-

Barley performance tables

Table 41. Sacramento Valley region, barley yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
6RSF	2020-2022	UC 960	960	5430	1086	1	1436	367	0	5303	576	1	7.47	1.54	17	-0.91	1.31	0.49	6.94	2.54	16	-
2RSM	2020-2022	UC 1915	1915	4983	1119	2	989	471	0.04	-	-	-	7.73	2.03	15	-0.65	1.86	0.73	-	-	-	-
2RSM	2020-2022	UC 1960	1960	4754	1145	3	761	506	0.13	4272	733	5	7.25	2.02	18	-1.12	1.81	0.54	9.18	2.62	7	-
6RSF	2020-2022	UC TEHAMA	1280	4542	1069	4	548	316	0.08	-	-	-	7	1.55	24	-1.38	1.3	0.29	-	-	-	Released
6RSF	2020-2022	ISHI	1047	4308	1047	5	314	239	0.19	4401	554	4	7.67	1.31	16	-0.71	1.06	0.51	4.92	2.62	17	Available
6RSF	2020-2022	UC 933	933	4303	1054	6	309	267	0.25	4645	655	2	7.14	1.21	21	-1.24	0.92	0.19	7.28	2.54	15	Released
2RSM	2020-2022	UC CAPAY	1390	4195	1043	7	201	231	0.39	3852	668	7	7.05	1.12	23	-1.33	0.83	0.12	8.67	2.55	13	Available
6RSN	2020-2022	UC 937	937	4127	1051	8	133	256	0.6	3955	614	6	8.67	1.33	9	0.29	1.06	0.79	9.24	2.62	6	-
2RSM	2020-2022	UC 1412	1412	4121	1054	9	128	268	0.63	4593	733	3	7.11	1.33	22	-1.27	1.06	0.24	8.74	2.62	11	-
2RSM	2020-2022	UC GALLAGHER	1911	4121	1045	10	127	242	0.6	2951	848	18	10.28	1.32	2	1.91	1.07	0.08	-	-	-	-
6RSF(H)	2020-2022	SCHALLER	1355	4106	1116	11	112	442	0.8	3801	655	8	8.33	1.32	12	-0.05	1.07	0.96	8.14	2.54	14	Available
2RSM	2020-2022	UC BUTTA 12	1360	4081	1093	12	87	395	0.83	3072	733	17	7.23	1.32	19	-1.15	1.07	0.29	9.15	2.55	8	Available
6RSF	2020-2022	UC 969	969	3908	1047	13	-86	239	0.72	3150	554	15	8.09	1.14	14	-0.28	0.84	0.74	8.73	2.51	12	Released
2RSM	2020-2022	UC B9K94	1861	3880	1116	14	-114	442	0.8	3397	668	11	6.92	2.02	25	-1.45	1.81	0.43	8.85	2.62	9	-
6RSF	2020-2022	UC 603	603	3791	1145	15	-203	506	0.69	3783	719	9	13.06	2.02	1	4.69	1.81	0.01	10.09	2.62	2	Released
2RSM	2020-2022	LCS GENIE	1414	3767	1045	16	-226	239	0.34	3109	733	16	8.36	1.12	11	-0.02	0.83	0.98	9.45	2.55	4	Available
2RSM	2020-2022	LCS ODYSSEY	1415	3726	1043	17	-268	233	0.25	3253	733	14	8.74	1.12	8	0.36	0.83	0.67	9.35	2.55	5	Available
2RSM	2020-2022	UC TAHOE	1409	3667	1043	18	-327	231	0.16	3356	655	13	8.31	1.04	13	-0.06	0.72	0.93	8.81	2.5	10	Available
6RSN	2020-2022	TAMALPAIS	1134	3632	1047	19	-362	239	0.13	3381	578	12	9.42	1.12	4	1.04	0.83	0.21	10.35	2.54	1	Available

2RSM	2020-2022	ACC SYNERGY	1859	3600	1062	20	-394	298	0.19	-	-	-	9.35	1.32	5	0.97	1.07	0.37	-	-	-	Available
6RSF	2020-2022	UC 1385	1385	3594	1069	21	-400	316	0.21	-	-	-	7.15	1.55	20	-1.22	1.3	0.35	-	-	-	-
2RSF	2020-2022	CHOWFORD	1925	3419	1069	22	-574	316	0.07	-	-	-	10.26	1.55	3	1.88	1.3	0.16	-	-	-	-
2RSM	2020-2022	CDC COPELAND	1858	3408	1045	23	-586	239	0.02	3702	733	10	9.12	1.07	7	0.75	0.76	0.33	9.5	2.52	3	Available
6RSF(H)	2020-2022	BELFORD	1923	3206	1069	24	-788	316	0.01	-	-	-	8.57	1.55	10	0.2	1.3	0.88	-	-	-	-
2RSF(H)	2020-2022	STOCKFORD	1926	3177	1069	25	-817	316	0.01	-	-	-	9.15	1.55	6	0.77	1.3	0.56	-	-	-	-

Table 42. North Central San Joaquin Valley region, barley yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
6RSF	2020-2022	UC TEHAMA	1280	5900	752	1	1263	441	0	-	-	-	6.3	1.43	24	-1.99	0.97	0.05	-	-	-	Released
6RSF	2020-2022	ISHI	1047	5474	656	2	837	267	0	4157	293	8	7.39	1.24	20	-0.9	0.69	0.21	-	-	-	Available
2RSM	2020-2022	UC 1412	1412	5249	678	3	613	311	0.05	4350	293	3	8.44	1.24	10	0.15	0.69	0.83	6.54	-	6	-
2RSM	2020-2022	LCS GENIE	1414	5096	651	4	459	256	0.07	3797	293	15	8.92	1.16	6	0.63	0.56	0.28	7.85	-	2	Available
6RSN	2020-2022	UC 937	937	5007	678	5	370	311	0.23	4175	293	7	8.59	1.24	9	0.3	0.69	0.66	6.43	-	8	-
6RSN	2020-2022	TAMALPAIS	1134	4997	651	6	360	256	0.16	3685	293	16	9.27	1.16	3	0.98	0.56	0.1	7.14	-	3	Available
6RSF	2020-2022	UC 933	933	4938	678	7	301	311	0.33	4383	293	2	8.18	1.24	15	-0.11	0.69	0.87	6.02	-	13	Released
6RSF	2020-2022	UC 603	603	4907	751	8	270	441	0.54	4216	293	5	-	-	-	-	-	-	-	-	-	Released
2RSM	2020-2022	UC GALLAGHER	1911	4907	651	9	270	256	0.29	4348	293	4	8.07	1.24	16	-0.22	0.69	0.76	-	-	-	-
2RSM	2020-2022	UC B9K94	1861	4882	751	10	245	441	0.58	4191	293	6	8.27	1.43	13	-0.02	0.98	0.98	6.34	-	9	-
6RSF	2020-2022	UC 1385	1385	4847	752	11	210	441	0.63	-	-	-	7.14	1.43	21	-1.15	0.97	0.25	-	-	-	-
2RSM	2020-2022	UC TAHOE	1409	4829	651	12	192	256	0.45	4705	293	1	8.39	1.16	12	0.1	0.56	0.86	6.04	-	11.5	Available
2RSM	2020-2022	UC 1960	1960	4821	751	13	184	441	0.68	4130	293	9	8.4	1.43	11	0.11	0.98	0.91	6.47	-	7	-
2RSM	2020-2022	LCS ODYSSEY	1415	4813	651	14	176	256	0.49	3963	293	12	8.9	1.16	7	0.61	0.56	0.29	5.81	-	15	Available

2RSM	2020-2022	UC BUTTA 12	1360	4750	678	15	113	316	0.72	4007	293	10	7.99	1.23	17	-0.3	0.7	0.67	6.16	-	10	Available
6RSF	2020-2022	UC 960	960	4666	751	16	29	441	0.95	3975	293	11	7.97	1.43	18	-0.32	0.98	0.75	6.04	-	11.5	-
2RSM	2020-2022	CDC COPELAND	1858	4499	651	17	-137	256	0.59	3950	293	13	9.1	1.16	4	0.81	0.56	0.17	6.77	-	5	Available
6RSF(H)	2020-2022	BELFORD	1923	4176	752	18	-461	441	0.3	-	-	-	6.93	1.43	22	-1.36	0.97	0.18	-	-	-	-
2RSM	2020-2022	ACC SYNERGY	1859	4167	677	19	-470	315	0.14	-	-	-	8.88	1.24	8	0.59	0.69	0.41	-	-	-	Available
2RSF	2020-2022	CHOWFORD	1925	4129	752	20	-507	441	0.25	-	-	-	8.93	1.43	5	0.64	0.97	0.52	-	-	-	-
6RSF	2020-2022	UC 969	969	4116	678	21	-521	311	0.1	3833	293	14	7.55	1.24	19	-0.74	0.69	0.29	5.82	-	14	Released
2RSF(H)	2020-2022	STOCKFORD	1926	4064	752	22	-572	441	0.2	-	-	-	6.51	1.43	23	-1.78	0.97	0.08	-	-	-	-
2RSM	2020-2022	UC 1915	1915	4027	753	23	-609	451	0.18	-	-	-	11.09	1.43	1	2.8	0.99	0.01	-	-	-	-
6RSF(H)	2020-2022	SCHALLER	1355	3469	678	24	-1167	316	0	3114	293	17	8.21	1.23	14	-0.08	0.7	0.91	6.92	-	4	Available
2RSM	2020-2022	UC CAPAY	1390	3187	651	25	-1449	256	0	3060	293	18	9.54	1.16	2	1.25	0.56	0.04	7.86	-	1	Available

Table 43. South San Joaquin Valley region, barley yield and protein 3-year summaries.

No data from the last 3-years

Table 44. Water-limited locations, barley yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
2RSM	2018, 2021, 2022	OSU FULL PINT	1411	4783	667	1	1246	546	0.02	-	-	-	11.38	1.88	2	1.83	0.95	0.06	-	-	-	Released
6RSF	2018, 2021, 2022	UC TEHAMA	1280	4402	515	2	865	360	0.02	-	-	-	7.71	1.8	26	-1.84	0.79	0.02	-	-	-	Released
6RSF	2018, 2021, 2022	UC 603	603	4145	549	3	608	409	0.14	4216	293	5	8.54	1.8	22	-1.01	0.78	0.2	-	-	-	Released
6RSF	2018, 2021, 2022	UC 969	969	4015	431	4	478	241	0.05	3833	293	14	8.56	1.68	21	-0.99	0.46	0.03	5.82	-	14	Released
6RSF	2018, 2021, 2022	ISHI	1047	4015	449	5	477	270	0.08	4157	293	8	8.25	1.71	24	-1.3	0.56	0.02	-	-	-	Available

6RSF	2018, 2021, 2022	UC 933	933	3913	446	6	376	264	0.15	4383	293	2	8.28	1.68	23	-1.27	0.46	0.01	6.02	-	13	Released
6RSN	2018, 2021, 2022	UC 937	937	3796	446	7	259	264	0.33	4175	293	7	9.17	1.69	16	-0.37	0.51	0.47	6.43	-	8	-
2RSM	2018, 2021, 2022	UC 1412	1412	3788	477	8	251	310	0.42	4350	293	3	8.79	1.75	19	-0.76	0.68	0.27	6.54	-	6	-
2RSM	2018, 2021, 2022	UC 1960	1960	3724	725	9	187	615	0.76	4130	293	9	9.32	2.12	14	-0.22	1.36	0.87	6.47	-	7	-
2RSM	2018, 2021, 2022	UC B9K94	1861	3594	509	10	57	357	0.87	4191	293	6	10.08	1.7	7	0.53	0.53	0.32	6.34	-	9	-
2RSM	2018, 2021, 2022	UC TAHOE	1409	3586	450	11	49	270	0.86	4705	293	1	9.84	1.69	10	0.3	0.51	0.57	6.04	-	11.5	Available
2RSM	2018, 2021, 2022	UC GALLAGHER	1911	3580	477	12	43	310	0.89	4348	293	4	11	1.8	3	1.46	0.79	0.07	-	-	-	-
2RSM	2018, 2021, 2022	LCS GENIE	1414	3562	419	13	25	221	0.91	3797	293	15	10.09	1.66	6	0.54	0.39	0.16	7.85	-	2	Available
2RSM	2018, 2021, 2022	ACC SYNERGY	1859	3456	452	14	-81	272	0.76	-	-	-	10.03	1.69	8	0.48	0.49	0.32	-	-	-	Available
6RSF	2018, 2021, 2022	UC 960	960	3420	520	15	-117	372	0.75	3975	293	11	8.96	1.75	18	-0.59	0.68	0.39	6.04	-	11.5	-
6RSF	2018, 2021, 2022	UC 1385	1385	3419	515	16	-118	360	0.74	-	-	-	8.09	1.8	25	-1.45	0.79	0.07	-	-	-	-
2RSM	2018, 2021, 2022	LCS ODYSSEY	1415	3411	442	17	-126	259	0.63	3963	293	12	9.82	1.68	11	0.28	0.48	0.57	5.81	-	15	Available
2RSM	2018, 2021, 2022	UC CAPAY	1390	3353	439	18	-184	254	0.47	3060	293	18	8.64	1.68	20	-0.91	0.46	0.05	7.86	-	1	Available
6RSN	2018, 2021, 2022	TAMALPAIS	1134	3326	436	19	-211	249	0.4	3685	293	16	9.76	1.68	13	0.21	0.46	0.64	7.14	-	3	Available
2RSM	2018, 2021, 2022	UC BUTTA 12	1360	3256	520	20	-281	372	0.45	4007	293	10	9.87	1.73	9	0.32	0.61	0.6	6.16	-	10	Available
2RSM	2018, 2021, 2022	CDC COPELAND	1858	3129	434	21	-408	245	0.1	3950	293	13	10.72	1.67	5	1.17	0.42	0.01	6.77	-	5	Available
2RSF	2018, 2021, 2022	CHOWFORD	1925	3064	515	22	-473	360	0.19	-	-	-	10.76	1.8	4	1.21	0.79	0.13	-	-	-	-
6RSF(H)	2018, 2021, 2022	BELFORD	1923	2937	515	23	-600	360	0.1	-	-	-	8.97	1.8	17	-0.58	0.79	0.46	-	-	-	-
2RSF(H)	2018, 2021, 2022	STOCKFORD	1926	2880	515	24	-657	360	0.07	-	-	-	9.22	1.8	15	-0.33	0.79	0.67	-	-	-	-
6RSF(H)	2018, 2021, 2022	SCHALLER	1355	2708	725	25	-829	615	0.18	3114	293	17	9.77	2.12	12	0.23	1.36	0.87	6.92	-	4	Available
2RSM	2018, 2021, 2022	KLAGES	1860	2702	598	26	-835	466	0.07	-	-	-	12.61	2.11	1	3.06	1.32	0.02	-	-	-	Released

Table 45. Statewide barley yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
6RSF	2020-2022	UC 960	960	5139	896	1	965	304	0	4765	322	1	7.85	1.38	17	-0.8	1.12	0.48	6.64	1.65	16	-
6RSF	2020-2022	UC TEHAMA	1280	4996	887	2	822	275	0	-	-	-	6.51	1.38	25	-2.14	1.11	0.06	-	-	-	Released
6RSF	2020-2022	ISHI	1047	4779	862	3	604	191	0	4320	310	4	7.7	1.16	21	-0.94	0.86	0.28	4.22	1.79	17	Available
6RSF	2020-2022	UC 933	933	4582	869	4	408	218	0.06	4467	351	3	7.46	1.11	23	-1.18	0.79	0.14	6.86	1.65	15	Released
2RSM	2020-2022	UC 1960	1960	4539	918	5	365	358	0.31	4216	375	5	7.81	1.59	19	-0.84	1.35	0.54	8.18	1.68	7	-
6RSN	2020-2022	UC 937	937	4522	868	6	348	214	0.1	4002	336	7	8.47	1.17	12	-0.17	0.86	0.84	8.23	1.68	6	-
2RSM	2020-2022	LCS GENIE	1414	4437	859	7	263	179	0.14	3528	375	14	8.85	1.01	9	0.21	0.65	0.75	8.88	1.65	3	Available
2RSM	2020-2022	UC 1412	1412	4364	865	8	190	204	0.35	4479	375	2	8.08	1.12	14	-0.56	0.79	0.48	7.99	1.68	10	-
6RSF	2020-2022	UC 603	603	4363	918	9	189	359	0.6	3988	371	8	13.75	2.1	1	5.1	1.88	0.01	9.39	1.79	1	Released
2RSM	2020-2022	UC GALLAGHER	1911	4363	859	10	189	179	0.29	3886	399	9	10.22	1.11	2	1.58	0.8	0.05	-	-	-	-
2RSM	2020-2022	UC 1915	1915	4340	910	11	166	348	0.63	-	-	-	9.84	1.6	4	1.19	1.38	0.39	-	-	-	-
2RSM	2020-2022	LCS ODYSSEY	1415	4252	858	12	78	176	0.66	3684	375	12	9.15	1.01	8	0.5	0.65	0.44	8.14	1.65	8	Available
2RSM	2020-2022	UC BUTTA 12	1360	4237	882	13	63	265	0.81	3631	375	13	7.84	1.17	18	-0.81	0.87	0.36	8.12	1.65	9	Available
6RSN	2020-2022	TAMALPAIS	1134	4174	861	14	0	187	1	3519	322	15	9.45	1.03	7	0.81	0.69	0.24	9.28	1.65	2	Available
2RSM	2020-2022	UC B9K94	1861	4157	909	15	-17	337	0.96	3835	356	11	7.58	1.59	22	-1.07	1.35	0.43	7.95	1.68	11	-
2RSM	2020-2022	UC TAHOE	1409	4150	858	16	-24	175	0.89	4042	352	6	8.84	0.97	10	0.19	0.6	0.75	7.94	1.62	12	Available
6RSF	2020-2022	UC 1385	1385	4013	887	17	-162	275	0.56	-	-	-	6.89	1.38	24	-1.75	1.11	0.12	-	-	-	-
6RSF	2020-2022	UC 969	969	3991	865	18	-183	203	0.37	3406	310	18	8.02	1.07	15	-0.63	0.74	0.4	7.81	1.63	13	Released
2RSM	2020-2022	CDC COPELAND	1858	3674	859	19	-500	179	0.01	3869	375	10	9.72	0.99	5	1.08	0.62	0.09	8.59	1.64	4	Available
2RSF	2020-2022	CHOWFORD	1925	3657	887	20	-517	275	0.06	-	-	-	9.56	1.38	6	0.91	1.11	0.41	-	-	-	-
2RSM	2020-2022	ACC SYNERGY	1859	3631	868	21	-543	215	0.01	-	-	-	9.94	1.11	3	1.29	0.8	0.11	-	-	-	Available
2RSM	2020-2022	UC CAPAY	1390	3550	858	22	-624	176	0	3497	356	16	8.23	1.01	13	-0.42	0.65	0.52	8.37	1.65	5	Available
6RSF(H)	2020-2022	BELFORD	1923	3530	887	23	-644	275	0.02	-	-	-	7.77	1.38	20	-0.87	1.11	0.43	-	-	-	-
2RSF(H)	2020-2022	STOCKFORD	1926	3474	887	24	-700	275	0.01	-	-	-	8.02	1.38	16	-0.63	1.11	0.57	-	-	-	-

6RSF(H)	2020-2022	SCHALLER	1355	3439	885	25	-735	275	0.01	3470	352	17	8.58	1.17	11	-0.06	0.87	0.94	7.73	1.65	14	Available

Intermountain region performance tables

Table 46. Intermountain region, winter wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
SWW	2020-2022	13-046145A	29320	11386	421	1	2239	355	0	-	-	-	10.31	0.51	95	-1.16	0.24	0	-	-	-	-
SWW	2020-2022	11PN039#20	29323	10992	336	2	1845	251	0	11397	332	1	10.81	0.48	82	-0.66	0.17	0	9.39	0.27	59	-
SWW	2020-2022	LWW16 71088	29216	10971	426	3	1823	368	0	-	-	-	10.51	0.51	92	-0.96	0.25	0	-	-	-	-
SWW	2020-2022	LWW19-2232	29371	10856	421	4	1709	355	0	11211	332	2	11.04	0.51	71	-0.42	0.24	0.08	10.16	0.27	44	-
SWW	2020-2022	LWW19-6219	29368	10773	421	5	1626	355	0	11128	332	3	10.9	0.51	78	-0.57	0.24	0.02	10.02	0.27	47	-
SWW	2020-2022	LWW18-5078	29318	10698	421	6	1551	355	0	-	-	-	10.66	0.51	87	-0.81	0.24	0	-	-	-	-
HRW	2020-2022	WB 4394	29239	10588	336	7	1441	251	0	10319	332	11	11.75	0.48	34	0.28	0.17	0.1	10.94	0.27	20	-
HWW	2020-2022	MILLIE	29246	10389	336	8	1242	251	0	10584	332	8	11.5	0.48	41	0.03	0.17	0.86	10.67	0.27	26	Released
SWW	2020-2022	OR2160264	29307	10330	336	9	1183	251	0	10907	332	4	11.47	0.48	42	0.01	0.17	0.97	10.53	0.27	29	-
SWW	2020-2022	LCS BLACKJACK	29199	10315	300	10	1167	205	0	10220	332	15	10.82	0.46	80	-0.65	0.14	0	9.8	0.27	53	-
HRW	2020-2022	LWH18-0122	29299	10295	336	11	1148	251	0	10546	332	9	12.71	0.48	5	1.25	0.17	0	11.93	0.27	4	-
SWW	2020-2022	BOBTAIL	29011	10162	300	12	1015	205	0	10829	332	5	11.07	0.46	68	-0.4	0.14	0.01	9.96	0.27	50	Available
SWW	2020-2022	LWW19-6591	29369	10134	421	13	987	355	0.01	10489	332	10	10.72	0.51	84	-0.75	0.24	0	9.83	0.27	52	-
SWW	2020-2022	LWW18-5080	29315	10082	421	14	935	355	0.01	-	-	-	10.74	0.51	83	-0.73	0.24	0	-	-	-	-
SWW	2020-2022	LCS GHOST	29138	10033	426	15	886	368	0.02	-	-	-	9.98	0.51	96	-1.49	0.25	0	-	-	-	-
SWW	2020-2022	MARY	29059	9993	426	16	846	368	0.02	-	-	-	11.08	0.51	67	-0.39	0.25	0.13	-	-	-	Released
SWW	2020-2022	09PN118-02	29324	9989	421	17	842	355	0.02	-	-	-	11.11	0.51	63	-0.36	0.24	0.14	-	-	-	-
SWW	2020-2022	LCS HULK	29058	9971	300	18	824	205	0	10302	332	12	11.11	0.46	64	-0.36	0.14	0.01	10.27	0.27	42	Available
SWW	2020-2022	LWW18-1171	29319	9893	421	19	746	355	0.04	-	-	-	11.09	0.51	65	-0.38	0.24	0.12	-	-	-	-

HRW	2020-2022	KELDIN	29039	9871	421	20	724	355	0.04	10226	332	14	12.05	0.51	18	0.58	0.24	0.02	11.17	0.27	11	Released
SWW	2020-2022	IDO 1708	29198	9839	421	21	691	355	0.05	-	-	-	11.44	0.51	43	-0.03	0.24	0.9	-	-	-	-
SWW	2020-2022	WB 1783	29146	9772	335	22	625	254	0.01	-	-	-	11.06	0.48	69	-0.41	0.17	0.02	-	-	-	Released
SWW	2020-2022	LCS SHINE	29136	9766	300	23	619	205	0	10731	332	6	11.27	0.46	51	-0.2	0.14	0.16	10.46	0.27	33	-
SWW	2020-2022	OR2160243	29306	9710	336	24	563	251	0.03	9785	332	22	11.04	0.48	70	-0.42	0.17	0.01	10.02	0.27	46	-
SWW	2020-2022	LWW17-5877	29317	9636	336	25	489	251	0.05	9856	332	18	11.19	0.48	60	-0.27	0.17	0.11	10.37	0.27	39	-
SWW	2020-2022	OR2180149	29381	9602	421	26	455	355	0.2	9957	332	17	11.33	0.51	48	-0.14	0.24	0.56	10.44	0.27	34	-
SWW	2020-2022	LWW17-8185	29313	9554	336	27	407	251	0.11	10727	332	7	10.71	0.48	85	-0.76	0.17	0	9.7	0.27	57	-
HRW	2020-2022	OR2190064R	29386	9493	421	28	346	355	0.33	9848	332	19	12.75	0.51	4	1.29	0.24	0	11.87	0.27	5	-
SWW	2020-2022	OR2150346	29256	9492	426	29	345	368	0.35	-	-	-	11.23	0.51	56	-0.24	0.25	0.35	-	-	-	-
SWW	2020-2022	OR2150141	29257	9452	426	30	305	368	0.41	-	-	-	11.88	0.51	28	0.41	0.25	0.1	-	-	-	-
HRW	2020-2022	LWH19-1103	29384	9432	421	31	285	355	0.42	9787	332	21	11.82	0.51	31	0.35	0.24	0.15	10.94	0.27	19	-
SWW	2020-2022	STINGRAY CL+	29223	9424	426	32	277	368	0.45	-	-	-	11.26	0.51	54	-0.21	0.25	0.4	-	-	-	Released
SWW	2020-2022	ROSALYN	29090	9398	300	33	251	205	0.22	9651	332	24	10.38	0.46	93	-1.09	0.14	0	9.92	0.27	51	Released
HRW	2020-2022	PN13201002-04	29301	9389	336	34	242	251	0.33	10041	332	16	11.99	0.48	22	0.52	0.17	0	11.02	0.27	18	-
SWW	2020-2022	LCS ARTDECO	29041	9371	336	35	224	251	0.37	9582	332	26	11.03	0.48	72	-0.43	0.17	0.01	9.97	0.27	49	Released
SWW	2020-2022	SY OVATION	29102	9304	426	36	157	368	0.67	-	-	-	11.26	0.51	53	-0.21	0.25	0.4	-	-	-	Available
-	2020-2022	ARSX500-14CBW	29327	9291	421	37	144	355	0.68	-	-	-	11.61	0.51	36	0.14	0.24	0.55	-	-	-	-
SWW	2020-2022	WB 1529	29115	9241	421	38	94	355	0.79	-	-	-	11.59	0.51	38	0.12	0.24	0.62	-	-	-	Released
SWW	2020-2022	AP Illiad	29321	9232	336	39	85	251	0.74	9825	332	20	12.02	0.48	20	0.55	0.17	0	11.12	0.27	12	-
HRW	2020-2022	LCS JET	29241	9216	336	40	68	251	0.79	9719	332	23	12.39	0.48	9	0.93	0.17	0	11.24	0.27	9	Released
SWW	2020-2022	WB 1532	29211	9191	426	41	44	368	0.9	-	-	-	12.63	0.51	6	1.16	0.25	0	-	-	-	-
SWW	2020-2022	OR2140401	29220	9176	426	42	28	368	0.94	-	-	-	10.63	0.51	89	-0.84	0.25	0	-	-	-	-
SWW	2020-2022	15-451104B	29373	9171	421	43	24	355	0.95	9526	332	27	10.53	0.51	91	-0.94	0.24	0	9.65	0.27	58	-
HWW	2020-2022	OR2170052H	29303	9140	336	44	-7	251	0.98	9234	332	36	11.25	0.48	55	-0.21	0.17	0.22	10.39	0.27	36	-
SWW	2020-2022	NORTHWEST DUET	29044	9134	300	45	-13	205	0.95	9260	332	34	11.02	0.46	74	-0.45	0.14	0	10.1	0.27	45	Released
SWW	2020-2022	STEPHENS	29093	9129	426	46	-18	368	0.96	-	-	-	11.08	0.51	66	-0.39	0.25	0.13	-	-	-	Released
SWW	2020-2022	WA8307	29310	9126	336	47	-21	251	0.93	10232	332	13	11.84	0.48	30	0.38	0.17	0.03	10.52	0.27	31	-
SWW	2020-2022	LWW19-5862	29370	9071	421	48	-76	355	0.83	9426	332	29	10.68	0.51	86	-0.79	0.24	0	9.8	0.27	54	-
SWW	2020-2022	UI MAGIC CL+	29255	9019	426	49	-128	368	0.73	-	-	-	12.03	0.51	19	0.56	0.25	0.03	-	-	-	-
HRW	2020-2022	OR2160011R	29251	8998	421	50	-150	355	0.67	-	-	-	11.61	0.51	35	0.14	0.24	0.55	-	-	-	-
SWW	2020-2022	NIXON	29075	8993	300	51	-154	205	0.45	8934	332	45	10.88	0.46	79	-0.58	0.14	0	9.8	0.27	55	-
HWW	2020-2022	IRV	29245	8975	336	52	-172	251	0.49	9416	332	30	12.08	0.48	17	0.61	0.17	0	11.24	0.27	8	Released
SWW	2020-2022	LWW18-0587	29316	8950	421	53	-197	355	0.58	-	-	-	10.34	0.51	94	-1.13	0.24	0	-	-	-	-
SWW	2020-2022	AP Dynamic	29322	8946	421	54	-201	355	0.57	-	-	-	11.36	0.51	46	-0.11	0.24	0.66	-	-	-	-
SWW	2020-2022	SY ASSURE	29144	8945	336	55	-202	251	0.42	9012	332	42	12.19	0.48	15	0.73	0.17	0	11.94	0.27	3	Released

SWW	2020-2022	VI BULLDOG	29035	8939	426	56	-208	368	0.57	-	-	-	11.36	0.51	47	-0.11	0.25	0.66	-	-	-	-
-	2020-2022	Cameo	29377	8939	421	57	-208	355	0.56	9294	332	33	11.93	0.51	24	0.46	0.24	0.06	11.05	0.27	14	-
-	2020-2022	ARSX492-6CBW	29328	8935	421	58	-212	355	0.55	-	-	-	12.01	0.51	21	0.54	0.24	0.03	-	-	-	-
HRW	2020-2022	LWH19-0192	29300	8914	336	59	-234	251	0.35	8875	332	47	12.33	0.48	11	0.87	0.17	0	11.57	0.27	7	-
SWW	2020-2022	WB1621	29374	8904	421	60	-243	355	0.49	9259	332	35	11.26	0.51	52	-0.21	0.24	0.39	10.38	0.27	37	-
HWW	2020-2022	Breck	29305	8902	421	61	-245	355	0.49	-	-	-	12.39	0.51	10	0.92	0.24	0	-	-	-	-
SWW	2020-2022	SY DAYTON	29207	8897	300	62	-251	205	0.22	9592	332	25	11.27	0.46	50	-0.19	0.14	0.17	10.37	0.27	38	Released
SWW	2020-2022	IDO2008	29312	8869	336	63	-278	251	0.27	9497	332	28	11.5	0.48	40	0.03	0.17	0.85	10.35	0.27	40	-
SWW	2020-2022	WB1922	29376	8828	421	64	-319	355	0.37	9183	332	38	11.29	0.51	49	-0.18	0.24	0.46	10.4	0.27	35	-
HWW	2020-2022	IDO2006	29298	8800	336	65	-347	251	0.17	9317	332	32	11.41	0.48	44	-0.05	0.17	0.76	10.78	0.27	23	-
SWW	2020-2022	M PRESS	29200	8775	335	66	-373	254	0.14	-	-	-	11.03	0.48	73	-0.43	0.17	0.01	-	-	-	Released
HRW	2020-2022	SCORPIO	29232	8734	336	67	-413	251	0.1	9375	332	31	11.96	0.48	23	0.49	0.17	0	11.02	0.27	17	Released
SWW	2020-2022	WA8336	29311	8723	421	68	-425	355	0.23	-	-	-	10.54	0.51	90	-0.93	0.24	0	-	-	-	-
SWW	2020-2022	OR2130755	29219	8709	336	69	-439	251	0.08	8456	332	55	11.2	0.48	59	-0.27	0.17	0.11	10.65	0.27	28	-
SWW	2020-2022	WB1720	29375	8687	421	70	-460	355	0.2	9042	332	40	11.39	0.51	45	-0.08	0.24	0.74	10.5	0.27	32	-
SWW	2020-2022	M-Idas	29325	8681	421	71	-466	355	0.19	-	-	-	11.01	0.51	76	-0.46	0.24	0.06	-	-	-	-
SWW	2020-2022	LWW19-1576	29372	8675	421	72	-472	355	0.18	9030	332	41	11.23	0.51	58	-0.24	0.24	0.32	10.34	0.27	41	-
SWW	2020-2022	ORI2190027 CL+	29380	8610	421	73	-537	355	0.13	8965	332	43	11.75	0.51	33	0.29	0.24	0.24	10.87	0.27	22	-
SWW	2020-2022	LCS DRIVE	29052	8585	336	74	-562	251	0.03	8787	332	50	11.02	0.48	75	-0.45	0.17	0.01	10.01	0.27	48	Released
HWW	2020-2022	Snowmass 2.0	29302	8560	336	75	-587	251	0.02	8850	332	49	11.91	0.48	27	0.44	0.17	0.01	11.07	0.27	13	-
SWW	2020-2022	WA8371	29383	8552	421	76	-595	355	0.09	8907	332	46	10.64	0.51	88	-0.83	0.24	0	9.76	0.27	56	-
HRW	2020-2022	WB 4311	29238	8510	421	77	-637	355	0.07	8865	332	48	12.91	0.51	3	1.44	0.24	0	12.02	0.27	2	-
HRW	2020-2022	LCS ROCKET	29242	8486	336	78	-661	251	0.01	8193	332	58	11.86	0.48	29	0.39	0.17	0.02	11.04	0.27	15	Released
SWW	2020-2022	OR2170559	29308	8412	336	79	-735	251	0	9216	332	37	11.92	0.48	25	0.45	0.17	0.01	10.92	0.27	21	-
-	2020-2022	OR5180071	29309	8333	336	80	-814	251	0	9044	332	39	11.23	0.48	57	-0.24	0.17	0.17	10.67	0.27	27	-
SWW	2020-2022	OR2180377	29382	8309	421	81	-838	355	0.02	8664	332	52	11.14	0.51	61	-0.33	0.24	0.17	10.25	0.27	43	-
SWW	2020-2022	ORI2190025 CL+	29379	8278	468	82	-869	408	0.03	8731	370	51	11.77	0.53	32	0.3	0.28	0.29	10.72	0.29	24	-
HRW	2020-2022	OR2170199R	29385	8262	421	83	-885	355	0.01	8657	334	53	12.11	0.51	16	0.65	0.24	0.01	11.21	0.27	10	-
HWW	2020-2022	OR2160065H	29248	8129	336	84	-1018	251	0	8475	332	54	12.52	0.48	7	1.05	0.17	0	11.74	0.27	6	-
HRW	2020-2022	LCS EVINA	29240	8125	336	85	-1022	251	0	7987	332	59	13.76	0.48	1	2.29	0.17	0	12.96	0.27	1	Released
SWW	2020-2022	NORTHWEST TANDEM	29045	8122	326	86	-1026	237	0	8348	307	57	10.99	0.47	77	-0.48	0.16	0	10.53	0.25	30	Released
HRW	2020-2022	WA8309	29296	8026	336	87	-1121	251	0	8957	332	44	12.2	0.48	14	0.73	0.17	0	11.04	0.27	16	-
-	2020-2022	ARS09500-17CBW	29378	8015	421	88	-1132	355	0	8370	332	56	11.6	0.51	37	0.13	0.24	0.58	10.72	0.27	25	-
SWW	2020-2022	WB 1604	29116	8000	426	89	-1147	368	0	-	-	-	12.23	0.51	13	0.76	0.25	0	-	-	-	Available
HRW	2020-2022	OR2180100R	29304	7954	421	90	-1193	355	0	-	-	-	10.81	0.51	81	-0.66	0.24	0.01	-	-	-	-
SWW	2020-2022	OR5170022	29258	7953	426	91	-1195	368	0	-	-	-	13.18	0.51	2	1.71	0.25	0	-	-	-	-

SWW	2020-2022	LWW17-5815	29314	7783	421	92	-1365	355	0	-	-	-	11.91	0.51	26	0.44	0.24	0.07	-	-	-	-
-	2020-2022	Castella	29326	7713	421	93	-1434	355	0	-	-	-	12.29	0.51	12	0.82	0.24	0	-	-	-	-
HWW	2020-2022	OR2150168H	29247	7682	421	94	-1465	355	0	-	-	-	11.54	0.51	39	0.07	0.24	0.77	-	-	-	-
HWW	2020-2022	IDO1906	29297	7379	421	95	-1768	355	0	-	-	-	12.51	0.51	8	1.04	0.24	0	-	-	-	-
-	2020-2022	PRITCHETT	29254	7140	426	96	-2007	368	0	-	-	-	11.13	0.56	62	-0.34	0.35	0.33	-	-	-	-

Table 47. Intermountain region, spring wheat yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
SWS	2020-2022	IDO1802S	29283	9885	607	1	2212	265	0	-	-	-	11.11	0.48	69	-2.04	0.16	0	-	-	-	-
SWS	2020-2022	IDO01405S	29190	9495	565	2	1821	151	0	8434	214	2	11.48	0.46	62	-1.66	0.09	0	10.68	0.19	32	-
SWS	2020-2022	WB 6341	19091	9292	576	3	1618	186	0	-	-	-	10.43	0.47	73	-2.72	0.11	0	-	-	-	-
SWS	2020-2022	IDO1902s	29284	9197	576	4	1524	187	0	8563	214	1	11.21	0.47	66	-1.94	0.11	0	10.43	0.19	36	-
SWS	2020-2022	IDO1401S	29269	9004	608	5	1331	267	0	-	-	-	11.19	0.48	67	-1.95	0.16	0	-	-	-	-
HRS	2020-2022	UC 16010 20	29181	8922	576	6	1248	187	0	7705	214	3	13.47	0.47	31	0.33	0.11	0	12.48	0.19	16	-
-	2020-2022	SY TETON	29266	8910	608	7	1236	267	0	-	-	-	13.07	0.48	46	-0.07	0.16	0.65	-	-	-	-
HWS	2020-2022	UC 1917	29366	8676	606	8	1002	264	0	7692	214	4	13.24	0.48	40	0.09	0.16	0.56	12.34	0.19	21	-
HRS	2020-2022	WB 9699	1888	8597	608	9	924	267	0	-	-	-	13.34	0.48	36	0.2	0.16	0.22	-	-	-	Released
SWS	2020-2022	10PN2013-02	29270	8594	608	10	920	267	0	-	-	-	11.37	0.48	64	-1.77	0.16	0	-	-	-	-
HWS	2020-2022	WB 7202 CLP	29171	8582	607	11	909	265	0	-	-	-	12.61	0.48	49	-0.54	0.16	0	-	-	-	-
SWS	2020-2022	WA TEKOA	29150	8522	565	12	849	151	0	7226	214	11	11.46	0.46	63	-1.69	0.09	0	10.44	0.19	34	-
DURUM	2020-2022	SOFT SVEVO	19118	8467	608	13	793	267	0	-	-	-	14.19	0.48	20	1.05	0.16	0	-	-	-	-
HWS	2020-2022	IDO2004S	29292	8437	580	14	764	199	0	7676	214	5	12.07	0.47	52	-1.08	0.12	0	10.98	0.19	29	-
SWS	2020-2022	WB6211 CLP	29285	8398	576	15	725	187	0	7328	214	8	11.81	0.47	55	-1.34	0.11	0	11.01	0.19	28	-
HWS	2020-2022	IDO1203S A	19033	8372	608	16	698	267	0.01	-	-	-	14.17	0.48	21	1.03	0.16	0	-	-	-	-

SWS	2020-2022	IDO01702S	29191	8324	576	17	650	186	0	7474	214	7	10.82	0.47	71	-2.33	0.11	0	10.09	0.19	39	-
SWS	2020-2022	WB 6121	19090	8271	565	18	597	151	0	6961	214	15	12.14	0.46	51	-1	0.1	0	11.37	0.22	25	-
-	2020-2022	WB 9668	29206	8230	565	19	556	151	0	6830	214	22	14.73	0.46	6	1.59	0.09	0	13.64	0.19	6	-
HRS	2020-2022	AP RENEGADE	19113	8173	576	20	499	186	0.01	7235	214	10	13.75	0.47	26	0.6	0.11	0	13.08	0.19	8	Released
HWS	2020-2022	UC CENTRAL WHITE	29367	8167	606	21	494	264	0.06	7184	214	13	13.34	0.48	37	0.2	0.16	0.22	12.44	0.19	18	-
HRS	2020-2022	UC CENTRAL RED	29180	8131	576	22	457	187	0.02	6792	214	23	13.38	0.47	34	0.24	0.11	0.04	12.61	0.19	12	Available
SWS	2020-2022	IDO1404S	29268	8128	573	23	455	176	0.01	6741	200	24	10.99	0.46	70	-2.16	0.11	0	10.32	0.18	37	-
HWS	2020-2022	IDO2002S	29291	8128	576	24	454	187	0.02	7295	214	9	13.19	0.47	44	0.04	0.11	0.69	12.27	0.19	23	-
-	2020-2022	LNR16-1485	29265	8051	608	25	377	267	0.16	-	-	-	13.47	0.48	32	0.33	0.16	0.05	-	-	-	-
SWS	2020-2022	WA8377	29354	8004	625	26	330	303	0.28	6966	238	14	12.15	0.49	50	-0.99	0.18	0	11.28	0.22	26	-
HRS	2020-2022	WB PATRON	29147	7993	608	27	319	267	0.23	-	-	-	13.62	0.48	29	0.48	0.16	0	-	-	-	Available
HRS	2020-2022	WB 9662	29154	7969	607	28	296	265	0.27	-	-	-	14.66	0.48	9	1.51	0.16	0	-	-	-	-
-	2020-2022	WA 8315	29201	7896	576	29	223	186	0.23	6875	214	17	13.95	0.47	23	0.81	0.11	0	12.76	0.19	9	-
HRS	2020-2022	Jefferson HF	29356	7885	606	30	211	264	0.42	6901	214	16	13.37	0.48	35	0.22	0.16	0.16	12.47	0.19	17	-
HRS	2020-2022	WB 9904	19119	7880	608	31	207	267	0.44	-	-	-	12.89	0.48	48	-0.25	0.16	0.13	-	-	-	Available
HRS	2020-2022	AP VENOM	1877	7861	608	32	187	267	0.48	-	-	-	14.17	0.48	22	1.03	0.16	0	-	-	-	Available
SWS	2020-2022	ALPOWA	19014	7851	608	33	178	267	0.51	-	-	-	11.49	0.48	61	-1.65	0.16	0	-	-	-	-
HRS	2020-2022	WA8355	29361	7850	606	34	177	264	0.5	6867	214	18	13.28	0.48	39	0.13	0.16	0.41	12.38	0.19	20	-
HRS	2020-2022	WB 9518	19096	7832	608	35	158	267	0.55	-	-	-	14.79	0.48	5	1.65	0.16	0	-	-	-	-
-	2020-2022	WB 9303	29202	7830	565	36	157	151	0.3	6842	214	20	14.67	0.46	8	1.53	0.09	0	13.69	0.19	5	-
SWS	2020-2022	IDO 2101 FHB	29353	7828	606	37	155	264	0.56	6845	214	19	11.59	0.48	58	-1.56	0.16	0	10.69	0.19	30	-
HRS	2020-2022	IDO2202CL2	29359	7821	606	38	147	264	0.58	6838	214	21	13.34	0.48	38	0.19	0.16	0.23	12.44	0.19	19	-
SWS	2020-2022	WA RYAN	29148	7740	565	39	66	151	0.66	6532	214	26	11.81	0.46	56	-1.34	0.09	0	10.67	0.19	33	-
SWS	2020-2022	WA SEAHAWK	19054	7738	576	40	65	187	0.73	7536	214	6	11.57	0.47	60	-1.58	0.11	0	10.68	0.19	31	-
HRS	2020-2022	IDO2105S	29290	7731	607	41	57	265	0.83	-	-	-	13.13	0.48	45	-0.01	0.16	0.94	-	-	-	-
HWS	2020-2022	UC PATWIN 515	19053	7563	607	42	-111	265	0.68	-	-	-	13.76	0.48	25	0.61	0.16	0	-	-	-	Available
-	2020-2022	IDO1804S	29267	7561	565	43	-112	151	0.46	7221	214	12	13.69	0.46	27	0.55	0.09	0	12.26	0.19	24	-
HRS	2020-2022	WB9623	29355	7554	606	44	-119	264	0.65	6571	214	25	13.65	0.48	28	0.5	0.16	0	12.75	0.19	10	-
HRS	2020-2022	WB 9990	1922	7482	608	45	-192	267	0.47	-	-	-	12.94	0.48	47	-0.2	0.16	0.22	-	-	-	-
-	2020-2022	WA 8325	29289	7476	576	46	-197	187	0.29	6434	214	27	10.66	0.47	72	-2.48	0.11	0	9.82	0.19	40	-
HRS	2020-2022	KELSE	19042	7361	576	47	-312	187	0.1	6174	214	31	14.6	0.47	12	1.46	0.11	0	13.72	0.19	3	-
HWS	2020-2022	IDO2104HF	29358	7312	606	48	-362	264	0.17	6328	214	29	13.47	0.48	30	0.33	0.16	0.04	12.57	0.19	13	-
HRS	2020-2022	WA8387 CL+	29365	7259	606	49	-414	264	0.12	6276	214	30	13.2	0.48	41	0.06	0.16	0.72	12.3	0.19	22	-
SWS	2020-2022	WA 8321	29286	7239	576	50	-434	187	0.02	6394	214	28	11.25	0.47	65	-1.89	0.11	0	10.27	0.19	38	-
HRS	2020-2022	ALUM	19016	7200	608	51	-474	267	0.08	-	-	-	14.37	0.48	19	1.23	0.16	0	-	-	-	-
SWS	2020-2022	WA MELBA	19050	7170	608	52	-503	267	0.06	-	-	-	11.64	0.48	57	-1.5	0.16	0	-	-	-	-

HRS	2020-2022	AP OCTANE	1878	7126	608	53	-547	267	0.04	-	-	-	14.49	0.48	16	1.35	0.16	0	-	-	-	Available
SWS	2020-2022	WA 8323	29287	7048	607	54	-626	265	0.02	-	-	-	11.96	0.48	53	-1.19	0.16	0	-	-	-	-
HRS	2020-2022	Net CL+	29360	6946	606	55	-727	264	0.01	5963	214	32	13.42	0.48	33	0.28	0.16	0.09	12.52	0.19	14	-
HRS	2020-2022	WA8358 CL+	29364	6915	606	56	-758	264	0	5932	214	33	14.65	0.48	10	1.51	0.16	0	13.75	0.19	2	-
HWS	2020-2022	UC AMARILLO	29329	6866	576	57	-808	187	0	5713	214	37	13.2	0.47	42	0.05	0.11	0.65	12.48	0.19	15	-
SWS	2020-2022	WA 8324	29288	6856	607	58	-817	265	0	-	-	-	11.58	0.48	59	-1.56	0.16	0	-	-	-	-
HWS	2020-2022	IDO 2103 FHB	29357	6846	606	59	-827	264	0	5863	214	35	14.59	0.48	13	1.45	0.16	0	13.69	0.19	4	-
-	2020-2022	LNR16-1223	29264	6835	608	60	-838	267	0	-	-	-	13.19	0.48	43	0.05	0.16	0.76	-	-	-	-
HRS	2020-2022	YECORA ROJO	19106	6811	608	61	-862	267	0	-	-	-	15.47	0.48	3	2.33	0.16	0	-	-	-	Available
SWS	2020-2022	WA LOUISE	19048	6755	576	62	-919	187	0	5766	214	36	11.82	0.47	54	-1.33	0.11	0	11.1	0.19	27	-
HRS	2020-2022	GLEE	19025	6693	576	63	-980	187	0	5926	214	34	13.86	0.47	24	0.72	0.12	0	12.69	0.22	11	-
HRS	2020-2022	WA8356	29362	6624	606	64	-1050	264	0	5640	214	38	14.46	0.48	17	1.31	0.16	0	13.56	0.19	7	-
HRS	2020-2022	YECORA ROJO 515	29330	6618	607	65	-1055	265	0	-	-	-	14.58	0.48	14	1.44	0.16	0	-	-	-	-
HRS	2020-2022	WA 8314	29294	6423	625	66	-1251	304	0	-	-	-	14.68	0.49	7	1.54	0.19	0	-	-	-	-
HRS	2020-2022	WA 8280 CLP	29185	6388	607	67	-1286	265	0	-	-	-	14.63	0.48	11	1.49	0.16	0	-	-	-	-
HRS	2020-2022	WA 8299 CL+	29293	6357	607	68	-1317	265	0	-	-	-	14.41	0.48	18	1.26	0.16	0	-	-	-	-
-	2020-2022	IDO1805S	29208	6232	608	69	-1442	267	0	-	-	-	14.54	0.48	15	1.4	0.16	0	-	-	-	-
SWS	2020-2022	AP COACHMAN	19115	6218	576	70	-1455	186	0	5538	214	39	11.14	0.47	68	-2	0.11	0	10.43	0.19	35	Released
HRS	2020-2022	WA8357	29363	6157	606	71	-1516	264	0	5174	214	40	15.16	0.49	4	2.02	0.18	0	14.29	0.22	1	-
HRS	2020-2022	MSU LANNING	29176	5810	607	72	-1864	265	0	-	-	-	16.41	0.48	1	3.26	0.16	0	-	-	-	Released
HRS	2020-2022	MT1716	29295	5798	607	73	-1875	265	0	-	-	-	15.48	0.48	2	2.34	0.16	0	-	-	-	-

Table 48. Intermountain region, spring barley yield and protein 3-year summaries.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall mean	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
-	2020-2022	KWS JESSIE	9168	8937	330	1	1231	226	0	9039	342	1	9.48	0.64	30	-1.08	0.21	0	8.52	0.41	20	-
-	2020-2022	KWS Thalis	29273	8843	371	2	1137	278	0	8714	342	2	10.09	0.66	17	-0.48	0.26	0.07	9.65	0.41	9	-
-	2020-2022	BC Lexy	29347	8605	468	3	900	389	0.02	8450	342	4	9.54	0.71	29	-1.03	0.37	0.01	8.78	0.41	18	-
-	2020-2022	KWS Fantex	29275	8537	468	4	832	395	0.04	-	-	-	9.85	0.71	23	-0.72	0.38	0.06	-	-	-	-
2RSF	2020-2022	CLAYMORE	9162	8509	330	5	804	226	0	8568	342	3	10.01	0.64	18	-0.56	0.21	0.01	9.02	0.41	14	-
-	2020-2022	CHARGER	9167	8380	473	6	675	401	0.09	-	-	-	9.57	0.72	28	-1	0.38	0.01	-	-	-	-
-	2020-2022	OREANA	9165	8349	330	7	643	226	0	8248	342	5	9.95	0.64	22	-0.61	0.21	0	9.14	0.41	13	-
-	2020-2022	KWS CHRISSIE	9169	8332	473	8	627	401	0.12	-	-	-	9.77	0.72	24	-0.8	0.38	0.04	-	-	-	-
2RSM	2020-2022	LCS OPERA	9158	8262	330	9	557	226	0.01	7763	342	8	9.64	0.64	27	-0.92	0.21	0	8.83	0.41	17	Released
2RSM	2020-2022	LCS ODYSSEY	9164	8206	468	10	501	389	0.2	8052	342	6	9.72	0.71	26	-0.85	0.37	0.02	8.96	0.41	16	Available
-	2020-2022	BC Leandra	29345	8157	468	11	452	389	0.25	8003	342	7	9.97	0.71	21	-0.6	0.37	0.11	9.21	0.41	12	-
-	2020-2022	LCS DIABLO	9166	8133	473	12	427	401	0.29	-	-	-	10.17	0.72	16	-0.4	0.38	0.3	-	-	-	-
2RSM	2020-2022	CDC COPELAND	9054	8065	473	13	360	401	0.37	-	-	-	10	0.72	20	-0.57	0.38	0.14	-	-	-	Available
-	2020-2022	KWS Willis	29276	7872	371	14	167	278	0.55	7543	342	11	10.59	0.66	13	0.02	0.26	0.95	10.14	0.41	5	-
-	2020-2022	BC Ellinore	29346	7854	468	15	149	389	0.7	7700	342	9	9.32	0.74	31	-1.25	0.42	0	8.64	0.46	19	-
-	2020-2022	HO517-245	29352	7736	468	16	31	389	0.94	7582	342	10	9.74	0.71	25	-0.83	0.37	0.03	8.98	0.41	15	-
-	2020-2022	KWS Amadora	29274	7694	371	17	-11	278	0.97	7315	342	14	10	0.66	19	-0.57	0.26	0.03	9.3	0.41	11	-
-	2020-2022	MS21-B1	29349	7631	468	18	-74	389	0.85	7476	342	12	10.32	0.71	15	-0.24	0.37	0.51	9.57	0.41	10	-
-	2020-2022	14WAIM-3620.70	29278	7578	468	19	-127	395	0.75	-	-	-	10.45	0.71	14	-0.12	0.38	0.75	-	-	-	-
-	2020-2022	DH190481	29350	7517	468	20	-188	389	0.63	7362	342	13	11.19	0.71	7	0.63	0.37	0.09	10.44	0.41	4	-
-	2020-2022	ALTORADO	9171	7491	330	21	-215	226	0.34	7223	342	16	11	0.64	10	0.43	0.21	0.05	10.12	0.41	6	-
-	2020-2022	DH190346	29351	7440	468	22	-266	389	0.5	7285	342	15	12.18	0.71	3	1.62	0.37	0	11.43	0.41	2	-
2RSM	2020-2022	FRANCIN	9148	7320	473	23	-385	401	0.34	-	-	-	10.9	0.72	11	0.33	0.38	0.39	-	-	-	-
-	2020-2022	13WAM-136.1	29277	7111	468	24	-594	395	0.13	-	-	-	11.07	0.71	9	0.5	0.38	0.18	-	-	-	-

-	2020-2022	14WAIM-3614.1	29279	7076	468	25	-629	395	0.11	-	-	-	11.35	0.71	6	0.78	0.38	0.04	-	-	-	-
-	2020-2022	AAC CONNECT	9170	6919	330	26	-786	226	0	7106	342	17	11.14	0.64	8	0.57	0.21	0.01	9.89	0.41	8	-
-	2020-2022	MS21-B2	29348	6871	468	27	-835	389	0.03	6716	342	19	10.85	0.71	12	0.28	0.37	0.45	10.09	0.41	7	-
-	2020-2022	Survivor	29272	6790	371	28	-915	278	0	6805	342	18	11.92	0.66	5	1.35	0.26	0	11.11	0.41	3	-
-	2020-2022	Lenetah	29271	6694	371	29	-1011	278	0	6203	342	20	12.15	0.66	4	1.58	0.26	0	11.81	0.41	1	-
-	2020-2022	MEG'S SONG	9163	6461	473	30	-1244	401	0	-	-	-	12.4	0.72	2	1.83	0.38	0	-	-	-	-
-	2020-2022	DH130910	29263	5493	473	31	-2212	401	0	-	-	-	13.27	0.72	1	2.7	0.38	0	-	-	-	-

Table 49. Intermountain region, winter barley yield and protein from the 2019-20 to 2021-22 seasons.

Crop Classification	Years	Name	UC Number	3-yr Yield (lb/acre)	3-yr St.Err. Yield (lb/acre)	3-yr Yield Rank	Yield diff. from overall mean	Yield st.err.diff. from overall mean	Yield p-Value	2022 Yield (lb/acre)	2022 St.Err.Yield (lb/acre)	2022 Yield Rank	3-yr Protein (%)	3-yr St.Err. Protein (%)	3-yr Protein Rank	Protein diff. from overall	Protein st.err.diff. from overall mean	Protein p-Value	2022 Protein (%)	2022 St.Err.Protein (%)	2022 Protein Rank	Status
-	2020-2022	STRIDER	29260	8220	772	1	1303	422	0	-	-	-	9.54	1.78	10	-2.23	0.39	0	-	-	-	-
-	2020-2022	DH141917	29387	7427	764	2	511	374	0.18	7642	292	2	11.11	1.78	8	-0.66	0.35	0.06	9.05	0.28	8	-
-	2020-2022	THUNDER	29262	7335	680	3	419	229	0.07	7447	292	4	11.64	1.75	6	-0.13	0.21	0.54	9.64	0.28	6	-
-	2020-2022	WINTMALT	29261	7230	680	4	314	229	0.18	8003	292	1	11.46	1.75	7	-0.31	0.21	0.15	9.01	0.28	9	-
-	2020-2022	DH141225	29282	6920	704	5	4	273	0.99	7600	292	3	11.88	1.75	5	0.11	0.25	0.68	9.64	0.28	5	-
-	2020-2022	DH141222	29281	6812	704	6	-104	273	0.7	7089	292	6	12.45	1.75	4	0.68	0.25	0.01	10.39	0.28	3	-
-	2020-2022	Lightning	29280	6780	712	7	-137	290	0.64	7358	337	5	12.51	1.76	3	0.74	0.27	0.01	10.37	0.33	4	-
-	2020-2022	ALBA	29259	6566	677	8	-351	220	0.12	5799	261	8	10.87	1.74	9	-0.9	0.21	0	9.2	0.25	7	-
-	2020-2022	DH150683	29388	6564	764	9	-353	374	0.35	6779	292	7	12.79	1.78	2	1.02	0.35	0	10.72	0.28	2	-
-	2020-2022	DH162310	29389	5311	764	10	-1605	374	0	5526	292	9	13.46	1.78	1	1.69	0.35	0	11.39	0.28	1	-

Tables 50-59 Are single year summaries from 2021-22 season for forage yield and protein.

Table 50. 2021-22 Davis site Common Wheat and Triticale boot stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
COMMON	2022	Davis	38.543	-121.783	boot	MIX	9404 BAG FORAGE W/ RYE	4001	3410	575	0.28	6	8.45	0.44	8	40
	2022	Davis	38.543	-121.783	boot	MIX	3031 BLUE BALE GOLD W/ RYE	4000	3357	2190	0.28	7	8.61	1.29	5	38
	2022	Davis	38.543	-121.783	boot	-	UC CENTRAL RED	1817	3340	448	0.28	8	8.63	1.01	4	48
	2022	Davis	38.543	-121.783	boot	-	UC PATWIN 515 HP	1743	3298	1003	0.28	10	7.61	0.87	14	47
	2022	Davis	38.543	-121.783	boot	-	WB PATRON*	1731	3242	901	0.28	11	8.52	1.34	6	45
	2022	Davis	38.543	-121.783	boot	-	FV 2808+*	1970	2964	1051	0.28	13	8.48	0.57	7	38
	2022	Davis	38.543	-121.783	boot	-	WB 9990*	1922	2198	428	0.28	15	8.99	0.49	2	41
	2022	Davis	38.543	-121.783	boot	-	UC PATWIN 515	1680	2155	1057	0.28	16	8.91	1.32	3	46
	2022	Davis	38.543	-121.783	boot	-	BAG NEW DIRKWIN*	1667	2046	771	0.28	17	9.18	1.1	1	35
TRITICALE	2022	Davis	38.543	-121.783	boot	-	UC 3196	3196	5142	918	0.28	1	6.67	0.48	17	57
	2022	Davis	38.543	-121.783	boot	-	UC BOPAK	3190	5005	774	0.28	2	6.83	0.52	16	53
	2022	Davis	38.543	-121.783	boot	-	UC 3193	3193	3970	875	0.28	3	7.88	0.56	11	53
	2022	Davis	38.543	-121.783	boot	-	UC 3197	3197	3944	1058	0.28	4	7.18	0.31	15	50
	2022	Davis	38.543	-121.783	boot	-	WB PACHECO	3164	3742	765	0.28	5	7.87	0.58	12	49
	2022	Davis	38.543	-121.783	boot	-	APB T470298	3194	3327	928	0.28	9	7.62	1.06	13	48
	2022	Davis	38.543	-121.783	boot	-	UC ATREA	3185	2970	1121	0.28	12	8.17	1.41	10	49
	2022	Davis	38.543	-121.783	boot	-	APB T470308	3195	2896	451	0.28	14	8.18	0.74	9	47

Table 51. 2021-22 Davis site Common Wheat and Triticale soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
COMMON	2022	Davis	38.543	-121.783	soft dough	MIX	9404 BAG FORAGE W/ RYE	4001	13578	1208	0.12	8	6.61	0.18	14	85
	2022	Davis	38.543	-121.783	soft dough	-	FV 2808+*	1970	13171	1997	0.12	9	6.78	0.34	10	84
	2022	Davis	38.543	-121.783	soft dough	-	WB PATRON*	1731	12928	901	0.12	11	6.62	0.65	13	84
	2022	Davis	38.543	-121.783	soft dough	-	UC PATWIN 515 HP	1743	12824	1844	0.12	12	7.1	0.5	6	85
	2022	Davis	38.543	-121.783	soft dough	-	BAG NEW DIRKWIN*	1667	12674	2697	0.12	13	7.62	0.18	1	80
	2022	Davis	38.543	-121.783	soft dough	-	UC CENTRAL RED	1817	11683	460	0.12	14	7.34	1.22	4	86
	2022	Davis	38.543	-121.783	soft dough	MIX	3031 BLUE BALE GOLD W/ RYE	4000	11606	1963	0.12	15	6.62	0.99	12	82
	2022	Davis	38.543	-121.783	soft dough	-	WB 9990*	1922	11555	1367	0.12	16	7.38	0.37	3	84
	2022	Davis	38.543	-121.783	soft dough	-	UC PATWIN 515	1680	9617	2781	0.12	17	7.06	0.69	7	84
TRITICALE	2022	Davis	38.543	-121.783	soft dough	-	WB PACHECO	3164	15418	1544	0.12	1	6.55	0.67	15	84
	2022	Davis	38.543	-121.783	soft dough	-	UC BOPAK	3190	15376	1919	0.12	2	6.23	0.57	17	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3196	3196	14902	1740	0.12	3	6.68	0.46	11	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3197	3197	13831	1480	0.12	4	7.54	0.75	2	84
	2022	Davis	38.543	-121.783	soft dough	-	UC ATREA	3185	13735	855	0.12	5	7.03	0.74	8	84
	2022	Davis	38.543	-121.783	soft dough	-	APB T470308	3195	13639	937	0.12	6	6.8	0.48	9	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3193	3193	13592	1532	0.12	7	6.45	0.46	16	84
	2022	Davis	38.543	-121.783	soft dough	-	APB T470298	3194	13028	1585	0.12	10	7.34	0.24	5	84

Table 52. 2021-22 Fresno site Common Wheat and Triticale boot stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
COMMON	2022	Fresno	36.337	-120.109	boot	-	UC PATWIN 515 HP	1743	5396	647	0.14	5	6.41	1.01	17	50
	2022	Fresno	36.337	-120.109	boot	-	UC CENTRAL RED	1817	5163	287	0.14	6	6.86	0.68	10	47
	2022	Fresno	36.337	-120.109	boot	-	FV 2808+*	1970	4813	630	0.14	9	6.52	0.75	15	41
	2022	Fresno	36.337	-120.109	boot	MIX	9404 BAG FORAGE W/ RYE	4001	4567	448	0.14	11	6.78	0.57	11	38
	2022	Fresno	36.337	-120.109	boot	-	UC PATWIN 515	1680	4456	632	0.14	13	6.7	0.81	13	42
	2022	Fresno	36.337	-120.109	boot	-	WB 9990*	1922	4058	450	0.14	14	7.06	1.03	8	42
	2022	Fresno	36.337	-120.109	boot	-	WB PATRON*	1731	3955	514	0.14	15	7.36	0.46	3	50
	2022	Fresno	36.337	-120.109	boot	MIX	3031 BLUE BALE GOLD W/ RYE	4000	3843	514	0.14	16	7.43	0.73	2	36
	2022	Fresno	36.337	-120.109	boot	-	BAG NEW DIRKWIN*	1667	3751	673	0.14	17	7.11	0.91	7	36
TRITICALE	2022	Fresno	36.337	-120.109	boot	-	UC 3197	3197	6705	1650	0.14	1	6.51	1.3	16	55
	2022	Fresno	36.337	-120.109	boot	-	UC 3196	3196	6036	976	0.14	2	6.72	0.57	12	51
	2022	Fresno	36.337	-120.109	boot	-	WB PACHECO	3164	5642	1380	0.14	3	7	0.92	9	53
	2022	Fresno	36.337	-120.109	boot	-	UC BOPAK	3190	5436	622	0.14	4	7.34	0.29	4	55
	2022	Fresno	36.337	-120.109	boot	-	APB T470298	3194	4979	1064	0.14	7	7.57	0.28	1	49
	2022	Fresno	36.337	-120.109	boot	-	APB T470308	3195	4870	574	0.14	8	7.23	0.99	5	52
	2022	Fresno	36.337	-120.109	boot	-	UC ATREA	3185	4615	411	0.14	10	7.21	0.64	6	53
	2022	Fresno	36.337	-120.109	boot	-	UC 3193	3193	4563	383	0.14	12	6.59	0.41	14	50

Table 53. 2021-22 Fresno site Common Wheat and Triticale soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
COMMON	2022	Fresno	36.337	-120.109	soft dough	-	UC PATWIN 515 HP	1743	11993	7617	0.16	1	4.77	0.95	10	86
	2022	Fresno	36.337	-120.109	soft dough	MIX	3031 BLUE BALE GOLD W/ RYE	4000	10099	880	0.16	7	4.2	0.22	15	85
	2022	Fresno	36.337	-120.109	soft dough	-	BAG NEW DIRKWIN*	1667	9257	1417	0.16	11	4.7	0.81	12	81
	2022	Fresno	36.337	-120.109	soft dough	MIX	9404 BAG FORAGE W/ RYE	4001	9160	1513	0.16	12	4.12	0.25	16	81
	2022	Fresno	36.337	-120.109	soft dough	-	UC CENTRAL RED	1817	8879	1115	0.16	13	4.83	0.17	9	86
	2022	Fresno	36.337	-120.109	soft dough	-	WB PATRON*	1731	8752	971	0.16	14	5.34	0.77	1	86
	2022	Fresno	36.337	-120.109	soft dough	-	FV 2808+*	1970	8661	869	0.16	15	3.86	0.7	17	86
	2022	Fresno	36.337	-120.109	soft dough	-	WB 9990*	1922	8076	1129	0.16	16	4.77	1.18	11	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC PATWIN 515	1680	8068	1530	0.16	17	4.67	0.42	14	84
TRITICALE	2022	Fresno	36.337	-120.109	soft dough	-	UC 3196	3196	11451	864	0.16	2	5.31	0.82	2	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 3193	3193	10783	2260	0.16	3	4.84	0.54	8	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC ATREA	3185	10757	1721	0.16	4	4.86	0.36	7	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC BOPAK	3190	10525	876	0.16	5	4.89	0.57	6	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC 3197	3197	10208	1650	0.16	6	4.68	0.77	13	85
	2022	Fresno	36.337	-120.109	soft dough	-	WB PACHECO	3164	9687	465	0.16	8	4.92	0.88	5	84
	2022	Fresno	36.337	-120.109	soft dough	-	APB T470298	3194	9421	719	0.16	9	5.03	0.15	3	84
	2022	Fresno	36.337	-120.109	soft dough	-	APB T470308	3195	9324	2096	0.16	10	4.97	0.42	4	85

Table 54. 2021-22 Davis site Oat and Barley soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Davis	38.543	-121.783	soft dough	-	UC 969	969	14540	1022	0.11	2	5.39	0.46	21	86
	2022	Davis	38.543	-121.783	soft dough	-	UC CAPAY	1390	14495	1895	0.11	3	5.88	0.5	17	86
	2022	Davis	38.543	-121.783	soft dough	-	TAMALPAIS	1134	14134	1776	0.11	4	6.36	0.83	9	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 603	603	13865	1375	0.11	6	5.67	1.04	19	86
	2022	Davis	38.543	-121.783	soft dough	-	SCHALLER*	1355	13550	1755	0.11	11	5.47	0.62	20	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 933	933	13404	1033	0.11	12	6.33	0.37	10	86
	2022	Davis	38.543	-121.783	soft dough	-	ISHI	1047	13382	1758	0.11	13	6.32	0.48	11	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 960	960	12839	2059	0.11	15	6.6	0.47	8	86
	2022	Davis	38.543	-121.783	soft dough	-	CDC COPELAND	1858	12688	326	0.11	17	6.72	0.41	7	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 937	937	12125	1442	0.11	19	7.08	0.53	3	86
	2022	Davis	38.543	-121.783	soft dough	-	UC TAHOE	1409	11796	2221	0.11	21	5.97	0.89	14	84
	2022	Davis	38.543	-121.783	soft dough	-	LCS GENIE	1414	10798	391	0.11	24	7.56	0.74	1	84
OAT	2022	Davis	38.543	-121.783	soft dough	-	UC 128	128	14760	2223	0.11	1	5.89	0.7	15	84
	2022	Davis	38.543	-121.783	soft dough	-	KANOTA	152	13948	2630	0.11	5	5.36	0.76	22	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 148	148	13807	1053	0.11	7	5.27	0.86	23	84
	2022	Davis	38.543	-121.783	soft dough	-	MONTEZUMA	151	13724	2038	0.11	8	6.11	0.68	12	85
	2022	Davis	38.543	-121.783	soft dough	-	UC 153	153	13685	904	0.11	9	5.88	0.98	16	86
	2022	Davis	38.543	-121.783	soft dough	-	SWAN	150	13593	2227	0.11	10	5.22	0.71	24	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 113	113	13105	323	0.11	14	6.92	0.84	5	84
	2022	Davis	38.543	-121.783	soft dough	-	TAURA	154	12696	2390	0.11	16	5.77	0.55	18	85
	2022	Davis	38.543	-121.783	soft dough	-	UC 1968	1968	12209	1591	0.11	18	6.76	0.52	6	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 1965	1965	12006	1647	0.11	20	6.07	0.85	13	84
	2022	Davis	38.543	-121.783	soft dough	-	CALIFORNIA RED	149	11508	924	0.11	22	7.03	0.94	4	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 142	142	11013	718	0.11	23	7.32	0.68	2	84

Table 55. 2021-22 Fresno site Oat and Barley boot stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Fresno	36.337	-120.109	boot	-	CDC COPELAND	1858	5707	1061	0.22	1	6.44	1.51	22	48
	2022	Fresno	36.337	-120.109	boot	-	UC 969	969	5374	972	0.22	4	6.2	0.7	23	55
	2022	Fresno	36.337	-120.109	boot	-	UC CAPAY	1390	5335	450	0.22	5	6.16	0.34	24	59
	2022	Fresno	36.337	-120.109	boot	-	UC 603	603	4917	484	0.22	6	6.54	0.37	21	56
	2022	Fresno	36.337	-120.109	boot	-	SCHALLER*	1355	4867	473	0.22	7	6.88	0.24	20	43
	2022	Fresno	36.337	-120.109	boot	-	ISHI	1047	4539	525	0.22	9	7.51	0.43	14	47
	2022	Fresno	36.337	-120.109	boot	-	UC 933	933	4467	148	0.22	11	7.8	0.67	10	54
	2022	Fresno	36.337	-120.109	boot	-	LCS GENIE	1414	4126	1260	0.22	13	7.94	0.46	7	45
	2022	Fresno	36.337	-120.109	boot	-	UC 937	937	4037	440	0.22	15	8.12	1.06	5	43
	2022	Fresno	36.337	-120.109	boot	-	UC TAHOE	1409	3421	394	0.22	19	7.52	0.89	13	45
	2022	Fresno	36.337	-120.109	boot	-	TAMALPAIS	1134	3116	1364	0.22	20	8.02	0.68	6	54
	2022	Fresno	36.337	-120.109	boot	-	UC 960	960	3061	887	0.22	22	8.19	0.81	4	44
OAT	2022	Fresno	36.337	-120.109	boot	-	UC 148	148	5579	2135	0.22	2	7.44	0.51	15	35
	2022	Fresno	36.337	-120.109	boot	-	TAURA	154	5501	776	0.22	3	7.36	0.57	17	52
	2022	Fresno	36.337	-120.109	boot	-	SWAN	150	4845	666	0.22	8	7.43	0.71	16	39
	2022	Fresno	36.337	-120.109	boot	-	MONTEZUMA	151	4533	1254	0.22	10	7.64	0.31	12	48
	2022	Fresno	36.337	-120.109	boot	-	KANOTA	152	4232	679	0.22	12	7.78	1.05	11	49
	2022	Fresno	36.337	-120.109	boot	-	UC 153	153	4110	601	0.22	14	7.31	0.56	18	49
	2022	Fresno	36.337	-120.109	boot	-	CALIFORNIA RED	149	4017	753	0.22	16	7.81	0.9	9	35
	2022	Fresno	36.337	-120.109	boot	-	UC 1965	1965	3939	1296	0.22	17	8.39	0.6	3	39
	2022	Fresno	36.337	-120.109	boot	-	UC 113	113	3663	181	0.22	18	7.92	0.4	8	36
	2022	Fresno	36.337	-120.109	boot	-	UC 128	128	3115	551	0.22	21	6.99	0.6	19	39
	2022	Fresno	36.337	-120.109	boot	-	UC 1968	1968	2999	1339	0.22	23	9.03	0.77	2	32
	2022	Fresno	36.337	-120.109	boot	-	UC 142	142	2258	1710	0.22	24	9.24	0.94	1	32

Table 56. 2021-22 Fresno site Oat and Barley soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Fresno	36.337	-120.109	soft dough	-	UC 603	603	9291	1672	0.19	5	3.76	0.71	18	90
	2022	Fresno	36.337	-120.109	soft dough	-	CDC COPELAND	1858	8996	1238	0.19	6	3.99	0.62	14	89
	2022	Fresno	36.337	-120.109	soft dough	-	LCS GENIE	1414	8831	2242	0.19	7	4.32	0.64	8	86
	2022	Fresno	36.337	-120.109	soft dough	-	ISHI	1047	8213	1521	0.19	10	4.76	0.84	2	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC 969	969	8213	1029	0.19	11	4.22	1.28	9	89
	2022	Fresno	36.337	-120.109	soft dough	-	UC CAPAY	1390	8116	1215	0.19	12	4.77	0.2	1	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC TAHOE	1409	7337	2171	0.19	13	3.71	0.46	19	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC 933	933	7252	1456	0.19	14	4.38	0.36	7	89
	2022	Fresno	36.337	-120.109	soft dough	-	TAMALPAIS	1134	6466	1260	0.19	18	4.49	0.45	3	85
	2022	Fresno	36.337	-120.109	soft dough	-	SCHALLER*	1355	6301	772	0.19	21	3.35	0.74	24	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 937	937	6288	3226	0.19	22	3.85	0.58	16	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC 960	960	5854	787	0.19	24	4.4	1.16	6	89
OAT	2022	Fresno	36.337	-120.109	soft dough	-	SWAN	150	10370	934	0.19	1	3.69	0.37	20	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 148	148	10251	1084	0.19	2	3.89	0.3	15	85
	2022	Fresno	36.337	-120.109	soft dough	-	CALIFORNIA RED	149	10066	935	0.19	3	4.04	0.74	11	85
	2022	Fresno	36.337	-120.109	soft dough	-	KANOTA	152	9567	1382	0.19	4	4	0.5	12	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 113	113	8683	1343	0.19	8	4.42	0.53	5	81
	2022	Fresno	36.337	-120.109	soft dough	-	UC 153	153	8593	2527	0.19	9	3.54	0.29	23	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 1965	1965	7120	1680	0.19	15	4.44	0.39	4	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 128	128	6980	1322	0.19	16	3.84	0.35	17	85
	2022	Fresno	36.337	-120.109	soft dough	-	MONTEZUMA	151	6628	1933	0.19	17	3.64	0.67	21	87
	2022	Fresno	36.337	-120.109	soft dough	-	UC 142	142	6355	1002	0.19	19	4.18	0.18	10	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC 1968	1968	6349	844	0.19	20	3.56	0.42	22	81
	2022	Fresno	36.337	-120.109	soft dough	-	TAURA	154	6083	1572	0.19	23	3.99	0.79	13	88

Table 57. 2021-22 Davis site all crops (barley, oat, common wheat, and triticales) soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Davis	38.543	-121.783	soft dough	-	UC 969	969	14540	1022	0.11	5	5.39	0.46	38	86
	2022	Davis	38.543	-121.783	soft dough	-	UC CAPAY	1390	14495	1895	0.11	6	5.88	0.5	34	86
	2022	Davis	38.543	-121.783	soft dough	-	TAMALPAIS	1134	14134	1776	0.11	7	6.36	0.83	25	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 603	603	13865	1375	0.11	9	5.67	1.04	36	86
	2022	Davis	38.543	-121.783	soft dough	-	SCHALLER*	1355	13550	1755	0.11	19	5.47	0.62	37	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 933	933	13404	1033	0.11	20	6.33	0.37	26	86
	2022	Davis	38.543	-121.783	soft dough	-	ISHI	1047	13382	1758	0.11	21	6.32	0.48	27	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 960	960	12839	2059	0.11	26	6.6	0.47	22	86
	2022	Davis	38.543	-121.783	soft dough	-	CDC COPELAND	1858	12688	326	0.11	29	6.72	0.41	17	86
	2022	Davis	38.543	-121.783	soft dough	-	UC 937	937	12125	1442	0.11	32	7.08	0.53	9	86
	2022	Davis	38.543	-121.783	soft dough	-	UC TAHOE	1409	11796	2221	0.11	34	5.97	0.89	31	84
	2022	Davis	38.543	-121.783	soft dough	-	LCS GENIE	1414	10798	391	0.11	40	7.56	0.74	2	84
COMMON	2022	Davis	38.543	-121.783	soft dough	MIX	9404 BAG FORAGE W/ RYE	4001	13578	1208	0.12	18	6.61	0.18	21	85
	2022	Davis	38.543	-121.783	soft dough	-	FV 2808+*	1970	13171	1997	0.12	22	6.78	0.34	15	84
	2022	Davis	38.543	-121.783	soft dough	-	WB PATRON*	1731	12928	901	0.12	25	6.62	0.65	20	84
	2022	Davis	38.543	-121.783	soft dough	-	UC PATWIN 515 HP	1743	12824	1844	0.12	27	7.1	0.5	8	85
	2022	Davis	38.543	-121.783	soft dough	-	BAG NEW DIRKWIN*	1667	12674	2697	0.12	30	7.62	0.18	1	80
	2022	Davis	38.543	-121.783	soft dough	-	UC CENTRAL RED	1817	11683	460	0.12	35	7.34	1.22	5	86
	2022	Davis	38.543	-121.783	soft dough	MIX	3031 BLUE BALE GOLD W/ RYE	4000	11606	1963	0.12	36	6.62	0.99	19	82
	2022	Davis	38.543	-121.783	soft dough	-	WB 9990*	1922	11555	1367	0.12	37	7.38	0.37	4	84
	2022	Davis	38.543	-121.783	soft dough	-	UC PATWIN 515	1680	9617	2781	0.12	41	7.06	0.69	10	84
OAT	2022	Davis	38.543	-121.783	soft dough	-	UC 128	128	14760	2223	0.12	4	5.89	0.7	32	84
	2022	Davis	38.543	-121.783	soft dough	-	KANOTA	152	13948	2630	0.12	8	5.36	0.76	39	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 148	148	13807	1053	0.12	11	5.27	0.86	40	84
	2022	Davis	38.543	-121.783	soft dough	-	MONTEZUMA	151	13724	2038	0.12	13	6.11	0.68	29	85

	2022	Davis	38.543	-121.783	soft dough	-	UC 153	153	13685	904	0.12	14	5.88	0.98	33	86
	2022	Davis	38.543	-121.783	soft dough	-	SWAN	150	13593	2227	0.12	16	5.22	0.71	41	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 113	113	13105	323	0.12	23	6.92	0.84	13	84
	2022	Davis	38.543	-121.783	soft dough	-	TAURA	154	12696	2390	0.12	28	5.77	0.55	35	85
	2022	Davis	38.543	-121.783	soft dough	-	UC 1968	1968	12209	1591	0.12	31	6.76	0.52	16	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 1965	1965	12006	1647	0.12	33	6.07	0.85	30	84
	2022	Davis	38.543	-121.783	soft dough	-	CALIFORNIA RED	149	11508	924	0.12	38	7.03	0.94	11	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 142	142	11013	718	0.12	39	7.32	0.68	7	84
TRITICALE	2022	Davis	38.543	-121.783	soft dough	-	WB PACHECO	3164	15418	1544	0.12	1	6.55	0.67	23	84
	2022	Davis	38.543	-121.783	soft dough	-	UC BOPAK	3190	15376	1919	0.12	2	6.23	0.57	28	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3196	3196	14902	1740	0.12	3	6.68	0.46	18	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3197	3197	13831	1480	0.12	10	7.54	0.75	3	84
	2022	Davis	38.543	-121.783	soft dough	-	UC ATREA	3185	13735	855	0.12	12	7.03	0.74	12	84
	2022	Davis	38.543	-121.783	soft dough	-	APB T470308	3195	13639	937	0.12	15	6.8	0.48	14	84
	2022	Davis	38.543	-121.783	soft dough	-	UC 3193	3193	13592	1532	0.12	17	6.45	0.46	24	84
	2022	Davis	38.543	-121.783	soft dough	-	APB T470298	3194	13028	1585	0.12	24	7.34	0.24	6	84

Table 58. 2021-22 Fresno site all crops (barley, oat, common wheat, and triticales) boot stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Fresno	36.337	-120.109	boot	-	CDC COPELAND	1858	5707	1061	0.17	3	6.44	1.51	38	48
	2022	Fresno	36.337	-120.109	boot	-	UC 969	969	5374	972	0.17	9	6.2	0.7	40	55
	2022	Fresno	36.337	-120.109	boot	-	UC CAPAY	1390	5335	450	0.17	10	6.16	0.34	41	59
	2022	Fresno	36.337	-120.109	boot	-	UC 603	603	4917	484	0.17	13	6.54	0.37	35	56
	2022	Fresno	36.337	-120.109	boot	-	SCHALLER*	1355	4867	473	0.17	15	6.88	0.24	29	43

	2022	Fresno	36.337	-120.109	boot	-	ISHI	1047	4539	525	0.17	21	7.51	0.43	15	47
	2022	Fresno	36.337	-120.109	boot	-	UC 933	933	4467	148	0.17	23	7.8	0.67	10	54
	2022	Fresno	36.337	-120.109	boot	-	LCS GENIE	1414	4126	1260	0.17	26	7.94	0.46	7	45
	2022	Fresno	36.337	-120.109	boot	-	UC 937	937	4037	440	0.17	29	8.12	1.06	5	43
	2022	Fresno	36.337	-120.109	boot	-	UC TAHOE	1409	3421	394	0.17	36	7.52	0.89	14	45
	2022	Fresno	36.337	-120.109	boot	-	TAMALPAIS	1134	3116	1364	0.17	37	8.02	0.68	6	54
	2022	Fresno	36.337	-120.109	boot	-	UC 960	960	3061	887	0.17	39	8.19	0.81	4	44
COMMON	2022	Fresno	36.337	-120.109	boot	-	UC PATWIN 515 HP	1743	5396	647	0.14	8	6.41	1.01	39	50
	2022	Fresno	36.337	-120.109	boot	-	UC CENTRAL RED	1817	5163	287	0.14	11	6.86	0.68	30	47
	2022	Fresno	36.337	-120.109	boot	-	FV 2808+*	1970	4813	630	0.14	17	6.52	0.75	36	41
	2022	Fresno	36.337	-120.109	boot	MIX	9404 BAG FORAGE W/ RYE	4001	4567	448	0.14	19	6.78	0.57	31	38
	2022	Fresno	36.337	-120.109	boot	-	UC PATWIN 515	1680	4456	632	0.14	24	6.7	0.81	33	42
	2022	Fresno	36.337	-120.109	boot	-	WB 9990*	1922	4058	450	0.14	28	7.06	1.03	26	42
	2022	Fresno	36.337	-120.109	boot	-	WB PATRON*	1731	3955	514	0.14	31	7.36	0.46	19	50
	2022	Fresno	36.337	-120.109	boot	MIX	3031 BLUE BALE GOLD W/ RYE	4000	3843	514	0.14	33	7.43	0.73	18	36
	2022	Fresno	36.337	-120.109	boot	-	BAG NEW DIRKWIN*	1667	3751	673	0.14	34	7.11	0.91	25	36
OAT	2022	Fresno	36.337	-120.109	boot	-	UC 148	148	5579	2135	0.27	5	7.44	0.51	16	35
	2022	Fresno	36.337	-120.109	boot	-	TAURA	154	5501	776	0.27	6	7.36	0.57	20	52
	2022	Fresno	36.337	-120.109	boot	-	SWAN	150	4845	666	0.27	16	7.43	0.71	17	39
	2022	Fresno	36.337	-120.109	boot	-	MONTEZUMA	151	4533	1254	0.27	22	7.64	0.31	12	48
	2022	Fresno	36.337	-120.109	boot	-	KANOTA	152	4232	679	0.27	25	7.78	1.05	11	49
	2022	Fresno	36.337	-120.109	boot	-	UC 153	153	4110	601	0.27	27	7.31	0.56	22	49
	2022	Fresno	36.337	-120.109	boot	-	CALIFORNIA RED	149	4017	753	0.27	30	7.81	0.9	9	35
	2022	Fresno	36.337	-120.109	boot	-	UC 1965	1965	3939	1296	0.27	32	8.39	0.6	3	39
	2022	Fresno	36.337	-120.109	boot	-	UC 113	113	3663	181	0.27	35	7.92	0.4	8	36
	2022	Fresno	36.337	-120.109	boot	-	UC 128	128	3115	551	0.27	38	6.99	0.6	28	39
	2022	Fresno	36.337	-120.109	boot	-	UC 1968	1968	2999	1339	0.27	40	9.03	0.77	2	32
	2022	Fresno	36.337	-120.109	boot	-	UC 142	142	2258	1710	0.27	41	9.24	0.94	1	32
TRITICALE	2022	Fresno	36.337	-120.109	boot	-	UC 3197	3197	6705	1650	0.14	1	6.51	1.3	37	55
	2022	Fresno	36.337	-120.109	boot	-	UC 3196	3196	6036	976	0.14	2	6.72	0.57	32	51
	2022	Fresno	36.337	-120.109	boot	-	WB PACHECO	3164	5642	1380	0.14	4	7	0.92	27	53

	2022	Fresno	36.337	-120.109	boot	-	UC BOPAK	3190	5436	622	0.14	7	7.34	0.29	21	55
	2022	Fresno	36.337	-120.109	boot	-	APB T470298	3194	4979	1064	0.14	12	7.57	0.28	13	49
	2022	Fresno	36.337	-120.109	boot	-	APB T470308	3195	4870	574	0.14	14	7.23	0.99	23	52
	2022	Fresno	36.337	-120.109	boot	-	UC ATREA	3185	4615	411	0.14	18	7.21	0.64	24	53
	2022	Fresno	36.337	-120.109	boot	-	UC 3193	3193	4563	383	0.14	20	6.59	0.41	34	50

Table 59. 2021-22 Fresno site all crops (barley, oat, common wheat, and triticales) soft dough stage forage yield and protein summary.

Crop	Year	Trial Location	Latitude	Longitude	Harvest	Forage Mix	Variety	UC Number	Avg. Yield (lb/ac)	St. Dev., Yield	Trial Coef.Var., Yield	Rank, Yield	Avg. Protein (%)	St. Dev., Protein	Rank, Protein	Avg. Growth Stage (Zadoks)
BARLEY	2022	Fresno	36.337	-120.109	soft dough	-	UC 603	603	9291	1672	0.21	15	3.76	0.71	35	90
	2022	Fresno	36.337	-120.109	soft dough	-	CDC COPELAND	1858	8996	1238	0.21	18	3.99	0.62	29	89
	2022	Fresno	36.337	-120.109	soft dough	-	LCS GENIE	1414	8831	2242	0.21	20	4.32	0.64	22	86
	2022	Fresno	36.337	-120.109	soft dough	-	ISHI	1047	8213	1521	0.21	25	4.76	0.84	13	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC 969	969	8213	1029	0.21	26	4.22	1.28	23	89
	2022	Fresno	36.337	-120.109	soft dough	-	UC CAPAY	1390	8116	1215	0.21	27	4.77	0.2	12	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC TAHOE	1409	7337	2171	0.21	30	3.71	0.46	36	86
	2022	Fresno	36.337	-120.109	soft dough	-	UC 933	933	7252	1456	0.21	31	4.38	0.36	21	89
	2022	Fresno	36.337	-120.109	soft dough	-	TAMALPAIS	1134	6466	1260	0.21	35	4.49	0.45	17	85
	2022	Fresno	36.337	-120.109	soft dough	-	SCHALLER*	1355	6301	772	0.21	38	3.35	0.74	41	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 937	937	6288	3226	0.21	39	3.85	0.58	33	86

	2022	Fresno	36.337	-120.109	soft dough	-	UC 960	960	5854	787	0.21	41	4.4	1.16	20	89
COMMON	2022	Fresno	36.337	-120.109	soft dough	-	UC PATWIN 515 HP	1743	11993	7617	0.16	1	4.77	0.95	10	86
	2022	Fresno	36.337	-120.109	soft dough	MIX	3031 BLUE BALE GOLD W/ RYE	4000	10099	880	0.16	9	4.2	0.22	24	85
	2022	Fresno	36.337	-120.109	soft dough	-	BAG NEW DIRKWIN*	1667	9257	1417	0.16	16	4.7	0.81	14	81
	2022	Fresno	36.337	-120.109	soft dough	MIX	9404 BAG FORAGE W/ RYE	4001	9160	1513	0.16	17	4.12	0.25	26	81
	2022	Fresno	36.337	-120.109	soft dough	-	UC CENTRAL RED	1817	8879	1115	0.16	19	4.83	0.17	9	86
	2022	Fresno	36.337	-120.109	soft dough	-	WB PATRON*	1731	8752	971	0.16	21	5.34	0.77	1	86
	2022	Fresno	36.337	-120.109	soft dough	-	FV 2808+*	1970	8661	869	0.16	23	3.86	0.7	32	86
	2022	Fresno	36.337	-120.109	soft dough	-	WB 9990*	1922	8076	1129	0.16	28	4.77	1.18	11	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC PATWIN 515	1680	8068	1530	0.16	29	4.67	0.42	16	84
OAT	2022	Fresno	36.337	-120.109	soft dough	-	SWAN	150	10370	934	0.18	6	3.69	0.37	37	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 148	148	10251	1084	0.18	7	3.89	0.3	31	85
	2022	Fresno	36.337	-120.109	soft dough	-	CALIFORNIA RED	149	10066	935	0.18	10	4.04	0.74	27	85
	2022	Fresno	36.337	-120.109	soft dough	-	KANOTA	152	9567	1382	0.18	12	4	0.5	28	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 113	113	8683	1343	0.18	22	4.42	0.53	19	81
	2022	Fresno	36.337	-120.109	soft dough	-	UC 153	153	8593	2527	0.18	24	3.54	0.29	40	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 1965	1965	7120	1680	0.18	32	4.44	0.39	18	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 128	128	6980	1322	0.18	33	3.84	0.35	34	85
	2022	Fresno	36.337	-120.109	soft dough	-	MONTEZUMA	151	6628	1933	0.18	34	3.64	0.67	38	87
	2022	Fresno	36.337	-120.109	soft dough	-	UC 142	142	6355	1002	0.18	36	4.18	0.18	25	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC 1968	1968	6349	844	0.18	37	3.56	0.42	39	81
	2022	Fresno	36.337	-120.109	soft dough	-	TAURA	154	6083	1572	0.18	40	3.99	0.79	30	88
TRITICALE	2022	Fresno	36.337	-120.109	soft dough	-	UC 3196	3196	11451	864	0.16	2	5.31	0.82	2	85
	2022	Fresno	36.337	-120.109	soft dough	-	UC 3193	3193	10783	2260	0.16	3	4.84	0.54	8	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC ATREA	3185	10757	1721	0.16	4	4.86	0.36	7	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC BOPAK	3190	10525	876	0.16	5	4.89	0.57	6	84
	2022	Fresno	36.337	-120.109	soft dough	-	UC 3197	3197	10208	1650	0.16	8	4.68	0.77	15	85
	2022	Fresno	36.337	-120.109	soft dough	-	WB PACHECO	3164	9687	465	0.16	11	4.92	0.88	5	84
	2022	Fresno	36.337	-120.109	soft dough	-	APB T470298	3194	9421	719	0.16	13	5.03	0.15	3	84
	2022	Fresno	36.337	-120.109	soft dough	-	APB T470308	3195	9324	2096	0.16	14	4.97	0.42	4	85

References

1. https://www.cdfa.ca.gov/Statistics/PDFs/2022_Ag_Stats_Review.pdf
2. USDA National Agricultural Statistics Service (2023). NASS - Quick Stats. USDA National Agricultural Statistics Service. https://data.nal.usda.gov/dataset/nass-quick-stats. Accessed 2023-03-16.
3. Schoeneberger, P.J., D.A. Wysocki, and E.C. Benham, Field book for describing and sampling soils. Version 3.0. 2012, National Soil Survey Center. National Resources Conservation Service. U.S. Department of Agriculture.: Lincoln, NE.
4. Soil Survey Staff, Soil survey field and laboratory methods manual. . 2014, U.S. Department of Agriculture, Natural Resouces Conservation Service. p. 487.
5. McNeill, S., Equilibrium moisture content of grains. University of Kentucky Agricultural Extension. p. 2.
6. CIMIS, California Irrigation Management Information System https://cimis.water.ca.gov/WSNReportCriteria.aspx. 2018, California Department of Water Resources Office of Water Use Efficiency.
7. UC IPM. Evaluation of several degree-day estimation methods in California climates http://ipm.ucanr.edu/WEATHER/ddeval.html - DOUBLE. . 2016 [cited 2016 March].
8. UC IPM. Degree-Days http://ipm.ucanr.edu/WEATHER/ddconcepts.html. 2016 [cited 2016 March].
9. Roltsch, W.J., et al., Evaluation of several degree-day estimation methods in California climates. International Journal of Biometerology, 1999. 42(4): p. 169-176.
10. Ottman, M., Small grain growth and development. 2015, The University of Arizona Cooperative Extension: Tuscon, Arizona. p. 3.
11. George, N.A. and S.R. Kaffka, Canola as a New Crop for California: A Simulation Study. Agronomy Journal, 2017. 109(2): p. 496-509.
12. NRCS. Web Soil Survey http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. 2015.
13. Doane, T.A. and W.R. Horwath, Spectrophotometric Determination of Nitrate with a Single Reagent. Analytical Letters 2003. 36(12): p. 2713-2722.
14. APSIM, Agricultural Production Systems Simulator http://www.apsim.info/Wiki/. 2015, Commonwealth Scientific and Industrial Research Organisation (CSIRO), University of Queensland (UQ); State of Queensland, Department of Agriculture and Fisheries (DAF); and AgResearch Limited.(AgResearch).

15. Trimble. Trimble http://www.trimble.com. 2018 [cited 2018 March].
16. 3D Robotics. 3dr https://3dr.com/solo-drone/specs/. 2018 [cited 2018 March].
17. MicaSense. Parrot Sequoia https://www.micasense.com/parrotsequoia/. 2018 [cited 2018 March].
18. R Core Team, R: A language and environment for statistical computing. https://www.R-project.org/. 2022, R Foundation for Statistical Computing: Vienna, Austria.
19. pix4D. pix4D https://pix4d.com/. 2018 [cited 2018 March].
20. QGIS. QGIS A Free and Open Source Geographic Information System https://www.qgis.org/en/site/. 2018 [cited 2018 March].
21. Haghighattalab, A., et al., Application of unmanned aerial systems for high throughput phenotyping of large wheat breeding nurseries. Plant Methods, 2016. 12: p. 35.
22. Bowman, D.T., Common use of the CV: a statistical aberration in crop performance trials. Journal of Cotton Science, 2001. 5: p. 137-141.
23. Yan, W., Crop Variety Trials: Data Management and Analysis. First Edition ed. 2014: John Wiley & Sons, Inc. 351.
24. Doi, S.A.R. and G.M. Williams, Methods of Clinical Epidemiology. 2013, Heidelberg New York Dordrecht London: Springer 288.
25. Smith, A., B. Cullis, and A. GIlmour, The analysis of crop and variety evaluation data in Australia. Australian and New Zealand Journal of Statistics, 2001. 43(2): p. 129-145.
26. Taylor, S.L., M.E. Payton, and W.R. Ruan, Relationship Between Mean Yield, Coefficient of Variation, Mean Square Error and Plot Size in Wheat Field Experiments. Communication in Soil Science and Plant Analysis, 1999. 30: p. 1439-1447.
27. Smith, A., B. Cullis, and R. Thompson, Analyzing variety by environment data using multiplicative mixed models and adjustments for spatial field trends. Biometrics, 2001. 57: p. 1138-1147.
28. Lenth, R.V., Least-Squares Means: The R Package lsmeans. Journal of Statistical Software, 2016. 69(1): p. 1-33.
29. Yan, W., et al., Cultivar evaluation and mega-environment investigation based on the GGE biplot. Crop Science, 2000. 40: p. 597-605.
30. Wright, K. and J.-L. Laffont, gge: Genotype Plus Genotype-by-Environment Biplots. R package version 1.0. 2015: https://CRAN.R-project.org/package=gge.
31. Laffont, J.-L., K. Wright, and M. Hanafi, Genotype plus genotype x block of environments biplots. Crop Science, 2013. 53: p. 2332-2341.
32. Jackson, L., Personal communication, 2017.

33. Muggeo, M.R., segmented: an R Package to Fit Regression Models with Broken-Line Relationships. R News, 8/1, 20-25. URL https://cran.r-project.org/doc/Rnews/. 2008.
34. Schwenke, G.D., S.R. Simpfendorfer, and B.C.Y. Collard, Confirmation of chloride deficiency as the cause of leaf spotting in durum wheat grown in the Australian north grains region. Crop & Pasture Science, 2012. 66: p. 122-134.
35. Engel, R.E. Chloride Requirements for Wheat Production and Leaf Spot Suppression https://www.ipipotash.org/udocs/Chloride Requirements for Wheat Production.pdf.
36. Ruiz, D.A., et al., Meta-analysis of winter wheat response to chloride fertilization in Kansas. Communication in Soil Science and Plant Analysis, 2012. 43: p. 2437-2447.
37. Yan, W. and L.A. Hunt, Genotype by environment interaction and crop yield. Plant Breeding Reviews, 1998. 16: p. 135-178.
38. Yan, W. and N.A. Tinker, An intergrated biplot analysis system for displaying, interpreting, and exploring genotype x environment interaction. Crop Science, 2005. 45: p. 1004-1016.
39. Piepho, H.-P. and J. Möhring, Best linear unbiased predictions of cultivar effects for subdivided target regions. Crop Science, 2005. 45: p. 1151-1159.
40. Gauch, H.G. and R.W. Zobel, Identifying mega-envrionments and targeting genotypes. Crop Science, 1997. 37: p. 311-326.
41. Yan, W., Analysis and handling of G x E in a practical breeding program. Crop Science, 2016. 56: p. 1-13.
42. Holzworth, P.D., et al., APSIM - Evolution towards a new generation of agricultural systems simulation. Environmental Modelling & Software, 2014. 62: p. 327-350.
43. Keating, B.A., et al., An overview of APSIM, a model designed for farming systems simulation. Europ. J. Agronomy, 2003. 18: p. 267-288.
44. PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu.
45. AOAC Official Method 972.43, Microchemical Determination of Carbon, Hydrogen, and Nitrogen, Automated Method, in Official Methods of Analysis of AOAC International, 18th edition, Revision 1, 2006. Chapter 12, pp. 5-6, AOAC International, Gaithersburg, MD.
46. AOAC Official Method 990.03. Protein (Crude) in Animal Feed, Combustion Method, in Official Methods of Analysis of AOAC International, 18th Edition (2005). Revision 1, 2006, Chapter 4, pp. 30-31. AOAC International, Arlington, VA.