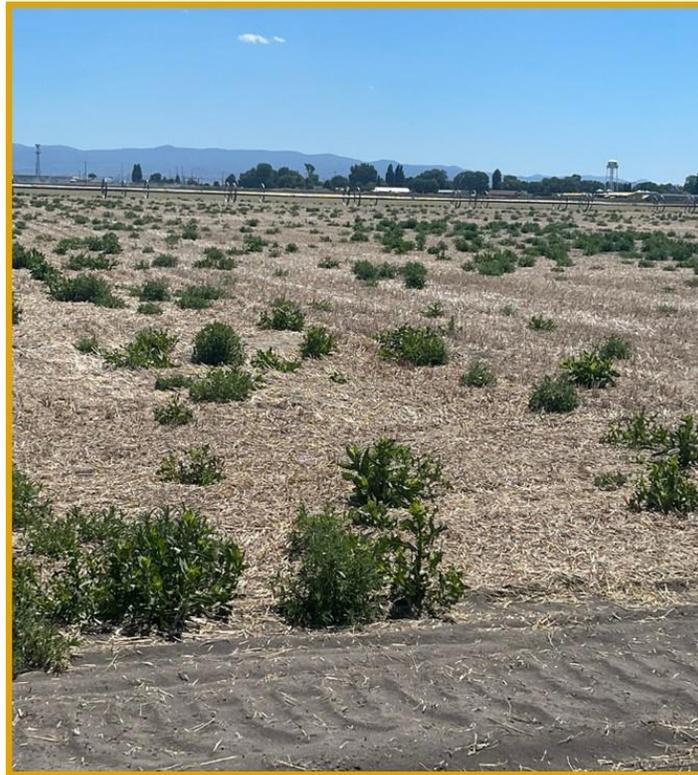


# 2023 Spring Research Update



## Intermountain Research and Extension Center



University of California  
Agriculture and Natural Resources

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## **Kayad hired as an Ag. Engineer advisor at the University of California Intermountain Research and Extension Center, Tulelake, CA**

Ahmed Kayad started working as a UC Cooperative Extension Ag. Engineer advisor at the Intermountain Research and Extension Center (IREC) in January 2023. He will implement an applied research and extension program to address regional needs in relation to integrating and adapting new technologies related to mechanization, automation, and precision agriculture into intermountain cropping systems.

Kayad is an expert in developing precision and digital agriculture solutions at field scale to help farmers improve crop management, save money, and protect natural resources. His recent research activities prior to joining IREC include monitoring crop yield through ground and remote sensing for alfalfa and corn, using drone images for weed detection in vegetable crops, and investigating the impact of digital solutions in agriculture.

Kayad earned a Ph.D in the field of digital agriculture from the University of Padua, Italy, studying corn yield mapping through ground and remote sensing techniques. He earned a bachelor's and Master's in Agricultural Engineering from Alexandria University, Egypt and King Saud University, Saudi Arabia respectively. Along with his education training, Kayad worked as a service engineer at farm equipment manufacturer, CLAAS, in Egypt specializing in hay balers and forage/grain combine harvesters. He was a visiting doctoral researcher at the International Maize and Wheat Improvement Center (CIMMYT), Mexico in 2020. Most recently, Kayad worked for UC Riverside as a postdoctoral researcher focusing on using drone imaging for weed detection.



Kayad is eager to investigate differences in crop growth and development within agricultural fields in Modoc and Siskiyou counties using satellite, drone and ground sensors. One of his first objectives is to map fields spatial and temporal yield variability to better understand management practices that increase crop production. Such information can allow farmers to make better and informed management decisions across their farming operation. Furthermore, he is willing to investigate and evaluate digital solutions for agricultural management practices such as weed robots, variable rate application equipment, drone and sensors applications.

Kayad is located at the Intermountain Research and Extension Center and can be reached at [agkayad@ucanr.edu](mailto:agkayad@ucanr.edu) or calling his office at (530) 667-5117.

# Managing Fallow Lands for Future Benefits

Written By Rob Wilson

The drought and numerous irrigation curtailments tied to fish centric water management along the Klamath River has forced many farms and ranches to reduce their irrigated acreage the last several years. Most crops grown in the Klamath Basin require full season irrigation for economically viable yields, thus farmers normally decide to leave some fields unirrigated to fully irrigate other fields and comply with curtailment regulations. Crops such as established alfalfa and winter grain can be grown without irrigation, but in some cases the best option for lands without irrigation is dryland fallow. Dryland fallow is the decision to not plant a crop and instead manage the land to conserve rainfall as stored soil water. Fallowing ground also helps suppress soilborne pests and increase soil nutrients.

In spring and summer, weed management often has the greatest impact on the success or failure of fallowing land. Growers can conserve significant soil moisture, reduce weed seeds in the soil, and suppress soilborne pests when weeds are controlled when they are small in spring and early summer. If weeds are allowed to grow large and produce seed, growers will likely see a huge increase in weed seeds in the soil, pest population remain high as insects and diseases can reproduce on weeds, and the weeds use most stored soil moisture. Mowing and disking large weeds is a good practice to prevent allowing weed seeds to blow on neighboring fields, but it provides little benefit to fallowed lands. In fall and winter months, residue retention such as leaving stubble or planting a cover crop provides the greatest benefit to retention of soil moisture and preventing soil erosion.

Timing of weed control activities is often the most influential component of a successful weed control program. Weeds are much easier to control when they are small and actively growing. Controlling small weeds also helps conserve soil moisture and soil nutrients. Annual weeds must be controlled before flowering to prevent weed seed production. Mowing, disking, and spraying annual weeds after flowering does not reduce weed seed production.

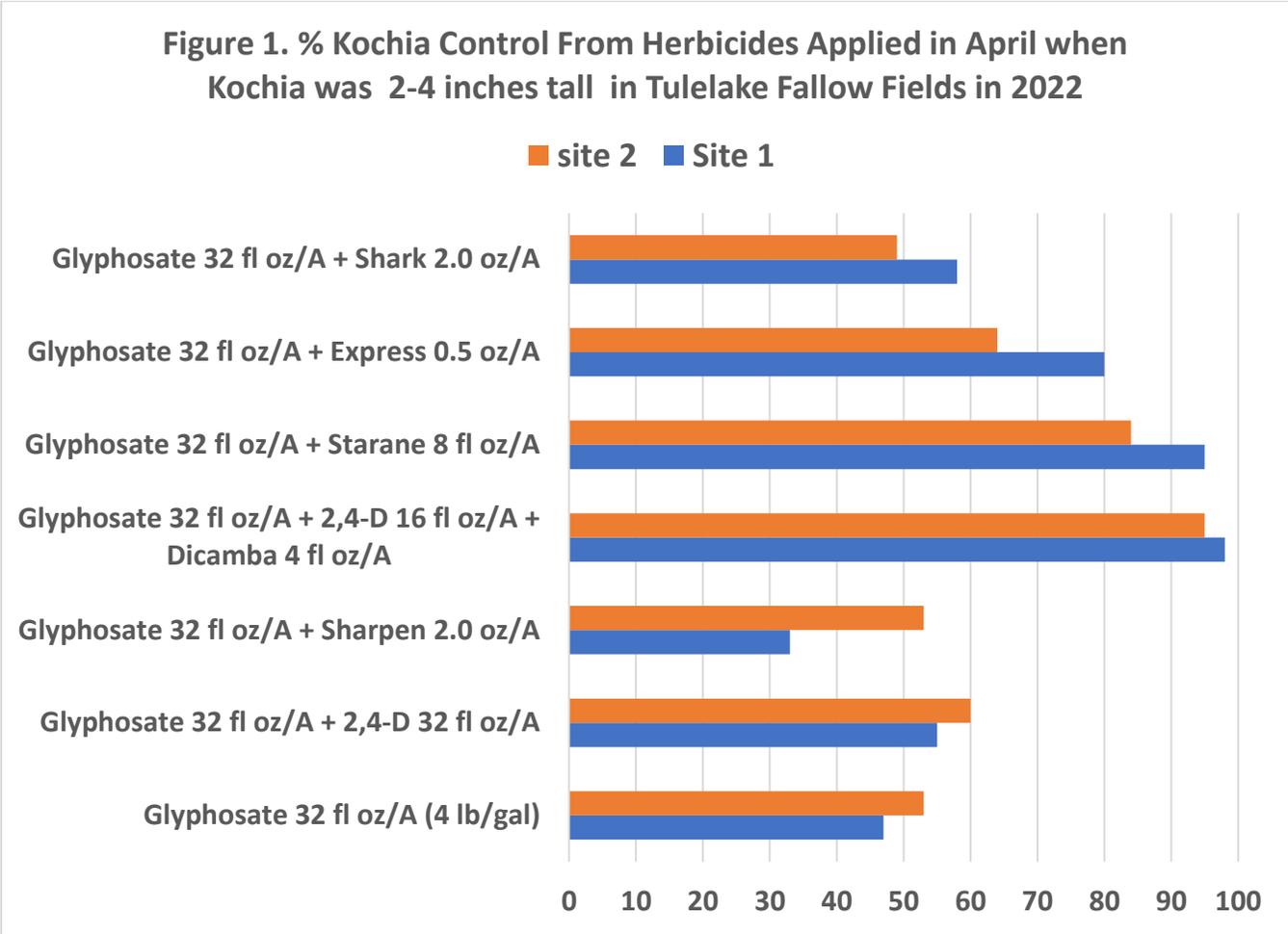
One problem with controlling weeds in dryland fallow is drought stressed weeds are more difficult to control with herbicides compared to weeds growing in irrigated crops. Weeds growing in fallow lands lack crop competition and hot, dry conditions increase plants' cuticle wax thickness, close stomata holes, and slow translocation (all factors that decrease herbicide activity). Some people have suggested drought stressed weed have developed resistance to herbicides, but university trials often show herbicides are effective when used at the correct timing and rate.

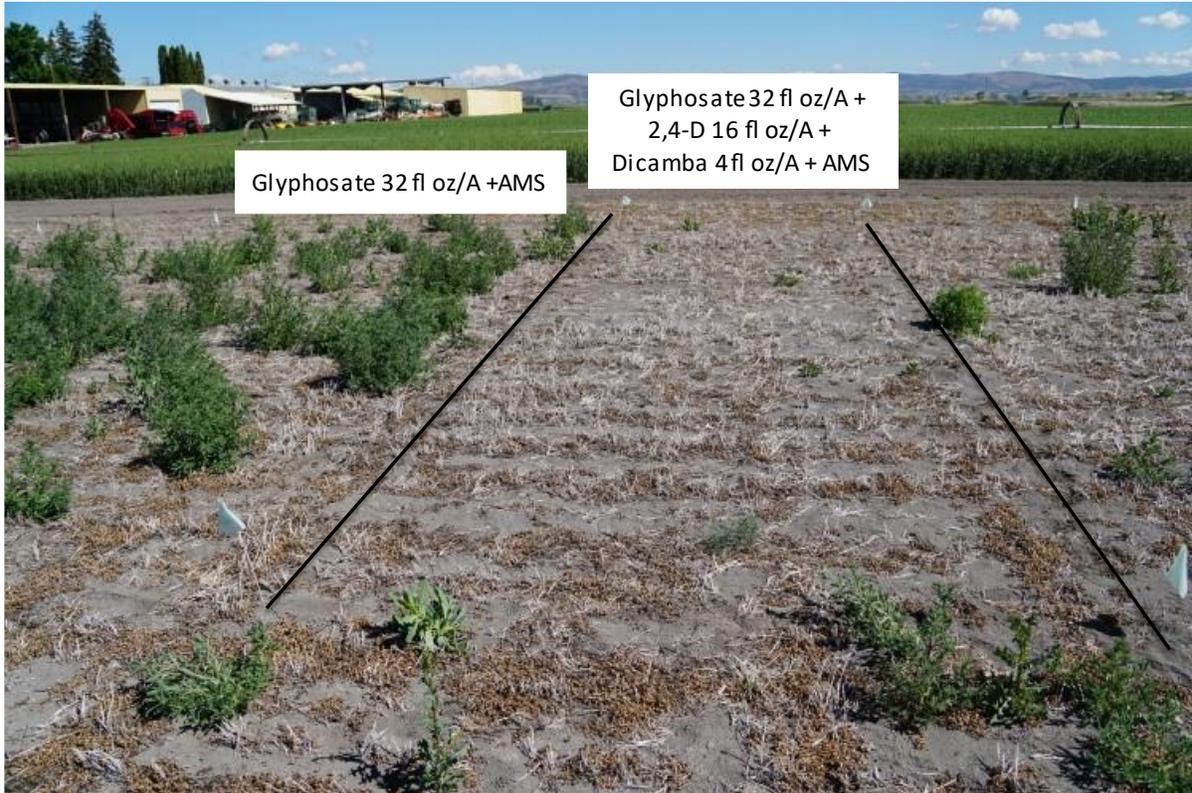


**Figure. One tumbling kochia plant can spread seed across a field.**

Maximizing herbicide performance on drought stressed weeds often comes down to applying herbicides to small weeds before they are stressed and considering adding a preemergence herbicide to control weeds that may germinate after application. Spraying at a cooler time of the day with large spray droplets can help increase the amount of time herbicide solution sits on leaves increasing absorption into the weed. Surfactants and oil additives are also very helpful at increasing herbicide absorption in weeds. In University trials conducted in Northeast California, adding ammonium sulfate before adding glyphosate in the spray tank greatly improves glyphosate activity on drought-stressed weeds.

In 2022, IREC staff conducted a trial on fallow land to test herbicide efficacy for controlling kochia throughout the season. Kochia was treated in the spring when it was 2-4 inches tall. Results from the trial are shown in the Figure 1. Treatments with glyphosate in combination with dicamba or fluroxypyr provided the best kochia control (Figure 2). Treatments with glyphosate alone or glyphosate in combination with burndown herbicides such as Sharpen and Shark only provided partial control.





**Figure 2. Differences in Kochia Control between herbicide treatments at IREC.**

In summary, treating annual weeds when they are small usually results in the best control with herbicides. Growers need to realize drought stressed weeds are more difficult to control especially when they are large, but control is extremely important for future land productivity. Weeds that set seed often create a tremendous weed problem for years to come.

# Alfalfa Production Considerations after Two Consecutive Years of Water Curtailment

Written By Rob Wilson

Alfalfa fields (and farmers) throughout the Klamath Project have witnessed rough times the last two years. Several alfalfa fields received partial irrigation or no irrigation stressing plants making them more prone to disease, weed invasion, and rodent damage. Many alfalfa fields also had significant weed seed production from escaped winter annual weeds such as shepherdspurse last winter. The most likely cause for the poor weed control appears to be a trend of winter annual weeds germinating earlier in the fall and growing too big for control with herbicides applied in late winter. Another factor that worked against herbicide control last year was the lack of rain to incorporate dormant herbicides applied in late winter.

Below are some alfalfa production topics growers should consider going into 2023 to increase yield, profit, and stand longevity.

**Weed Control-** Growers and PCAs need to scout fields for weeds this winter. Many fields will likely have high weed populations given the weed escapes last year and the moist soil conditions throughout the winter. In fields with large shepherdspurse and flixweed, growers may want to consider using Pursuit or Raptor if weeds are too large to control with burndown herbicides such as Gramoxone or Sharpen. Another consideration is possibly applying burndown herbicides in the fall to control shepherdspurse when its small with a tiny root system. In fields with small winter annual weeds, a dormant application of a burndown herbicide such as Sharpen in combination with a preemergent herbicide such as Sencor or Chateau has provided effective weed control in University trials.

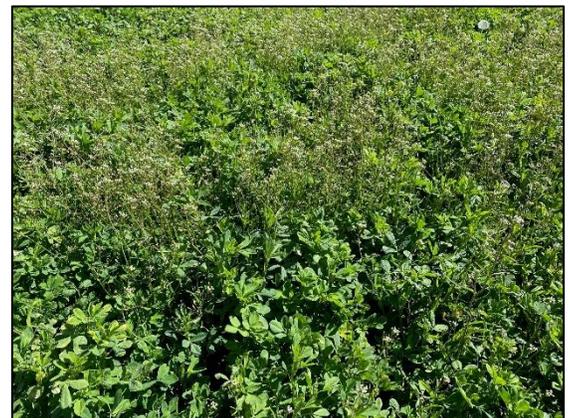


Figure. Shepherdspurse invading alfalfa

**Rodents-** Many alfalfa fields saw a substantial increase in gopher, squirrel, and vole populations over the last couple years. The increase in alfalfa acreage has created a continuum of neighboring alfalfa fields throughout the Basin allowing gophers and squirrels to migrate to neighboring alfalfa fields after stand removal. This phenomenon means growers should be constantly vigilant of rodents establishing along field borders and aggressively control new rodent populations before they invade the entire field. It's a good idea to implement an aggressive trapping or poison program after harrowing when it's easy to identify active gopher mounds. Another option for control is to consider flooding alfalfa if adequate water is available. Most fields lack flood checks as they have been



Figure. Gopher mound in alfalfa

irrigated with sprinklers for several years, but pulling flood checks and flooding for a year is one of the few methods that can control large populations of burrowing rodents after alfalfa greenup.

**Irrigation-** Prioritize irrigation water to your most productive fields. In fields that only receive partial irrigation, apply allocated water to refill the soil profile before 1<sup>st</sup> cutting and remaining water before 2<sup>nd</sup> cutting. The first two cuttings make up 70% of total yield in a 3-cut system, and once alfalfa is drought stressed in summer plants will go dormant until fall. It makes little sense to irrigate fields throughout the season after fields stop growing due to drought stress. If surface water is available, many producers will likely want to start new fields of alfalfa. Growers should avoid growing alfalfa stands back-to-back. Planting a new alfalfa field without rotating to another crop often leads to immediate problems with rodents and alfalfa diseases. In fields with poor stands or low yield potential, consider rotating out of alfalfa to a grain or a row crop for a few years. New alfalfa stands should be planted fields that were idled or rotated out of alfalfa for at least two years.

# Latest Alfalfa Variety Yield Results

University of California  
Agriculture and Natural Resources



Research and Extension Center System

By Chris DeBen, Dan Putnam, UC Davis

Choosing superior varieties of alfalfa is a significant economic factor for alfalfa growers. Many commercial varieties are currently available, enabling wide range of options. UC trials provide unbiased data from a wide range of environments related to variety performance of alfalfa. In California, alfalfa is grown from the Oregon border to the Mexican border, and throughout the Great Central Valley, which consists of the Sacramento and San Joaquin Valleys. The tables below represent sites using a 3-4 cut system (dormant varieties) in the Intermountain Region. See the University of California Alfalfa and Forages Website for full report and more information. <http://alfalfa.ucdavis.edu>



**Yield Studies:** The California Alfalfa Cultivar Yield, Fall Dormancy, and Forage Quality Trials are open to any certified alfalfa cultivar, which is sold or is likely to be sold in California. Blends or brands (unless they are certified blends) are not included in these trials. Experimental cultivars with a high likelihood of release within the next few years are tested as space permits.

Cutting schedules were determined by the most common practice in that region and are the same for all varieties within a trial. The data is obtained from each of the locations and analyzed and summarized at the UC Davis campus.

**2017 UC Tulelake Drought Trial** -- This trial was planted with 44 entries on May 22, 2017. IN 2022, THIS TRIAL WAS CONDUCTED WITH ZERO ADDITIONAL IRRIGATION WATER. This was due to the sudden cutoff of water in the Klamath irrigation project due to the drought and Endangered Species Act – but it also gave us an opportunity to test lines under drought. Approximately 8” of rainfall was contributed during the winter rainy period, far below normal for this region. Thus, this should be considered a ‘drought’ trial, with the crop growing based only upon residual moisture with zero additions of moisture starting in mid-first cutting growth period. Three cuttings were taken during the 2022 season with the first cutting taking place on June 24, 2022. Surprisingly, these first two cuttings of 2022 were similar to 2021 (also not irrigated that year), and the first two cuttings under fully irrigated conditions in 2020 (see results on-line at <https://alfalfa.ucdavis.edu> for previous year’s trials). This trial demonstrated that substantial yields can be achieved with only natural rainfall and residual moisture in these soil types. Single year results from the 2022 harvests are provided in Table 1. The average yield across all varieties was 7.1 tons/acre. The yearly yield averages between high and low varieties (8.0 t/A and 6.2 t/A respectively)

varied by 1.8 tons or about 29% of the lowest yielding line. Yields for 2017-2022 averaged nearly 7.3 tons/acre, ranging from 6.6 -7.7 t/A (Table 2). It should be pointed out that this trial was spring planted, and thus yields were understandably low for 2017, and no additional irrigation for the final two years of the trial in 2021-2022. The CVs were relatively low, indicating good control of variation over each cut in this trial.

**THE NEARLY FULL YIELD OF THIS TRIAL DURING 2021 AND 2022 UNDER RAIN-FED (DROUGHT) CONDITIONS IS NOTHING SHORT OF ASTOUNDING.**

Yields were reduced approximately 1.5 to 2 tons/acre in year 4 and 5 (with zero irrigation water) compared with years 2 and 3, which were fully watered. Plants survived well. Yields declined especially in the third cutting of each year compared with previous year's fully watered trials. Vernal control, normally at the bottom of our trials, was mid-pack in this trial. The top 1/3 of this trial may be considered as candidates for rainfed (dryland) types of production. However, the excellent performance of this trial during drought is an unusual result and should not be extrapolated to other soil types. These high organic matter Tulelake soils have tremendous depth and water-holding capacity, a residue of the old Tule Lake bed. We have observed rooting depths of greater than 8 feet in trenches dug here. We would expect very different results on a high mineral soil and especially on sandy or sandy-loam soils, so this data should be view with caution.

**2021 UC Tulelake Variety Trial-** This 24-entry trial was planted 8/19/21 to replace the 2017 planting. Three harvests were taken in 2022, the first year of harvest. The average yield for this trial was 7.6 t/A with a spread of 7.0-8.3 t/A among varieties (Table 3). Unlike the 2017-planted trial, this trial was fully irrigated throughout 2022.



**2021-2022 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL (Drought). TRIAL PLANTED 5/22/17**

		2021	2022	Average		% of
		Yield	Yield			Vernal
	FD		Dry t/a			
<b>Released Varieties</b>						
54Q29	4	7.24 ( 1)	7.77 ( 2)	7.51 ( 1)	A	111.1
HybriForce-3600	6	7.06 ( 4)	7.76 ( 3)	7.41 ( 2)	A B	109.7
Nexgrow 6422Q	4	6.87 ( 9)	7.95 ( 1)	7.41 ( 3)	A B	109.6
Integra 8450	4	7.03 ( 5)	7.71 ( 4)	7.37 ( 4)	A B C	109.1
FG R513W227S	5	7.09 ( 2)	7.32 (18)	7.21 ( 5)	A B C D	106.6
WL377HQ	5	6.95 ( 6)	7.43 (14)	7.19 ( 6)	A B C D	106.4
WL365HQ	5	6.74 (13)	7.62 ( 5)	7.18 ( 7)	A B C D E	106.2
SW4107	4	6.65 (18)	7.62 ( 6)	7.13 ( 8)	A B C D E F	105.5
Archer III	5	6.69 (15)	7.51 ( 9)	7.10 (10)	B C D E F G H	105.1
Genuity-RR	4	7.09 ( 3)	7.11 (26)	7.10 (11)	B C D E F G H	105.0
HybriForce-4400	4	6.76 (10)	7.43 (13)	7.09 (12)	B C D E F G H	105.0
FG R513W224S	5	6.89 ( 8)	7.26 (21)	7.08 (13)	B C D E F G H I	104.7
Nexgrow 6585Q	5	6.65 (19)	7.46 (11)	7.05 (14)	B C D E F G H I J	104.4
SW5210	6	6.53 (25)	7.56 ( 7)	7.04 (15)	B C D E F G H I J	104.2
PG459	4	6.67 (17)	7.38 (15)	7.03 (16)	B C D E F G H I J	104.0
Dekalb 43-13	4	6.74 (14)	7.31 (19)	7.02 (17)	B C D E F G H I J	104.0
SW5213	5	6.92 ( 7)	7.02 (27)	6.97 (19)	D E F G H I J K	103.1
Integra 8420	4	6.42 (30)	7.46 (12)	6.94 (20)	D E F G H I J K L	102.7
Xtra-3	4	6.59 (21)	7.26 (20)	6.93 (21)	D E F G H I J K L	102.5
WL363HQ	5	6.58 (22)	7.21 (23)	6.90 (22)	D E F G H I J K L M	102.0
HybriForce-3420/Wet	4	6.19 (36)	7.52 ( 8)	6.85 (23)	D E F G H I J K L M N	101.4
AmeriStand 545NT RR	5	6.68 (16)	7.01 (28)	6.85 (24)	D E F G H I J K L M N	101.3
4R200	4	6.38 (32)	7.20 (24)	6.79 (25)	E F G H I J K L M N O	100.4
FG R410W253	4	6.75 (11)	6.79 (35)	6.77 (26)	F G H I J K L M N O	100.2
Vernal	2	6.18 (38)	7.34 (17)	6.76 (27)	F G H I J K L M N O P	100.0
Ameristand 445-NT	4	6.23 (35)	7.22 (22)	6.72 (28)	G H I J K L M N O P	99.5
Integra 8444R	4	6.44 (29)	6.93 (30)	6.69 (30)	I J K L M N O P Q	99.0
WL 372HQ-RR	5	6.45 (28)	6.92 (31)	6.68 (31)	I J K L M N O P Q	98.9
FG R513M225S	5	6.38 (31)	6.94 (29)	6.66 (32)	J K L M N O P Q	98.6
Ameristand 427TQ	4	6.12 (40)	7.13 (25)	6.62 (33)	K L M N O P Q R	98.0
Hi-Gest 360	3	6.10 (41)	6.85 (32)	6.47 (36)	N O P Q R S	95.8
HybriForce-3430	3	5.91 (44)	6.82 (34)	6.36 (38)	P Q R S	94.2
<b>Experimental Varieties</b>						
msSunstra-143146	3	6.75 (12)	7.47 (10)	7.11 ( 9)	A B C D E F G	105.2
msSunstra-155202	6	6.60 (20)	7.38 (16)	6.99 (18)	C D E F G H I J K	103.4
RRL414M104	4	6.57 (23)	6.84 (33)	6.70 (29)	H I J K L M N O P Q	99.2
H0415QT111	4	6.53 (24)	6.59 (37)	6.56 (34)	L M N O P Q R S	97.1
RRL514W209	5	6.47 (26)	6.54 (38)	6.50 (35)	M N O P Q R S	96.2
SW4466	4	6.03 (42)	6.78 (36)	6.40 (37)	O P Q R S	94.8
H0415ST202	4	6.18 (37)	6.46 (40)	6.32 (39)	Q R S	93.6
H0515QT102	5	6.34 (33)	6.31 (42)	6.32 (40)	Q R S	93.5
RRL414W208	4	6.46 (27)	6.16 (44)	6.31 (41)	Q R S	93.3
H0415A3144	4	6.00 (43)	6.53 (39)	6.26 (42)	R S	92.7
RRL414M377	4	6.15 (39)	6.34 (41)	6.24 (43)	R S	92.4
RRL514W201	5	6.24 (34)	6.20 (43)	6.22 (44)	S	92.1
MEAN		6.55	7.12	6.84		
CV		6.87	5.85	4.90		
LSD (0.1)		0.53	0.50	0.40		

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.

FD = Fall Dormancy reported by seed companies.

\*No supplemental irrigation used for 2021-22 harvests (only natural rainfall and residual soil moisture)

2017-2020 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 5/22/17

		2017	2018	2019	2020	Average		% of
		Yield	Yield	Yield	Yield			Vernal
	FD			Dry t/a				
<b>Released Varieties</b>								
WL365HQ	5	3.80 ( 9)	9.64 ( 9)	9.42 ( 2)	9.23 ( 1)	8.02 ( 1)	A	116.7
HybriForce-4400	4	4.14 ( 4)	9.74 ( 6)	8.95 (10)	8.63 (21)	7.86 ( 2)	A B	114.4
Integra 8450	4	3.76 (11)	9.72 ( 7)	9.03 ( 5)	8.88 ( 6)	7.85 ( 3)	A B C	114.1
SW5210	6	3.74 (12)	9.51 (12)	9.05 ( 4)	8.92 ( 4)	7.81 ( 5)	A B C D	113.6
SW4107	4	3.04 (29)	9.84 ( 2)	9.50 ( 1)	8.84 ( 8)	7.81 ( 6)	A B C D	113.5
Nexgrow 6422Q	4	3.03 (35)	9.89 ( 1)	9.27 ( 3)	8.98 ( 3)	7.79 ( 7)	A B C D E	113.3
HybriForce-3430	3	3.98 ( 6)	9.79 ( 4)	8.66 (22)	8.37 (29)	7.70 ( 8)	B C D E F	112.0
WL363HQ	5	3.78 (10)	9.26 (21)	8.94 (11)	8.75 (13)	7.68 ( 9)	B C D E F	111.7
Nexgrow 6585Q	5	3.74 (13)	9.25 (22)	8.83 (15)	8.89 ( 5)	7.68 (10)	B C D E F	111.7
FG R513W224S	5	3.64 (18)	9.50 (13)	8.92 (12)	8.64 (18)	7.68 (11)	B C D E F	111.6
WL377HQ	5	3.04 (27)	9.66 ( 8)	8.98 ( 6)	8.88 ( 7)	7.64 (12)	B C D E F	111.1
HybriForce-3420/Wet	4	4.09 ( 5)	9.57 (10)	8.55 (30)	8.25 (36)	7.61 (13)	C D E F	110.7
SW5213	5	3.51 (22)	9.51 (11)	8.82 (16)	8.61 (22)	7.61 (14)	C D E F	110.7
FG R513W227S	5	3.27 (24)	9.20 (26)	8.96 ( 8)	9.01 ( 2)	7.61 (15)	C D E F	110.7
FG R513M225S	5	3.71 (16)	9.19 (27)	8.69 (20)	8.80 (11)	7.60 (16)	D E F	110.5
54Q29	4	3.04 (30)	9.76 ( 5)	8.95 ( 9)	8.63 (20)	7.59 (17)	D E F	110.5
HybriForce-3600	6	4.28 ( 2)	9.25 (23)	8.32 (36)	8.53 (24)	7.59 (18)	D E F	110.4
FG R410W253	4	3.61 (20)	9.20 (24)	8.67 (21)	8.82 ( 9)	7.58 (19)	D E F G	110.2
Genuity-RR	4	3.74 (14)	9.20 (25)	8.81 (17)	8.53 (23)	7.57 (20)	D E F G	110.1
AmeriStand 545NT Rf	5	3.41 (23)	9.35 (17)	8.83 (14)	8.66 (16)	7.56 (21)	E F G	110.0
Xtra-3	4	3.54 (21)	9.41 (15)	8.89 (13)	8.39 (27)	7.56 (22)	E F G	110.0
Dekalb 43-13	4	3.81 ( 8)	9.27 (19)	8.71 (19)	8.38 (28)	7.54 (23)	F G H	109.7
Integra 8444R	4	3.72 (15)	9.27 (20)	8.42 (34)	8.67 (15)	7.52 (25)	F G H I	109.4
PGI459	4	4.16 ( 3)	9.01 (31)	8.64 (23)	8.25 (35)	7.52 (26)	F G H I J	109.3
Archer III	5	3.03 (38)	9.41 (16)	8.62 (27)	8.32 (32)	7.34 (27)	G H I J K	106.8
Integra 8420	4	3.03 (34)	9.42 (14)	8.44 (33)	8.28 (33)	7.29 (30)	I J K	106.1
Hi-Gest 360	3	3.03 (39)	9.30 (18)	8.63 (26)	8.17 (39)	7.28 (31)	J K	105.9
WL 372HQ-RR	5	3.02 (42)	9.19 (28)	8.56 (29)	8.18 (38)	7.24 (33)	K L	105.3
4R200	4	3.67 (17)	8.72 (37)	8.29 (37)	8.24 (37)	7.23 (35)	K L M	105.1
Ameristand 427TQ	4	3.04 (25)	8.95 (32)	8.24 (38)	7.77 (43)	7.00 (40)	M N O P	101.8
Ameristand 445-NT	4	3.04 (26)	8.86 (35)	8.12 (40)	7.82 (42)	6.96 (41)	N O P	101.2
Vernal	2	3.03 (32)	8.68 (39)	8.10 (41)	7.69 (44)	6.88 (43)	O P	100.0
<b>Experimental Varieties</b>								
msSunstra-143146	3	4.30 ( 1)	9.83 ( 3)	8.73 (18)	8.50 (25)	7.84 ( 4)	A B C	114.0
SW4466	4	3.62 (19)	9.13 (29)	8.98 ( 7)	8.36 (30)	7.52 (24)	F G H I	109.4
RRL414M377	4	3.04 (28)	8.86 (34)	8.52 (31)	8.82 (10)	7.31 (28)	H I J K	106.3
msSunstra-155202	6	3.86 ( 7)	9.03 (30)	8.04 (42)	8.26 (34)	7.30 (29)	I J K	106.2
RRL414M104	4	3.03 (40)	8.69 (38)	8.63 (24)	8.76 (12)	7.28 (32)	J K	105.9
RRL514W209	5	3.03 (31)	8.63 (40)	8.57 (28)	8.70 (14)	7.23 (34)	K L M	105.2
H0415ST202	4	3.03 (37)	8.87 (33)	8.63 (25)	8.36 (31)	7.22 (36)	K L M	105.0
H0415A3144	4	3.03 (36)	8.73 (36)	8.45 (32)	8.44 (26)	7.16 (37)	K L M N	104.1
H0515QT102	5	3.02 (41)	8.43 (42)	8.33 (35)	8.65 (17)	7.11 (38)	K L M N O	103.3
H0415QT111	4	3.02 (44)	8.46 (41)	8.00 (44)	8.63 (19)	7.03 (39)	L M N O	102.2
RRL414W208	4	3.02 (43)	8.42 (43)	8.15 (39)	8.14 (40)	6.93 (42)	N O P	100.8
RRL514W201	5	3.03 (33)	8.20 (44)	8.01 (43)	7.90 (41)	6.79 (44)	P	98.7
MEAN		3.44	9.20	8.66	8.51	7.45		
CV		8.16	3.66	3.47	3.97	2.69		
LSD (0.1)		0.33	0.40	0.36	0.40	0.24		

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.

FD = Fall Dormancy reported by seed companies.

## 2021 Planted Tulelake Yield Trial:

### 2022 YIELDS, TULELAKE ALFALFA CULTIVAR TRIAL. TRIAL PLANTED 8/19/21

Note: Single year data should not be used to evaluate alfalfa varieties or choose alfalfa cultivars

		Cut 1	Cut 2	Cut 3	YEAR		% of	
		24-Jun	8-Aug	14-Sep	TOTAL		VERNAL	
	FD		Dry t/a					
<b>Released Varieties</b>								
Magna150RR	4	3.69 ( 4)	3.04 ( 1)	1.61 ( 2)	8.33 ( 1)	A	110.3	
54Q29	4	3.78 ( 1)	2.89 ( 3)	1.59 ( 4)	8.26 ( 2)	A	109.3	
HybriForce-4420/Wet	4	3.66 ( 5)	2.83 ( 5)	1.63 ( 1)	8.11 ( 3)	A B	107.4	
54VQ52	4	3.72 ( 3)	2.62 (14)	1.55 ( 6)	7.90 ( 4)	A B C	104.6	
AWS 455 salt	4	3.46 (11)	2.82 ( 6)	1.59 ( 3)	7.87 ( 6)	A B C D	104.2	
AWS 418RL	4	3.50 (10)	2.86 ( 4)	1.51 (13)	7.87 ( 7)	A B C D	104.2	
WL377 HQ	5	3.63 ( 7)	2.64 (10)	1.43 (18)	7.71 ( 8)	B C D E	102.1	
6453Q	4	3.59 ( 8)	2.60 (16)	1.51 (12)	7.70 ( 9)	B C D E	102.0	
Ameristand 428TQ	4	3.53 ( 9)	2.68 ( 8)	1.45 (16)	7.66 (10)	B C D E	101.4	
Bison Alfalfa	3.5	3.15 (24)	2.98 ( 2)	1.51 (11)	7.64 (11)	C D E	101.1	
AFX 439	4	3.64 ( 6)	2.54 (21)	1.38 (23)	7.56 (12)	C D E F	100.1	
Vernal	2	3.45 (12)	2.74 ( 7)	1.36 (24)	7.55 (13)	C D E F G	100.0	
6585Q	5	3.28 (19)	2.66 ( 9)	1.54 ( 7)	7.48 (14)	C D E F G	99.1	
Nexgrow 6516R	4.5	3.38 (14)	2.56 (19)	1.52 (10)	7.46 (15)	C D E F G	98.8	
WL341 HVXRR	4	3.43 (13)	2.59 (17)	1.39 (22)	7.42 (16)	D E F G	98.3	
LG5R300	5	3.33 (18)	2.63 (13)	1.46 (15)	7.41 (17)	D E F G	98.2	
WL375 HVXRR	4.6	3.34 (17)	2.63 (12)	1.41 (20)	7.37 (18)	E F G	97.5	
AWS 390	3.9	3.22 (20)	2.57 (18)	1.57 ( 5)	7.35 (19)	E F G	97.3	
Ameristand 416NT RR	4	3.36 (16)	2.56 (20)	1.40 (21)	7.32 (20)	E F G	96.9	
LG4R300	4	3.36 (15)	2.47 (23)	1.42 (19)	7.25 (21)	E F G	96.1	
Ameristand 446NT	4	3.16 (23)	2.63 (11)	1.46 (14)	7.25 (22)	E F G	96.0	
Ameristand 518NT	5	3.16 (22)	2.47 (22)	1.53 ( 9)	7.16 (23)	F G	94.8	
WL3441 RR	4	3.18 (21)	2.45 (24)	1.45 (17)	7.08 (24)	G	93.8	
<b>Experimental Varieties</b>								
SW4615	5	3.74 ( 2)	2.60 (15)	1.53 ( 8)	7.87 ( 5)	A B C D	104.3	
MEAN		3.45	2.67	1.49	7.61			
CV		6.41	7.27	7.25	5.11			
LSD (0.1)		0.27	0.24	0.13	0.47			

Trial seeded at 25 lb/acre viable seed at Intermountain Research and Extension Center, Tulelake, CA.

Entries followed by the same letter are not significantly different at the 10% probability level according to Fisher's (protected) LSD.

FD = Fall Dormancy reported by seed companies.

# 2022 Grass Forage Variety Trial Report

University of California  
Agriculture and Natural Resources



Research and Extension Center System

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## Introduction

This report summarizes hay forage yield and agronomic characteristics for public and private entries in IREC's 2021-2022 grass forage variety testing. IREC forage trials were irrigated using well water thanks to a well on site and TID support. All varieties were planted on September 10<sup>th</sup>, 2020 at the following pure live seed rates: Orchard Grass: 15 lbs , Tall and Meadow Fescue: 20lbs, Timothy and Reed Canarygrass: 5 lbs, Tall Wheatgrass: 10 lbs, and Meadow Bromegrass : 8 lbs.



## General Trial Information for all trials

**Location:** Intermountain Research and Extension Center, Tulelake, CA

**Soil Type:** Tulebasin mucky silty clay loam

**Irrigation amount:** Fully irrigated according to ET.

**Pest Management:** Typical herbicides for grass, spot treatment for rodents

**Fertilizer:**

**Pre-plant 2020:** 22# N/Acre, 100# P205 and 100# K20

**2021 Season:** 100# N/Acre Before 1<sup>st</sup> cutting; 75# N/Acre after each cutting  
Fall: 100# P205, 150# K20 and 22# N/Acre

**2022 Season:** 150# N/Acre Before 1<sup>st</sup> cutting; 75# N/Acre after each cutting  
Fall: 100# P205, 150# K20 and 22# N/Acre

**Harvest Dates 2021:** 3-Cut Orchardgrass: 6-8, 7-20 and 9-21

3-Cut Fescue: 6-4, 7-20 and 9-21

2-Cut Timothy: 6-17 and 8-25

**Harvest Dates 2022:** 3-Cut Orchardgrass: 6-28, 8-10 and 9-15

3-Cut Fescue: 6-23, 8-10 and 9-15

2-Cut Timothy: 7-7 and 8-17

**Table 1: 2021-2022 YIELDS, 3-Cut Orchard Grass Variety Trial**

	2021	2022		2 Year Total 100% Dry Matter Yield Tons/Acre
	100% Dry Matter Yield Tons/Acre	100% Dry Matter Yield Tons/Acre	Heading Date	
Quickdraw HSG	11.96 a <sup>1</sup>	6.76 a	26-Jun	18.72 a
Barlegrow	11.05 ab	7.17 a	23-Jun	18.22 ab
Endurance	11.27 ab	6.88 a	21-Jun	18.14 ab
Rushmore II	11.11 ab	6.97 a	25-Jun	18.08 abc
Persist	10.94 abc	7.11 a	25-Jun	18.05 abc
Potomac	11.19 ab	6.80 a	27-Jun	17.99 abc
Devour	10.51 abc	7.46 a	21-Jun	17.97 abc
Latar	10.95 abc	6.80 a	25-Jun	17.75 abc
Icon	11.06 ab	6.64 a	25-Jun	17.71 abc
Baridana	11.15 ab	6.50 a	18-Jun	17.64 abc
Alpine II	11.06 ab	6.51 a	25-Jun	17.57 abc
Pennlate	10.68 abc	6.85 a	26-Jun	17.52 abc
Paiute	10.72 abc	6.80 a	24-Jun	17.52 abc
Echelon	10.66 abc	6.84 a	25-Jun	17.49 abc
Mammoth	11.06 ab	6.43 a	27-Jun	17.49 abc
Tekapo	10.62 abc	6.78 a	27-Jun	17.40 abc
Crown Royale	10.85 abc	6.42 a	24-Jun	17.27 abc
Profit	11.07 ab	6.19 a	24-Jun	17.26 abc
Extend	11.18 ab	6.07 a	22-Jun	17.25 abc
Intensiv	10.50 abc	6.66 a	23-Jun	17.16 abc
Hallmark	10.91 abc	6.20 a	23-Jun	17.10 abc
Husar	10.75 abc	6.34 a	23-Jun	17.09 abc
Niva	10.72 abc	6.35 a	22-Jun	17.07 abc
HLR Blend	10.44 abc	6.55 a	24-Jun	16.99 abc
Harvestar	10.52 abc	6.37 a	23-Jun	16.89 abc
Bighorn	10.69 abc	6.05 a	24-Jun	16.74 abc
Baraula	10.00 bc	6.02 a	25-Jun	16.02 bc
Amba	9.43 c	6.38 a	19-Jun	15.81 c
Average	10.82	6.60	24-Jun	17.42

<sup>1</sup>Mean comparisons were performed using Tukey's-Kramer HSD; means with the same letter within columns are not significantly different

**Table 2: 2021-2022 YIELDS, 2-Cut Timothy Variety Trial**

	2021	2022		2 Year Total
	100% Dry Matter Yield	100% Dry Matter Yield	Heading Date	100% Dry Matter Yield Tons/Acre
Zenyatta	9.55 ab <sup>1</sup>	7.32 a	21-Jun	16.86 a
SDTF-Chisholm/Flecha	9.52 ab	7.29 a	28-Jun	16.82 a
KY-Early	10.81 a	5.82 ab	11-Jun	16.62 ab
Claire	9.59 ab	6.90 a	16-Jun	16.49 ab
Barfleo	9.46 ab	7.01 a	19-Jun	16.47 ab
Lischka	9.32 ab	6.73 a	21-Jun	16.04 abc
Aurora	8.74 bcd	6.96 a	20-Jun	15.70 abcd
Conquest	9.97 ab	5.62 ab	9-Jun	15.59 abcd
Basho	8.79 abc	6.44 ab	22-Jun	15.24 abcd
Tuuka	6.84 cde	6.85 a	24-Jun	13.69 bcde
Presto	7.14 cde	6.08 ab	23-Jun	13.21 cde
Barpenta	6.67 e	6.03 ab	27-Jun	12.70 de
Baronaise	6.22 e	5.31 ab	26-Jun	11.53 e
Climax	6.70 de	4.34 b	26-Jun	11.04 e
Average	8.52	6.34	21-Jun	14.86

<sup>1</sup>Mean comparisons were performed using Tukey's-Kramer HSD; means with the same letter within columns are not significantly different



**Table 3: 2021-2022 YIELDS, 3-Cut Tall Fescue Variety Trial**

	2021	2022		2 Year Total
	100% Dry Matter Yield Tons/Acre	100% Dry Matter Yield Tons/Acre	Heading Date	100% Dry Matter Yield Tons/Acre
Lipalma	13.77 abc <sup>1</sup>	8.50 a	16-Jun	22.27 a
Baroptima Plus E34*	13.99 ab	8.24 a	17-Jun	22.23 a
TF-Lacefield MaxQ II*	13.74 abc	8.45 a	15-Jun	22.20 a
Fawn	13.83 abc	8.09 a	21-Jun	21.92 ab
Armory	14.09 ab	7.68 a	14-Jun	21.77 ab
Bariane	13.83 abc	7.89 a	16-Jun	21.72 ab
Cajun II	13.50 abc	8.21 a	13-Jun	21.71 ab
Atlas II	14.30 a	7.35 a	19-Jun	21.65 ab
Barelite	13.98 abc	7.66 a	16-Jun	21.63 ab
FSG 402TF	13.27 abc	8.10 a	15-Jun	21.37 ab
Martin II Protek*	14.05 ab	7.31 a	16-Jun	21.36 ab
Estancia*	13.43 abc	7.86 a	16-Jun	21.28 ab
Tuscany II	13.20 abc	8.04 a	17-Jun	21.24 ab
TF-Jesup MaxQ II*	13.84 abc	7.33 a	16-Jun	21.17 ab
Rustler	13.24 abc	7.84 a	20-Jun	21.08 ab
Goliath	13.92 abc	7.16 a	16-Jun	21.08 ab
Jesup MaxQ*	13.15 abc	7.71 a	18-Jun	20.86 ab
Drover	12.87 abc	7.96 a	17-Jun	20.83 ab
Bronson	13.41 abc	7.38 a	13-Jun	20.79 ab
Kora	13.21 abc	7.52 a	15-Jun	20.72 ab
Barolex	13.12 abc	7.55 a	16-Jun	20.68 ab
Tower Protek*	13.09 abc	7.48 a	18-Jun	20.58 ab
Texoma MaxQ II*	12.70 abc	7.81 a	15-Jun	20.51 ab
Atlas	12.96 abc	7.50 a	18-Jun	20.46 ab
NF1100	11.94 c	8.05 a	14-Jun	19.99 ab
Hymark	12.32 abc	7.18 a	22-Jun	19.50 b
Teton II	12.06 bc	7.41 a	15-Jun	19.47 b
Average	13.36	7.75	14-Jan	21.11

\*Denotes Endophyte free

<sup>1</sup>Mean comparisons were performed using Tukey's-Kramer HSD; means with the same letter within columns are not significantly different

**Table 4: 2021-2022 YIELDS, 3-Cut Meadow Fescue Variety Trial**

	2021	2022		2 Year Total
	100% Dry Matter Yield Tons/Acre	100% Dry Matter Yield Tons/Acre	Heading Date	100% Dry Matter Yield Tons/Acre
Liherald	11.54 a <sup>1</sup>	6.41 a	13-Jun	17.96 a
Azov	10.89 ab	6.83 a	13-Jun	17.72 ab
KF Galaxy	10.94 ab	6.48 a	13-Jun	17.41 ab
Preval	11.19 ab	6.11 a	12-Jun	17.30 ab
Pradel	10.64 ab	6.40 a	13-Jun	17.05 ab
Driftless	10.77 ab	6.21 a	13-Jun	16.99 ab
Hidden Valley	10.21 b	5.66 ab	15-Jun	15.87 b
Tetrax	8.14 c	4.68 b	21-Jun	12.82 c
Average	10.54	6.10	11-Jan	16.64

<sup>1</sup>Mean comparisons were performed using Tukey's-Kramer HSD; means with the same letter within columns are not significantly different

**Table 5: 2021-2022 YIELDS, 3-Cut Other Grasses Variety Trial**

	2021	2022		2 Year Total
	100% Dry Matter Yield Tons/Acre	100% Dry Matter Yield Tons/Acre	Heading Date	100% Dry Matter Yield Tons/Acre
RC-Chiefton	9.93 ab <sup>1</sup>	8.07 a	22-Jun	18.00 a
RC-Palaton	10.23 ab	7.51 ab	21-Jun	17.74 a
MB-Macbeth	10.47 a	6.98 abc	6-Jun	17.46 a
MB-Cache	8.20 c	7.86 ab	6-Jun	16.05 ab
TW-NF6020 (Plainsman)	9.75 ab	5.39 cd	28-Jun	15.14 b
TW-Jose	8.95 bc	6.15 bcd	21-Jun	15.10 b
W-NF8000	9.41 abc	4.73 d	26-Jun	14.14 b
Average	9.56	6.67	11-Jan	16.23

<sup>1</sup>Mean comparisons were performed using Tukey's-Kramer HSD; means with the same letter within columns are not significantly different

MB = Meadow Bromegrass

RC = Reed Canarygrass

TW = Tall Wheatgrass

W = Rhizomatous wheatgrass, unk. species

# 2022 Small Grain Variety Trial Report

University of California  
Agriculture and Natural Resources



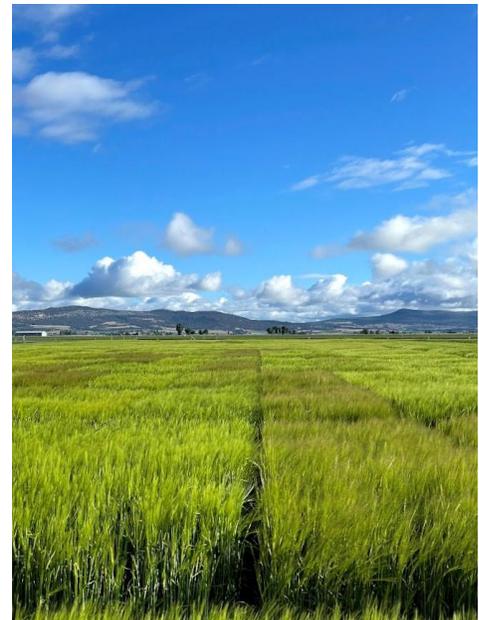
Research and Extension Center System

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## Introduction

This report summarizes grain yield and agronomic characteristics for public and private entries in IREC's 2022 small grain variety testing. Thanks to well water provided through Tulelake Irrigation District and a small well on-site, the 2022 IREC grain trials were fully irrigated. This project is a cooperative effort with Oregon State University's Cereal Variety Testing organized by Ryan Graebner and University of California Small Grain Breeding Programs. Research received funding support from the California Wheat Commission, private seed companies, and UC ANR. Trials conducted during the 2021-2022 growing season included: winter wheat, winter barley, spring hard wheat, spring soft wheat, and spring barley. Entries included released and experimental varieties adapted to Tulelake's high desert climate.

Grain yield and agronomic data was collected by IREC staff. Grain protein and test weights were generated in collaboration with Ryan Graebner, Oregon State University. Four-year average yield tables along with variety agronomic traits are summarized in this report. These tables can be viewed online along with other Northwest locations at: <https://cropandsoil.oregonstate.edu/wheat/variety-trials/2022-oregon-wheat-and-barley-yield-trial-data>



UC small grain variety trial summaries for multi-year and multi-trial data can be found at <http://smallgrainselection.plantsciences.ucdavis.edu/>.

## 2022 General Trial Information for all trials

<b>Location:</b>	Intermountain Research and Extension Center, Tulelake, CA
<b>Soil Type:</b>	Tulebasin mucky silty clay loam
<b>Weed Control:</b>	Rhomene MCPA @ 1 pt. /Acre; Detonate @ 2 fl oz./Acre; Express 0.5 oz./Acre
<b>Plot size:</b>	Winter Trials 75 ft <sup>2</sup> Spring Trials 75ft <sup>2</sup>
<b>Seeding Rate:</b>	100 lbs./Acre
<b>Row Spacing:</b>	6 Inches
<b>Number of Reps:</b>	4

## Hard Winter Wheat Trial

**Planting Date:** 10/12/2021  
**Previous Crop:** Fallow  
**Spring 2022 Soil Test N:** 30.4 ppm (73 lbs. N/Acre)  
**Fertilizer:** Season total applied Nitrogen was 161 lbs. N/Acre applied through the season. 21 lbs. N/A at planting (10/12/2021), 30 lbs. N/A early through late tillering (4/7/2022), 80lbs. N/A through stem elongation (5/13/2022), 30 lbs. N/A at flowering (6/24/2022) to raise protein in the seed.  
**Irrigation Quantity:** Solid-set sprinklers 14.65 Acre inches (final irrigation 6/24/2022)  
**Harvest Date:** 8/22/2022

### Variety Highlights

Only LCS Evina met the quality protein standard of 13% in 2022. This variety is an awnless hard red wheat and made protein in both 2021 and 2022 with 30 lbs. of nitrogen applied at flowering. The varieties with the highest 3-Year yield were WB4394, Millie, and LCS Jet. All had yields above 171 bu/ac for this period. LCS Evina was ranked near the bottom for average yield during this same time.



### 2022 OREGON HARD WINTER WHEAT YIELD TRIALS Tulelake (Irrigated)



3-Year averages include data from 2022, 2021, and 2019

This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	2022 Yield		2-Year		3-Year		4-Year		Best Estimate* Yield bu/ac
		Yield bu/ac	Rank	Yield bu/ac	Rank	Yield bu/ac	Rank	Yield bu/ac	Rank	
LWH18-0122	HRW	176	2	171	3					178 ± 15
WB4394	HRW	172	3	176	1	177	1			177 ± 12
Millie	HWW	176	1	173	2	171	2			171 ± 12
Keldin	HRW	170	4							170 ± 14
OR2190064R	HRW	164	6							166 ± 20
LCS Jet	HRW	162	8	153	5	166	3			166 ± 12
LWH19-1103	HRW	163	7							165 ± 20
PN13201002-04	HRW	167	5	156	4					163 ± 15
OR2170052H	HWW	154	12	152	6					159 ± 15
Scorpio	HRW	156	10	145	10	157	4			157 ± 12
Irv	HWW	157	9	149	7	157	5			157 ± 12
LWH19-0192	HRW	148	14	148	8					155 ± 15
IDO2006	HWW	155	11	146	9					154 ± 15
LCS Rocket	HRW	137	19	141	12	152	6			152 ± 12
Snow mass 2.0	HWW	147	16	142	11					150 ± 15
LCS Evina	HRW	133	20	135	14	147	7			147 ± 12
OR2170199R	HRW	144	17							145 ± 20
OR2160065H	HWW	141	18	135	13	141	8			141 ± 12
WB4311	HRW	148	15							141 ± 14
WA8309	HRW	149	13	133	15					141 ± 15
	Average	156		151		158				158
	LSD (0.05)	15								
	CV (%)	6.9								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.

This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Quality*	Height in	Test Weight lbs/bu	Protein %	Heading Date	Lodging %
LWH18-0122	HRW		34.9	60.0	11.9	6/16	0.0
WB4394	HRW	A	43.3	63.5	10.9	6/19	16.3
Millie	HWW	MD	36.3	63.7	10.7	6/18	0.0
Keldin	HRW	D	36.6	63.2	11.2	6/18	31.3
OR2190064R	HRW		36.0	62.4	11.9	6/19	0.0
LCS Jet	HRW	A	37.2	61.2	11.2	6/19	0.0
LWH19-1103	HRW		36.8	62.0	10.9	6/18	52.5
PN13201002-04	HRW		42.4	61.9	11.0	6/21	31.3
OR2170052H	HWW		38.1	60.0	10.4	6/23	1.3
Scorpio	HRW	MD	34.5	60.6	11.0	6/22	0.0
Irv	HWW	MD	38.0	60.9	11.2	6/18	0.0
LWH19-0192	HRW		36.9	60.4	11.6	6/20	0.0
IDO2006	HWW		38.6	61.6	10.8	6/17	0.0
LCS Rocket	HRW	A	33.1	56.7	11.0	6/21	0.0
Snow mass 2.0	HWW		36.0	62.9	11.1	6/19	75.0
LCS Evina	HRW	A	42.1	61.0	13.0	6/24	0.0
OR2170199R	HRW		33.9	59.2	11.2	6/17	0.0
OR2160065H	HWW		38.2	59.9	11.7	6/19	0.0
WB4311	HRW	D	35.5	63.4	12.0	6/17	2.5
WA8309	HRW		29.9	57.2	11.0	6/21	0.0
Average			36.9	61.1	11.3	6/19	10.5
LSD (0.05)			1.9	1.0	0.6	3.4	18.5
CV (%)			3.7	1.2	3.7		

\*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.

Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses



## Soft White Winter Wheat Trial

**Planting Date:** 10/12/2021  
**Previous Crop:** Fallow  
**Spring 2022 Soil Test N:** 30.4 ppm (73 lbs. N/Acre)  
**Fertilizer:** Season total Nitrogen was 131 lbs. N/Acre applied through the season. 21 lbs. N/A at planting (10/12/2021), 30 lbs. N/A early through late tillering (4/7/2022), 80lbs. N/A through stem elongation (5/13/2022).  
**Irrigation Quantity:** Solid-set sprinklers 14.65 Acre inches (final irrigation 6/24/2022)  
**Harvest Date:** 8/23/2022

### **Variety Highlights**

Soft white winter wheats continue to be the highest yielding class of wheat raised in the Tulelake, CA area under full irrigation. The awnless variety LCS Blackjack ranked the highest with a 4-year average yield of 186 bu/ac (5.58 tons/A). Other released varieties with high 4-year average yields were Bobtail (179 bu/ac), LCS Hulk (176 bu/ac) and LCS Shine (172 bu/ac). Bobtail is a recent release of the Oregon State University Small Grains Program. Lastly, Bobtail and LCS Blackjack have shown no lodging in either the 2021 or 2022 season.





**2022 OREGON SOFT WINTER WHEAT YIELD TRIALS  
Tulelake (Irrigated)**



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Herbicide Resistance	Class	2022 Yield		2-Year		3-Year		4-Year		Best Estimate*
			Yield bu/ac	Rank	Yield bu/ac						
AP Exceed		SWW	190	1	183	1					193 ± 11
LWW19-2232		SWW	187	2							191 ± 15
LWW19-6219		SWW	185	3							190 ± 15
LCS Blackjack		SWW	170	11	168	4	179	1	186	1	186 ± 8
OR2160264		SWW	182	4	172	2					182 ± 11
Bobtail		SWW	180	5	169	3	176	2	179	2	179 ± 8
LWW19-6591		SWW	175	8							179 ± 15
LCS Hulk		SWW	172	9	168	6	173	3	176	3	176 ± 8
WA8307		SWW	171	10							175 ± 15
OR2160243		SWW	163	15	162	7					172 ± 11
LCS Shine		SWW	179	6	168	5	169	4	172	4	172 ± 8
LWW17-5877		SWW	164	13	160	8					171 ± 11
Rosalyn		SWW	161	16	153	12	163	5	171	5	171 ± 8
OR2180149		SWW	166	12							170 ± 15
LCS Jefe (LWW17-8185)		SWW	179	7	159	9					169 ± 11
AP Iliad		SWW	164	14							168 ± 15
LCS Artdeco		SWW	160	18	156	10					166 ± 9
Norw est Duet		SWW	154	23	149	13	159	6	164	6	164 ± 8
15-451104B		SWW	159	19							163 ± 15
Nixon		SWW	149	32	145	17	156	7	163	7	163 ± 8
LWW19-5862		SWW	157	21							161 ± 15
SY Dayton		SWW	160	17	153	11	154	8	160	8	160 ± 8
Cameo		Club	155	22	149	15					159 ± 11
WB1621		SWW	154	24							158 ± 15
IDO2008		SWW	158	20	148	16					158 ± 11
WB1922		SWW	153	26							157 ± 15
WB1720		SWW	151	28							155 ± 15
LWW19-1576		SWW	150	29							155 ± 15
OR2130755		SWW	141	37	145	18					155 ± 9
LCS Drive		SWW	146	34	143	19					154 ± 9
SY Assure		SWW	150	30	149	14					154 ± 9
OR2190027 CL+	CL+	SWW	149	31							154 ± 15
WA8371		SWW	148	33							153 ± 15
OR2170559		SWW	154	25	140	20					150 ± 11
OR5180071		Club	151	27	139	21					149 ± 11
OR2190025 CL+	CL+	SWW	144	35							149 ± 15
OR2180377		SWW	144	36							149 ± 15
Norw est Tandem		SWW	139	39	134	22					145 ± 9
ARS09500-17CBW		Club	139	38							144 ± 15
		Average	160		155		166		171		165
		LSD (0.05)	12								
		CV (%)	5.4								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.



2022 OREGON SOFT WINTER WHEAT YIELD TRIALS

Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Quality*	Height in	Test Weight lbs/bu	Protein %	Heading Date	Lodging %
AP Exceed	SWW		41.1	60.6	9.4	6/17	1.3
LWW19-2232	SWW		46.0	60.3	10.2	6/21	27.5
LWW19-6219	SWW		40.9	60.3	10.0	6/20	0.0
LCS Blackjack	SWW	D	37.0	58.3	9.8	6/20	0.0
OR2160264	SWW		40.8	59.7	10.5	6/17	0.0
Bobtail	SWW	MD	37.9	58.9	10.0	6/18	0.0
LWW19-6591	SWW		39.6	59.7	9.8	6/20	5.0
LCS Hulk	SWW	A	40.6	60.9	10.3	6/20	1.3
WA8307	SWW		43.4	60.1	10.5	6/21	3.8
OR2160243	SWW		39.2	59.2	10.0	6/20	0.0
LCS Shine	SWW	MD	35.1	59.4	10.5	6/16	1.3
LWW17-5877	SWW		39.3	59.3	10.4	6/17	0.0
Rosalyn	SWW	A	39.3	58.3	9.9	6/21	0.0
OR2180149	SWW		40.1	58.6	10.4	6/21	0.0
LCS Jefe (LWW17-8185)	SWW		40.9	59.6	9.7	6/21	0.0
AP Iliad	SWW	A	39.2	60.0	11.1	6/21	0.0
LCS Artdeco	SWW	A	39.2	56.3	10.0	6/19	0.0
Norw est Duet	SWW	D	47.0	59.9	10.1	6/22	33.8
15-451104B	SWW		41.5	57.0	9.6	6/17	0.0
Nixon	SWW	MD	42.3	57.5	9.8	6/22	0.0
LWW19-5862	SWW		38.4	56.6	9.8	6/23	0.0
SY Dayton	SWW	A	38.6	59.8	10.4	6/21	0.0
Cameo	Club		39.5	58.3	11.0	6/20	6.3
WB1621	SWW		42.9	61.5	10.4	6/21	3.8
IDO2008	SWW		42.9	58.5	10.4	6/21	5.0
WB1922	SWW		42.8	60.7	10.4	6/22	1.3
WB1720	SWW		37.0	58.6	10.5	6/18	0.0
LWW19-1576	SWW		36.9	59.0	10.3	6/20	0.0
OR2130755	SWW		44.0	59.4	10.6	6/17	2.5
LCS Drive	SWW	D	32.9	55.0	10.0	6/14	1.3
SY Assure	SWW	D	36.6	60.4	11.9	6/16	0.0
OR12190027 CL+	SWW		39.8	59.9	10.9	6/19	1.3
WA8371	SWW		41.3	61.0	9.8	6/20	0.0
OR2170559	SWW		37.5	58.8	10.9	6/22	0.0
OR5180071	Club		40.3	59.5	10.7	6/23	0.0
OR12190025 CL+	SWW		38.1	58.6	10.6	6/18	0.0
OR2180377	SWW		37.7	57.3	10.3	6/22	0.0
Norw est Tandem	SWW	A	36.0	55.9	10.6	6/17	0.0
ARS09500-17CBW	Club		41.2	59.4	10.7	6/20	5.0
	Average		39.9	59.0	10.3	6/19	2.6
	LSD (0.05)		1.3	1.4	0.5	2.4	12.3
	CV (%)		2.4	1.7	3.8		

\*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.

Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses



## Winter Barley Trial

**Planting Date:** 10/12/2021  
**Previous Crop:** Fallow  
**Spring Soil Test N:** 30.4 ppm (73 lbs. N/Acre)  
**Fertilizer:** Season total Nitrogen was 51 lbs. N/Acre applied through growing season. 22 lbs. N/A at planting (10/12/2021), 30 lbs. N/A at tillering (4/7/2027)  
**Irrigation Quantity:** Solid-set sprinklers 10.71 Acre inches (final irrigation 6/8/2022)  
**Harvest Date:** 8/16/2022 (delayed 1 week due to mechanical issues)

**Variety Highlights:** Newer winter barley varieties have shown promise in our basin recently since they require less irrigation and a lower amount of nitrogen fertilizer when compared to wheat. This is done to keep protein levels low and lessen the likelihood of lodging. Thunder (malting type) and Lightning (feed

type) are both recent releases from the Oregon State University Barley Program. Thunder was ranked highest for 3-year average yield at 7,572 lbs./A. Desirable protein levels for malting barley range between 9.5-12.5% dry basis. Thunder met this requirement in both 2021 and 2022.



### 2022 OREGON WINTER BARLEY YIELD TRIALS

Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	2022 Yield		2-Year		3-Year		4-Year		Best Yield lb/ac
		Yield lb/ac	Rank	Yield lb/ac	Rank	Yield lb/ac	Rank	Yield lb/ac	Rank	
DH141917	Malt	7642	2							7663 ± 1493
Thunder	Malt	7447	4	8068	2	7572	1			7572 ± 903
Wintmalt	Malt	8003	1	8247	1	7438	2			7438 ± 903
DH141225	Malt	7600	3	7514	3					7214 ± 1087
DH141222	Malt	7089	6	7406	4					7105 ± 1087
Lightning	Feed	7280	5	7380	5	6933	3			6933 ± 903
DH150683	Malt	6779	7							6800 ± 1493
Alba	Feed	5487	9	6638	6	6798	4			6798 ± 903
DH162310	Malt	5526	8							5547 ± 1493
	Average	6984		7542		7185				7008
	LSD (0.05)	720								
	CV (%)	7.4								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.



2022 OREGON WINTER BARLEY YIELD TRIALS

Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Height	Test Weight	Protein	Lodging	
		in	lbs/bu	%	Heading Date	%
DH141917	Malt	43.5	50.7	9.0	6/11	30.0
Thunder	Malt	42.5	53.0	9.6	6/11	42.5
Wintmalt	Malt	42.5	51.1	9.0	6/10	43.8
DH141225	Malt	44.7	53.5	9.6	6/6	65.0
DH141222	Malt	42.9	53.7	10.4	6/6	31.3
Lightning	Feed	43.9	52.9	10.4	6/10	18.8
DH150683	Malt	41.7	51.8	10.7	6/6	25.0
Alba	Feed	47.3	50.5	8.9	6/10	42.5
DH162310	Malt	43.8	53.0	11.4	6/8	10.0
	Average	43.7	52.2	9.9	6/9	34.3
	LSD (0.05)	2.1	0.7	0.7	1.2	22.9
	CV (%)	3.4	1.0	4.9		



## Spring Soft Wheat Trial

**Planting Date:** 4/25/2022  
**Previous Crop:** Pea Cover Crop  
**Spring Soil Test N:** 31.7 ppm (76lbs. N/Acre)  
**Fertilizer:** Season total nitrogen was 131 lbs. per acre applied through the season. 21 lbs. N/A at planting (4/25/2022), 30 lbs. N/A at tillering (5/27/2022), 80 lbs. N/A through early boot (6/24/2022).  
**Irrigation Quantity:** Solid-set sprinklers 15.54 Acre inches (final irrigation 7/12/2022)  
**Harvest Date:** 8/30/2022

**Variety Highlights:** UI Cookie, Tekoa, and WB6121 were three varieties with high grain yields, minimal lodging, and desirable grain quality over a 4-year period. UI Cookie had the highest 4-year yield averaging 164 bu/ac (4.92 tons/A). Several new spring soft white wheat varieties including Ryan, Roger, and Louise had greater than 50% lodging under Tulelake conditions.



### 2022 OREGON SOFT SPRING WHEAT YIELD TRIALS

UNIVERSITY OF CALIFORNIA  
Agriculture and Natural Resources

#### Tulelake (Irrigated)

This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Herbicide Resistance	Class	2022 Yield		2-Year		3-Year		4-Year		Best Estimate* Yield bu/ac
			Yield bu/ac	Rank	Yield bu/ac	Rank	Yield bu/ac	Rank	Yield bu/ac	Rank	
UI Cookie		SWS	141	2	152	1	158	1	164	1	164 ± 9
IDO1902S		SWS	143	1	146	2					159 ± 12
Tekoa		SWS	120	6	131	6	142	3	151	2	151 ± 9
IDO1702S		SWS	125	4	141	3	144	2	148	3	148 ± 9
WB6211 CLP	CL+	SWS	122	5	133	4					145 ± 12
IDO1404S		SWS	116	7							145 ± 12
WB6121		SWS	116	8	131	5	138	4	140	4	140 ± 9
IDO 2101 FHB		SWS	114	9							136 ± 17
Ryan		SWS	109	11	119	8	129	5			135 ± 10
Seahawk		SWS	126	3	122	7					134 ± 12
WA8377		SWS	111	10							133 ± 17
Roger (WA 8325)		Club	107	12	117	9					130 ± 12
WA8321		SWS	107	13	113	10					126 ± 12
Louise		SWS	96	14	105	11					118 ± 12
AP Coachman		SWS	92	15							113 ± 10
Average			116		128		142		151		138
LSD (0.05)			8								
CV (%)			5.1								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.



## 2022 OREGON SOFT SPRING WHEAT YIELD TRIALS

Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Quality*	Height in	Test Weight	Protein	Heading Date	Lodging
				lbs/bu	%		%
UI Cookie	SWS	MD	39.4	62.6	10.7	7/4	4.3
IDO1902S	SWS		39.9	64.2	10.4	7/4	10.0
Tekoa	SWS	MD	40.9	63.2	10.4	7/7	12.5
IDO1702S	SWS		38.3	62.6	10.1	7/2	0.0
WB6211 CLP	SWS		39.0	60.6	11.0	7/2	3.8
IDO1404S	SWS		38.2	61.1	10.0	7/7	1.3
WB6121	SWS	D	37.5	62.0	11.4	7/3	1.3
IDO 2101 FHB	SWS		40.2	62.5	10.7	7/4	7.5
Ryan	SWS	MD	37.9	58.1	10.7	7/2	86.3
Seahawk	SWS	MD	41.1	62.0	10.7	7/7	5.0
WA8377	SWS		40.6	59.7	11.3	7/4	68.8
Roger (WA 8325)	Club		38.6	61.2	9.8	7/4	26.3
WA8321	SWS		38.3	61.3	10.3	7/7	61.8
Louise	SWS	MD	41.6	58.5	11.1	7/5	72.5
AP Coachman	SWS	A	40.5	59.6	10.4	7/8	24.8
	Average		39.5	61.3	10.6	7/4	25.7
	LSD (0.05)		1.6	1.0	0.3	1.8	19.6
	CV (%)		2.8	1.2	2.1		

\*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.

Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses



## Spring Hard Wheat Trial

**Planting Date:** 4/25/2022  
**Previous Crop:** Pea Cover Crop  
**Spring Soil Test N:** 31.7 ppm (76 lbs. N/Acre)  
**Fertilizer:** Season total nitrogen was 212 lbs. per acre applied through the season. 22 lbs. N/A at planting (4/25/2022), 30 lbs. N/A at tillering (5/27/2022), 80 lbs. N/A through early boot (6/24/2022), and 30 lbs. N/A at flowering (7/12/2022) to raise protein in the seed.  
**Irrigation Quantity:** Solid-set sprinklers 15.54 Acre inches (final irrigation 7/12/2022)  
**Harvest Date:** 8/31/2022



**Variety Highlights:** AP Renegade, WB9668, WB9303 and Kelse all met the protein standard of 13% with a nitrogen fertilizer application applied during flowering in 2022. WB9668 was rated as desirable by the USDA Western Wheat Quality Laboratory and ranked highest for 4-year average yield at 138 bu/ac (4.14 tons/A).



### 2022 OREGON HARD SPRING WHEAT YIELD TRIALS Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Herbicide Resistance	Class	2022 Yield		2-Year		3-Year		4-Year		Best
			Yield bu/ac	Rank	Yield bu/ac						
UC1838		HRS	128	1	141	1					152 ± 11
UC1917		HWS	128	2							147 ± 16
AP Renegade		HRS	121	5							144 ± 9
IDO2004S		HWS	128	3	133	2					143 ± 11
UC1932		HWS	120	7							139 ± 16
UC Central Red		HRS	113	14	128	4					138 ± 11
IDO2002S		HWS	122	4	128	5					138 ± 11
WB9668		HRS	114	13	131	3	137	1	138	1	138 ± 8
Hale (WA8315)		HRS	115	9							136 ± 11
WB9303		HRS	114	11	128	6	131	2			135 ± 9
Jefferson HF		HRS	115	8							134 ± 16
WA8355		HRS	114	10							134 ± 16
IDO2202CL2	CL+	HRS	114	12							133 ± 16
IDO1804S		HWS	120	6	118	7	126	3			130 ± 9
WB9623		HRS	110	15							129 ± 16
Kelse		HRS	103	18	115	8					126 ± 11
IDO2104HF		HWS	105	16							125 ± 16
WA8387 CL+	CL+	HRS	105	17							124 ± 16
WA8358 CL+	CL+	HRS	99	20							118 ± 16
UC Amarillo		HWS	95	23	107	9					117 ± 11
IDO 2103 FHB		HWS	98	22							117 ± 16
Glee		HRS	99	21	104	10					114 ± 11
Net CL+	CL+	HRS	99	19	104	11					114 ± 11
WA8356		HRS	94	24							113 ± 16
WA8357		HRS	86	25							105 ± 16
Average			110		122		131		138		130
LSD (0.05)			8								
CV (%)			5.1								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.



2022 OREGON HARD SPRING WHEAT YIELD TRIALS



Tulelake (Irrigated)

This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Quality*	Height in	Test Weight	Protein	Heading Date	Lodging
				lbs/bu	%		%
UC1838	HRS		39.9	63.1	12.5	7/4	1.3
UC1917	HWS		35.4	61.3	12.3	7/4	0.0
AP Renegade	HRS	D	34.2	63.8	13.1	7/4	0.0
IDO2004S	HWS		40.5	62.6	11.0	7/4	1.3
UC1932	HWS		34.5	62.9	12.4	7/4	0.0
UC Central Red	HRS		33.0	62.1	12.6	7/4	0.0
IDO2002S	HWS		35.3	62.7	12.3	7/4	0.0
WB9668	HRS	D	34.4	63.1	13.6	7/4	0.0
Hale (WA8315)	HRS	MD	40.6	63.1	12.8	7/4	50.0
WB9303	HRS		37.8	64.1	13.7	6/28	0.0
Jefferson HF	HRS		40.6	62.8	12.5	7/4	16.3
WA8355	HRS		38.0	63.6	12.4	7/4	7.3
IDO2202CL2	HRS		38.9	63.0	12.4	7/4	2.5
IDO1804S	HWS		38.4	61.2	12.3	7/4	4.0
WB9623	HRS		40.1	60.4	12.7	7/4	5.0
Kelse	HRS	D	39.7	63.3	13.7	7/4	0.0
IDO2104HF	HWS		38.8	62.0	12.6	7/4	0.0
WA8387 CL+	HRS		37.9	63.2	12.3	7/4	2.0
WA8358 CL+	HRS		38.6	62.6	13.8	7/4	2.5
UC Amarillo	HWS		30.0	61.0	12.5	7/3	0.0
IDO 2103 FHB	HWS		40.6	63.4	13.7	6/29	2.5
Glee	HRS	MD	39.0	62.4	12.8	7/4	24.3
Net CL+	HRS	MD	39.8	63.9	12.5	7/4	11.3
WA8356	HRS		37.8	61.8	13.6	7/4	7.8
WA8357	HRS		43.7	65.0	14.3	7/4	53.8
Average			37.9	62.7	12.8	7/3	7.7
LSD (0.05)			2.2	0.9	0.4	0.4	12.7
CV (%)			4.1	1.1	2.5		

\*Quality ratings assigned by the USDA Western Wheat Quality Laboratory.

Quality Ratings: MD = Most Desirable; D = Desirable; A = Acceptable; LD = Least Desirable; UCS = Unacceptable Except Customer-Specific Uses

## Spring Barley Trial

**Planting Date:** 4/25/2022  
**Previous Crop:** Pea Cover Crop  
**Spring Soil Test N:** 31.7 ppm (76 lbs. N/Acre)  
**Fertilizer:** Season total Nitrogen was 51 lbs. N/Acre applied through growing season. 22 lbs. N/A at planting (4/14/2021), 30 lbs. N/A late tillering (5/27/2022).  
**Irrigation Quantity:** Solid-set sprinklers 14.07 Acre inches (final irrigation 7/6/2022)  
**Harvest Date:** 8/26/22



**Variety Highlights:** The 2022 Spring Barley trial included many promising new varieties to keep an eye on. KWS Jessie ranked highest with a 3-year yield of 8,937 lbs./A for a malting type, while Claymore (feed type) ranked highest for 4-year average yield of 8,621 lbs./A. KWS Jessie had minimal lodging in 2021 and 2022 due to its average height only being 33.55 inches.



### 2022 OREGON SPRING BARLEY YIELD TRIALS Tulelake (Irrigated)



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	2022 Yield		2-Year		3-Year		4-Year		Best Estimate* Yield lb/ac
		Yield lb/ac	Rank	Yield lb/ac	Rank	Yield lb/ac	Rank	Yield lb/ac	Rank	
KWS Jessie	Malt	9039	1	9407	1	8937	1			8904 ± 526
KWS Thalís	Malt	8714	2	8992	2					8802 ± 652
Claymore	Feed	8568	3	8839	3	8509	2	8621	1	8621 ± 447
BC Lexy		8450	4							8537 ± 899
LCS Opera	Malt	7763	8							8387 ± 520
Oreana	Feed	8248	5	8263	4	8349	3			8315 ± 526
BC Leandra		8003	7							8089 ± 899
KWS Willis	Malt	7543	11	8021	5					7831 ± 652
BC Ellinore		7700	9							7786 ± 899
HO517-245		7582	10							7668 ± 899
KWS Amadora	Malt	7315	14	7843	6					7652 ± 652
MS21-B1		7476	12							7563 ± 899
Altorado	Feed	7223	16	7634	7	7491	4			7457 ± 526
DH190481	Feed	7362	13							7449 ± 899
LCS Odyssey	Malt	8052	6							7428 ± 635
DH190346	Feed	7285	15							7372 ± 899
AAC Connect	Malt	7106	17							6950 ± 638
MS21-B2		6716	19							6803 ± 899
Survivor	Feed	6805	18	6939	8					6748 ± 652
Lenetah	Feed	6203	20	6843	9					6652 ± 652
	Average	7658		8087		8321		8621		7751
	LSD (0.05)	978								
	CV (%)	9.1								

\*Best linear unbiased estimators (BLUEs) are best estimators of variety performance relative to other varieties, based on up to four years of data.



**2022 OREGON SPRING BARLEY YIELD TRIALS**  
**Tulelake (Irrigated)**



This trial was a collaboration between the OSU Cereal Extension Program and the UC-Davis Intermountain Research and Extension Center

Variety	Class	Height	Test Weight	Protein	Heading Date	Lodging
		in	lbs/bu	%		%
KWS Jessie	Malt	34.4	49.4	8.5	7/9	7.0
KWS Thalix	Malt	36.8	50.2	9.7	7/1	26.3
Claymore	Feed	46.3	51.2	9.0	7/1	25.0
BC Lexy		36.3	48.1	8.8	7/10	6.3
LCS Opera	Malt	37.3	47.1	8.8	7/9	22.5
Oreana	Feed	35.7	51.1	9.1	7/10	20.0
BC Leandra		37.3	48.0	9.2	7/8	21.3
KWS Willis	Malt	38.9	49.7	10.1	7/8	7.5
BC Ellinore		36.8	47.7	8.6	7/9	5.0
HO517-245		44.6	51.5	9.0	7/1	22.5
KWS Amadora	Malt	35.1	50.9	9.3	7/7	16.3
MS21-B1		46.3	50.4	9.6	7/3	37.5
Altorado	Feed	41.9	50.0	10.1	7/1	23.8
DH190481	Feed	41.1	52.3	10.4	6/25	12.5
LCS Odyssey	Malt	35.6	49.3	9.0	7/9	3.8
DH190346	Feed	37.6	49.3	11.4	6/25	28.8
AAC Connect	Malt	46.1	50.4	9.9	7/1	30.0
MS21-B2		45.6	51.3	10.1	7/3	27.5
Survivor	Feed	43.1	52.3	11.1	7/1	22.5
Lenetah	Feed	41.7	50.8	11.8	7/1	63.8
	Average	39.9	50.1	9.7	7/4	21.5
	LSD (0.05)	2.9	1.6	1.0	2.7	25.8
	CV (%)	5.3	2.2	7.4		

# 2022 Potato Variety Development

University of California  
Agriculture and Natural Resources



Research and Extension Center System

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Three potato variety trials were conducted at the Intermountain Research and Extension Center in Tulelake, CA. Trials were categorized by market type and included a Russet trial with 17 entries, a Specialty trial with 10 entries, and a Chipping trial with 12 entries. Entries included selections from the Western Regional (WR) variety development program, Southwest Regional (SWR) variety development program, and varieties of local interest. The tables below highlight some of the results from these trials.

**Table 1: 2022 Intermountain Research & Extension Center Russet Variety Trial**

	Total CWT/Acre	Culls + 2's CWT/Acre	%1's	U.S. 1's CWT/Acre	Merit Score (1-5, 5=best)	Tubers per Plant	Average Tuber Size (oz)
<b>Clearwater Russet</b>	343.1	7.2	79.3	273.0	4.0	6.0	5.5
<b>Ranger Russet</b>	170.6	9.9	70.1	121.8	3.0	4.5	4.1
<b>Russet Norkotah</b>	242.3	4.4	70.0	170.2	4.0	5.0	4.6
<b>COTX08063-2Ru</b>	349.5	13.9	77.3	270.9	2.0	6.1	5.5
<b>A09086-1LB</b>	508.6	7.6	88.5	450.7	2.5	7.1	6.9
<b>A10594-4sto</b>	498.1	8.1	90.3	449.5	3.0	7.1	7.0
<b>A12305-2adg</b>	456.1	7.7	90.5	412.4	4.0	7.0	6.5
<b>AFA5661-8</b>	533.9	22.4	90.3	482.1	3.0	6.9	7.4
<b>AOR11217-3</b>	380.3	8.5	81.3	309.1	3.5	6.1	5.8
<b>AOR08540-1</b>	450.7	10.8	87.0	392.6	4.0	6.3	6.8
<b>AC12090-3RU</b>	434.4	26.2	83.0	361.9	2.5	5.9	6.8
<b>CO13003-1RU</b>	420.8	4.8	86.8	367.2	3.5	6.3	6.1
<b>CO10085-1RU</b>	430.3	26.8	80.8	347.6	3.0	6.5	6.1
<b>CO11009-3RU</b>	473.8	21.9	87.0	413.1	3.0	6.1	7.3
<b>Mean</b>	<b>406.6</b>	<b>12.9</b>	<b>83</b>	<b>344.4</b>	<b>3.2</b>	<b>6.2</b>	<b>6.1</b>

**Table 2: 2022 Intermountain Research & Extension Center Specialty Variety Trial**

Clone / Variety	Skin Color	Flesh Color	Total Yield CWT/Acre	Culls CWT/Acre	Merit Score		
					(1-5, 5=best)	Tubers/ Plant	Average Size (oz)
<b>Chieftain</b>	Red	White	546.8	65.9	3.5	7.9	6.5
<b>Red LaSoda</b>	Red	White	470.6	66.9	2.5	6.2	7.0
<b>Modoc</b>	Red	White	410.6	15.1	3.5	10.4	3.9
<b>A08122-12Rsto</b>	Red	White	533.8	8.2	3.0	15.0	3.3
<b>CO14040-3R</b>	Red	White	414.3	2.7	2.0	14.4	2.7
<b>Yukon Gold</b>	Yellow	Yellow	351.6	35.0	3.0	5.6	6.3
<b>AC10376-2012-1W/Y</b>	Yellow	Yellow	541.4	8.7	2.0	15.3	3.2
<b>AORTX09037-1W/Y</b>	Yellow	Yellow	472.5	7.1	3.0	13.4	3.2
<b>COTX10118-4Wpe/Y</b>	Yellow/Purple	Yellow	600.9	11.1	2.0	14.8	4.0
<b>AORTX09037-5W/Y</b>	Yellow	White	458.8	41.1	3.0	12.3	3.5
<b>CO14226-3W/Y</b>	Yellow	Yellow	615.6	54.5	2.0	16.5	3.5
<b>Mean</b>			<b>492.4</b>	<b>28.8</b>	<b>2.7</b>	<b>12.0</b>	<b>4.3</b>

**Table 3: 2022 Intermountain Research & Extension Center Chip Variety Trial**

Clone / Variety	Total Yield CWT/Acre	Culls CWT/Acre	Merit		Average	
			Score (1-5, 5=best)	Tubers/ Plant	Tuber Size (oz)	Specific Gravity
<b>Lamoka</b>	487.4	18.2	3.5	8.0	6.0	1.085
<b>CO11037-5W</b>	489.6	4.0	4.0	6.7	6.9	1.086
<b>CO12235-3W</b>	367.7	8.9	4.0	6.0	5.8	1.084
<b>CO12293-1W</b>	496.5	17.1	3.0	6.7	7.1	1.085
<b>CO13232-25W</b>	499.4	11.5	3.5	8.4	5.7	1.086
<b>AC13126-1Wadg</b>	490.1	32.7	3.5	6.2	8.3	1.083
<b>Mean</b>	<b>471.8</b>	<b>15.4</b>	<b>3.6</b>	<b>7.0</b>	<b>6.6</b>	<b>1.085</b>



## **Influence of Potato Vine Kill Timing and Skin-set duration on Black Dot (*Colletotrichum coccodes*) and Potato Quality- 2 year Summary**

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### **Introduction**

Black dot fungal structures (sclerotia) on harvested tubers are a consistent problem for fresh market potato producers throughout California. Tubers infected with black dot have a rash like appearance that is especially evident on red and yellow skin potatoes making them unmarketable. Black dot infection on below ground stems and stolons occurs within weeks of sprouting. Fungicides are effective at suppressing black dot during the growing season, but fungicides have failed to reduce severity of black dot sclerotia on daughter tubers. Cultural management and harvest timing can influence black dot on daughter tubers. Studies suggest the duration between haulm (stem) senescence and harvest increases severity of black dot; high soil moisture increases black dot, and plant stress can increase severity of black dot. These findings served as a guide for setting up the experiment. The primary study objective was to document the effect of vine kill timing and skin set duration on potato yield, potato quality, and black dot on potatoes under California conditions.

### **Site Information**

- **Soil type-** mucky silty clay loam-6% OM
- **Irrigation** – solid-set sprinklers
- **Potato Spacing-** 36 inch rows with 10 inch seed spacing
- **Design-** Split Block with 4 blocks (reps)

### **Study Methods**

The study was conducted in field at the Intermountain REC with a long history of natural black dot infection. The study was set up in a split-plot design with four replications. Dark Red Norland, an early maturing red skinned variety was grown in 2021 and Anouk, a medium maturing yellow skin and yellow flesh variety was grown in 2022. Potatoes were grown under normal conventional management conditions. Vines were killed at three timings: 95% green (77 & 84 days after planting DAP in 2021 and 2022 respectively), 50% green (92 & 98DAP in 2021 and 2022 respectively), and 10% green (106 & 112 DAP in 2021 and 2022 respectively).



**Figure 1. Drone photo of different vine kill timing plots shortly after the 50% vine kill timing.**

Vines were killed using Reglone and rolling and soil moisture was kept around 60% ASM from vine kill to harvest to minimize bruising (Figure 1). For each vine kill timing, potatoes were harvested 2 weeks after vine kill or 4 weeks after vine kill. Data included tuber yield, tuber size, tuber skinning, tuber bruise, and the incidence and severity of black dot on daughter tubers. Tuber yield and size was determined by running all potatoes from each plot across an automated grade-line. Black dot incidence and severity was determined by evaluating percent coverage of black dot infection on a 20 tuber sub-sample from each plot. Skinning severity was evaluated by placing 20 tubers from each plot in a cement mixer without paddles for 1 minute at harvest (figure 2.)



**Figure 2. Cement mixer setup for evaluating tuber skinning.**

### **Results**

Potato yields differed significantly between treatments with the later vine kill timing having the highest yield both years (Tables 1 & 2). The early 95% green vine kill timing had the lowest yield, tubers per and tuber size both years. The 50% green vine kill timing had lower total yield compared to the 10% vine kill timing in 2021, but average tuber size, tubers per plant, and the % of larger tubers were similar between timings (Tables 1 & 2).

Vine kill timing and skin set duration had a significant affect on black dot coverage (Tables 3 & 4). The 95% vine kill timing had the least amount of black dot both years, and the general trend was for black dot to increase the longer we waited to kill vines and the longer tubers sat in the ground between vine kill and harvest. A major concern with killing vines early and shortening the time between vine kill and harvest is poor skin set. The 95% green vine kill timing harvested 2 weeks after vine kill had an unacceptable skinning both years (Tables 3 & 4). Tuber skinning was low for the 50% and 10% vine kill timings harvested 4 weeks after vine kill. Tuber shape uniformity and tuber quality were similar across treatments except for the 95% green treatment having slightly less growth cracks in 2021 and slightly better shape uniformity in 2022 compared to the 10% timing (Tables 3-4).

In summary, harvesting both varieties earlier in the season while vines were still green and shorting the skin set duration reduced the severity of black dot tuber blemish. In the case of the yellow variety, black dot coverage was reduced below 10% when potatoes were harvested at 50% green or earlier. Tuber skinning was unacceptable for the 95% green vine kill timing if the skin set duration was 2 weeks, but skinning was low at most vine kill timings with a 4-week skin set period. These results agree with previous published research, and they serve as a guide for growers trying to weigh the trade-off of maximizing yield versus minimizing black dot tuber blemish as the reduction in black dot from early vine kill can outweigh the reduction in yield.

***Special Thanks: The research team would like to thank the California Potato Research Advisory Board for financial or in-kind support of this research.***

**Table 1. Potato stand, yield, and size for vine kill and skin set treatments at IREC in 2021.**

Trt #	Treatment	Potato Stand %	Tubers/plant #	Avg tuber size oz	Total yield CWT/A	>14 oz	Tuber size class percentages					culls
							10-14 oz	6-10 oz	4-6 oz	<4 oz		
1	10% green vine kill (106 DAP) & 2 week skin set before harvest	94% a <sup>1</sup>	5.84 a	7.87 a	443 a	7% a	15% a	36% a	19% c	19% b	6% ab	
2	10% green vine kill (106 DAP) & 4 week skin set before harvest	97% a	5.81 a	7.63 ab	436 a	6% a	15% a	32% a	22% bc	19% b	6% ab	
3	50% green vine kill (92 DAP) & 2 week skin set before harvest	98% a	5.16 ab	7.04 ab	363 b	3% ab	11% ab	35% a	24% abc	21% b	7% a	
4	50% green vine kill (92 DAP) & 4 week skin set before harvest	92% a	5.62 a	6.86 b	360 b	4% ab	9% b	33% a	24% abc	23% b	7% a	
5	95% green vine kill (77 DAP) & 2 week skin set before harvest	96% a	4.27 b	4.58 c	191 c	0% b	1% c	18% b	35% a	43% a	4% b	
6	95% green vine kill (77 DAP) & 4 week skin set before harvest	94% a	4.37 b	4.31 c	181 c	0% b	1% c	14% b	31% ab	49% a	5% ab	

<sup>1</sup> Means with the same letter within columns are not statistically different using the Tukey HSD mean comparison test.

**Table 2. Potato stand, yield, and size for vine kill and skin set treatments at IREC in 2022.**

Trt #	Treatment	Potato Stand %	Tubers/plant #	Avg tuber size oz	Total yield CWT/A	>14 oz	10-14 oz	6-10 oz	4-6 oz	<4 oz	Undersize	culls
1	10% green vine kill (106 DAP) & 2 week skin set before harvest	95% a <sup>1</sup>	15.43 ab	2.79 ab	444.34 ab	0% a	0.2% ab	4.8% ab	13.8% ab	37.0% a	35.0% c	2.5% a
2	10% green vine kill (106 DAP) & 4 week skin set before harvest	94% a	16.93 ab	2.87 a	496.78 a	0% a	0.3% a	6.3% a	16.6% a	36.7% a	41.9% bc	3.3% a
3	50% green vine kill (92 DAP) & 2 week skin set before harvest	96% a	17.05 a	2.45 bc	435.12 ab	0% a	0.0% b	2.8% bc	11.0% bc	36.1% a	49.5% ab	3.5% a
4	50% green vine kill (92 DAP) & 4 week skin set before harvest	95% a	15.73 ab	2.36 c	383.80 bc	0% a	0.1% ab	1.7% cd	8.7% c	32.6% ab	45.9% abc	2.0% a
5	95% green vine kill (77 DAP) & 2 week skin set before harvest	97% a	14.92 ab	2.09 cd	325.72 cd	0% a	0.0% b	0.5% d	4.5% d	27.6% bc	57.0% a	1.9% a
6	95% green vine kill (77 DAP) & 4 week skin set before harvest	91% a	14.58 b	1.90 d	273.30 d	0% a	0.0% b	0.3% d	3.8% d	25.0% c	52.8% ab	1.9% a

<sup>1</sup> Means with the same letter within columns are not statistically different using the Tukey HSD mean comparison test.

**Table 3. Black dot Coverage and Potato Quality for vine kill and skin set treatments at IREC in 2021.**

Trt #	Treatment	Tuber black dot coverage %	Tuber skinning rating	Tuber skin appearance rating	Tuber shape uniformity	Knobs	Growth cracks	Green	Black spot bruise	Vascular discoloration	Hollow Heart
1	10% green vine kill (106 DAP) & 2 week skin set before harvest	28% ab	4.21 a	3.42 b	3.3 a	2.7% ab	8.2% abc	0.5% a	0.0% a	0.3% a	0.2% a
2	10% green vine kill (106 DAP) & 4 week skin set before harvest	30% a	4.25 a	3.42 b	3.3 a	2.2% ab	9.3% a	0.7% a	0.2% a	0.5% a	0.2% a
3	50% green vine kill (92 DAP) & 2 week skin set before harvest	20% bc	3.58 bc	3.67 ab	3.5 a	6.2% a	5.8% abc	0.3% a	0.0% a	1.0% a	0.0% a
4	50% green vine kill (92 DAP) & 4 week skin set before harvest	28% a	4.00 ab	3.58 ab	3.5 a	3.3% ab	8.8% ab	0.2% a	0.2% a	0.7% a	0.0% a
5	95% green vine kill (77 DAP) & 2 week skin set before harvest	14% c	3.17 c	3.83 a	3.8 a	1.5% b	4.0% bc	0.0% a	0.0% a	0.8% a	0.2% a
6	95% green vine kill (77 DAP) & 4 week skin set before harvest	20% bc	4.00 ab	3.92 a	3.8 a	3.8% ab	3.0% c	0.0% a	0.0% a	0.7% a	0.2% a

<sup>1</sup> Means with the same letter within columns are not statistically different using the Tukey HSD mean comparison test.

**Table 4. Black dot Coverage and Potato Quality for vine kill and skin set treatments at IREC in 2022.**

Trt #	Treatment	Tuber black dot coverage %	Tuber skinning rating	Tuber skin appearance rating	Tuber shape uniformity	Knobs	Growth cracks	Green	Black spot bruise	Vascular discoloration	Hollow Heart
1	10% green vine kill (106 DAP) & 2 week skin set before harvest	13.68 b	4.9 a	4.1 a	3.5 bc	1.8% a	0.0% a	0.9% ab	0.0% a	2.5% a	0.0% a
2	10% green vine kill (106 DAP) & 4 week skin set before harvest	20.78 a	5.0 a	4.1 a	3.3 c	2.1% a	0.1% a	1.1% ab	0.0% a	2.5% a	0.8% a
3	50% green vine kill (92 DAP) & 2 week skin set before harvest	6.73 c	2.8 c	4.3 a	4.3 a	1.9% a	0.0% a	1.1% a	0.8% a	5.0% a	0.0% a
4	50% green vine kill (92 DAP) & 4 week skin set before harvest	9.35 bc	4.9 a	4.3 a	3.8 b	1.4% a	0.0% a	0.7% ab	0.0% a	2.5% a	0.0% a
5	95% green vine kill (77 DAP) & 2 week skin set before harvest	0.35 d	2.8 c	4.1 a	4.5 a	1.9% a	0.0% a	0.2% b	0.8% a	3.3% a	0.0% a
6	95% green vine kill (77 DAP) & 4 week skin set before harvest	6.68 cd	4.3 b	4.3 a	4.4 a	1.5% a	0.0% a	0.9% ab	0.0% a	4.2% a	0.0% a

<sup>1</sup> Means with the same letter within columns are not statistically different using the Tukey HSD mean comparison test.



**Figure. Post-harvest skinning severity. From left to right: 95% green vinekill 2 wk; 95% green vinekill 4 wk; & 50% green vinekill 4 wk**

# Alfalfa Cultivar Performance Under Full and Deficit Irrigation

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## Introduction

Alfalfa can be a highly productive hay crop in the intermountain region of California, Oregon, and Nevada provided sufficient irrigation water is available throughout the growing season. Precipitation throughout the region can be highly variable year-to-year, and climate models suggest this variability will increase coupled with a concomitant increase in temperature during summer. Thus, irrigation restrictions seen over the past several years are likely to become a regular occurrence throughout the region, especially in the Klamath Basin.

This experiment was conducted to determine the relative performance of alfalfa cultivars under full and deficit irrigation and to identify characteristics of cultivars that perform well under both conditions. This experiment is part of a larger trial involving companion trials in Minnesota and Wisconsin to examine the resilience of alfalfa cultivars to contrasting environments.

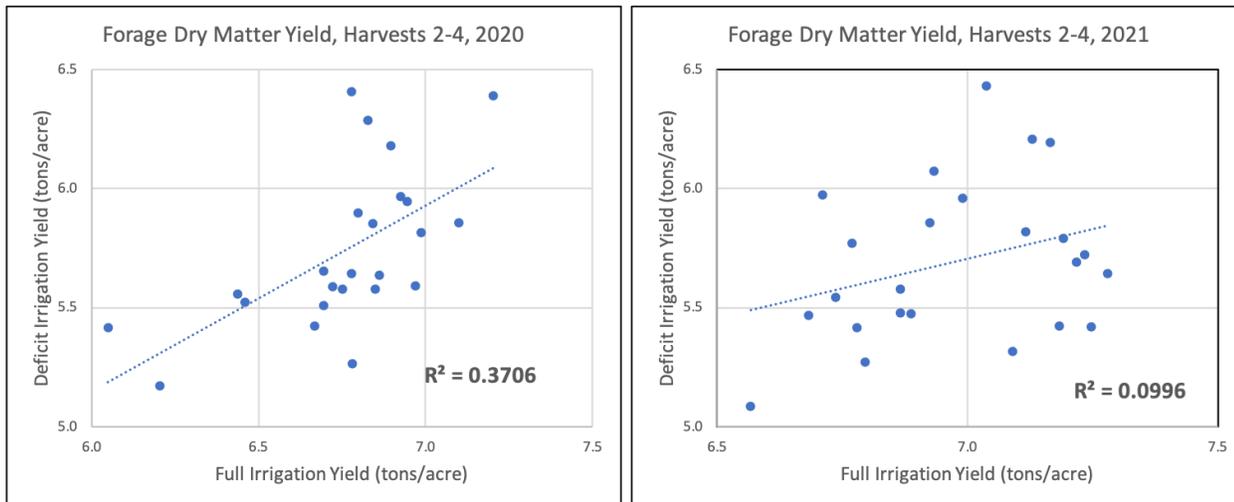
## Methods

Our trial evaluated 26 alfalfa cultivars under full irrigation and deficit irrigation. The trial was planted at the Oregon State University's Klamath Research Station in May 1999. All cultivars were replicated four times in each of two irrigation treatments, and was allowed to establish in 1999 under full irrigation. Starting in 2000, we imposed the deficit irrigation treatment after first harvest, applying roughly ½ of the irrigation water throughout the season that we applied to the full irrigation treatment. Forage was harvested four times in 2002 and 2001.

## Results and discussion

Total season yield was higher under full irrigation, as expected. First harvest yield was similar between irrigation treatments due to over winter precipitation in both years, but yield in deficit treatments across the three subsequent harvests was 85% of full irrigation in 2020 and 82% in 2021. Considering only these final three harvests each year, we compared performance of individual cultivars between the deficit and full irrigation treatments (Fig. 1). In both years, the yield of full irrigation did not explain much of the variation in yield under deficit irrigation, with  $R^2=0.37$  in 2020 and 0.10 in 2021. This suggests that in most instances, the yield of a cultivar under full irrigation is not a good predictor of its yield under water limitation. Consequently, if deficit irrigation is going to be a routine practice, evaluating cultivars under those conditions would provide a better measure of performance.

The best way to identify desirable cultivars is to evaluate them under the prevailing management conditions and select the highest yielding. A ratio of yield under deficit irrigation to full irrigation is often used to assess "drought tolerance"(Table 1). However, this ratio does not necessarily identify high yielding cultivars. In 2021, most of the highest yielding cultivars under stress had a high ratio; however, in 2020, Oneida VR, a cultivar with among the highest ratios also had among the lowest yields under either treatment. Choosing a cultivar based on a combination of yield estimates under both full and deficit irrigation would be a sensible way to select if the amount of irrigation water in any given year were unknown. However, the best yielding cultivars under either treatment are generally unlikely to be high yielding under both, although a cultivar like SW4503Z comes close, especially in 2020.



**Figure 1.** A comparison of alfalfa cultivar dry matter yield when grown under full and deficit irrigation at the OSU Klamath Research Station in 2020 and 2021.

**Table 1.** Dry matter yield of alfalfa cultivars under full and deficit irrigation, harvests 2 – 4 in each year. The top 7-8 cultivars is identified in red for each variable, and the list is sorted in descending order based on deficit yield in 2021.

Cultivar	2020			2021		
	Full	Deficit	Ratio	Full	Deficit	Ratio
RR AphaTron						
2XT	6.83	6.29	0.92	7.04	6.43	0.91
Hybriforce-4400	6.90	6.18	0.90	7.13	6.21	0.87
Velvet II	6.99	5.82	0.83	7.17	6.19	0.86
SW3407	6.70	5.51	0.82	6.93	6.07	0.88
SW5511	6.95	5.95	0.86	6.71	5.97	0.89
SW4503Z	7.20	6.39	0.89	6.99	5.96	0.85
6427R	6.85	5.58	0.81	6.93	5.86	0.85
Vernal	6.78	6.41	0.95	7.12	5.82	0.82
AFX 469	6.84	5.85	0.86	7.19	5.79	0.81
SW5212	6.86	5.64	0.82	6.77	5.77	0.85
Hi-Gest 360	6.78	5.26	0.78	7.23	5.72	0.79
X-C0416A3360	6.93	5.97	0.86	7.22	5.69	0.79
Rugged	7.10	5.85	0.82	7.28	5.64	0.78
Renew+	6.78	5.64	0.83	6.87	5.58	0.81
DKA40-16	6.70	5.66	0.84	6.74	5.54	0.82
Rebound AA	6.80	5.90	0.87	6.87	5.48	0.80
WL 365HQ	6.75	5.58	0.83	6.89	5.47	0.79
Oneida VR	6.05	5.42	0.90	6.68	5.47	0.82
Magnum 8-Wet	6.67	5.42	0.81	7.18	5.42	0.76
WL 349HQ	6.97	5.59	0.80	7.25	5.42	0.75
6472A	6.46	5.52	0.86	6.78	5.42	0.80
6585Q	6.72	5.59	0.83	7.09	5.32	0.75
WL 336HQ.RR	6.44	5.56	0.86	6.80	5.27	0.78
Pillar ST	6.20	5.17	0.83	6.57	5.09	0.77
Mean	6.76	5.74	0.85	6.98	5.69	0.82



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**Mint Variety Trial**



**Triticale Harvest**

