



2023-2024 Texas A&M AgriLife Small Grain Silage Trial at Bushland

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Small grains have historically been an important forage source for beef and dairy producers, and because of increasing livestock numbers and associated forage requirements, the demand for ensiled small grains continues to increase across the Southern Great Plains. Ensiled forages provide livestock producers an opportunity to preserve forage quality for future consumption.

The 2023-2024 Texas A&M AgriLife small grain silage trials consisted of 40 entries including wheat (n=20), triticale (n=10), rye (n=9) and a wheat-triticale blend (n=1). Evaluated varieties were submitted by seed companies on a per fee basis. Varieties were evaluated under a lateral move irrigation system in a randomized complete block design and replicated three times. All varieties were harvested at boot and soft-dough stages. Uniform sub-samples were collected for dry matter and nutritional composition from all plots. A sub-sample of the chopped forage was dried at 221°F (105°C) to determine harvest moisture. A 600-gram sample was submitted to Cumberland Valley Analytical Services for forage nutritional analyses using near infrared reflectance spectroscopy (NIR), and forage constituents are reported on a dry matter (DM) basis (Tables 3 and 4).

Yield responses were driven by forage type and late season environmental interactions. As with summer forages, moisture (rainfall and/or irrigation) is essential to overcome heat stress. Wheat varieties reached boot and heading stages earlier than triticale varieties, and moderate temperatures (80-90 °F) coupled with timely rainfall and irrigation during the wheat heading stage (Fig. 1) benefited wheat yields at soft-dough (Fig. 2; Table 1). Conversely, temperatures were 90-100°F during the triticale heading period, and late rainfall did not provide yield benefits. Producers should consider year-to-year variability and irrigation system limitations when making forage type selections to optimize production with the selected forage type. Multi-year datasets demonstrate the value of timely irrigation and/or precipitation, which explain yield inconsistencies between forage types.

Agronomics

Planted 10/22/2023

Seeding Rate: Wheat and Triticale 1.2 M seeds/acre, Rye 0.8 M seeds/acre

Fertilizer 80 lbs. N and 35 lbs. P

Herbicides: Prowl H20 3/5/2024

Fungicides: Prosaro 4/19/2024

Irrigation: 9.5 inches to Boot and 12 inches to Soft-Dough

Precipitation: 6.8 inches (planting - 6/11/2024)

Crop water use is an important consideration for Southern Great Plains producers, and to answer producer questions about differences in water use between forage types, seasonal crop water use was determined for three varieties representing wheat, rye, and triticale (Table 4). Data confirmed significant differences in total crop water use between forage types, but producers should consider 1) greater water use is a function of a longer growing season and 2) greater water use efficiencies are a function of greater yields within the respective forage type. To minimize yield losses and overcome potential heat stress, irrigation capacity is an important agronomic consideration.

Forage Nutritive Analyses Defined:

CP: Crude Protein

ADF: Acid Detergent Fiber; a fraction of the cell wall includes cellulose and lignin.

NDF: Neutral Detergent Fiber; cell wall fraction of the forage.

NDFD30: NDF digestibility; estimated fiber digestibility after 30 hours.

Lignin: A structural material for cell walls and thus important for plant standability. Lignin is almost completely indigestible.

Starch: A carbohydrate primarily located in the grain. Starch availability is a function of harvest timing and berry processing.

WSC: A measurement of simple sugars (glucose, fructose, and sucrose) and fructans. WSCs accumulate in the stalk until anthesis. After anthesis, they remobilize to the grain. WSCs are important for fermentation as they are used during the development of lactic acid.

TDN: % Total Digestible Nutrients representing digestible protein, digestible crude fiber, digestible nitrogen free extract, and digestible fat.

tons TDN produced per acre: Represents the energy production under the evaluated management and environmental conditions. Calculated as $\% \text{ TDN} \times \text{forage yield (tons/acre; DM basis)} = \text{tons of TDN produced per acre}$

Milk/ton: An index based on several variables that influence intake and nutritive value. These are applied to a standard dairy cow to project milk produced per ton of forage. Calculated using Milk 2006.

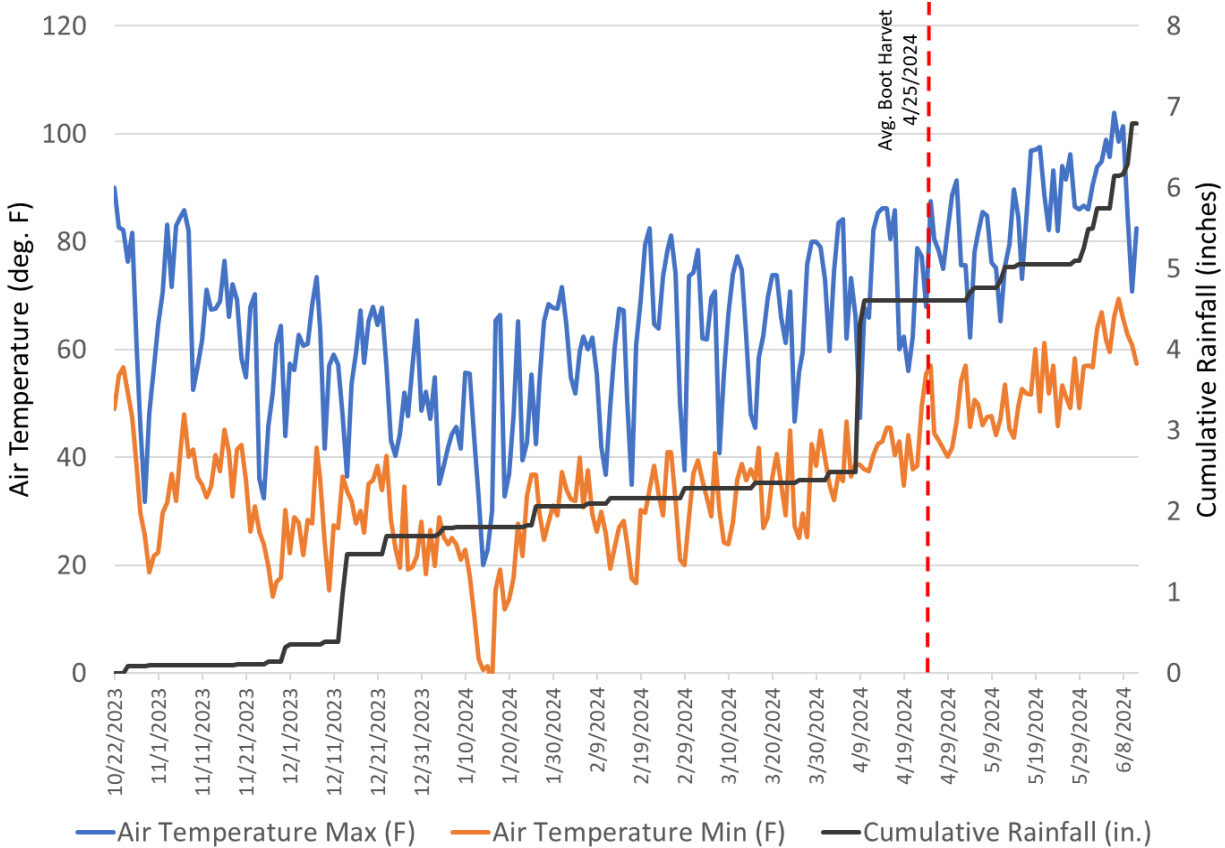


Figure 1. Daily temperature and precipitation during the 2023-2024 production season in Bushland, Texas.

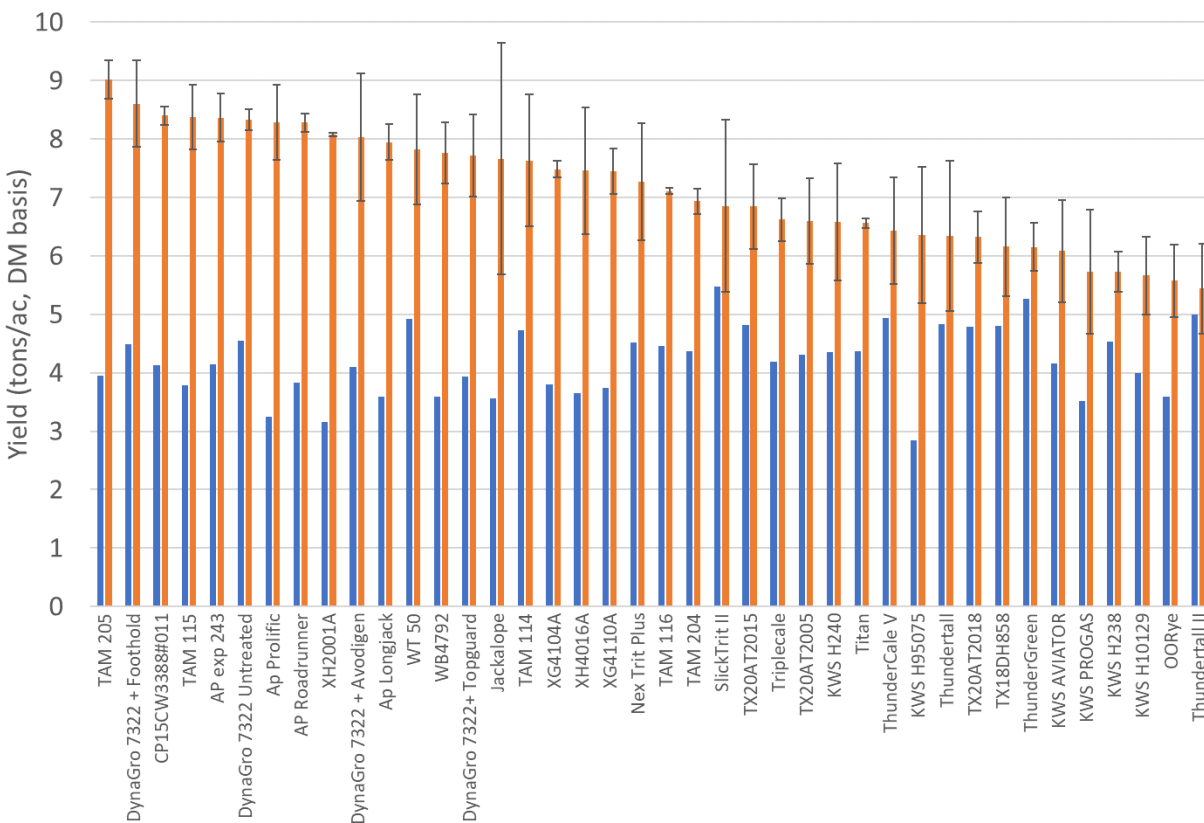


Figure 2. Yield distribution (DM basis) at boot and soft-dough for the varieties evaluated in the 2023-2024 Texas A&M AgriLife Small Grain Variety Trial.

Table 1. Yield data at boot and soft-dough stages at the reported harvest dates. Emergence and winter vigor rating scale: 0=no stand, 1=poor, 3=good, 4=very good, 5=excellent. The spring development rate is represented by the feekes stages on March 12 and March 27, 2024. Feekes scale: 3=tillering, 4=leaf sheaths lengthening, 5=leaf sheaths erect, 6=first node, and 7=second node.

Entry	Variety	Company/Developer	Type	11/8/2023	2/8/2024	3/12/2024	3/27/2024	Boot (Feekes 10)			Soft-Dough		
				Emer. Rating	Winter Vigor Rating	Feekes Stage	Feekes Stage	Harvest Date	Ht (in.)	Yield (lbs/ac) DM Basis*	Harvest Date	Ht (in.)	Yield (lbs/ac) DM Basis*
1	AP exp 243	AgriPro/Syngenta	HRWW	4.0	3.7	5.5	7.0	4/26/2024	32	8,287	6/3/2024	35	16,732
2	Ap Longjack	AgriPro/Syngenta	HRWW	4.7	4.0	5.0	6.5	4/26/2024	30	7,199	6/4/2024	36	15,899
3	Ap Prolific	AgriPro/Syngenta	HRWW	3.0	2.8	6.0	7.0	4/26/2024	32	6,488	6/4/2024	34	16,575
4	AP Roadrunner	AgriPro/Syngenta	HRWW	3.7	3.7	5.5	6.8	4/24/2024	29	7,657	6/4/2024	35	16,560
5	CP15CW3388#011	AgriPro/Syngenta	HRWW	3.7	3.7	6.0	6.5	4/26/2024	29	8,273	6/4/2024	33	16,799
6	DynaGro 7322 + Foothold	Nutrien/Texas A&M AgriLife	HRWW	4.0	3.7	5.5	5.5	4/26/2024	29	8,985	6/5/2024	35	17,210
7	DynaGro 7322 + Avodigen	Nutrien/Texas A&M AgriLife	HRWW	4.3	3.7	5.5	6.0	4/26/2024	30	8,200	6/4/2024	35	16,062
8	DynaGro 7322+ Topguard	Nutrien/Texas A&M AgriLife	HRWW	4.3	3.0	5.5	6.0	4/26/2024	30	7,878	6/4/2024	34	15,437
9	DynaGro 7322 Untreated	Nutrien/Texas A&M AgriLife	HRWW	4.7	3.7	5.5	6.0	4/26/2024	30	9,103	6/6/2024	35	16,662
10	TAM 114	Texas A&M AgriLife	HRWW	3.3	3.3	6.0	6.5	4/26/2024	31	9,454	6/3/2024	34	15,267
11	TAM 115	Watley/Texas A&M AgriLife	HRWW	4.0	3.7	6.5	7.0	4/26/2024	30	7,565	6/4/2024	38	16,753
12	TAM 116	Warner/Texas A&M AgriLife	HRWW	4.0	3.7	5.5	6.5	4/26/2024	29	8,905	6/4/2024	34	14,218
13	TAM 204	Watley/Texas A&M AgriLife	HRWW	3.7	3.5	5.5	6.5	4/26/2024	31	8,731	6/3/2024	35	13,875
14	TAM 205	Warner/Texas A&M AgriLife	HRWW	4.0	3.7	5.3	6.8	4/26/2024	33	7,912	6/4/2024	37	18,050
15	TX18DH858	Texas A&M AgriLife	HRWW	3.7	4.3	6.0	6.5	4/22/2024	32	9,615	6/3/2024	38	12,315
16	WB4792	WestBred/Bayer	HRWW	3.0	3.0	6.0	7.0	4/26/2024	30	7,175	6/5/2024	36	15,526
17	XH2001A	WestBred/Bayer	HRWW	3.0	2.3	4.5	6.5	4/26/2024	31	6,326	6/5/2024	36	16,157
18	XG4110A	WestBred/Bayer	HRWW	4.0	3.7	6.5	7.0	4/18/2024	28	7,469	6/3/2024	37	14,899
19	XG4104A	WestBred/Bayer	HRWW	3.7	3.3	6.5	6.5	4/26/2024	29	7,615	6/4/2024	35	14,970
20	XH4016A	WestBred/Bayer	HRWW	3.3	4.0	6.0	7.0	4/26/2024	31	7,303	6/4/2024	36	14,914
21	Jackalope	Ehmke	Rye	1.3	2.8	4.0	6.0	4/18/2024	33	7,132	6/4/2024	44	15,326
22	OORye	Ehmke	Rye	3.0	4.2	5.0	6.0	4/12/2024	36	7,195	6/3/2024	49	11,147
23	ThunderGreen	Ehmke	Rye	1.0	2.3	4.0	6.0	4/26/2024	38	10,522	6/5/2024	43	12,303
24	KWS AVIATOR	KWS	Rye	2.0	3.5	4.0	6.5	4/26/2024	41	8,307	6/4/2024	45	12,174
25	KWS PROGAS	KWS	Rye	2.0	4.0	5.0	6.0	4/26/2024	37	7,039	6/4/2024	44	11,465
26	KWS H10129	KWS	Rye	2.3	3.7	4.0	6.0	4/24/2024	37	7,993	6/4/2024	44	11,327
27	KWS H240	KWS	Rye	2.0	4.2	4.5	7.0	4/23/2024	37	8,715	6/4/2024	44	13,166
28	KWS H95075	KWS	Rye	1.7	4.0	6.0	8.0	4/8/2024	30	5,677	6/4/2024	43	12,708
29	KWS-H238	KWS	Rye	2.7	4.5	4.5	6.0	4/23/2024	37	9,060	6/5/2024	41	11,464
30	ThunderCale V	Ehmke	Triticale	3.7	4.0	4.5	6.0	4/26/2024	36	9,888	6/11/2024	44	12,861
31	Thundertall	Ehmke	Triticale	2.3	2.5	4.0	5.5	5/3/2024	38	9,658	6/11/2024	53	12,679
32	Thundertall II	Ehmke	Triticale	4.0	3.8	4.5	6.0	5/3/2024	46	10,007	6/11/2024	51	10,870
33	TX20AT2005	Texas A&M AgriLife	Triticale	3.7	3.8	4.5	6.5	4/26/2024	42	8,619	6/11/2024	52	13,194
34	TX20AT2015	Texas A&M AgriLife	Triticale	3.3	3.7	4.3	6.3	4/26/2024	44	9,639	6/11/2024	52	13,689
35	TX20AT2018	Texas A&M AgriLife	Triticale	3.7	3.7	4.5	6.5	4/26/2024	45	9,586	6/11/2024	49	12,646
36	Triplecale	Warner Seed	Triticale	4.3	4.5	4.5	6.0	4/26/2024	43	8,367	6/11/2024	49	13,243
37	SlickTrit II	Watley Seed	Triticale	4.0	3.2	4.0	5.0	5/4/2024	46	10,944	6/11/2024	52	13,708
38	Titan	Watley Seed/Texas A&M AgriLife	Triticale	4.7	4.3	5.0	6.0	4/23/2024	37	8,740	6/11/2024	50	13,122
39	Nex Trit Plus	West Gaines Seed	Triticale	3.7	4.2	4.5	6.0	4/26/2024	42	9,046	6/11/2024	53	14,539
40	WT 50	Warner Seed	Wheat-Trit.	4.2	4.0	5.0	5.0	4/29/2024	45	9,855	6/11/2024	52	15,654
								Trial Average	35	8,403	Trial Average	42	14,304
								p-value	<0.0001	<0.0001	p-value	<0.0001	0.0004
								CV	7.8	9.8	CV	5.3	11.8
								LSD	4.4	1,342	LSD	3.6	3,141

Table 2. Nutrient composition of small grain varieties evaluated in the 2023-2024 small grain variety trial at Bushland harvested at the boot stage sorted by maximum tons TDN/ac.

Entry	Variety	Type	Nutrient Composition at Boot (DM Basis)										
			Harvest Date	% CP	% ADF	% NDF	% Lignin	% NDFD30	% WSC	% Starch	% TDN	Milk/Ton	Tons TDN/ac
23	ThunderGreen	Rye	4/26/2024	16	33	57	4	37	10	0.3	62	3057	3.3
37	SlickTrit II	Triticale	5/4/2024	13	37	61	5	37	9	0.5	58	2723	3.2
15	TX18DH858	HRWW	4/22/2024	14	31	52	4	34	16	1.0	63	3166	3.0
40	WT 50	Wheat-Triticale	4/29/2024	13	34	58	4	37	11	0.8	61	2953	3.0
30	ThunderCale V	Triticale	4/26/2024	15	35	58	4	38	9	1.0	60	2909	3.0
32	Thundertall II	Triticale	5/3/2024	13	36	59	4	36	9	0.4	59	2805	3.0
10	TAM 114	HRWW	4/26/2024	14	33	56	4	36	12	0.9	61	2981	2.9
31	Thundertall	Triticale	5/3/2024	14	35	59	4	36	9	0.6	60	2775	2.9
9	DynaGro 7322 Untreated	HRWW	4/26/2024	15	31	54	4	36	14	1.1	63	3194	2.9
29	KWS-H238	Rye	4/23/2024	15	31	55	3	37	11	0.6	63	3168	2.9
34	TX20AT2015	Triticale	4/26/2024	14	37	61	4	38	9	0.6	59	2772	2.8
6	DynaGro 7322 + Foothold	HRWW	4/26/2024	14	32	55	4	36	15	1.3	62	3085	2.8
12	TAM 116	HRWW	4/26/2024	13	33	56	4	37	14	1.3	63	3103	2.8
27	KWS H240	Rye	4/23/2024	15	31	55	4	37	12	0.4	64	3190	2.8
35	TX20AT2018	Triticale	4/26/2024	14	38	61	5	38	8	0.3	57	2654	2.7
38	Titan	Triticale	4/23/2024	14	33	56	4	38	12	0.8	62	3117	2.7
13	TAM 204	HRWW	4/26/2024	14	32	55	4	35	16	1.2	62	3073	2.7
39	Nex Trit Plus	Triticale	4/26/2024	14	35	60	4	40	9	0.7	60	2890	2.7
33	TX20AT2005	Triticale	4/26/2024	15	32	56	4	36	13	0.3	62	3037	2.7
7	DynaGro 7322 + Avodigen	HRWW	4/26/2024	14	30	53	3	36	16	1.2	64	3246	2.6
24	KWS AVIATOR	Rye	4/26/2024	16	33	58	4	38	10	0.5	62	3068	2.6
5	CP15CW3388#011	HRWW	4/26/2024	14	32	55	4	36	15	1.2	62	3042	2.6
1	AP exp 243	HRWW	4/26/2024	13	33	56	4	36	15	1.4	62	3007	2.6
36	Triplecale	Triticale	4/26/2024	15	35	58	4	37	10	0.5	60	2853	2.5
26	KWS H10129	Rye	4/24/2024	16	32	56	4	38	10	0.2	63	3118	2.5
8	DynaGro 7322+ Topguard	HRWW	4/26/2024	15	30	53	3	36	16	1.4	63	3193	2.5
14	TAM 205	HRWW	4/26/2024	13	32	55	4	36	14	1.1	63	3109	2.5
4	AP Roadrunner	HRWW	4/24/2024	15	32	54	4	37	14	1.0	62	3125	2.4
11	TAM 115	HRWW	4/26/2024	15	31	55	4	36	14	0.9	63	3126	2.4
19	XG4104A	HRWW	4/26/2024	14	32	55	4	35	15	1.1	62	3064	2.4
18	XG4110A	HRWW	4/18/2024	15	31	53	4	36	15	0.9	63	3231	2.4
22	OORye	Rye	4/12/2024	20	28	51	3	37	11	0.6	65	3357	2.3
21	Jackalope	Rye	4/18/2024	19	29	53	3	38	11	0.3	64	3321	2.3
20	XH4016A	HRWW	4/26/2024	15	32	55	4	34	14	0.9	62	2984	2.2
16	WB4792	HRWW	4/26/2024	14	33	56	4	36	14	0.9	62	3015	2.2
2	Ap Longjack	HRWW	4/26/2024	14	33	56	4	36	14	1.3	61	3010	2.2
25	KWS PROGAS	Rye	4/26/2024	15	34	59	4	36	8	0.5	60	2812	2.1
3	Ap Prolific	HRWW	4/26/2024	13	33	57	4	36	14	1.3	62	3053	2.0
17	XH2001A	HRWW	4/26/2024	16	31	54	3	36	14	0.9	63	3121	2.0
28	KWS H95075	Rye	4/8/2024	19	30	53	3	36	11	0.5	64	3215	1.8
Trial Average				15	33	56	4	36	12	0.8	62	3043	2.6
CV (%)				12	8	5	11.2	5	24	47.8	3	6	15.4
p-value				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD				1.2	1.9	2.4	0.4	1.8	2.1	0.3	1.9	160.2	0.3

Table 3. Nutrient composition of small grain varieties evaluated in the 2023-2024 small grain variety trial at Bushland harvested at the soft-dough stage sorted by maximum tons TDN/ac.

Entry	Variety	Type	Nutrient Composition at late Soft Dough (DM Basis)											
			Harvest Date	% CP	% ADF	% NDF	% Lignin	% NDFD30	% WSC	% Starch	% TDN	Milk/Ton	Tons TDN/ac	
14	TAM 205	HRWW	6/4/2024	10	33	51	5	20	11	18.8	60	2499	5.4	
5	CP15CW3388#011	HRWW	6/4/2024	11	29	45	5	15	11	24.7	62	2602	5.2	
6	DynaGro 7322 + Foothold	HRWW	6/5/2024	11	32	49	5	17	10	22.5	60	2463	5.1	
11	TAM 115	HRWW	6/4/2024	10	33	51	5	20	10	19.7	60	2522	5.0	
9	DynaGro 7322 Untreated	HRWW	6/6/2024	12	31	48	5	18	11	21.8	60	2585	5.0	
3	Ap Prolific	HRWW	6/4/2024	10	32	48	6	16	12	21.2	60	2483	5.0	
4	AP Roadrunner	HRWW	6/4/2024	11	32	49	5	19	10	20.3	60	2536	4.9	
1	AP exp 243	HRWW	6/3/2024	10	33	51	5	19	11	19.0	59	2428	4.9	
7	DynaGro 7322 + Avodigen	HRWW	6/4/2024	11	31	48	5	18	10	22.3	61	2601	4.9	
2	Ap Longjack	HRWW	6/4/2024	11	32	47	5	18	10	22.0	60	2585	4.8	
17	XH2001A	HRWW	6/5/2024	10	34	52	6	18	12	17.5	58	2330	4.7	
21	Jackalope	Rye	6/4/2024	10	33	53	6	22	11	14.2	61	2641	4.6	
16	WB4792	HRWW	6/5/2024	10	35	53	6	20	10	18.1	59	2399	4.6	
10	TAM 114	HRWW	6/3/2024	11	33	51	5	20	10	17.7	59	2511	4.5	
19	XG4104A	HRWW	6/4/2024	11	31	48	5	17	11	22.2	60	2530	4.5	
8	DynaGro 7322+ Topguard	HRWW	6/4/2024	11	34	52	6	20	10	18.7	58	2399	4.5	
12	TAM 116	HRWW	6/4/2024	11	29	45	5	17	11	25.1	63	2788	4.5	
20	XH4016A	HRWW	6/4/2024	10	34	50	6	17	10	20.3	58	2352	4.3	
40	WT 50	Wheat-Triticale	6/11/2024	8	40	60	7	20	8	14.5	55	1988	4.3	
18	XG4110A	HRWW	6/3/2024	10	35	53	6	19	13	14.1	57	2304	4.3	
13	TAM 204	HRWW	6/3/2024	11	31	49	5	18	11	21.7	61	2572	4.2	
39	Nex Trit Plus	Triticale	6/11/2024	9	39	59	6	19	8	15.2	55	1935	4.0	
34	TX20AT2015	Triticale	6/11/2024	10	36	55	6	18	10	18.0	57	2136	3.9	
28	KWS H95075	Rye	6/4/2024	10	32	51	6	18	10	19.5	61	2540	3.9	
27	KWS H240	Rye	6/4/2024	10	34	53	6	19	11	15.7	60	2471	3.8	
30	ThunderCale V	Triticale	6/11/2024	10	35	53	5	20	9	19.2	58	2361	3.8	
37	SlickTrit II	Triticale	6/11/2024	9	42	63	7	22	7	10.8	54	1896	3.7	
36	Triplecale	Triticale	6/11/2024	10	39	58	6	20	8	15.2	55	2035	3.7	
15	TX18DH858	HRWW	6/3/2024	11	33	49	5	18	10	21.5	59	2452	3.6	
38	Titan	Triticale	6/11/2024	9	39	59	6	20	10	12.0	55	2014	3.6	
23	ThunderGreen	Rye	6/5/2024	9	37	58	6	22	10	12.9	58	2374	3.6	
24	KWS AVIATOR	Rye	6/4/2024	9	37	58	6	22	10	11.9	58	2378	3.5	
33	TX20AT2005	Triticale	6/11/2024	9	41	61	7	22	9	11.2	54	1919	3.5	
31	Thundertall	Triticale	6/11/2024	9	39	60	6	19	8	13.3	54	1853	3.4	
25	KWS PROGAS	Rye	6/4/2024	10	34	54	5	22	10	16.2	60	2518	3.4	
26	KWS H10129	Rye	6/4/2024	9	35	56	6	22	10	12.7	59	2447	3.4	
29	KWS-H238	Rye	6/5/2024	10	35	56	6	21	10	13.8	58	2368	3.3	
35	TX20AT2018	Triticale	6/11/2024	9	42	62	7	17	9	12.3	52	1647	3.3	
22	OORye	Rye	6/3/2024	10	37	57	7	18	10	11.1	57	2168	3.2	
32	Thundertall II	Triticale	6/11/2024	10	40	62	7	19	9	9.7	53	1826	2.9	
Trial Average				10	35	53	6	19	10	17.2	58	2336	4.2	
CV (%)				12	8	5	11.2	5	24	47.8	3	6	15.4	
p-value				0.0050	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD				1.2	1.9	2.4	0.4	1.8	2.1	0.3	1.9	160.2	0.3	

Table 4. Crop water use to boot and soft-dough harvest stages. Total crop water use represents the combined soil water, precipitation, and irrigation from planting to the reported harvest date. The water use efficiency represents the pounds of forage (DM basis) per inch of total water.

Variety	Forage Type	Boot						Soft-Dough							
		Harvest Date	Soil Water Use (in)	Precip (in)	Irrig (in)	Total Water Use (in)	WUE (lbs/in.)	Harvest Date	Soil Water Use (in)	Precip (in)	Irrig (in)	Total Water Use (in)	WUE (lbs/in.)		
TAM 114	Wheat	4/26/2024	2.5	4.6	9.5	16.6 b	571	6/3/2024	6.4	5.7	12	24.2 b	621		
Aviator	Rye	4/26/2024	1.9	4.6	9.5	16.0 c	520	6/4/2024	5.3	6.3	12	23.6 c	527		
Slick Trit II	Triticale	5/4/2024	3.4	4.6	9.5	17.5 a	623	6/11/2024	6.7	6.3	12	25.0 a	538		
Average						16.7	571	Average						24.3	562
CV (%)						4	11	CV (%)						3	12
p-value						<0.0001	0.0326	p-value						0.0073	0.4157
LSD						0.2	75	LSD						0.5	117