



2024-2025 Growth, Physiology, Yield, And Quality Evaluation Of Small Grain Varieties In Central Arizona

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Introduction

Choosing an appropriate crop variety is critical for farmers, especially in Arizona's small-grain production systems. There exists considerable variation among small grain varieties, with each displaying distinct levels of adaptability and performance traits that ultimately affect the profitability of farming ventures. The performance of varieties can fluctuate significantly from year to year, highlighting the importance of conducting evaluations across multiple site-years to assess a variety's yield potential accurately. It is recognized that different varieties react uniquely to particular management practices and climatic conditions. As part of an ongoing initiative to assess productivity and traits, small grain varieties are currently being evaluated at the Maricopa Agricultural Center (MAC) in Maricopa, Arizona. This report summarizes

the growth, physiology, yield, and quality attributes of seventeen commercially available varieties of durum wheat (*Triticum durum*), hard red wheat (*Triticum aestivum* L.), hard white wheat (*Triticum turgidum*), barley (*Hordeum vulgare*), and triticale (X *Triticosecale* Wittmack) intended for spring planting in the 2024/25 growing season.

Procedure

Three types of small grains (wheat, barley, and triticale) commercial cultivars were evaluated at the University of Arizona Maricopa Agricultural Center in 2024/25 (Picture 1). Treatments were assigned to plots measuring 20 feet long by ten rows wide with a row spacing of 6.5 inches. The seed was planted using a cone planter at a seeding



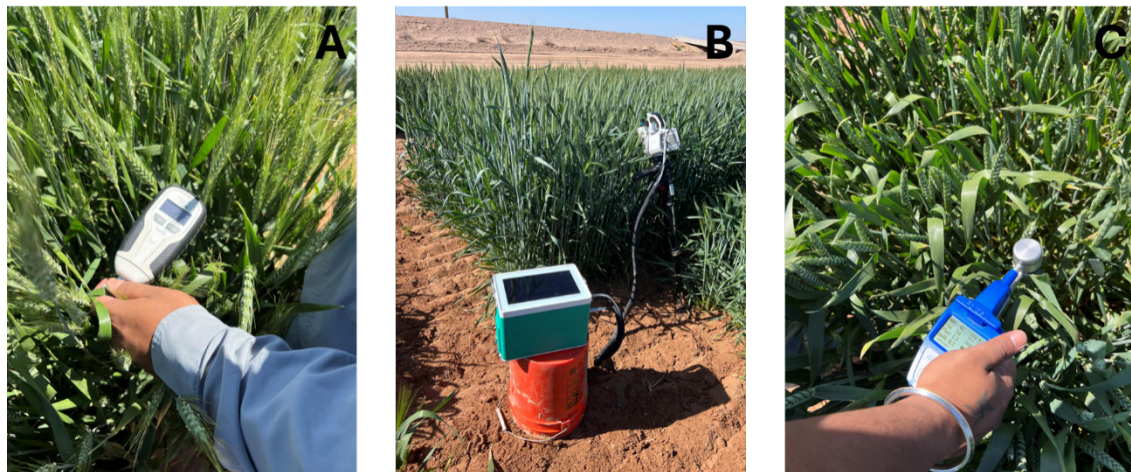
Picture 1. Pictorial representation of end-of-season small grains variety trial at the Maricopa Agricultural Center, University of Arizona, 2024/25 (Picture Credit: Dr. Bhupinder Singh).

rate of approximately 100 pounds per acre. The study was organized in a randomized complete block design with treatment plots replicated four times. Additional details on experimental design, field history, and soil properties can be found in our recent Extension publication, which highlights the early to mid-season performance of the varieties included in the trial (Singh et al., 2025). Cultural practices followed during the season to successfully conduct the trial are outlined in Table 1. The physiological characteristics, including net photosynthesis and chlorophyll content, were measured on the flag leaf during the anthesis period (Picture 2). The yield was taken “as in” moisture basis and then adjusted to 12% moisture.

Results And Discussion

The results regarding the growth, physiology, yield, and quality characteristics of commercially available small-grain varieties included in the variety trial are summarized in Tables 2 and 3. Overall, the average yield

among the three types of small grains was highest for wheat at 6,208 lbs./acre, followed by triticale at 6,100 lbs./acre, and barley at 4,661 lbs./acre (Table 2). Similar trends were observed in quality parameters, such as test weight and protein content (Table 3). The study also noted variation among cultivars within each grain class in terms of growth, physiology, yield, and quality traits. For example, the coefficient of variation for yield was 5% across barley cultivars, 15% across wheat cultivars, and 6% across triticale cultivars. It's essential to emphasize that while trials at agricultural experimental stations are valuable, they should be complemented by localized on-farm testing of new varieties. To accurately assess the performance of different varieties, it's important to gather data from multiple locations and over several years. The findings from this trial offer useful insights and are best understood when integrated with data from various years, serving as preliminary observations to guide further research.



Picture 2. The physiological characteristics, including photochemical quantum yield of photosystem II (A), net photosynthesis (B), and chlorophyll content (C), were measured on the flag leaf during the anthesis period (Picture Credit: Dr. Bhupinder Singh).

Table 1. Cultural practices for a small grains variety trial at the Maricopa Agricultural Center, 2024/25.

Previous crop	Fallow		
Planting date	12/10/2024		
Irrigation events	Date	Acre-Inches	Method
	12/10/2024	4.0	Flood
	1/16/2025	4.0	Flood
	2/12/2025	4.0	Flood
	3/5/2025	4.0	Flood
	3/24/2025	5.0	Flood
	4/8/2025	5.0	Flood
	4/22/2025	5.0	Flood
	SUM = 31 inches		
Nitrogen applications	Date	Lbs. N/A	Type
	12/10/2024	11	11-52-0
	1/16/2025	50	UAN 32
	2/12/2025	50	UAN 32
	3/5/2025	50	UAN 32
	3/24/2025	25	UAN 32
	4/8/2025	25	UAN 32
	4/22/2025	25	UAN 32
	SUM = 236 Lbs. N/A		
Phosphorus application	Date	Lbs. N/A	Type
	12/10/2024	11	11-52-0
Pesticide applications	none		
Harvest date	5/20/2025		

Table 2. Summary of growth, physiology, and yield characteristics for small grain variety trial at Maricopa Agricultural Center, 2024/25.

Class	Name	Company	Final plant height Inches	Flag leaf area cm ²	Chlorophyll content µg/cm ²	Net photosynthesis µmol CO ₂ m ⁻² s ⁻¹	Yield ^β Lbs./A
Barley	KOPIUS	APB	31	16	48	16	4678
Barley	ISHI	UC Davis	39	13	46	15	4874
Barley	Tehama	UC Davis	43	17	53	18	4430
Mean			38	15	49	16	4661
SD			6	2	4	2	223
CV (%)			16	14	7	9	5
Durum wheat	DORATO	APB	39	30	58	24	7873
Durum wheat	TIBURON	APB	40	27	68	26	7204
Durum wheat	ALBERTO	APB	35	25	52	26	6387
Hard Red Wheat	Central Red	UC Davis	39	24	53	25	5388
Hard Red Wheat	XF9222	WESTBRED	39	18	51	20	5388
Hard Red Wheat	WB9725	WESTBRED	35	22	55	24	5347
Hard Red Wheat	WB9215	WESTBRED	38	21	60	13	6996
Hard Red wheat	APB709	APB	39	18	56	27	7061
Hard Red Wheat	WB9444	WESTBRED	39	24	58	23	5996
Hard Red Wheat	WB9623	WESTBRED	39	28	55	23	5138
Hard White Wheat	Central White	UC Davis	41	25	51	23	5514
Mean			38	24	56	23	6208
SD			2	4	5	4	944
CV (%)			5	16	9	17	15
Triticale	BOPAK	UC Davis	41	23	61	32	6120
Triticale	T298	APB	43	22	56	22	5714
Triticale	T308	APB	43	26	31	30	6467
Mean			42	24	49	28	6100
SD			1	2	16	5	377
CV (%)			3	9	33	19	6
^β Yield was adjusted to 12% moisture content.							

Table 3. Summary of quality characteristics for small grain variety trial at Maricopa Agricultural Center, 2024/25.

Class	Name	Company	Test weight lbs/bu	Protein dry basis	Ash dry basis	Fiber dry basis	NDF dry basis	Starch dry basis
				%				
Barley	KOPIUS	APB	51	12.0	1.9	2.0	22.0	72
Barley	ISHI	UC Davis	54	11.6	1.8	1.9	23.0	71
Barley	Tehama	UC Davis	51	12.6	1.8	1.8	23.3	71
Mean			52	12.1	1.8	1.9	22.8	71
SD			2	0.5	0.1	0.1	0.7	0
CV (%)			3	4.2	3.1	5.3	3.0	1
Durum wheat	DORATO	APB	63	14.3	1.7	2.3	7.6	79
Durum wheat	TIBURON	APB	61	16.3	1.9	2.5	7.8	77
Durum wheat	ALBERTO	APB	61	15.0	1.8	2.4	8.4	78
Hard Red Wheat	Central Red	UC Davis	56	16.0	1.7	2.4	9.8	77
Hard Red Wheat	XF9222	WESTBRED	62	16.6	1.9	2.5	10.8	77
Hard Red Wheat	WB9725	WESTBRED	57	15.8	1.8	2.5	10.3	76
Hard Red Wheat	WB9215	WESTBRED	62	15.5	1.7	2.5	9.9	78
Hard Red wheat	APB709	APB	61	15.1	1.6	2.5	8.9	78
Hard Red Wheat	WB9444	WESTBRED	61	15.3	1.7	2.4	10.9	77
Hard Red Wheat	WB9623	WESTBRED	59	18.3	1.8	2.6	10.6	75
Hard White Wheat	Central White	UC Davis	61	15.1	1.7	2.4	8.5	78
Mean			60	15.9	1.8	2.5	9.6	77
SD			2	1.1	0.1	0.1	1.2	1
CV (%)			4	6.7	5.3	3.3	12.7	1
Triticale	BOPAK	UC Davis	53	13.1	1.6	2.2	12.2	78
Triticale	T298	APB	57	15.3	1.7	2.5	11.1	76
Triticale	T308	APB	57	14.1	1.6	2.5	11.3	77
Mean			56	14.2	1.6	2.4	11.5	77
SD			2	1.1	0.1	0.2	0.6	1
CV (%)			4	7.8	3.5	7.2	5.1	2

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Disclaimer

This publication provides an objective summary of a small grain trial experiment and does not endorse or promote any particular brand, product, or trademark. Any references to product names, trademarks, or companies are included for informational purposes only.

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