



Current Report

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Protein Concentration of Winter Wheat Varieties in Oklahoma – 2022–2023

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General Information

Protein is just one of many attributes that determines end-use quality and marketability of winter wheat. In fact, some millers and bakers would argue that functionality of wheat protein is more important than the quantity of protein. While varietal differences exist, variability in protein among environments is generally much larger. Factors such as nitrogen (N) fertilization and drought stress, for example, can sharply impact final wheat protein concentration.

To reflect these management and environmental impacts on wheat protein concentration, data are reported by variety and location in Table 1. In Table 2, it shows the wheat protein concentration by variety as a deviation from the location mean. This allows for easier comparison of wheat protein among varieties across locations. Doublestop CL Plus and Green Hammer, for example, showed positive deviation from the location mean in all of this year's trials where it was planted, indicating a tendency for above-average wheat protein concentration. Adequate and timely N fertility as recommended by a recent soil test or sensor-based N management program can help ensure that varieties with lower than average protein produce wheat or flour protein within the acceptable range for the end-users.

However, protein quantity should not be considered a barometer for protein quality (i.e., dough strength and functionality), though high protein quantity and quality can occur in the same variety. Doublestop CL Plus is one example. Iba is a prime example of how protein data can sometimes be misleading, as the functionality of the protein in Iba is above average, which can offset lower absolute protein concentration. More information on end-use quality is available in Current Report 2165, Wheat and Flour Quality for Varieties Tested in the 2016 OSU Variety Performance Tests.

Procedures

Approximately 600 g subsamples of wheat grain were collected at harvest from four field replicates of all entries for each Oklahoma State University Wheat Variety Performance Test. Each test was properly fertilized and managed according

to OSU Extension recommendations. Additional information on test locations and management practices is available in Current Report 2143, 2022-2023 Oklahoma Small Grains Variety Performance Tests online at www.wheat.okstate.edu. Samples were analyzed nondestructively immediately after harvest for wheat protein concentration on a 12% moisture basis, using a Diode Array Near Infrared (NIR) moisture and protein instrument (model DA 7200, Perten Instruments, Sweden). The expected wheat protein concentration for hard red winter wheat in the Southern Great Plains resides in the 10% to 15% range. Grain samples with extremely high protein concentration (e.g., 18-21%) were also analyzed using the LECO and Elemental CN combustion method and results were confirmed. Overapplication of N in a low-yielding drought year could inflate grain protein concentration values.

Data Interpretation

At the bottom of Table 1, the mean and least significant difference (LSD) values are reported. The LSD is a test statistic that aids in determining whether there is a true difference in protein. In this report, one can be 95% confident that the difference between two varieties is real if the difference is greater than the LSD value. Data that is not statistically different is indicated by "NS." For example, if the LSD value is 1% in a trial where Variety A had 13% protein and Variety B had 10% protein, then Variety A would be considered to have a statistically higher protein. However, if Variety C had 12% protein, then Variety A and Variety C would be considered to have a similar protein. In that same example trial, there is a 5% chance that the 1% protein difference between Variety A and Variety B does not truly exist, but random chance caused the difference. These chance factors may include differences in fertility, moisture availability and diseases. To aid in visualizing the varieties with the highest protein, values highlighted in gray do not differ statistically from the highest value within a column.

Table 1. Wheat protein concentration (12% moisture basis) of varieties and experimental lines tested in the 2022-2023 Oklahoma Wheat Variety Performance Tests.

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Licensee	Variety	Altus	Alva	Apache IM	Balko	Cherokee	Chickasha	Chickasha IM
-----protein concentration %-----								
AgriMaxx	AM Cartwright	18.6	17.1	14.2	14.5	16.6	14.1	13.9
AGSECO	AG Golden	18.1	14.8	12.5	13.2	--	12.8	12.9
AGSECO	AG Radical	20.6	--	--	--	16.0	15.4	14.5
AgriPro	AP Bigfoot	17.0	--	12.7	--	--	13.2	13.7
AgriPro	AP EverRock	--	--	--	--	17.5	13.1	14.0
AgriPro	AP Longjack	18.7	--	--	--	--	14.7	15.5
AgriPro	AP Prolific	--	--	--	--	--	13.8	13.6
AgriPro	Bob Dole	--	16.7	--	--	17.4	13.5	14.0
AgriPro	SY Wolverine	--	17.0	--	14.9	16.5	--	--
Croplan	CP7017AX	16.4	15.0	12.5	13.2	15.1	13.2	13.7
Croplan	CP7266AX	17.1	--	12.8	--	--	13.3	13.7
KWA	KS Ahearn	18.9	15.8	--	14.3	15.6	13.9	13.5
KWA	KS Providence	18.4	16.4	13.5	14.5	16.7	13.3	13.3
LCS	LCS Atomic AX	16.5	16.5	12.9	15.4	15.7	13.1	12.8
LCS	LCS Chrome	18.8	--	--	--	--	14.9	14.4
LCS	LCS Galloway AX	19.3	--	--	--	--	14.8	15.0
LCS	LCS Helix AX	17.2	--	--	--	15.2	12.9	13.2
LCS	LCS Julep	18.5	--	13.5	--	15.8	13.7	14.2
LCS	LCS Photon AX	17.9	18.0	14.3	16.3	--	14.0	14.4
LCS	LCS Steel AX	17.7	--	--	--	--	13.3	13.8
OGI	Baker's Ann	--	16.7	--	15.6	16.6	--	--
OGI	Bentley	17.3	--	--	15.1	--	--	--
OGI	Big Country	--	16.7	--	--	17.3	14.5	15.0
OGI	Breakthrough	--	--	--	14.4	--	--	--
OGI	Butler's Gold	18.9	19.3	14.0	--	19.3	14.5	14.7
OGI	Butler's Gold (late-planted)	17.8	--	15.4	17.4	--	--	--
OGI	Doublestop CL+	18.3	18.0	13.9	--	17.4	15.3	15.9
OGI	Gallagher	18.3	16.3	13.0	14.1	16.8	13.7	13.6
OGI	Green Hammer	18.9	18.4	14.7	--	19.2	15.8	16.0
OGI	High Cotton	18.1	16.2	13.4	14.4	17.1	13.3	13.5
OGI	Iba	17.7	15.0	13.0	13.7	14.9	--	--
OGI	Lonerider	--	--	--	15.7	--	--	--
OGI	OK Corral	19.2	16.1	12.9	14.5	17.1	13.6	14.1
OGI	Showdown	18.8	15.9	12.7	14.1	16.4	13.2	13.2
OGI	Smith's Gold	17.7	17.1	13.7	14.6	16.3	13.7	14.1
OGI	Strad CL+	17.7	17.4	14.1	--	16.2	15.3	15.9
OGI	Uncharted	17.0	16.2	13.3	--	15.9	13.8	13.9
PlainsGold	Breck	18.0	--	--	14.2	--	13.2	13.8
PlainsGold	Canvas	17.6	14.9	13.0	14.2	15.0	13.6	13.4
PlainsGold	Crescent AX	17.3	17.4	12.9	14.7	15.3	13.1	13.1
PlainsGold	Kivari AX	17.1	--	--	--	--	12.3	12.8
Watley	TAM112	--	--	--	--	--	--	--
Watley	TAM115	--	--	--	14.5	--	--	--
Watley	TAM204	--	--	--	--	--	--	--
Westbred	WB4401	18.4	16.6	12.6	--	16.2	12.9	13.3
Westbred	WB4422	18.8	--	--	--	16.9	13.6	13.9
Westbred	WB4632	18.7	16.8	--	--	16.7	12.8	12.9
Westbred	WB4792	16.8	15.6	12.7	13.6	15.4	13.3	13.4
	Experimentals	--	--	--	--	--	--	--
OSU	OK15DMASBx7 ARS 6-8	18.7	16.5	13.8	--	16.4	14.8	15.2
OSU	OK15MASBx7 ARS 8-29	18.9	16.2	13.0	14.1	15.5	13.3	13.7
OSU	OK16103083	--	--	--	--	--	--	--
OSU	OK16107133-19-3	18.3	17.4	14.0	--	17.5	14.2	14.0
OSU	OK18205	19.6	--	--	--	--	--	--
OSU	OK19225	--	--	13.5	--	--	13.9	13.6
	Mean	18.1	16.5	13.4	14.6	16.5	13.8	14.0
	LSD (0.05)	0.8	1.0	0.8	0.5	1.3	0.6	0.7

Notes: Protein was adjusted to 12% moisture content. Shaded values are not statistically different from the highest value within a column. Double-dashes "--" = data not available.

Table 1. Wheat protein concentration (12% moisture basis) of varieties and experimental lines tested in the 2022-2023 Oklahoma Wheat Variety Performance Tests. (cont'd)

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Licensee	Variety	EI Reno DP	Kildare	Lahoma	Lahoma IM	Morris IM	Walters DP
-----protein concentration %-----							
AgriMaxx	AM Cartwright	12.9	17.5	15.1	14.9	15.0	11.2
AGSECO	AG Golden	--	--	13.4	13.4	--	9.4
AGSECO	AG Radical	12.3	14.9	15.0	15.7	14.2	10.1
AgriPro	AP Bigfoot	--	--	15.2	15.3	13.2	--
AgriPro	AP EverRock	12.7	16.3	15.9	16.8	14.5	--
AgriPro	AP Longjack	--	--	15.6	15.3	--	--
AgriPro	AP Prolific	12.1	16.1	14.9	15.0	--	--
AgriPro	Bob Dole	--	--	15.4	16.0	14.4	--
AgriPro	SY Wolverine	--	--	15.7	15.6	--	--
Croplan	CP7017AX	12.5	--	14.5	15.1	14.0	10.6
Croplan	CP7266AX	--	16.3	14.7	15.1	--	--
KWA	KS Ahearn	12.7	15.8	15.2	15.6	13.4	11.0
KWA	KS Providence	--	16.0	15.0	14.8	13.4	--
LCS	LCS Atomic AX	12.7	15.8	13.9	15.4	13.3	10.2
LCS	LCS Chrome	--	--	15.6	15.6	--	12.0
LCS	LCS Galloway AX	--	--	15.4	15.5	--	--
LCS	LCS Helix AX	--	16.4	14.2	14.8	--	--
LCS	LCS Julep	--	--	15.5	15.8	14.2	--
LCS	LCS Photon AX	--	--	15.7	15.9	15.0	11.6
LCS	LCS Steel AX	--	15.9	15.0	15.6	--	--
OGI	Baker's Ann	--	16.4	15.3	15.4	--	--
OGI	Bentley	--	16.2	15.4	15.4	--	--
OGI	Big Country	12.5	15.7	15.4	15.8	15.2	--
OGI	Breakthrough	--	--	--	--	--	--
OGI	Butler's Gold	13.5	18.9	16.8	17.7	--	--
OGI	Butler's Gold (late-planted)	--	--	19.2	19.4	--	--
OGI	Doublestop CL+	13.1	16.9	16.8	17.0	--	12.0
OGI	Gallagher	12.3	15.4	14.7	14.7	13.9	11.0
OGI	Green Hammer	13.7	18.0	16.9	16.8	--	12.2
OGI	High Cotton	13.1	15.6	14.7	14.8	13.7	10.7
OGI	Iba	--	16.1	13.9	13.7	--	11.2
OGI	Lonerider	--	--	--	--	--	--
OGI	OK Corral	12.3	16.3	15.0	15.1	13.7	10.9
OGI	Showdown	11.8	15.5	14.7	14.9	--	10.2
OGI	Smith's Gold	12.2	15.8	15.4	15.4	13.9	10.8
OGI	Strad CL+	13.7	16.8	17.1	16.5	--	11.8
OGI	Uncharted	12.4	16.2	15.8	15.5	13.6	11.9
PlainsGold	Breck	11.9	15.9	14.7	15.2	--	--
PlainsGold	Canvas	--	--	14.4	14.8	--	10.0
PlainsGold	Crescent AX	12.1	16.6	14.4	14.9	14.0	10.1
PlainsGold	Kivari AX	--	--	13.6	14.7	--	--
Watley	TAM112	--	--	--	--	--	--
Watley	TAM115	--	--	--	--	--	--
Watley	TAM204	--	--	--	--	--	--
Westbred	WB4401	11.9	15.5	14.3	14.5	12.3	9.8
Westbred	WB4422	12.2	--	15.4	16.3	--	10.9
Westbred	WB4632	11.3	17.3	14.1	14.2	12.5	--
Westbred	WB4792	--	--	15.1	15.2	--	10.1
	Experimentals	--	--	--	--	--	--
OSU	OK15DMASBx7 ARS 6-8	12.9	16.7	15.5	15.2	--	11.1
OSU	OK15MASBx7 ARS 8-29	11.1	16.3	14.5	14.2	13.2	10.5
OSU	OK16103083	--	17.8	--	--	14.9	--
OSU	OK16107133-19-3	13.1	18.3	16.4	16.6	14.1	12.1
OSU	OK18205	12.4	--	--	--	--	--
OSU	OK19225	--	--	--	--	14.6	--
	Mean	12.5	16.4	15.2	15.4	13.9	10.9
	LSD (0.05)	0.7	1.6	0.6	0.5	0.5	0.7

Notes: Protein was adjusted to 12% moisture content. Shaded values are not statistically different from the highest value within a column. Due to the presence of weed seeds in the grain samples of the EI Reno grain-only trial, grain protein concentration was not measured. Double-dashes "--" = data not available.

Table 2. Wheat protein concentration relative to the location mean (expressed as a deviation) for varieties and experimental lines in the 2022-2023 Oklahoma Wheat Variety Performance Tests.

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Licensee	Variety	Altus	Alva	Apache IM	Balko	Cherokee	Chickasha	Chickasha IM
-----% wheat protein relative to location mean-----								
AgriMaxx	AM Cartwright	0.4	0.6	0.8	-0.1	0.1	0.3	-0.1
AGSECO	AG Golden	0.0	-1.7	-0.9	-1.4	--	-1.0	-1.1
AGSECO	AG Radical	2.5	--	--	--	-0.6	1.6	0.4
AgriPro	AP Bigfoot	-1.1	--	-0.7	--	--	-0.7	-0.3
AgriPro	AP EverRock	--	--	--	--	1.0	-0.7	0.0
AgriPro	AP Longjack	0.6	--	--	--	--	0.9	1.5
AgriPro	AP Prolific	--	--	--	--	--	0.0	-0.4
AgriPro	Bob Dole	--	0.2	--	--	0.9	-0.3	-0.1
AgriPro	SY Wolverine	--	0.5	--	0.3	0.0	--	--
Croplan	CP7017AX	-1.7	-1.5	-0.9	-1.4	-1.4	-0.7	-0.3
Croplan	CP7266AX	-0.1	--	-0.6	--	--	-0.5	-0.3
KWA	KS Ahearn	0.8	-0.7	--	-0.4	-0.9	0.1	-0.5
KWA	KS Providence	0.2	-0.1	0.1	-0.1	0.2	-0.5	-0.7
LCS	LCS Atomic AX	-1.6	-0.1	-0.5	0.8	-0.8	-0.7	-1.2
LCS	LCS Chrome	0.7	--	--	--	--	1.1	0.4
LCS	LCS Galloway AX	1.2	--	--	--	--	1.0	1.0
LCS	LCS Helix AX	-0.9	--	--	--	-1.3	-0.9	-0.8
LCS	LCS Julep	0.4	--	0.0	--	-0.8	-0.1	0.2
LCS	LCS Photon AX	-0.2	1.5	0.9	1.7	--	0.2	0.4
LCS	LCS Steel AX	-0.4	--	--	--	--	-0.6	-0.2
OGI	Baker's Ann	--	0.1	--	1.0	0.1	--	--
OGI	Bentley	-0.8	--	--	0.5	--	--	--
OGI	Big Country	--	0.2	--	--	0.8	0.7	1.0
OGI	Breakthrough	--	--	--	-0.2	--	--	--
OGI	Butler's Gold	0.8	2.8	0.6	--	2.8	0.7	0.7
OGI	Butler's Gold (late-planted)	-0.3	--	2.0	2.8	--	--	--
OGI	Doublestop CL+	0.2	1.5	0.4	--	0.9	1.5	1.9
OGI	Gallagher	0.2	-0.2	-0.4	-0.5	0.3	-0.1	-0.4
OGI	Green Hammer	0.7	1.9	1.3	--	2.7	2.0	2.0
OGI	High Cotton	0.0	-0.3	0.0	-0.3	0.6	-0.5	-0.5
OGI	Iba	-0.4	-1.5	-0.4	-0.9	-1.6	--	--
OGI	Lonerider	--	--	--	1.1	--	--	--
OGI	OK Corral	1.1	-0.4	-0.5	-0.1	0.6	-0.2	0.1
OGI	Showdown	0.7	-0.7	-0.7	-0.5	-0.1	-0.6	-0.8
0.8	Smith's Gold	-0.5	0.6	0.3	0.0	-0.3	-0.1	0.1
OGI	Strad CL+	-0.5	0.9	0.7	--	-0.3	1.5	1.9
OGI	Uncharted	-1.1	-0.3	-0.2	--	-0.6	0.0	-0.1
PlainsGold	Breck	-0.1	--	--	-0.4	--	-0.6	-0.2
PlainsGold	Canvas	-0.6	-1.6	-0.4	-0.4	-1.5	-0.2	-0.6
PlainsGold	Crescent AX	-0.8	0.9	-0.5	0.1	-1.2	-0.7	-0.9
PlainsGold	Kivari AX	-1.1	--	--	--	--	-1.5	-1.2
Watley	TAM112	--	--	--	--	--	--	--
Watley	TAM115	--	--	--	-0.1	--	--	--
Watley	TAM204	--	--	--	--	--	--	--
Westbred	WB4401	0.3	0.1	-0.9	--	-0.3	-0.9	-0.7
Westbred	WB4422	0.6	--	--	--	0.4	-0.3	-0.1
Westbred	WB4632	0.6	0.3	--	--	0.2	-1.0	-1.1
Westbred	WB4792	-1.3	-0.9	-0.7	-0.7	-1.1	-0.5	-0.6
	Experimentals	-	-	-	-	-	-	-
OSU	OK15DMASBx7 ARS 6-8	0.6	0.0	0.4	--	-0.1	1.0	1.2
OSU	OK15MASBx7 ARS 8-29	0.7	-0.3	-0.4	-0.5	-1.1	-0.6	-0.4
OSU	OK16103083	--	--	--	--	--	--	--
OSU	OK16107133-19-3	0.2	0.9	0.6	--	1.0	0.4	0.0
OSU	OK18205	1.4	--	--	--	--	--	--
OSU	OK19225	--	--	0.1	--	--	0.1	-0.4
Location Mean		18.1	16.5	13.4	14.6	16.5	13.8	14.0

Notes: Protein was adjusted to 12% moisture content. Double-dashes "--" = data not available.

Table 2. Wheat protein concentration relative to the location mean (expressed as a deviation) for varieties and experimental lines in the 2022-2023 Oklahoma Wheat Variety Performance Tests. (cont'd)

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Licensee	Variety	El Reno DP	Kildare	Lahoma	Lahoma IM	Morris IM	Walters DP
-----% wheat protein relative to location mean-----							
AgriMaxx	AM Cartwright	0.4	1.1	-0.1	-0.5	1.1	0.3
AGSECO	AG Golden	--	--	-1.8	-2.0	--	-1.5
AGSECO	AG Radical	-2.0	-1.5	-0.2	0.3	0.3	-0.8
AgriPro	AP Bigfoot	--	--	0.0	-0.1	-0.7	--
AgriPro	AP EverRock	0.2	-0.1	0.7	1.4	0.6	--
AgriPro	AP Longjack	--	--	0.4	-0.2	--	--
AgriPro	AP Prolific	-0.4	-0.3	-0.3	-0.4	--	--
AgriPro	Bob Dole	--	--	0.2	0.6	0.5	--
AgriPro	SY Wolverine	--	--	0.5	0.2	--	--
Croplan	CP7017AX	0.0	--	-0.7	-0.3	0.0	-0.3
Croplan	CP7266AX	--	-0.1	-0.5	-0.3	--	--
KWA	KS Ahearn	0.2	-0.6	0.0	0.2	-0.5	0.1
KWA	KS Providence	--	-0.4	-0.3	-0.6	-0.6	--
LCS	LCS Atomic AX	0.2	-0.6	-1.3	-0.1	-0.6	-0.8
LCS	LCS Chrome	--	--	0.4	0.2	--	1.1
LCS	LCS Galloway AX	--	--	0.2	0.0	--	--
LCS	LCS Helix AX	--	0.0	-1.1	-0.6	--	--
LCS	LCS Julep	--	--	0.3	0.4	0.3	--
LCS	LCS Photon AX	--	--	0.5	0.5	1.1	0.7
LCS	LCS Steel AX	--	-0.5	-0.3	0.2	--	--
OGI	Baker's Ann	--	0.0	0.1	0.0	--	--
OGI	Bentley	--	-0.3	0.2	0.0	--	--
OGI	Big Country	0.0	-0.7	0.2	0.4	1.3	--
OGI	Breakthrough	--	--	--	--	--	--
OGI	Butler's Gold	1.0	2.5	1.6	2.3	--	--
OGI	Butler's Gold (late-planted)	--	--	4.0	4.0	--	--
OGI	Doublestop CL+	0.6	0.5	1.6	1.6	--	1.1
OGI	Gallagher	-0.2	-1.0	-0.5	-0.7	0.0	0.1
OGI	Green Hammer	1.2	1.6	1.7	1.4	--	1.3
OGI	High Cotton	0.6	-0.8	-0.5	-0.6	-0.2	-0.2
OGI	Iba	--	-0.3	-1.4	-1.7	--	0.3
OGI	Lonerider	--	--	--	--	--	--
OGI	OK Corral	-0.2	-0.1	-0.2	-0.3	-0.2	0.0
OGI	Showdown	-0.7	-0.9	-0.5	-0.5	--	-0.7
OGI	Smith's Gold	-0.3	-0.6	0.2	-0.1	-0.1	-0.1
OGI	Strad CL+	1.2	0.4	1.9	1.1	--	0.9
OGI	Uncharted	-0.1	-0.3	0.6	0.1	-0.3	1.0
PlainsGold	Breck	-0.6	-0.5	-0.5	-0.2	--	--
PlainsGold	Canvas	--	--	-0.8	-0.7	--	-1.0
PlainsGold	Crescent AX	-0.4	0.2	-0.8	-0.5	0.1	-0.8
PlainsGold	Kivari AX	--	--	-1.7	-0.7	--	--
Watley	TAM112	--	--	--	--	--	--
Watley	TAM115	--	--	--	--	--	--
Watley	TAM204	--	--	--	--	--	--
Westbred	WB4401	-0.7	-0.9	-0.9	-0.9	-1.6	-1.2
Westbred	WB4422	-0.3	--	0.2	0.9	--	0.0
Westbred	WB4632	--	0.9	-1.1	-1.2	-1.4	--
Westbred	WB4792	--	--	-0.1	-0.3	--	-0.8
	Experimentals	--	--	--	--	--	--
OSU	OK15DMASBx7 ARS 6-8	0.4	0.3	0.3	-0.3	--	0.2
OSU	OK15MASBx7 ARS 8-29	--	-0.1	-0.8	-1.2	-0.8	-0.4
OSU	OK16103083	--	1.4	--	--	1.0	--
OSU	OK16107133-19-3	0.6	1.9	1.2	1.2	0.2	1.2
OSU	OK18205	-0.1	--	--	--	--	--
OSU	OK19225	--	--	--	--	0.7	--
	Location Mean	12.5	16.4	15.2	15.4	13.9	10.9

Notes: Protein was adjusted to 12% moisture content. Shaded values are not statistically different from the highest value within a column. Due to the presence of weed seeds in the grain samples of the El Reno grain-only trial, grain protein concentration was not measured. Double-dashes "--" = data not available.

Participating Seed Companies

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Variety: AM Cartwright

AgriPro

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Varieties: AP EverRock, AP Bigfoot, AP Longjack, AP Prolific,
Bob Dole, SY Wolverine

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Varieties: AG Golden, AG Radical

CROPLAN by Winfield United

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Julep, LCS Photon AX, LCS Galloway, LCS Steel AX

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Varieties: Baker's Ann, Bentley, Big Country, Breakthrough,
Butler's Gold, Doublestop CL+, Gallagher, Green Hammer,
High Cotton, Iba, Lonerider, OK Corral, Showdown, Smith's
Gold, Strad CL+, Uncharted

PlainsGold

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Varieties: Breck, Canvas, Crescent AX, Kivari AX

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Hooker – Ernest & Dan Herald
Lahoma – David Victor, OSU North Central Research Station
Morris – Chris Ledbetter
Walters – Jimmy Kinder

Additional Information on the Web

A copy of this publication as well as additional information about wheat management can be found at:

Website: www.wheat.okstate.edu

Blog: www.osuwheat.com



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The Oklahoma Cooperative Extension Service

Education Everywhere for Everyone

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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