SUPPLEMENTAL MATERIALS

Table S1: Select ANOVA results for **Hard White Spring Wheat**, including data and statistics on grain yield, residue production, harvest index, residue carbon contents, and residue uptake values of 10 mineral nutrients. No statistical results were generated for Fe and Cu due to analytical issues.

Treatments	Grain Yield		Residue Prod.		Harvest Index		Residue C		Residue N		Residue P		Residue K	
	(Mg ha^{-1})	(%CV)	(Mg ha^{-1})	(%CV)	(Mg Mg^{-1})	(%CV)	(Mg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)
Location														
Aberdeen	8.05 a	15	7.96 a	22	0.51	8	3.14 a	23	58.0 a	29	1.75 ab	45	297 a	26
Ashton	5.66 b	32	5.38 b	29	0.51	11	2.22 b	29	34.6 b	55	1.48 b	100	193 b	38
Idaho Falls	8.49 a	17	7.70 a	19	0.52	8	3.18 a	18	39.0 b	38	1.86 b	48	216 b	26
Rupert	8.25 a	19	8.31 a	22	0.50	8	3.34 a	22	55.2 a	38	2.62 a	41	280 a	26
Soda Springs	5.57 b	44	4.83 b	31	0.52	10	2.11 b	30	22.9 c	29	1.26 b	29	116 c	47
OVERALL	7.20	30	6.84	31	0.51	9	2.80	30	42	50	1.84	59	220	42
P-Values														
Location (L)	<0.0001		<0.0001		0.0865		<0.0001		<0.0001		<0.0001		<0.0001	
Variety (V)	0.9443		<0.0001		<0.0001		<0.0001		0.0014		0.0430		<0.0001	
LxV	0.5644		0.3550		0.5345		0.3425		0.1424		0.3003		0.0130	

	Residue Ca		Residue Mg		Residue S		Residue Fe		Residue Zn		Residue Mn		Residue Cu	
	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)
Location														
Aberdeen	34.0 a	20	9.39 b	20	17.4 ab	22	47.9	170	67.7 b	68	197 a	49	12.0	128
Ashton	21.4 b	37	3.89 d	42	12.2 c	38	97.7	146	16.6 c	118	218 a	70	5.70	115
Idaho Falls	29.2 a	26	7.62 c	23	18.9 a	26	186	82	145 a	79	87.7 b	61	7.25	143
Rupert	31.7 a	18	10.9 a	20	15.4 b	19	197	133	57.9 b	85	222 a	50	9.20	111
Soda Springs	18.0 b	52	4.88 d	38	7.38 d	43	397	78	47.8 bc	84	202 a	90	8.33	204
OVERALL	26.9	36	7.33	44	14.3	40	185	128	67.1	112	185	73	8.50	147
P-Values														
L	<0.0001		<0.0001		<0.0001		-		<0.0001		0.0004		-	
V	<0.0001		<0.0001		<0.0001		-		0.8335		0.5686		-	
LxV	0.1230		0.0325		0.0438		-		0.8017		0.2736		-	

Table S2: Select ANOVA results for **Soft White Spring Wheat**, including data and statistics on grain yield, residue production, harvest index, residue carbon contents, and residue uptake values of 10 mineral nutrients. No statistical results were generated for Fe and Cu due to analytical issues.

Treatments	Grain Yield		Residue Prod.		Harvest Index		Residue C		Residue N		Residue P		Residue K	
	(Mg ha^{-1})	(%CV)	(Mg ha^{-1})	(%CV)	(Mg Mg-1)	(%CV)	(Mg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)
Location														
Aberdeen	7.49 b	24	8.76 a	18	0.46	9	3.51 a	19	60.6 a	26	2.71 a	42	272 a	21
Ashton	5.38 c	25	5.68 b	25	0.49	7	2.37 b	25	27.5 bc	43	1.46 b	74	165 b	37
Idaho Falls	7.70 ab	20	8.45 a	19	0.48	10	3.53 a	19	39.5 b	47	2.84 a	78	193 b	23
Parma	8.97 a	23	9.20 a	27	0.50	9	3.78 a	28	36.4 bc	42	3.49 a	44	194 b	32
Rupert	8.47 ab	22	9.17 a	25	0.48	5	3.74 a	24	55.4 a	45	2.67 a	55	278 a	33
Soda Springs	5.28 c	27	4.98 b	27	0.51	13	2.18 b	27	23.6 c	39	1.42 b	50	103 c	39
OVERALL	7.22	31	7.71	32	0.48	10	3.19	31	40.5	52	2.46	66	201	43
P-Values														
Location (L)	<0.0001		<0.0001		0.0032		<0.0001		<0.0001		<0.0001		<0.0001	
Variety (V)	0.0028		0.1264		0.0783		0.1064		0.1481		0.0283		0.9656	
LxV	0.9290		0.9931		0.8140		0.9927		0.7755		0.1368		0.9946	

	Residue Ca		Residue Mg		Residue S		Residue Fe		Residue Zn		Residue Mn		Residue Cu	
	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)
Location														
Aberdeen	35.1 a	20	9.39 b	25	14.9 a	19	302	104	39.8 ab	46	194 b	46	14.5	68
Ashton	20.8 cd	36	3.56 e	48	9.42 b	34	263	112	15.3 b	68	282 a	62	5.96	111
Idaho Falls	29.1 ab	25	7.54 c	26	13.8 a	28	264	75	89.2 ab	109	86.9 d	64	10.2	121
Parma	25.9 bc	28	5.35 d	27	6.17 c	30	367	64	126 a	232	103 cd	62	12.4	132
Rupert	34.8 a	24	12.5 a	22	15.0 a	23	406	118	72.1 ab	53	232 ab	67	9.12	110
Soda Springs	16.6 d	38	4.61 de	34	5.46 c	36	381	39	52.5 ab	75	186 bc	80	6.23	118
OVERALL	27.1	37	7.16	51	10.8	46	330	90	66	199	180	72	9.73	115
P-Values														
L	<0.0001		<0.0001		<0.0001		-		0.0459		<0.0001		-	
V	0.0047		0.1102		0.3364		-		0.7168		0.1788		-	
LxV	0.9905		0.6950		0.6084		-		0.1368		0.5808		-	

Table S3: Select ANOVA results for **Hard Red Winter Wheat**, including data and statistics on grain yield, residue production, harvest index, residue carbon contents, and residue uptake values of 10 mineral nutrients. No statistical results were generated for Fe and Cu due to analytical issues.

Treatments	Grain Yield		Residue Prod.		Harvest Index		Residue C		Residue N		Residue P		Residue K	
	(Mg ha^{-1})	(%CV)	(Mg ha^{-1})	(%CV)	(Mg Mg-1)	(%CV)	(Mg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)
Location														
Aberdeen	10.1 a	19	10.6 a	18	0.48 ab	6	4.20 a	20	74.8 a	21	4.65 b	24	279 a	21
Parma	6.85 b	44	8.17 a	46	0.46 b	13	3.29 a	46	16.9 c	50	7.05 a	33	96.4 b	44
Rupert	9.40 a	25	10.2 a	25	0.48 ab	7	4.13 a	25	43.2 b	40	7.40 a	47	234 a	30
Soda Springs	4.33 c	34	4.09 b	49	0.53 a	14	1.75 b	53	17.9 c	56	1.71 c	49	71.1 b	65
OVERALL	7.63	42	8.22	45	0.49	12	3.33	44	37.6	71	5.21	61	168	62
P-Values														
Location (L)	<0.0001		<0.0001		0.0093		<0.0001		<0.0001		<0.0001		<0.0001	
Variety (V)	0.2360		0.0485		0.1058		0.0313		0.3787		0.2539		0.0752	
LxV	0.0881		0.1040		0.8853		0.1206		0.8164		0.5000		0.0977	

	Residue Ca		Residue Mg		Residue S		Residue Fe		Residue Zn		Residue Mn		Residue Cu	
	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(kg ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)	(g ha^{-1})	(%CV)
Location														
Aberdeen	42.2 a	21	19.2 a	18	18.2 a	25	271	98	127 b	67	344 a	30	6.98	99
Parma	18.4 b	47	6.60 c	46	5.55 c	34	341	90	43.7 c	74	184 b	53	3.26	133
Rupert	35.2 a	32	15.8 b	22	13.7 b	34	339	80	182 a	40	314 a	33	7.76	107
Soda Springs	11.4 b	38	4.72 c	28	4.53 c	50	92.4	106	48.9 c	70	181 b	48	4.66	118
OVERALL	26.6	57	11.5	59	10.4	65	261	101	100	83	254	48	5.64	116
P-Values														
L	<0.0001		<0.0001		<0.0001		-		<0.0001		<0.0001		-	
V	0.2206		0.5005		0.1505		-		0.0004		0.2691		-	
LxV	0.1316		0.1807		0.6046		-		0.0165		0.5256		-	

Table S4: Select ANOVA results for **Soft White Winter Wheat**, including data and statistics on grain yield, residue production, harvest index, residue carbon contents, and residue uptake values of 10 mineral nutrients. No statistical results were generated for Fe and Cu due to analytical issues.

Treatments	Grain Yield (Mg ha^{-1})	(%CV)	Residue Prod. (Mg ha^{-1})	(%CV)	Harvest Index (Mg Mg^{-1})	(%CV)	Residue C (Mg ha^{-1})	(%CV)	Residue N (kg ha^{-1})	(%CV)	Residue P (kg ha^{-1})	(%CV)	Residue K (kg ha^{-1})	(%CV)
Location														
Aberdeen	9.30 a	14	9.87 a	15	0.49	9	3.93 a	17	60.4 a	27	4.67 b	63	257 a	43
Rupert	8.66 a	17	9.07 a	22	0.49	7	3.65 a	23	35.3 b	38	7.24 a	47	221 a	23
OVERALL	8.98	16	9.47	19	0.49	8	3.79	20	47.8	41	5.96	57	239	36
P-Values														
Location (L)	0.1069		0.0724		0.6049		0.1311		<0.0001		0.0090		0.1292	
Variety (V)	0.2129		0.0002		0.0018		0.0001		0.9143		0.3939		0.2498	
LxV	0.1185		0.1167		0.8223		0.1787		0.1176		0.5468		0.2885	

	Residue Ca (kg ha^{-1})	(%CV)	Residue Mg (kg ha^{-1})	(%CV)	Residue S (kg ha^{-1})	(%CV)	Residue Fe (g ha^{-1})	(%CV)	Residue Zn (g ha^{-1})	(%CV)	Residue Mn (g ha^{-1})	(%CV)	Residue Cu (g ha^{-1})	(%CV)
Location														
Aberdeen	36.9 a	43	13.8 a	44	14.9 a	45	173	133	75.8 b	123	284 a	43	11.7	115
Rupert	31.5 a	35	13.0 a	36	11.5 b	34	248	89	140 a	37	301 a	33	8.47	147
OVERALL	34.2	40	13.4	40	13.2	43	211	107	108	75	292	38	10.1	128
P-Values														
L	0.0855		0.5467		0.0220		-		0.0044		0.5174		-	
V	<0.0001		0.0008		0.0202		-		0.1317		0.0004		-	
LxV	0.1918		0.0923		0.2149		-		0.7997		0.0375		-	