

Table S1. Growth, yield, and quality of winter wheat under the effect of the harvest year, sowing method, and combination.

Season	Variable	Plant height (cm)	Spike number (No. m ⁻²)	TKW (g)	Yield (t ha ⁻¹)	HW (kg hL ⁻¹)	Protein content (%)	Wet gluten (%)	Gluten index (%)	Falling number (s)
2019/20	Sowing method									
	Control	94.17	422.33	51.46	6.78	72.02	8.99	14.10	80.27	261.50
	Mixed	90.42	356.67	49.92	4.94	71.90	9.19	17.08	59.91	239.00
	Row-Row	91.58	463.33	49.77	5.54	72.87	9.48	16.60	70.71	243.25
	Combination									
	Butterfly	95.00	380.00	48.97	5.74	73.53	9.60	16.66	84.98	310.00
	Illusion	90.00	450.67	51.42	7.19	73.33	9.08	18.01	58.82	226.00
	Lorien	98.33	372.00	55.73	6.76	70.60	9.23	17.31	79.84	248.33
	Vanessa	93.33	486.67	49.73	7.42	70.60	8.04	4.44	97.44	261.67
	Bu+Lo-Mi	91.67	276.00	50.80	4.54	73.70	9.60	19.34	56.79	250.67
	Bu+Va-Mi	90.00	424.00	48.78	5.30	71.33	9.13	14.76	64.04	272.67
	Bu+Lo-Ro	93.33	340.00	50.82	4.40	72.07	9.44	18.84	63.53	223.67
	Bu+Va-Ro	86.67	386.67	49.27	5.52	70.50	8.59	15.38	55.27	209.00
	Illu+Lo-Mi	99.33	417.33	50.75	5.12	73.57	10.46	16.31	76.58	249.67
	Illu+Va-Mi	88.67	485.33	49.22	5.63	71.83	9.50	17.51	75.83	299.33
	Illu+Lo-Ro	90.00	421.33	48.97	5.06	72.53	9.01	16.71	73.19	191.67
	Illu+Va-Ro	88.33	529.33	50.13	6.34	73.53	8.94	15.85	57.22	232.33
2020/21	Sowing method									
	Control	66.02	261.98	42.15	2.47	68.24	9.31	16.53	86.00	240.75
	Mixed	66.97	252.60	40.81	2.28	67.68	9.62	15.05	89.99	243.92
	Row-Row	69.73	356.25	41.05	2.80	67.78	9.53	16.08	90.19	236.25
	Combination									
	Butterfly	66.73	228.47	43.71	2.18	64.73	9.60	18.42	92.10	237.67
	Illusion	64.93	251.39	42.81	2.62	72.07	9.57	13.42	84.72	237.67
	Lorien	71.00	254.86	44.92	2.51	68.77	9.58	15.88	82.97	241.33
	Vanessa	61.40	313.19	37.17	2.55	67.40	8.50	18.38	84.19	246.33
	Bu+Lo-Mi	72.67	191.67	43.90	2.18	67.07	9.60	17.06	86.37	246.33
	Bu+Va-Mi	64.07	285.42	39.41	2.54	66.70	9.58	13.71	90.29	263.00
	Bu+Lo-Ro	70.70	256.25	41.04	2.19	68.90	9.70	12.56	92.13	234.00
	Bu+Va-Ro	60.43	277.08	38.89	2.23	68.07	9.61	16.88	91.17	232.33
	Illu+Lo-Mi	74.77	292.36	43.99	2.18	66.23	9.09	15.53	89.22	239.67
	Illu+Va-Mi	65.70	397.92	38.31	2.50	66.00	9.72	13.10	94.41	253.33
	Illu+Lo-Ro	74.97	352.08	42.81	3.19	69.17	9.77	18.64	82.16	222.33
	Illu+Va-Ro	63.47	382.64	39.08	3.34	69.73	9.55	17.03	94.97	229.67
2021/22	Sowing method									
	Control	82.34	308.18	43.23	5.28	73.63	9.15	18.04	73.04	224.17
	Mixed	89.08	423.15	44.56	6.86	73.32	9.04	17.28	69.43	212.08
	Row-Row	82.73	331.48	42.10	4.95	71.90	8.89	16.13	79.70	246.33
	Combination									
	Butterfly	85.90	304.93	45.00	5.19	77.10	9.62	19.27	66.37	227.33
	Illusion	84.67	259.83	43.70	5.02	76.37	9.77	22.15	73.28	182.67
	Lorien	90.37	308.67	45.17	5.07	70.60	8.84	16.77	64.29	229.33
	Vanessa	68.43	359.27	39.07	5.82	70.47	8.38	13.96	88.20	257.33
	Bu+Lo-Mi	93.67	378.40	46.65	6.63	73.10	9.25	17.69	60.89	221.33
	Bu+Va-Mi	88.67	452.47	42.60	7.03	73.67	9.01	16.44	73.30	229.00
	Bu+Lo-Ro	91.33	412.97	46.60	6.73	72.53	9.07	17.90	69.84	205.00
	Bu+Va-Ro	82.63	448.77	42.40	7.06	73.97	8.81	17.10	73.68	193.00
	Illu+Lo-Mi	83.23	327.77	43.36	4.25	72.40	8.99	15.96	81.00	248.00
	Illu+Va-Mi	82.67	359.90	41.96	5.91	72.87	8.62	14.56	85.01	250.33
	Illu+Lo-Ro	88.80	296.90	43.48	4.65	71.47	8.88	17.35	71.06	243.67
	Illu+Va-Ro	76.23	341.33	39.60	4.98	70.87	9.06	16.66	81.72	243.33

TKW, thousand kernel weight; HW, hectoliter weight.

Table S2. Rheological properties of dough by Mixolab of winter wheat under the effect of the harvest year, sowing method, and combination.

Season	Variable	WA (%)	TimeC1 (min)	TC2 (Nm)	TC3 (Nm)	TC4 (Nm)	TC5 (Nm)	α	β	γ	Amp.	Stability (min)
2019/20	Sowing method											
	Control	61.05	1.92	0.38	1.70	1.01	1.71	-0.08	0.50	-0.11	0.08	5.11
	Mixed	61.52	2.11	0.36	1.66	0.85	1.46	-0.09	0.51	-0.12	0.08	5.17
	Row-Row	61.70	2.63	0.37	1.65	0.87	1.53	-0.08	0.52	-0.09	0.07	5.88
	Combination											
	Butterfly	64.13	2.13	0.42	1.55	1.03	1.57	-0.07	0.44	-0.13	0.07	6.20
	Illusion	61.07	1.41	0.38	1.65	0.85	1.53	-0.08	0.43	-0.13	0.10	4.43
	Lorien	59.90	1.99	0.36	1.71	0.96	1.69	-0.09	0.52	-0.11	0.08	4.50
	Vanessa	59.10	2.17	0.35	1.87	1.21	2.04	-0.07	0.62	-0.07	0.07	5.30
	Bu+Lo-Mi	62.37	1.85	0.39	1.67	0.87	1.44	-0.09	0.51	-0.11	0.09	6.37
	Bu+Va-Mi	62.90	3.32	0.36	1.70	0.96	1.63	-0.08	0.61	-0.11	0.05	4.60
	Bu+Lo-Ro	60.20	1.70	0.36	1.62	0.80	1.43	-0.09	0.46	-0.12	0.09	4.37
	Bu+Va-Ro	60.60	1.59	0.33	1.64	0.77	1.34	-0.09	0.47	-0.12	0.08	5.33
	Illu+Lo-Mi	63.33	3.13	0.35	1.58	0.81	1.43	-0.07	0.56	-0.09	0.06	5.60
	Illu+Va-Mi	63.50	3.78	0.43	1.70	1.01	1.72	-0.07	0.54	-0.09	0.06	7.13
	Illu+Lo-Ro	60.03	1.45	0.36	1.63	0.76	1.37	-0.09	0.48	-0.10	0.09	4.37
	Illu+Va-Ro	59.93	2.18	0.35	1.70	0.91	1.59	-0.08	0.50	-0.09	0.07	6.40
2020/21	Sowing method											
	Control	61.88	2.07	0.38	1.61	0.92	1.68	-0.08	0.53	-0.08	0.08	5.84
	Mixed	61.14	2.37	0.39	1.65	0.96	1.75	-0.08	0.57	-0.09	0.07	7.13
	Row-Row	61.05	2.31	0.38	1.61	0.92	1.73	-0.09	0.51	-0.10	0.07	6.95
	Combination											
	Butterfly	68.87	1.26	0.36	1.31	0.53	0.95	-0.08	0.41	-0.09	0.07	6.63
	Illusion	59.37	1.72	0.40	1.70	1.00	1.90	-0.09	0.54	-0.10	0.10	6.37
	Lorien	60.47	1.66	0.36	1.62	0.98	1.84	-0.08	0.54	-0.07	0.10	4.87
	Vanessa	58.83	3.66	0.39	1.80	1.17	2.04	-0.07	0.63	-0.06	0.06	5.50
	Bu+Lo-Mi	63.83	2.08	0.37	1.44	0.74	1.33	-0.08	0.41	-0.09	0.06	7.40
	Bu+Va-Mi	62.17	2.78	0.40	1.73	1.04	1.79	-0.07	0.60	-0.08	0.06	7.03
	Bu+Lo-Ro	59.37	2.12	0.38	1.67	1.02	1.93	-0.09	0.57	-0.10	0.08	6.03
	Bu+Va-Ro	59.20	2.49	0.39	1.77	1.06	1.96	-0.08	0.69	-0.10	0.07	8.07
	Illu+Lo-Mi	62.50	1.77	0.37	1.46	0.79	1.44	-0.08	0.38	-0.09	0.07	5.77
	Illu+Va-Mi	62.00	3.52	0.38	1.61	0.96	1.74	-0.07	0.48	-0.08	0.06	6.83
	Illu+Lo-Ro	59.67	2.23	0.39	1.64	0.92	1.76	-0.10	0.51	-0.11	0.07	6.63
	Illu+Va-Ro	60.03	1.74	0.40	1.75	1.03	1.97	-0.09	0.65	-0.11	0.09	8.57
2021/22	Sowing method											
	Control	61.72	2.48	0.36	1.48	0.81	1.38	-0.08	0.44	-0.08	0.08	4.61
	Mixed	61.10	2.43	0.34	1.44	0.74	1.36	-0.07	0.41	-0.07	0.07	4.92
	Row-Row	61.38	2.36	0.38	1.53	0.88	1.61	-0.07	0.43	-0.08	0.07	5.36
	Combination											
	Butterfly	66.47	3.07	1.09	0.34	1.26	0.53	0.89	-0.08	0.36	-0.08	0.06
	Illusion	61.40	1.72	1.10	0.36	1.37	0.57	0.92	-0.09	0.34	-0.09	0.10
	Lorien	59.07	2.10	1.09	0.34	1.55	0.94	1.55	-0.07	0.53	-0.09	0.09
	Vanessa	59.93	3.02	1.10	0.39	1.74	1.22	2.16	-0.07	0.54	-0.08	0.07
	Bu+Lo-Mi	61.73	2.49	1.08	0.32	1.38	0.69	1.27	-0.07	0.39	-0.08	0.07
	Bu+Va-Mi	62.50	3.04	1.10	0.36	1.45	0.76	1.36	-0.07	0.43	-0.06	0.05
	Bu+Lo-Ro	60.17	1.98	1.06	0.32	1.43	0.74	1.40	-0.08	0.39	-0.07	0.08
	Bu+Va-Ro	60.00	2.22	1.08	0.37	1.51	0.76	1.42	-0.07	0.44	-0.09	0.08
	Illu+Lo-Mi	61.90	1.90	1.11	0.36	1.45	0.84	1.52	-0.07	0.42	-0.08	0.07
	Illu+Va-Mi	62.50	3.23	1.11	0.38	1.51	0.86	1.55	-0.07	0.42	-0.09	0.06
	Illu+Lo-Ro	60.43	1.94	1.10	0.36	1.51	0.88	1.64	-0.09	0.39	-0.07	0.08
	Illu+Va-Ro	60.70	2.35	1.11	0.42	1.64	0.92	1.73	-0.07	0.51	-0.09	0.08

WA, water absorption; TimeC1, time development of C1; TC2, torque C2; TC3, torque C3; TC4, torque C4; TC5, torque C5; Amp., amplitude.