

SUPPLEMENTARY MATERIALS

to the article by O.A. Orlovskaya, K.K. Yatsevich, L.V. Milko, N.M. Kaznina, N.I. Dubovets, A.V. Kilchevsky

“Using a wheat line with wild emmer genetic material to improve modern *Triticum aestivum* L. varieties by a complex of economically useful traits”

Table S1. The content of macroelements in the grain of secondary common spring wheat hybrids and their parental forms in 2021 and 2022; average

Genotype	Ca, mg/kg			K, mg/kg		
	2021	2022	Mean value	2021	2022	Mean value
	X ± SEM					
Line 29	401.75 ± 2.12	336.31 ± 0.06	369.03 ± 18.91	5901.56 ± 32.81	4514.06 ± 7.81	5207.81 ± 400.77
Darya	516.62 ± 9.87	474.76 ± 2.81	495.69 ± 12.79	6740.62 ± 18.75	4350.11 ± 28.16	5545.36 ± 690.21
Toma	544.03 ± 1.00	452.17 ± 0.45	498.10 ± 26.52	5846.35 ± 0.14	4565.99 ± 22.01	5206.17 ± 369.71
Laska	569.61 ± 3.78	420.77 ± 3.20	495.19 ± 43.01	5429.50 ± 6.95	4134.62 ± 5.13	4782.06 ± 373.81
Lyubava	492.51 ± 3.11	357.77 ± 0.91	425.14 ± 38.91	5579.03 ± 20.55	4023.71 ± 5.37	4801.37 ± 449.06
Darya × I29	565.68 ± 13.18*	346.44 ± 2.47*	456.06 ± 63.52	6084.37 ± 25.00*	4359.93 ± 26.67	5222.15 ± 498.02
Toma × I29	491.51 ± 2.56*	407.33 ± 3.29*	449.42 ± 24.35	4828.26 ± 12.31*	4279.52 ± 47.96*	4553.89 ± 159.69
Laska × I29	519.21 ± 8.46*	391.45 ± 0.38*	455.33 ± 37.04	5631.86 ± 82.39*	4604.86 ± 12.72*	5118.36 ± 298.41
Lyubava × I29	581.25 ± 3.23*	330.72 ± 1.01*	455.98 ± 72.33	5053.23 ± 21.75*	4083.64 ± 21.30	4568.44 ± 280.17
I29 × Darya	499.81 ± 5.68	392.23 ± 3.34*	446.02 ± 31.17	6287.50 ± 15.62*	4350.37 ± 26.08	5318.93 ± 559.33
I29 × Toma	479.99 ± 2.31*	380.46 ± 7.00*	430.22 ± 28.88	5412.78 ± 1.68*	4592.42 ± 58.78	5002.60 ± 238.03
I29 × Laska	541.58 ± 3.20*	444.52 ± 0.16*	493.05 ± 28.04	5614.25 ± 16.44*	4569.96 ± 22.20*	5092.10 ± 301.67
I29 × Lyubava	489.81 ± 2.18	415.67 ± 32.64*	452.74 ± 25.22	5451.68 ± 13.17*	4439.68 ± 68.19*	4945.68 ± 300.14

Table S1 (end)

Genotype	Mg, mg/kg			P, mg/kg		
	2021	2022	Mean value	2021	2022	Mean value
	X ± SEM					
Line 29	1507.50 ± 10.00	1232.56 ± 0.18	1370.03 ± 79.47	4946.87 ± 43.75	4064.06 ± 10.93	4505.46 ± 255.51
Darya	1585.00 ± 33.75	1229.63 ± 2.70	1407.31 ± 103.51	4853.12 ± 31.25	3349.57 ± 16.04	4101.35 ± 434.27
Toma	1411.18 ± 11.20	1193.02 ± 3.94	1302.10 ± 63.16	4600.09 ± 30.17	3852.21 ± 25.31	4226.15 ± 216.49
Laska	1511.47 ± 4.38	1178.54 ± 7.33	1345.01 ± 96.17	4350.53 ± 28.62	3577.22 ± 3.31	3963.87 ± 223.54
Lyubava	1519.76 ± 7.57	1290.27 ± 2.23	1405.01 ± 66.32	4588.89 ± 10.87	3930.72 ± 11.86	4259.80 ± 190.11
Darya × I29	1456.25 ± 32.50*	1218.53 ± 0.61	1337.39 ± 69.89	4676.56 ± 45.31*	3820.39 ± 1.46*	4248.47 ± 247.84
Toma × I29	1352.55 ± 9.42*	1216.34 ± 7.93	1284.44 ± 39.63	4020.53 ± 2.91*	3897.22 ± 72.11	3958.88 ± 46.20
Laska × I29	1495.48 ± 20.60	1183.95 ± 2.08	1339.72 ± 90.32	4401.20 ± 78.31	3782.50 ± 0.04*	4091.85 ± 181.44
Lyubava × I29	1533.61 ± 4.13	1260.60 ± 0.38	1397.10 ± 78.83	4188.41 ± 23.86*	3784.09 ± 17.21*	3986.25 ± 117.33
I29 × Darya	1500.62 ± 11.87*	1290.96 ± 8.64*	1395.79 ± 60.82	5017.18 ± 10.93*	4098.83 ± 38.59*	4558.01 ± 265.61
I29 × Toma	1436.05 ± 0.16	1240.07 ± 19.96*	1338.06 ± 57.15	4521.27 ± 20.48	4117.99 ± 73.09*	4319.63 ± 120.47
I29 × Laska	1389.52 ± 8.57*	1255.77 ± 3.00*	1322.64 ± 38.78	4179.15 ± 16.21*	3765.86 ± 1.12*	3972.50 ± 119.49
I29 × Lyubava	1455.60 ± 9.01*	1251.60 ± 9.57*	1353.60 ± 59.13	4336.31 ± 5.15*	3751.22 ± 41.63*	4043.76 ± 169.76

Note. Here and in Tables S2 and S3: X – mean trait values; SEM – the standard error of the mean. * Statistically significant differences compared to the parental variety, where $p < 0.05$.

Table S2. Quantitative traits of secondary common spring wheat hybrids and their parental forms in 2021 and 2022; average

Genotype	Productive tillering, items			Spike length, cm			Number of spikelets per spike, items		
	2021	2022	Mean value	2021	2022	Mean value	2021	2022	Mean value
	X ± SEM								
Line 29	2.90 ± 0.23	4.00 ± 0.29	3.45 ± 0.22	10.35 ± 0.25	10.30 ± 0.21	10.32 ± 0.16	19.20 ± 0.32	20.00 ± 0.42	19.60 ± 0.37
Darya	3.00 ± 0.21	3.10 ± 0.23	3.10 ± 1.16	10.40 ± 0.27	10.30 ± 0.26	10.35 ± 0.18	19.40 ± 0.52	19.80 ± 0.46	19.60 ± 0.34
Toma	3.20 ± 0.20	3.40 ± 0.16	3.30 ± 0.12	9.20 ± 0.08	8.90 ± 0.19	9.05 ± 0.10	19.20 ± 0.32	18.00 ± 0.29	18.60 ± 0.25
Laska	3.50 ± 0.22	3.20 ± 0.29	3.35 ± 0.18	10.25 ± 0.18	9.75 ± 0.19	10.00 ± 0.14	19.00 ± 0.53	18.80 ± 0.32	18.90 ± 0.30
Lyubava	3.00 ± 0.21	3.20 ± 0.13	3.10 ± 0.12	10.30 ± 0.28	9.45 ± 0.17	9.87 ± 0.18	18.40 ± 0.58	18.40 ± 0.26	18.40 ± 0.31
Darya × I29	3.20 ± 0.20	3.30 ± 0.21	3.25 ± 0.14	10.05 ± 0.20	9.75 ± 0.25	9.90 ± 0.16	19.00 ± 0.44	19.20 ± 0.32	19.10 ± 0.27
Toma × I29	3.80 ± 0.29	3.10 ± 0.10	3.45 ± 0.16	10.35 ± 0.18*	9.30 ± 0.27	9.82 ± 0.20*	20.60 ± 0.42*	19.60 ± 0.40*	20.10 ± 0.30*
Laska × I29	2.90 ± 0.23	2.60 ± 0.16	2.75 ± 0.14*	11.18 ± 0.18*	10.10 ± 0.24	10.66 ± 0.19*	18.80 ± 0.44	19.80 ± 0.46	19.30 ± 0.33
Lyubava × I29	3.60 ± 0.22	2.80 ± 0.24	3.20 ± 0.18	11.45 ± 0.22*	9.95 ± 0.34	10.70 ± 0.26*	19.00 ± 0.33	19.60 ± 0.49*	19.30 ± 0.30*
I29 × Darya	3.90 ± 0.23*	2.80 ± 0.20	3.35 ± 0.19	11.20 ± 0.37*	10.35 ± 0.18	10.77 ± 0.22	20.00 ± 0.59	21.60 ± 0.40*	20.80 ± 0.39*
I29 × Toma	3.60 ± 0.22	2.90 ± 0.23	3.25 ± 0.16	10.30 ± 0.24*	9.85 ± 0.38*	10.07 ± 0.22*	19.40 ± 0.42	21.00 ± 0.53*	20.20 ± 0.38*
I29 × Laska	3.90 ± 0.27	3.70 ± 0.21	3.80 ± 0.17	10.15 ± 0.22	9.90 ± 0.38	10.02 ± 0.21	18.40 ± 0.40	19.60 ± 0.40	19.00 ± 0.30
I29 × Lyubava	3.60 ± 0.33	3.10 ± 0.17	3.35 ± 0.19	11.60 ± 0.20*	10.05 ± 0.25	10.82 ± 0.23*	21.60 ± 0.27*	19.80 ± 0.62*	20.70 ± 0.39*

Table S3. Grain productivity traits of secondary common spring wheat hybrids and their parental forms in 2021 and 2022; average

Genotype	Number of grains per spike, items			Grain weight per spike, g			Grain weight per plant, g			Thousand grain weight, g		
	2021	2022	Mean value	2021	2022	Mean value	2021	2022	Mean value	2021	2022	Mean value
	X ± SEM											
Line 29	44.90 ± 1.60	48.20 ± 1.76	46.55 ± 1.22	1.73 ± 0.05	1.99 ± 0.14	1.86 ± 0.07	3.21 ± 0.23	6.26 ± 0.54	4.74 ± 0.45	38.74 ± 0.83	41.03 ± 1.94	39.89 ± 1.06
Darya	31.90 ± 1.91	42.0 ± 2.11	36.95 ± 1.81	0.82 ± 0.07	1.99 ± 0.13	1.40 ± 0.15	1.67 ± 0.17	4.66 ± 0.37	3.16 ± 0.39	25.72 ± 1.15	47.15 ± 1.31	36.43 ± 2.60
Toma	51.80 ± 2.06	43.3 ± 3.16	47.55 ± 2.08	1.43 ± 0.08	1.75 ± 0.19	1.59 ± 0.11	3.06 ± 0.16	4.88 ± 0.60	3.97 ± 0.37	27.55 ± 0.79	39.98 ± 2.51	33.76 ± 1.91
Laska	46.20 ± 3.96	51.00 ± 1.33	48.60 ± 2.11	1.22 ± 0.17	2.26 ± 0.11	1.74 ± 0.16	2.84 ± 0.26	5.69 ± 0.32	4.27 ± 0.38	25.85 ± 1.87	44.47 ± 1.88	35.16 ± 2.49
Lyubava	33.60 ± 3.09	37.70 ± 1.22	35.65 ± 1.68	0.94 ± 0.09	2.01 ± 0.09	1.48 ± 0.13	2.03 ± 0.12	5.01 ± 0.30	3.52 ± 0.37	28.39 ± 1.42	53.60 ± 1.77	40.99 ± 3.09
Darya × I29	32.40 ± 1.68	44.70 ± 2.81	38.55 ± 2.13	0.74 ± 0.02	1.98 ± 0.17	1.36 ± 0.16	1.80 ± 0.14	5.00 ± 0.39	3.40 ± 0.42	23.40 ± 1.07	43.75 ± 1.72	33.58 ± 2.53
Toma × I29	47.70 ± 2.30	47.80 ± 2.08	47.75 ± 1.51	1.15 ± 0.10	2.03 ± 0.12	1.59 ± 0.12	2.74 ± 0.19	5.12 ± 0.35	3.93 ± 0.33	23.87 ± 1.36	42.39 ± 0.95	33.13 ± 2.27
Laska × I29	51.30 ± 3.40	58.70 ± 2.46*	55.00 ± 2.21*	1.29 ± 0.11	2.74 ± 0.17*	2.01 ± 0.19	3.03 ± 0.27	5.55 ± 0.46	4.29 ± 0.39	25.22 ± 1.17	46.42 ± 1.47	35.82 ± 2.59
Lyubava × I29	52.40 ± 2.48*	48.50 ± 3.56*	50.45 ± 2.16*	1.28 ± 0.13	2.53 ± 0.19*	1.90 ± 0.18*	3.10 ± 0.25*	5.50 ± 0.52	4.30 ± 0.40	24.15 ± 1.57	52.23 ± 1.36	38.19 ± 3.37
I29 × Darya	39.70 ± 2.47*	47.80 ± 3.07	43.75 ± 2.13*	0.89 ± 0.08	2.27 ± 0.14	1.58 ± 0.17	2.38 ± 0.15	4.83 ± 0.21	3.60 ± 0.30	22.56 ± 1.95	47.72 ± 0.91	35.14 ± 3.07
I29 × Toma	39.70 ± 2.85*	53.80 ± 2.40*	46.75 ± 2.43	1.01 ± 0.009*	2.34 ± 0.15*	1.68 ± 0.18	2.56 ± 0.18	5.34 ± 0.60	3.95 ± 0.44	25.55 ± 1.35	43.25 ± 1.33	34.40 ± 2.23
I29 × Laska	43.20 ± 2.18	48.00 ± 2.62	45.60 ± 1.74	1.00 ± 0.08	2.30 ± 0.18	1.65 ± 0.17	2.82 ± 0.23	6.22 ± 0.44	4.52 ± 0.46	23.05 ± 1.15	47.58 ± 1.99	35.32 ± 3.02
I29 × Lyubava	43.60 ± 2.60*	42.70 ± 1.89	43.15 ± 1.57*	1.25 ± 0.11	1.98 ± 0.12	1.61 ± 0.11	2.99 ± 0.30*	5.08 ± 0.34	4.04 ± 0.32	28.47 ± 1.74	46.35 ± 1.38*	37.41 ± 2.31