

SUPPLEMENTARY MATERIALS

to the article N.A. Potapova, A.S. Zlobin, I.N. Leonova, E.A. Salina, Y.A. Tsepilov
 "The BLUP method in evaluation of breeding values of Russian spring wheat lines
 using micro- and macroelements in seeds"

Supplementary Material 1. Estimated breeding values (BV) and mean values (mean_residuals) of 7 elements content in wheat for 149 varieties

Sort_name	Ca_mean_residuals	Cu_mean_residuals	Fe_mean_residuals	K_mean_residuals	Mg_mean_residuals	Mn_mean_residuals	Zn_mean_residuals	Ca_BV	Cu_BV	Fe_BV	K_BV	Mg_BV	Mn_BV	Zn_BV
Kuibishev_1_2018	624.425	4.60225	40.81	3659	1390.25	35.0625	34.565	-95.7171	0.359039	-2.99958	-418.092	-25.2778	-2.20581	-3.89899
Lutesc840_1_2018	672.375	4.3605	35.9475	4359.5	1355.25	26.75	29.57	-137.035	0.313557	-3.04331	-129.219	-10.8576	-4.64479	-3.09536
Tulaik-belos_1_2018	737.775	5.05675	37.5825	3867	1344.75	31.8025	33.0325	9.56192	0.439791	-3.79207	-137.86	-47.1329	-2.45359	-4.23907
Tulaik-step_1_2018	682.8	5.094	45.1525	4179.75	1505.75	39.26	35.5225	-64.1469	0.372408	-1.43949	-84.2097	8.14026	-1.21665	-3.56951
Tulaik-zolot_1_2018	433.675	5.929	39.44	3585.75	1427.75	36.41	37.45	-224.128	1.093	-1.68106	-304.18	15.5959	-0.669555	-2.05818
Tulaik1_1_2018	777.95	4.07225	42.7725	3033.25	1298.5	37.22	34.31	26.0917	0.166851	-1.04821	-832.406	-59.6717	-1.15834	-3.87312
Tulaik10_1_2018	442.625	5.13875	45.9075	4045.25	1657.25	43.1275	41.315	-243.178	0.895193	-0.0913016	-130.552	65.7507	1.37489	-0.889594
Kinel40_1_2018	528.75	4.879	43.88	3455	1355	40.5975	37.8975	-109.453	0.499169	-2.14009	-161.142	-16.4327	0.244623	-2.77205
Kinel60_1_2018	288.35	4.11875	54.175	3739.25	1558	42.9675	44.0775	-282.036	0.224837	1.66115	-334.943	26.0852	1.2021	-0.623735
Bolgoural_1_2018	318.1	3.842	47.0625	3497.75	1385.125	33	34.8475	-303.886	0.416901	-0.538999	-513.346	-26.6814	-2.92052	-3.56007
Lutesc80_1_2018	401.65	4.11275	48.845	3731.5	1492.5	40.05	39.7775	-237.184	0.0987749	0.291213	-299.421	7.01946	-0.665805	-2.40185
Lutesc85_1_2018	570.55	4.38925	41.01	4093.25	1307.75	35.125	40.5425	-96.5159	0.271287	-1.5848	-142.536	-60.1592	-2.23682	-0.296122
Lutesc148_1_2018	629.45	3.986	39.8625	4094.5	1376.25	35.48	38.095	-102.757	0.0174876	-2.35863	-174.864	-18.222	-2.45177	-3.70403
Altai-prostor_1_2018	649.1	4.40725	47.3825	3564.5	1543	34.465	39.905	-102.518	0.160881	-0.224233	-368.646	27.3644	-3.05214	-1.24502
Altai92_1_2018	444.1	4.69175	39.925	2901.5	1287.25	33.06	34.7075	-208.903	0.425006	-2.17643	-711.053	-85.741	-3.26147	-1.40872
Altai99_1_2018	502.375	3.1845	43.4825	3427.25	1312.75	31.475	36.1025	-226.185	-0.182388	-1.68995	-392.886	-38.2649	-4.43207	-2.10497
Altai100_1_2018	615.925	4.0185	41.735	3465	1383.5	35.6325	36.975	-92.9069	0.150941	-1.90684	-434.733	-30.483	-1.77454	-2.22203
Altai325_1_2018	465.65	5.3245	43.6975	3562	1291	34.775	41.9425	-225.266	0.610029	-1.50631	-451.33	-59.3656	-2.65891	-0.775088
Altai530_1_2018	299.675	4.64375	41.965	3403.5	1288.275	33.4175	38.35	-325.884	0.462345	-1.79307	-555.47	-78.0613	-4.07047	-1.74348
Eritr72_1_2018	473.6	3.60325	42.5325	3847.25	1257.85	32.8975	34.6725	-225.213	-0.284939	-0.905268	-318.709	-126.861	-4.09438	-4.37483
Sibir12_1_2018	133.325	4.63675	45.0425	3524.5	1362.05	31.59	43.0175	-331.512	0.444606	0.91799	-293.909	-5.31778	-4.27901	-0.00412385
N15_1_2018	515.475	4.76825	40.2125	3509	1443	31.155	36.5625	-112.187	0.222986	-3.72428	-360.087	17.8731	-2.18786	-3.7018
N22_1_2018	616	4.8485	52.8725	4110	1570	34.87	41.93	-177.025	0.652891	3.67517	-155.298	35.6046	-3.78442	0.517749
N29_1_2018	666.275	3.83525	42.6375	4157.5	1493.25	32.59	39.12	-81.1678	-0.0303713	-1.8176	-234.747	-47.3083	-4.02677	-0.576477
N67_1_2018	478.6	3.16525	46.125	3815.5	1141.75	30.6125	35.925	-189.058	-0.166893	-0.9059	-337.435	-99.8648	-4.9041	-2.29482
N81_1_2018	645.775	4.95825	48.855	4134.5	1410.75	36.5925	44.2125	-77.282	0.357886	-0.0402935	-92.5784	-9.32262	-1.84675	-0.574616
N89_1_2018	655.325	4.17875	41.2725	3747.25	1276.75	29.185	41.14	-92.3401	0.0040828	-2.14614	-280.467	-83.5636	-6.12449	-1.13701
N91_1_2018	1002.675	4.327	44.17	3419.5	1450	29.6825	41.0775	184.85	0.330198	-0.5302	-533.872	-18.1651	-5.14603	-0.396718
Lutesc25_1_2018	443.475	3.319	44.9825	3226	1645.5	33.9675	43.765	-189.662	-0.0328244	-2.44329	-333.75	31.3863	-3.55691	-2.87737
Samsar_1_2018	934.975	4.909	49.08	4250.25	1612.75	44.0725	41.1425	165.112	0.686204	0.616538	11.9126	62.2707	2.61091	-0.620229
Obskaya14_1_2018	379.325	3.70075	45.5825	4227	1433.5	32.785	40.585	-272.796	-0.135067	-1.68944	-257.59	-34.9196	-4.62955	-1.81374
Kantegir89_1_2018	759.2	4.17175	42.5825	3810	1325.25	29.2575	42.6625	-80.6705	0.0510462	-1.97886	-313.178	-77.401	-5.62819	-0.948994
Alexandrina_1_2018	775.65	4.43225	43.49	3573.25	1645.25	40.8575	41.46	23.2881	0.477284	-0.0222183	-329.689	51.0557	1.27572	1.22035
Udacha_1_2018	611.7	4.156	41.825	3750.75	1462.25	36.83	38.6575	-73.1098	-0.0889735	-1.45378	-118.697	-7.90948	-1.53484	-0.568126
Polushko_1_2018	650.1	4.02075	39.48	3711.25	1569.5	43.7525	36.775	-112.016	0.222242	-3.70412	-358.421	17.6022	-2.18273	-3.70463

Supplementary Material 1 (continued)

Sort_name	Ca_mean_ residuals	Cu_mean_ residuals	Fe_mean_ residuals	K_mean_ residuals	Mg_mean_ residuals	Mn_mean_ residuals	Zn_mean_ residuals	Ca_BV	Cu_BV	Fe_BV	K_BV	Mg_BV	Mn_BV	Zn_BV
Bagan93_1_2018	284.85	4.1995	46.4075	2962.5	1606	31.93	38	-341.352	0.0820299	1.06511	-674.268	95.0465	-3.97438	-1.96746
Krasa2_1_2018	381.15	4.95625	50.885	3774.25	1424.75	40.3575	45.65	-233.028	0.386196	0.324071	-239.671	-8.04987	-1.0868	-0.0470245
Krasnoyar90_1_2018	463.9	4.19125	43.985	3800	1434.25	40.695	44.2575	-160.294	0.20389	-1.9224	-359.341	-40.1971	-0.254028	-1.77372
Vesnyanka8_1_2018	380.475	3.6995	44.22	3161.75	1632	36.695	46.425	-170.994	-0.00548375	-2.10209	-453.458	28.3295	-2.09406	-1.99167
Albidum73_1_2018	554.1	3.061	47.685	3575.5	1446.75	40.635	45.81	-154.793	-0.445173	0.814878	-444.622	-7.89912	0.0202612	1.62217
Ribinsk127_1_2018	499.525	3.29675	40.055	2776.25	1438.75	33.9525	42.515	-189.234	-0.552135	-2.25701	-950.203	23.742	-2.9587	1.79516
Angarida_1_2018	727.275	4.2535	43.01	3451.5	1593.75	36.9125	44.3975	-50.6532	0.0914418	-1.89276	-450.7	52.1923	-1.92567	-0.451285
Mana2_1_2018	601.275	4.1625	42.205	3295.5	1354.25	34.42	38.2025	-111.76	0.108522	-1.89542	-421.924	-52.5079	-3.74759	-1.9252
Tuleev_1_2018	727.625	4.8575	44.38	4110.25	1400.75	43.29	46.4725	-48.6787	0.547756	-0.381524	-151.151	-28.9932	1.98452	3.29902
Izida_1_2018	439.075	3.316	38.28	4062.75	1551.5	33.405	39.195	-210.86	-0.230815	-2.41978	-61.0052	41.1182	-3.72645	-1.58344
Mariya_1_2018	508.05	4.344	50.2125	4240	1649.5	38.8875	46.77	-105.705	0.207527	0.528138	-239.564	0.260509	-2.44977	0.169619
AN-34_1_2018	375.15	5.6135	49.4475	3815	1448.25	42.48	44.03	-174.308	0.84711	2.14474	-266.967	-55.683	0.537891	1.48725
Salimovka_1_2018	693.45	4.577	39.6925	4278.75	1557	32.64	38.945	-89.0222	0.319128	-2.75954	-76.9036	59.5432	-4.67256	-1.71555
Kiiskaya_1_2018	657.125	5.366	50.825	3922.5	1326.5	42.7875	42.6875	-154.335	1.01312	2.68492	-217.411	-51.599	1.19715	1.43973
Nostalgia_1_2018	526.675	3.7705	44.2225	3606.25	1250.75	33.5475	41.985	-235.706	0.0932945	-0.735332	-357.072	-66.2384	-3.46875	-0.0621728
Aleshina_1_2018	817.975	4.5535	51.935	3770	1512	38.98	48.04	-7.08545	0.358497	2.3116	-243.363	49.9607	0.851437	3.06255
Darnitsa_1_2018	903.125	6.13875	47.0975	3726.5	1318.5	43.9325	43.645	65.9642	1.06297	0.436518	-241.027	-39.0968	2.32836	0.691945
Serebrina_1_2018	547.075	4.20575	40.1675	3762.75	1212.875	35.8925	38.22	-199.73	0.370614	-1.9659	-389.426	-59.2604	-1.76388	-1.45664
Rechka_1_2018	561.225	3.934	38.825	3428.5	1339.25	32.6775	36.3525	-133.913	0.0082373	-2.5585	-351.652	-25.8965	-2.66128	-3.07177
Latona_1_2018	590.65	3.5845	41.955	3838.75	1544.25	32.9625	38.41	-100.834	0.0811836	-2.98049	-301.805	-13.2711	-3.25965	-2.53298
Provinc_1_2018	459.225	3.62875	51.3275	4031	1455.5	34.6925	49.1825	-204.794	-0.272275	1.44895	-229.06	-7.7156	-3.012	1.71419
Bell_1_2018	547.325	3.538	45.095	4024	1459.75	32.8475	42.6025	-150.683	-0.112813	-1.08195	-195.086	4.10022	-3.18369	-0.570014
Usty_a_1_2018	516.45	3.03175	44.865	3983.5	1484.25	30.5825	37.9275	-168.874	-0.425706	-0.831575	-284.807	6.08955	-3.59678	-1.27623
Chernyava_1_2018	477.7	4.0965	42.7225	3769	1513	37.2325	41.41	-194.879	0.0771732	-1.03042	-301.609	-3.80776	-1.95309	-0.263269
Zlotosara_1_2018	729.8	3.86875	46.3875	3556.25	1667.5	37.115	43.525	-13.9268	0.0883072	1.17947	-329.004	49.3077	-0.681947	0.578955
Tyumen99_1_2018	748.85	4.0715	34.9725	3736	1556.75	37.5425	43.8375	-15.5718	-0.00248321	-4.50732	-276.268	46.5721	-1.98135	0.386743
Ikar_1_2018	496.1	3.82375	42.635	4290	1619.5	42.28	44.4375	-201.999	0.031283	-1.51621	-95.5245	53.8227	1.7673	1.49396
Skent_1_2018	904.225	5.15	43.6575	3705.25	1313.25	41.9125	40.7625	105.762	0.600629	-1.84078	-272.318	-59.9533	0.910867	-2.33014
Ilninskaya_1_2018	641.1	4.221	42.9775	3708.5	1507.25	40.875	36.2875	-95.7674	0.445486	-1.26337	-426.144	6.3738	0.858859	-2.85683
Turinskaya_1_2018	659.75	4.132	40.08	3714.75	1429.75	35.13	34.5425	-61.6405	0.0579059	-4.46704	-322.955	-3.84386	-2.81087	-4.40148
Surenta1_1_2018	672.975	3.9665	46.085	3422	1402.25	31.12	38.6525	-110.01	0.13171	1.9915	-412.48	22.764	-2.89176	-0.228002
Surenta4_1_2018	623.05	4.663	44.805	3799.25	1436.75	37.2825	39.3875	-140.125	0.427012	-0.649809	-358.62	-24.6983	-1.33047	-1.21432
Surenta5_1_2018	715.45	3.96975	42.8625	3765.75	1393.75	37.965	35.34	-24.7947	0.34251	-1.48747	-330.883	-11.081	-0.439657	-2.17882
Surenta6_1_2018	657.55	4.66875	42.95	4213.75	1561	40.7075	37.66	-39.7088	0.280406	-3.59467	-101.928	-12.1057	-0.59494	-2.25743
Surenta7_1_2018	536.225	4.2385	41.84	3784.5	1392	34.915	36.5	-143.552	0.156278	-2.00602	-150.762	4.5608	-2.097	-2.12208
Dias2_1_2018	811.075	4.818	43.9375	3694.5	1460.25	41.75	40.445	-73.4061	0.113075	-1.1495	-291.437	13.077	-1.10503	-3.14704
Katyusha_1_2018	388.075	3.959	42.0425	3749.25	1579.25	39.7775	39.37	-194.768	0.186865	-2.47377	-273.718	13.8834	-0.17248	-2.74709
Tarskaya6_1_2018	713.925	5.06325	41.9025	3767.25	1367.5	47.445	38.1125	-38.1261	0.544557	-2.16197	-325.53	-42.0314	4.04554	-1.69661

Supplementary Material 1 (continued)

Sort_name	Ca_mean_ residuals	Cu_mean_ residuals	Fe_mean_ residuals	K_mean_ residuals	Mg_mean_ residuals	Mn_mean_ residuals	Zn_mean_ residuals	Ca_BV	Cu_BV	Fe_BV	K_BV	Mg_BV	Mn_BV	Zn_BV
Sonata_1_2018	322.95	3.65375	39.965	3858.25	1645	38.1375	42.775	-189.13	-0.0665025	-2.45099	-203.68	-4.78313	-0.574773	0.421457
Strada_1_2018	775.875	3.68625	39.8825	3554.25	1407.125	40.6375	42.3325	-68.1271	-0.13073	-2.02901	-351.499	-10.005	-1.81298	-1.38301
Otrada_1_2018	659.4	3.51925	42.2825	3537	1452.25	42.65	33.55	-67.947	-0.217701	-1.04018	-347.973	-15.094	2.05604	-4.06515
Tertciya_1_2018	360.525	4.17625	35.775	3937.5	1482.25	32.9175	36.28	-262.472	-0.0159035	-2.82357	-273.875	-16.6539	-3.36607	-3.33673
Priirtish_1_2018	654.3	3.276	30.535	3446.25	1394.75	28.78	30.2425	-66.1809	-0.262757	-5.04583	-368.767	9.8084	-4.47081	-4.99893
Rosinka_1_2018	661.65	4.49175	47.185	3909.75	1598.5	42.28	42.25	-55.1075	0.273121	-1.05931	-223.07	29.2958	0.781626	-0.319241
Om20_1_2018	736.15	4.46975	44.85	4033.25	1358.75	41.05	37.145	58.8918	0.273038	-1.87446	-136.51	-97.0037	-0.0661973	-3.47285
Om23_1_2018	627.7	4.05775	46.15	4077	1477.25	40.4825	34.6475	-131.239	0.109179	1.09875	-248.36	0.682763	-1.03047	0.357905
Om24_1_2018	777.2	4.3085	41.6375	3842.5	1411.5	42.305	38.8525	-52.6488	0.215514	-1.34674	-180.759	0.841042	-0.208566	-1.46531
Om26_1_2018	573.325	4.36725	45.1125	4050.5	1579.75	39.3675	40.7825	-141.239	-0.0973723	-1.64467	-248.446	16.985	-1.86995	-3.13618
Om28_1_2018	713.725	4.12975	39.04	3735.5	1315.75	39.185	43.0475	-30.4057	0.1973	-2.80804	-272.063	-52.5692	-0.0597075	0.769602
Om29_1_2018	897.475	4.0565	41.5075	4098.5	1186.65	35.1275	37.5075	53.1303	0.197275	-1.44336	-143.309	-82.6588	-1.55188	-2.72159
Om32_1_2018	839.35	3.43625	38.8025	3944.5	1211	35.6425	37.5125	32.1862	-0.0381693	-2.588	-141.518	-73.2952	-1.73576	-2.10501
Om33_1_2018	805.4	4.08275	42.09	3727	1394	36.54	41.59	66.361	0.265366	-1.83775	-272.327	-50.5959	-0.894693	0.428972
Om34_1_2018	760.225	4.56675	41.93	4129	1388.25	35.535	41.685	-46.6278	0.380037	-1.96253	-117.767	-13.8763	-2.07933	-1.32135
Om36_1_2018	714.85	4.27575	43.92	3681.75	1464	37.715	42.135	21.6621	0.199371	-0.61439	-246.286	-23.6829	-0.617633	-0.550144
S29_1_2018	617.9	5.9455	29.9825	4474.25	1639.75	27.785	42.085	-2.74137	0.516081	-3.52528	-18.0698	-1.8603	-1.71801	-2.56005
S42_1_2018	765.825	4.386	41.385	3828.75	1519.25	35.585	37.3875	-12.5923	0.406955	-1.7322	-198.674	23.6085	-1.90088	-2.17709
YA.P_1_2018	480.025	4.02075	35.775	3776	1489.5	32.64	28.5225	-152.619	-0.0466486	-5.01561	-108.792	34.7228	-2.8696	-6.63814
S.29_YA.P_1_2018	703.375	4.401	35.6075	3723.75	1476.25	33.7975	29.98	21.5458	0.230611	-2.7591	-53.0053	22.9543	-0.954473	-3.48618
Obskaya2_1_2018	537.675	4.0175	35.3775	4571.5	1620.25	38.3775	39.7525	-100.792	0.25326	-3.60402	149.585	69.6592	0.52144	-0.243071
Tulun_1_2018	608.225	4.435	39.055	4155.5	1616.75	35.36	41.36	-100.519	0.298863	-3.51244	11.6125	85.249	-2.36038	0.0556065
Skala_1_2018	735.575	3.09175	42.29	4256.75	1480.25	36.7225	30.2975	-89.0394	-0.169625	-1.61354	-206.113	10.9592	-2.07937	-3.60498
Irtyskaya_1_2018	891.275	3.45325	39.145	4308.25	1324	35.6875	35.5175	-31.8806	0.101306	-1.85121	-92.2711	-37.1048	-1.69906	-4.56645
Tselinnaya_1_2018	991.575	3.38925	33.625	3728.75	1239	36.6275	32.4325	194.834	-0.25089	-5.50287	-133.778	-43.7799	1.20941	-3.78898
Belorusskaya_1_2018	1107.025	3.4755	45.6325	5037.75	1613	41.6825	58.08	270.059	-0.416008	-0.320215	736.642	45.6448	2.05747	2.83085
Rassvet_1_2018	1308.875	2.12425	40.7175	4628.25	1718	41.385	27.24	429.567	-1.03486	0.793467	684.049	178.331	2.34467	-6.4007
Festivalnaya_1_2018	1116.75	2.986	43.32	4576	1422	41.6675	40.595	323.043	-0.447998	0.314911	676.849	46.0782	3.04161	2.95636
T.dicoccum_1_2018	929.05	4.54175	42.4875	4518	1584	40.7375	53.825	204.848	0.455175	0.411156	498.874	123.935	3.52125	12.417
744_1_2018	1011.225	3.58	56.26	4639.25	1599.5	46.34	43.5625	257.884	-0.226799	4.77189	280.654	45.5704	5.0992	1.97932
760_1_2018	1132.325	3.11325	55.5125	3500.25	1640	50.6825	49.6575	266.746	-0.606208	4.11461	280.564	2.87063	4.6421	0.171929
811_1_2018	1297.25	2.9065	43.7775	4734	1287.5	44.1275	41.3325	322.188	-0.308613	-0.469961	219.395	-23.8412	2.0221	-0.926831
821_1_2018	825.375	3.17725	43.175	4389.5	1321	39.52	39.27	154.629	-0.808654	4.42421	813.123	-1.58229	2.82714	1.80997
832_1_2018	842.05	3.34625	56.85	5649.25	1546.75	40.2875	48.165	126.958	-0.637051	4.63195	916.013	11.6458	2.56804	2.18716
837_1_2018	835.825	2.782	48.615	4762.75	1573.5	40.2275	50.185	126.996	-0.729579	6.55151	992.381	41.5539	4.15571	6.30677
842_1_2018	903.125	2.90125	52.2175	6683	1476	41.975	42.215	144.331	-0.631195	4.63509	1072.63	11.7371	2.85597	1.92827
141_1_2018	711.05	3.34325	47.7975	5142.25	1451	40.105	35.8575	1.41966	-0.680921	0.604314	360.263	-19.1345	-0.369626	-4.22104
157_1_2018	887.275	3.58425	58.765	4473.25	1429.75	47.635	53.91	118.114	-0.57988	6.94847	224.414	-8.70442	5.4057	6.03134

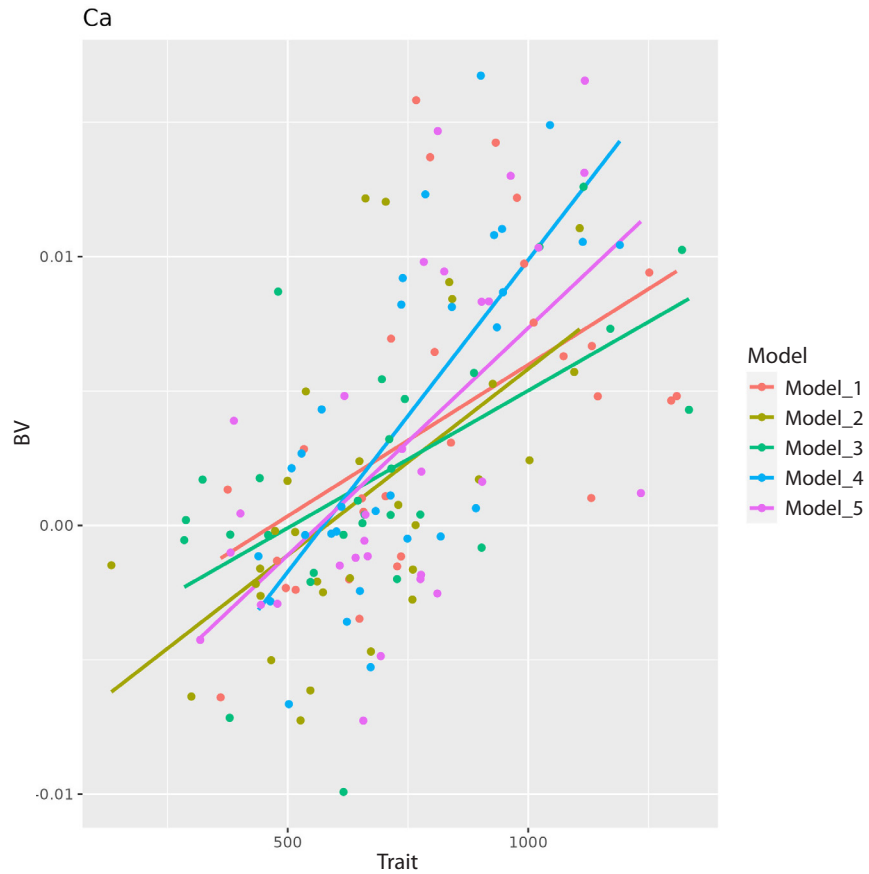
Supplementary Material 1 (end)

Sort_name	Ca_mean_ residuals	Cu_mean_ residuals	Fe_mean_ residuals	K_mean_ residuals	Mg_mean_ residuals	Mn_mean_ residuals	Zn_mean_ residuals	Ca_BV	Cu_BV	Fe_BV	K_BV	Mg_BV	Mn_BV	Zn_BV
175_1_2018	926.275	2.7615	44.34	4634.5	1223.75	37.89	34.545	109.759	-0.933986	4.22555	672.278	-79.2901	0.409357	-3.44586
178_1_2018	739.15	3.2675	52.745	4904.25	1410	37.6175	38.53	106.77	-0.935894	4.28091	684.515	-77.801	0.308104	-3.33016
184_1_2018	841.275	2.34675	47.6025	4753.5	1181.5	37.6325	32.4425	98.1061	-0.959638	4.0793	653.727	-79.6875	0.236718	-3.73843
10_1_2018	1021.425	3.129	50.455	4919.25	1306	41.34	31.31	232.897	-0.558872	5.31372	670.043	-70.5045	2.48415	-3.83156
28_1_2018	1023.3	4.13275	52.9275	5648.25	1377	43.7975	35.6825	223.608	-0.53078	5.31307	713.337	-69.4606	2.37984	-3.80568
38_1_2018	786.125	3.75025	57.06	4647.75	1467.75	37.575	45.89	150.276	-0.504322	9.33365	716.749	-30.4922	3.72268	1.46802
67_1_2018	441.8	3.1365	44.1175	3826	1482	39.4325	32.975	-158.243	-0.248384	0.279559	-1.32756	-8.43233	0.100527	-2.18382
94_1_2018	649.05	4.2235	50.8275	4174.25	1413.25	44.065	47.1025	-85.9247	-0.0149265	3.70367	114.273	-1.07167	2.77129	4.25917
140_1_2018	533.7	3.6015	45.0025	4088.5	1486.5	38.655	36.5925	-95.407	-0.0249978	0.826024	69.6297	-21.4017	-0.485846	-2.67049
191_1_2018	976.55	3.439	41.4625	3917.25	1411.75	45.375	37.0025	230.519	-0.720394	0.122639	101.39	-36.13	5.13434	-1.27636
199_1_2018	963.525	3.35975	59.47	4500.5	1538	49.1625	52.285	239.782	-0.488136	7.09066	430.201	30.7425	7.13155	6.92709
206_1_2018	796.1	2.63525	38.3225	4042.75	1261.75	40.785	35.405	183.521	-0.919743	-1.54821	129.87	-54.1606	4.40383	-2.35373
208_1_2018	1045.325	2.9085	49.2575	4546.25	1578.75	47.815	46.96	307.668	-0.716723	0.894401	143.142	5.88893	6.39774	2.14309
676_1_2018	695.775	2.64825	51.6675	3791.5	1408.25	42.0025	49.16	-2.49949	-0.686216	6.28252	-119.138	-48.1577	3.25241	7.32612
699_1_2018	1234.25	2.31625	41.57	4228	1403.25	39.4325	43.6675	257.076	-0.675991	0.631309	74.9844	-57.661	0.689977	3.17527
728_1_2018	1131.075	4.07	37.9675	4056.25	1394.75	41.1	35.765	259.367	-0.0751995	-3.11137	-116.039	-7.98357	3.18585	-2.19282
732_1_2018	661.675	3.451	42.365	3987.75	1370	39.1675	44.945	56.3362	-0.641684	1.14033	107.939	-66.2225	2.24071	3.15341
183_2-2_1_2018	1334.25	3.215	32.9025	4571.25	1247	38.3025	36.4975	308.688	-0.207972	-5.58056	42.851	-60.3937	0.220822	-3.21407
190_4-1_1_2018	1319.75	3.32	56.35	4549.75	1462.25	43.435	47.1225	491.083	-0.618576	5.3763	393.328	-15.3981	2.87136	4.00133
190_5-3_1_2018	1117.725	3.134	40.81	4361.5	1269	37.26	36.675	385.3	-0.694205	0.261986	355.612	-63.4794	0.0683143	0.0301892
190_6-1_1_2018	1190.5	2.9235	42.2775	4965.75	1354.75	38.245	37.76	270.213	-0.416166	-0.31646	736.85	45.6116	2.06405	2.8335
191_3-3_1_2018	1170.75	2.492	42.445	4921.75	1220.5	32.285	37.99	350.126	-0.830672	-0.760766	494.48	-110.291	-3.52085	-0.457059
195-3_1_2018	918.225	3.49675	49.6775	4954	1572.5	45.57	54.7575	169.206	-0.287608	1.45808	792.666	68.8938	4.48924	8.99684
196-1_1_2018	947.525	3.4165	41.75	5227.25	1553.5	43.29	46.48	178.537	-0.336954	1.16298	810.897	71.688	4.48298	8.4804
200-3_1_2018	1113.375	3.8765	49.2825	4850.5	1522	38.1725	44.9825	344.346	-0.174828	3.10193	739.934	61.5414	1.38905	4.72864
202-2_1_2018	901.425	4.90675	52.3275	4905.25	1398.25	46.475	61.0425	227.069	0.352512	3.61232	662.58	-56.5305	5.26741	12.538
206-2_1_2018	1073.475	3.711	40.1625	4301.5	1251.25	38.6775	44.32	267.365	0.113072	1.02369	311.263	-79.8052	2.94663	8.42228
213-1_1_2018	767	3.92725	44.0675	5039.5	1443.75	41.815	37.8175	269.066	-0.416052	-0.335453	734.353	45.1223	2.06187	2.79511
221-1_1_2018	703.8	3.0835	49.5325	6272.5	1569.5	44.06	51.11	44.1603	-0.705647	4.47254	1750.04	87.7696	5.30403	8.95069
226-7_1_2018	811.925	4.94425	56.8275	4183.75	1827	50.8325	70.3275	128.159	0.561734	7.42034	204.492	197.725	8.80997	19.656
31_1_2018	1144.675	3.48025	49.955	5265.5	1663.75	41.785	37.7575	423.517	-1.03284	0.810565	688.658	178.355	2.31889	-6.32725
29_1_2018	945.625	3.20625	50.0775	5077.5	1812.25	41.0525	35.565	226.84	-0.508121	3.40074	729.795	202.716	2.37446	-3.30866
19_1_2018	743.425	4.9045	48.26	5300	1508	41.9025	52.1675	25.0466	0.664019	3.84126	819.45	83.2872	3.80728	10.0952
20-1_1_2018	782.925	5.49225	52.4925	4629.75	1591	46.925	64.76	125.304	0.696933	4.50289	447.673	63.9918	6.04704	13.913
25-2_1_2018	1095.65	5.976	62.6475	5020	1637.75	52.545	65.87	296.335	1.04361	11.5884	785.169	110.525	9.68238	15.3201
34-1_1_2018	932.475	3.52	45.2325	5003.75	1598.25	40.12	34.625	234.413	-0.218736	2.47685	848.799	134.487	3.27211	-0.695114
13-3_1_2018	1115	4.41125	51.59	5279	1547.25	49.8675	51.3525	357.433	0.201773	5.41545	1023.58	91.6648	9.83059	9.71386
15-7_1_2018	1251.7	3.7095	48.1775	5212.75	1605.5	50.1075	49.2975	419.886	-0.212791	2.45086	982.763	124.896	7.57657	5.01248

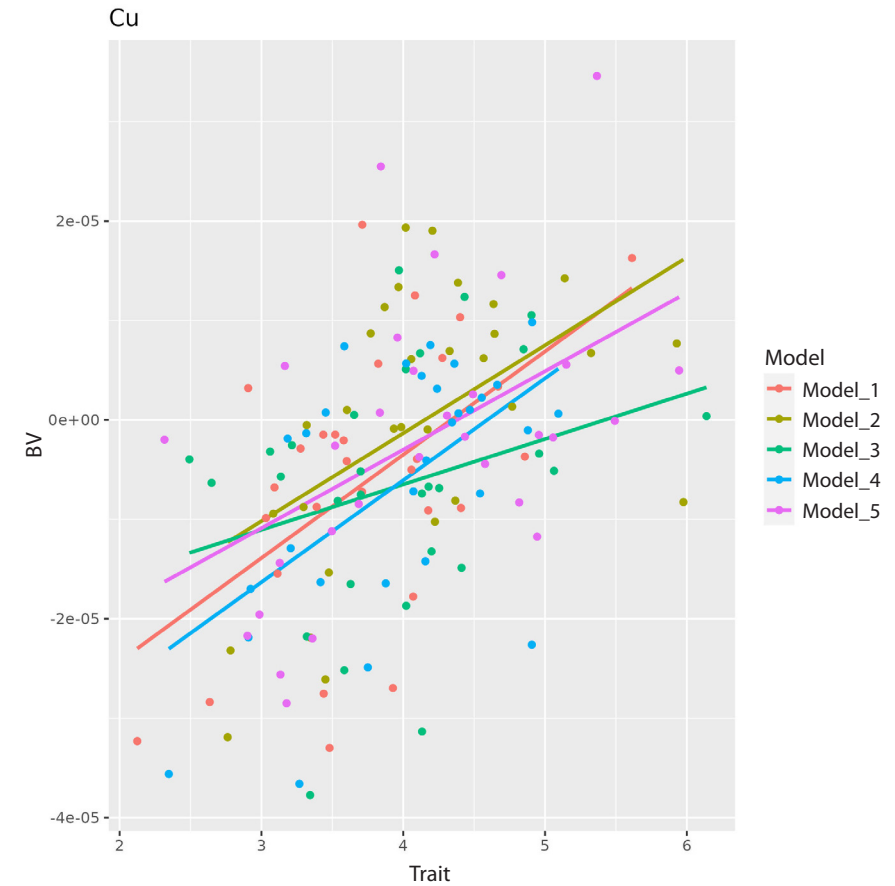
Supplementary Material 2. Information on the estimated correlation, confidence intervals and *p*-value between the estimated breeding value and real phenotype data for the seven micro- and macronutrients. Information on each of the models used for each studied element is presented

Element	Model	Correlation	Lower bound of the confidence interval	Upper bound of the confidence interval	<i>p</i> -value
Ca	model 1	0.54	0.21	0.75	0.003
	model 2	0.57	0.27	0.77	0.0009
	model 3	0.59	0.29	0.79	0.0007
	model 4	0.73	0.51	0.87	3.741e-06
	model 5	0.61	0.31	0.79	0.0003
Cu	model 1	0.53	0.2	0.75	0.003
	model 2	0.52	0.2	0.74	0.003
	model 3	0.28	-0.09	0.59	0.13
	model 4	0.56	0.24	0.76	0.001
	model 5	0.49	0.16	0.72	0.006
Fe	model 1	0.32	-0.05	0.61	0.09
	model 2	0.49	0.15	0.72	0.006
	model 3	0.53	0.2	0.75	0.003
	model 4	0.33	-0.03	0.62	0.071
	model 5	0.22	-0.15	0.54	0.24
K	model 1	0.46	0.11	0.7	0.01
	model 2	0.79	0.6	0.9	1.85e-07
	model 3	0.64	0.35	0.81	0.0002
	model 4	0.75	0.54	0.88	1.5e-06
	model 5	0.73	0.51	0.86	4.11e-06
Mg	model 1	0.39	0.03	0.66	0.037
	model 2	0.33	-0.03	0.62	0.073
	model 3	0.43	0.08	0.69	0.02
	model 4	0.45	0.11	0.7	0.012
	model 5	0.38	0.03	0.65	0.036
Mn	model 1	0.41	0.05	0.67	0.03
	model 2	0.55	0.24	0.76	0.001
	model 3	0.68	0.42	0.84	5.03e-05
	model 4	0.35	-0.01	0.63	0.05
	model 5	0.52	0.2	0.74	0.003
Zn	model 1	0.28	-0.09	0.59	0.14
	model 2	0.51	0.18	0.74	0.004
	model 3	0.49	0.15	0.73	0.007
	model 4	0.53	0.22	0.75	0.002
	model 5	0.51	0.19	0.74	0.004

Supplementary Material 3. Scatter plot for estimated breeding value and real phenotypes for calcium

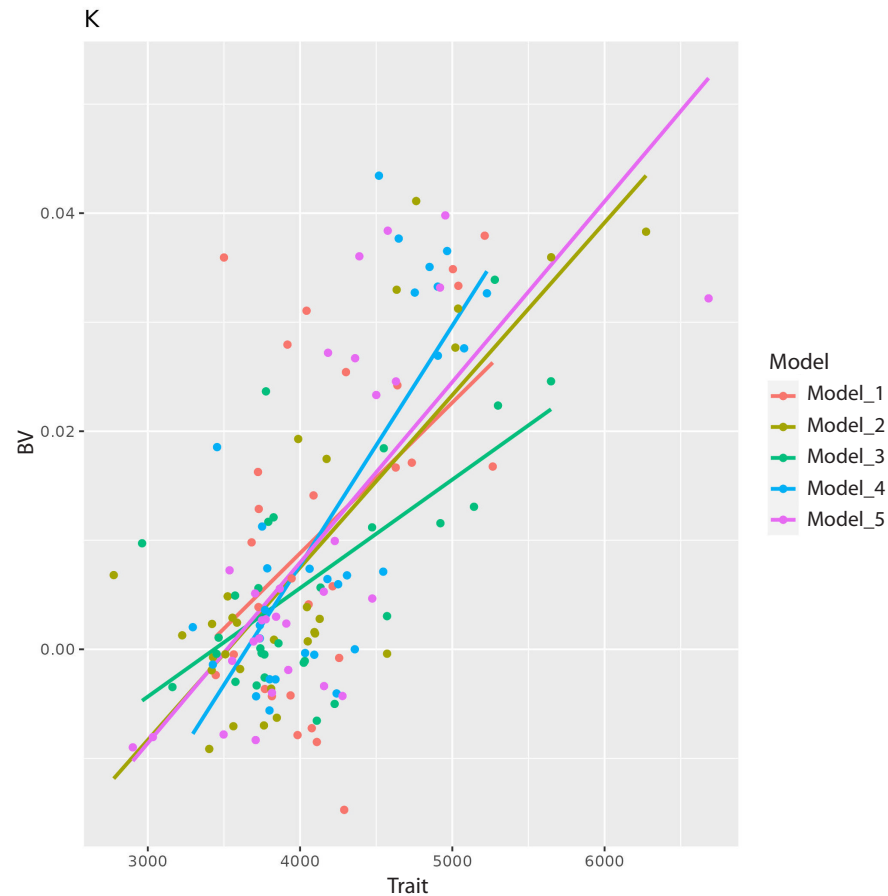
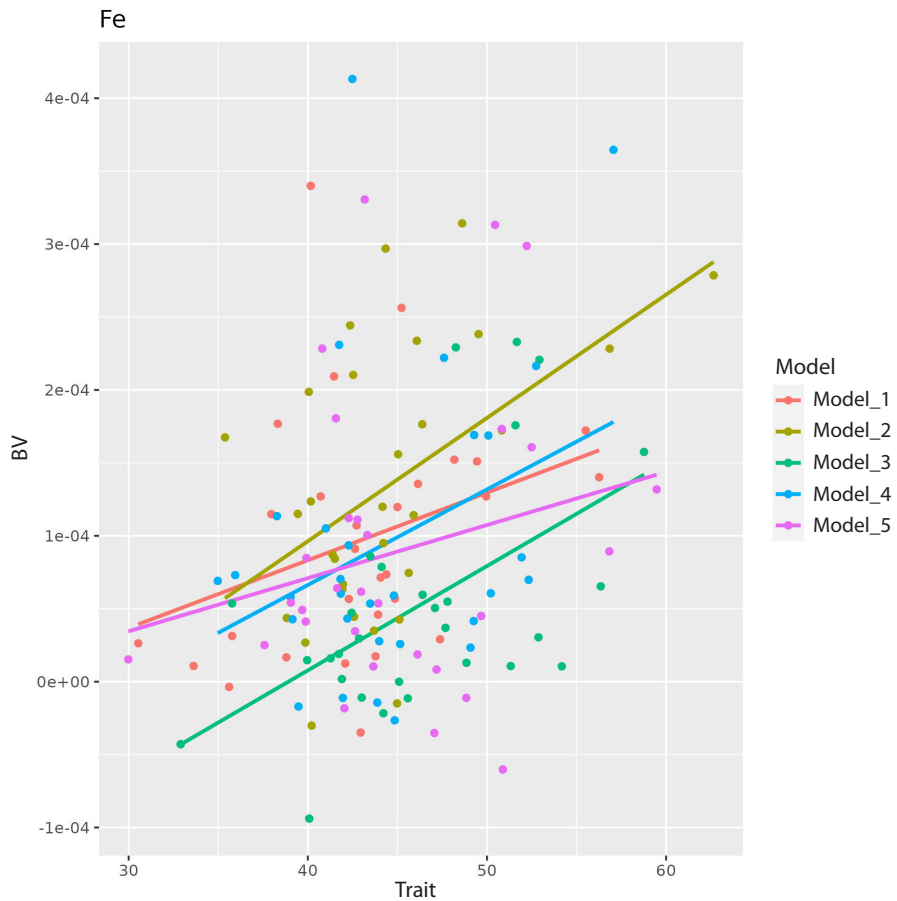


Supplementary Material 4. Scatter plot for estimated breeding value and real phenotypes for copper

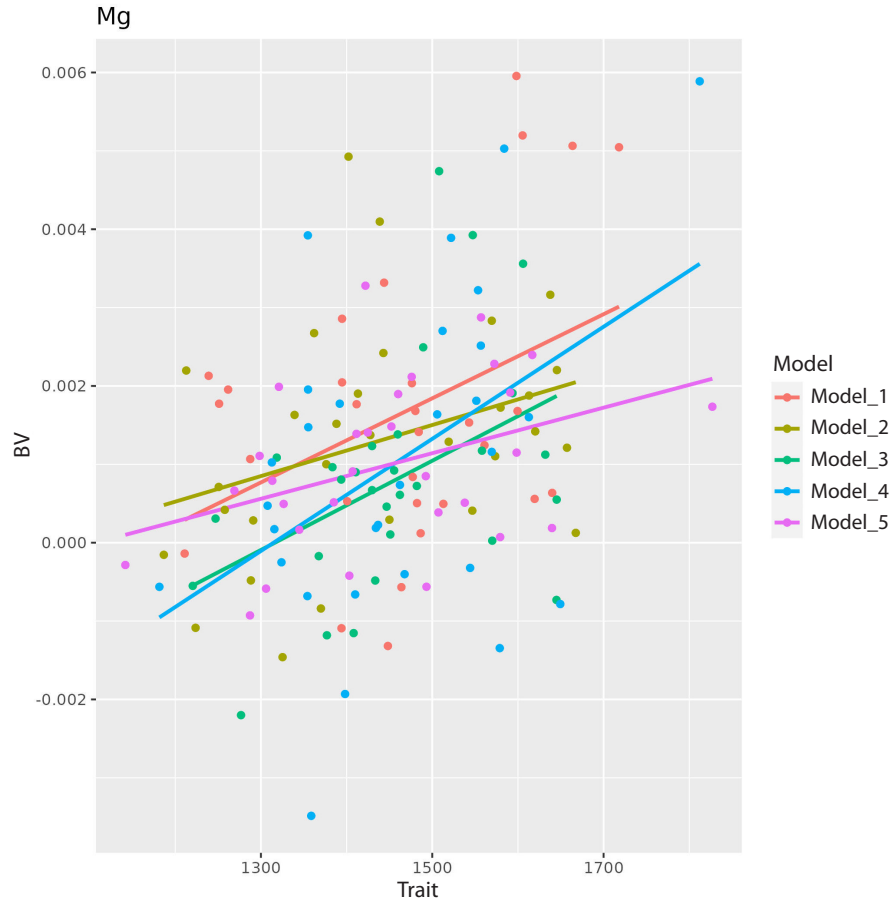


Supplementary Material 5. Scatter plot for estimated breeding value and real phenotypes for iron

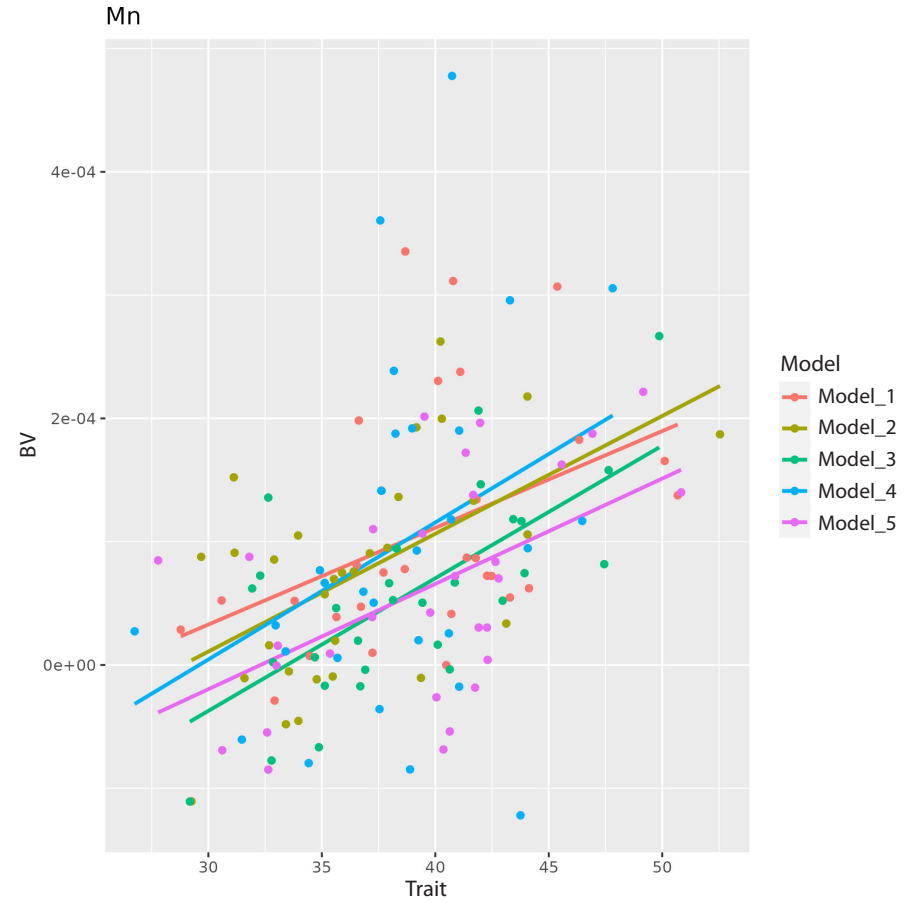
Supplementary Material 6. Scatter plot for estimated breeding value and real phenotypes for potassium



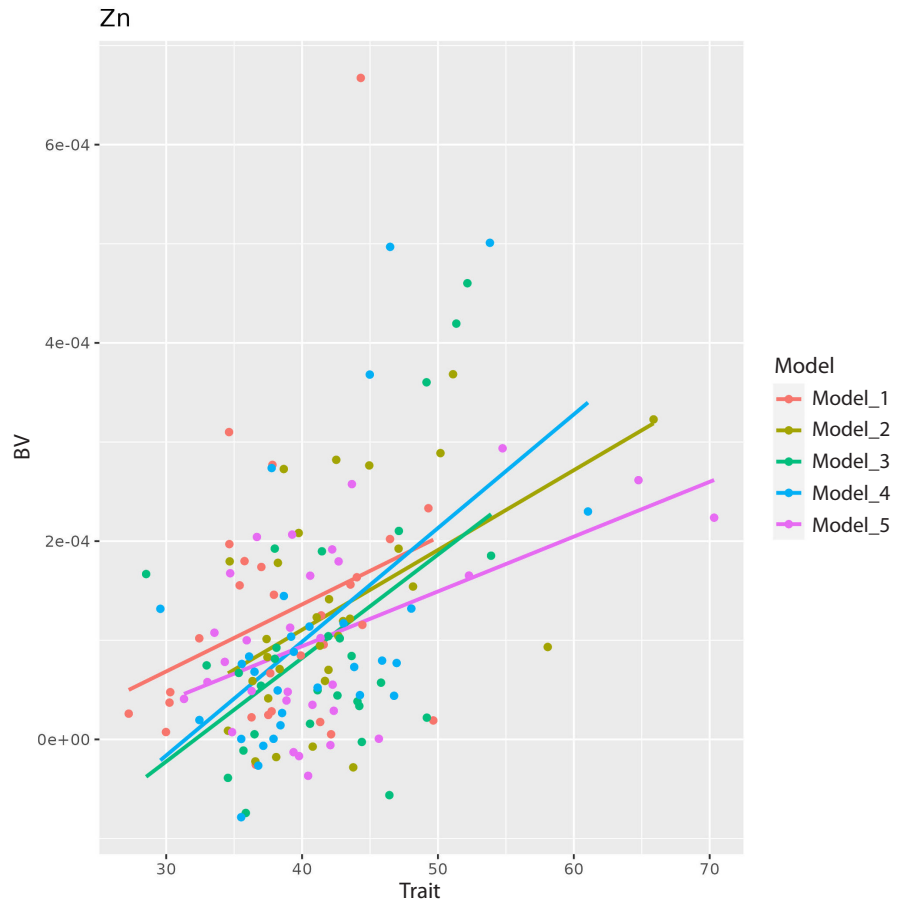
Supplementary Material 7. Scatter plot for estimated breeding value and real phenotypes for magnesium



Supplementary Material 8. Scatter plot for estimated breeding value and real phenotypes for manganese



Supplementary Material 9. Scatter plot for estimated breeding value and real phenotypes for zinc



Supplementary Material 10. List of registered databases with SNP breeding value estimates for seven elements

Element	Number of the certificate of the database state registration in Rospatent	Database name (in Russian and in English)
Ca	2023621647	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию кальция (КСЦКa) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by calcium content (CBVCa)
Cu	2023622284	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию меди (КСЦМ) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by cuprum content (CBVCu)
Fe	2023622283	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию железа (КСЦЖ) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by ferrum content (CBVFe)
K	2023622285	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию калия (КСЦК) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by magnesium content (CBVMg)
Mg	2023622542	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию магния (КСЦMg) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by potassium content (CBVK)
Mn	2023622543	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию марганца (КСЦMn) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by manganese content (CBVMn)
Zn	2023622544	Коэффициенты однонуклеотидных полиморфизмов для оценки селекционной ценности пшеницы по содержанию цинка (КСЦЦ) / Coefficients of single nucleotide polymorphisms for evaluation the breeding value of wheat by zinc content (CBVZn)