

SUPPLEMENTARY MATERIAL

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Online Resource 1:

Table S1. Summary of individual analysis of variance for Grain Yield (GY) (kg ha⁻¹) of common bean, carioca type, from trials conducted in Brazil.

ID ¹	Environment ²	Grain Yield (GY) (kg ha ⁻¹)										
		Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
1	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	D 2018	120634.4	16714.68	7.22	0.00 **	1200	10.77	0.93
3	Selvíria - MS	357	20° 22' 02"	51° 25' 08"	D 2018	516409.79	273138.22	1.89	3.91 *	4004	13.05	0.69
4	Janaúba - MG	516	15° 48' 10"	43° 18' 32"	D 2018	366957.39	178084.09	2.06	2.28 *	1645	25.66	0.72
5	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	393886.34	196731.92	2.00	2.75 *	2544	17.44	0.71
6	Cáceres - MT	176	16° 4' 16"	57° 40' 44"	W 2018	740595.95	179675.88	4.12	0.00 **	2942	14.41	0.87
7	Tangará da Serra - MT	423	14° 37' 8"	57° 29' 9"	W 2018	482943.06	160806.73	3.00	0.11 **	2534	15.82	0.82
8	Sinop - MT	384	11° 50' 53"	55° 38' 57"	R 2018	413242.48	134827.64	3.07	0.09 **	1562	23.51	0.82
9	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	786986.77	122285.62	6.44	0.00 **	2105	16.61	0.92
10	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2018	446362.49	408839.71	1.09	39.21 ns	3293	19.42	0.29
11	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	W 2018	393335.26	171594.19	2.29	1.09 *	2209	18.75	0.75
12	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	R 2018	178667.54	19838.44	9.01	0.00 **	1056	13.34	0.94
13	Holambra - SP	600	22° 37' 58"	47° 3' 21"	R 2018	204218.74	223369.13	0.91	100.0 ns	3709	12.74	-
14	Holambra - SP	600	22° 37' 58"	47° 3' 21"	R 2018	265306.56	246858.74	1.07	40.82 ns	3745	13.27	0.26
15	Janaúba - MG	516	15° 48' 10"	43° 18' 32"	W 2018	352165.65	267100.88	1.32	21.83 ns	2489	20.76	0.49
16	Rio Verde - GO	748	17° 47' 52"	50° 55' 40"	R 2018	452512.02	107549.68	4.21	0.00 **	1515	21.65	0.87
17	Janaúba - MG	516	15° 48' 10"	43° 18' 32"	D 2019	464176.55	76023.49	6.11	0.00 **	1076	25.62	0.91
18	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	D 2019	342658.66	153686.69	2.23	1.33 *	1552	25.27	0.74

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

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ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
19	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	D 2018	518508.53	158971.01	3.26	0.05 **	2368	16.84	0.83
20	Tangará da Serra - MT	423	14° 37' 8"	57° 29' 9"	D 2019	240805.42	37097.92	6.49	0.00 **	1277	15.08	0.92
22	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2019	458307.43	145223.01	3.16	0.07 **	2060	18.50	0.83
23	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2019	181041.98	57879.48	3.13	0.08 **	1380	17.44	0.82
24	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	W 2019	475496.74	165943.11	2.87	0.18 **	1878	21.69	0.81
25	Londrina - PR	610	23° 18' 36"	51° 9' 46"	R 2018	219275.63	92330.84	2.37	0.84 **	1550	19.60	0.76
26	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	W 2018	383730.65	118868.25	3.23	0.06 **	3372	10.22	0.83
27	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	743312.49	240451.74	3.09	0.09 **	3021	16.23	0.82
28	Coronel Macedo - SP	624	23° 37' 51"	49° 18' 50"	R 2018	278464.27	170826.22	1.63	8.79 ns	4239	9.75	0.62
29	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	R 2018	328381.66	109952.76	2.99	0.12 **	2591	12.80	0.82
30	Campos Novos - SC	946	27° 24' 7"	51° 13' 30"	R 2018	883247.74	304860.62	2.90	0.16 **	3012	18.33	0.81
31	Prudentópolis - PR	840	25° 12' 46"	50° 58' 40"	R 2018	502223.72	86578.89	5.80	0.00 **	2096	14.04	0.91
32	Araucária - PR	897	25° 35' 34"	49° 24' 36"	R 2018	773924.22	125771.52	6.15	0.00 **	2981	11.90	0.92
33	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	356947.82	269234.9	1.33	21.39 ns	3482	14.90	0.5
34	Sete Lagoas - MG	766	19° 27' 57"	44° 14' 49"	R 2018	439481.46	140310.65	3.13	0.08 **	2982	12.56	0.83
35	Formosa - GO	916	15° 32' 13"	47° 20' 2"	R 2019	604150.53	219489.34	2.75	0.25 **	3721	12.59	0.8
36	Formosa - GO	916	15° 32' 13"	47° 20' 2"	W 2019	420141.55	154792.29	2.71	0.28 **	3049	12.90	0.79

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ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
37	Cristalina - GO	916	15° 32' 13"	47° 20' 2"	W 2019	308640.43	40111.51	7.69	0.00 **	2383	8.41	0.93
38	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	R 2018	437176.85	133154.09	3.28	0.05 **	3161	11.55	0.83
39	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	D 2019	199313.73	24614.29	8.10	0.00 **	901	17.41	0.94
40	Selvíria - MS	357	20° 22' 02"	51° 25' 08"	W 2019	279588.37	113148.24	2.47	0.62 **	2868	11.73	0.77
41	Cáceres - MT	176	16° 4' 16"	57° 40' 44"	W 2019	281781.41	140866.25	2.00	2.76 *	2471	15.19	0.71
42	Coronel João Sá - BA	207	10° 17' 2"	37° 55' 33"	R 2019	246925.07	4391.88	56.20	0.00 **	915	7.24	0.99
44	Santana do Ipanema - AL	250	9° 22' 40"	37° 14' 42"	R 2019	324743.47	113463.89	2.86	0.18 **	1448	23.27	0.81
45	Carira - SE	351	10° 21' 29"	37° 42' 3"	R 2019	495263.4	62011.83	7.99	0.00 **	2211	11.26	0.94
46	Arapiraca - AL	264	9° 45' 7"	36° 39' 39"	R 2019	59223.37	13710.58	4.32	0.00 **	985	11.88	0.88
47	Paripiranga - BA	430	10° 41' 16"	37° 51' 43"	R 2019	180703.97	130750.01	1.38	18.27 ns	1647	21.96	0.53
48	Lagarto - SE	183	10° 55' 1"	37° 39' 0"	R 2019	45553	14570.99	3.13	0.08 **	841	14.35	0.82
49	Petrolina - PE	376	9 ° 23' 34"	40 ° 30' 28"	W 2019	286083.6	91562.26	3.12	0.08 **	1437	21.05	0.82
50	Janaúba - MG	516	15° 48' 10"	43° 18' 32"	W 2019	793324.33	426787.58	1.86	4.32 *	3191	20.47	0.68
51	Prudentópolis - PR	840	25° 12' 46"	50° 58' 40"	R 2019	401283.45	221368.01	1.81	5.00 ns	3762	12.51	0.67
52	Canoinhas - PR	839	26° 10' 37"	50° 23' 24"	R 2019	2840258.8	207662.23	13.70	0.00 **	2307	19.76	0.96
53	Araucária - PR	897	25° 35' 34"	49° 24' 36"	R 2019	581133.13	382719.22	1.52	12.29 ns	3815	16.21	0.58
54	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	R 2019	418446.14	308168.39	1.36	19.56 ns	4276	12.98	0.51

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ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
55	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	R 2019	614080.29	379279.16	1.62	9.09 ns	4125	14.93	0.62
56	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	R 2019	738608.84	145310.35	5.08	0.00 **	2465	15.47	0.9
57	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	R 2019	548788.06	86190.84	6.37	0.00 **	1683	17.44	0.92
58	Aquidauana - MS	149	20° 28' 15"	55° 47' 13"	W 2018	266491.13	103888.19	2.57	0.46 **	1954	16.49	0.78
59	Guarapuava - PR	1120	25° 23' 42"	51° 27' 28"	R 2018	280591.32	189276.41	1.48	13.67 ns	3501	12.43	0.57

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 2:

Table S2. Summary of individual analysis of variance for Stored Grain Color (SGC) of common bean, carioca type, from trials conducted in Brazil.

Stored Grain Color (SGC)												
ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
1	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	D 2018	1.38	0.18	7.82	0.00 **	3.21	13.09	0.93
9	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	2.48	0.16	15.89	0.00 **	2.33	16.92	0.97
10	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2018	1.58	0.2	7.87	0.00 **	2.30	19.48	0.93
11	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	W 2018	3.1	0.16	19.42	0.00 **	2.55	15.69	0.97
19	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	D 2018	3.53	0.24	15.01	0.00 **	3.24	14.96	0.97
22	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2019	1.85	0.12	15.15	0.00 **	2.24	15.57	0.97
23	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2019	2.47	0.15	16.06	0.00 **	2.52	15.59	0.97
27	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	2.17	0.19	11.56	0.00 **	2.29	18.93	0.96
29	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	R 2018	2.36	0.09	25.37	0.00 **	2.23	13.70	0.98
35	Formosa - GO	916	15° 32' 13"	47° 20' 2"	R 2019	1.52	0.35	4.29	0.00 **	2.17	27.44	0.88
36	Formosa - GO	916	15° 32' 13"	47° 20' 2"	W 2019	1.27	0.23	5.44	0.00 **	2.74	17.60	0.9
37	Cristalina - GO	916	15° 32' 13"	47° 20' 2"	W 2019	1.13	0.12	9.58	0.00 **	2.65	12.93	0.95
42	Adustina - BA	281	10° 31' 58"	38° 6' 0"	R 2019	1.61	0.13	12.61	0.00 **	2.18	16.38	0.96
43	Coronel João Sá - BA	207	10° 17' 2"	37° 55' 33"	R 2019	3.79	0.21	17.73	0.00 **	3.05	15.17	0.97
45	Carira - SE	351	10° 21' 29"	37° 42' 3"	R 2019	1.64	0.06	27	0.00 **	2.12	11.61	0.98
46	Arapiraca - AL	264	9° 45' 7"	36° 39' 39"	R 2019	1.52	0.06	26.04	0.00 **	2.08	11.65	0.98
47	Paripiranga - BA	430	10° 41' 16"	37° 51' 43"	R 2019	1.67	0.07	23.92	0.00 **	2.15	12.30	0.98
48	Lagarto - SE	183	10° 55' 1"	37° 39' 0"	R 2019	2.25	0.11	19.9	0.00 **	2.33	14.42	0.97

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 3:

Table S3. Summary of individual analysis of variance for Sieve Yield (SY) (%) of common bean, carioca type, from trials conducted in Brazil.

Sieve Yield (SY) (%)												
ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
7	Tangará da Serra - MT	423	14° 37' 8"	57° 29' 9"	W 2018	204.02	25.15	8.11	0.00 **	83.02	6.04	0.94
8	Sinop - MT	384	11° 50' 53"	55° 38' 57"	R 2018	115.67	31.74	3.64	0.01 **	91.83	6.14	0.85
9	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	92.36	43.6	2.12	1.90 *	74.93	8.81	0.73
10	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2018	8.00	2.61	3.06	0.09 **	95.12	1.70	0.82
11	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	W 2018	302.68	23.2	13.05	0.00 **	62.69	7.68	0.96
19	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	D 2018	232.9	20.05	11.62	0.00 **	77.22	5.80	0.96
22	Santo Antônio de Goiás - GO	821	16° 29' 2"	49° 18' 39"	W 2019	223.17	22.18	10.06	0.00 **	66.17	7.12	0.95
23	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	W 2019	299.69	64.86	4.62	0.00 **	62.07	12.98	0.89
26	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	W 2018	236.08	22.38	10.55	0.00 **	79.86	5.92	0.95
27	Brasília - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	158.41	28.37	5.58	0.00 **	81.98	6.50	0.91
29	Anápolis - GO	1167	16° 19' 37"	48° 57' 10"	R 2018	236.15	22.79	10.36	0.00 **	77.07	6.19	0.95
35	Formosa - GO	916	15° 32' 13"	47° 20' 2"	R 2019	337.1	69.05	4.88	0.00 **	75.30	11.04	0.89
36	Formosa - GO	916	15° 32' 13"	47° 20' 2"	W 2019	264.02	23.43	11.27	0.00 **	79.58	6.08	0.95
37	Cristalina - GO	916	15° 32' 13"	47° 20' 2"	W 2019	316.06	14.92	21.18	0.00 **	79.58	4.85	0.98

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 4:

Table S4. Summary of individual analysis of variance for 100-Grain mass (100M) (g) of common bean, carioca type, from trials conducted in Brazil.

100-Grain mass (100M) (g)												
ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
3	Selv3ria - MS	357	20° 22' 02"	51° 25' 08"	D 2018	9.42	1.15	8.22	0.00 **	26.55	4.03	0.94
5	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	9.05	1.53	5.91	0.00 **	26.77	4.62	0.91
6	C3ceres - MT	176	16° 4' 16"	57° 40' 44"	W 2018	9.90	3.35	2.96	0.13 **	27.03	6.77	0.81
8	Sinop - MT	384	11° 50' 53"	55° 38' 57"	R 2018	15.40	2.76	5.57	0.00 **	25.56	6.50	0.91
9	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	W 2018	10.42	2.18	4.78	0.00 **	27.31	5.41	0.89
10	Santo Ant3nio de Goi3s - GO	821	16° 29' 2"	49° 18' 39"	W 2018	4.96	4.80	1.03	44.94 ns	29.47	7.43	0.18
11	An3polis - GO	1167	16° 19' 37"	48° 57' 10"	W 2018	5.64	3.03	1.86	4.28 *	26.46	6.58	0.68
13	Holombra - SP	600	22° 37' 58"	47° 3' 21"	R 2018	8.40	4.51	1.87	4.24 *	28.38	7.48	0.68
14	Holombra - SP	600	22° 37' 58"	47° 3' 21"	R 2018	4.55	2.85	1.60	9.72 ns	27.66	6.10	0.61
19	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	D 2018	6.67	0.53	12.47	0.00 **	24.51	2.98	0.96
22	Santo Ant3nio de Goi3s - GO	821	16° 29' 2"	49° 18' 39"	W 2019	7.28	0.46	15.94	0.00 **	26.27	2.57	0.97
23	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	W 2019	7.32	0.62	11.89	0.00 **	26.07	3.01	0.96
26	Ponta Grossa - PR	975	25° 5' 42"	50° 9' 43"	W 2018	12.90	0.67	19.21	0.00 **	29.56	2.77	0.97
27	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	11.88	0.53	22.26	0.00 **	28.07	2.60	0.98
29	An3polis - GO	1167	16° 19' 37"	48° 57' 10"	R 2018	10.28	0.67	15.33	0.00 **	27.23	3.01	0.97
33	Bras3lia - DF	1171	15° 47' 38"	47° 52' 58"	R 2018	14.99	1.46	10.24	0.00 **	21.94	5.51	0.95
34	Sete Lagoas - MG	766	19° 27' 57"	44° 14' 49"	R 2018	12.83	2.50	5.14	0.00 **	27.34	5.78	0.90
35	Formosa - GO	916	15° 32' 13"	47° 20' 2"	R 2019	5.12	0.73	7.06	0.00 **	25.95	3.28	0.93
36	Formosa - GO	916	15° 32' 13"	47° 20' 2"	W 2019	8.03	0.69	11.72	0.00 **	27.29	3.03	0.96

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

											Continuing	
ID ¹	Environment ²	Alt ³	Lat ⁴	Long ⁵	Season ⁶	MSg ⁷	MSe ⁸	F ⁹	P ¹⁰	Mean	CV ¹¹	SA ¹²
37	Cristalina - GO	916	15° 32' 13"	47° 20' 2"	W 2019	8.04	0.33	24.08	0.00 **	27.71	2.09	0.98
40	Selvíria - MS	357	20º 22' 02"	51º 25' 08"	W 2019	11.51	1.90	6.05	0.00 **	29.49	4.68	0.91
41	Cáceres - MT	176	16° 4' 16"	57° 40' 44"	W 2019	9.10	2.08	4.37	0.00 **	27.50	5.25	0.88
42	Coronel João Sá - BA	207	10° 17' 2"	37° 55' 33"	R 2019	15.48	2.29	6.77	0.00 **	24.39	6.20	0.92
44	Santana do Ipanema - AL	250	9° 22' 40"	37° 14' 42"	R 2019	8.38	2.68	3.12	0.08 **	22.91	7.15	0.82
45	Carira - SE	351	10° 21' 29"	37° 42' 3"	R 2019	14.15	2.13	6.64	0.00 **	21.45	6.80	0.92
46	Arapiraca - AL	264	9° 45' 7"	36° 39' 39"	R 2019	5.79	2.02	2.87	0.17 **	21.11	6.73	0.81
47	Paripiranga - BA	430	10° 41' 16"	37° 51' 43"	R 2019	8.76	2.15	4.08	0.00 **	22.49	6.51	0.87
48	Lagarto - SE	183	10° 55' 1"	37° 39' 0"	R 2019	11.50	0.84	13.69	0.00 **	25.33	3.62	0.96
50	Janaúba - MG	516	15° 48' 10"	43° 18' 32"	W 2019	4.31	5.08	0.85	100.0 ns	27.14	8.31	.
58	Aquidauana - MS	149	20° 28' 15"	55° 47' 13"	W 2018	18.00	3.24	5.55	0.00 **	31.68	5.68	0.91

¹ Trial identification code, ² City and state of Brazil, ³ Altitude (m), ⁴ Latitude, ⁵ Longitude, ⁶ R = rains; D = dry; W = winter, ⁷ Mean Square of genotypes, ⁸ Mean Square of error, ⁹ F calculated value, ¹⁰ Associated error probability (%), ¹¹ Coefficient of variation (%), ¹² Selective accuracy. * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 5:

Table S5. Summary of joint analysis of variance for Grain Yield (GY) (kg ha⁻¹), Stored Grain Color (SGC), Sieve Yield (SY) (%) and 100-grain mass (100M) (g) of common bean, carioca type, from trials conducted in Brazil.

SV ¹	GY		SGC		SY		100M	
	DF ²	MS ³	DF	MS	DF	MS	DF	MS
Blocks/ Environments	112	518920.12	36	0.16	28	33.56	60	3.80
Genotypes	21	3437103.11 **	21	28.48 **	21	1559.14 **	21	157.92 **
Environments	55	63269311.95 **	17	9.14 **	13	5983.13 **	29	414.09 **
Genotypes x Environments	829	555256.22 **	357	0.52 **	206	149.56 **	431	6.43 **
Error	1679	221849.92	756	0.16	436	39.91	882	2.85
Total	3695		1187		923		1979	
Mean		2439		2.47		77.60		26.35
CV (%) ⁴		19.31		16.09		8.14		6.40

¹ Source of variation, ² Degrees of freedom, ³ Mean Square, ⁴ Coefficient of variation (%). * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 6:

Table S6. Summary of joint analysis of variance for Grain Yield (GY) (kg ha⁻¹) of producing regions I, II and III of common bean, carioca type, from trials conducted in Brazil.

SV ¹	GY - REG I		GY - REG II		GY - REG III	
	DF ²	MS ³	DF	MS	DF	MS
Blocks/ Environments	42	366724.01	60	661287.8	10	303937.58
Genotypes	21	1960261.69 **	21	2362021.45 **	21	296459.91 ns
Environments	20	73828335.96 **	29	38508493.58 **	4	18878490.53 **
Genotypes x Environments	326	569975.80 **	448	514460.51 **	62	309718.47 **
Error	677	240478.35	918	214900.59	144	86134.86
Total	1385		1979		329	
Mean		2959		2251		1385
CV (%) ⁴		16.57		20.59		21.19

¹ Source of variation, ² Degrees of freedom, ³ Mean Square, ⁴ Coefficient of variation (%). * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 7:

Table S7. Summary of joint analysis of variance for Grain Yield (GY) (kg ha⁻¹) of producing region I in 'Rains', and region II in the 'Rains' and 'Winter' seasons of common bean, carioca type, from trials conducted in Brazil.

SV ¹	GY - REG I (Rains)		GY - REG II (Rains)		GY - REG II (Winter)	
	DF ²	MS ³	DF	MS	DF	MS
Blocks/ Environments	34	433606.42	24	300989.04	28	993896.13
Genotypes	21	1716691.64 **	21	1295562.26 **	21	1484215.02 **
Environments	16	45159812.87 **	11	59220280.44 **	13	18688324.90 **
Genotypes x Environments	336	494546.83 **	178	464378.38 **	210	503079.43 **
Error	714	200478.12	380	177759.27	444	249600.9
Total	1121		791		923	
Mean		3204		2220		2466
CV (%) ⁴		13.97		19.00		20.25

¹ Source of variation, ² Degrees of freedom, ³ Mean Square, ⁴ Coefficient of variation (%). * e ** significant at 5% and 1% of probability, respectively; ns = not significant.

Online Resource 8:**Table S8.** Pedigree information of the genotypes.

Genotype	ID	Pedigree
1	ANFC09	-
2	BRS Estilo	EMP 250 /4/ A 769 /// A 429 / XAN 252 // V 8025 / PINTO UI 114
3	BRS FC402	LM 96200246 / LP 9632
4	BRSMG Uai	Embrapa Recurrent Selection Program
5	IPR Campos Gerais	LP91-22 (IAPAR 80) / Campeão 2
6	Pérola	Aporé: breeding line LR 720982 CPL53
7	CNFC 16183	CNFC 9506 / CNFE 8017
8	CNFC 16484	LM 202206076 *2 / CNFC 10281
9	CNFC 16495	LM 202206076 *2 / CNFC 8075
10	CNFC 16496	LM 202206076 *2 / CNFC 8075
11	CNFC 16497	LM 202206076 *2 / CNFC 8075
12	CNFC 16522	JURITI / 2* GX9792299-2
13	CNFC 16548	CNFC 9506 / OPNS 331
14	CNFC 16558	CNFC 8075 / GX 9792-229-2
15	CNFC 16561	CNFC 9437 / BRS Requite
16	CNFC 16562	CNFC 8063 / CNFC 9461
17	CNFC 16563	CNFC 8063 / OPNS 331
18	CNFC 16564	CNFC 8063 / OPNS 331
19	CNFC 16566	CNFC 8063 / OPNS 331
20	CNFC 16567	CNFC 8063 / OPNS 331
21	CNFC 16611	LM 203200702/ CNFE 8017
22	CNFC 16636	LMC 203203425 / FEB 219

Online Resource 9:

Table S9. Representation of trials' number across the multi-environment trials network from Grain Yield (GY), Stored Grain Color (SGC), Sieve Yield (SY) and 100-grain mass (100M).

Information	GY	SGC	SY	100M
Number of trials	56	18	14	30
Years	2018/2019	2018/2019	2018/2019	2018/2019
Region	I, II and III	I, II and III	I and II	I and II

