

Table S1. Common bean accessions collected from different villages of Garhwal Himalayas and their origin as analyzed by SSR markers.

S. NO	ACCESSION NAME	Village Name	Altitude	Gene pool	S. NO	ACCESSION NAME	Village Name	Altitude	Gene pool
1.	GFB-01	Badiyargarh (Rigolimalli)	2300	Mesoamerican	20.	GFB-20	Dandachilli	1600	Mesoamerican
2.	GFB-02	Pauri (Khola)	1000	Mesoamerican	21.	GFB-21	Harshil	2745	Andean
3.	GFB-03 (Registered with NBPGR, New Delhi, INGR20026)	Pauri (Gidrasu)	1600	Mesoamerican	22.	GFB-22	Harshil	2745	Andean
4.	GFB-04	Tehri (Chamba)	1750m	Andean	23.	GFB-23	Harshil	2745	Andean
5.	GFB-05	Badiyargarh (Rigolimalli)	2300	Mesoamerican	24.	GFB-24	Chamoli Lambagarh	2100	Mesoamerican
6.	GFB-06	Pauri (Khola)	1000	Andean	25.	GFB-25	Chakrata (Sidi)	2100	Andean
7.	GFB-07	Badiyargarh (Rigolimalli)	2300	Mesoamerican	26.	GFB-26	Chakrata (Sidi)	2100	Andean
8.	GFB-08	Badiyargarh (Rigolimalli)	2300	Mesoamerican	27.	GFB-27	Pauri Garhwal (Gidrasu)	1600	Mesoamerican
9.	GFB-09	Pauri (Gigrassu)	1600	Mesoamerican	28.	GFB-28	Pauri Garhwal (Gidrasu)	1600	Mesoamerican
10.	GFB-10	Badiyargarh (Rigoli Talli)	2400	Mesoamerican	29.	GFB-29	Pauri Garhwal (Gidrasu)	1600	Mesoamerican
11.	GFB-11	Joshimath (Karchi)	2200	Mesoamerican	30.	GFB-30 (Registered with NBPGR, New Delhi, INGR20027)	Pauri Garhwal (Dang)	1300	Mesoamerican
12.	GFB-12	Chamoli (Lambagarh)	2100	Mesoamerican	31.	GFB-31	Pauri Garhwal (Gidrasu)	1600	Mesoamerican
13.	GFB-13	Joshimath (Karchi)	2200	Andean	32.	GFB-32	Pauri Garhwal (Gidrasu)	1600	Mesoamerican
14.	GFB-14	Joshimath (Karchi)	2200	Andean	33.	GFB-33	Pauri Garhwal (Gidrasu)	1600	Andean

15.	GFB-15	Joshimath (Karchi)	2200	Andean	34.	GFB-34	Pauri Garhwal (Gidrasu)	1600	Andean
16.	GFB-16	Joshimath (Karchi)	2200	Mesoamerican	35.	GFB-35	Pauri Garhwal (Dang)	1300	Andean
17.	GFB-17	Joshimath (Karchi)	2200	Andean	36.	GFB-36	Pauri Garhwal (Dang)	1300	Andean
18.	GFB-18	Joshimath (Karchi)	2200	Andean	37.	GFB-37	Ghansali (Dhaamakot)	1400	Andean
19.	GFB-19	Dandachilli	1600	Mesoamerican	38.	GFB-38	Ghansali	1000	Andean
39.	GFB-39	Ghansali (Jhaggkot)	1100	Mesoamerican	64.	GFB-64	Badiyargarh	1300	Mesoamerican
40.	GFB-40	Gwar (Khirsu)	1900	Mesoamerican	65.	GFB-65	Gopeshwar	1400	Mesoamerican
41.	GFB-41	Gwar (Khirsu)	1900	Mesoamerican	66.	GFB-66	Gopeshwar	1400	Mesoamerican
42.	GFB-42	Gwar (Khirsu)	1900	Mesoamerican	67.	GFB-67	Gopeshwar	1400	Mesoamerican
43.	GFB-43	Badiyargarh	1300	Mesoamerican	68.	GFB-68	Gopeshwar	1400	Mesoamerican
44.	GFB-44	Badiyargarh	1300	Mesoamerican	69.	GFB-69	Gopeshwar	1400	Mesoamerican
45.	GFB-45	Gopeshwar	1400	Mesoamerican	70.	GFB-70	Badiyargarh	1300	Mesoamerican
46.	GFB-46	Gopeshwar	1400	Mesoamerican	71.	GFB-71	Badiyargarh	1300	Mesoamerican
47.	GFB-47	Badiyargarh	1400	Mesoamerican	72.	GFB-72	Badiyargarh	1300	Mesoamerican
48.	GFB-48	Badiyargarh	1400	Mesoamerican	73.	GFB-73	Gopeshwar	1400	Mesoamerican
49.	GFB-49	Badiyargarh	1400	Mesoamerican	74.	GFB-74	Pauri Garhwal (Gidrasu)	1600	Andean
50.	GFB-50	Pauri Garhwal (Dang)	1300	Mesoamerican	75.	GFB-75	Pauri Garhwal (Gidrasu)	1400	Andean
51.	GFB-51	Pauri Garhwal (Dang)	1300	Mesoamerican	76.	GFB-76	Ranichauri (Tehri)	1600	Mesoamerican
52.	GFB-52	Ghansali (Damkot)	1500	Mesoamerican	77.	GFB-77	Joshimath	1875	Mesoamerican
53.	GFB-53	Pauri Garhwal (Dang)	1300	Mesoamerican	78.	GFB-78	Khola (Pauri)	1000	Mesoamerican
54.	GFB-54	Ghansali (Damkot)	1500	Mesoamerican	79.	GFB-79	Khola (Pauri)	1000	Mesoamerican
55.	GFB-55	Ghansali (Dhaamakot)	1500	Mesoamerican	80.	GFB-80	Khola (Pauri)	1000	Mesoamerican
56.	GFB-56	Ghansali (Dhaamakot)	1500	Mesoamerican	81.	GFB-81	Khola (Pauri)	1000	Mesoamerican
57.	GFB-57	Badiyargarh	1400	Mesoamerican	82.	GFB-82	Khola (Pauri)	1000	Mesoamerican

Supplementary tables S1-S6 and figure S1 to the article “Genetic divergence and population structure analysis of common bean accessions from Garhwal Himalayas”, by Navneeti Chamoli, Deepti Prabha and Jai Singh Chauhan. Spanish Journal of Agricultural Research, Vol. 23, No. 2, 2025 (<https://doi.org/10.5424/sjar/2025232-20944>)

58.	GFB-58	Badiyargarh	1400	Mesoamerican	83.	GFB-83	Khola (Pauri)	1000	Mesoamerican
59.	GFB-59	Badiyargarh	1400	Mesoamerican	84.	GFB-84	Khirsu (Pauri)	1000	Mesoamerican
60.	GFB-60	Badiyargarh	1400	Mesoamerican	85.	GFB-85	Khirsu (Pauri)	1000	Mesoamerican
61.	GFB-61	Badiyargarh	1400	Mesoamerican	86.	GFB-86	Tilwada (Karnprayag)	800	Mesoamerican
62.	GFB-62	Badiyargarh	1400	Mesoamerican	87.	GFB-87	Tilwada (Karnprayag)	800	Mesoamerican
63.	GFB-63	Badiyargarh	1400	Mesoamerican	88.	GFB-88	Tilwada (Karnprayag)	800	Mesoamerican
89.	GFB-89	Tilwada (Karnprayag)	800	Mesoamerican	116.	GFB-116	Jaddhar Gaanv	1800	Mesoamerican
90.	GFB-90	Tilwada (Karnprayag)	800	Mesoamerican	117.	GFB-117	Jaddhar Gaanv	1800	Mesoamerican
91.	GFB-91	Tilwada (Karnprayag)	800	Mesoamerican	118.	GFB-118	Jaddhar Gaanv	1800	Mesoamerican
92.	GFB-92	Tilwada (Karnprayag)	800	Mesoamerican	119.	GFB-119	Jaddhar Gaanv	1800	Andean
93.	GFB-93	Tilwada (Karnprayag)	800	Mesoamerican	120.	GFB-120	Jaddhar Gaanv	1800	Mesoamerican
94.	GFB-94	Badiyargarh	1300	Andean	121.	GFB-121	Jaddhar Gaanv	1800	Mesoamerican
95.	GFB-95	Badiyargarh	1300	Mesoamerican	122.	GFB-122	Jaddhar Gaanv	1800	Mesoamerican
96.	GFB-96	Tilwada (Karnprayag)	800	Mesoamerican	123.	GFB-123	Jaddhar Gaanv	1800	Mesoamerican
97.	GFB-97	Tilwada (Karnprayag)	800	Mesoamerican	124.	GFB-124	Painula, New Tehri	1700	Andean
98.	GFB-98	Khirsu	1800	Mesoamerican	125.	GFB-125	Jaddhar Gaanv	1800	Mesoamerican
99.	GFB-99	Tilwada (Karnprayag)	800	Andean	126.	GFB-126	Jaddhar Gaanv	1800	Mesoamerican
100.	GFB-100	Khirsu	1800	Mesoamerican	127.	GFB-127	Jaddhar Gaanv	1800	Andean
101.	GFB-101	Jaddhar Gaanv	1800	Andean	128.	GFB-128	Jaddhar Gaanv	1800	Mesoamerican
102.	GFB-102	Jaddhar Gaanv	1800	Andean	129.	GFB-129	Jaddhar Gaanv	1800	Mesoamerican
103.	GFB-103	Jaddhar Gaanv	1800	Mesoamerican	130.	GFB-130	Jaddhar Gaanv	1800	Mesoamerican
104.	GFB-104	Jaddhar Gaanv	1800	Mesoamerican	131.	GFB-131	Jaddhar Gaanv	1800	Mesoamerican

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105 .	GFB-105	Jaddhar Gaanv	1800	Mesoamerican	132.	GFB-132	Jaddhar Gaanv	1800	Mesoamerican
106 .	GFB-106	Jaddhar Gaanv	1800	Mesoamerican	133.	GFB-133	Jaddhar Gaanv	1800	Mesoamerican
107 .	GFB-107	Jaddhar Gaanv	1800	Mesoamerican	134.	GFB-134	Jaddhar Gaanv	1800	Mesoamerican
108 .	GFB-108	New Tehri	1750	Andean	135.	GFB-135	Jaddhar Gaanv	1800	Mesoamerican
109 .	GFB-109	New Tehri	1750	Mesoamerican	136.	GFB-136	Gaja, Tehri Garhwal	1700	Mesoamerican
110 .	GFB-110	Jaddhar Gaanv	1800	Mesoamerican	137.	GFB-137	Jaddhar Gaanv	1800	Andean
111 .	GFB-111	Jaddhar gaanv	1800	Mesoamerican	138.	GFB-138	Jaddhar Gaanv	1800	Andean
112 .	GFB-112	Jaddhar Gaanv	1800	Mesoamerican	139.	GFB-139	Jaddhar Gaanv	1800	Mesoamerican
113 .	GFB-113	Jaddhar Gaanv	1800	Mesoamerican	140.	GFB-140	Jaddhar Gaanv	1800	Mesoamerican
114 .	GFB-114	Jaddhar Gaanv	1800	Mesoamerican	141.	GFB-141	Jaddhar Gaanv	1800	Mesoamerican
115 .	GFB-115	Jaddhar Gaanv	1800	Mesoamerican	142.	GFB-142	Jaddhar Gaanv	1800	Mesoamerican
137 .	GFB-137	Jaddhar Gaanv	1800	Andean	143.	GFB-143	Jaddhar Gaanv	1800	Mesoamerican
144 .	GFB-144	Pauri (khola)	1000	Mesoamerican	160.	GFB-160	Badiyarg arh	1300	Mesoamerican
145 .	GFB-145	Badiyargarh	1300	Mesoamerican	161.	GFB-161	Badiyarg arh	1300	Mesoamerican
146 .	GFB-146	Pauri (khola)	1000	Mesoamerican	162.	GFB-162	Badiyarg arh	1300	Mesoamerican
147 .	GFB-147	Ghansali	1000	Mesoamerican	163.	GFB-163	Dhanolti	2300	Andean
148 .	GFB-148	New Tehri	1750	Andean	164.	GFB-164	Khirsu	1800	Andean
149 .	GFB-149	New Tehri	1750	Andean	165.	GFB-165	Gaja (Tehri)	1600	Mesoamerican
150 .	GFB-150	Pauri (Gidrasu)	1600	Mesoamerican	166.	GFB-166	Chamoli	1400	Mesoamerican
151 .	GFB-152	Joshimath	1875	Mesoamerican	167.	GFB-167	Chamoli	1400	Mesoamerican
152 .	GFB-151	Chamoli	1400	Mesoamerican	168.	GFB-168	Joshimat h	1875	Mesoamerican
153 .	GFB-153	Gaja (Tehri)	1600	Mesoamerican	169.	GFB-169	Pauri	1650	Mesoamerican
154 .	GFB-154	Badiyargarh	1300	Mesoamerican	170.	GFB-170	Tehri	1750	Mesoamerican
155 .	GFB-155	Pauri	1650	Mesoamerican	172.	GFB-172	Joshimat h	1875	Mesoamerican
156 .	GFB-156	Joshimath	1875	Andean	173.	GFB-173	Dhanolti	2300	Andean
157 .	GFB-157	Joshimath	1875	Andean	174.	GFB-174	Dhanolti	2300	Andean
158 .	GFB-158	Joshimath	1875	Andean	175.	GFB-175	Joshimat h	1875	Mesoamerican

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159	GFB-159	Pauri	1650	Mesoamerican	176.	GFB-176	Joshimat h	1875	Mesoamerican
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Table S2. Data transformation details and relative frequency of the qualitative data.

S. No.	Characteristics	States/ RHS Colour chart reference	Note	Type of assessment	Relative frequency (%)
1.	Plant: Growth habit	Determinate Semideterminate Indeterminate	1 2 3	VG	2.84 10.795 86.36
2.	Colour of Leaves. Intensity of green colour	Light green Dark green	3 7	VG	54.54 45.45
3.	Colour of stem. Anthocyanin colouration	Green (Absent) Purple (Present)	1 9	VS	93.75 6.25
4.	Flower: colour of standard petals	White Yellow Pink Purple (violet) Red	1 2 3 4 5	VG	18.75 5.47 47.72 28.4 0.56
5.	Pod: colour	Green Green: with black stripes Green: with Purple stripes Green: with Maroon stripes Green: with pink stripes	1 2 3 4 5	VG	79.54 8.52 3.4 7.95 3.4
6.	Seed: Pattern	Unpattern Pinto	1 2	VG	30.11 69.31
7.	Seed coat colour	Maroon White Khaki Yellow Vream Green Grey Orange Light pink Red Dark purple Dark brown Black	1 2 3 4 5 6 7 8 9 10 11 12 13	VG	3.97 3.97 2.27 5.68 7.36 1.13 3.4 1.7 0.56 1.13 0.56 1.13 2.27

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		Cream mottled	14		19.31
		Maroon mottled	15		3.97
		Dark blue mottled	16		4.54
		White mottled	17		0.56
		Khaki mottled	18		0.56
		Light pink mottled	19		4.54
		Olive mottled	20		1.7
		Red mottled	21		2.84
		Purple mottled	22		5.68
		Brown mottled	23		7.36
		Black mottled	24		3.4
		Grey mottled	25		5.11
		Green mottled	26		0.56
		Grey speckled	27		2.84
		Yellow mottled	28		1.7
8.	Seed: Size(cm)	Small (<1.0cm)	3	MG	60.79
		Medium (1.0-1.5cm)	5		17.04
		Large (>1.5 cm)	7		22.15
9.	Seed: texture	Smooth	1	VG	95.45
		Rough	2		4.54
10.	Seed: Shape	Round	1	VG	7.95
		Oval	2		86.93
		Broad	3		5.11

*MG: Measurement by a single observation of a group of plants

*VG: Visual assessment by a single observation of a group of plants

*VS: Visual assessment by observation of individual plants

Table S3. List of markers used in SSR analysis of 176 French bean accessions along with their sequence and Annealing temperature.

S.No.	Marker	Forward/Reverse sequence 5' - 3'	LG	T _a (°C)
1.	BM218	GAGTGGGGAACGAAGCATAA GAAGTGCATTGCTGAGGTGA	PV06	55
2.	PVBR20	TGAGAAAGTTGATGGGATTG TACGCTGTTGAAGGCTCTAC	PV06	56
3.	PVBR25	GAGCTTCTCCGTCCGTGTGT CGAACTGAATCAGAAAGGAA	PV02	56
4.	BM236	GCTGAAAAGAGGAGGTGCGAA GGACTTGCCAGAAGAAGCTGC	PV02	55
5.	BM139	GCGTATGGCACTCTGAAGGT GCCCCGTGCTTGAGGATTAC	PV02	50
6.	GATS91	GAGTGCGGAAGCGAGTAGAG TGTCACCTCTCTCCTCCAAT	PV02	52
7.	PVBR5	ATTAGACGCTGATGACAGAG AGCAGAATCCTTTGAGTGTG	PV06	56
8.	BM278	CCAAGGTACATCTCAAGCAAA TCAATCACATACATCACATATAATTCA	PV06	53
9.	BM214	TTTGACAAAGCAGCTCCAG AATTAGAACCCTCTTTAGATACCAA	PV06	52
10.	BM143	GGGAAATGAACAGAGGAAA ATGTTGGGAACTTTTAGTGTG	PV02	55
11.	BM146	GAGATGAGTCCTTTCCCTACCC TGCAGACACAATTTAAGAACGC	PV01	58
12.	PVBR131	GCGTCTGAGGAGAAGGAGGT CTCCCAATCTCACCAAACCC	PV03	56
13.	PVBR182	CGCGCACGTAGGTACTACAA CAACAACACCACCCTGAGAC	PV04	53
14.	PVBR124	CCTAAAACGAGGTGCGAGA TGGGAAACCTAGCCAAACAC	PV05	56
15.	BM210	ACCACTGCAATCGTCATCTTTG CCCTCATCCTCCATCTTATCG	PV07	52
16.	BM151	CACAACAAGAAAGACCTCCT TTATGTATTAGACCACATTACTCC	PV08	50
17.	BM114	AGCCTGGTGAAATGCTCATAG GATGCTTGTGCTAACTCTCT	PV09	50
18.	BM212	AGGAAGGGATCCAAAGTCACTC TGAACCTTCAGGAATTGATGAATGAAG	PV10	50
19.	BM184	GCTCTATCAAGATGTGTG ACATAATCAATGGGTCCTG	PV11	52
20.	PVBR10	ACAACAACAGAGAATCTCTC AAGGATGAGAAGGAGGAC	PV02	54

Table S4. Eigen-values, proportion of variability and cumulative percentage for the fifteen PC's among 176 common bean genotypes.

PC	Eigen value	Variability (%)	Cumulative (%)
PC1	4.297	28.647	28.647
PC2	2.510	16.737	45.384
PC3	1.454	9.690	55.074
PC4	1.149	7.659	62.733
PC5	0.999	6.659	69.392
PC6	0.834	5.558	74.949
PC7	0.738	4.923	79.872
PC8	0.672	4.481	84.353
PC9	0.591	3.938	88.291
PC10	0.509	3.393	91.684
PC11	0.466	3.107	94.791
PC12	0.344	2.290	97.081
PC13	0.221	1.471	98.552
PC14	0.139	0.929	99.482
PC15	0.078	0.518	100.000

Table S5. Correlation matrix of fifteen quantitative traits. The highly positive and negative correlation between traits are in bold.

Variables	I Flowering	50 % Flowering	Days To I pod	Days to 50 % pod	I harvesting	50 % harvesting	Number of pods	Length of pods	Width of pods	No. of seed/pod	wt. of 5 green pod	Length of seed	width of seeds	100 seeds weight	Yield
First flowering initiation															
50% Flowering	0.838**														
Days to I Pod Initiation	0.790**	0.879**													
Days to 50% Pod	0.624**	0.647**	0.792**												
I harvesting	0.695**	0.795**	0.794**	0.736**											
50 % harvesting	0.272	0.252	0.235	0.120	0.389*										
Number of Pods	0.200	0.251	0.172	0.222	0.204	-0.057									
Length of Pods	-0.004	-0.036	0.024	-0.025	0.032	-0.004	-0.198								
width of pods	0.101	0.025	0.026	-0.051	-0.049	-0.004	-0.188	0.342*							
No. of seed/pod	0.162	0.242	0.179	0.220	0.300*	0.044	0.380*	0.032	-0.137						
Wt. of 5 green pod	-0.038	-0.097	-0.118	-0.153	-0.059	-0.288	-0.158	0.480**	0.252	-0.120					
Length of seed	0.106	0.065	-0.003	-0.104	-0.038	-0.099	-0.360*	0.292	0.229	-0.261	0.289				
Width of seeds	0.442*	0.427*	0.342*	0.252	0.355*	0.140	0.014	0.002	0.023	0.031	0.041	0.339*			
100 seeds weight	0.032	0.019	0.011	-0.038	0.019	0.008	-0.418	0.153	0.158	-0.365*	0.207	0.636**	0.202		
Yield	0.111	0.149	0.084	0.114	0.187	-0.143	0.235	0.200	0.063	0.289	0.296	0.389*	0.205	0.344*	

*and** indicate significant of values at P=0.05and 0.01, respectively

Table S6. Mean likelihoods of models and their standard deviations, Delta K for simulations for different K values, mean similarity coefficients for different Structure simulations within each preset K.

K	Reps	Mean LnP(K)	StdevLnP(K)	Ln'(K)	 Ln''(K) 	Delta K
1	5	-5508.68	1.9601	NA	NA	NA
2	5	-4720.34	4.8495	788.34	824.54	170.0245
3	5	-4756.54	32.7504	-36.2	37.14	1.134032
4	5	-4755.6	152.6079	0.94	302.74	1.983776
5	5	-5057.4	711.6007	-301.8	270.18	0.379679
6	5	-5089.02	688.7412	-31.62	4913.12	7.133478
7	5	-10033.76	11292.5181	-4944.74	19327.58	1.711539
8	5	-34306.08	64158.3103	24272.32	46792.66	0.729331
9	5	-11785.74	4213.7534	22520.34	55729.16	13.22554
10	5	-44994.56	54134.2205	-33208.82	NA	NA

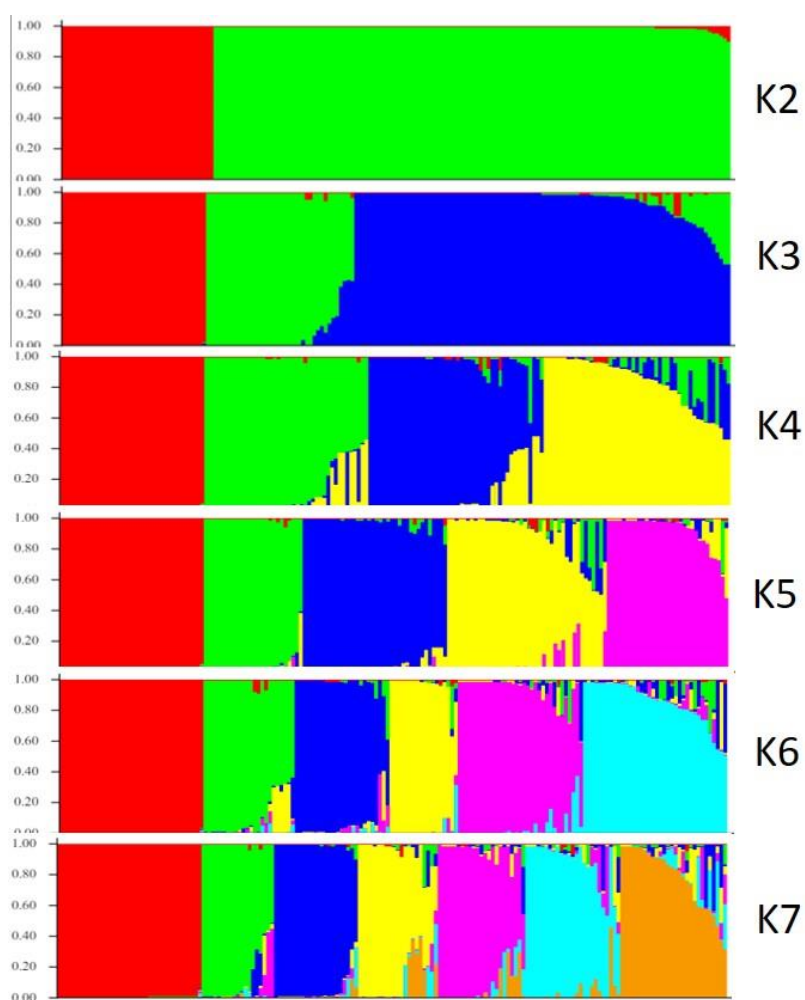


Figure S1. Structure analysis of the amplification data obtained from the two SSR markers BM 218 and GAT 591.