



Figure S1. Measurement of canopy reflectance using a multispectral radiometer.

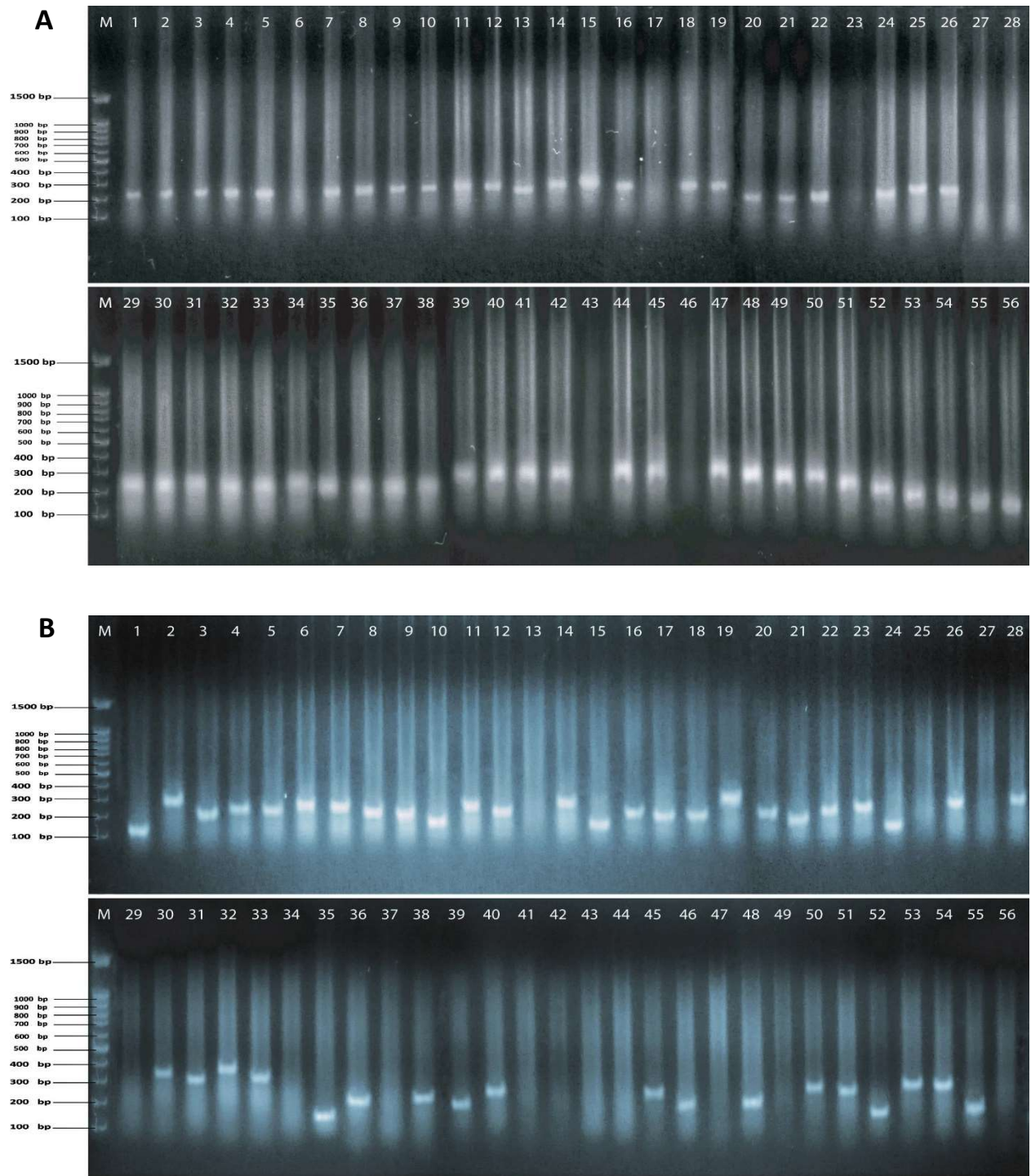


Figure S2. The SSR marker profiles of bread wheat genotypes using *wmc177* (A) and *wms292* (B) SSR primers. M indicates molecular weight. A list of 56 wheat genotypes is present in the supplementary **Table S1**.

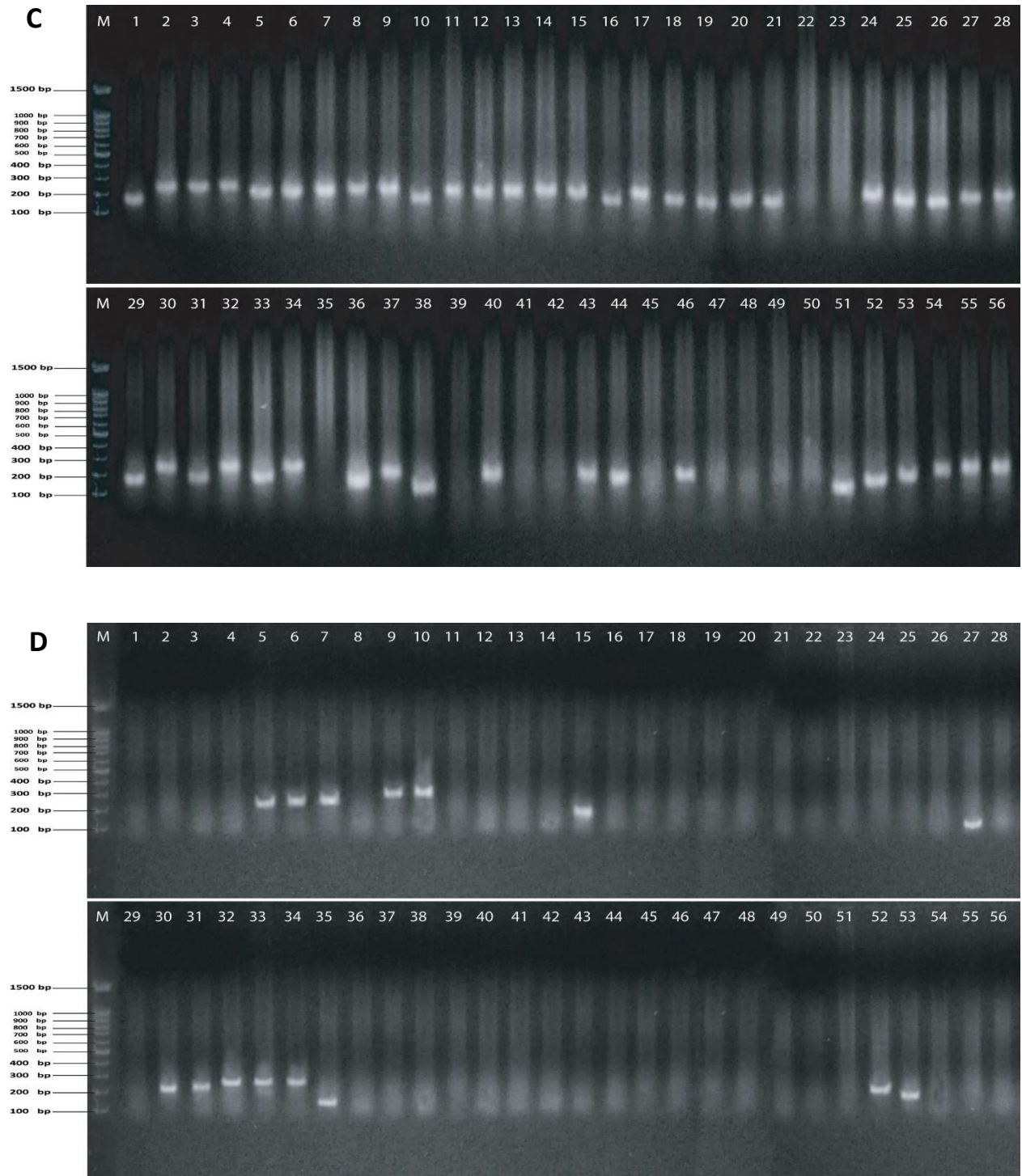


Figure S2 (contd.). The SSR marker profiles of bread wheat genotypes using *wms260* (C) and *wms186* (D) SSR primers. M indicates molecular weight. A list of 56 wheat genotypes is present in the supplementary **Table S1**.

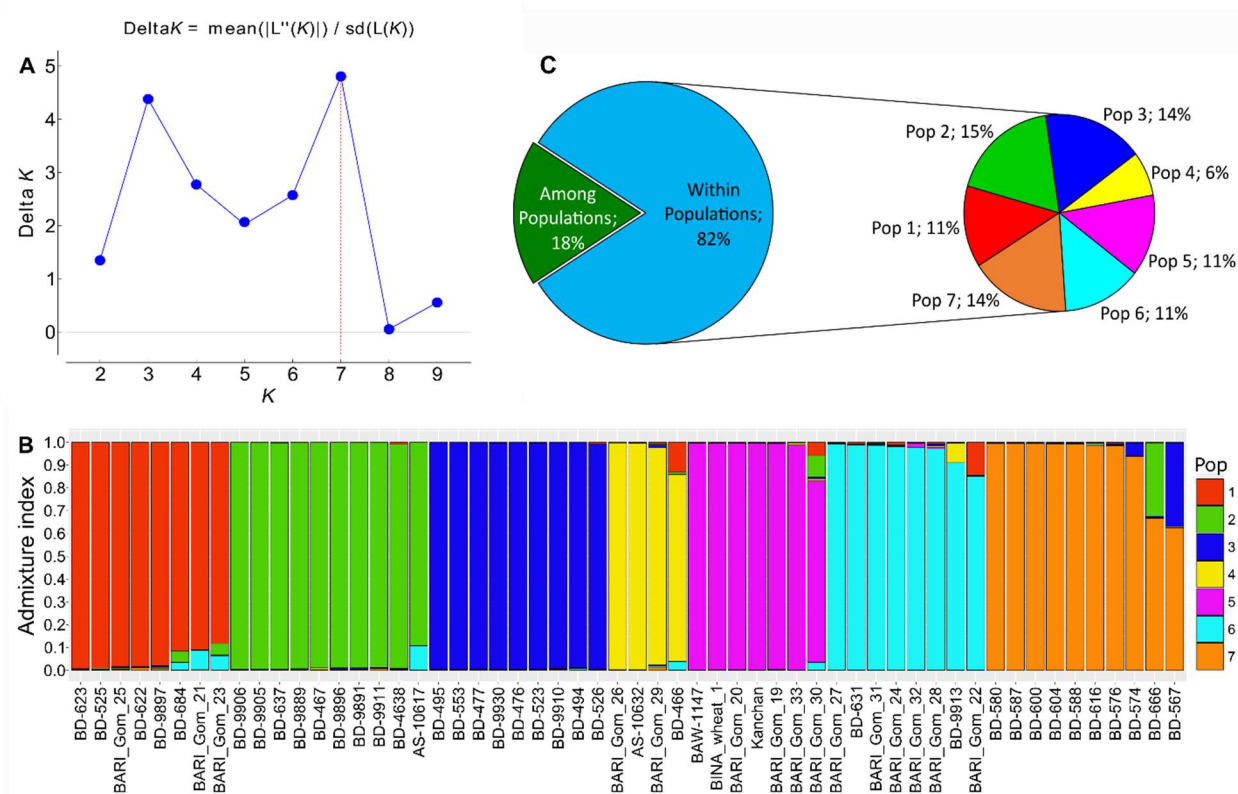


Figure S3. A. The peak of $\Delta K = 7$ determines the number of populations in our study, B. Estimated population structure of 56 bread wheat genotypes with 25 SSR markers for $\Delta K = 7$, and C. The population obtained by the STRUCTURE-based method was used to analyse the molecular variance (AMOVA) of 56 wheat genotypes.

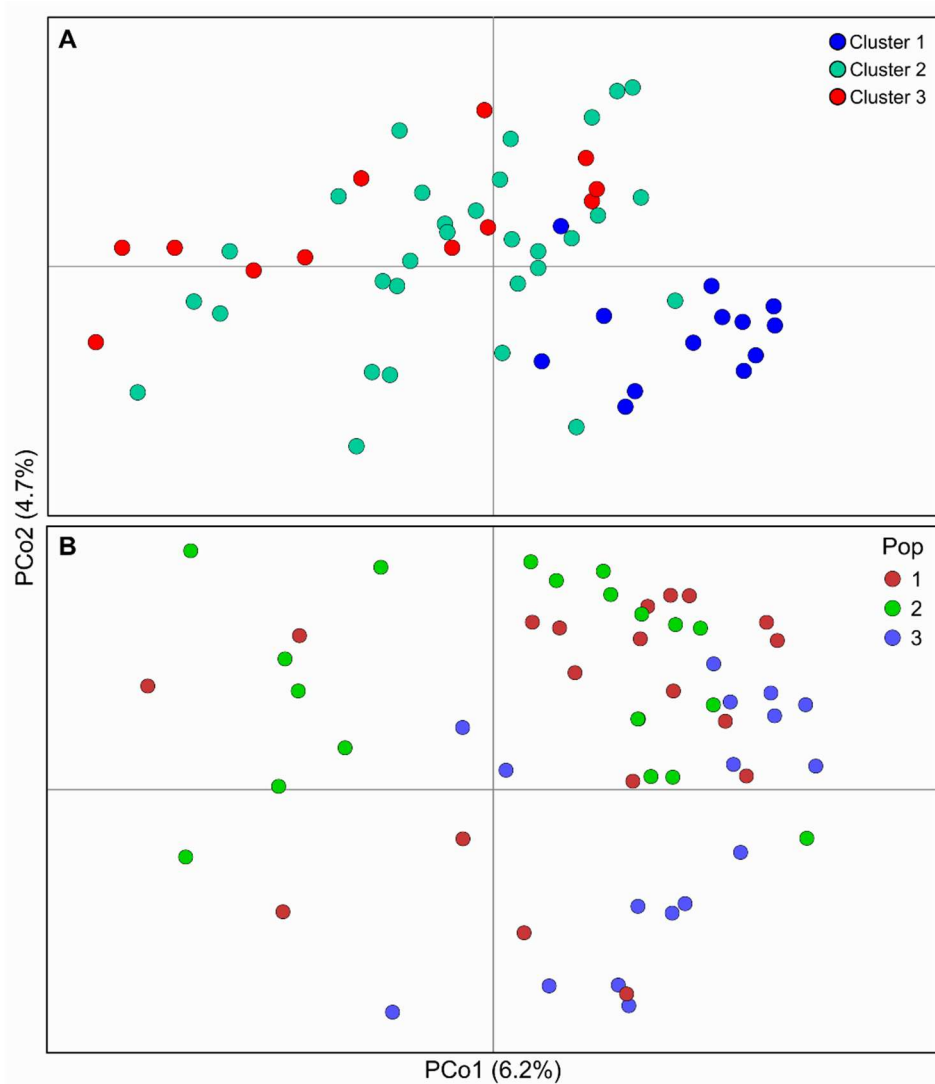


Figure S4. Principal coordinate analysis (PCoA) of SSR marker allelic data for 56 wheat genotypes with respect to phenotypic clusters (A), and model-based subpopulations (B). Individuals, clusters, and populations differences are visualized in the figure. Individuals from different clusters and populations are intermixed across the coordinates.

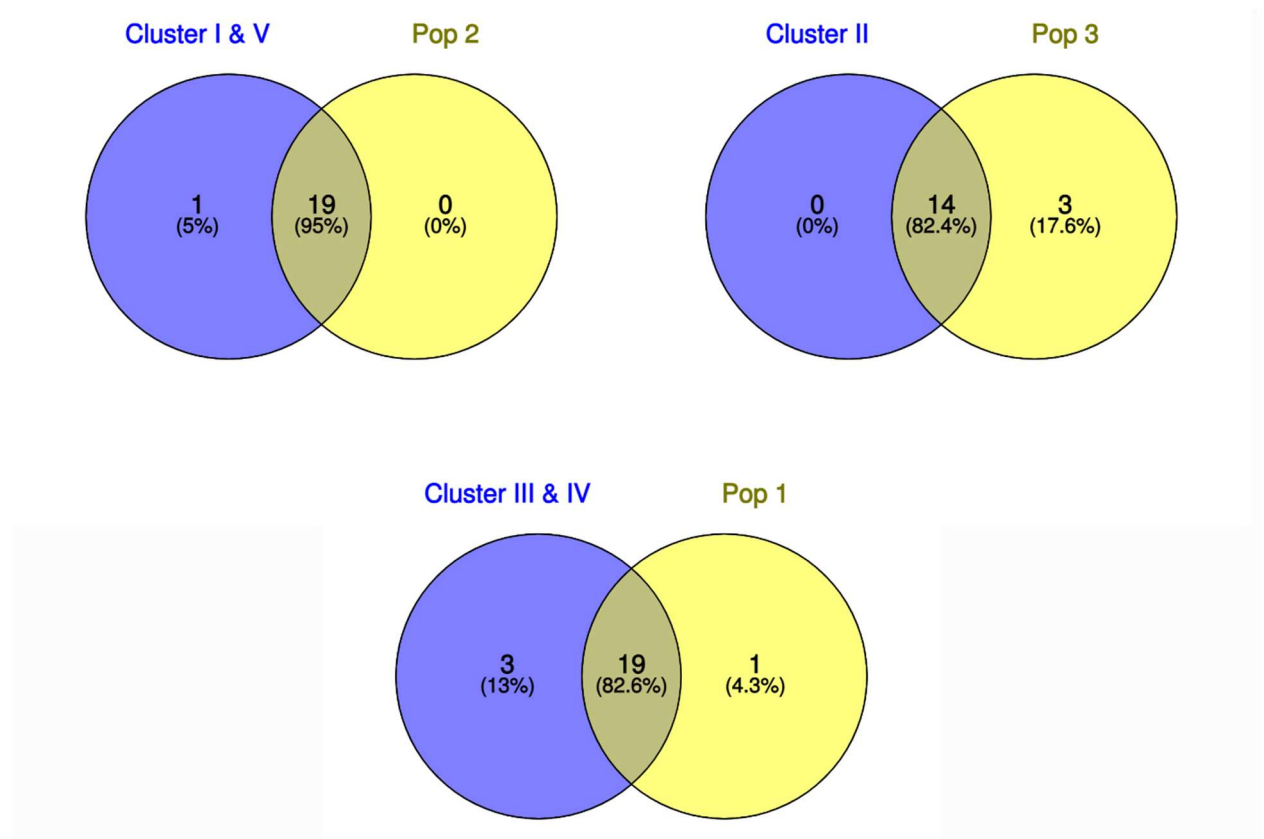


Figure S5. Venn diagram showing co-linearity between SSR-based NJ clusters and model-based populations. Overall, 86.7% co-linearity exists between NJ clusters and extracted model-based populations when $\Delta K = 3$.

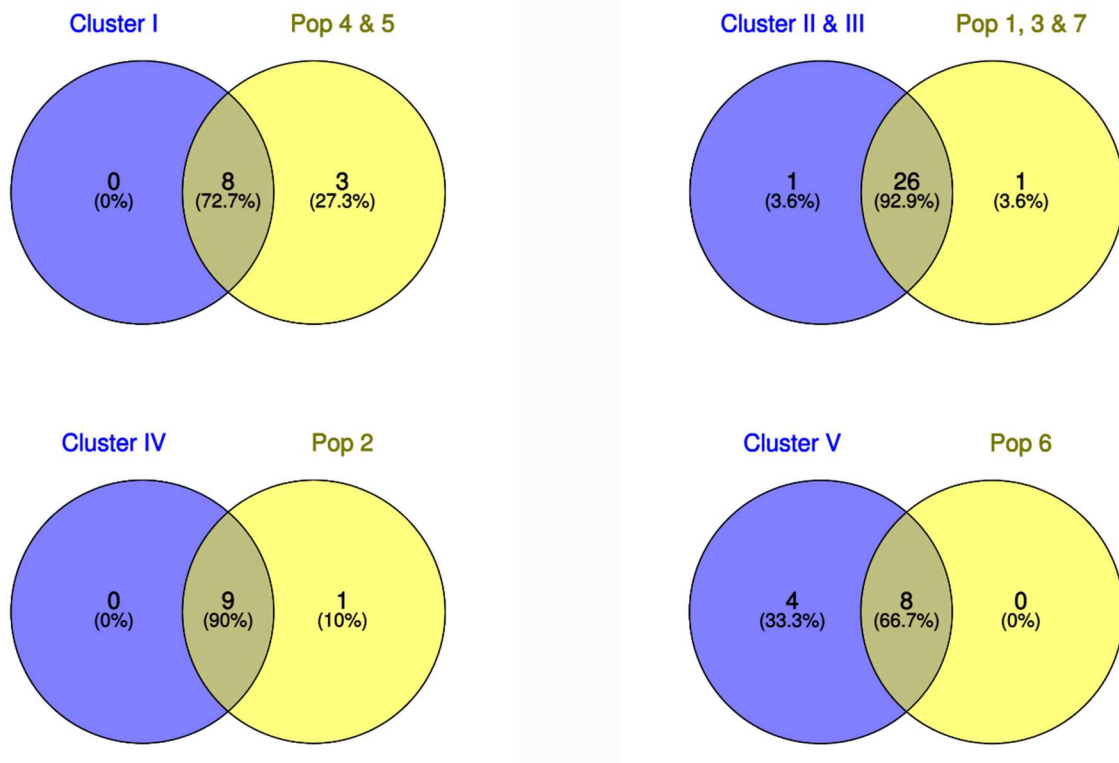


Figure S6. Venn diagram showing co-linearity between SSR-based NJ clusters and model-based populations. Overall, 80.6% co-linearity exists between NJ clusters and extracted model-based populations when $\Delta K = 7$.

Table S1. List of wheat genotypes used in the exploratory study

Sl. No.	Genotype	Source	Type	Pedigree/Collected from
1	AS-10617	ACI Seed	Mutant	BARI Gom 25; mutagen: 1% EMS
2	AS-10632	ACI Seed	Mutant	BARI Gom 25; mutagen: 1% EMS
3	BARI Gom 19	BWMRI	Variety	NAC/VEE (NL 560)
4	BARI Gom 20	BWMRI	Variety	TURACO/CHIL
5	BARI Gom 21	BWMRI	Variety	MRNG/BVC//BLO/PVN/3/PJB-81
6	BARI Gom 22	BWMRI	Variety	KAN/6/COQ/F61.70//CNDR/3/OLN/4/PHO/5/MRNG/ALDAN//CNO
7	BARI Gom 23	BWMRI	Variety	NL297*2/LR25
8	BARI Gom 24	BWMRI	Variety	G. 162/BL 1316//NL 297
9	BARI Gom 25	BWMRI	Variety	ZSH 12/HLB 19//2*NL297
10	BARI Gom 26	BWMRI	Variety	ICTAL 123/3/RAWAL 87//VEE/HD 2285
11	BARI Gom 27	BWMRI	Variety	WAXWING*2/VIVISTI
12	BARI Gom 28	BWMRI	Variety	CHIL/2*STAR/4/BOW/CROW//BUC/PVN/3/2*VEE#10
13	BARI Gom 29	BWMRI	Variety	SOURAV/7/KLAT/SOREN//PSN/3/BOW/4/VEE#5. 10/5/CNO 67/MFD// MON/3/SERI/6/NL297
14	BARI Gom 30	BWMRI	Variety	BAW 677/Bijoy
15	BARI Gom 31	BWMRI	Variety	KAL/BB/YD/3/PASTOR
16	BARI Gom 32	BWMRI	Variety	SHATABDI/GOURAB
17	BARI Gom 33	BWMRI	Variety	KACHU/SOLALA
18	BAW-1147	BWMRI	Advanced line	WRS, Gazipur
19	BD-4638	PGRC, BARI	Accession	-
20	BD-466	PGRC, BARI	Accession	-
21	BD-467	PGRC, BARI	Accession	-
22	BD-476	PGRC, BARI	Accession	-
23	BD-477	PGRC, BARI	Accession	-
24	BD-494	PGRC, BARI	Accession	-
25	BD-495	PGRC, BARI	Accession	-
26	BD-523	PGRC, BARI	Accession	-
27	BD-525	PGRC, BARI	Accession	-
28	BD-526	PGRC, BARI	Accession	-
29	BD-553	PGRC, BARI	Accession	-
30	BD-567	PGRC, BARI	Accession	-
31	BD-574	PGRC, BARI	Accession	-
32	BD-576	PGRC, BARI	Accession	-
33	BD-580	PGRC, BARI	Accession	-

Sl. No.	Genotype	Source	Type	Pedigree/Collected from
34	BD-587	PGRC, BARI	Accession	-
35	BD-588	PGRC, BARI	Accession	-
36	BD-600	PGRC, BARI	Accession	-
37	BD-604	PGRC, BARI	Accession	-
38	BD-616	PGRC, BARI	Accession	-
39	BD-622	PGRC, BARI	Accession	-
40	BD-623	PGRC, BARI	Accession	-
41	BD-631	PGRC, BARI	Accession	-
42	BD-637	PGRC, BARI	Accession	-
43	BD-666	PGRC, BARI	Accession	-
44	BD-684	PGRC, BARI	Accession	-
45	BD-9889	PGRC, BARI	Accession	RARS, Ishurdi
46	BD-9891	PGRC, BARI	Accession	RARS, Ishurdi
47	BD-9896	PGRC, BARI	Accession	RARS, Ishurdi
48	BD-9897	PGRC, BARI	Accession	RARS, Ishurdi
49	BD-9905	PGRC, BARI	Accession	RARS, Ishurdi
50	BD-9906	PGRC, BARI	Accession	RARS, Ishurdi
51	BD-9910	PGRC, BARI	Accession	RARS, Ishurdi
52	BD-9911	PGRC, BARI	Accession	RARS, Ishurdi
53	BD-9913	PGRC, BARI	Accession	RARS, Ishurdi
54	BD-9930	PGRC, BARI	Accession	RARS, Ishurdi
55	BINA wheat 1	BINA	Variety	L-880-43
56	Kanchan	BWMRI	Variety	UP301/C306

ACI- Advanced Chemical Industries; BARI- Bangladesh Agricultural Research Institute; BINA- Bangladesh Institute of Nuclear Agriculture; BWMRI- Bangladesh Wheat and Maize Research Institute; PGRC- Plant Genetic Resource Center; RARS- Regional Agricultural Research Station; WRS- Wheat Research Station.

Table S2. Details of SSR primers used in this study

Sl. No.	Marker	Chr. Location	Chr. Arm	Marker Sequence	Motif	Product Size (bp)	AT (°C)	Reference
1	wms136	1A	S	F- GAC AGC ACC TTG CCC TTT G R- CAT CGG CAA CAT GCT CAT C	CT	296	60	Somers <i>et al.</i> , (2004)
2	wms11	1B	L, S	F- GGA TAG TCA GAC AAT TCT TGT G R- GTG AAT TGT GTC TTG TAT GCT TCC	TA,CATA, CA,TA	196	61	Somers <i>et al.</i> , (2004)
3	wmc179	1D (2A, 4A, 6A,6B, 7A)	L	F- CAT GGT GGC CAT GAG TGG AGG T R- CAT GAT CTT GCG TGT GCG TAG G	GA	184	61	Somers and Isaac (2004)
4	wms337	1D	S	F- CCT CTT CCT CCC TCA CTT AGC R- TGC TAA CTG GCC TTT GCC	CT,CACT,CA	183	55	Dodig <i>et al.</i> , (2010)
5	wmc177	2A	S	F- AGG GCT CTC TTT AAT TCT TGC T R- GGT CTA TCG TAA TCC ACC TGT A	CA	184	51	Somers and Isaac (2004)
6	wms304	2A(5A)	S	F- AGG AAA CAG AAA TAT CGC GG R- AGG ACT GTG GGG AAT GAA TG	CT	217	55	Somers <i>et al.</i> , (2004)
7	wms257	2B	S	F- AGA GTG CAT GGT GGG ACG R- CCA AGA CGA TGC TGA AGT CA	GT	192	60	Somers <i>et al.</i> , (2004)
8	wms30	2D	L	F- ATC TTA GCA TAG AAG GGA GTG GG R- TTC TGC ACC CTG GGT GAT TGC	AT,GT	206	60	Somers <i>et al.</i> , (2004)
9	wms484	2D	S	F- ACA TCG CTC TTC ACA AAC CC R- AGT TCC GGT CAT GGC TAG G	CT	145	55	Somers <i>et al.</i> , (2004)
10	wms369	3A	S	F- CTG CAG GCC ATG ATG ATG R- ACC GTG GGT GTT GTG AGC	CT,T,CT	188	60	Somers <i>et al.</i> , (2004)
11	wms389	3B	S	F- ATC ATG TCG ATC TCC TTG ACG R- TGC CAT GCA CAT TAG CAG AT	CT,GT	130	60	Somers <i>et al.</i> , (2004)
12	wms161	3D (4A)	S	F- GAT CGA GTG ATG GCA GAT GG R- TGT GAA TTA CTT GGA CGT GG	CT	154	60	Somers <i>et al.</i> , (2004)
13	wms165	4A	S	F- TGC AGT GGT CAG ATG TTT CC R- CTT TTC TTT CAG ATT GCG CC	GA	199	60	Somers <i>et al.</i> , (2004)
14	wms149	4B	L	F- CAT TGT TTT CTG CCT CTA GCC R- CTA GCA TCG AAC CTG AAC AAG	GA imp	161	55	Somers <i>et al.</i> , (2004)
15	wms375	4B	L	F- ATT GGC GAC TCT AGC ATA TAC G R- GGG ATG TCT GTT CCA TCT TAG C	CA	156	55	Lowe <i>et al.</i> , (2011)

Sl. No.	Marker	Chr. Location	Chr. Arm	Marker Sequence	Motif	Product Size (bp)	AT (°C)	Reference
16	wms192	4D (4A, 4B)	L	F- GGT TTT CTT TCA GAT TGC GC R- CGT TGT CTA ATC TTG CCT TGC	CT	191	60	Somers <i>et al.</i> , (2004)
17	wms186	5A	L	F- GCA GAG CCT GGT TCA AAA AG R- CGC CTC TAG CGA GAG CTA TG	GA	140	60	Dodig <i>et al.</i> , (2010)
18	wms118	5B (4A)	L, S	F- GAT GGT GCC ACT TGA GCA TG R- GAT TGT CAA ATG GAA CAC CC	CA	110	60	Lowe <i>et al.</i> , (2011)
19	wms292	5D (5A)	L	F- TCA CCG TGG TCA CCG AC R- CCA CCG AGC CGA TAA TGT AC	CT	220	60	Lowe <i>et al.</i> , (2011)
20	wms169	6A	L	F- ACC ACT GCA GAG AAC ACA TAC G R- GTG CTC TGC TCT AAG TGT GGG	GA	196	60	Somers <i>et al.</i> , (2004)
21	psp3071	6A	L	F- CGT GCC CTA CAC CTC CTT TTC TCT C R- TCC GTA CAT ACT CCG GGA GAC C	TC	153	61	Stepheson <i>et al.</i> , (1998)
22	wmc105	6B	S	F- AAT GTC ATG CGT GTA GTA GCC A R- AAG CGC ACT TAA CAG AAG AGG G	GT	192	61	Somers and Isaac (2004)
23	psp3200	6D	S	F- GTT CTG AAG ACA TTA CGG ATG R- GAG AAT AGC TGG TTT TGT GG	AAG	170	61	Olson <i>et al.</i> , (2013)
24	barc108	7A	S	F- GCG GGT CGT TTC CTG GAA ATT CAT CTA A R- GCG AAA TGA TTG GCG TTA CAC CTG TTG	ATT		50	Somers <i>et al.</i> , (2004)
25	wmc603	7A (1A)	L	F- ACA AA CGG TGA CAA TGC AAG GA R- CGC CTC TCT CGT AAG CCT CAA C		120	61	Somers and Isaac (2004)
26	wmc9	7A	L	F- AAC TAG TCA AAT AGT CGT GTC CG F- GTC AAG TCA TCT GAC TTA ACC CG		168	61	Somers and Isaac (2004)
27	wms260	7A	L, S	F- GCC CCC TTG CAC AAA TC R- CGC AGC TAC AGG AGG CC	GA	157	55	Somers <i>et al.</i> , (2004)
28	wms130	7A (2A, 7B)	S	F- AGC TCT GCT TCA CGA GGA AG R- CTC CTC TTT ATA TCG CGT CCC	GT	113	60	Lowe <i>et al.</i> , (2011)
29	wms46	7B	S	F- GCA CGT GAA TGG ATT GGA C R- TGA CCC AAT AGT GGT GGT CA	GA,GC,GA	187	60	Somers <i>et al.</i> , (2004)
30	wms295	7D	S	F- GTG AAG CAG ACC CAC AAC AC R- GAC GGC TGC GAC GTA GAG	GA	258	60	Lowe <i>et al.</i> , (2011)

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Table S3. Combined analysis of variance (mean square values) across years for mean vegetation indices (VIs), and yield traits of bread wheat genotypes

Traits	Genotype (G)	Treatment (T)	Year (Y)	G×T	G×Y	T×Y	G×T×Y
df	55	1	1	55	55	1	55
SR	12.47***	1923.09***	1.51*	6.51***	0.00	5.18***	0.00
NDVI	0.0230***	3.7665***	0.0097**	0.0113***	0.0000	0.0478***	0.0000
GNDVI	0.0151***	1.45787***	0.00857**	0.00307***	0.00010	0.03429***	0.00005
EVI	0.0401***	7.0050***	0.0124*	0.0265***	0.0000	0.0581***	0.0000
NWI	0.000963***	0.033858***	0.000004	0.000151***	0.000009	0.000025	0.000009
NCPI	0.00920***	1.90720***	0.00006	0.00512***	0.00005	0.00572***	0.00002
PRI	0.001398***	0.098843***	0.000000	0.000509***	0.000013	0.000387***	0.000012
ARI	0.0587***	13.8834***	0.0386***	0.0474***	0.0008	0.0124*	0.0008
XES	5.23***	498.84***	0.37	1.62***	0.00	6.63***	0.00
SPAD	34.74***	1882.31***	7.58	7.48***	0.053	27.276***	0.050
CTD	4.064***	169.463***	0.228	0.664***	0.000	0.947***	0.001
DTH	273.17***	1560.44***	34.08***	4.34***	0.00	143.02***	0.01
PH	758.9***	12354.2***	74.3*	24.4***	0.5	163.9***	0.3
NKS	751.0***	12723.3***	36.6	131.8***	0.1	114.1*	0.1
WKS	2.1239***	21.0269***	0.0395	0.1253***	0.0001	0.1262	0.0003
HKW	5.4692***	31.0804***	0.2107	0.1382***	0.0002	0.5693*	0.0005
BY	24.63***	1300.90***	0.48	9.37***	0.02	1.89	0.01
GY	9.484***	180.453***	0.054	1.340***	0.000	0.331	0.000

*, **, *** Statistically significant at $P \leq 0.05$, 0.01, 0.001, respectively.

Table S4. Pairwise F_{ST} values among phenotypic clusters. F_{ST} values in the below diagonal and p values in the upper diagonal

	Cluster 1	Cluster 2	Cluster 3
Cluster 1	–	0.001	0.001
Cluster 2	0.050	–	0.001
Cluster 3	0.082	0.044	–

Table S5. Pairwise F_{ST} values among subpopulations. F_{ST} values in the below diagonal and p values in the upper diagonal

	Pop 1	Pop 2	Pop 3
Pop 1	–	0.001	0.001
Pop 2	0.057	–	0.151
Pop 3	0.055	0.017	–