

Table S1. The list of radish cultivars used in this study.

No.	Abbreviation	Cultivars	Types	Sources
1	SP01	Sincheongilpum	Large root (Spring)	Farm hannog
2	SP02	Sambakja	Large root (Spring)	Farm hannog
3	SP03	Cheongilchun	Large root (Spring)	Asia seed
4	SP04	Alpinegold	Large root (Spring)	Asia seed
5	SP05	Chunganghaneul	Large root (Spring)	Dailim seed
6	SP06	Chungdaebom	Large root (Spring)	Nongwoo bio
7	SP07	Daedeulbo	Large root (Spring)	Nongwoo bio
8	SP08	Gamtan	Large root (Spring)	Nongwoo bio
9	SP09	Junmuhumu	Large root (Spring)	Koregon
10	SP10	Neulsaengbom	Large root (Spring)	Nongwoo bio
11	SP11	Saepureunbom	Large root (Spring)	Farm hannog
12	SP12	Sanggam	Large root (Spring)	Farm hannog
13	SP13	Sanggreen	Large root (Spring)	NH Nonghyup seed
14	SP14	Style Bom	Large root (Spring)	Nongwoo bio
15	SP15	Supergiljo	Large root (Spring)	Nongwoo bio
16	SP16	Taecheong	Large root (Spring)	Syngenta Korea
17	SP17	Topgreenbom 2ho	Large root (Spring)	Kwonnonng seed
18	SP18	YR Sinchyongjanggun	Large root (Spring)	Koregon
19	SP19	Sunbaekok	Large root (Spring (Summer))	Dannong seed
20	HL01	Kwandongyeorum	Large root (High Land)	Farm hannog
21	HL02	Manchudaepung	Large root (High Land)	Gonong seed
22	HL03	Mansahyeongtong	Large root (High Land)	Nongwoo bio
23	HL04	Baekbong	Large root (High Land)	Farm hannog
24	HL05	Cheonggangyeoreum	Large root (High Land)	PPS
25	HL06	Cheonghaejin	Large root (High Land)	Thekiban
26	HL07	Cheonghwang	Large root (High Land)	Nongwoo bio
27	HL08	Gangchu	Large root (High Land)	Syngenta Korea
28	HL09	Gangjamujeok	Large root (High Land)	Jenong S&T
29	HL10	Gangpyeong	Large root (High Land)	PPS
30	HL11	Kwancheongplus	Large root (High Land)	Farm hannog
31	HL12	Nubira	Large root (High Land)	Sakata Korea
32	HL13	Tamsrun	Large root (High Land)	Farm hannog
33	SP01	Sincheongilpum	Large root (Spring)	Farm hannog
34	HL14	Yeongdong	Large root (High Land)	Nongwoo bio
35	HL15	YR Wihayeo	Large root (High Land)	Farm hannog
36	HL16	Chengrokplus	Large root (High Land (winter))	PPS

Table S1. The list of radish cultivars used in this study (continued).

No.	Abbreviation	Cultivars	Types	Sources
37	AU01	Cheongun	Large root (Autumn)	Farm hannog
38	AU02	Seohogold	Large root (Autumn)	Nongwoo bio
39	AU03	Chamjoeun	Large root (Autumn)	Sakata Korea
40	AU04	Baekja	Large root (Autumn)	Farm hannog
41	AU05	Cheongbokplus	Large root (Autumn)	Farm hannog
42	AU06	Cheongpungmyeongweol	Large root (Autumn)	Gonong seed
43	AU07	Cheongunplus	Large root (Autumn)	Farm hannog
44	AU08	Cheonmyeong	Large root (Autumn)	Asia seed
45	AU09	Cheonsu	Large root (Autumn)	Farm hannog
46	AU10	Chungbok	Large root (Autumn)	Farm hannog
47	AU11	Chunghan	Large root (Autumn)	Danong seed
48	AU12	Chungomabi	Large root (Autumn)	Jeil seed
49	AU13	Dalgona	Large root (Autumn)	Kwonnonng seed
50	AU14	Dongha	Large root (Autumn)	Asia seed
51	AU15	Gaeulhaneul	Large root (Autumn)	Danong seed
52	AU16	Gukbo Gold	Large root (Autumn)	Kwonnonng seed
53	AU17	Hangaeul	Large root (Autumn)	Sakata Korea
54	AU18	Jangan	Large root (Autumn)	Kyoungshin seed
55	AU19	Meotjinmatkkal	Large root (Autumn)	Nongwoo bio
56	AU20	Sambokdabal	Large root (Autumn)	Nongwoo bio
57	AU21	Seoho	Large root (Autumn)	Nongwoo bio
58	AU22	Sinbong	Large root (Autumn)	Kyoungshin seed
59	AU23	Songbaek	Large root (Autumn)	Farm hannog
60	AU24	Supertogwang	Large root (Autumn)	Farm hannog
61	AU25	Togwang	Large root (Autumn)	Farm hannog
62	AU26	Togwanggold	Large root (Autumn)	Farm hannog
63	WI01	Cheongjeonggowon	Large root (Winter)	Nongwoo bio
64	WI02	Nongwoo Osari	Large root (Winter)	Nongwoo bio
65	WI03	Gyeouldaechan	Large root (Winter)	Farm hannog
66	WI04	Himchan	Large root (Winter)	Jenong S&T
67	WI05	Matggalsheongjeong	Large root (Winter)	PPS
68	WI06	Ollematdong	Large root (Winter)	Thekiban
69	WI07	Shindaeji	Large root (Winter)	Farm hannog
70	WI08	Topdong	Large root (Winter)	Syngenta Korea
71	WI09	Woldongchanmi	Large root (Winter)	Farm hannog
72	SR01	Gichan	Small root	Nongwoo bio

Table S1. The list of radish cultivars used in this study (continued).

No.	Abbreviation	Cultivars	Types	Sources
73	SR02	Ildeungsohyeong	Small root	Farm hannog
74	SR03	Saerom	Small root	Syngenta Korea
75	SR04	Seodong	Small root	Farm hannog
76	SR05	Sinsuji	Small root	Nongwoo bio
77	SR06	Chobom altari	Small root (Altari)	Farm hannog
78	SR07	Chorong altari	Small root (Altari)	Thekiban
79	SR08	Hwameang altari	Small root (Altari)	Nongwoo bio
80	SR09	Shinnamgang altari	Small root (Altari)	Farm hannog
81	SR10	Sinjinbom altari	Small root (Altari)	Farm hannog
82	SR11	Sinmyeong altari	Small root (Altari)	Nongwoo bio
83	SR12	Tongil altari	Small root (Altari)	Farm hannog
84	SR13	Walchun altari	Small root (Altari)	Asia seed
85	SR14	Jinmat altari	Small root (Altari)	Asia seed
86	YO01	Asiachunha	Young radish (Yeolmu)	Asia seed
87	YO02	Dosi	Young radish (Yeolmu)	Koregon
88	YO03	Hong Vit Yeol	Young radish (Yeolmu)	Asia seed
89	YO04	Hukdanyeorumyeol	Young radish (Yeolmu)	Sakata Korea
90	YO05	Janchiyeol	Young radish (Yeolmu)	Nongwoo bio
91	YO06	Jinboriyeol	Young radish (Yeolmu)	Nongwoo bio
92	YO07	Matkkal	Young radish (Yeolmu)	Syngenta Korea
93	YO08	Namgwang	Young radish (Yeolmu)	Kyoungshin seed
94	YO09	Shinmanbokyeol	Young radish (Yeolmu)	Sakata Korea
95	YO10	YR heukboseokyeol	Young radish (Yeolmu)	Nongwoo bio
96	PR01	Chunchujangbackjosang	Pickled radish (Danmuji)	Dailim seed
97	PR02	Chobi	Pickled radish (Danmuji)	Koregon
98	PR03	Jangnoksudanmuji	Pickled radish (Danmuji)	Farm hannog
99	PR04	Worldminong	Pickled radish (Danmuji)	Nongwoo bio
100	DR01	Anthoful	Dried radish (Shiraegi)	Asia seed
101	DR02	Nongcham	Dried radish (Shiraegi)	
102	DR03	Jeil Geongangshiraegi	Dried radish (Shiraegi)	Jeil seed
103	DR04	Danongshiraegi	Dried radish (Shiraegi)	Danong seed
104	HA01	Bordeaux	High anthocyanin	Syngenta Korea
105	HA02	Kwonnong Bravo	High anthocyanin	Kwonnong seed

Table S2. The list of radish elite lines used in this study.

Elite lines	Generations advanced	Parents	Elite lines	Generations advanced	Parents
1020	F ₆	Line 17× E Cultivar	1274	F ₋	N Cultivar
1669	F ₋	Line 36	1353	F ₅	C Cultivar× A Cultivar
7626			1430	F ₅	D Cultivar× A Cultivar
7628	F ₋	Line 27	1705	F ₋	Line 44
7633	F ₋	Line 29	1894	F ₋	E Cultivar
7635	F ₋	Line 28	7575	F ₄	Line 41× Line 40
7661			7577	F ₅	Line 40× Line 19
7705	F ₋	Line 27× Line 26	7607	F ₅	Line 27× Line 43
7710			7623	F ₋	Line 30
7727	F ₆	Line 33× Line 34	7643	F ₆	L Cultivar× Line 20
7810	F ₆	Line 35× M Cultivar	7645	F ₆	L Cultivar× Line 20
7832	F ₋	Line 14× Line 13	7830	F ₋	Line 14× Line 13
1028	F ₆	Line 2× E Cultivar	7837	F ₇	Line 45× Line 14
1045	F ₆	A Cultivar× E Cultivar	7841	F ₇	Line 45× Line 14
1048	F ₅	A Cultivar× Line 2	7843	F ₇	Line 45× Line 14
1051	F ₆	B Cultivar× A Cultivar	7846	F ₇	Line 3× Line 4
1052	F ₆	B Cultivar× A Cultivar	7849	F ₋	Line 9× Line 10
1053	F ₆	B Cultivar× A Cultivar	7871	F ₋	Line 16
1054	F ₆	B Cultivar× A Cultivar	1104	F ₋	E Cultivar× Line 1
1062	F ₅	E Cultivar× A Cultivar	1023	F ₋	Line 9× Line 10
1067	F ₅	F Cultivar× A Cultivar	1034	F ₅	Line 2× H Cultivar
1068	F ₋	Line 11× Line 7	1086	F ₇	Line 5× Line 6
1070	F ₆	C Cultivar× A Cultivar	1090	F ₄	I Cultivar
1072	F ₆	J Cultivar	1112	F ₇	E Cultivar
1075	F ₇	D Cultivar× A Cultivar	1146	F ₆	G Cultivar× Line 1
1087	F ₇	Line 18	1149	F ₆	G Cultivar× A Cultivar
1089	F ₋	Line 9× Line 44	1369	F ₋	Line 7× Line 8
1093	F ₋	Line 7× Line 12	1392	F ₆	C Cultivar× A Cultivar
1095	F ₋	Line 7× Line 11	1393		
1099	F ₅	H Cultivar	7529	F ₅	Line 17× Line 40
1143	F ₋	Line 23× Line 24	7581	F ₅	Line 19× L Cultivar
1229	F ₅	Line 2× E Cultivar	7581	F ₅	Line 19× L Cultivar
1237	F ₆	Line 2× E Cultivar	7638	F ₆	L Cultivar× Line 20

F₋: Elite lines went through F₈ or more generation advancement.

Table S2. The list of radish elite lines used in this study (continued).

Elite lines	Generations advanced	Parents	Elite lines	Generations advanced	Parents
7870	F ₋	Line 13	7754		
1679	F ₋	Line 32	7813	F ₅	Line 26 × Line 32
7858	F ₋	Line 26	7821	F ₋	Line 15
7859	F ₋	Line 25	1024	F ₋	Line 21 × Line 22
1006	F ₆	Line 5 × E Cultivar	1268	F ₇	D Cultivar × A Cultivar
1007	F ₇	Line 5 × E Cultivar	1346	F ₆	E Cultivar × Line 1
1010	F ₋	Line 5 × Line 6	7624	F ₇	Line 42
1013	F ₆	Line 17 × E Cultivar	7872		
1019	F ₆	Line 17 × E Cultivar	1021		
1036	F ₅	G Cultivar × A Cultivar	1085		
1079	F ₇	D Cultivar × E Cultivar	1145	F ₆	Line 8 × E Cultivar
1081	F ₅	D Cultivar × E Cultivar	1152		
1083	F ₇	Line 5 × E Cultivar	1159		
1109	F ₋	E Cultivar	1160		
1134	F ₅	Line 17 × E Cultivar	1659		
1158	F ₇	Line 11 × Line 7	1666		
1159	F ₆	C Cultivar × E Cultivar	1877		
1162	F ₅	D Cultivar × E Cultivar	1889		
1166	F ₋	Line 7 × Line 11	7537		
1670	F ₋	Line 37	7713		
1671	F ₋	Line 39	7714		
1678	F ₋	Line 31	7718		
1895	F ₋	K Cultivar	7874		
7674	F ₇	Line 5 × E Cultivar			
7719	F ₅	Line 33 × Line 32			

F₋: Elite lines went through F₈ or more generation advancement.

Table S3. Information on 21 molecular markers showing polymorphism among 12 radish cultivars.

Primer	Chr. ¹	Genetic Position	Marker type	Forward	Reverse	T _m (°C)	N _A ²
RsIBP15	1	90.131	IBP	tctaacttcagcgcttgt	gccgaagtgtcctttaccaa	55	3
RsIBP13	1	95.845	IBP	catctttgatctgcacccaa	caccaatgcggatcatagtg	55	2
RsIBP06	1	117.274	IBP	gtcaaatccgcagcttcttc	gcaatgccactgatctctga	54	4
RsInD70	2	154.623	InDel	tcctaataatgatctcagcttatcc	tcacagttctgaagtcaattgtc	55	2
RsInD38	2	211.991	InDel	ttgtcacgataagtaacgaacag	gaggaaaaatctaccacatggag	55	2
RsInD61	3	63.501	InDel	attgctgtgtaaagtctagctag	gttcttcattgttacagagagg	53	2
RsInD50	4	52.188	InDel	attgaaaaggtgaacaacgagat	aaatgaaaggggttagctacac	55	2
RsInD22	4	153.731	InDel	tctacaataacacacgcacatac	ctccattctacttctatccgtca	54	2
RsIBP17	5	85.928	IBP	aacgtcatccgaacttctc	atcgctcaagcgagttcgt	55	2
RsIBP08	5	157.602	IBP	ctggctcgagttggattctc	aggccactcctctgattcct	55	2
RsSSR100	6	132.961	SSR	gggatcatcacacttgagca	agatgtcctcgtaagccacg	54	2
RsInD36	6	134.048	InDel	gtctcctaattgtctgtgtgtt	tgtcgtgtggagttacatgtata	55	2
RsInD37	6	174.734	InDel	tggaaatgaaattctgtctcacc	gcatcaaggaaacagaggtaaat	55	2
RsSSR108	7	45.24	SSR	agcgcaatttcatgggtatc	cttctccaacgcaaagaac	53	2
RsInD58	7	58.936	InDel	taacatttgcgatcgagaaaaga	caccttcttctcctctatatcc	55	2
RsInD42	7	81.288	InDel	actgtaagtctgcaacattaacc	ggaaagctcttcttttagtggtt	55	2
RsInD60	8	91.735	InDel	aatccaaaaccatctgagaatcg	ttggagaagatgatctctgtcaa	56	2
RsSSR104	8	10.903	SSR	tcgtgaaatcctggaagctc	gtcccgagaaacttgatgtc	55	2
BrEST03	9	58.116	IBP	catcgacctcaaggttcctc	ccggagcaacacacaagtta	55	2
RsInD79	9	124.755	InDel	tatcccttgttcagaactgtaa	ttagcctctggttagctaatga	55	2
RsInD25	9	137.67	InDel	tcttcttctctttagtgcttg	atttcacccctaagtaccacat	55	2

¹ Chromosome number² The number of alleles

Table S4. The pairs of genetically similar radish cultivars identified in previous studies.

Cultivars		Genetic similarity	Marker types	References
Pyungganggimjang	Chongjinju	0.91	AFLP	Choe et al., 2002
Baekja	Ocbong	0.98	AFLP	Choe et al., 2002
Baekja	Chongil	0.98	AFLP	Choe et al., 2002
Togwanggold	Supertogwang	1.00	SSR	Bae et al., 2015
YR Sinchyongjanggun	Junmuhumu	0.96	SSR	Lee and Park, 2017
Cheongun	Seoho	0.96	SSR	Lee and Park, 2017

Table S5. The pairs of genetically similar radish cultivars identified in previous studies.

Elite lines	Generation separated	Parents	Generations advanced
1070	F ₂	cultivar C × cultivar A	F ₆
1392			F ₅
1109	S ₂	cultivar E (Selfing)	S-
1894			S-
1019	F ₄	line 17 × cultivar E	F ₆
1020			F ₆
1081	F ₄	cultivar D × cultivar E	F ₅
1162			F ₅
1007	F ₅	line 5 × cultivar E	F ₇
1083			F ₇
7837	F ₅	line 45 × line 14	F ₆
7841			F ₆
7843			F ₆
1051	F ₅	cultivar B × cultivar A	F ₆
1052			F ₆
1053			F ₆
1054			F ₆
1075	F ₆	cultivar D × cultivar A	F ₇
1268			F ₇