

Genomic SSR marker development in lentil (*Lens culinaris* Medik.) and assessment of cross-species/genera transferability to related legumes

MELIKE BAKIR¹, ŞEHRIBAN DEMİR¹, CEBRAİL YILDIRIM², ABDULLAH KAHRAMAN³

¹Department of Agricultural Biotechnology, Faculty of Agriculture, Erciyes University, Kayseri, Türkiye

²Institute of Hemp Research, Yozgat Bozok University, Yozgat, Türkiye

³Department of Field Crops, Faculty of Agriculture, Harran University, Sanliurfa, Türkiye

Electronic Supplementary Material (ESM)

The authors are fully responsible for both the content and the formal aspects of the electronic supplementary material. No editorial adjustments were made.

2 Table S1. Developed lentil simple sequence repeat (SSR) markers and information on these markers

Locus name	5'→3'	Repeat	Clone	Bs	Tm (°C)
Lc_MCu68F	TGTAGTGGTGAAATGAAGCA	(AT) ₄ .(GA) ₉ .(GA) ₃ .(GA) ₄ .(TG) ₃ imperf	P6_5B	359	58
Lc_MCu68R	TCATCACTGACAAGTCACTACC				
Lc_MCu69F	GAGCGTGAATGAGAGAGAGA	(GA) ₃ .(GA) ₃ .(GA) ₃ .(GA) ₄ .(GA) ₆ imperf	P6-5H	197	55
Lc_MCu69R	CGGTCGTTTCATTCTAAAAG				
Lc_MCu70F	AGTTGGAAACCCTGATTTG	(GA) ₉ .(TA) ₃ imperf	P6-9C	176	55
Lc_MCu70R	GCCAACTAGTCCATTCGTTA				
Lc_MCu71F	CTCTCTAACACTATCACGCTCA	(TC) ₄ .(TC) ₃ .(CT) ₅ .(TC) ₃ .(TC) ₃ .(TC) ₃ imperf	P6-11C	282	60
Lc_MCu71R	GAAGGAGTAGACAGGGAGAAG				
Lc_MCu72F	AAGAACAGAGCAATGGAAGA	(AG) ₄ .(AG) ₃ .(AG) ₄ .(AG) ₃ .(AG) ₃ imperf	P6-11G	207	–
Lc_MCu72R	AAGACAAATGTTGCCTCCTA				
Lc_MCu73F	TGGGACTTGAGAGAAGATTG	(GA) ₃ 4T(GA) ₃ G4T(GA) ₃ .(GTAT) ₃ G3A(GT) ₃ .(GT) ₃ .(GT) ₃ imperf	P6-12A	209	58
Lc_MCu73R	GTCTCTCTCCCTCCTCATTT				
Lc_MCu74F	GTGGAAAACCCTAATTCCTT	(CT) ₆ .(CT) ₄ .(TC) ₃ .(CT) ₃ .(CT) ₃ .(TC) ₅ imperf	P6-12C	283	55
Lc_MCu74R	AGTTGCCGGAGAGAGAAT				
Lc_MCu75F	TCACGTCTTCTAGGAAGTCTCT	(CCG) ₃ ...(TC) ₃ ...(TC) ₂ T(TC) ₃ imperf	P8-1D	296	55
Lc_MCu75R	ATTGAGGATCCTGAGGTTG				
Lc_MCu76F	TCAACTTCTTCTCCCTACCA	(CT) ₁₇ (AC) ₇ ...(TC) ₃ .(CTT) ₃ imperf	P8-3E	175	–
Lc_MCu76R	CTACAAAGTTCCCAAGGTCA				
Lc_MCu77F	GATGAGAGAGGGAGAATGAGT	(GA) ₃ TA(GA) ₂ .(GA) ₃ .(GA) ₄ imperf	P8-5D	270	55
Lc_MCu77R	CCAAACCCAGTTCACACATA				
Lc_MCu78F	GGTTGGGTGACAGTGAGA	(GA) ₅ .(GA) ₃ .(GA) ₃ .(GA) ₃ .(GA) ₄ .(GA) ₅ imperf	P8-5E	195	50
Lc_MCu78R	AACGAAGGAGTCCCAAAC				
Lc_MCu79 F	AGGTGGATTTCATGTATGCTT	(GA) ₃ .(GA) ₆ .(GA) ₄ .(GA) ₃ .(GA) ₅ .(GA) ₃ imperf	P8-6D	296	55
Lc_MCu79R	CATACACGGAAGAGGAAAAA				
Lc_MCu80F	GGAATCTAACTGCAAAATCG	(AC) ₁₂ perf	P8-8A	368	58
Lc_MCu80R	CACGTAAAGATGACTTTCTCAC				
Lc_MCu81F	CCCTTTTCAAGATAGGGAAT	(GA) ₁₇ pref	P8-8F	245	52
Lc_MCu81R	TTGGAACATCTTGTTTCATCA				
Lc_MCu82F	ACACGTACAGCACAAACTCA	(TA) ₃ .(CT) ₃ .(CT) ₄ .(CT) ₃ .(CT) ₃ .(CA) ₃ .(CT) ₃ .(CT) ₄ .(CA) ₄ imperf	P8-9F	387	–
Lc_MCu82R	AGTTGTATGGGTGGAGAATG				
Lc_MCu83F	ATCCTAAGCAAAGAATGACG	(GA) ₄ .(GA) ₃ .(GA) ₄ .(GA) ₃ .(GA) ₆ imperf	P9-1C	388	55
Lc_MCu83R	AAGGAGTCCACATACAAAACC				
Lc_MCu84F	ATCGTGTTTGCGCGTGAAT	(GA) ₅ .(GA) ₃ .(GA) ₃ .(GA) ₃ .(GA) ₄ .(GA) ₆ imperf	P9-3G	248	52
Lc_MCu84R	ACAACAAAGGGTGAAAAAC				

Table S1 to be continued

Locus name	5'→3'	Repeat	Clone	Bs	Tm (°C)
Lc_MCu85F	CAGTCGTTTCATTCTCTTCC	(CT) ₄ ..(CT) ₃ ..(TC) ₃ ..(CT) ₃ CA(TC) ₃ imperf	P9-6A	249	55
Lc_MCu85R	GAGTACGGAACCGGAGAT				
Lc_MCu86F	GTTGCTTACCATCCACATTT	(GA) ₃ ..(GA) ₆ ..(GA) ₄ ..(GA) ₃ ..(GA) ₂₀ imperf	P9-8F	283	58
Lc_MCu86R	GGAGTCTCTTAAACGCTCTCT				
Lc_MCu87F	ACCCCTTTAGGGAATTACAC	(TC) ₁₈ perf	P9-9D	155	53
Lc_MCu87R	AGGAGTCTTTTGTGCAAAAT				
Lc_MCu88F	GCTGTATCACTAACTGTGATGT	(TTC) ₄ ...(GA) ₁₀ imperf	P9-11E	292	55
Lc_MCu88R	GGCTCCTTTGTAGAAGAAAGA				
Lc_MCu89F	CCATGGACCTTCCACTTAG	(TC) ₅ ..(TC) ₆ A(TC) ₃ ..(TC) ₃ imperf	P9-12C	151	55
Lc_MCu89R	CAAGGTGCGATTGAGTTTAT				
Lc_MCu90F	AGGCTTTGACATATGGTAGG	(GA) ₄ ..(AG) ₆ ..(AG) ₄ ..(AG) ₃ ..(AG) ₃ ..(AG) ₃ imperf	P9-12D	154	58
Lc_MCu90R	TAATGCACACACGTACTGCT				
Lc_MCu91F	AAAATGATGCTTGTTTTGT	(GA) ₄ A(AG) ₃ AT(AG) ₃ ..(GA) ₃ ..(GT) ₃ imperf	P10-1G	202	58
Lc_MCu91R	CCACAACCCCTAACATAC				
Lc_MCu92F	TGTGGGAGATTTCCAAGAC	(TA) ₃ ..(CTAT) ₂ (CT) ₈ ..(AAG) ₃ imperf	P10-2D	294	58
Lc_MCu92R	AGAGCAACGAAGGAGTACAA				
Lc_MCu93F	CTTATAAACTTGGTGCCCTCTC	(AT) ₃ ..(CT) ₄ ..(CT) ₃ imperf	P10-2H	240	50
Lc_MCu93R	GGAGAGCTAATAAACCTCTCT				
Lc_MCu94F	CGCCACTGTAATTTTTCTTC	(CT) ₃ ..(AG) ₂ A(AG) ₃ ..(AG) ₆ imperf	P10-3A	189	58
Lc_MCu94R	CTCACCTCGCTTTCTCTTAC				
Lc_MCu95F	CCTTCACTCTACTCTCTCGTTC	(CT) ₅ CG(CT) ₃ comp	P10-4C	233	55
Lc_MCu95R	CTTTCATTCACTCGTTCCCTC				
Lc_MCu96 F	GGAGTTTGAGAACTTGATGA	(GA) ₃ ATT(GA) ₃ ..(GA) ₉ ..(AT) ₃ imperf	P10-5E	260	55
Lc_MCu96R	TTCTTTCACATTTTACAACC				
Lc_MCu97 F	CTACTCTCTCGTTCAGATCCTC	(CT) ₅ CG(CT) ₃ comp	P10-6A	248	55
Lc_MCu97R	ATCCATAAGAGCCCGTATTT				
Lc_MCu98 F	GAGAGATCATGTTTGGGAGA	(GA) ₃ ..(AG) ₃ ..(AG) ₄ ..(AG) ₅ imperf	P10-6G	181	55
Lc_MCu98R	CGGTCGTTTCATTCTAAAG				
Lc_MCu99 F	CATCGAAAGAGGAAGACAAG	(AG) ₁₉ perf	P10-7B	196	55
Lc_MCu99R	TTCTTTTACCACTGCCTCT				
Lc_MCu100F	CTTTTCTCAAGATGCCAAAC	(GA) ₈ perf	P10-7E	158	55
Lc_MCu100R	GCAACGAAGGAGTACTTTTG				

Lc – *Lens culinaris*; MCu – Melike Bakır(Cu); *perf* – perfect (perfect repeats); *imperf* – imperfect (imperfect repeats); *comp* – compound (compound repeats); Bs – band size; Tm – temperature

Supplementary Table 2a. Information on markers amplified in other legumes

<i>Pisum sativum</i>			<i>Vicia faba</i>			<i>Medicago sativa</i>			<i>Onobrychis sativa</i>		
Loci	Tm	bp	loci	Tm	bp	loci	Tm	bp	loci	Tm	bp
Lc_MCu9	58	172–174	Lc_MCu11	58	160	Lc_MCu8	58	192	Lc_MCu41a	55	193
Lc_MCu11	58	172	Lc_MCu17	58	176	Lc_MCu11	58	168	Lc_MCu69	50	249
Lc_MCu17	58	176	Lc_MCu33	58	314	Lc_MCu41a	55	193	Lc_MCu74	50	283
Lc_MCu41a	55	193	Lc_MCu41a	55	193	Lc_MCu43	55	154	Lc_MCu75	50	296
Lc_MCu58a	55	300	Lc_MCu43	55	158–162	Lc_MCu73	55	209	Lc_MCu78	50	195
Lc_MCu69	50	262–290	Lc_MCu47a	52	157	Lc_MCu78	50	195	Lc_MCu91	58	202
Lc_MCu75	50	241–245	Lc_MCu68	52	359	Lc_MCu83	55	388	Lc_MCu95	55	241
Lc_MCu78	50	195	Lc_MCu74	50	283	Lc_MCu92	55	294	Lc_MCu97	55	248
Lc_MCu80	55	378	Lc_MCu75	50	249	Lc_MCu95	55	245			
Lc_MCu83	55	388	Lc_MCu77	55	270	Lc_MCu97	55	260			
Lc_MCu85	55	225	Lc_MCu83	55	388						
Lc_MCu88	55	292	Lc_MCu88	55	292						
Lc_MCu91	58	201	Lc_MCu90	55	154						
Lc_MCu95	55	249	Lc_MCu95	55	249						
Lc_MCu97	55	264	Lc_MCu97	55	264						
<i>Glycine max</i>			<i>Phaseolus vulgaris</i>			<i>Trifolium pratense</i>					
Loci	Tm	bp	loci	Tm	bp	loci	Tm	bp			
Lc_MCu41a	55	193	Lc_MCu8	58	192	Lc_MCu11	58	160			
Lc_MCu68	52	359	Lc_MCu9	58	172–178	Lc_MCu41a	55	193			
Lc_MCu74	50	283	Lc_MCu88	55	292	Lc_MCu74	55	283			
Lc_MCu78	50	278									
Lc_MCu88	55	292									
Lc_MCu92	55	294									

Supplementary Table 2b. Information on markers amplified in other legumes

<i>Vicia sativa</i>			<i>Vicia pannonica</i>			<i>Vicia narbonensis</i>			<i>Vicia villosa</i>		
Loci	Tm	bp	loci	Tm	bp	loci	Tm	bp	loci	Tm	bp
Lc_MCu11	58	172	Lc_MCu11	58	172	Lc_MCu11	58	172	Lc_MCu11	58	172
Lc_MCu17	58	168–170	Lc_MCu17	58	166	Lc_MCu17	58	190	Lc_MCu17	58	166–170
Lc_MCu41a	55	193	Lc_MCu41a	55	193	Lc_MCu41a	55	193	Lc_MCu41a	55	193
Lc_MCu43	55	164	Lc_MCu43	55	164	Lc_MCu43	55	162	Lc_MCu43	55	150–164
Lc_MCu47a	52	155	Lc_MCu47a	52	165	Lc_MCu47a	52	157–175	Lc_MCu47a	52	155–165
Lc_MCu71	55	282	Lc_MCu71	55	282	Lc_MCu71	55	282	Lc_MCu71	55	282
Lc_MCu73	55	209	Lc_MCu73	55	209	Lc_MCu73	55	209	Lc_MCu73	55	209
Lc_MCu74	50	283	Lc_MCu75	50	296	Lc_MCu75	50	249	Lc_MCu75	50	249
Lc_MCu75	50	249	Lc_MCu78	50	195	Lc_MCu78	50	195	Lc_MCu78	50	195
Lc_MCu78	50	188–226	Lc_MCu80	55	264	Lc_MCu83	55	388	Lc_MCu80	55	362–364
Lc_MCu80	55	362	Lc_MCu83	55	325	Lc_MCu85	55	249	Lc_MCu83	55	385
Lc_MCu83	55	335	Lc_MCu85	55	249	Lc_MCu95	55	249	Lc_MCu85	55	249
Lc_MCu85	55	249	Lc_MCu95	55	249	Lc_MCu97	55	264	Lc_MCu90	55	206
Lc_MCu88	55	292	Lc_MCu97	55	264				Lc_MCu95	55	249
Lc_MCu95	55	249	Lc_MCu98	55	197				Lc_MCu97	55	264
Lc_MCu97	55	264									

Tm – temperature; bp – base pair