Table S1: Subsections and their origin of different oak species sequences, which were included in the initial alignment.

Subsection	Species	Author	NCBI Code
Lobatae	*Q. rubra*	Alexander & Woeste (2014)	NC020152
Lobatae	*Q. rubra*	Pang et al. (2019)	MK105463
Lobatae	*Q. palustris*	Pang et al. (2019)	MK105461
Lobatae	*Q. coccinea*	Yang et al. (2019)	MN308055
Quercus	*Q. gambelii*	Pang et al. (2019)	MK105457
Quercus	*Q. griffithii*	Xv, direct submission (2019)	MK922347
Quercus	*Q. lobata*	Sork et al. (2016)	CM012305
Quercus	*Q. mongolica*	Xv, direct submission (2019)	MK922349
Quercus	*Q. petraea*	Lloyd Evans, direct submission (2018)	LT996899
Quercus	*Q. robur*	Paterson, direct submission (2018)	LT999600
Mesobalanus	*Q. dentata*	Yang et al. (2019)	MK105453
Cerris	*Q. aquifolioides*	Y. Yang et al. (2018)	KX911971
Cerris	*Q. pannosa*	Wang, direct submission (2020)	NC050963
Cerris	*Q. spinosa*	Y. Yang et al. (2018)	KX911972

Table S2: Origin, as well as previously defined (H_P, based on Götz et al., 2020) and novel (H_N, based on novel developed cpSSR markers) chloroplast red oak haplotypes of test samples for the polymorphic marker set. Haplotypes in parenthesis lack data in single markers, but are unlikely to differ from the reported haplotype.

species	origin	H_P[1]	H_N
Q. rubra	NRW, Germany[1]	A.3	A.3_1
Q. rubra	NRW, Germany[1]	A.3	A.3_1
Q. rubra	NRW, Germany[1]	A.3	A.3_1
Q. rubra	NRW, Germany[1]	A.3	A.3_1
Q. rubra	Tennessee, USA[1,*]	A.3	A.3_3
Q. rubra	Tennessee, USA[1,*]	A.3	A.3_3
Q. rubra	Ontario, Canada[1,*]	A.3	A.3_2
Q. rubra	Ontario, Canada[1,*]	A.3	A.3_3
Q. rubra	Michigan, USA[2]	A.4	A.4
Q. rubra	Michigan, USA[2]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Michigan, USA[3]	A.4	A.4
Q. rubra	Lower Saxony, Germany[3]	A.5	A.5
Q. rubra	Lower Saxony, Germany[3]	A.5	A.5
Q. rubra	Lower Saxony, Germany[3]	A.5	A.5
Q. rubra	Lower Saxony, Germany[3]	A.5	A.5
Q. rubra	NRW, Germany[3]	A.5	A.5
Q. rubra	NRW, Germany[3]	A.5	A.5

Q. rubra	NRW, Germany[3]	A.5	A.5
Q. rubra	NRW, Germany[3]	A.5	A.5
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Michigan, USA[2]	B.1	(B.1)
Q. rubra	Michigan, USA[2]	B.1	B.1
Q. rubra	Brandenburg, Germany[3]	A.1	A.1_1
Q. rubra	Brandenburg, Germany[3]	A.1	A.1_1
Q. rubra	Brandenburg, Germany[3]	A.1	A.1_1
Q. rubra	Brandenburg, Germany[3]	A.1	A.1_1
Q. rubra	Wisconsin, USA[4]	A.1	A.1_2
Q. rubra	Wisconsin, USA[4]	A.1	A.1_2
Q. rubra	Wisconsin, USA[4]	A.1	A.1_2
Q. rubra	Wisconsin, USA[4]	A.1	A.1_2
Q. rubra	Tennessee, USA[5, *]	A.1	(A.1_2)
Q. rubra	Tennessee, USA[5, *]	A.1	A.1_2
Q. rubra	Tennessee, USA[5, *]	A.1	A.1_2
Q. rubra	Tennessee, USA[5, *]	A.1	A.1_2
Q. rubra	Ontario, Canada[5, *]	A.1	A.1_1
Q. rubra	Ontario, Canada[5, *]	A.1	A.1_1
Q. rubra	Ontario, Canada[5, *]	A.1	A.1_1
Q. rubra	Ontario, Canada[5, *]	A.1	A.1_1
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	NRW, Germany[1]	A.2	A.2
Q. rubra	BW, Germany[3]	A.2	N/A
Q. rubra	BW, Germany[3]	A.2	A.2
Q. rubra	BW, Germany[3]	A.2	A.2
Q. rubra	BW, Germany[3]	A.2	A.2
Q. rubra	Michigan, USA[2]	A.2	A.2
Q. rubra	Michigan, USA[2]	A.2	A.2
Q. rubra	Michigan, USA[2]	A.2	A.2
Q. rubra	Michigan, USA[2]	A.2	A.2
Q. rubra	Brandenburg, Germany[3]	B.3	B.3
Q. rubra	Brandenburg, Germany[3]	B.3	(B.3)
Q. rubra	Brandenburg, Germany[3]	B.3	B.3
Q. rubra	Brandenburg, Germany[3]	B.3	B.3

Q. rubra	NRW, Germany[1]	B.3	B.3
Q. rubra	NRW, Germany[1]	B.3	B.3
Q. rubra	NRW, Germany[1]	B.3	B.3
Q. rubra	NRW, Germany[1]	B.3	B.3
Q. rubra	Michigan, USA[3]	B.3	B.3
Q. rubra	Michigan, USA[3]	B.3	B.3
Q. rubra	Michigan, USA[3]	B.3	B.3
Q. rubra	Michigan, USA[3]	B.3	B.3
Q. rubra	BW, Germany[3]	B.3	B.3
Q. rubra	BW, Germany[3]	B.3	B.3
Q. rubra	BW, Germany[3]	B.3	B.3
Q. rubra	BW, Germany[3]	B.3	B.3
Q. petraea	France[6, *]	H1	W1
Q. petraea	France[6, *]	H1	W1
Q. petraea	France[6, *]	H1	N/A
Q. petraea	Denmark[6, *]	H2	W4
Q. petraea	Denmark[6, *]	H2	W4
Q. petraea	Denmark[6, *]	H2	N/A
Q. petraea	Great Britain[6, *]	H3	W3
Q. petraea	Great Britain[6, *]	H1	N/A
Q. robur	North-Rhine Westphalia[7]	1	W4
Q. robur	North-Rhine Westphalia[7]	1	W4
Q. robur	North-Rhine Westphalia[7]	1	W4
Q. robur	North-Rhine Westphalia[7]	1	W4
Q. robur	North-Rhine Westphalia[7]	10/11	W2
Q. robur	North-Rhine Westphalia[7]	10/11	W2
Q. robur	North-Rhine Westphalia[7]	10/11	W2
Q. robur	North-Rhine Westphalia[7]	10/11	N/A

1 = Götz et al. (2020), 2 = Lind & Gailing (2014), 3 = Pettenkofer et al. (2019), 4 = Lind-Riehl et al. (2014), 5 = Liesebach & Schneck (2011), 6 = unpublished data, 7 = Burger et al. (unpublished) * = taken from a German provenance trial

Table S3: Primer sequences, repeat motives, PCR product size without primer tails, and number of different alleles of novel northern red oak chloroplast SSR markers in northern red oak and European white oaks.

Primer	Primer sequence (5´-3´)	Repeat motif[1]	PCR product size	Red oak alleles*	White oak alleles*
QRcp01 F QRcp01 R	CGTTTAATTAGATCGGGTAATCGT GCAGCATGTCGTATCAATGTGG	$T_{(10)}$	215	239, 240, 241	239, 240
QRcp02 F QRcp02 R	AGTTTCTGTTTTCCTTGCTTGATTT CGAATCCCTCTCTTTCCGCT	$A_{(11)}$	169	191, 192	190, 191
QRcp03 F QRcp03 R	CTGACATAGATGTTATGGGCGGA GTTAGCTTGGAAGGCTAGGGG	$T_{(10)}$	193	218	Not tested
QRcp04 F QRcp04 R	TTCTTCGAAACATTCACAAGAGTT GATTGTACCTGCGTCGGCT	$T_{(9)}$	156	181	Not tested
QRcp05 F QRcp05 R	CAAGTTTCCAATTTAGACCAAGCA TCTCATTCGAAGGGGCGTAG	$T_{(10)}$	161	186	Not tested
QRcp06 F QRcp06 R	TAGTGGGAGCGTATCGCAAA AACCCACTTGTTGTTCCCCA	$A_{(8)}$	311	338	Not tested
QRcp07 F QRcp07 R	ACCTTTCGGGGAGTGATTGG TCCCTCTTCCCAGATTTCCA	$A_{(16)}$	181	204, 205, 206	199, 200
QRcp08 F QRcp08 R	ATTTTTGTTCCGACAACGGG TCAAAGCAAGCAACGCACTT	$A_{(9)}$	193	216	Not tested
QRcp09 F QRcp09 R	TGGGAATTGATGGATAGGTCAACA CTTGGCCATGAACCCCCCTTT	$T_{(12)}$	253	278	Not tested
QRcp10 F QRcp10 R	TGGGATCAATCCCCTCTACCA TGCTCTGGACCCACTCTTTC	$TTA_{(3)}$	173	198	Not tested
QRcp11 F QRcp11 R	CGAATGGAGGCCCTTATTTTCA CCACTTCCGAATGGTATGCT	$A_{(11)}$	337	361, 362	360
QRcp12 F QRcp12 R	AACCGCATTCCTTTCGAGCA CTTGGGTCGTTTACCGATGT	$T_{(11)}$	187	211	Not tested
QRcp13 F QRcp13 R	TACCAAACGATTGGGATGCT AGAAATGCATGAAAGAGCCCC	$T_{(14)}$	227	251, 252	249, 250, 251, 252
QRcp14 F QRcp14 R	GGGCCCTCTCTTTATACCTCT TCGCTTTCGAGCCCTTACTT	$A_{(9)}$	144	167, 168	166
QRcp15 F QRcp15 R	CCATGGGTTAGTGTCCCACC TGCTTAGTCTGGCTTTTATGGA	$T_{(9)}$	199	221	Not tested
QRcp16 F QRcp16 R	AGGCTCCTGCAACCATGAC GGGAATTGGTCTATGGGCTCT	$T_{(10)}$	177	201	Not tested
QRcp17 F QRcp17 R	CCGCGAGACCAGAAAGGG TCCCTCTTCCCAGATTTCCA	$A_{(16)}$	160	183, 184	178, 179
QRcp18 F QRcp18 R	TCTGGGAAGAGGGATAGGGA TGAATTGATCCACATCATAACGAAA	$T_{(11)}$	187	212	Not tested
QRcp19 F QRcp19 R	GATCTGGCGGGCCTCTTTT TGCTGTATGACTTATTAGCACCTTT	$A_{(12)}$	106	218	Not tested
QRcp20 F QRcp20 R	TGGATTAGTCTTTTTGGTGGGT ATATAAGAAGTTTGTTTGACCCCTC	$A_{(11)}$	201	225	Not tested
QRcp21 F QRcp21 R	AGACGTGACTTCGCAAAAATGAA TCAGCAAAGAAAAAGCCTTCC	$C_{(10)}$	112	134	Not tested
QRcp22 F QRcp22 R	TAGGTGTCTGAGAATATACCCTTTC ACGGTAAGAGACACCGTATGA	$A_{(9)}$	138	No amplification	No amplification
QRcp23 F QRcp23 R	GCTGTTCGATCAAGTAAGGGA ATGGCGAAAAGGAGCATTGGA	$T_{(11)}$	133	158	Not tested
QRcp24 F QRcp24 R	AACGAGTCACACACTAAGCA AGCCTAAGCCTTTATTTGACTTG	$T_{(9)}$	182	206, 207	198, 199
QRcp25 F QRcp25 R	AGTTAAATTGACCAAGCTCGAAAA ACACAGCCCATAACTTAACCCA	$T_{(10)}$	243	266	Not tested
QRcp26 F	AATTTCATCCGCTCGAATGGT	$A_{(11)}$	128	152	Not tested

QRcp26 R	ATTGGCATGTTTGGGACGCT				
QRcp27 F QRcp27 R	CGGATTCGGGATTTGATCTGT CAATTGAATCCGCGAAAAGGT	$T_{(11)}$	113	136	Not tested
QRcp28 F QRcp28 R	TAGATCGTTCTGCAAAGCCC TCGTTGGACAACCACTATGTCT	$T_{(14)}$	166	191, 192	189
QRcp29 F QRcp29 R	GGCAATTGCGATGGCTTCTT TTCGGGGGAAACCACATCAC	$T_{(12)}$	176	201,202	188, 200, 203
QRcp30 F QRcp30 R	TACCAAACGATTGGGATGCT AGAAATGCATGAAAGAGCCCC	$T_{(14)}$	227	252, 253	250, 251, 252, 253
QRcp31 F QRcp31 R	CGGAGGACTCTTCTGAACAAACA ATCCAATGCTGAATCGATGACCT	$T_{(12)}$	114	135, 136	135
QRcp32 F QRcp32 R	AGGTTCCCCATGGAACCGAA AGAATCCTGGTATCCACCGAA	$A_{(10)}$	161	186	Not tested
QRcp33 F QRcp33 R	CCAAGGAGAAGATGCGGGTT GGTGGGCAGGAGGAAAAGAA	$T_{(11)}$	160	185, 189	183, 184, 185
QRcp34 F QRcp34 R	CTTCTTTTCCTCCTGCCCACC ATGGAGGTTTGACTCCGGTAA	$A_{(16)}$	88	106, 107	99
QRcp35 F QRcp35 R	ACCGGAGTCAAACCTCCATTTT ACCTTGAGGTCACGGGTTCA	$A_{(8)}$	73	95	Not tested
QRcp36 F QRcp36 R	AGTTATGTTATAGAGGGTCCGCC TCCGAACGAAAGCGGAGGAA	$A_{(9)}$	128	150	Not tested
QRcp37 F QRcp37 R	AGATTCCTCCGCTTTCGTTC TAGATTATGTATGCCCCTCTTTCTT	$A_{(10)}$	115	135	Not tested
QRcp38 F QRcp38 R	TTCATTCTGGGGTGACGGAG TTCGGAAAGGGAGGATTAGGA	$T_{(7)}$	113	136	Not tested
QRcp39 F QRcp39 R	TCGGAGAAGGGCAATCACTC TCCGGAGGATCCATCTACAG	$G_{(8)}$	111	133	Not tested
QRcp40 F QRcp40 R	GCGTAGAGGAACCACACCAA GCGTGAAGTGGGAGAGAAGG	$A_{(9)}$	223	245	Not tested
QRcp41 F QRcp41 R	GAAGCACGAACCAACCCCT TTGCTCGAAAGGAATGCGGT	$T_{(9)}$	84	105, 106	106, 107
QRcp42 F QRcp42 R	GGCGTGAAGTGGGAGAGAAG AAAATAGCTCGACGCCAGGA	$T_{(9)}$	140	165	Not tested
QRcp43 F QRcp43 R	CTACAGGAGAACCAGGAACGG CGGAGAAGGGCAATCACTC	$C_{(8)}$	96	118	Not tested
QRcp44 F QRcp44 R	TGCCCGAGGCTTATGCTTTT GGGTCCGAATGAGGAACTGG	$A_{(8)}$	274	299	Not tested

* Fragment sizes of all primers include the added M13 primer sequences (tail & pigtail). Therefore, the observed fragment sizes are about 20 Base pairs longer as expected from directly dye labeled primer pairs.

[1] in investigated genome sequence (Alexander & Woeste, 2014)

Table S4: Allele/cutting pattern distribution in previously defined (H_P) and novel (H_N) chloroplast haplotypes of three different red and white oak species. Novel cpSSR markers, which allow haplotype differentiation within previously defined haplotypes are highlighted in blue.

	Q. rubra										*Q. petraea*			*Q. robur*		
H_P	**A.1**		**A.2**	**A.3**			**A.4**	**A.5**	**B.1**	**B.3**	**H1**	**H2**	**H3**	**H 1**	**H 10/11**	**Σ**
H_N	**A.1_1**	**A.1_2**	**A.2**	**A.3_1**	**A.3_2**	**A.3_3**	**A.4**	**A.5**	**B.1**	**B.3**						
ccmp2	228	228	228	228	228	228	228	228	227	227						**2**
ccmp4	116	116	116	116	116	116	116	116	115	115						**2**
ucd4	99	99	99	99	99	99	99	99	98	98						**2**
udt1	86	86	87	85	85	85	85	86	85	85						**3**
udt4	145	145	145	145	145	145	145	145	146	146						**2**
4.1/HaeIII	Cut	Cut	Cut	Cut	Cut	Cut	Cut twice	Uncut	Cut	Uncut						**3**
5.2/AciI	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut						**1**
17.1/ApaI	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut	Uncut						**1**
QRcp01	239	240	239	240	239	240	240	239	239	241	239	240	239	240	239	**3**
QRcp02	192	192	192	192	192	192	192	192	192	191	191	190	190	190	191	**3**
QRcp07	205	205	206	204	205	205	204	205	205	204	201	200	200	199	200	**6**
QRcp11	362	362	362	362	362	362	362	362	362	361	360	360	360	360	360	**3**
QRcp13	252	252	252	252	252	252	252	252	252	251	251	249	250	249	252	**4**
QRcp14	167	167	167	167	167	167	167	167	167	168	166	166	166	166	166	**3**
QRcp17	184	184	185	183	184	184	183	184	184	183	179	178	178	178	179	**5**
QRcp24	206	206	206	206	206	206	206	206	206	207	198	199	199	199	198	**4**
QRcp28	192	192	192	192	192	192	192	192	192	191	189	189	188	189	189	**4**
QRcp29	201	201	201	201	201	201	201	201	201	202	203	188	200	188	203	**5**
QRcp30	253	253	253	253	253	253	253	253	253	252	252	250	251	250	253	**4**
QRcp31	136	136	136	136	136	136	136	136	136	135	135	135	135	135	135	**2**
QRcp33	185	185	185	185	185	185	185	185	185	189	183	184	185	184	183	**4**
QRcp34	107	107	107	107	107	107	107	107	107	106	99	99	99	99	99	**3**
QRcp41	105	105	105	105	105	105	105	105	105	106	107	106	107	106	107	**3**