

Improving procedures for obtaining Sanger sequences from old herbarium specimens

Mika Bendiksby, Lisbeth Thorbek, Charlotte Bjorå, Rune Halvorsen

ESM Table 1, 1/2

Coll.	Extr.	Taxon	Voucher information	L	LF	16	K	SG	AH	A2	SS
1826	2009	<i>Lagopsis marrubiastrum</i> (Stephan) Ikonn.-Gal.	Bunge s.n., 1826 (C)	0,n,r	0,n,r	0,n	–	–	–	–	–
1842	2010	<i>Stachys acerosa</i> Boiss.	Th. Kotschy s.n., 24.05.1842 (O)	1	1	1	1,f	–	–	–	–
1848	2009	<i>Eriophyton rhomboideum</i> (Benth.) Ryding	T. Thomson (C)	1,n	1,n	1	1,n	1	1	–	1
1848	2009	<i>Lagopsis marrubiastrum</i> (Stephan) Ikonn.-Gal.	T. Thomson s.n., no date (C)	1,n	1,r	1,f	1,f,r	–	–	–	–
1849	2004	<i>Lamium incisum</i> Willd.	Engler s.n., Sept. 1849 (WU)	0,n	0,n,r	0,n	0,r	–	0	–	–
1850	2009	<i>Anisomeles heyneana</i> Benth.	Stocks 3649 (O)	1,r	1,r	1	1,f,r	–	–	–	–
1853	2009	<i>Lamium multifidum</i> L.	HDP s.n., May 1853 (O)	1,n	1,n	1	–	1	1	1	–
1853	2010	<i>Stachys neuracalycina</i> Boiss.	I. Branche 88 (C)	0	0	0	–	–	–	–	–
1862	2004	<i>Lamium galactophyllum</i> Boiss. and Reut.	E. Bourgeau 223 (WU)	1	1	1	–	1	1	1	–
1875	2004	<i>Lamium hybridum</i> Vill.	Kerner 397 (WU)	1	1	1	–	1	1	–	–
1879	2009	<i>Eriophyton rhomboideum</i> (Benth.) Ryding	Dr. J.E.T. Aitchison 831 (C)	1	1	1,n	1,f,r	–	–	–	–
1879	2009	<i>Eriophyton rhomboideum</i> (Benth.) Ryding	A.W. Heyde 106 (UPS)	0,n	0,n	–	–	–	–	–	–
1879	2009	<i>Stachyopsis oblongata</i> (Schrenk) Popov and Vved.	A. Regel s.n., 08.06.1879 (C)	0,n	0,n	0,n	–	–	–	–	–
1882	2009	<i>Lamium amplexicaule</i> L. var. <i>aleppicum</i> (Boiss. and Hausskn.) Bornm.	Th. Pichler s.n., anno 1882 (WU)	1	1	1	–	1	1	–	1
1882	2004	<i>Galeopsis pyrenaica</i> Bartl.	G. Gautier s.n., 12.07.1882 (WU)	0	0	–	–	–	–	–	–
1883	2009	<i>Hypogomphia turkestanica</i> Bunge	A. Regel s.n., 18.04.1883 (C)	0,n	0,n	0,n	0,f,r	–	–	–	–
1884	2009	<i>Lamium garganicum</i> subsp. <i>corsicum</i> (Gren. and Godr.) Mennema	D.C. Forsyth Major s.n., 15.5.1884 (UPS)	1	1	1	1	1	1	1	1
1884	2010	<i>Matsumurella chinensis</i> (Benth.) Bendiksby	Dr. A. Henry 5220 (H)	0,n	0,n	0,n	–	–	–	–	–
1888	2004	<i>Lamium amplexicaule</i> L. var. <i>aleppicum</i> (Boiss. and Hausskn.) Bornm.	O. Stapf. 209 (WU)	1	1	1	–	1	1	–	1
1890	2003	<i>Lamium x halsaticum</i> E.Krause	Wettstein s.n., anno 1890 (WU)	1	1	1	–	1	1	1	–
1893	2004	<i>Galeopsis x pernhofferi</i> Wettst.	D. Pernhoffer 1326 (WU)	1	1	–	–	1	1	1	1
1894	2004	<i>Lamium galactophyllum</i> Boiss. and Reut.	P. Sintenis 5538 (WU)	0,n	0,n	0,n	0,f,r	0,r	–	–	–
1894	2009	<i>Lamium macradon</i> Boiss. et Huet.	P. Sintenis 15477 (WU)	1	1	1	–	1	1	1	1
1895	2004	<i>Lamium eriocephalum</i> Benth.	Gerolle 340 (WU)	1	1	1	–	1	1	1	–
1896	2003	<i>Ballota spinosa</i> Lk.	C. Baenitz/ Bertrand 1132506 (US)	0	–	–	–	–	–	–	–
1898	2009	<i>Hypogomphia turkestanica</i> Bunge	O. Paulsen 275 (C)	1	1	1	1,n	–	–	–	–
1902	2004	<i>Lamium album</i> L. subsp. <i>crinitum</i> (Montbret & Aucher ex Benth.) Mennema	J. Bornmüller 7947 (WU)	1	1	1	1	1	1	1	–
1902	2004	<i>Lamium macradon</i> Boiss. et Huet.	E. Zederbauer s.n., May 1902 (WU)	1	1	1	–	1	1,r	1	–
1902	2009	<i>Lamium macradon</i> Boiss. et Huet.	E. Zederbauer s.n., June 1902 (WU)	1,n	1,n	1,n	–	0	1,r	–	–
1902	2010	<i>Lamium tomentosum</i> Willd.	J. et A. Bornmüller s.n., 17.7.1902 (S)	1	1	1	–	1	1	1	1
1903	2009	<i>Lamium pazcoskianum</i> Vorosch. ined.	C. Roth s.n., April 1903 (S)	1	1	1	–	1	1	–	–
1904	2009	<i>Lamium galactophyllum</i> Boiss. and Reut.	E. Koenig s.n., 7.6.1904 (WU)	1	1	1	–	1	1	1	1
1905	2010	<i>Lamium hybridum</i> Vill.	J.E. Palmér s.n., May 1905 (UPS)	1	1	0	–	1	1	–	0
1906	2003	<i>Ajugoides humilis</i> (Miq.) Makino	T. Makino 41905 (US)	0,n	0,n	0,n	–	–	–	–	–
1908	2004	<i>Lamium hybridum</i> Vill.	M. and M. Malzéville 2436 (WU)	1	1	1	–	1	1	–	–
1909	2009	<i>Holmskioldia sanguinea</i> Retz.	Brixen s.n., 06.09.1909 (O)	1	1	1	0	–	–	–	–
1909	2003	<i>Lamium bifidum</i> Cirillo	A Latzel s.n., 29.3.1909 (UPS)	1	1	1	–	1	1	1	1
1910	2009	<i>Petitia domingensis</i> Jacq.	M. Fuertes 195 (O)	1,r	1,r	1,n	1,f,r	–	–	–	–
1910	2010	<i>Stachys heraclea</i> All.	Elias s.n., 01.07.1910 (C)	1	1	1	–	–	–	–	–
1911	2004	<i>Stachys aspera</i> Michx.	F.F. Forbes s.n., 27.06.1911 (UPS)	1	1	1	–	–	–	–	–
1912	2003	<i>Lamium moschatum</i> Mill.	S. Linder s.n., 4.11.1912 (UPS)	1	1	1	1	1	1	1	1
1913	2010	<i>Moluccella bucharica</i> (B. Fedtsch.) Ryding	B. Fedtschenko 7441 (C)	1	1	1	–	–	–	–	–
1914	2002	<i>Galeopsis segetum</i> Neck.	Landmark, A. 12 (O)	1	1	1	–	–	–	–	–
1914	2004	<i>Galeopsis reuteri</i> Rchb.	C. Bicknell and L. Pollini 2344 (WU)	0,n	0,n	–	–	–	–	–	–
1914	2010	<i>Microtoena patchoulii</i> (C.B. Clarke ex Hook.f.) C.Y.Wu and S.J.Hsuan	Levrou 21009 (L)	0,n	0,n	0,f,n	–	–	–	–	–
1916	2004	<i>Lagopsis supina</i> (Steph. ex Willd.) Ikonn.-Gal.	Siméon s.n., (28.03.1916) 17 (C)	1,n	1,r	1,f	1,f,r	–	–	–	–
1918	2009	<i>Loxocalyx quinquevenis</i> Hand-Mazz.	Dr. Heinr. Frh. V. Handel-Mazzetti 12507 (C)	1,n,r	1,n,r	1,f	–	–	–	–	–
1919	2010	<i>Microtoena delavayi</i> Prain.	T. Siméon 1291 (C)	1	1	1	–	–	–	–	–
1920	2005	<i>Gomphostemma javanicum</i> (Blume) Benth.,	M. Ramos and C. Edano s.n., June 1920 (US)	0	0	0	–	–	–	–	–
1920	2009	<i>Loxocalyx ambiguus</i> (Makino) Makino	Tomitaro Makino 41885 (S)	0,n,r	0,n,r	0,n	0,f,r	0,r	–	–	0
1929	2003	<i>Paraphlomis javanica</i> (Blume) Prain	J. F. Rock 1097 (US)	1	1	1	1	–	–	–	–
1921	2009	<i>Matsumurella chinensis</i> (Benth.) Bendiksby	Wang Te Hui 272 (C)	0	1	0	0	–	–	–	–
1921	2009	<i>Vitex trifolia</i> L. <i>trifolia</i>	D. W. Garber 622 (O)	0n	0n	0n	–	–	–	–	–
1921	2010	<i>Stachys angustifolia</i> M.Bieb.	Soska s.n., 28.07.1921 (O)	1	1	1	1	–	–	–	–

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Coll.	Extr.	Taxon	Voucher information	L	LF	16	K	SG	AH	A2	5S
1922	2005	<i>Achyrospermum parviflorum</i> S.Moore	R.A. Dummer 5603 (US)	1	1	1	1	–	–	–	–
1922	2004	<i>Leucas volkensis</i> var. <i>parviflora</i> Sebald	Rob. E. and Th. C. E. Fries s.n., 16.01.1922 (UPS)	1	1	1	–	–	–	–	–
1923	2009	<i>Hemigenia pedunculata</i> Diels	M. Koch s.n., 02.11.1923 (O)	1	1	1	1	–	–	–	–
1923	2004	<i>Lamium flexuosum</i> Ten.	O. Gavioli 2942 (WU)	0,n	0,n	0,n	0,f,r	0,r	–	–	–
1923	2009	<i>Microcorys loganiacea</i> F. Muell.	M. Koch s.n., 19.11.1923 (O)	1	1	1	1	–	–	–	–
1924	2003	<i>Lamium album</i> L. ssp. <i>barbatum</i> (Siebold and Zucc.) Mennema	H. Smith 6513 (S)	1	1	1	–	1	1	1	1
1924	2009	<i>Stachys affinis</i> Bunge	Harry Smith 5839 (UPS)	1	1	1	–	–	–	–	–
1925	2009	<i>Hypogomphia turkestanica</i> Bunge	A. Vvedensky 211 (C)	0,n	0,n	0,n	0,f,r	–	–	–	–
1925	2009	<i>Lamium amplexicaule</i> L. var. <i>orientale</i> (Pacz.) Mennema	G. Kleopow 5000 (S)	1	1	1	–	1	1	1	–
1925	2010	<i>Acrotome pallescens</i> Benth.	Arthur Örtendahl sn., 1925 (UPS)	1	1	1	–	–	–	–	–
1926	2009	<i>Colebrookea oppositifolia</i> Sm.	Navkumar Datt Gairola 03 (S)	1	1	1	1	–	–	–	–
1926	2010	<i>Eremostachys sogdiana</i> Pazij and Vved.	M. Popov 6294 (C)	1	1	1	–	–	–	–	–
1926	2009	<i>Lamium flexuosum</i> Ten.	H. Lindberg 3722 (S)	1	1	1	–	1	1	1	–
1926	2010	<i>Stachyopsis oblongata</i> (Schrenk) Popov and Vved.	M. Popov and A. Vvedensky s.n., 07.1926 (H)	1	1	–	–	–	–	–	–
1926	2010	<i>Stachys arenaria</i> Vahl	J. Lid s.n., 21.04.1926 (O)	0	0	–	–	–	–	–	–
1926	2010	<i>Stachys saxicola</i> Coss. and Balansa	J. Lid s.n., 21.04.1926 (O)	1	1	1	–	–	–	–	–

ESM Table 1: List of herbarium specimens tested that were collected prior to 1927, sorted by year of collection (Coll.). Additional information includes year of DNA extraction (Extr.), voucher information and genetic markers for which attempts at amplification were made for subsets of taxa. Successful/unsuccessful amplification using the ‘regular procedure’ is marked with 1/0. Amplification not attempted is marked with “–”. Sequence obtained via nested PCR is marked with n. Sequence obtained via the ‘replicate’ PCR procedure is marked with r. Sequence obtained by amplification of two shorter fragments is marked with f (possible for the *trnL-trnF* region, *rps16* and *matK*; see Fig. 1). DNA templates that did not generate any sequence are shaded in gray. Abbreviations: The plastid regions, L= *trnL* intron, LF=*trnL-trnF* spacer, 16=*rps16* intron, K=*matK*, SG=*trnS-trnG*, and AH=*psbA-trnH* spacer, and the nuclear regions, A2=RNA polymerase A2, and 5S=nuclear ribosomal 5S-NTS.