

NEW MEASUREMENTS OF THOUSAND-SEED WEIGHTS OF SPECIES IN THE PANNONIAN FLORA

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For understanding local and regional seed dispersal and plant establishment processes and for considering the ecotypes and other forms of specific variability, hard data of locally or regionally measured traits are necessary. We provided newly measured seed weight data of 193 taxa, out of which 24 taxa had not been represented in the SID, LEDA or BioFlor databases. Our new measurements and formerly published data of locally collected seed weight records together covers over 70% of the Pannonian flora. However, there is still a considerable lack in seed weight data of taxonomically problematic genera, even though they are represented in the Pannonian flora with a relatively high number of species and/or subspecies (e.g. *Sorbus*, *Rosa*, *Rubus*, *Crataegus* and *Hieracium*). Our regional database contains very sporadic data on aquatic plants (including also numerous invasive species reported from Hungary and neighbouring countries) and some rare weeds distributed in the southwestern part of the country. These facts indicate the necessity of further seed collection and measurements.

Key words: dry storage, hard trait, herbarium, plant trait, restoration, seed database, seed mass

INTRODUCTION

One of the most easily measurable physical trait of a plant is the weight of its seeds. Seed weight (or referred to also as seed mass) affects the regeneration strategy and the dispersal of plant species both in space (spatial dispersal) and time (development of a seed bank). Seed weight is also strongly related

to seed predation events (larger seeds are more likely predated), germination processes, seedling establishment and survival (Eriksson 2000). Thus, in the last few decades seed traits (incl. seed weight) became frequently used for explaining crucial dynamical processes in plant communities (Leishman *et al.* 2001, Moles *et al.* 2007) and for analysing life trait scenarios (Beaulieu *et al.* 2007, Moles and Westoby 2003). There is also an increasing trend to collect hard and soft traits into searchable and electronically available databases. This also holds for seed traits, which can be found for the European flora in comprehensive databases, such as BioFlor (Klotz *et al.* 2002), BIOPOP (Kleyer 1995), LEDA (Kleyer *et al.* 2008), TRY (Kattge *et al.* 2011a, b) the Seed information database SID 7.1 (Kew Botanical Garden, Liu *et al.* 2008), the Dispersal and diaspore database (Hintze *et al.* 2013), and the Digital seed atlas of the Netherlands (Cappers *et al.* 2012). These databases contain data for most of the common European species, especially species with a northwestern or Central European distribution. Species distributed mostly in southern or eastern Europe are generally underrepresented in these databases; thus, providing new, locally collected data on seed weights is a vital task in these regions (see also Csontos *et al.* 2003, 2007, Török *et al.* 2013). Furthermore, for understanding local and regional seed dispersal and plant establishment processes and for considering the ecotypes and local specific variability hard data of locally or regionally measured traits are necessary (Cordlandwehr *et al.* 2013). Beyond the measurement of traits, biological collections, such as seed herbaria and seed banks can store a large number of viable seeds; so they can be used as genetic material for *ex situ* conservation (Li and Pritchard 2009). Especially hard-coated seeds can retain their viability in dry storage for prolonged periods, even over a century (Molnár *et al.* 2015).

In the current paper, in addition to Török *et al.* (2013), we provided new locally measured thousand-seed weight records for 193 species of the Pannonian flora.

MATERIALS AND METHOD

Seeds and fruits were collected typically between 2010 and 2014 in Hungary (in total 161 items, 82.6%). Some other seed sorts were collected in the neighbouring countries, in Romania (5.7%, RO), Croatia (0.5%, CRO), Slovakia (0.5%, SK) and Slovenia (0.5%, SL). In addition, some other sorts originated from outside of the Pannonian Basin: Finland (8.7%, FIN), Greece (0.5%, GR), or Turkey (1.0%, TR). A fraction (4.1%) of the seeds was collected from living plant collections mostly in the Botanical Garden of the University of Debrecen (C – see Appendix 1). Seven seed sorts originated from cultivated stands without knowing the origin of seeds used for cultivation. Collection

dates and locations are reported in Appendix 1. The collected plant material was air-dried then cleaned by hand (also using seed blower and sieves) and dry-stored till measurement. The seeds from fleshy fruits were washed out, then dried. Seed sorts of 100 seeds (germinules or dispersules) were counted to estimate thousand-seed weights. In case of easy-to-harvest and/or common species at least three sorts of 100 seeds were measured. Physically damaged or unfertile seeds were omitted from counting. The air-dry weight of species was measured with 0.0001 g accuracy using a Sartorius 1702, a Kern ACJ 120-4M or a Kern 410 type analytical balance, up to 200 g. Kern 572 type balance was used above 200 g, with an accuracy of 0.01 g. Dust-seeded species (orchids, *Monotropa*, *Pyrola* and *Orobanche* species) were measured using an AA-200DS (Denver Instrument) type analytical balance with an accuracy of 0.00001 g. Following the seed weight measurements, most of the seed samples were placed at the seed herbarium (containing more than 2,500 records) located at the Department of Ecology (University of Debrecen, DE), at the Soó Rezső Herbarium at the Department of Botany (University of Debrecen, DE), or at the CPD active storage facility (Tápiószele).

RESULTS

In total, we provided newly measured seed weight data of 193 taxa (Appendix 1), out of which 24 taxa had not been represented in the SID, LEDA or BiolFlor databases.

DISCUSSION

We are convinced that a database of locally collected seed records and other easily measurable traits would enhance not only the theoretical research of local plant community assembly and functioning, but can help in the practical restoration works. For habitat restoration it is important to use locally harvested plant material (incl. also locally produced or collected seeds; Mijnsbrugge *et al.* 2010). To compose and fine-tune a proper seed mixture for restoration works and other purposes (i.e. setting the ratios of constituent species) it is necessary to have locally measured seed weights (adjusting or assess the seed numbers sown for respective species). It can also help in the technical implication of sowing, seeds with different sizes, shapes and weights can be hardly sown together with sowing machinery and it requires specific knowledge.

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Appendix 1

Thousand-seed weight records of 193 vascular plant taxa; incl. species and some subspecies. Abbreviations: HS = half-samara, C = caryopsis, AC = achenium, CC = carcerulus, SD = seed, SI = silicula, D = drupa, G = glans, N = nucula, P = pteridium.

Species	SW	Location	Date	SN	M
<i>Abies alba</i>	41.2035	Mátrafüred	20.04.2014	3	SD
<i>Acer platanoides</i>	104.2833	Farkasgyepű	10.12.2011	4	HS
<i>Aconitum variegatum</i> subsp. <i>gracile</i>	0.5846	Miskolc	11.08.2011	3	SD
<i>Agrostis capillaris</i>	0.0473	Bátorliget	16.07.2013	3	C
<i>Allium moschatum</i>	1.1213	Budapest	10.11.2011	3	SD
<i>Allium rotundum</i> subsp. <i>waldsteinii</i>	0.8683	Mezőhegyes	31.07.2013	4	SD
<i>Allium scorodoprasum</i>	1.2315	Kesznyéten	14.07.2013	3	SD
<i>Andromeda polifolia</i>	0.1687	Kirakkajärvi (FIN)	20.08.2010	3	SD
<i>Angelica archangelica</i>	3.1053	Sântimbru (Csík-szentimre) (RO)	03.08.2013	3	AC
<i>Apera interrupta</i>	0.0490	Almásfüzitő	05.06.2014	0 (56)	C*
<i>Aphanes arvensis</i>	0.1495	Debrecen	11.07.2013	3	CC
<i>Armoracia macrocarpa</i>	0.6640	Kesznyéten	14.07.2013	3	SI
<i>Blackstonia acuminata</i>	0.0135	Fülöpháza (Bg)	20.08.2013	3	SD
<i>Borago officinalis</i>	12.8670	Debrecen (C)	29.07.2013	1	CC
<i>Brassica elongata</i>	0.6517	Budapest	10.11.2011	3	SD
<i>Brassica napus</i>	3.1030	Kemiö (FIN)	15.08.2010	3	SD
<i>Bromus pannonicus</i>	4.6167	Várvölgy	21.06.2013	4	C*
<i>Calepina irregularis</i>	3.6403	Szeged	01.06.2012	4	SD
<i>Calla palustris</i>	3.2010	Taalintedás (FIN)	10.09.2010	3	SD
<i>Campanula rapunculus</i>	0.0070	Tiszaújváros	14.07.2013	3	SD
<i>Cardaminopsis arenosa</i>	0.0703	Budapest	20.05.2013	3	SD
<i>Cardaminopsis petraea</i>	0.0940	Gyenesdiás	05.05.2013	1	SD
<i>Carex acutiformis</i>	0.7387	Kunfehértó	19.05.2013	4	C**
<i>Carex appropinquata</i>	0.9287	Bátorliget	10.06.2011	3	C**
<i>Carex bohemica</i>	0.2620	Tiszaadony	22.07.2012	3	C**
<i>Carex buxbaumii</i>	0.8843	Vámospércs	09.06.2012	3	C**
<i>Carex cespitosa</i>	0.4660	Ispánk	15.06.2013	3	C**
<i>Carex diandra</i>	0.8510	Baile (Bálványos) (RO)	10.08.2013	3	C**

Species	SW	Location	Date	SN	M
<i>Carex halleriana</i>	0.4215	Budapest	05.06.2011	2	C**
<i>Carex humilis</i>	1.3985	Fót	11.04.2014	3	C**
<i>Carex lasiocarpa</i>	1.7300	Lompolonjänkkä (FIN)	02.08.2014	3	C**
<i>Carex lasiocarpa</i>	0.7207	Sirok	24.07.2012	3	C**
<i>Carex limosa</i>	1.9500	Kirakkajärvi (FIN)	20.08.2010	3	C**
<i>Carex otrubae</i>	1.2960	Hódmezővásárhely	22.09.2012	4	C**
<i>Carex paniculata</i>	0.6997	Isaszeg	28.05.2011	3	C**
<i>Carex spicata</i>	1.9250	Bátorliget	15.07.2013	3	C**
<i>Catabrosa aquatica</i>	0.2735	Lacu Roşu (Gyilkos- tó) (RO)	09.08.2013	3	C
<i>Catalpa bignonioides</i>	19.7467	Debrecen	05.03.2015	3	SD
<i>Celtis occidentalis</i>	100.8655	Debrecen	26.10.2010	3	D
<i>Centaurea jacea</i> subsp. <i>angustifolia</i>	1.0465	Hortobágy	28.07.2012	3	AC
<i>Centaurea pseudophrygia</i>	2.0300	Valea Rece (Hideg- ség) (RO) (Bg)	04.09.2013	2	AC
<i>Ceratophyllum demersum</i>	3.8460	Tiszapalkonya	15.08.2013	1	AC
<i>Chamaenerion angustifolium</i>	1.8530	Kemiö (FIN)	12.08.2010	3	SD*
<i>Chamaenerion dodonaei</i>	0.1005	Dunaalmás	21.08.2013	3	SD
<i>Chenopodium botrys</i>	0.3920	Valea Rece (Hideg- ség) (RO) (Bg)	20.06.2014	1	SD
<i>Cicuta virosa</i>	1.0840	Tiszafüred	20.08.2013	3	AC
<i>Commelina communis</i>	9.2129	Debrecen	13.09.2011	3	SD
<i>Coronopus squamatus</i>	4.3525	Karcag	09.07.2013	3	SI
<i>Corylus avellana</i>	1293.8667	Álmosd	24.08.2013	3	G
<i>Cotoneaster integerrimus</i>	8.9120	Mályinka	08.06.2013	1	SD
<i>Crepis pulchra</i>	0.2630	Vámospércs	23.09.1999	2	AC
<i>Crupina vulgaris</i>	15.2430	Budapest	31.05.2011	3	AC
<i>Cucurbita foetidissima</i>	43.8320	Tápiószele	20.11.2013	3	SD
<i>Cuscuta lupuliformis</i>	5.9400	Tiszaújváros, Tiszaszederkény	30.08.2013	3	SD
<i>Dasypyrum villosum</i>	7.5625	Paks	26.08.2013	2	C*
<i>Dianthus plumarius</i> subsp. <i>praecox</i>	0.7125	Bélapátfalva	10.07.2012	1	SD
<i>Dichostylis micheliana</i>	0.0215	Lakitelek	01.10.2013	3	C

Species	SW	Location	Date	SN	M
<i>Digitalis lanata</i>	0.4667	Konyár (Bg)	16.08.2012	3	SD
<i>Draba lasiocarpa</i>	0.1295	Krystallopygi (GR)	23.05.2012	3	SD
<i>Eleocharis uniglumis</i>	1.2070	Kesznyéten	14.07.2013	3	C
<i>Epilobium collinum</i>	0.0540	Csatár	12.08.2013	4	SD
<i>Epipactis palustris</i>	0.0032	Monostorpályi	10.09.2013	3	SD
<i>Eriochloa villosa</i>	4.5365	Szentborbás	25.08.2013	3	C
<i>Erophila spathulata</i>	0.0049	Bócs	07.04.2015	3	SD
<i>Erucastrum gallicum</i>	0.0965	Tata	25.08.2013	3	SD
<i>Euphorbia epithymoides</i>	1.0980	Zgornji Leskovec (SL)	01.06.2013	1	SD
<i>Euphorbia glareosa</i>	0.6787	Veszprém	22.07.2012	4	SD
<i>Euphorbia helioscopia</i>	2.4055	Debrecen	01.05.2014	3	SD
<i>Euphorbia lucida</i>	1.3425	Hajdúböszörmény	17.07.2013	3	SD
<i>Euphorbia villosa</i>	1.4930	Miskolc	26.07.2013	3	SD
<i>Festuca arundinacea</i>	1.8463	Tápiószele	16.06.2012	4	C*
<i>Fritillaria meleagris</i>	1.7335	Kisar	20.05.2014	3	SD
<i>Galeopsis tetrahit</i>	3.5083	Kemiö (FIN)	02.09.2010	3	CC
<i>Galium rubioides</i>	0.1627	Pócsmegyer	12.11.2011	4	SD
<i>Genista tinctoria</i> subsp. <i>elata</i>	2.9860	Telkibánya	05.08.2011	3	SD
<i>Helictotrichon adsurgens</i>	6.5267	Budapest	01.08.2011	2	C
<i>Helminthia echioides</i>	0.6225	Makó	02.09.2013	3	AC
<i>Herniaria glabra</i>	0.0397	Kemiö (FIN)	08.10.2010	3	SD
<i>Hesperis matronalis</i>	1.7313	Felsőtárkány	14.08.2012	3	SD
<i>Hieracium bupleuroides</i>	0.3883	Bélapátfalva	10.07.2012	3	AC
<i>Hieracium sabaudum</i>	0.3540	Budapest	31.08.2011	3	AC
<i>Hierochloa repens</i>	0.4687	Budapest	30.05.2012	3	C
<i>Hordelymus europaeus</i>	7.9490	Miskolc, Ómassa	10.09.2013	3	C*
<i>Hordeum murinum</i>	14.1993	Budapest	26.06.2011	4	C*
<i>Inula germanica</i>	0.0895	Tápióság	10.04.2014	3	AC
<i>Iris arenaria</i>	6.1003	Bagamér (Bg)	13.06.2013	3	SD
<i>Juncus subnodulosus</i>	0.0140	Csatár	12.08.2013	4	SD
<i>Koeleria glauca</i>	0.1183	Fülöpháza	29.06.2011	4	C*
<i>Lathyrus cicera</i>	29.1607	Villány	11.06.2013	3	SD
<i>Lathyrus sphaericus</i>	23.7883	Harkány, Terehegy	08.05.2013	3	SD

Species	SW	Location	Date	SN	M
<i>Lavandula angustifolia</i>	0.7605	Debrecen (C)	31.07.2013	3	CC
<i>Leymus arenarius</i>	10.4650	Strömme (FIN)	21.08.2010	3	C
<i>Ligularia sibirica</i>	1.2110	Sâncrăieni (Csík-szentkirály)(RO)	31.07.2013	1	AC
<i>Linum austriacum</i>	1.2237	Budapest	19.06.2011	4	SD
<i>Loranthus europaeus</i>	8.1885	Debrecen	10.12.2013	2	SD
<i>Lotus angustissimus</i>	0.4750	Nagyiván	17.07.2013	3	SD
<i>Mahonia aquifolium</i>	12.0810	Kunhegyes	01.07.2014	3	SD
<i>Malva pusilla</i>	1.3000	Gödöllő	30.10.2012	4	SD
<i>Malva sylvestris</i>	1.7700	Gödöllő	22.07.2012	4	CC
<i>Medicago monspeliaca</i>	0.5025	Almásfüzitő	15.06.2014	3	SD
<i>Menyanthes trifoliata</i>	2.6660	Lampojänkka (FIN)	02.08.2014	3	SD
<i>Mespilus germanica</i>	173.262	Debrecen	08.12.2013	10	SD
<i>Micromeria thymifolia</i>	0.2990	Bélapátfalva	29.09.2012	3	CC
<i>Minuartia fastigiata</i>	0.0600	Dunaalmás	21.08.2013	3	SD
<i>Minuartia glaucina</i>	0.0650	Pietroasa (Vasaskőfalva) (RO)	11.07.2010	3	SD
<i>Moneses uniflora</i>	0.0013	Kolari (FIN)	31.07.2014	3	SD
<i>Montia perfoliata</i>	0.3275	Debrecen (C)	05.05.2013	3	SD
<i>Myosotis sicula</i>	0.1530	Nagyiván	29.05.2014	3	CC
<i>Nigella damascena</i>	3.0445	Debrecen (C)	16.09.2013	3	SD
<i>Nuphar lutea</i>	29.406	Hortobágy	17.07.2013	3	SD
<i>Ononis pusilla</i>	2.3020	Budapest	06.08.2011	4	SD
<i>Ophrys fuciflora</i>	0.0020	Učka (CRO)	08.07.2013	3	SD
<i>Orchis pallens</i>	0.0022	Hajmáskér	15.06.2010	3	SD
<i>Orobanche cernua</i>	0.0026	Almásfüzitő	05.06.2014	3	SD
<i>Orobanche hederæ</i>	0.0055	Dizdaroğlu (Sinop) (TR)	19.07.2014	3	SD
<i>Orobanche ramosa</i>	0.0059	Sajószöged	15.09.2013	3	SD
<i>Oxalis acetosella</i>	1.4575	Nagyvisnyó, Bánkút	07.05.2015	2	SD
<i>Papaver argemone</i> (!)	0.0675	Javorník (CZ) by Vrbovce (SK)	31.05.2010	3	SD
<i>Papaver hybridum</i> (!)	0.0465	Kengyel	14.05.2015	3	SD
<i>Parietaria diffusa</i>	0.0643	Budapest	15.09.2013	3	CC
<i>Pedicularis palustris</i>	0.7093	Sâncrăieni (Csík-szentkirály) (RO)	01.08.2013	3	SD

Species	SW	Location	Date	SN	M
<i>Phacelia tanacetifolia</i>	2.5410	Gönc (C)	02.08.2013	1	CC
<i>Physospermum cornubiense</i>	3.8283	Dömös	22.08.2013	3	AC
<i>Pinguicula cf. vulgaris</i>	0.0150	Lapland (FIN)	01.08.2014	3	SD
<i>Plantago altissima</i>	1.2543	Lenti	13.08.2013	4	SD
<i>Platanus × hybrida</i>	5.2560	Debrecen	24.04.2014	3	G
<i>Poa palustris</i>	0.1540	Kesznyéten	14.07.2013	2	C
<i>Poa remota</i>	0.2383	Mátraszentimre	22.07.2013	3	C
<i>Potamogeton natans</i>	6.0920	Kirakkajärvi (Kemiö, FIN)	20.08.2010	3	CC
<i>Potentilla indica</i>	0.2613	Miskolc	05.06.2015	3	N
<i>Potentilla micrantha</i>	0.6160	Mátrafüred	18.04.2014	3	N
<i>Prenanthes purpurea</i>	0.4415	Répáshuta	12.08.2012	2	AC
<i>Primula farinosa</i>	0.0433	Budapest (C)	08.07.2012	3	SD
<i>Pseudofumaria lutea</i>	1.1035	Debrecen (C)	21.08.2013	3	CC
<i>Pseudolysimachion longifolium</i>	0.0613	Álmosd	15.08.2013	3	SD
<i>Pyrola rotundifolia</i>	0.0013	Kemiö (FIN)	02.09.2010	3	SD
<i>Puccinellia distans</i>	0.1443	Gödöllő	02.07.2012	4	C*
<i>Quercus palustris</i>	1455.2577	Körmend (C)	22.12.2012	1	G
<i>Ranunculus bulbosus</i>	3.3640	Várvölgy	21.06.2013	4	SD
<i>Ranunculus lingua</i>	1.1175	Kesznyéten	14.07.2013	3	N
<i>Ranunculus nemorosus</i>	0.2480	Valea Rece (Hideg- ség) (RO) (Bg)	28.07.2014	1	N
<i>Ranunculus psilostachys</i>	0.2330	Nagyharsány (Deb- recen, Bg)	22.05.2014	3	N
<i>Rheum rhabarbarum</i>	21.7447	Taalinthedas (FIN)	10.09.2010	3	CC
<i>Rorippa sylvestris</i>	0.0470	Érd	30.10.2011	4	SD
<i>Rosa gallica</i>	26.8135	Tarcal	19.10.2013	3	N
<i>Rosa villosa</i>	13.7653	Budapest	11.11.2011	3	N
<i>Salix pentandra</i>	0.3317	Bátorliget	29.10.2011	3	SD
<i>Salvia × betonicifolia</i>	0.9220	Kondoros	10.06.2012	2	SD
<i>Sambucus racemosa</i>	1.7585	Miskolc	06.07.2013	3	SD
<i>Sanguisorba minor</i>	6.1557	Budapest	31.05.2011	3	N
<i>Saxifraga bulbifera</i>	0.0133	Bojt	08.05.2014	3	SD
<i>Scabiosa canescens</i>	0.7630	Dunaalmás	25.08.2013	1	AC
<i>Scandix pecten-veneris</i>	19.7110	Hadim (Konya) (TR)	08.06.2014	3	AC

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<i>Schoenoplectus tabernaemontani</i>	1.9265	Szabadkígyós	18.07.2013	3	C
<i>Scorzonera parviflora</i>	3.4090	Budapest	30.05.2012	3	AC
<i>Sedum sexangulare</i>	0.0157	Pomáz	20.07.2011	4	SD
<i>Sedum spurium</i>	0.0670	Taalinthedas (FIN)	07.09.2010	3	SD
<i>Sedum urvillei</i> subsp. <i>hillebrandtii</i>	0.1915	Fülöpháza	23.09.2013	3	SD
<i>Senecio paludosus</i>	0.5377	Sântimbru (Csík-szentimre) (RO)	01.08.2013	3	AC
<i>Seseli peucedanoides</i>	0.9840	Felsőtárkány	16.08.2013	3	AC
<i>Sesleria sadleriana</i>	2.2257	Budapest	23.05.2011	3	C
<i>Sesleria uliginosa</i>	0.8163	Tuşnadu Nou (Újtusnád) (RO)	04.08.2013	3	C
<i>Sicyos angulatus</i>	55.8015	Tiszaújváros, Tiszaszederkény	30.08.2013	3	SD
<i>Silene bupleuroides</i>	0.5333	Budapest	10.11.2011	3	SD
<i>Silene borysthenica</i>	0.2257	Bócsa	01.11.2010	3	SD
<i>Silene dichotoma</i>	0.7810	Bócs	14.07.2013	3	SD
<i>Silene viridiflora</i>	0.3080	Bátorliget	15.07.2013	3	SD
<i>Sisymbrium loeselii</i>	0.5945	Kányaháza	25.07.2011	3	SD
<i>Spergula arvensis</i>	0.4553	Strömme (FIN)	21.08.2010	3	SD
<i>Stellaria palustris</i>	0.4370	Kesznyéten	14.07.2013	1	SD
<i>Succisella inflexa</i>	1.4563	Lakócsa	25.08.2013	3	AC
<i>Tamus communis</i>	14.8610	Keszthely	15.09.2014	2	SD
<i>Taraxacum serotinum</i>	0.8580	Isaszeg	26.08.2011	2	AC
<i>Tephrosieris crispa</i>	0.4300	Mátraszentimre	22.07.2013	3	AC
<i>Teucrium scordium</i>	0.3247	Szatymaz	27.08.2012	4	SD
<i>Thalictrum flavum</i>	1.3267	Zákányszék	17.08.2011	4	CC
<i>Thlaspi alliaceum</i>	0.5420	Dobronhegy	15.05.2014	1	SD
<i>Thymus praecox</i>	0.6390	Budapest	28.06.2012	3	CC
<i>Tragopogon floccosus</i>	4.6860	Budapest	30.09.2013	2	AC
<i>Trifolium medium</i>	1.8420	Gönc	30.07.2013	3	SD
<i>Triglochin maritimum</i>	0.2557	Kunpeszér	25.09.2012	4	SD
<i>Triglochin maritimum</i>	0.4830	Kemiö (FIN)	20.08.2010	3	SD
<i>Trigonella caerulea</i>	1.8345	Almásfüzitő	15.06.2013	3	SD
<i>Turgenia latifolia</i>	36.1210	Körös Ladány	18.07.2013	3	AC
<i>Ulmus pumila</i>	11.0445	Debrecen	25.04.2014	3	P

Species	SW	Location	Date	SN	M
<i>Ulmus pumila</i>	5.4505	Debrecen, Szepes	28.04.2014	3	P
<i>Urtica urens</i>	0.4540	Debrecen	18.06.2012	3	CC
<i>Veratrum nigrum</i>	4.0107	Keszthely	07.09.2012	3	SD
<i>Verbascum densiflorum</i>	0.0837	Hódmezővásárhely	13.09.2012	4	SD
<i>Veronica praecox</i>	0.1170	Budapest	20.04.2014	3	SD
<i>Viburnum lantana</i>	37.9590	Ganna	17.07.2011	3	SD
<i>Viola ambigua</i>	2.4100	Mezőhegyes	06.08.2011	4	SD
<i>Viola canina</i> subsp. <i>montana</i>	0.2360	Mátrafüred	19.05.2013	1	SD
<i>Viola reichenbachiana</i>	1.1780	Telkibánya	30.07.2013	2	SD
<i>Viola suavis</i>	2.4223	Tápiószele	12.05.2011	4	SD

SW = thousand-seed weights (g), Date = day.month.year, SN = number of hundred-seed sorts measured; without respective sorts of hundred seeds, the number of seeds measured is reported in brackets.

Location: for collections outside of the border of Hungary, country codes are given in brackets. M = measured morphological unit: * = measured with appendix, ** = measured in utriculus. Altogether 24 records missing from SID (Kew), LEDA and BiolFlor databases are indicated with boldface. The location of the botanical garden or the place of cultivation and "(C)" are inserted when the seeds originated from a botanical garden or cultivation with unknown source of seed was used for cultivation. With known origin of the seed used for cultivation, the location and "(Bg)" are inserted. (!) – Green capsules collected, matured later – thus, much smaller seeds can be expected than in the literature