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THOUSAND-SEED WEIGHT RECORDS OF SPECIES FROM THE FLORA OF HUNGARY, II. DICOTYLEDONOPSIDA

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New records of thousand-seed weight are reported for 227 members of the Hungarian dicotyledonous flora (including some introduced or naturalised species). Seed samples were harvested from natural populations, kept dry until the end of the vegetation period, then the seed weights were determined. One to three hundred-seed lots were used for measurements with accuracy of 0.1 mg (up to 30 g) and 0.1 g (above 30 g). Thirty-seven of the new records belong to protected species of the Hungarian flora. When the average seed weights of three distinct species groups (1: annuals and biennials, 2: non-woody perennials and 3: woody perennials) were compared, the group of woody plants showed significantly heavier seeds than the other two groups (Kruskal-Wallis test, $P < 0.001$). However, seed weights of groups 1 and 2 were statistically identical.

Key words: Hungarian flora, Dicotyledonopsida, life form, seed mass, thousand-seed weight

INTRODUCTION

The role of seeds and fruits in the dispersal and establishment of species and the recognition of their importance in vegetation restoration resulted an increasing interest in the reproductive propagules of higher plants (HOWE 1986, BAKKER *et al.* 1996, LEVEY *et al.* 2002). In the last few decades new ecological rules were recognised in the relationships between size and shape of seeds (or fruits) and other plant traits (THOMPSON and RABINOVITZ 1989, CSONTOS 1998, MILBERG *et al.* 2000). These studies require extensive databases of raw data on the species' reproductive propagules. As we discussed in an earlier paper (CSONTOS *et al.* 2003) seed morphological and seed

ecological databases were established in western Europe (GRIME *et al.* 1981, THOMPSON *et al.* 1997, VAN SLAGEREN 2003) to support these research works, as well as better planning of vegetation restoration projects. Building a database in Hungary on seed size and shape was also initiated (CSONTOS 1998). This database includes data of three different sources: data published in the literature, measurements of seeds received from botanical gardens and measurements of seeds collected in spontaneous populations in Hungary. In the present paper data of 227 dicotyledonous species of the Hungarian flora are published for what thousand-seed weights, based on new measurements, are first reported.

MATERIALS AND METHODS

Seeds or fruits of species were collected in the field at mature stage. For species with easy-to-harvest seeds several hundreds were collected, otherwise at least 100 seeds were taken. Whenever it was possible, attention was paid to collect pooled seed samples from several mother plants of the same stand. In case of fleshy fruits the seeds were cleaned in the lab and dried at room temperature. The seed samples were placed into labelled paper bags and stored at room temperature until the end of the vegetation period (early November). For measurements hundred-seed lots were prepared (damaged seeds were not considered). Three lots were measured for the majority of species, in some cases two or one. Up to 30 g the accuracy was 0.1 mg (using KERN-410 automatic chemical balance), whereas 0.1 g above 30 g (NAGEMA digital weighing machine). Thousand-seed weight of a species was calculated as the average of the seed lots measured. In case of 40 species the seeds were collected from spontaneous populations by colleagues of the Botanical Garden of the Ecological and Botanical Research Institute of the Hungarian Academy of Sciences (Vácrátót). These samples were subjected to the same procedure described above.

To illustrate the use of seed weight data in vegetation studies, we made statistical comparisons of average seed weights of pairs of three distinct species groups (1: annuals and biennials, n = 37; 2: non-woody perennials, n = 132 and 3: woody perennials, n = 58) following the proposed method of THOMPSON and RABINOVITZ (1989). Since the logarithm of seed weight data for the third group did not follow Gaussian distribution the non-parametric Kruskal–Wallis test was applied (INSTAT 1997). $P < 0.05$ was required for significant differences among group medians.

RESULTS AND DISCUSSION

The Appendix contains of the thousand-seed weight records of 227 dicotyledons of the Hungarian flora, including 36 plant taxa introduced or

naturalised. Families Asteraceae (45 species) and Rosaceae (32 species) have the greatest representation in this list. Of Rosaceae, several data came from the rose collection maintained by Géza Facsar at the Soroksár Botanical Garden (FACSAR 1993).

Following seed weight measurements the samples were deposited in the seed collections of both the Department of Plant Taxonomy and Ecology of the Eötvös Loránd University, Budapest, and the Botanical Department of the Hungarian Natural History Museum (BP). Thirty-seven among the studied species are protected members of the Hungarian flora (*e.g. Crambe tataria*, *Doronicum hungaricum*, *Dracocephalum austriacum*, *Telekia speciosa*, *Vincetoxicum pannonicum*, etc.). Seed weight studies on protected species may improve seed quality assessment and propagation success of these valuable species, as it was published for *Vinca herbacea* (BÉNYEI-HIMMER *et al.* 1999). A further benefit of seed weight data in conservation activities can be achieved when they are used for determining sowing density of matrix species in habitat restoration projects. Statistical analysis of seed weight data among species groups resulted significant differences in two of the three cases of possible pair-wise comparisons (Table 1).

Table 1. Differences of mean seed weights of three distinct species groups. Seed weights were considered as the logarithm of raw data, and analysed by the Kruskal–Wallis test (non-parametric ANOVA) (INSTAT 1997).

Species groups compared	Mean rank difference	Level of significance	
annuals and biennials *vs.* non-woody perennials	−8.411	$P > 0.05$	ns
annuals and biennials *vs.* woody perennials	−112.66	$P < 0.001$	***
non-woody perennials *vs.* woody perennials	−104.25	$P < 0.001$	***

ns = not significant

The group of woody perennials showed higher average seed weight than the other two species groups. This corresponds to the finding of THOMPSON and RABINOVITZ (1989) and underline a loose, but existing positive correlation between plant size and seed weight.

The statistical similarity of seed weights between short lived and long lived herbaceous plants may indicate that longer life-span does not necessarily cause larger body size in non-woody perennials. An additional

reason of the relatively low seed weight data of non-woody perennials can be related to their two sorts of reproductive strategy. Most of the species in this group produce both seeds and clonal offsprings, thus the energy budget they allocate for reproduction has to be shared between the two sorts, and this may lead to smaller seed size. A direct comparison of seed weights between non-woody clonal perennials and obligate seeder perennials, would be a question worth for studying, however, this would require a more extensive data set.

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Appendix. Seed weight records first published for 227 species of the Hungarian flora. SN = number of hundred-seed samples measured, W = thousand-seed weight in grams

Species name	Origin of the seeds	Date	SN	W (g)
Acer negundo L.	Budapest, Svábhegy	22.11.1998	3	34.2600
Acer platanoides L.[1]	Budapest, Kútvölgy	08.10.1998	3	49.3900
Acer platanoides L.[2]	Budapest, Kútvölgy	08.10.1998	3	126.3000
Achillea collina J. Becker	Visegrád Mts	01.09.1998	3	0.1170
Achillea distans W. et K.	Pilisszentkereszt	01.09.1998	2	0.1200
Achillea pannonica Scheele	Vácrátót	2000	1	0.1450
Aegopodium podagraria L.	Farkasfa	15.07.1995	3	1.5310
Ailanthus altissima (Mill.) Swingle	Budapest, Istenhegyi út	10.09.2000	3	38.4900
Amorpha fruticosa L.	Gencsapáti (Vas county)	28.10.1995	3	8.3710
Anagallis foemina Mill.	Öskü, quarry	1995	2	0.5990
Artemisia alba Turra	Vácrátót	2000	3	0.0910
Asclepias syriaca L.	Budapest, 18th district	26.10.1996	3	5.6530
Asperula cynanchica L.	Buda Mts, Kutya-hegy	26.09.1998	3	0.7310
Aster novi-belgii L.	Szombathely, Herény, side of ditch	05.10.2000	3	0.2360
Aster sedifolius L.[2]	Vácrátót	2000	1	0.5640
Aster tripolium L. subsp. *pannonicus* (Jacq.) Soó	Zsámbék	22.10.1995	2	0.4100
Aster x *lanceolatus* Willd.[1]	Magyarlak, bank of river Rába	17.11.1998	3	0.1670
Astragalus glycyphyllos L.	Hollókő, Gyertyános-hegy	12.09.1998	3	4.6590
Berberis vulgaris L.	Gete Hills, Öreg-kő	15.08.1998	2	12.0500
Biscutella laevigata L.	Budapest, Zsíros-hegy	02.06.1999	2	3.1200
Bupleurum praealtum L.	Solymár, Zsíros-hegy	1995	1	3.9900

Species name	Origin of the seeds	Date	SN	W (g)
Campanula latifolia L.	Szombathely, botanical garden	1996	3	0.4630
Cardaminopsis arenosa (L.) Hay.	Budapest, Tündér-szikla	20.06.1999	3	0.0680
Carduus crispus L.	Bükk Mts, Szalajka-völgy	27.08.1996	3	1.6120
Carpesium cernuum L.	Szigetköz, Feketeerdő	1995	3	0.6020
Carpinus orientalis Mill.	Budapest, botanical garden (ELTE)	1995	3	14.0800
Celtis occidentalis L.	Budapest, Városliget	24.11.2000	3	93.7000
Centaurea rhenana Bor.	Vácrátót	2000	3	2.0800
Centaurea stenolepis Kern.	Visegrád Mts	01.09.1998	3	2.3000
Cerasus mahaleb (L.) Mill.	Badacsonylábdihegy	24.07.1995	2	85.7000
Chaerophyllum aromaticum L.	Bükk Mts, Szalajka-völgy	27.08.1996	3	15.2700
Chenopodium vulvaria L.	Vácrátót	2000	1	0.0450
Cimicifuga europaea Schipczinskij	Vácrátót	2000	3	0.4540
Cirsium brachycephalum Jur.	Sárkeresztúr, Sárkány-tó	10.08.1995	1	0.6300
Cirsium pannonicum (L. f.) Link	Budapest, Zugliget	11.06.1999	2	2.5370
Cornus sanguinea L.	Budapest, Angyalföld	01.09.1996	3	54.0100
Coronilla vaginalis Lam.	Buda Mts, Nagy-Szénás	18.09.1998	2	3.0100
Cotinus coggygria Scop.	Balatonfüred, Tamás-hegy	11.08.1999	2	7.3180
Cotoneaster integerrimus Medik.	Mt Badacsony	27.07.1996	3	9.8830
Crambe tataria Sebeók	Belsőbáránd, loess wall	13.08.1996	1	46.5000
Crataegus oxyacantha L.	Bükk, Szarvaskő	28.08.1996	3	47.8800
Cruciata pedemontana (Bell.) Ehrend.	Hortobágy	1995	3	0.3290
Cydonia oblonga Mill.	Zsámbék	17.10.1998	3	31.8300
Dentaria enneaphyllos L.	Budapest, János-hegy	30.05.1999	2	6.3870
Dianthus arenarius L. subsp. ***borussicus*** Vierh.	Vácrátót	2000	1	0.6310
Dianthus collinus W. et K.	Pomáz, Kő-hegy	30.09.1999	2	0.6570
Dianthus pontederae Kern.	Buda Mts, Nagy-Szénás	25.06.1998	3	0.8250
Dianthus serotinus W. et K. subsp. ***regis-stephani*** (Rapcs.) Jáv.	Buda Mts, Kis-Szénás	08.08.1999	1	1.0400
Digitalis ferruginea L.	Vácrátót	00.00.2000	3	0.4670
Digitalis grandiflora Mill.	Mt Gulács	26.07.1995	3	0.1870
Doronicum hungaricum (Sadl.) Rchb. f.	Visegrád Mts	03.06.2000	1	0.8230
Dracocephalum austriacum L.	Jósvafő, near ANP Research Station	24.07.1996	1	0.5400
Elaeagnus angustifolia L.	Budapest, Angyalföld	01.09.1996	3	133.1000
Epilobium collinum C. C. Gmel.[1]	Bozsok, near Kalaposkő	25.08.1998	3	0.0540
Epilobium montanum L.	Visegrád Mts, saddle of Peres-hegy	01.09.1998	3	0.0500
Epilobium roseum Schreb.	Bükk, Keselyű-bérc	28.08.1996	3	0.0870
Epilobium tetragonum L.	Százhalombatta, bank of a fish pond	1995	3	0.0676

Species name	Origin of the seeds	Date	SN	W (g)
Eranthis hyemalis (L.) Salisb.	Budapest, botanical garden (ELTE)	27.04.2000	3	4.5210
Erechtites hieraciifolia (L.) Raf.	Felsőszölnök, near the Austrian border, in forest	1995	3	0.3240
Erigeron acris L.	Hollókő, Bükk-völgy	12.09.1998	2	0.0870
Erigeron canadensis L.	Pilisszentlászló	05.09.1998	3	0.0510
Erysimum diffusum Ehrh.	Vácrátót	2000	3	0.2740
Euonymus europaea L.	Zsámbék	22.10.1995	3	55.4500
Euonymus verrucosa Scop.	Budapest, SW of the KFKI	20.09.1998	3	34.8700
Euphorbia maculata L.	Budapest, Angyalföld	01.09.1996	3	0.1600
Euphrasia stricta D. Wolff	Vácrátót	2000	3	0.0660
Fallopia dumetorum (L.) Holub	Rátót, along the Rátóti-patak	30.09.1995	2	3.6940
Ferula sadleriana Ledeb.	Budapest, botanical garden (ELTE)	05.07.2002	2	10.7500
Filipendula vulgaris Moench	Nagytarcsa	05.07.1995	3	0.9160
Frangula alnus Mill.	Lipót, bank of the river Danube	1995	1	26.8200
Fraxinus ornus L.	Buda Mts	10.10.1998	3	17.8600
Galeopsis speciosa Mill.	Máriaújfalu, Hársas-patak	30.09.1995	2	4.3060
Genista tinctoria L.	Belsőbáránd, loess wall	13.08.1996	3	3.0200
Gentiana asclepiadea L.	Felsőszölnök, Hampó-völgy	13.11.1998	3	0.1220
Gentiana cruciata L.	Nagykovácsi	05.10.1996	3	0.1470
Globularia punctata Lap.	Nagykovácsi, Nagy-Szénás	1995	3	0.2613
Gnaphalium sylvaticum L.	Kőszeg, Írott-kő	1995	3	0.0506
Helichrysum arenarium (L.) Moench	Pesti-sík	03.08.1995	2	0.0765
Heracleum mantegazzianum Somm. et Lev.	Vép, bank of the creek Kozár-Borzó	18.08.1995	3	9.9200
Hieracium racemosum W. et K.[1]	Vácrátót	2000	1	0.3180
Hieracium sabaudum L.[1]	Budapest, in oak forest SW of the KFKI	20.09.1998	3	0.4900
Hieracium sylvaticum (L.) Gruftbg.	Budapest, Frank-hegy	19.06.1999	3	0.3750
Hieracium umbellatum L.	Vácrátót	2000	2	0.3590
Hippophaë rhamnoides L. subsp. *carpatica* Rousi	Szombathely, Nagyszombat tér	24.11.2001	3	11.7500
Humulus japonicus Sieb. et Zucc.	Szombathely, Herény, bank of the creek Perint-patak	21.10.2000	3	9.8270
Hypericum hirsutum L.	Zsámbék, Nyakas-hegy	20.08.1998	3	0.0980
Hypericum maculatum Cr.	Vácrátót	2000	3	0.0100
Hypericum montanum L.	Bozsok, near Kalaposkő	25.08.1998	3	0.0630
Impatiens glandulifera Royle	Szombathely, creek Perint	26.08.1998	3	9.2400
Impatiens noli-tangere L.	Rohonc (Austria), bank of a creek	25.08.1998	3	4.9800
Inula britannica L.[2]	Budakeszi	06.08.2000	2	0.1520
Inula conyza DC.	Budapest, Remete-szurdok	31.10.1995	3	0.1680
Inula ensifolia L.	Gete Hills, Nagy-Gete	15.08.1998	3	0.2960

Species name	Origin of the seeds	Date	SN	W (g)
Inula germanica L.	Belsőbáránd, loess hill	13.08.1996	3	0.0980
Inula salicina L.	Budakeszi	06.08.2000	3	0.1470
Inula spiraeifolia L.[1]	Vácrátót	2000	1	0.1950
Ipomoea purpurea (L.) Roth	Szombathely, Herény	10.10.2000	2	26.8000
Isopyrum thalictroides L.	Pilis Mts, Oszoly-hegy	08.05.1999	1	4.4900
Jovibarba hirta (L.) Opiz[3]	Buda Mts	10.10.1998	1	0.0760
Juglans nigra L.	Szombathely, Kámon, Szent Imre herceg utca	16.10.1998	3	1096 1.0000
Lactuca quercina L.[1]	Börzsöny Mts, near Nógrád	26.08.2000	2	1.2330
Lathraea squamaria L.	Börzsönyliget	1995	3	0.6380
Leontodon autumnalis L.	Vát, bank of road	1995	3	0.7810
Leonurus marrubiastrum L.	Hollókő	11.09.1998	3	0.2880
Ligustrum vulgare L.	Kőszeg, Chernel-kert	28.10.1995	3	26.1900
Linum flavum L.	Vácrátót	2000	2	0.8530
Linum hirsutum L.	Szin, meadow	1995	3	0.7410
Linum tenuifolium L.	Buda Mts, Kálvária-hegy	23.09.1998	3	0.5550
Lonicera xylosteum L.	Budapest, Hűvösvölgy	28.08.1999	1	2.7560
Loranthus europaeus Jacq.	Budapest, János-hegy	03.04.1998	1	22.1300
Lysimachia nummularia L.	Hollókő, Gyertyános-hegy	12.09.1998	2	0.3150
Lysimachia punctata L.	Pomáz, Kő-hegy	30.09.1999	3	0.2910
Lythrum salicaria L.	Nógrádsipek, Malom-völgy	12.09.1998	3	0.0500
Mahonia aquifolium (Pursh) Nutt.	Szombathely, Herény	14.09.1995	3	10.0100
Malva alcea L.	Szőce, Kisréti-dűlő, old-field	26.08.1998	3	2.6170
Melandrium viscosum (L.) Celak.	Isaszeg	26.07.1995	3	0.6710
Mentha aquatica L.	Nadap, wet meadow	1995	2	0.1190
Mespilus germanica L.	Zsámbék, Kálvária-hegy	17.10.1998	3	119.2000
Minuartia glomerata (M. B.) Deg.	Fülöpháza	06.08.2002	3	0.0663
Morus alba L.	Budapest	28.06.2000	3	2.1800
Ononis pusilla L.	foot of Gete-hegy, above Ódorog	15.08.1998	1	2.0790
Orobanche hederae Duby	Mt Badacsony	25.07.1995	1	0.0090
Ostrya carpinifolia Scop.	Budapest, Gellért-hegy (planted tree)	07.04.2000	3	3.2450
Oxalis corniculata L.	Szombathely, Herény	14.09.1995	3	0.2360
Oxytropis pilosa (L.) DC. subsp. *hungarica* (Borb.) Soó	Esztergom	14.08.1998	3	1.1400
Parthenocissus tricuspidata (S. et Z.) Planch.	Budapest, 12th district	21.10.1998	3	36.2800
Peucedanum alsaticum L.	Budapest, Óbuda, grassland near Kiscelli kastély	1995	3	0.4980
Peucedanum arenarium W. et K.	Bócsa, sandy grassland	1995	3	5.4030
Peucedanum cervaria (L.) Lap.	Mátrafüred	1995	3	3.2410

Species name	Origin of the seeds	Date	SN	W(g)
Peucedanum palustre (L.) Moench	Szigetköz, Arak, near swamp forest (*Alnetum glutinosae*)	1995	3	0.5346
Phlomis tuberosa L.	Vácrátót	2000	1	1.5230
Physocaulis nodosus (L.) Tausch	Mt Badacsony	25.07.1995	3	14.0400
Phyteuma orbiculare L.	Buda Mts, Nagy-Szénás	25.06.1997	3	0.1880
Pimpinella major (L.) Huds.	Lipót, bank of the river Danube	1995	3	1.5410
Plantago maxima Juss.	Vácrátót	2000	3	0.3300
Podospermum canum C. A. Mey.	Hortobágy	1995	3	2.5060
Potentilla collina Wibel	Vácrátót	2000	1	0.2850
Potentilla pedata Willd.	Vácrátót	2000	3	0.2080
Primula veris L.	Buda Mts, Nagy-Szénás	18.09.1998	3	0.8520
Prunus cerasifera Ehrh.	Zamárdi	29.06.2000	1	215.0000
Prunus serotina Ehrh.	Őrtilos (Somogy county)	01.08.2000	1	65.8300
Prunus spinosa L.	Vép (Vas county)	28.08.1998	3	182.4000
Ptelea trifoliata L.	Budapest, Sas-hegy	25.05.2004	2	13.8200
Pulicaria dysenterica (L.) Gärtn.	Sárkeresztúr, Sárkány-tó	22.08.1996	3	0.0673
Pulsatilla patens (L.) Mill.	Vácrátót	2000	1	1.9600
Pulsatilla pratensis (L.) Mill.[1]	Vácrátót	2000	1	2.0100
Pyrus pyraster Burgsd.	Pilis Mts, Szántói-nyereg	05.09.1998	1	18.5600
Quercus pubescens Willd.	Buda Mts	16.10.1996	3	633.7000
Ranunculus polyanthemos L.	Nagytarcsa	09.07.1995	3	2.8370
Reynoutria japonica Houttuyn	Szombathely, bank of Külső-Nárai utca	22.10.2000	3	2.0650
Fallopia x sachalinensis Ronsedecr.	Vácrátót	16.10.2000	3	1.0720
Rhamnus catharticus L.	Lipót, hedge along road	1995	1	22.2300
Rosa agrestis Savi [3]	Budapest, Soroksár Botanical Garden	25.09.1998	3	18.1600
Rosa arvensis Huds.	Budapest, Soroksár Botanical Garden	25.09.1998	2	14.7800
Rosa deseglisei Bor.	Budapest, Soroksár Botanical Garden	25.09.1998	1	43.0200
Rosa elliptica Tausch	Budapest, Soroksár Botanical Garden	25.09.1998	3	19.2400
Rosa gallica L.	Budapest, Soroksár Botanical Garden	25.09.1998	3	34.8000
Rosa gizellae Borb.	Budapest, Soroksár Botanical Garden	25.09.1998	2	21.9200
Rosa glauca Pourr.	Vácrátót	2000	2	10.6700
Rosa inodora Fr.	Budapest, Soroksár Botanical Garden	25.09.1998	3	16.0300
Rosa livescens Bess.	Budapest, Soroksár Botanical Garden	25.09.1998	3	27.2800
Rosa micrantha Borrer [3]	Budapest, Soroksár Botanical Garden	25.09.1998	3	11.8800

Species name	Origin of the seeds	Date	SN	W (g)
Rosa polyacantha (Borb.) Deg.	Budapest, Soroksár Botanical Garden	25.09.1998	3	18.9000
Rosa rubiginosa L.[3]	Budapest, Soroksár Botanical Garden	25.09.1998	3	16.1500
Rosa sancti-andreae Deg. et Trtm.	Budapest, Soroksár Botanical Garden	25.09.1998	3	21.7600
Rosa spinosissima L.	Budapest, Soroksár Botanical Garden	25.09.1998	3	17.7700
Rosa subcollina (Christ) DT. et Sarnth.	Budapest, Soroksár Botanical Garden	25.09.1998	3	14.3900
Rosa zagrebiensis Vukot. et H. Br.	Budapest, Soroksár Botanical Garden	25.09.1998	3	17.5200
Rubus canescens DC.	Visegrád Mts	01.09.1998	3	3.8900
Rubus fruticosus agg.	Visegrád Mts	01.09.1998	3	3.2900
Rudbeckia hirta L.	Szombathely, Herény, side of ditch	09.09.2000	3	0.4920
Rudbeckia laciniata L.	Rönök, bank of Rönöki-patak	30.09.1995	3	2.6610
Rumex confertus Willd.	Vácrátót	2000	1	2.6600
Rumex palustris Sm.	Vácrátót	2000	1	0.9530
Rumex pseudonatronatus Borb.	Vácrátót	2000	1	0.3360
Salvia nutans L.	Vácrátót	2000	1	1.0500
Salvia verbenaca L.	Vácrátót	2000	3	1.1900
Samolus valerandi L.	Budapest, botanical garden (ELTE)	16.06.2000	1	0.0200
Saxifraga bulbifera L.	Visegrád Mts, above Tahi	24.05.1999	1	0.0150
Scabiosa canescens W. et K.	Buda Mts, Zsíros-hegy	10.09.1998	3	0.8420
Scabiosa ochroleuca L.	Pesti-sík	03.08.1995	3	1.5390
Scorzonera purpurea L.	Vácrátót	2000	1	0.5440
Scrophularia vernalis L.	Vácrátót	2000	2	0.2000
Sedum album L.	Buda Mts, Kutya-hegy	26.09.1998	2	0.0290
Sedum spurium M. B.	Vácrátót	2000	3	0.0800
Senecio doria L.[3]	Zsámbék	22.10.1995	3	1.8730
Senecio erucifolius L.	Lipót, hay meadow	1995	3	0.2870
Senecio fluviatilis Wallr.	Lipót, edge of reeds near river Danube	1995	3	0.4110
Serratula radiata (W. et K.) M. B.	Budaörs	06.08.1996	3	2.6940
Seseli leucospermum W. et K.	Nagykovácsi, Nagy-Szénás, dry grassland	1995	3	2.3180
Silaum silaus (L.) Sch. et Th.	Szigetköz	10.09.1996	3	1.1330
Silene borysthenica (Gruner) Walters	Fülöpháza	07.08.2002	3	0.2140
Silene multiflora (Ehrh.) Pers.	Dinnyés, salty meadow	09.08.1995	3	0.1660
Silene viridiflora L.	Bükk, Keselyű-bérc	28.08.1996	3	0.4490
Sisymbrium loeselii L.	Budapest, 18th district	20.10.1996	3	0.0646
Sisymbrium strictissimum L.	Vácrátót	2000	3	0.5130

Species name	Origin of the seeds	Date	SN	W (g)
Solidago canadensis L.[1]	Pesthidegkút	25.09.1998	3	0.0670
Sonchus palustris L.	Budakeszi, Makkosmária	11.09.1999	3	0.4910
Sorbus aucuparia L.	Budakeszi	20.09.1998	3	2.4870
Sorbus torminalis (L.) Cr.	Buda Mts, near KFKI	20.09.1998	3	18.8900
Stachys byzantina C. Koch	Budapest, 2nd district, garden	07.08.1996	3	2.2690
Stenactis annua (L.) Nees	Őrtilos, bank of river Dráva	01.08.2000	2	0.0540
Succisa pratensis Moench	Felsőszölnök, hay meadow	1995	3	0.8670
Syrenia cana (Pill. et Mitterp.) Neilr.	Vácrátót	2000	3	0.1050
Syringa vulgaris L.	Zsámbék, Nyakas-hegy	09.09.2000	3	4.3900
Taraxacum bessarabicum (Hornem.) Hand.-Mazz.	Zsámbék	22.10.1995	2	0.5550
Taraxacum serotinum (W. et K.) Poir.	Gyapa near Paks, loess steppe	22.08.1996	2	0.5390
Telekia speciosa (Schreb.) Baumg.	Szombathely, Kámoni Arborétum	25.08.1998	3	0.5640
Teucrium montanum L.	Gete Hills, Gete-hegy	15.08.1998	3	0.8800
Thalictrum minus L. subsp. ***pseudominus*** (Borb.) Soó	Buda Mts, Zsíros-hegy	16.09.1998	3	2.4100
Trifolium pannonicum Jacq.	Pilisszentlászló, grassland near Panoráma út	05.08.1998	3	3.0000
Trifolium strictum L.	Hortobágy, fish ponds	1995	3	0.5220
Turritis glabra L.	Nagytarcsa	09.07.1995	3	0.0506
Ulmus minor Mill.	Tahi, hedge along roads	24.05.1999	3	4.6730
Urtica kioviensis Rogowitsch	Vácrátót	2000	1	0.1210
Urtica pilulifera L.	Vácrátót	2000	1	0.7640
Verbascum austriacum Schott	Vácrátót	2000	3	0.0540
Verbascum phoeniceum L.	Nagytarcsa	09.07.1995	3	0.0810
Veronica austriaca L.[3]	Vácrátót	2000	3	0.0710
Veronica officinalis L.	Hollókő, near Földvár	12.09.1998	3	0.1140
Veronica prostrata L.	Vácrátót	2000	1	0.3330
Veronica spicata L.[3]	Buda Mts, Zsíros-hegy	27.09.1996	3	0.0660
Viburnum lantana L.	Gete Hills, Gete-hegy	15.08.1998	3	36.9000
Viburnum opulus L.	Viszák, at forest margin	01.10.1995	3	33.2900
Vicia cassubica L.	Pilisszentkereszt	01.09.1998	3	22.5000
Vincetoxicum hirundinaria Medik.	Pomáz, Kő-hegy	30.09.1999	2	7.6330
Vincetoxicum pannonicum (Borhidi) Holub	Buda Mts, Csíki-hegyek	19.08.2005	3	2.6340

1 = seed weight without pappus or wing; 2 = seed weight with pappus or wing; 3 = *sensu stricto*