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Distribution and diversity of Phleum Hubbardii and Phleum pratense (Poaceae) in the Carpathian Basin

By

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Abstract: Author collected and mapped the distribution data of Phleum Hubbardii D. Kov. and Phleum pratense L. in the Carpathian Basin and the Great Hungarian Plain, and analyzed the distribution and diversity of specimens per species according to natural habitats and altitudes. Both species are frequent in different meadows. Phleum pratense has higher diversity of habitats, it is common not only meadows, but in different waste places and moist soils also. Phleum Hubbardii is more frequent at about 400-500 m while Ph. pratense is living mostly at about 100-200 m a.s.l.

Introduction

The author has been dealing with Phleums in Hungary for the last four years (Kováts 1976, 1977), investigating the morphological and anatomical differences and habits of Phleum Hubbardii D. Kov. and Ph. pratense L. These differences are not only the above mentioned but exist in their natural habitats, altitudes and distribution also (Nordenskiöld 1945, Hubbard 1968).

In connection with the plan of Central-European flora mapping, we as members of this international floristic group, collected data of flowering plants (Szujkó-Lacza & Sen 1977, Kováts & Szujkó-Lacza 1979), listed by Ehrendorfer (1973), and mapped these data into grids according to Niklfeld (1971).

Our herbariums (Bp) are the most outstanding and complete ones in Hungary and considered to be significant even in Europe (Szujkó-Lacza 1973). One of the collections is the Herbarium Carpato-Pannonicum, containing the flora of the Carpathian Basin and the Great Hungarian Plain (Fekete & Kováts 1974).

The common area and habitats of these species in question are mentioned in Hungary by Jávorka (1925), Soó & Jávorka (1951), Soó & Kárpáti (1968), Máthé & Heszky (1972), and Soó (1973), but the detailed data have not been published yet, and frequently the two species are mixed or not exactly separated. It was necessary to study every specimens in the herbarium, making revision, because the identification sometimes proved difficult. For instance, often specimens in the herbarial material were identified as Phleum nodosum L. (correctly Ph. Hubbardii D. Kov., Kováts, 1977), merely because they had well developed bulb bases. The diploid (2n=14) Phleum Hubbardii does not differ specifically in this respect from the hexapolid (2n=42) Phleum pratense (Nordenskiöld 1945, Hubbard 1968, Kováts 1977).

Since Phleum pratense is valuable in agriculture its ecological requirement was described by Máthé & Heszky (1972) in detail.

Material and methods

In the enumeration the locality of collecting appears in alphabetical order, followed by the code numbers of grids, according to Niklfeld (1971) and Borhidi, Thury & Zotter, when the data refer to the territory of present-day Hungary. The names of counties correspond to the names used at the time of collecting, these are between brackets than the detailed topography, found on the labels, followed by the collectors' names in abreviated form and the data of collecting are given. The data of collecting localities are mapped.

Herbarial labels of the sheets contain various informations - sometimes very few - referring to the habitats and the altitudes of localities, these are figured in two tables. The two groups of data are analysed by the Shannon (1948) diversity index and by Pielou (1975) evenness also.

Abbreviations of collectors' names

Alexi	Alexi, A. P.	Kup.	Kupcok, S.
Andrs.	Andrasovsy	Le.	Lengyel, G.
Baksay	Baksay, L.	Lencsó	Lencsó, V.
Barth	Barth, J.	Má.	Mágócsy-Dietz, S.
Ber.	Bernátsky, J.	Mar.	Margittai, A.
Borb.	Borbás, V.	Márton	Márton, J.
Bs.	Boros, Á.	Moesz	Moesz, G.
Budai	Budai, J.	Nagy	Nagy, B.
Csap.	Csapody, V.	Pauca	Pauca, A. M.
Csató	Csató, J.	Pax	Pax
De.	Degen, Á.	Pénzes	Pénzes, A.
Feich.	Feichtinger, M.	Po.	Polgár, S.
Fil.	Filarszky, N.	Pócs	Pócs, T.
Flatt	Flatt, C.	Priszter	Priszter, Sz.
Gr.	Grundl	Rossi	Rossi, L.
Hazsl.	Hazslinszky, F.	Simk.	Simonkai, L.
Haynald	Haynald, L.	Szab.	Szabó, Z.
Heuff.	Heuffel, L.	Sz. L.	Szujkó-Lacza, J.
Jáv.	Jávorka, S.	Tausch.	Tauscher, J. A.
K.	Kováts, D.	T.	Tóth, S.
Ká.	Kárpáti, Z.	Th.	Thaisz, L.
Kár.	Károlyi, Á.	U.	Ujhelyi, J.
Kell.	Keller, J.	V.	Valkó, E.
Kmet	Kmet, Ág.	Wais.	Waisbecker
Ko.	Kocsis, J.		

Abbreviations of towns (Maps 1-2)

B. = Bucuresti (Rumania)
BE. = Beograd (Yugoslavia)
BP. = Budapest (Hungary)
BR. = Brasov (Brassó, Rumania)
BS. = Banska Stiavnica (Selmecbánya, Czechoslovakia)
BT. = Bratislava (Pozsony, Czechoslovakia)
C. = Cluj (Kolozsvár, Rumania)
CS. = Chernovtsy (Sovjet Union)
D. = Debrecen (Hungary)
G. = Graz (Austria)
GY. = Győr (Hungary)
K. = Kosice (Kassa, Czechoslovakia)
KP. = Kaposvár (Hungary)
M. = Miskolc (Hungary)
MU. = Mukachevo (Munkács, Soviet Union)
O. = Oradea (Nagyvárad, Rumania)
P. = Pécs (Hungary)
R. = Rijeka (Fiume, Yugoslavia)
SZ. = Szolnok (Hungary)
SZE. = Szeged (Hungary)
T. = Timisoara (Temesvár, Rumania)
U. = Uzhgorod (Soviet Union)
V. = Veszprém (Hungary)
W. = Wien (Austria)
Z. = Zagreb (Zágráb, Yugoslavia)

Other abbreviations:
Com. = Comitatus=County
Herb. = Herbarium

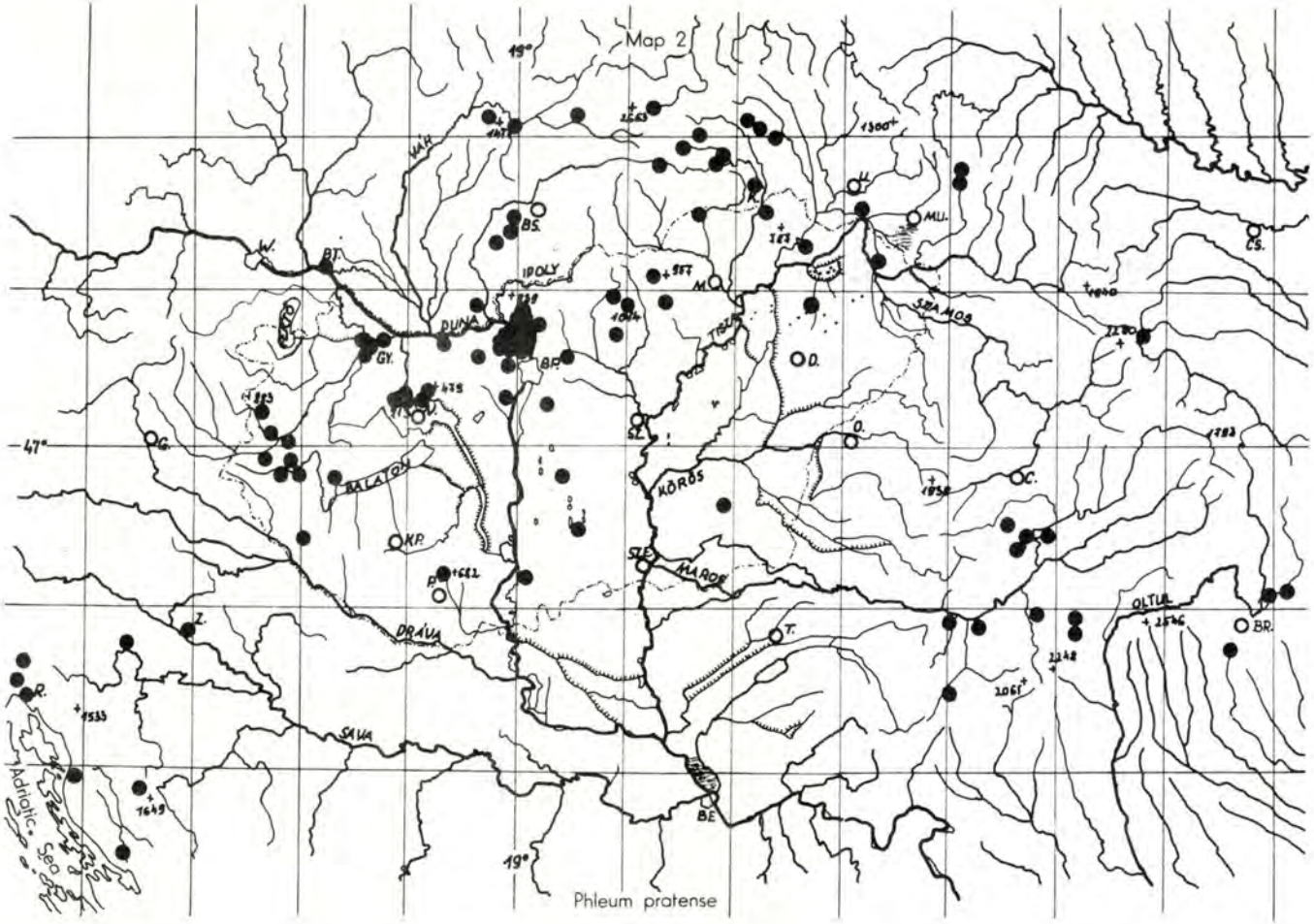
Map 1
49°
47°
DUNA
IPOLY
KÖRÖS
MAROS
DRÁVA
SAVA
KALADON
Adriatic Sea
Phleum Hubbardii

Phleum Hubbardii D. Kov.

Bagola 9568 (Com. Zala) Kár. 12,07,1948 - Bakonynána 8773 (Com. Veszprém) at valley "Galya-szurdok" U. T. K. 05,07,1974 - Bálinttelep (Com. Zólyom) at mountain "Krizsa" Herb. Th. 11,07,1911 - Bálvány 7888, 7988 (Com. Heves) near to Szilvásvárad, Baksay 07,07,1947 - Bártfa (Com. Sáros) near to "Alsóvizköz" Herb. Th. 12,07,1910 - Besztercebánya (Com. Zólyom) Herb. Hazsl. 12,07,1813 - Breznobánya (Com. Zólyom) Kup. 20,07,1902 - Burokvölgy 8773 (Com. Veszprém) near to Isztimér Pénzes 12,07,1949 - Carlopago (Com. Lika-Krbava) Herb. De. 20,06,1903 - Cirkvenica (Com. Modrus-Fiume) Herb. De. 21,06,1904 - Csúcstelek (Com. Bihar) Herb. De. 11,07,1914 - Dobsina (Com. Gömör) at "Langenberg" Herb. Le. 09,07,1929 - Dömös 8279 (Com. Komárom) Feich. 11,07,1858 - Eperjes (Com. Sáros) Herb. Hazsl. - Felső Meczenzéf (Com. Abauj-Torna) Herb. Th. 22,07,1910 - Felső-Vidra (Com. Torda-Aranyos) at mountain "Piatra" Herb. De. 24,07,1903 - Fiume (Com. Modrus-Fiume) Herb. De. 22,06,1908 - Gölniczbánya (Com. Gömör) Andrs. 08,07,1909 - Guthin (Com. Máramaros) at thermal spring "Bréb" Borb. 21,08,1876 - Gyöngyös 8285 (Com. Heves) at mountain "Sárhegy" 17,08,1920 - Hárskut 8872 (Com. Veszprém) near to Veszprém at mountains "Bakony" U. T. K. 04,07,1974 - Hernádtihany (Com. Abauj-Torna) at mountain "Dárius hegy" Th. 30,06,1908 - Hrastovica (Com. Zágráb) between Zagreb and Petrinja. Rossi 08,07,1891 - Ják 8865 (Com. Vas) Pénzes 20,07,1972 - Kassa (Com. Abauj-Torna) at mountain "Farkas hegy" Th. 25,06,1905 - Kisszalánc (Com. Abauj-Torna) at mountain "Dargo hegység" Herb. Th. 08,07,1910 - Kovászna (Com. Háromszék) at valley of river "Baszka" Jáv. 08,07,1914 - Kőszeg 8565, 8665 (Com. Vas) at edge of plaungh-land Wais. 07,06,1903 - Krbava (Com. Lika-Krbava) Rossi 25,07,1896 - Lavac (Com. Modrus-Fiume) at mountain Sneznik Herb. De. 30,07,1904 - Lőcse (Com. Szepes) Hazsl. ? - Lugos (Com. Krassó-Szörény) Herb. Haynald, Heuff. ? - Mihályi 9468 (Com. Sopron) at forest "Pelleni erdő" Kár. 23,07,1953 - Nagyszeben (Com. Szeben) Barth 16,08,1910 - Papuk, at mountain (Com. Verőce) Herb. Po. 18,06,1930 - Petrikeresztur 9266 (Com. Zala) Kár. 13,07,1956 - Pilisszentlászló 8279 (Com. Pest) Bs. 03,08,1952, K. 08,07,1978 - Raduc (Com. Lika-Krbava) at mountains Velebit Herb. De. 03,08,1906 - Pomáz 8380 (Com. Pest) at mountain "Kőhegy" Pénzes 01,07,1972 - Radna at mountain (Com. Beszterce-Naszód) at the peak of "Horthy-csúcs" Priszter 02,09,1943 - Ránk (Com. Abauj-Torna) Herb. Th. 14,07,1910 - Salgó 7984, 7884 (Com. Nógrád) beyond Salgótarján, at mountain "Salgóvár" U. 04,07,1966 - Senj Zengy (Com. Lika-Krbava) at mountains "Velebit" Herb. De. 10,08,1920 - Sladikovac (Com. ?) De. 17,07,1902 - Svica Herb. De. 14,08,1920 - Szentendre 8380 (Com. Pest) at mountains "Pilis" Pócs. 05,09,1951 - Szepes-Tótfalu (Com. Szepes) Herb. Hazsl. ? - Szilice et Aggtelek 7989, 7588 (Com. Borsod-Abauj-Zemplén) at "Haragistya" Herb. Bs. 15,06,1953 - Szkevisova (Com. Torda-Aranyos) Herb. De. 30,07,1903 - Szőce 9165, 9065 (Com. Vas) Kár. 03,07,1964 - Ungvár (Com. Ung) Herb. Hazsl. ? - Ünökő (Com. Beszterce-Naszód) at mountains "Radnai havasok" Herb. De. 17,08,1902 - Vác 8280 (Com. Pest) at mountains "Cserhát, Cserepes-hegy" U. 05,10,1971 - Zalalövő 9165 (Com. Zala) near Zalaegerszeg, at mountain "Nagy-hegy" U. V. 30,09,1970 - Zubrohlova et Slanica (Com. Árva) Herb. De. 10,07,1904 - Zvolen, Czecho-Slovakia at "Dolne Mirina" Pénzes 05,07,1958 - Yracac (Com. Lika-Krbava) at mountains "Velebit" Herb. De. 01,08,1905.

Phleum pratense L.

Abda 8371 (Com. Győr) near to the river "Rába" Bs. 17,07,1961 - Alcsut 8577 (Com. Fehér) Jáv.-Csap. 12,05,1961 - Alsó-Tátrafüred (Com. Szepes) at mountains "High Tátra" Herb. De. 17,07,1928 - Alsó-Vereczke (Com. Bereg) Th. 23,08,1907 - Bajaszentiván 9879 (Com. Bács-Kiskun) Baksay 09,06,1960 - Bakabánya (Com. Hont) Kup. 09,06,1908; 18,06,1908 - Bakonybél 8772 (Com. Veszprém) at mountain "Somhegy" Jáv. 06,07,1933 - Bakonynána 8773 (Com Veszprém) at valley "Galya szurdok" at mountains "Bakony" U. T. K. 05,07,1974 - Borsabánya (Com. Máramaros) at mountain "Esztena csúcs" Ká. 24,08,1942 - Brassó (Com. Brassó) Moesz 20,07,1905 - Budakeszi 8479 (Com. Pest) Jáv. 02,08,1959 - Budapest 8679, 8680, 8581, 8481, 8480, 8479, 8580, 8579 (Com. Pest) at mountain "Csúcshegy" Jáv. 30,06,1944 - near to the bridge "Erzsébet-híd" Pénzes 15,08,1956; at "Gyáli uti telep" Herb. De. 13,07,1915 - Kispest ? 26,06,1903 - near to "Közvágóhíd" Andrs. 29,06,1904; Ko. 12,07,1904 - "Lágymányos" Ká. 09,06,1931; Pénzes 05,06,1956; 19,06,1956; 25,06,1956 - at "Lipótmező" Ko. 25,06,1905 - "Pestszentlőrinc" Ber. 09,1904 - Between "Rákospalota and Megyer" Ber. 22,07,1903 - at mountain "Szemlőhegy" Flatt. 14,07,1900 - near to sports ground "Vasas pálya" Pénzes 03,07,1974 - at the sove of the artifical lake of "Városligeti-


Map 2
19°
47°
19°
DUNA
BALATON
KÖRÖS
MAROS
DRÁVA
SAVA
Adriatic Sea
Phleum pratense

tó" U. 08,1966 - "Zöldmál" Herb. De. 04,07,1913 - "Zugliget" Borb. 17,06,1895 - Chocs (Com. Lipto) ? 21,07,1888 - Csáklyai kő (Com. Alsó-Fehér) Haynald 07,1859 - Csap (Com. Ung) Má. 21, 07,1881 - Csorvás 9390 (Com. Békés) Th. 01,07,1888 - Dobsina (Com. Gömör) Le.18,07,1925; 05,08,1933 - Dömös 8279 (Com. Esztergom) at valley "Szőkeforrás völgye" Bo. 29,09,1919; Jáv.- Kell. 26,08,1944 - Eger 8280 (Com. Heves) at mountains "Bükk hegység Nagyeged" U. T. 08,09, 1971 - Eperjes (Com. Sáros) Hazsl. ? - Ercsi 8779 (Com. Fehér) Tausch. 13,07,1816; 13,07,1877 - Felsőtárkány 8088 (Com. Borsod) at mountains "Bükk hegység" Jáv. 18,07,1948 - Felsőmarosujvár (Com. Alsó-Fehér) Csató 27,07,1881 - Ferencháza-puszta 8371, 8372, 8271, 8272 (Com. Győr) ? - Fiume (Com. Modrus-Fiume) Herb. De. 15,06,1902; Herb. V. 21,06,1904; Le. 07,07,1908 - Gödöllő 8482, 8382 (Com. Pest) near to "Máriabesnyő" Jáv. 01,10,1948 - Gölnic (Com. Gömör) at valley"Sztracena" Herb. Le. 25,09,1940 - Gölnicbánya (Com. Gömör) Andrs. 08,07,1909 - Groseni (Com. Bihar) Pauca 09,07,1937 - Gyirmót 8371 (Com. Győr) ? - Gyöngyös 8285 (Com. Heves) at mountain "Sárhegy" Pénzes 25,09,1949; at mountains Mátra at the top "Kékes-tető" U. 23,07,1871 - Győr 8371, 8271, 8372, 8272 (Com. Győr-Sopron) Herb. Po. 23,08,1915; 27,06,1916; at river side "Rába" beyond "Miska hegy" Herb. Bs. 18,07,1918; 25,06,1919 - Hárskut 8872 (Com. Veszprém) at mountain "Bakony hegység" at valley "Esztergáli völgy" U. T. K. 04,07,1974 - Helemba (Com. Hont) at river side "Ipoly" Gr. 06,1858 - Hutaszentlélek 8278 (Com. Pest) at mountain "Széplak" Herb. Bs. 30,09,1919 - Igló (Com. Szepes) Fil. 13,07,1900 - Isztimér 8775 (Com. Veszprém) at mountain "Bakony hegység" at valley "Burokvölgy" beyond "Székesfehérvár" K. U. 05,07, 1974 - Izbég 8380 (Com. Pest) near to Szentendre Herb. De. 15,07,1900; 25,06,1902 - Ják 8865 (Com. Vas) Pénzes 20,07,1902 - Jelenje at Lazac (Com. Modrus-Fiume) Herb. De. 29,07,1907 - Kassa (Com. Abauj-Torna) Jáv. 21,08,1941 - Karlovac (Károlyváros) (Com. Zágráb) Rossi 25,04, 1904; 25,06,1904 - Kászon (Com. Csik) Alexi ? - Keszthely 9269 (Com. Zala) Borb. 27,07,1893; Kár. 18,06,1947 - Kékestető 8186 (Com. Heves) at the highest top of mountains "Mátra-hegység" U. 25,09,1974 - Kiskőrös, 9381 (Com. Bács-Kiskun) at forest "Szücsi erdő" SzL., K. 31,07,1979 - Kiskunhalas 9582, 9583 (Com. Bács-Kiskun) Herb. Bs. 01,08,1919 - Kisszalánc (Com. Abauj-Torna) at mountain "Dargó hegység" Th. 07,07,1910 - Kis Torony (Com. Szeben) Simk. 03,07,1904 - Komló 9875 9775 (Com. Baranya) beyond Pécs, at mountains "Mecsek hegység" Jáv. 27,06,1948 - Koncza (Com. Alsó-Fehér) Csató 27,06,1860 - Koronco (Com. Győr) at the riverside "Marcal" Po. 14, 06,1916 - Kőpataki tó (at lake, Com. Szepes) at mountains "Magas Tátra" Fil.30,07,1903 - Kőszeg 8565, 8665 (Com. Vas) Wais. 14,08,1896; 25,06,1900; 10,08,1902; 05,07,1903 - Larac (Com. Modrus-Fiume) at mountains "Sneznik" Herb. De. 30,07,1904 - Leányfalu 8280 (Com. Pest) at mountains "Pilis hegység" Pócs 03,09,1950 - Mali Halon (Com. Lika-Krbava) at mountains "Velebit" Herb. De. 1912 - Matlárháza (Com. Szepes) at mountains "Magas Tátra" Jáv. 01,07,1953 - Mátrafüred 8185 (Com. Heves) at mountains "Mátra-hegység" beyond Gyöngyös U. 25,09,1974 - Medak (Com. Lika-Krbava) Herb. De. 07,08,1909 - Misefa 9167 (Com. Zala) Ká. 01,07,1961 - Miskolc 7790, 7889, 7890 (Com. Borsod-Abauj-Zemplén) Budai 16,07,1905 - Mosócz (Com. Turóc) Lencsó 03,07,1906 - Munkács (Com. Bereg) at mountain "Pálhegy" Mar. 08,1911 - Müska (Com. Alsó-Fehér) Pax 09,08,1897 - Nagyenyed (Com. Alsó-Fehér) Csató 14,06,1879; 25,07,1880; 30,05,1883 - Nagykanizsa 9567, 9568 (Com. Zala) Kár. 28,06,1945 - Nagymaros 8279 (Com.Pest) Fil. 06,08,1902 Nagyszeben (Com. Szeben) Simk. 02,07,1904 - Nógrádverőce 8180 (Com. Pest) at mountain "Cserepes tető" U. 05,10,1971 - Nyiregyháza 8096 (Com. Szabolcs-Szatmár) Simk. 1868 - Ócsa 8781, 8681 (Com. Pest) Jáv. 09,07,1950 - Őskü 8874 (Com. Veszprém) ? 16,07,1895 - Páhi 9282 (Com. Pest) at forest "Kulléri erdő" Herb. Bs. 03,08,1930 - Pilisszántó 8379 (Com. Pest) at mountain "Pilis hegység" Szabó and Le. 19,09,1909 - Pilisszentlászló 8279 (Com. Pest) at mountain "Pilis hegység" K. 08,07,1975 - Pilisvörösvár 8379 (Com. Pest) Nagy 09,07,1972 - Plesui (Com. Hunyad) at mountains "Retyezát" Jáv. 14,07,1909 - Plitvice (Com. Lika-Krbava) et mountain "Kapella" Rossi 12,07,1893 - Pomáz 8380 (Com. Pest) at mountain "Csikóvár" Pénzes 20,07,1948; at mountain "Kőhegy" De. 29,06,1916; 04,08,1918; Pénzes 03,08,1948; 01,07,1972; 18,07,1972; at mountain "Nagycsikóvár" U. 08,09,1974 - Pozsony (Com. Pozsony) De. 09,09,1883 - Prencow-Harrman (Com. Hont, Berecsfalu) Kmet. 16,08,1890 - Prencow (Com. Hont) at mountain "Sytno" Kmet. 17, 08,1890 - Rajecfürdő (Com.Trencsén) Borb. 20,07,1898 - Ravazd 8472 (Com. Győr) Po. 21,07,1909 - Retyezát (at mountains, Com. Hunyad) at valley "Kolozsvári völgy" Herb. De. 01,08,1907 - Rétyi-Nyir (Com. Csik) Moesz 18,07,1907 - Szászváros (Com. Hunyad) Csató 06,1869 - Sejn (Com. Lika-Krbava) Herb. De. 13,08,1920 - Sorkitótfalu 8865 (Com. Vas) near to "Kisunyom" Márton 05, 1889 - Sublechnicz (Com. Szepes, Alsólechnicz) at river Dunajec Simk. 05,07,1907 - Szamárhegy and Ágasvár 8084 (Com. Heves) at mountains "Mátra hegység" U. 26,09,1974 - Szentendre 8380 (Com. Pest) ? 17,07,1870; at valley "Dömölkapu" Herb. De. 15,07,1917; 15,08,1920; at "Sikáros" Bs. 17,06,1945 - Szilvásvárad 7888, 7988 (Com. Heves) at mountains "Bükk hegység" at the top of

Table 1. Distribution of Phleum Hubbardii and Ph. pratense according to habitats

Species \ Habitats	All kinds of meadows					forests or skirts of forests	sea side	rivulets or river-sides, shores of lakes	muddy places	clay places	margins of plough land	waste places along ditchs and roads	rocky moun-tain slopes	different base rocks
	Hilly (or alpine) meadows		Meadows											
	from hilly to alpine meadows	dry hilly meadows	meadows	dry meadows	wet meadows									
Phleum Hubbardii														
number of presence	32	7	5	-	2	5	4	-	-	-	-	-	3	-
per cent	56.1	12.3	8.8	-	3.5	8.8	7.0	-	-	-	-	-	5.3	-
	68.4		12.3											
	80.7													
Phleum pratense														
number of presence	50	-	12	6	9	9	2	5	1	3	6	37	-	10
per cent	33.3	-	8.0	4.0	6.0	6.0	1.3	3.3	0.7	2.0	4	24.6	-	6.7
			18.0											
	51.3													

Key to abbreviations: H' = value of diversity; J = evenness; N = number of specimens; S = number of habitat's categories

H'= 2.105817
J = 0.7501071
N = 58 S = 7

H'= 2.844658
J = 0.7934971
N = 150 S = 12

Table 2. Distribution of Phleum Hubbardii and Ph. pratense according to altitude

Altitude in m / Species:	0 - 99	100 - 199	200 - 299	300 - 399	400 - 499	500 - 599	600 - 699	700 - 799	800 - 899	900 - 999	1000 - 1099	1100 - 1199	1200 - 1299	1300 - 1399	1400 - 1499	1500 - 2199	2200 - 2299
Phleum Hubbardii number of precence	4	2	6	6	17	4	4	4	4	1	1	1	2	-	-	-	2
per cent	7.0	3.5	10.5	10.5	29.8	7.0	7.0	7.0	7.0	1.8	1.8	1.8	3.5	-	-	-	3.5
Phleum pratense number of presence	3	41	24	22	12	10	8	10	6	3	1	3	2	-	2	-	-
per cent	2.0	27.9	16.3	15.0	8.2	6.8	5.4	6.8	4.1	2.0	0.6	2.0	1.4	-	1.4	-	-

Key to abbreviations: H' = value of diversity; J = evenness; N = number of specimens; S = number of altitude's categories

H' = 3.297691
J = 0.8661369
N = 58 S = 14

H' = 3.15179
J = 0.8278161
N = 147 S = 14

"Bálvány" U. 08,07,1971 - Szokolya 8180, 8179 (Com. Pest) Borb. 30,06,1873 - Szolnok 8887, 8886 (Com. Szolnok) Herb. Hazsl. ? - Szomód 8376 (Com. Komárom) Bs. 01.08,1925 - Tapolca 9170 (Com. Borsod) Budai 23,07,1907 - Tákos 7800 (Com.Szabolcs-Szatmár) at forest "Bockerek erdő" ? 15, 07,1948 - Tölcsvár (Com. Brassó) Herb. De. 25,07,1902 - Trnovac and Debelo-brdo (Com. Lika-Krbava) Herb. De. 20,08,1910 - Vác 8280 (Com. Pest) at mountains "Cserhát, Cserepes hegy" U. 05,10,1971 - Visegrád 8279 (Com. Pest) Simk. 06,30,1872; Herb. De. 30,07,1916 - Volocz (Com. Bereg) Th. 24,08,1907 - Zágráb (Com. Zágráb) Rossi 01,07,1879 - Zalalövő 9175 (Com. Zala) near to Zalaegerszeg, at mountain "Nagy hegy" U. V. 30,08,1970.

Discussion

The two species are recorded and devided into groups of habitats according to the data of labels in Table 1. Phleum pratense L. occurs in 12 different habitats, while Phleum Hubbardii D. Kov. was collected only in 7. Phleum pratense gives the higher diversity of habitat values, the evenness is also high. It has comparatively high frequency values in meadows of hilly and mountainous regions of medium heights. It is often found in waste places, roadsides and margin of plough-lands also (nearly a quarter of the data).

Because of its water requirement it is native on moist soils of water-meadows and other low-lying grasslands, riversides, shores of lakes, muddy places (Table 1). This frequency value is showing the capacity of adaptation for different habitats and weedy characters of this species.

Phleum pratense is an important fodder plant, a relatively tall grass, it is very suitable for hay, altough the leafy persistent indigenous strains make good pasture grasses when used in combination with other herbage plants. It has been cultivated for more than two centuries, that is evidently promoted its spraeding not only in Hungary and Europe, but in the whole world.

Since the two species have often been confused with each other, it seems more probably, that the grass seeds (grains) of Phleum pratense have been mixed with those of Phleum Hubbardii (Ph. nodosum). It may be supposed that in this way both species have spreaded in the temperate regions all over the world. Nevertheless, Phleum pratense has higher distribution and diversity of habitats. It seems very likely because the capacity of adaptation for different natural habitats of Ph. pratense is much better than of Ph. Hubbardii, moreover the weedy character of Ph. pratense also promoted to its distribution. It is supported by the fact that the herbarial specimens - are found at our herbarium and collected randomly over a long period - of Phleum pratense are nearly triple in number than Ph. Hubbardii.

Phleum Hubbardii was collected mostly in different meadosw also (80.7% of data), especially from hilly (dry hilly meadows) to alpine meadows, in 56% of data, but not living in waste places and not native on moist soils (Table 1).

According to the data of labels the two Phleum species could be arranged in 14 categories of altitudes (Table 2). Diversity of altitudes of both species are nearly equal, but in the case of Phleum Hubbardii it is a little bit higher, because its adaptation for higher places seems to be better than that of Ph. pratense. Phleum Hubbardii is more frequent at about 400-500 m, while Ph. pratense is living mostly at about 100-200 m above sea level.

It is obvious that the cultivation, the weedy character and the water requirement of Phleum pratense have an influence on its diversity of altitude also. This species is living rather in lowlands, partly on the plains, on the other hand, Phleum Hubbardii occurs mostly on the hills and mountains of medium heights, or higher places on old grassland. The Adriatic sesside is the lowland place where Ph. Hubbardii is found in a comparatively greater percentage (Maps 1-2, Table 2).

Conclusion

It may be supposed that the two Phleum species were cutivated under the name of Phleum pratense, as an important fodder plant. Nevertheless Ph. pratense is more distributed and has higher diversity of natural habitats than Ph. Hubbardii. Ph. pratense shows greater adaptability to different habitats, probably partly issuing from its weedy character. All the two species mostly are

living on different meadows, especially Phleum Hubbardii (80.7%).

It is not the same in the diversity of altitude here the value is about equal, a little bit higher in Ph. Hubbardii, probably it is adaptated to higher places better than Ph. pratense.

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