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Distribution and diversity of three Astragalus taxa (Leguminosae)

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Abstract: Author studied Astragalus exscapus L., A. exscapus var. caulifer Borb. emend. Szujkó-Lacza and Astragalus dasyanthus Pall. in Hungary and Czechoslovakia. They occur in different types of soil and the localities are scattered. The population of the same species occur separately from each other, determined by the discontinuity of the localities. Numerous localities have disappeared up to the present day. The area-overlap of the examined species exists only between the rivers Duna and Tisza where the eastern border line of the Astragalus exscapus and the western one of the Astragalus dasyanthus are.

Introduction

Within the framework of the "Flora of Central Europe" area investigations have been continued concerning three Astragalus taxa. For this purpose we studied the herbaria of the Botanical Department of the Hungarian Natural History Museum (BP) and during the study trip the herbaria of Bratislava, by the help of K. ZAHRADNIKOVA and L. BERTOVA; and the herbarium of the Natural History Museum of Prague in Pruhonice near Prague. Moreover, by the help of M. HUSOVA and J. HOLUB. (Sz.L.) have paid a visit to the "locus classicus" of Astragalus exscapus and A. exscapus var. caulifer Borb. in Mount "Radobyl" at Litomeritz and Oblik Mts. at Louny in the Bohemian Central Mountain. Both are basalt cones lying far from each other. Because some differences can be found between the floristical compositions of the two mountains, and A.e.var.caulifer occurs only in the Oblik Mts., we decided to publish the data of the herbaria of Czechoslovakia referring to the two Astragalus taxa. Before collecting of the data from the herbarium sheets of the examined Astragalus taxa was started a taxonomical revision of them had to be made by SZUJKÓ-LACZA (1981). BECK (cf. REICHENBACH 1903) used the name of Astragalus exscapus f. scaposus Beck and Soó (1966, 1973) followed it and they have given the name of A. exscapus f. caulifer as a synonim. After studies of the sheets of BP we found the most probable holo- or lectotype specimens of the A. exscapus var. caulifer Borb.. According to BORBÁS (1885a, 1885b) this name is older than the f. scaposus by Beck (l.c.). Since the description was published in a short form and in German language (BORBÁS 1885a).

Material and methods

The data of the labels are listed below and other information is collected in Table 1. The enumeration of localities is put in a, b, c, order followed by the code number of grid(s) according

to NIKLFELD (1971) and completed in Hungary by BORHIDI and his coworkers (mscr), if the data refer to the area of the Central European Flora and the Hungarian territory of today. The name of the county is in brackets, in accordance with the data of the label and irrespective of the change in the name of the village and county after the World War I in different countries. But we did not give code numbers outside of the grids that are beyond Hungary. After this the loci are given (inverted commas) bordering the village(s). The name of collector(s) are given in shortened form except the Czechoslovakian ones, and the date follows. Data of localities are mapped. The types of soil, in which the Astragalus taxa grow were analysed with the diversity index, elaborated by SHANNON (1948) and the evenness was calculated according to PIELOU's (1975) information.

Abbreviations of collectors' names

Aj.	= Ajtai J.	Ková.	= Kováts J.
Ands.	= Andrasovszky	Kümm.	= Kümmerle J.B.
And.	= Andreánszky G.	Le.	= Lengyel G.
Bar.	= Barth J.	M.	= Margitai L.
Br.	= Bartha A.	Má.	= Mágócsy-Dietz S.
Bánó	= Bánó L.	Moesz	= Moesz G.
Ber.	= Bernátsky J.	N.	= Nendtvich K.
B.	= Bilimek	Ny.	= Nyárády Gy.
Borb.	= Borbás V.	Papp	= Papp J.
Bs.	= Boros Á.	Per.	= Perlaky G.
Csap.	= Csapody V.	Pénzes	= Pénzes A.
Csató	= Csató J.	Pét.	= Péterfi M.
De.	= Degen Á.	Po.	= Polgár S.
Dietz	= Dietz S.	Pro.	= Prodan J.
Do.	= Dorner	Rpcs.	= Rapaics R.
E.	= Egey A.	Ráp.	= Rápóti J.
Facsar	= Facsar G.	R.	= Richter A.L.
Fil.	= Filarszky N.	Ro.	= Rochel A.
Fuss	= Fuss M.	S.	= Sadler J.
G.	= Gammel A.	Simk.	= Simkovics L.
Ge.	= Gerenday J.	Sim.	= Simonkai L.
Gomb.	= Gombocz E.	Soó	= Soó R.
Gr.	= Greinich F.	Sza.	= Szabó E.
Har.	= Hargitai Z.	Sz.	= Szabó L.
H.	= Haynald L.	Szé.	= Szépligeti L.
Hazsl.	= Hazslinszky F.	Szt.	= Sztankov J.
He.	= Hermann G.	SzL.	= Szujkó-Lacza J.
Heu.	= Heuffel J.	Szur.	= Szurák
Hul.	= Hulják J.	Tam.	= Tamássy G.
J.	= Janka V.	Tausch.	= Tauscher J.
Jáv.	= Jávorka S.	Th.	= Thaisz L.
Ká.	= Kárpáti Z.	Tim.	= Timkó Gy.
Kiss	= Kiss Á.	Tur.	= Turnan
Koch.	= Kochmeist	Tuzs.	= Tuzson J.
Ko.	= Kocsis I.	V.	= Vajda L.
Ksz.	= Koszilkov J.	Wa.	= Wagner J.
Kov.	= Kovács Gy.	Wan.	= Wanisch S.
K.	= Kováts F.	W.	= Wolff J.

Other abbreviations: at le.= at lake; Com. = Comitat (County); □ = The data is lacking on the herbarium labels; (?) collector's name is lacking on the herbarium labels.

Astragalus exscapus L.

Ács 8274 (Com. Komárom), at the river "Concó patak", Bs. 26.04.1934 - Budapest 8479, 8480, 8481, 8580, 8581 (Com. Pest), "Zugliget", Pénzes 04.06.1949; "Disznófő", V. 08.1912; Bs. 30.04.1925; Pénzes 05.05.1949; "Jánoshegy", G. 05.05.1922; "Óbuda", Má.-Dietz; between "Csömör" and "Rákospalota", Per. 27.06.1888; "Kispest", Ko. 14.05.1909; "Rákos", Kov. 06.1856; N. 06.1863; Borb. 14.06.1871; Simk. 04.06.1874; R. 18.09.1878; Szé. 04.06.1879; Szé. 03.06. 1881; He. 21.09.1881; Sz. 22.09.1881; Fil. 13.05.1891; Fil. 03.06.1891; Fil. 03.07.1891; Ksz. 08.05.1914; S. 05.1821; Do. 1896; Ge.□; Hazsl.□; R.□ - Császártöltés 9581 (Com. Pest), H. 05.1876 - Csepel island 8679, 8779 (Com. Pest), "Tököl", Simk. 10.05.1902; Simk. 20.06.1902; "Szigetujfalu", Ká. 09.05.1943; V. 09.05.1943; Papp 06.05.1948 - Alsó-Dabas 8881 (Com. Pest), Pénzes 17.05.1936 - Dunakeszi 8380 (Com. Pest), Le. 15.05.1905; Le. 08.06.1905; Simk. 20.06. 1905; Ká. 08.05.1938; Pénzes 05.06.1947; And. 06.06.1947 - Dunavarsány 8780 (Com. Pest), "Varsány hegy", SzL. 14.05.1980; SzL. 21.05.1980; 18.06.1980 - at le "Fertő tava", B.□ - Fót 8381 (Com. Pest), "Somlyó-hegy", Jáv.-Csap. 14.05.1955; Csap. 29.05.1962 - Göd 8380 (Com. Pest), Bánó 05.06.1947; "Alsógöd", Ká. 15.06.1938; Ká. 01.05.1943; "Felsőgöd", De. 27.08.1916; De. 17.08.1924; De. 09.06.1930; Ká. 11.06.1936 - Hajós 9680 (Com. Pest), H.□ - Győr 8272 (Com. Győr), Po. 23.05.1903; Bs. 02.05.1920 - Győrszentiván 8372 (Com. Győr), Po. 23.09.1930 - Győrszentjános 8273 (Com. Győr), Po. 16.05.1909 - Megyer 8380, 8480 (Com. Pest), Papp 28. 05.1949; "Békásmegyer", Simk. 02.05.1874; "Káposztásmegyer", Fil.-Kümm. 15-05.1905; Th. 16. 06.1905; Le. 06.1906; Tuzs. 15.05.1909; Ads. 18.05.1909; Bs. 09.05.1917; Bs. 21.04.1918; Jáv. 12.05.1922; Pénzes 28.05.1933; Jáv.-Csap. 17.09.1935 - Páty 8497 (Com. Pest), Koch□ - Sükösd 9780 (Com. Pest), Moesz 12.07.1912; Gr. 01-05.1920 - Szentendrei island 8380 (Com.Pest), Jáv.-Csap. 01-07.1947; Jáv. 17.09.1948 - Szentmártonkáta 8584 (Com. Pest), Gomb. 25.05.1925 - Sződ 8280, 8281 (Com. Pest), Ká. 28.04.1936 - Szőny 8274, 8275 (Com. Komárom), Tur. 29.06. 1859 - Vasad 8682 (Com. Pest), Bs. 18.05.1918 - Vác 8280 (Com. Pest), Moesz-Jáv. 13.05.1920; Jáv. 11.05.1930. - Védény (Com. Mosony), Th. 11.06.1914.

In Czechoslovakia: Slovakian Karst - J. Michalko (ex verb) - Stúrovo (Párkány) "Cenkov puszta", M. Holubíkova and R. Ondraková 19.05.1952; F. Weber 05.1976. - Moravian: Čejče = Čeič "Obecny", J. Bayer 30.05.1852; 10.08.1885; M. Deyl 9.05.1940 - between Zleloy and Čeič; F. Weber 05.1928; 05.1938 - Hustopeč, "Pouzdranské strané", S. Schuster 26.06.1921; F. Weber 05.1927; 15.05.1932 - Kyov, "Bilé stény" supra Zeletice, F. Weber 05.1927 - Müstern (?) Alborn 09.05.1881 - Pourdran, "Kolby", J. Smarda 05.1922; 10.05.1923 - Bohemian: Bečon, "Langenberg", J. Podpeřa 05.1899 - Čžernosek, Malinsky 07.1853 - Dreikrenzburg, F. Petrák 05.1909 - Litomeřitz, "Mt. Radobyl", Čelakovsky 06.1870; K. Tocl 06.1894; 1895; J. Schubert 18.05.1898; J. Podpeřa 06.1902; E. Leiblatt 06.06.1911; J. Polivka 27.05.1924; J. Klástersky 08.05.1926; M. Deyl 08.05.1936; J. Hampel 18.05.1951; J. Soják 16.06.1956; J. Holub, M. Husova and SzL. 23.05.1980 - Louny, "Mt. Oblik", L. Fiala 06.1902; J. Holub, M. Husova and SzL. 23.05.1980 - Minica, "Krahepy", K. Tocl 13.06.1895; Rochlena 06.1899; F. Rosicky 25.95.1973 - Obrnice, "Lázne Zlatnik", (Com. Teplice), A. Beregerová 27.05.1962 - Seidovitz, "Klampenberg", Schubák 17.05.1890 - Teplitz, M. Winkler 1852 - Zákolony, river bank of "Zákolansky", M. Deyl 06.1941.

Astragalus exscapus var. caulifer Borb. emend. Sz.L.

Ács 8274 (Com. Komárom), Bs. 26.04.1934 - Budapest 8479, 8580, 8581 (Com. Pest), "Zugliget", Borb. 06.1891; Borb. 18.05.1893; V. 08.1912; Bs. 30.04.1925; M. 24.05.1929; "Disznófő", K. 18.05.1934; Pénzes 16.06.1958; "Rákos", Borb. 14.06.1871; Szé. 03.06.1881; Borb. 11. 07.1888 (lectotyp!); Fil. 30.05.1889; Per. 20.06.1892; De. 10.05.1898; Sza. 24.05.1898; "Stateforest", Do. 05.1893 - Császártöltés 9581 (Com. Pest), H. 05.1876 - Csepel island 8580, 8679 (Com. Pest), "Sorokšár", Kov. 29.05.1931; "Tököl", Tausch. 29.06.1872; Simk. 20.06.1902 - Dunaharaszti 8680 (Com. Pest), Szt. 04.06.1944 - Dunakeszi 8380 (Com. Pest), Simk. 10.06. 1894; E. 23.05.1928 - Dunavarsány 8780 (Com. Pest), SzL. 06.1979; SzL. 14.05.1980; SzL. 21.05.1980 - Fót 8381 (Com. Pest), De. 21.05.1901; V. 17.05.1930 - Göd 8380 (Com. Pest), De. 09.06.1930; De. 09.06.1931; "Alsógöd", Ká. 15.06.1938; Papp 02.09.1956; "Felsődög", De. 09.06.1930; De. 09.11.1930; Ká. 24.05.1936; Soó 28.08.1948 - Gyéres (Com. Kolozs), Simk.

23.08.1889 - Hajós 9680 (Com. Pest), H. □ - Megyer 8380 (Com. Pest), Papp 11.09.1948; "Békásmegyer", Per. 30.06.1891; "Káposztásmegyer", Fil.-Kümm.-Jáv. 25.05.1916 - Nádudvar 8592, 8593 (Com.Hajdu), (?) 08.05.1882 - Páty 8478, 8479 (Com. Pest), Koch □ - Peszéradacs 8981 (Com.Pest), Bs. 29.06.1920 - Sári 8781 (Com. Pest), Le. 26.06.1926 - Soroksár 8580 (Com. Pest), Th. 27.05.1904 - Sükösd 9780 (Com. Pest), Gr. 23.04.1912 - Szentendrei island 8380 (Com. Pest), Jáv.-Csap. 01.07.1947 - Szentmártonkáta 8584 (Com. Pest), Gomb. 25.05.1925 - Sződ 8280, 8281 (Com. Pest), between Sződ and Göd, Ber.-Kümm. 18.06.1902 - Vasad 8682 (Com. Pest), Bs. 18.05.1918 - Vác 8280 (Com. Pest), Jáv. 11.05.1930.

In Czechoslovakia: Moravian - Čejče, "Obecny", J. Bubela □ - Hustopeč, "Pouzdransky kopcun", S. Schuster 1921 - Müstern (?), Alborn 29.06.1886 - Bohemian: Litomeřitz, "Mt. Radobyl", Celakovsky 06.1870; J. Holub, M. Husova and SzL. 23.05.1980.

Astragalus dasyanthus Pall.

Abaujszántó 7793 (Com. Abauj-Torna), in the mountain "Süveges hegy", Kiss 09.08.1937 - Abtsdorf (Pókafalva) (Com. Alsó-Fehér), Bar. 10.06.1875 - Acsa 8282 (Com. Fejér), Tausch. 06.1877 - Adony 8879 (Com. Fejér), Tausch. 20.07.1877; Tausch. 25.06.1879; Tausch. 25.07. 1879 - Alibunár (Com. Torontál), H. 06.1872; Th. 01.06.1911 - Al-Vincz (Com. Fejér), Csató 21.06.1871; Csató 11.07.1871; Csató 11.06.1874; Csató 13.06.1877; Csató 02.06.1878; Csató 13.06.1884 - Banat (Com. Torontál), Heu.□ ; Ro. □ - Borberek (Com. Fejér), in the mountain "Véres hegy", (?) 06.1858; Csató 20.06.1868 - Bugac 9384 (Com Pest), Ráp. 1950; "Nagy-Sivány", Szur-Tim. 24.05.1914; Bs. 24.06.1918; "Orgovány" 9282, Jáv. 25.06.1920 - Kis-Bócsa 9382 (Com. Pest), V. 21.05.1957 - Carlsdorf (Com. Torontál), Borb. 29.06.1874 - Cibinium (Com. Szeben), Ková. □ - Csetelke (Com. Kolozs), J. 12.06.1876 - Mező-Nagy-Csán (Com. Torda), W. 07.1893 - Debrecen 8495, 8496 (Com. Hajdu), Gomb. 06.1901; Rpcs. 15.06.1914; "Haláp", Tam. 26.05.1922 - Delfblat (Com. Temes), Wa. 10.06.1896; Wa. 06.1900; Wa. 05. 1908; Wa. 06.1908; De. 12.06.1911; Ma.-Dietz. 11.05.1913; Th. 29.05.1913; Tuzs. 08.06.1913; Aj. 16.06.1914; "Fejértelep", Wan. 11.05-1901; Ber. 03.07.1901; Ber. 09.06.1902; Ber. 10.06. 1902; Tuzs. 26.06.1911; Jáv. 23.04.1917; "Flamunda", De. 16.06.1887; Ber. 13.06.1904; "Garaboncz", Le. 02.06.1912; "Rosiana-kut", Le. 03.06.1912 - Dubovacz (Com. Temes), Ro. 1830 - Grossscheuern (Com. Szeben), Fuss □ ; "Hermannstadt" (Nagyszeben), Fuss 19.06.1878; in the mountain "Zaikelsberg", Simk.-Fuss 16.06.1881; "Salzenburg", Fuss □ - Hajós 9680 (Com. Pest), H. □ - Marosvásárhely (Com. Maros-Torda), in the mountain "Szt. Anna", Ny. 23.06. 1912 - Nyiregyháza 8096 (Com. Szabolcs), Hazsl. □ - Soroksár 8580 (Com. Pest), Kov. 29.05.1931 - Suát (Com. Kolozs), Pét.- Pro. 09.08.1921 - Szék (Com. Szolnok-Doboka), Har. 29.06.1943 - Tarna Eörs 8486 (Com. Heves), Tausch. 07.1863 - Tarcal 7894 (Com. Zemplén), in the mountain "Kopasz", Bs. 30.05.1927; Hul. 21.07.1927; Jáv. 01.06.1936; "tarcali temető" (cemetery at Tarcal), Facsar 1979 - Tokaj 7894 (Com. Zemplén), in the mountain "Nagy hegy", Hul. 01.07.1916; in the mountain "Kiskopasz", Bs. 26.09.1926; in the mountain "Nagykopasz", Hul. 06.1933; Br. 10.06.1935; "Ménesoldal", Hul. 18.07.1937; "Lencsésoldal", Hul. 04.06. 1939 - Torda (Com. Torontál), H. 06.1860; W. 06.1893 - between Ulma and Mramorek (Com. Temes), Simk. 20.07.1889 - between Záh and Frata (Com. Torda-Aranyos), J. 15.05.1869.

In Czechoslovakia: Urmitu z Nitranska (= Ürmény), (Com. Nitra), Dostal, 1950.

Discussion

According to the data presented here and the distribution map the localities of the three Astragalus taxa appear as insules in the examined area and are determined by the discontinuity of suitable soil types in Hungary, and in Czechoslovakia also. Astragalus exscapus and A. exscapus var. caulifer often occur together in Hungary except a few loci and in Mt. Radobyl at Litomeřitz but in Mt. Oblik at Louny only the Astragalus exscapus has been growing for more than one hundred years, though both localities can be found on basalt rocks.

The area of Astragalus exscapus and that of A. exscapus var. caulifer are narrow in Hungary

and they can always grow in different steppe communities (cf. SZUJKÓ-LACZA l.c.).

Astragalus dasyanthus is more extended and the different populations of this species grow in different communities from the margin of oak-forests to the steppe.

Comparing the areas of Astragalus exscapus (Albania, Austria, Bulgaria, Czechoslovakia, Germany, Greece, Switzerland, Spain, Hungary, Italy, Rumania, c.f. CHATER 1968) and A. dasyanthus (S.E. Europe extending northwards to Hungary to C.53° in C. Russia, Bulgaria, Hungary, Yugoslavia, Rumania Rs), (C,W,E) (c.f. CHATER l.c.) with the localities of the two species in the Carpathian Basin and in the Great Hungarian Plain we can come to the conclusion that there is an spatial "overlap" in these territories. Geographically, the eastern border of the area of A. exscapus and the western one of A. dasyanthus is in Hungary (except only some locality of both species in Rumania and Czechoslovakia respectively see Map 1). A. dasyanthus has only one loci in Czechoslovakia at Urminu (Ürmény) (Com. Nitra) (c.f. DOSTAL 1950) near the Hungarian localities. The overlap exist between the two species areas only in two localities. One of these is in outskirts of Budapest s.l. and the other is in Deliblat, between the rivers Duna and Tisza.

In Hungary A. dasyanthus prefer hills, except the localities between the rivers Duna and Tisza (see Map 1). In Deliblat both species grow on lowland on calcifilous sandy soil. Probably (similarly to the numerous other continental and East- and West-Illirian species) the Deliblat or beside it the hills were that of the territories introducing the A. exscapus and A. dasyanthus from the opposite direction towards the Great Hungarian Plain. (Both species are absent in the Transdanubia; see Map 1). Taking into consideration the areas of the two species generally and concretely in Hungary, A. exscapus is a Mediterranean-Alp-Balkan-Pannonian or South- and Central European-Balkan-Pannonian species and A. dasyanthus is a continental East-Illirian-Pannonian one.

The number of localities of the three taxa is decreasing rapidly in consequence of increase of cities, towns, villages but also due to the intensivities of agriculture. (Where the A. dasyanthus occurs the soil is rich in humus, and it is suitable for afforestation in the Great Hungarian Plain and for agriculture, too c.f. MAGYAR 1933, 1961.) A. exscapus and A. exscapus var. caulifer disappear from the sandy soil around Budapest though numerous herbarium sheets were collected from "Obuda", "Rákos", "Soroksár", etc.. They occur in Astrogalo-Festucetum rupicolae danubiale assotiation at Dunavarsány "Varsány hegy" approximately 30 km south of Budapest which is probable the nearest locality around the capital of Hungary today. (Probably both species grow in Buda hills e.g. "Zugliget", "Disznófő" up to the present.)

In the BP there are 78 sheets of A. exscapus and 51 sheets of A. exscapus var. caulifer, and there are numerous in Czechoslovakia, too. The number of the sheets of A. dasyanthus is 74 all together but numerous sheets were collected from the same localities, or some of them did not contain any information of the type of soil where one or another Astragalus species grow. Therefore, Table 1 contains fewer numbers of localities than the number of herbarium sheets refering to the species respectively.

Table 1. Distribution of specimens of the three Astragalus taxa according to soil types

Type of soil / Name	Calcifilous sand	Acidifilous	Calc. rocks	Loess	Andesitic	Basaltic	Clay	Saline
A. exscapus	28		2	2		2		1
A. exscapus var. caulifer	20		3	1		1		
A. dasyanthus	6	1	1	1	3		3	3
A. exscapus	N = 35 S = 5 H' = 1.1119 J = 0.4788							
A. e.var.c.	N = 25 S = 4 H' = 0.9961 J = 0.4980							
A. dasyanthus	N = 18 S = 7 H' = 2.5157 J = 0.8961							

According to Table 1 Astragalus exscapus and A. exscapus var. caulifer occur together on the same types of soil except the salinity one. The soil type calssification shows that A. dasyanthus grows in wider scale of soil types than the other two.

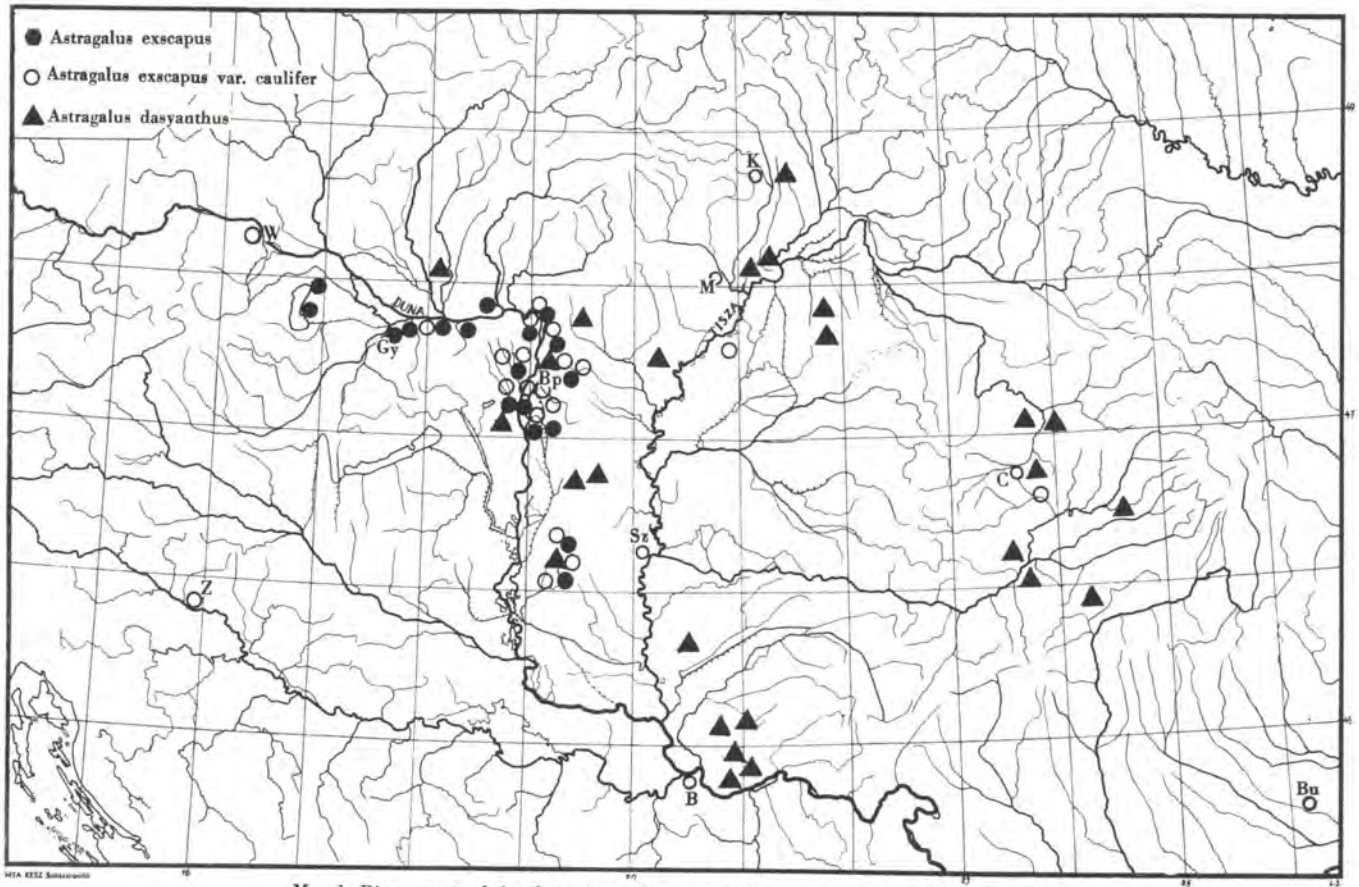
The diversity value is less in A. exscapus var. caulifer and higher in A. dasyanthus. The three taxa are perennial, therefore the life-form analysis is not presented here. Sufficient data for the studies of specimens/species distribution among the communities cannot be found, either.

Abbreviations of towns in the Map:

B	= Beograd (Yugoslavia)	K	= Košice (Czechoslovakia)
Bp	= Budapest (Hungary)	M	= Miskolc (Hungary)
Bu	= Bucureşti (Rumania)	Sz	= Szeged (Hungary
C	= Cluj (Rumania)	W	= Wien (Austria)
Gy	= Győr (Hungary	Z	= Zagreb (Yugoslavia)

Notes: Information to the localities of the different taxa are often, but not always, to be found on the herbarium labels. Besides them numerous sheets were collected in the same locality by different author(s) at different time.

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Map 1. Distribution of the three Astragalus taxa in Carpathians and Carpathian Basin

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