Volume 24(4), 9 - 14, 2020
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

ASTER Genus in "ALEXANDRU BELDIE" Herbarium from "MARIN DRĂCEA" National Institute for Research and Development in Forestry

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Abstract *Aster* Genus is well represented within Alexandru Beldie Herbarium from „Marin Drăcea" National Institute for Research and Development in Forestry. This aspect is proved by a significant number that amounts to 125 vouchers that contain plants from this genus as well as by the information contained in them. These refer to the plants' harvesting places which cover the entire country, as well as to renowned specialists who have contributed to the collection's development by harvesting or identifying *Aster* plants. The present paper organizes and presents species from *Aster* genus present in the above-mentioned herbarium, amounting to 36 species in 125 vouchers. The species were analysed based on their harvesting place and year, as well as on the specialist who gathered them. Additional criteria are also present such as: drawer's number, voucher's number, botanic collection, specie's name, harvesting date, harvesting place, the specialist who has collected and / or determined the species, and the conservation degree. This last element was classified on a scale from 1 to 4 where 1 means a very good conservation state, while 4 represents a very weak conservation state. The paper begins with the description of the herbarium, and continues with presenting the studied material (125 vouchers containing 36 *Aster* species). This section also details the used materials and methods for elaborating the article, for organizing the plants and describes some of the most important ones. The herbarium hosts three *Aster* samples that belong to a species present in the Red Book of superior Romanian plants (*Aster canus* W. et. K.). Furthermore, the herbarium can take pride in old plants, with an historical value, that were collected 170 years ago (*Aster tripolium* L.,1849, *Aster amellus* L., 1851). In this regard, the article renders graphically the harvesting periods for these plants as well as a map of the harvesting locations from Romania. The conclusions present some remarkable aspects regarding the Aster species and samples present in this herbarium.

Key words

Aster, herbarium, plants, flowers, leaves, botanists

„Marin Drăcea" National Institute for Research and Development in Forestry from Bucharest hosts in proper conditions a herbarium created in 1929 – "Alexandru Beldie" Herbarium. With approximately 40.000 vouchers, the herbarium is inscribed in Index Herbariorum and has the international BUCF code [9, 13].

The significant contribution of important personalities from the systematic domain has led to the herbarium's collection and development. The herbarium is named after Alexandru Beldie, one of the most important Romanian botanists who dedicated his work to studying the flora from Bucegi Mountains [1, 2].

Besides the Aster Genus that makes the subject of this article, the herbarium contains other genera such as: 6 *Vaccinium* species [11], 25 *Asperula* species [10], 41 *Polygonum* species [14]. 19 *Centaurea* species [9], 7 *Lycopodium* species [14], 25 *Epilobium* species [5], 80 *Trifolium* species [3], 42 *Aconitum* species [4], 17 *Amaranthus* specues [9], and 36 *Bronus* species [12].

The herbarium contains species collected from different regions of our country such as Bazoș Dendrology Park [7], or from the former Vlașca County [4], and even from abroad.

Material and Method

The present paper systematizes and presents *Aster* species present in the herbarium, amounting to 36 species present in their 125 vouchers.

The method used was systematization, with each plant belonging to this genus being organized on a number of criteria such as: herbarium drawer number, drawer

voucher number, botanic collection to which it belongs, species name, harvesting date, harvesting place, the specialist that has collected and/or determined it, as well as the plant's conservation degree. This last aspect was graded on a scale of 1 to 4, where 1 means a very good conservation state and 4 a poor conservation state.

Table 1

Aster Genus inventory from Al. Beldie Herbarium, INCDS Bucharest (excerpt)

Drawer number	Voucher number	Herbarium/ Botanic Collection/ Institution	Specie's name	Harvesting date	Harvesting place	Collected/ Determined by:	Conservation degree (1..4)
49	104	-	Aster tripolium L.	1849.01.01.	Kolosvar	-	1
49	17	-	Aster amellus L.	1851.01.01.	Torda	Wolff	1
49	106	Museum Botanicum Universitatis, Cluj Flora Romaniae Exaiccata	Aster tripolium L.	1922.08.27.	Cluj District, Someș, 320 m	Gh. Bujorean	1
49	44	Museum Botanicum Universitatis, Cluj Flora Romaniae Exaiccata	Aster amellus L.	1923.08.24.	Ialomița District, Speteni 60 m alt	G. P. Grințescu	1
49	12	Museum Botanicum Universitatis, Cluj Flora Romaniae Exaiccata	Aster alpinus L.	1925.08.07.	Bistrița Năsăud	Al. Borza	1
49	19	Cluj University Herbarium	Aster amellus L.	1926.08.27.	Cluj District, Someșul Rece 480 m alt	E. I. Nyárády	1
49	88	Museum Botanicum Universitatis, Cluj Flora Romaniae Exaiccata	Aster punctatus Wald st. & Kit.	1934.08.24.	Hotin District, Marșinița 130 m alt	E. Țopa	1
49	74	Bucharest Polytechnic School's Herbarium, Botanic Laboratory	Aster linosyris (L.) Bernh.	1934.09.01.	Banat, towards Ciucea Alba	C.C. Georgescu	1
49	114	Museum Botanicum Universitatis, Cluj Flora Romaniae Exaiccata	Aster tripolium L.	1934.09.02.	Basarabia, Hotin District	E. Țopa	
49	76	ICEF, The Institute of Forestry Research and Experimentation	Aster linosyris (L.) Bernh.	1935.08.22.	Sabed, Mureș County	S. Pașcovschi, P. Cretzoiu	1
49	90	Bucharest Polytechnic School's Herbarium, Botanic Laboratory	Aster punctatus Wald st. & Kit.	1935.09.29.	Tighina District, Zlați Forest	C.C. Georgescu	1
49	111	Bucharest Polytechnic School's Herbarium, Botanic Laboratory	Aster tripolium L.	1935.09.29.	J. Lăpușna, Basarabia	C.C. Georgescu	1
49	46	Fkora Romanae exiccata Museo Botanico Universitatis Clunensis (in Timisoara)	Aster canus W. et. K.	1943.10.07.	Timiș Torontal District, Timișoara 90 m alt	S. Pașcovschi	1
49	8	ICEF, The Institute of Forestry Research and Experimentation	Aster alpinus L.	1945.08.27.	Piatra Craiului	T. Coman	1
49	3	Bucharest Polytechnic's Herbarium, Silviculture Faculty, Botanic Laboratory	Aster alpinus L.	1946.07.13.	Bucegi, Gaura	Al. Beldie	2

49	33	Forestry Research Institute's Herbarium / Agriculture and Silviculture Ministry	Aster amellus L.	1955.09.15.	Deva, Bejan Forest	I. Dumitriu	1
49	115	Hortus Botanicus Instituti Agronomici "T. Vladimirescu" Craiova - R.P.R "Floram Olteniae Exsiccatam"	Aster tripolium L. v. Pannonicus f depastus Nyar.	1960.09.15.	Băileşti District, 65 m alt	Al. Buia, M. Păun, C. Malos, M. olaru	1

Results and Discussions

Aster is a genus of perennial flowering plants in the Asteraceae family. The genus Aster contained nearly 600 species in Eurasia and North America. Morphological and molecular investigations in the 1990s determined that North American species should be treated in a number of other related genera. About 180 species belong to this genus after this division, all being limited to Eurasia, except for one species.

The name Aster comes from the ancient Greek word ἀστήρ (astḗr), which means "star" and refers to the shape of the flower's head. Many species and a variety of hybrids and varieties are popular as garden species due to their attractive and colorful flowers. Aster species are also used as food for the larvae of many species of lepidoptera.The species found in the Herbarium were the following: *Asplenium fontanum B., Asplenium adiantum nigrum L., Asplenium angustatum B, Asplenium crenatum Fr., Asplenium cuneifolium Viv., Asplenium fissum Kit., Asplenium forisieuse, Asplenium lanceolatum H., Asplenium lepidum Presl., Asplenium maximum, Asplenium nidis L., Asplenium ruta-muraria, Asplenium septentrionale L. Hoffm, Asplenium serpentini Taush., Asplenium trichomane L., and Asplenium viride H.*

The most numerous *Asplenium* species present in the Herbarium are: *Aster tripolium L.* (14 plants), *Aster alpinus L.* (11 plants), *Aster amellus L.* (32 plants), *Aster canus W. et. K (this species appears in the Red Book of Higher Plants in Romania)* (3 plants), *Aster novi-belgii L.* (2 plants), *Aster linosyris (L.) Bernh.* (7 plants), *Aster pannonicus Jacq.* (5 plants), *and Aster punctatus Waldst. & Kit.* (11 plants). (Figure 1).

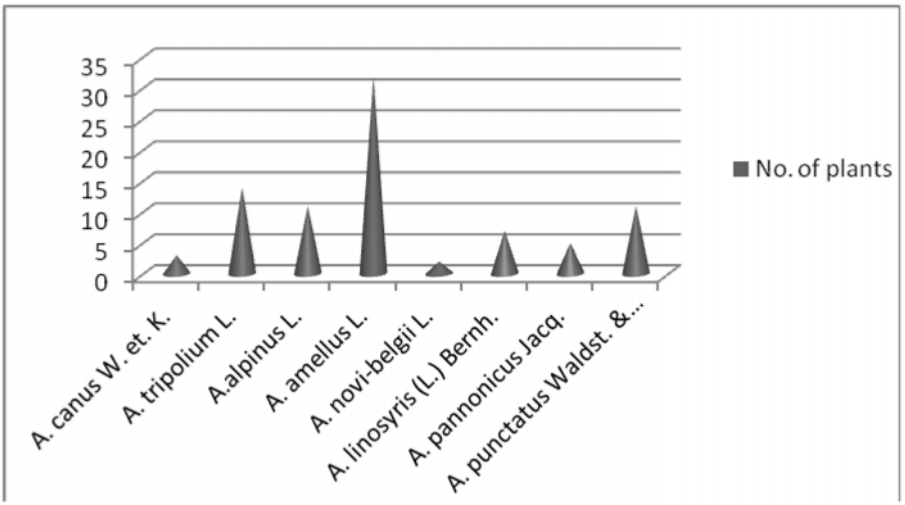

Figure 1. *Aster* Genus species present in the herbarium

The most representative species from this Genus present in the Herbarium are: *Aster tripolium L., Aster alpinus L., Aster amellus L., and Aster punctatus Waldst. & Kit..*

Aster alpinus, the alpine aster or blue alpine daisy, is a species of flowering plant in the Asteraceae family, native to the European mountains, with a subspecies native to Canada and the United States. This herbaceous perennial has purple, pink or blue flowers in summer (Figure 2).

The plant can grow up 15-30 centimeters in height. The color of the flower can be pink, purple-lavender or white-almost white. In the UK, this plant has won the Royal Horticultural Society's Merit Garden Award.

It grows very slowly in clay, mud, clay, sandy clay, etc. Its minimum pH scale is 6, while its maximum pH scale is 7.5. It grows erect in the form of a "single crown".

The plant does better in generally colder climates. It is usually suitable for clay, mud, clay, loamy clay, sandy clay, loamy clay, loamy clay, sandy loam, loamy loam and sandy loam soils and prefers low fertility. The plant can only tolerate a minimum temperature of -28 ° C / -18.4F after cell damage.

Fig. 2. ***Aster alpinus***

Fig. 3. ***Aster amellus***

(Photo: "Alexandru Beldie" Herbarium from INCDS „Marin Drăcea" Bucharest)

Aster amellus (Fig. 3), commonly known as Italian aster or Italian starwort, is a compact bushy aster that typically grows to 20-50 centimeters. The stem is erect and branched, while the leaves are dark green. The basal leaves are obovate and petiolate, while the cauline ones are alternate and sessile, increasingly narrow and lanceolate. It is in flower from September to October, and the seeds ripen in October. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees, flies, beetles, Lepidoptera (Moths & Butterflies). The plant is self-fertile. Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It prefers moist soil. No serious insect or disease problems. Crown rot may occur in wet, poorly drained soils, particularly in winter. Verticillium wilt may attack plants grown in poor soils. Good resistance to powdery mildew, particularly if soils remain somewhat dry.This plant is present in the European mountains, from the Pyrenees and the Alps to the Carpathians. Outside Europe it is found in Western Asia (Turkey), the Caucasus, Siberia and Central Asia (Kazakhstan). (Wikipedia.org).

Among the genus Aster, this plant is best represented in "Alexandru Beldie", with 32 samples.

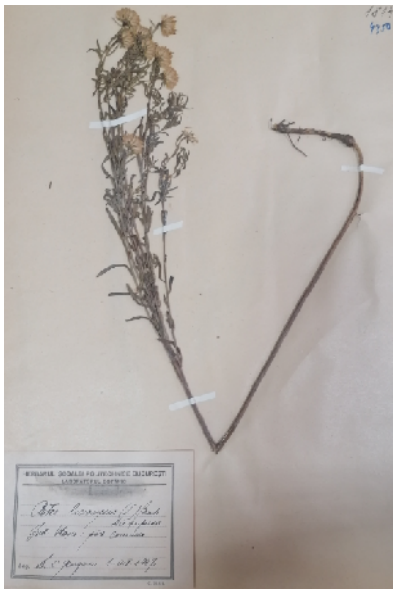

Fig. 4. ***Aster linopsis***

Fig. 5. ***Aster novii-belgi***

(Photo: "Alexandru Beldie" Herbarium from INCDS „Marin Drăcea" Bucharest)

The number of collected plants that enriched the herbarium collection in different periods of time was determined and reproduced in a graphical form. As such, Aster samples were collected over a period of over 170 years, from the mid-nineteenth century to the end of the twentieth century.
As can be seen in Figure no. 6, the number of plants collected increased over time, until 1941-1960, when it reached a peak, because most of the samples were collected during this time. The oldest plant of this genus is an Aster tripoloium L., collected in 1849 around Cluj. In addition, the herbarium contains three samples of a species that appears in the Red Book of superior Romanian plants (Aster canus W. and K.), collected between 1938-1943 from Timiş, by S. Paşcovschi. Figure 6 also shows on a map the areas in Romania where the Aster plants were collected.

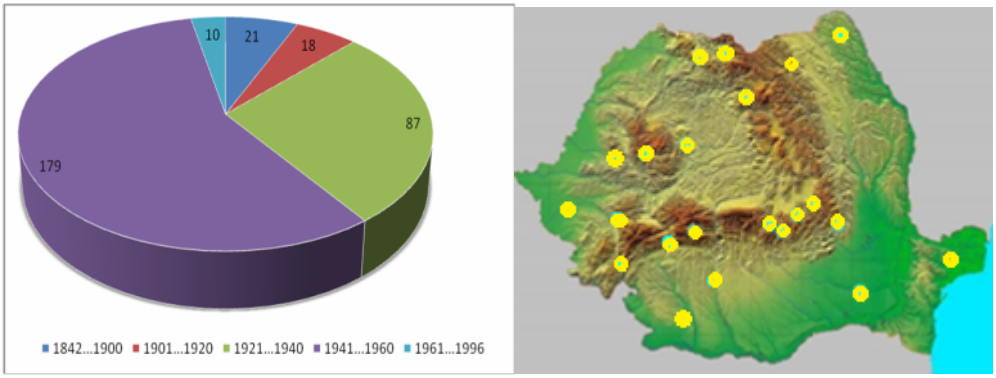

Fig. 6. Time (left) and place (right) of *Aster* collections

The Romanian specialists that have enriched „Alexandru Beldie" Herbarium with *Aster* species are: Al. Beldie, C.C. Georgescu, G. P. Grintescu, M. Badea, S P. Cretzoiu, S. Paşcovschi, A. Coman, M. Naret, I. Lupe, I. Morar, I. Zaharia, N Iacobescu etc. From the foreign ones, we mention: D. Wolff, E. I. Nyarady, Hausser, A Margittai, E. Reverchon, E. Broer, J. Barth, M. Fuss, O. Rosenberg, and P. John van de Put

Conclusions

Aster Genus is well represented within Al. Beldie Herbarium from INCDS Bucharest through a number of 36 species distributed in 125 vouchers. Amongst the maps with *Aster* species, the most well represented ones are *Aster tripolium L.* and *Aster amellus L.,* which can be found in 14 and 32 vouchers.
Aster Genus is also represented in the Herbarium by a rare species inscribed in the Book of superior plants from Romania (rare, endangered, endemic species): three *Aster canus W. et K.* species harvested between 1938-1943 from Timiş by S. Paşcovschi.
In addition, the *Aster* species present in the herbarium have an exceptional historic value as the oldest sample dates back to 1849 (an *Aster tripoloium* L., harvested from around Cluj).
As can be seen from Figure number 6, the *Aster* species from the herbarium have been harvested from all areas of our country, both from mountain areas (Bucegi, Retezat), hill areas (Mureş, Cluj, Buzău Arad, etc.), as well as from plain areas (Ialomiţa, Ilfov, Timiş). Besides the local locations, *Aster* samples were also gathered from different European countries such as Germany, Czech Republic or Hungary.
In regard with the harvesting period, the *Aster* collection was created by harvesting plants on a period of over 170 years, starting with *Aster tripoloium* L. (harvested in 1849 from around Cluj) and ending with *Aster arragonensis Auct.* (gathere in 1994). The collection's maximum development period for this genus ranges between 1941 and 1960. Even though this period coincides with a difficult time and with the Second World War, our predecessors have not relinquished their task of leaving us an exceptional inheritance: Alexandru Beldie Herbarium.

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