

HERBORIZED PLANTS FROM *ARCTIUM* GENUS

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ABSTRACT

Arctium genus contains 65 vouchers within "Alexandru Beldie" Herbarium from Bucharest. All these vouchers are organized in a database that contains information regarding: species, harvesting place, the person that has collected them, harvesting date and the conservation degree. This was followed by a short description of the main species conserved in the herbarium. The oldest *Arctium* plant dates back to 1875, while the persons who have gathered these plants are renowned Romanian and foreign botanists. The harvesting place of these plants is focused in Romania but complemented by samples from outside its borders, mainly from the origin countries of the foreign botanists that have collaborated with the Romanian specialists. Even though the species of this Genus are mainly considered weeds, numerous studies show important usages in medicine.

INTRODUCTION

"Marin Drăcea" National Forestry Research-Development Institute from Bucharest hosts in adequate conditions a herbarium created in 1929 – "Alexandru Beldie" Herbarium. This collection is inscribed in Index Herbariorum, having the international BUCF code and contains approximately 40.000 vouchers (Dincă *et al.*, 2017a; Vechiu *et al.*, 2018a).

The Herbarium contains numerous plant species and genera among which we

mention: 19 *Centaurea* species (Dincă *et al.*, 2017b); 29 *Allysum* species (Cântar *et al.*, 2018), 41 *Polygonum* species (Vechiu *et al.*, 2018b), 15 *Ornitogalum* species (Enescu *et al.*, 2017), 15 *Veronica* species (Dincă *et al.*, 2017c), 80 *Trifolium* species (Cântar *et al.*, 2018), 69 *Potentilla* species (Crișan *et al.*, 2017), 19 *Scorzonera* species (Dincă and Cântar, 2017), 16 *Abies* species (Enescu *et al.*, 2018a).

MATERIALS AND METHODS

The research material was represented by a number of 65 vouchers that was then organized in a database. This was then repeatedly sorted based on more criteria, namely: species, harvesting

year, harvesting place, and the botanist that has gathered them. The database's organization is rendered in Table number 1 in a small excerpt.

Database organization from *Arctium* Genus

Table 1

Number drawer	Number voucher	Herbarium/ Botanic Collection/ Institution	Specie's Name	Harvesting Date	Harvesting Place	Collected/ Determined by:	Conservation Degree (1..4)
40	15	Cluj University Herbarium	<i>A. lappa</i>	1923.08.12	Transilvania Cojocna district, 500-600 m	E.J. Nyárády	2
40	55	Paul Cretzoiu Herbarium	<i>A. tomentosum</i> Mill.	1942.09.24	Bucovina, Cernăuți distr.	P. Cretzoiu	1
40	12	Bucharest Polytechnic's Herbarium, Silviculture Faculty / Botanic Laboratory	<i>A. lappa</i>	1942.10.07	Vlașca distr., Frasinul forest	I. Morariu	1
40	17	ICEF	<i>A. lappa</i>	1937.07.17	Padurea Casa Verde, Timisoara	S. Pașcovschi	1
40	34	Museum Botanicum Universitatis, Cluj / Flora Romaniae exsiccata	<i>A. minus</i>	1942.09.10	Muntenia, distr. Ilfov, 85 m alt	G.P. Grintescu	1
40	22	ICEF	<i>A. lalla</i>	1935.08.06	Broasca, Buzau	At. Haralmb	1

RESULTS AND DISSCUTION

Arctium genus belongs to *Magnoliopsida* class, *Asterales* order, *Asteraceae* family. This genus contains biennial plants originating from Europe and Asia (www.wikipedia.org). The following paragraphs describe the most important representatives of this genus that are conserved in the herbarium.

the generic delimitation between *Cousinia* genus and *Arctium* genus does not have conclusive results (Susanna *et al.*, 2003).

***Arctium lappa* L.** (synonym *A. majus* (Gaertn.) Bernh., *Lappa major* Gaertn.) - **greater burdock** (Figure 1) – is a biennial plant that can reach 1,5 – 3 m in height. The stem is ramified, rough and reddish, while the leaves are alternate, ovate, with a cordate base and can

***Arctium x ambiguum* (Čelak.) Nyman** – is a hybrid resulted from the crossing of *A. lappa* and *A. tomentosum* (www.wikipedia.org).

***Arctium crispum* (J.Wolff) Kuntze** – synonymous with ***Cousinia crispum* Jaub. & Spach** (www.theplantlist.org). Some molecular genetic studies have shown that measure 50x60 cm. Their margins are complete, glabrous on the superior side and tomentose on the inferior one, with a thick petiole. The flowers are grouped in a corymb or raceme inflorescence – corymb on the lateral branches (Moore and Frankton 1974 in Gross *et al.*, 1980). In popular medicine, the species is well known for its diuretic, depurative and digestive properties (De Almeida *et al.*, 2013). Other studies show that this plant

has also antiallergenic and anti-inflammatory properties (Sohn *et al.*, 2011). In numerous countries, it is even cultivated as edible plant (Sohn *et al.*, 2011). As such, the roots are used worldwide for cooking, while the seeds are used in traditional medicines as diuretic and as detoxifying (Park *et al.*, 2007). A substance named arctigenina is extracted from *A. lappa*, a bioactive lignin with numerous biologic activities (De Almeida *et al.*, 2013). Furthermore, the plant is used for treating diseases such as arterial hypertension, gout and hepatitis (Predes *et al.*, 2011). Traditional Chinese medicine recommends these roots as aphrodisiac agent (Jiang *et al.*, 2017). The species can be used as nourishment as it contains a higher quantity of polyzaharids and residues than certain legumes and as it is easily accessible all year long (Huang *et al.*, 2010).



Figure 1. *Arctium lappa*

***Arctium minus* (Hill) Bernh.** – (synonym *Lappa minor*, *A. pubens*) – **lesser burdock** (Figure 2, 3) – is a biannual herbaceous plant with large leaves and purple flowers. Starting with its second year, the plant can reach heights ranging between 90 and 210 cm (Lubian *et al.*, 2010). The species multiplies only through seeds, while the blooming stem grows as a rosette and is strongly ramified; the leaves are alternate, 50x35 cm in height, ovate up to cordate or rounded, glabrous above and tomentose on the back (Gross *et al.*, 1980). The flowers do not have a smell but attract insects as they have an increased reflection degree of blue ultraviolet light (Duistermaat *et al.*, 1996). In Brazil, the plant grows spontaneously on fields, at the margin of forests and can even become an invasive species (Cavalli *et al.*, 2007). Originating from Japan, the plant was used even from antiquity in medicinal purposes, especially for treating diabetes, as it is a good hypoglycemic agent (Cavalli *et al.*, 2007). In addition, the plant is widespread in North and South America where it is considered a weed, and grows rarely even in Africa (López-Vinyallonga *et al.*, 2010).



Figure 2. *Arctium minus*



Figure 3. *Arctium pubens*

***Arctium nemorosum* Lej.**
(synonym *Lappa nemorosa*, *L. macrosperma*, *A. macrospermum*) (Figure 4) – is a protected and endangered species in Finland (Galambosi, 2002), while in Lithuania is included in the list of aromatic



Figure 4. *Arctium nemorosum*

***Arctium tomentosum* Mill.**
(synonym *A. leptophyllum*, *Lappa*

and medicinal plants being also mentioned in the National Red Book (Radušienė, 2002). Onopordopicrin is extracted from its aerial parts, having an inhibiting effect on certain parasites (Zimmermann *et al.*, 2012).

tomentosa) – was identified in European countries, as well as in Russia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. It can also be found in Canada and the USA (Hassler, 2019). The main difference from *A. lappa* and *A. minus* is given by a corymb form inflorescence with a glandular corolla (Moore and Frankton 1974 in Gross *et al.*, 1980).

THE PLANTS HARVESTING YEARS

The plants of this genus were gathered in an interval of approximately 100 years, with the first plant collected in 1875 (*Arctium nemorosum*), and the last one in 1978 (*Lappa macrosperma* synonymous with *A. lappa*). Three of these vouchers are not dated at all, while other three have only the harvesting date and

month. However, the majority of the plants were harvested during 1940-1949 (32 samples), followed by 1930-1939, when 15 plants were collected (Figure 5). As such, 47 plants from the 65 *Arctium* plants conserved in “Al. Beldie” Herbarium were harvested in an interval of twenty years. In

the same interval (1940-1949), the majority of *Gentiana* samples were also gathered (Enescu *et al.*, 2018b). Long intervals of time (amounting to 30 years) when plants belonging to this genus were not harvested were also identified.

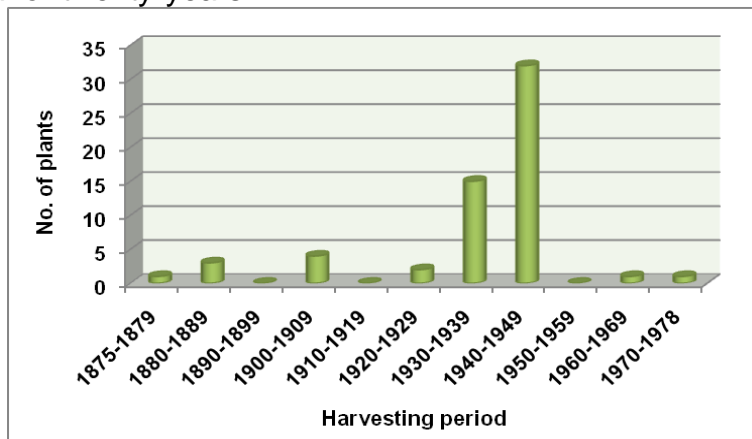


Figure 5. Number of plants from *Arctium* genus harvested in different time periods

HARVESTING PLACE

A historical map of Romania's counties was used in order to render correctly the harvesting locations (Figure 6). This map contains the exact names from the voucher's labels. The majority of samples (22) were harvested from the South part, namely from Muntenia and Oltenia, with a predominance in Ilfov and

Bucharest. The second place is occupied by Transylvania, from where 11 samples were gathered, followed by the North part with nine samples. Amongst these nine samples, eight were collected from Cernauti, an area that presently does not belong to Romania. The least number of plants were collected from the West part, namely from Timis and Caras-Severin. A few plants belonging to *Arctium* Genus were also gathered from abroad, namely four samples, two from Sweden, one from France and another one from Hungary.



Figure 6. Harvesting place of *Arctium* plants

The persons that have collected *Arctium* plants are renowned Romanian and foreign botanists. Amongst the Romanian ones we mention G.P. Grințescu, pharmacist doctor specialized in medicinal plants who has obtained a Romanian Academy award (www.medichub.ro). He is responsible for the majority of plants belonging to this genus and conserved in the herbarium but has also collected plants with other foreign botanists such as the German mycology specialist H. Wolff (www.wikidata.org). Another important botanists were: P. Research and Development Institute, professor at Brasov's Silviculture Faculty (www.unitbv.ro), Marin Păun – botanist and university professor, Artur Coman – renowned botanist and silvicultor born in

Cretzoiu, who has died at the early age of 35 (www.wikidata.org), Sergiu Pașcovschi - a Basarabian silvicultor preoccupied by the Romanian forestry typology (Doniță and Biriș, 2018), Iuliu Morariu - university professor and the founder of the Scientific Herbarium from Brasov's Silviculture Faculty (Parascan, 2014), Erasmus Nyárády – Romanian botanists of Hungarian origins from Transylvania, professor at Cluj University and member of the Romanian Academy (Mititelu *et al.*, 1994), Atanase Haralamb – silviculture engineer, founding member of the Forestry Maramureș, at Borșa, where he realized detailed studies in Rodnei Mountains (Bîrda and Nădișan, 2017), with an *Arctium* sample harvested by him from Maramureș, Vișeu de Sus.

CONCLUSIONS

Arctium species conserved in "Al. Beldie" Herbarium amount to 65 vouchers that date back from 1875 up to 1978. The oldest conserved plant is an *Arctium nemorosum* gathered from Hungary by the famous botanist G. P. Grintescu. The last collected plant is a *Lappa macrosperma*. The majority of plants are harvested from

Romania, with a focus on the South part (Muntenia and Oltenia). These plants are widespread in both Europe and Asia, as well as in North and South America. Some of these plants (*A. lappa*, *A. minus*) have numerous usages in traditional medicine such as detoxification, as diuretic or digestive stimulant.

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