

DESCRIBING THE *Ranunculus* GENUS BASED ON THE PLANTS PRESENT IN ALEXANDRU BELDIE HERBARIUM

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Abstract

The present paper presents the morphological and ecological description of species belonging to the *Ranunculus* genus found in “Alexandru Beldie” Herbarium from “Marin Drăcea” National Institute for Research and Development in Forestry (INCDS), Bucharest. A database was created with information about species, their gathering year, as well as the botanists who have identified and conserved them. The first part of the article shortly describes the herbarium and its specific, together with a presentation of the material and method used for elaborating this paper. As such, the material that was used is represented by the 480 vouchers that contain the specimens of 106 species belonging to the *Ranunculus* genus. The plants were gathered between 1818 and 1994, with a larger incidence during 1880-1890 and 1931-1950. The paper ends with a series of conclusions regarding the analysis of the *Ranunculus* genus species and specimens present in the herbarium.

Key words: herbarium, plants, *Ranunculus*, botanists.

INTRODUCTION

The “Alexandru Beldie” Herbarium from “Marin Drăcea” National Institute for Research and Development in Forestry, located in Bucharest, contains an impressive collection (40000 vouchers) of certain plants, preponderantly from mountain areas. The plants from the collection are kept in their original folders and are arranged in 600 drawers (Vasile et al., 2017). This collection is enrolled as INDEX HERBARIUM and all the species were gathered by known personalities in the field of systematic botany, one of the Romanian botanists being Alexandru Beldie, who dealt especially with this herbarium. As such, the herbarium is named after Alexandru Beldie, a renowned Romanian botanist, which was very interested in the flora present in Bucegi Mountains (Beldie, 1967; Beldie, 1972).

Besides the *Ranunculus* species presented in this paper, the Herbarium also contains other species such as 32 *Arabis* species (Dincă et al., 2017a), 29 *Alyssum* species (Cântar C. et al., 2018), 40 *Alchemilla* species (Deleanu E. et al., 2018a), 29 *Plantago* species (Deleanu E. et

al., 2018), 19 *Centaurea* species (Dincă et al., 2017b), 112 *Hieracium* species (Dincă et al., 2017c), 15 *Ornithogalum* species (Enescu R. et al., 2017) and 19 *Scorzonera* species (Dincă et al., 2017d).

Ranunculus is the largest genus within Ranunculaceae including about 600 species, primarily distributed in temperate to arctic or subantarctic zones, with a few species also present in tropic high montane regions (Tamura, 1995).

The aim of this article is to present the state of this collection, to describe the species and the total number of *Ranunculus* specimens (106 species), together with the date when they were collected, their location, the botanist who collected each exemplar and their conservation.

MATERIALS AND METHODS

The work methods used are the ones characteristic to the research activity. As such, research and bibliographic documentation have played a very important role, especially from a morphologic and ecologic point of view. Together with these methods, analysis and synthesis were used as main method for

digitizing and systematizing the data from the herbarium's vouchers. Furthermore, creating the map, preparing the work, results and its conclusions have implied the analysis and synthesis of the initially systematized data.

The vouchers were grouped by species, harvest year, the place where they were harvested and by the specialist who harvested them. An excerpt of the *Ranunculus* genus inventory is rendered in Table 1.

Table 1. The inventory of *Ranunculus* genus from INCDS Bucharest's, "Alexandru Beldie" Herbarium (excerpt)

Plate no.	Drawer no.	Herbarium/ Botanic collection/ Institution	Species	Harvest date	Harvest place	Collected/ Determined by:	Conservation degree (1..4)
90	33	Bucharest's Polytechnics School Herbarium/ Botanic Laboratory	<i>Ranunculus acer</i> L.	1918.09.07	Bucegi: Colții lui Barbeș	M. Haret	1
90	3	Herbarul Institutului de Cercetări Silvice/ Ministerul Agriculturii și Silviculturii	<i>Ranunculus acris</i>	1954.08.07	Bucegi: Poiana Crucii	Al. Beldie	1
90	50	Forestry Research Institute Herbarium/ Agriculture and Silviculture Ministry	<i>Ranunculus arvensis</i> L.	1933.05.01	Păd. Cormana	C. C Georgescu	1
91	22	Bucharest's Polytechnics School Herbarium/ Botanic Laboratory	<i>Ranunculus illyricus</i> L.	1939.05.12	Hanul Conachi, jud. Tecuci	C.C Georgescu	2
91	43	Bucharest's Polytechnics School Herbarium/ Botanic Laboratory	<i>Ranunculus flammula</i> L.	1937.05.29	Maramureș Vișeu de Jos, alt 457 m	A. Coman	1
91	58	Bucharest's Polytechnics School Herbarium/ Botanic Laboratory	<i>Ranunculus constantinopolitanus</i> DC D'Urville	1935.05.01	Ilfov, păd. Cărcioarele	Al. Beldie	1
91	75	Bucharest's Polytechnics School Herbarium, Silviculture Faculty/ Botanic Laboratory	<i>Ranunculus cassubicus</i> L.	1943.06.01	Bucegi: Valea Coștilei 1300 m	Al. Beldie	2
92	14	Bucharest's Polytechnics School Herbarium, Silviculture Faculty/ Botanic Laboratory	<i>Ranunculus hornschuchii</i> Hoppe	1943.06.01	Bucegi: Valea Albă 1600 m	Al. Beldie	1
92	19	Bucharest's Polytechnics School Herbarium, Silviculture Faculty/ Botanic Laboratory	<i>Ranunculus montanus</i>	1947.07.17	Bucegi	Al. Beldie	2
92	37	ICEF, Forestry Research and Experimentation Institute	<i>Ranunculus napolitanus</i> Ten.	1940.05.12	Hăgălar, jud. Constanța	I. Lupu	1
93	32	ICEF, Forestry Research and Experimentation Institute	<i>Ranunculus polyanthemus</i> L.	1936.06.14	Gurghiu, jud. Mureș	S. Pașcovschi Al. Beldie	1
93	17	Herbarul Școalei Politehnicei București/ Laboratorul de botanică	<i>Ranunculus platanifolius</i> L.	1938.07.01	Țibleş-Fundu Dilețului	I. Morariu	2
94	16	ICEF, Institutul de Cercetări și Experimentație Forestieră	<i>Ranunculus repens</i> L.	1937.05.21	Pădurea Casa Verde, Timișoara	S. Pașcovschi	1

RESULTS AND DISCUSSIONS

The research material is composed of the 480 *Ranunculus* genre species vouchers present in the maps of “Alexandru Beldie” Herbarium from INCDS “Marin Drăcea”. *Ranunculus* belongs to the Ranunculaceae Family, the Ranunculales order having approximately 600 species. Members of the genus include buttercups, spearwort and water crowfoots.

The species belonging to this genus that are present in the above-mentioned collection are the following:

Ranunculus acris is a herbaceous perennial plant that grows up to a height of 30-70 cm, with ungrooved flowing stems bearing glossy yellow flowers about 25 mm across (Figure 1). Five overlapping petals exist above five green sepals that soon turn yellow as the flower mature. The plant has numerous stamens inserted below the ovary. The leaves are compound, with three lobed leaflets. Unlike *Ranunculus repens*, the terminal leaflet is sessile (https://en.wikipedia.org/wiki/Ranunculus_acris).



Figure 1. *Ranunculus acris*

Ranunculus abortivus produces erect stems ranging from 10 to 60 cm in height. The leaves are variable in shape, while both stems and leaves are hairless. The basal leaves are kidney-shaped to circular and persistent, with scalloped

margins, while the stem leaves are alternate and deeply lobed or divided. Those at the bottom have long petioles (stems), while those at the top are shorter-stemmed to stemless, with narrow blades or lobes. Each stem can bear up to 50 flowers. The flower has five petals up to 1.5 to 3.5 mm long, with a ring of stamens around a round cluster of green carpels. The carpels develop into brown, shiny rounded and slightly flattened achenes with a tiny beak (https://en.wikipedia.org/wiki/Ranunculus_abortivus) (Figure2).



Figure 2. *Ranunculus abortivus*

Ranunculus asiaticus, native to the eastern Mediterranean region of south-western Asia, south-eastern Europe (Crete, Karpathos) and north-eastern Africa. It is a herbaceous perennial plant that can reach 45 cm in height, with simple or branched stems. The basal leaves are three-lobed, with leaves higher on the stems more deeply divided; like the stems, they are downy or hairy. The flowers are 3-5 cm in diameter, variably red to pink, yellow, or white, with one to several flowers on each stem (https://en.wikipedia.org/wiki/Ranunculus_asiaticus).

Ranunculus bulbosus, is a perennial plant that has attractive yellow flowers, and deeply divided, three-lobed long-petioled basal leaves.

Bulbous buttercup is known to form tufts. The stems are 20-60 cm tall, erect, branching, and slightly hairy flowering. Alternate and sessile leaves are present on the stem. The flower forms at the apex of the stems, and is shiny and yellow with 5-7 petals. The flowers are 1.5-3 cm wide. The plant blooms from April to July (https://en.wikipedia.org/wiki/Ranunculus_bulbosus).

***Ranunculus platanifolius*.** The large white buttercup is an herbaceous plant 30-100 cm tall, with glabrous stem characterized by many branches. The leaves are palmate, each divided into five segments with dentate margins. Flowers are organized into cymes, each flower having a calyx with five sepals, a corolla with five white petals, many stamens with yellow anthers and many styles (Figure 3) (https://en.wikipedia.org/wiki/Ranunculus_platanifolius).



Figure 3. *Ranunculus platanifolius*

Ranunculus repens is a herbaceous, stoloniferous perennial plant growing up to 50 cm in height. It has both prostrate running stems that produce roots and new plants at the nodes, and less erect flowering stems. The basal leaves are compound, grown on a 4-20 cm long petiole and divided into three broad leaflets 1.5-8 cm long, shallowly to deeply lobed, each stalked. The higher leaves from the stems are smaller, with narrower leaflets and may be

simple and lanceolate. Both the stems and the leaves are hairy. The flowers are golden yellow, glossy, reaching a diameter of 2-3 cm, usually with five petals, while flower stem is finely grooved. The gloss is caused by the smooth upper surface of the petal that acts like a mirror, the gloss aids in attracting pollinating insect and thermo regulating the flowers reproductive organs. The fruit is a cluster of achenes being 2.5-4 mm long. Creeping buttercup has three-lobed dark green, white-spotted leaves that grow out of the node. It grows in field and pastures preferring wet soils (Figure 4) (https://en.wikipedia.org/wiki/Ranunculus_repens).



Figure 4. *Ranunculus repens*

The plant's harvest years. The plants were gathered in a time period ranging between 1818 and 1994. The oldest plants of this genre are *Ranunculus amplexicaulis*, collected in 1818. The periods in which most plants were gathered were 1880-1890 and 1931-1950 (Figure 5). The plants were gathered from Romanian mountain areas (Bucegi, Retezat, Rotnei) or near cities from our country (Azuga, Constanta, Craiova, Caracal, Brasov, Buzau, Branesti), as well as from some European areas (Austria, Albania, Croatia, Franta). The plants are in a good state.

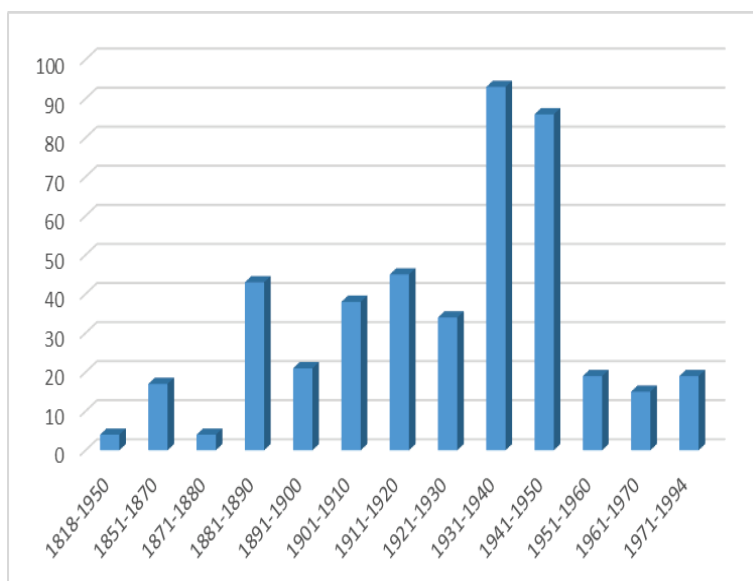


Figure 5. Harvesting periods for *Ralunculus* plants from Al. Beldie

CONCLUSIONS

In "Alexandru Beldie" Herbarium, which contains more than 40,000 vouchers, 480 vouchers belong to the *Ranunculus* genus.

Even if the first fir samples were collected almost 140 years ago, the majority of them are in a good conservation state, meaning that the methods used for preserving the biological materials were adequate.

The plants from this herbarium were gathered between 1818 and 1994, reaching a maximum in the period 1880-1890 and 1931-1950. Furthermore, they were gathered by renowned Romanian and foreign botanists (Al. Beldie, P. Cretzoiu, C. Georgescu, E.I. Nyarady, N. Boscan, G. Bujoreanu).

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