THE IMPORTANCE OF THE VACCINIUM SPECIES COLLECTION

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Abstract. *Vaccinium Genus (Ericaceae), Vaccinioideae subfamily, Vaccinieae tribe comprises 36 sections and, reaches more than 450 species. V. mirtillus, commonly named "Heildelbeere","Blaubeere" etc is the most known species in Europe where it is commonly used as a medicinal plant or as potted fruit. The aim of this article is to describe some Vaccinium species that are collected in the Al Beldie Herbarium from INCDS Marin Drăcea Bucharest. The Herbarium hosts 149 plates with Vaccinium species. Most plates belong to V. myrtillus, V. uliginosum and V. vitis-idaea. The oldest Vaccinium specimen was collected in 1850. The herbarium specimens are kept in generally good condition except for a smaller number of specimens which were damaged. The Al Beldie Herbarium Collection stored in INCDS Bucharest has an immense historical and museological importance. Furthermore, the Vaccinium genus from this collection is very diverse. The diversity of this material also pertains to areas and habitat types in which the material was collected. Considering the age of this herbarium material, it may be further used for comparisons with present-day conditions of flora from the same areas.*

Keywords: *areas, collection, flora, genus, specimen.*

INTRODUCTUON

The *Vaccinium L.* Genus belongs to the *Bicornes* Order, *Ericaceae* Family and includes all types of Ericaceae plants with inferior ovaries and camoses fruits that are more or less eatable and commonly known as bilberies. The genus comprises 36 subgenres and approximately 450 global species and is present on all continents, with the exception of Antarctica and Australia (STEVENS 1969, LUBY ET AL, 1991). Fruits harvested from wild Vaccinium populations have significantly contributed to the human diet for thousands of years (DARROW ȘI CAMP, 1945; HUNN ȘI NORTON, 1983).

The majority of Vaccinium species originate from the coldest areas of the North Hemisphere. However, tropical species can also be found. Vaccinium species prefer soils with a low pH and are developing best in forests with acid soils (GILLASPY ET AL. 1993, GIOVANNONI 2004).

North Hemisphere species bloom from May until June, while the fruits appear from July until October (STĂNESCU ET AL 1997).

The plant is generally cross-pollinated, by insects. However, auto pollination can also occur even though it significantly reduces the seed production (KREBS AND HANCOCK 1990; NUORTILA ET AL., 2002).

The bilberry development from flower to fruits usually last from 55 to 70 days, depending on the year. The fruits are camoses, round or oval shaped and contain many seeds. The Vaccinium fruits are well known for their high content of phenol compounds that are strong antioxidants and contain properties important for human health. Furthermore, they are amongst the best sources of antociani and proantocianidine (OVASKAINEN ET AL., 2008), glucoses and fructose (CANO-MERDANO AND DARNELL 1997, VILJAKAINEN ET AL. 2002).

For red-bilberry (*Vaccinium vitis-idaea*), the most abundant organic acid is the citric acid (73%), followed by the malic acid and ascorbic acid. The total concentration of citric and

malic acid increases until the fruits maturity, while the ascorbic acid concentration decreases (CELIK ET AL 2008).

Besides their usage as food products, the Vaccinium species are used as medicinal products, being used as antibiotics, diuretics, urinary antiseptics, ant diarrheal, antipyretics and astringents (SCHMIDT AND SOBOTA, 1989; ZAFRIRI ET AL., 1989; AVORN ET AL., 1994; AHUJA, ET AL., 1998; FOO ET AL., 2000A,B; STOTHERS, 2002). The species with a largest number of usages are *V. vitis-idaea* and *V. myrtillus.* The fruits and leaves are the most used parts of the plant. As such, for all species, the fruit is used as food, while the leaves or aerial part are used with medicinal purposes (MEDIAVILLA ET AL., 2005; MARCUSSON ET AL., 2009).

Due to these species importance, many exemplars were gathered and kept in herbariums, starting with the year 1800 in order to be investigated and studied by future generations.

Vaccinium species from Romania or other worldwide countries are present in the ”Al Beldie” Herbarium from ”Marin Drăcea” National Forest Research and Development Institute (INCDS), Bucharest where they are kept in very good conditions so that all specific details can be observed.

As such, the present article presents the Vaccinium species that belong to the ”Al. Beldie” collection, followed by a description of the species that can be preponderantly found in our country.

MATERIAL AND METHODS

The investigations were realized within ”Marin Drăcea„ INCDS Bucharest, where the ”Al. Beldie” Herbarium exists. This herbarium comprises 60.000 plates with herbaceous and wood species (trees, shrubs, plants), moss, lichens and ferns, and even some species that can be found on the Red List (VASILE ET AL. 2016).

Each plate is kept in their original map, and the herbarium specimens organization scheme follows a naturally taxonomy system concentrated on philogenetic classification principles.

As such, the plants are arranged and grouped based on their kinship degree and evolution relations. Each plate is labelled and each label presents the following data: scientific and popular name; taxonomy; place of harvest; harvest date; summary data about the collected plant biotope; the person who harvested the plant; the person who has determined the plant.

RESULTS AND DISCUSSIONS

The ”Al Beldie” Herbarium contains 149 Vaccinium plates with six species, namely *Vaccinium vitis idaea, V. myrtillus, V. uliginosum, V. oxicoccos, V. micfrocarpum* and *V. corymbosum* (Fig. 1).

The most plates belong to *Vaccinium vitis idaea, V. myrtillus* and *V. uliginosum*, representing 34%, 32% and 23% of the total 149 plates.

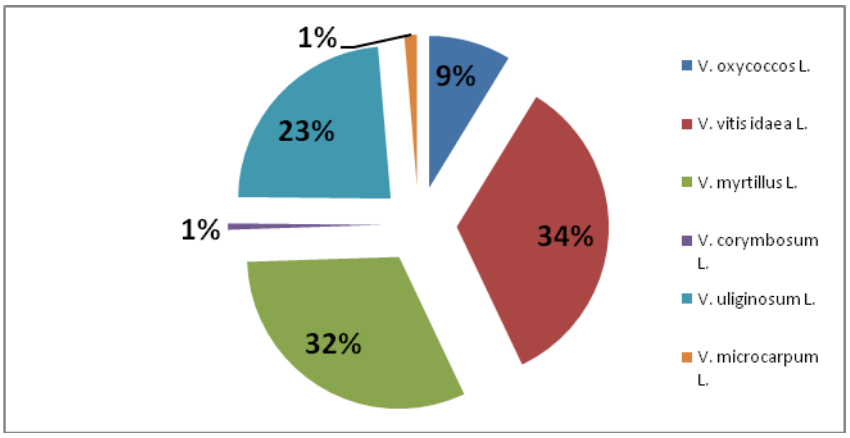

Fig. 1. *Vaccinium* species present in the herbarium

The Vaccinium plates are better represented, even though they have fewer species, in comparison with the Androsace Genus, which has only 66 plates but 19 species (DINCĂ ET AL. 2017) or Centaurea Genus which has 71 plates with 19 species also (DINCĂ ET AL. 2017), Orobanche Genus with 79 plates and 33 species (SCĂRLĂTESCU ET AL. 2017) or Allium Genus with 111 plates and 56 species.

As such, the Vaccinium Genus has the most plates, while the Hieracium Genus has the most species, namely 112 (DINCĂ ET AL 2017).

The most Vaccinium exemplars are *Vaccinium vitis idaea* (Fig. 2 and 3) and were collected from Romania (Maramureș, Transylvania, Caraș-Severin, Parâng, Ceahlău, Bucegi, Țibleș) and even Finland.

The oldest plate dates back to 1880, while the newest one to 1974. The exemplars were collected and identified by well known botanists, such as S. Pașcovschi, P. Cretzoiu, A. Haralamb and C. C. Georgescu.

The common name of this plant is red bilberry, being a bushy shrub that can reach 10-40 cm in height. The stem is cylindrical and ramified, while the flowers are campanulate, white-pink in colour, in terminal raceme with two-six flowers. The plant grows at high altitudes, on alpine meadows or clearings, rarely in shadow places (Norway spruce stands). Red bilberry grows on skeleton soils, strongly acid, and with lower requests towards the soil. Furthermore, the plant is resistant to drought (FROBORG 1996).

Fig. 2. Red bilberry (*Vaccinium vitis-idaea* L.)

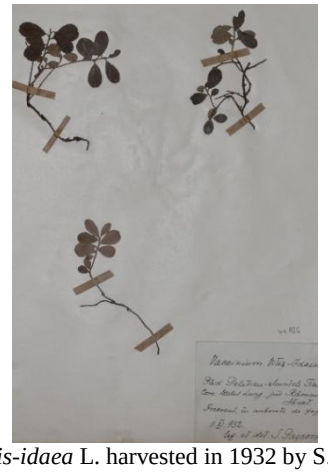

Fig. 3. *V. vitis-idaea* L. harvested in 1932 by S. Paşcovschi

The leaves (Folium vitis idaea) are usually harvested, being coriaceous, elliptical, shortly petiolate and with a rounded peak; the marginal limb is reverberating on the inferior side. The colour is dark green and silky on the superior side and a mat darker green on the inferior side that also presents numerous brown spots (secretive glands) (STĂNESCU ET AL. 2004).

The taste is astringent, slightly bitter, while the smell is missing. The leaves chemical composition is as follows: hidrochinona derivatives - arbutozida (quantitatively significant), metil-arbutozida, acetil-arbutozidă; galic tannins; flavonozides; chinic acid, ursolic acis, glucose, wax, etc.

Red bilberry leaves (Folium vitis idaea) are used for cystitis, diuretic and gripes (ȚULUCA 2010). Vitis ideae folium remedies have a better gastric tolerance than *Uva ursi* folium.

In the traditional medicine it is used for controlling leucoreea, diarrhoea and haemorrhages (combined in equal parts with mint leaves in order to reduce the irritation of the mucous membrane caused by tannins).

Blueberry (*Vaccinium myrtillus* L.) (Fig.4) is the second Vaccinium species as number of samples present in the Herbarium. This plant occupies a large areal from Europe, Asia and North America, while in Romania it is a common species in the hill region and even towards the alpine area (STĂNESCU ET AL. 1997).

It usually grows in the mountain area, starting at the Norway spruce's inferior limit and reaching the alpine area up to the height of over 2000 m. The plant develops well both in the semi shadow of Norway spruce stands, juniper and mountain pine shrubberies, as well as on cuttings and forest breaks or even on meadows. It can be found in all counties from the entire Carpathian chain.

Taking into consideration its strong roots system, the blueberry is a good fixing plant for plants amenable to erosion. The *Vaccinium myrtillus* fruits have a black-blue colour and are harvested during July-October by hand or with special devices shaped like combs.

Blueberry fruits are used for treating diarrhoea and for improving the sight during night (ULLTVEIT 1998), while the leaf tea is recommended in controlling diabetes.

The *V. myrtillus* fruit is commonly used in Europe as food source and is highly appreciated in Nordic countries (Finland, Norway, Sweden) for increasing visual acuity during

night, especially by drivers as the antocianozids increase the regeneration degree of rohodopsine in the retina. Furthermore, blueberries are recommended by fito-terapheutists for treating diabetes microangiopaties, for preventing coronary diseases, flebita, tromboflebita and circulatory diseases linked with the sight (PERIS ET AL., 1995).

The *V. myrtillus* exemplars present in the herbarium are collected only from Romania, from places such as Bucegi Mountains, Cernei Valley, Lotrului Valley, Buzău, Făgăraș Mountains, Small Mountain, etc. They were collected by renowned Romanian botanists such as Al. Beldie, S. Pașcovschi, A. Haralamb, C.C. Georgescu, Al. Borza etc. The oldest samples were gathered in 1850, while the most recent date to 1949.

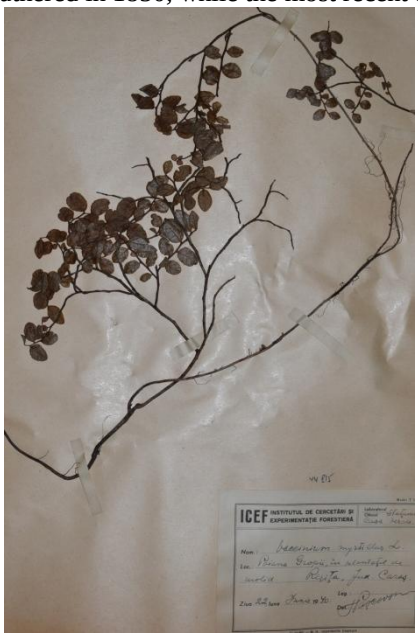

Fig.4. *V. myrtillus* collected in 1940 by S. Pașcovschi

Fig.5. *V. uliginosum* collected in 1943 by Al. Beldie

Another species with a large number of samples in the herbarium is *V. uliginosum* (Fig.5). The plant is an undershrub, with a height of 15-17 cm, a straight woody stem, ramified at the basis and brown in colour. The flowers measure 4-6 mm, are grouped in terminal raceme, have a white-red colour and bloom between May-June. The leaves alternate, are short petiolate and fade during the winter. The limb is obovat-elliptical, with the margin intact and prominent green-blue nervures (SEERAM 2008).

The fruits are spherical-ovoid, measure 8-12 mm, have a dark colour, are light and succulent.

V. uliginosum appears on pet moors and marsh areas but also in forest areas, open woods and eutrophic marsh ecosystems. This species seems to be the best example of relict boreal (arctic) mountain plant adapted only at high altitudes and latitudes, with isolated azonal apparitions in peat moors from the temperate area. It has a very long life expectancy and can reach even 100 years (CONNOLY & DAHL 1970).

During autumn, the fruits have extremely beautiful colours, ranging from purple to yellow, orange and red. This colour range is caused by antocianins and can reach even 15 different antocianins in some fruits (ANDERSEN 1987).

In North-East China, their attractive colours and abundance make the *Vaccinium uliginosum* fruits an excellent source of natural pigments. Furthermore, the fruits have antioxidant properties with a cleaning effect for free radicals, having the capacity to inhibit the development of cancerous cells (KONG ET AL. 2003; ELISIA AND KITTS 2008; WANG AND STONER 2008).

In Romania, this species is rarely found and is even mentioned as a rare species (R), being included in the Red List and, as such, prohibited from harvesting.

The *V. uliginosum* species present in the herbarium were collected between 1858 and 1956. The oldest exemplar, dating from 1858, was collected from the Pyrenees Mountains. The other exemplars are collected from Bucegi Mountains, Călimani Mountain, Small Mountain, Retezat Mountain, Parâng Mountain, Băița (Vișeu) peat moor, etc.

The botanists who collected or identified these plants were: Al. Beldie, A. Haralamb, Șt. Purcelean, S. Pașcovschi, C.C. Georgescu and P. Cretzoiu.

The Herbarium exemplars are in a very good conservation state, even though some of them have are 168 years old (Fig.6).

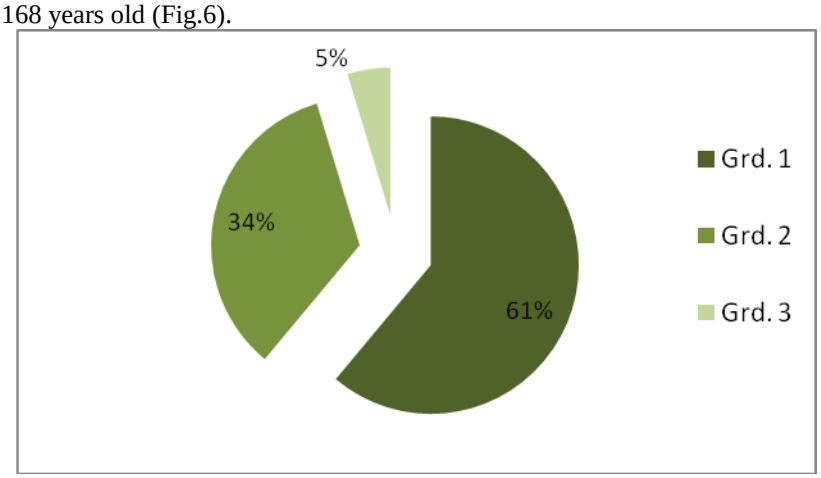

Fig.6. Conservation degree of *Vaccinium* species present in the Herbarium

The largest percentage is represented by complete and well-fixed plants (1st degree) or complete plants with some parts detached from the plate (2nd degree).

CONCLUSIONS

The *Vaccinium* species are very important both from a gastronomic as well as medicinal point of view. They were widely used as traditional medicines for treating diabetes symptoms. The leaves were the main parts used as remedies by entire generations. The fruits (berries) are rich in antocianins and polyphenols – and renowned for their ability to ensure and activate the antioxidant cellular protection.

Taking into consideration their importance, it is implicitly understood that the *Vaccinium* samples stored in the Herbarium are very well preserved, so that any identification error can be corrected in the light of recent taxonomy progresses.

As such, each specimen has its own label with information about the location and date of harvest, as well as its habitat. The *Vaccinium* samples can be used to define conservation properties as well as in emphasizing the species decline.

There is a high probability that due to climatic changes, many *Vaccinium* species that were collected from a certain habitat, do not exist there anymore. As such, the exemplars from this collection could be the only proof that these species existed in those habitats. This fact is valid especially for *Vacciunium uliginosum*, which is included in Romania's Red List of critically endangered species.

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