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**SPECIES OF THE GENUS CREPIS COLLECTED IN "AL. BELDIE"
HERBARIUM**

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ABSTRACT

Crepis is a genus of annual and perennial flowering plants of the family Asteraceae. The genus name *Crepis* derives from the Greek *krepis*, meaning "slipper" or "sandal", possibly in reference to the shape of the fruit. There are about 200 species in the genus. The aim of this article is to describe some *Crepis* species that are collected in the Al Beldie Herbarium from INCDS Marin Drăcea Bucharest. The Herbarium host 184 plates with *Crepis* genus species. Most plates belong to *Crepis rhoedifolia* and *C. setosa*. The oldest *Crepis* specimen was collected in 1802. The *Crepis* genus in this collection is very diverse. The diversity of this material also pertains to areas and habitat types in which the material was collected. Most of the herbarium specimens were generally in good condition except for a smaller number of specimens which were damaged.

INTRODUCTION

It is assumed that *Crepis* Genus originates from Altai / Tien Shan, Central Asia (Babcock 1947). The genus belongs to the Asteraceae family and has annual and perennial flowers that resemble Hieracium Genus (that also belongs to the same family).

There are over 200 *Crepis* species spread out around the globe, but especially in the north hemisphere and in Africa (Enke & Gemeinholzer 2008, Shi et al. 2011). The largest diversity of this genus is found in the Mediterranean area (Enke & Gemeinholzer 2008).

Due to the importance of these species, numerous samples were harvested and kept in herbariums, starting from 1802. This activity was very useful for future generations that intend to study them.

Crepis species from our country or from abroad are present in "Al Beldie" Herbarium from "Marin Drăcea" National Institute of Research and Development in Forestry (INCDS), Bucharest. Here, they are kept in optimum conditions that allow them to be studied and observed in all their details. The herbarium also contains numerous other species from Romania or abroad: Moldavia (Vasile et al., 2019), the Balkans (Kachova et al. 2020), Dolj (Cantar et al. 2019), Ilfov (Dinca et al. 2020), Bucegi (Crisan et al. 2020), Vlasca (Ciontu et al. 2019) and Buzau (Crisan et al. 2020). Other genus is also present, namely *Orobanche* (Scarlatescu et al. 2017), *Rubus* (Dinca et al. 2018), *Elymus* (Plesca et al. 2019), *Alnus* (Dinca et al. 2019), *Cornus* (Vechiu et al., 2019), *Bromus* (Tudor et al. 2019), and *Campanula* (Dinca et al. 2020).

The purpose of this article is to describe the *Crepis* species present in “Al. Beldie” Herbarium. This includes their origin location, the years in which they were harvested, the botanists that gathered them and their conservation degree.

MATERIAL AND METHODS

The research took place in the place that hosts “Al. Beldie” Herbarium, in INCDS “Marin Drăcea,” Bucharest. The Herbarium contains over 40.000 vouchers with herbaceous and wood forest species, moss, fern and rare species included on the Red List (Vasile et al. 2016).

The vouchers are kept in their original maps, while the specimens are organised in a taxonomy system centered on phylogenetic classification principles. All plants are grouped on their relatedness, with each voucher having a label that contains the following data: the specie’s scientific and popular name; taxonomy; harvesting place and date; data about the habitat from which it was collected and the name of the researcher or botanist who collected the sample. Together with the identification of *Crepis* vouchers, we have also verified the plant’s conservation degree. As such, each plant has received a grade from 1 to 4 that represents the current conservation state: 1 = well preserved plant, entire and attached to the voucher, 2 = plant detached from the voucher, with detached but existing parts, 3 = plant detached from the voucher, with missing parts and 4 = plant detached and fragmented, with over 50% missing.

RESULTS AND DISCUSSIONS

From the total of 184 vouchers with *Crepis* samples, the most well represented ones are *C. rhoeadifolia* (14%) and *C. setosa* (13%). *C. tectorum*, *C. paludosa*, *C. bienis*, *C. conyzifolia*, *C. pulchera*, *C. capilaris*, *C. grandiflora*, *C. modocensis*, *C. incarnata*, and *C. premorsa* represent between 5% and 2%, while the remaining species have only one sample (Fig. 1).

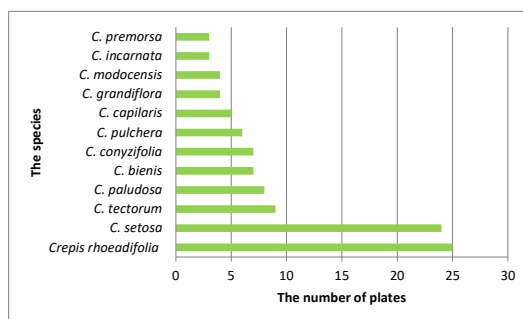


Figure 1. *Crepis* species form the herbarium

It can be seen that amongst the 184 herbarium vouchers, *Crepis* has 50 species.

The oldest voucher dates back to 1802 (*Crepis tectorum*) – gathered by the botanist Otto Holm while the most recent one is from 1960 (*Crepis foetida*) – gathered from Oltenia by the botanists M. Păun, C. Maloș and M. Olaru.

***Crepis* species from the herbarium**

Crepis tectorum L. (Foto 2,3) – is formed of groups of up to 20 flowers that are similar to dandelions. The flowers are located in the superior part and on stems and split from the superior axes of leaves. Individual flowers are yellow, reach 2,5 cm in height and have 30-70 petals (Anderson 1989). The basis presents a leaf rosette of 13 cm length and 2,5 cm width, while the leaves are serrated, acuminate and shortly pedunculate (Anderson 1992).



Foto 2. *Crepis tectorum* var. *pygmaea*

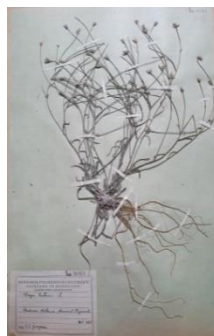


Foto 3. *Crepis tectorum*

Crepis pygmaea L. subsp. *pygmaea* (Photo 4) - is a perennial herbaceous plant (Pignatti 1982) widespread in South Europe where it usually grows in high mountain areas. In this area, located in the Apennine Mountains, the plant grows exclusively on slopes with unstable limestone debris (Di Pietro et al. 2001). The plant is small, more or less tomentose. The leaves form a rosette of 11 x 3 cm, have an oval shape and an oval or rounded higher lobe. The flowers are yellow, grouped in capitulum situated at the end of a tomentose stem.



Foto 4. *Crepis pygmaea*
– from Pyrene Mountains



Foto 5. *Crepis vesicaria*

Crepis vesicaria L. (Photo 5) - is an European species widespread in West and South Europe, in Ireland and Portugal and up to Germany, Austria and Greece. The plant is annual and can reach 120 cm in height. It can have up to 20 flower capitals, each with up to 70 petals. The plant grows in hill areas and on sandy soils (Greuter 2009).

Crepis virens L. sinonim cu *Crepis capillaris* Wall. (Photo 6) - an annual or biennial herbaceous plant, with a height between 10 and 90 cm. The stem is erect, with branches that start from the base, glabrous, light green with purple veins and it usually lacks leaves. Each plant can have a maximum of 6 branches.

The inflorescence is formed of terminal flower capitals that are erect and numerous (from 10 up to 15). The fruits are brown achene of 1,5-2,5 mm length, with 10 longitudinal veins (Kadereit et al. 2007). Their habitat is represented by uncultivated fields, plains, rural areas and banks.



Foto 6. *Crepis virens* – from Pyrenee Mountains

The herbarium samples were collected mainly between 1858 and 1947 (Fig. 7) and were kept with care so that they are presently in a very good conservation state even if some of them are older than 200 years (Fig. 8).

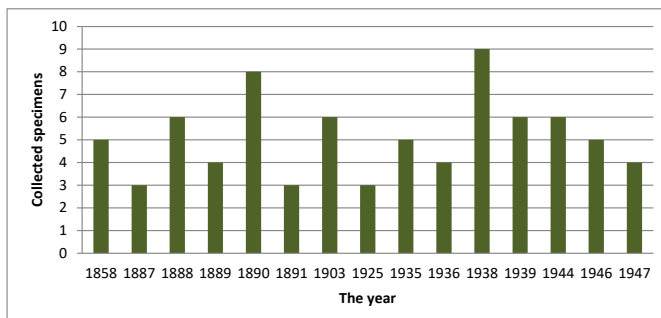


Figure 7. The time interval in which the majority of samples were collected in the herbarium

The majority of vouchers contain entire plants that are well fixed (grd. 1). However, there are some plants that are entire but with detached parts (grd. 2) as well as detached plants with missing parts (grd. 3) even though they are few (a total of 10 vouchers (Fig. 8).

The herbarium vouchers originate mainly from Bucharest's Polytechnic School Herbarium, Cluj Botanical Museum, and from ICEF (Institute of Forestry Research and Experimentation). Other vouchers were obtained through exchanges with collections owned by foreign botanists, namely Plante Italie Superioris, Herbar Pastor Rehsteiner Helvet, M. Gandoger – Flora Hispanica Exicata, etc.

As such, the *Crepis* species from the herbarium originate from Romania (Transylvania, Bucegi Mountains, Oltenia, Bucovina, Maramureş, Argeş, Ilfov, Timiş etc.) as well as from Dalmatia, Hungary, Tirol, Germany, Pyrenee Mountains, Athos Mountains, Tatra Mountains etc.

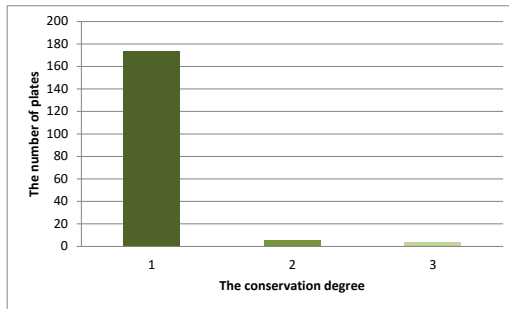


Figure 8. The conservation state of *Crepis* samples

Furthermore, the botanists that have collected and identified these plants are also Romanian (Al. Beldie, A. Haralamb, Șt. Purcelean, S. Pașcovschi, C.C. Georgescu, P. Cretzoiu) or foreign (Otto Holm, Don C. A. Geraro, M. Melsheimer, G.B. Canneva, R. Pirota, G.A. Poscharsky, H. Bourdot, Franz Fiala, etc.)

CONCLUSIONS

Crepis species as well as all the plant species conserved in worldwide herbariums can be used for accessing a large number of genomes especially in the context of new DNA extraction methods. The data obtained from these plants, some dating from hundred of years, can be used for different evolution analysis, including estimating phylogenetic relations and rebuilding the history of entire populations. If we take into account worldwide climatic changes and the fact that a larger number of species are introduced in other habitats, it is very important to understand how species react to environment changes and how they respond to anthropic perturbations. In order to understand how species responded in the past to all these perturbations, future research should combine genetic and climatic data with the data inscribed on herbarium vouchers (habitat information) as well as with morphologic values taken directly from conserved plants. In this way, predictions about how plants answer to climatic changes can be realized based on direct measurements from historical collections.

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