FIRST OF "ALEXANDRU BELDIE" HERBARIUM

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Abstract: *"Alexandru Beldie" Herbarium (Code: BUCF), hosted by "Marin Drăcea" National Institute for Research and Development in Forestry, was founded in 1929. Together with other fifteen herbaria from Romania, BUCF is listed in Index Herbariorum. This herbarium is composed of more than 60.000 samples (paper sheets) of preserved specimens of trees, mosses, lichens, ferns and plants. The aim of this paper was to provide an overview of the representatives of genus Abies Mill. included in "Alexandru Beldie" Herbarium. Eighty paper sheets containing sixteen taxa belonging to genus Abies Mill. were analyzed. The majority of the plant material was collected from Romania by known botanists, between 1880 and 1960. European silver fir (Abies alba Mill.) and Nordmann fir [Abies nordmanniana (Steven) Spach] were the most common species. The Herbarium contains also some rare species such as Spanish fir (Abies pinsapo Boiss.).*

Keywords*: Abies, Alexandru Beldie, firs, herbarium, silver fir.*

INTRODUCTION

A herbarium represents a collection of preserved plants used for a broad range of scientific studies. In recent decades, herbaria collections provided input for studies related to taxonomy, ecology, systematics, pollination ecology, climate change, teaching, genetics, anatomy and morphology, phytogeography, biogeography, environment variation, anthropology, ethnobotany, economic botany, insect ecology, medical studies, etc. (FUNK, 2003). Moreover, the herbaria represent one of the main means used by specialists for studying the history of plants (VASILE ET AL., 2016).

In Romania, sixteen herbaria exist. One of the well-known collection among specialists is "Alexandru Beldie" Herbarium (Code: BUCF), hosted by "Marin Drăcea" National Institute for Research and Development in Forestry (INCDS). BUCF was founded in 1929 by professor Alexandru Beldie and incorporates a collection of more than 60.000 samples (paper sheets) of preserved specimens of trees, mosses, lichens, ferns and plants.

The collection contains numerous plates with plants from the mountain area such as 32 species of the genus *Arabis* L. (DINCĂ ET AL., 2017a), 33 species of genus *Orobanche* L. (SCĂRLĂTESCU ET AL., 2017) and 112 species of genus *Hieracium* L. (DINCĂ ET AL., 2017b). BUCF includes also plants originating from other parts of the country, such as those collected by S. Pașcovschi from Bazoș Dendrological Park from Timișoara (CHISĂLIȚĂ ET AL., 2017). The herbarium contains also plates with preserved biological material belonging to 9 species of genus *Melica* L., 11 species of genus *Eragrostis* (L.) Wolf. (CÂNTAR AND DINCĂ., 2017), 19 species of genus *Androsace* L. (DINCĂ ET AL., 2017c) and 15 species of genus *Veronica* L. (DINCĂ ET AL., 2017d).

The gymnosperms are represented by several genera, genus *Abies* Mill. being one of the most common. From a taxonomic perspective, genus *Abies* was established by Miller more than two and a half centuries ago (in 1754), having *A. alba* as the representative species (FARJON AND RUSHFORTH, 1989).

Silver fir (*Abies alba* Mill.) is a large evergreen resinous tree species, that is mainly distributed in montane areas in Central Europe, being also present in Southern and Eastern Europe (MAURI ET AL., 2016). In Romania, silver fir together with Norway spruce [Picea abies (L.) H. Karst.] represent the most important coniferous species from economic and ecological point of view (CURTU ET AL., 2009). Its Romanian distribution range is along the Carpathian Mountains, including largest areas of remnant native stands, such as the one from Apuseni National Park (FEURDEAN AND WILLIS, 2008).

Nowadays, many fir species are located in small areas, being in most of the cases relict and endemic populations. It is the case of the Spanish fir (*A. pinsapo* var. *pinsapo* Boiss.) that occurs in South Spain in the provinces of Malaga and Granada or Algerian fir (*A. numidica* de Lannoy ex Carrière) that occupies an area on Mounts Babor and Talahor in the Kabylia region of Algeria (CAUDULLO AND TINNER, 2016).

MATERIAL AND METHODS

The samples are kept in their original sheets and are arranged in 30 modules, each module having 20 drawers. The scheme for the organization of herbaceous specimens follows a natural taxonomic system based on phylogenetic classification principles. Thus, the plants are arranged and grouped according to the degree of relationship between them and their evolutionary relationships (VASILE ET AL., 2016).

Each sample is labeled and the labels provide the following data: the scientific and popular names of the species, the taxonomic classification of the species, the place of collection, the date of collection, summary data about the biotope of the harvested plant, the name of the person who collected the plant and the name of the one who determined the plant (Figure 1 – example for fir species).

Every sample is evaluated and the degree of conservation is assessed by using the following scale: 1 = well preserved plant (whole plant) properly attached to the sheet, 2 = plant detached from the sheet with detached, but existing parts, 3 = plant detached from the sheet with missing parts and 4 = detached and fragmented plant with over 50% missing parts (VASILE ET AL., 2016).

Abies balsamea (L.) Mill. | *Abies lasiocarpa* (Hooker) Nuttall. | *Abies nobilis* Lindl. | *Abies veitchii* Lindley

Figure 1. Samples of preserved biological material (fir species)

RESULTS AND DISCUSSIONS

A total of eighty paper sheets and sixteen taxa belonging to genus *Abies* were sampled, namely silver fir (*Abies alba* Mill.), corkbark fir (*A. arizonica* Merriam.), balsam fir [*A. balsamea* (L.) Mill.], Greek fir (*A. cephalonica* Loudon), white fir [*A. concolor* (Gordon) Lindley ex Hildebrand], Delavay's silver-fir (*A. delavayi* Franchet), *A. faxoniana* Rehd. & Wils, giant fir [*A. grandis* (Douglas ex D. Don) Lindley], Nikko fir (*A. homolepis* Sieb. & Zucc), Rocky Mountain fir (*A. lasiocarpa* (Hooker) Nuttall.), *A. nobilis* Lindl., Nordmann fir [*A. nordmanniana* (Steven) Spach], Algerian fir (*A. numidica* de Lannoy ex Carrière), *A. pectinata* D.C (*A. alba* Mill.), Spanish fir (*A. pinsapo* Boiss.) and Veitch's fir (*A. veitchii* Lindley). Ones of the most representatives samples are given in Table 1.

Table 1

Description of fir species

Drawer no.	Plate no.	Herbarium/ Botanic collection/ Institution	Name of species	Harvest date	Harvest place	Collector	Conservation status (1..4)
83	2	Herbarul Universităţii din Cluj, România	*Abies alba* Mill.	1909.06.02	Croatia	P. Richter	2
83	23	ICEF, Institutul de Cercetări şi Experimentaţie Forestieră	*Abies arizonica* Marr.	1943.04.14	A. Friedrich Garden, Timişoara	S. Paşcovschi	1
83	24	ICEF, Institutul de Cercetări şi Experimentaţie Forestieră	*Abies balsamea* (L.) Mill.	1951	Timişul de Jos Park	Al. Beldie	2
83	30	Herbarul Institutului de Cercetări Silvice/ Ministerul Agriculturii şi Silviculturii	*Abies concolor* (Gordon) Lindley ex Hildebrand	1917.06.18	Ghica-Dofteana Park	Dumitriu Tătăranu	2
83	33	ICEF, Institutul de Cercetări şi Experimentaţie Forestieră	*Abies delavayi* Franchet	1942.08.25	Ocskay Park, Simeria	Nascov	1
83	37	Herbarul Universităţii "Regele Ferdinand I." din Cluj, Flora Romaniae	*Abies lasiocarpa* (Hooker) Nuttall.	1941.10.06	Garden of the Faculty of Agriculture, Timişoara	Bujoreanu	1
14	7	P.Sintenis Inter orientale 1892	*Abies nordmanniana* (Steven) Spach	1892.05.17	Paphlagonia Wilaget Kstambuli	Prof. Koehnc	1
14	33	ICEF	*A. numidica* de Lannoy ex Carrière	1950.09.28	Sabed	Ocskay	1
14	35	Dr.C.Baenitz Herbarium Europaeum	*Abies pinsapo* Boiss.	1935	Sierra de Yunguera Andalusia	E.Reverchon	3
14	41	ICEF	*Abies veitchii* Lindley	1951.01.01	Timişul de Jos Park	Al. Beldie	1

Among the identified taxa, six of them are native to North America, namely corkbark fir, balsam fir, white fir, giant fir, Rocky Mountain fir and *Abies nobilis*. Also, the herbarium contains species originating from Asia, such as Nikko fir, Veitch's fir (both from Japan), Delavay's silver fir and *Abies faxoniana* (both from China) and Nordmann fir (from Caucasus). The list is completed by Algerian fir (native to North Africa), Greek fir and Spanish fir.

Fir specimens included in the herbarium were sampled between 1880 and 1960. Among the oldest ones, there is a sample of a silver fir collected by Woeff in 1880 and a sample of a Nordmann fir collected by Professor Koehnc in 1892. Both of them are in good conservation status.

Most of the biological materials was sampled in the timeframe between 1940 and 1949, with the peak in 1942 (Figure 2 - left), when 18 samples were collected especially from Ocskay Park (Simeria, Hunedoara County) by S. Pașcovschi and by Al. Beldie from Mihăești forest district.

In the majority of the cases, the biological material originated from Romania (Figure 2 - right) across silver fir's natural distribution range, but from different micro-regions (*e.g.* Timișul de Sus, Siriu, Bucegi, Muntele Mic) or from famous public or private dendrological collections (*e.g.* Doftana-Bacău, Simeria-Hunedoara, Bazoș-Timișoara, Peleș-Sinaia, Mihăești).

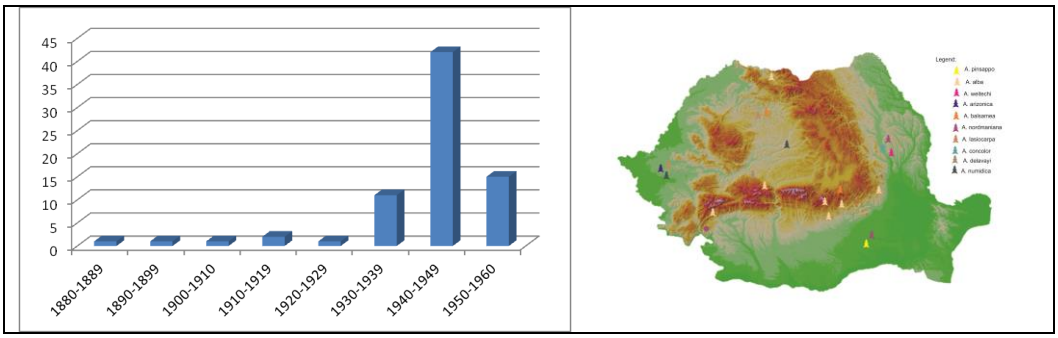

Figure 2. Time (left) and place (right) of collections

The people who collected the biological material were mainly well-known Romanian specialists, namely C.C. Georgescu, I. Morariu, Al. Beldie, S. Pașcovschi, I. Moiceanu, G. Bujorean, I. Dumitriu Tătăranu and M. Ciucă.

CONCLUSIONS

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

The firs' collection of "Alexandru Beldie" Herbarium represents a useful historical and biological database that could be used in several multi-disciplinary studies.

The recent initiative of INCDS staff aimed at reviewing the status of the collection and to publish several papers presenting the most representatives genera for Romanian flora could be an opportunity for researches to gain insights regarding important aspects as regards the morphology, evolution, taxonomy, systematics, etc. We consider also that an online

publically available database will be very appreciated by the specialists and the general public in the same time.

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