

Herbarium of Botanical Garden of Pavol Jozef Šafárik University in Košice – a part of the botanical history of the region of eastern Slovakia

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Abstract: In 1884, Seed Station (Vetőmagvizsgáló Állomás) as a state institution of Hungary was established in Košice. On its ground probably the second institutional herbarium in this region was established. It gathered collections of wild and introduced plants from the vicinity of Košice and eastern Slovakia (Carpathian and Pannonian bioregions), including exsiccates of the collectors like A. Degen, L. de Thaisz and later M. Deyl. This herbarium later got into the administration of the Košice branch of the Central Agricultural Inspection and Testing Institute (Ústřední kontrolní a zkušební ústav zemědělský, ÚKZUZ) with the main office in Prague. In 1950, the Botanical Garden of the University of Agricultural and Forest Engineering (Vysoká škola poľnohospodárskeho a lesníckeho inžinierstva, VŠPLI) was established in Košice. Plant documentation material from the region of eastern Slovakia began to be concentrated there and another institutional herbarium, which was later taken over by the Slovak Academy of Sciences, was established. In 1960, the Botanical Garden in Košice was taken over by the Pedagogical Institute (Pedagogický inštitút), and the rather large herbarium was then reduced to 3,415 herbarium specimens. In the years 1958-1960, however, it was enriched by 9,539 herbarium specimens of the Košice branch of ÚKZUZ, which passed the herbarium from the years 1897 – 1943 to the botanical garden. In 1964, the botanical garden became a part of the Pavol Jozef Šafárik University (UPJŠ). At that time, the herbarium included

16,000 herbarium specimens of seed plants. For many years, the herbarium had only provisional rooms for its storage. In the early 1990s, a part of the building of the Botanical Garden was rebuilt and herbarium depositary and study room were formed. Later an electronic database has been created and in recent years the herbarium specimens have also been digitized. In September 2020 the herbarium included about 55,000 specimens, of which more than 34,500 were registered in local database and some of them (more than 9,000) are digitized.

Keywords: botanical garden, collection, Slovakia.

The first institutional herbaria in Košice and their fate

The tradition of university education in the town of Košice in eastern Slovakia dates back to the 17th century, when on 20th of February 1657 in the village of Jasov near Košice Roman Catholic bishop of the Archdiocese of Eger (both at that time and today in Hungary, where the town of Košice also belonged), Benedict Kisdy, issued the establishing document of Academia Cassoviensis. On the 7th of August 1660 it was awarded by Golden Bull by Leopold I, which gave the University and the city the same privileges as for instance, Cologne, Vienna, Graz and others (Frický 1974). Despite this tradition, the oldest preserved herbarium from Košice dates from a later period and is related to the existence of the Grammar School. For several periods it was under the administration of Premonstratensian Order (at present, it is the Premonstratensian Grammar School at Kováčska 28 Street in Košice, which was founded by the Premonstratensian Order - Jasov Abbey). At the end of the 20th century, a state grammar school was in the building. The grammar school ceased to exist. Fortunately, rare herbarium collections were preserved, as they were offered to the East Slovak Museum. In September 2020, its collection consisted of a total of 7193 herbarium specimens. In the international Index Herbariorum (Thiers 2021+), the museum's collection abbreviation is VSM and has existed since 1988. In 1997 the museum took over 4 collections from the above grammar school: 1. preserved algae collections from 1856 and 1872; 2. herbarium of seed plants from 1872 and 1873 (Növénygyűjtemény = Plant collection); 3. Gift Pflanzen (poisonous plants) from 1861; 4. Herbarium of Adami Loniceri - Kräuter Buch - from 1770 (Sitášová pers.comm.).

Another institutional herbarium in Košice emerged after the establishment of the Seed Station as a state institution of Hungary in Košice in 1884. It concentrated collections of wild plants from the vicinity of Košice and eastern Slovakia, which included also the exsiccates of the collectors A. Degen and L. Thaisz. In 1909, this herbarium collection had 2000 specimens (Petráš 1983). In 1920 the seed station together with herbarium passes to State Agricultural Research Institutes (Petráš 1983), after the Second World War in 1951 to the Košice branch of the Central Agricultural Inspection and Testing Institute with the main office in Prague (Onačila & Janotik 1983). In the later period, the collections of the seed station get to the

herbarium of the Botanical Garden of P. J. Šafárik University in Košice (Thiers 2021+), which is mentioned later.

The beginnings of the herbarium of the Botanical Garden in Košice

On May 5, 1950, the Botanical Garden at the University of Agricultural and Forest Engineering (Vysoká škola poľnohospodárskeho a lesníckeho inžinierstva – VŠPLI, since 1951 under the name University of Agriculture and Forestry in Košice, Mochnacký 2001, 2013) was established in Košice. Since its foundation, works on the building of the herbarium of the Botanical Garden (BG) have also begun. Information about its beginnings is available from the work of the former director of the Botanical Garden of P. J. Šafárik University Tibor J. Antoš (Antoš 1964). For its building also Dr. Ján Martin Novacký was credited, who, however, was a professor at VŠPLI only until 1949 (Hrabovec & Vozárová 2010), but apparently even then, as a former rector, he influenced events at VŠPLI. Antoš (1964) writes: „The task of the herbarium was to concentrate plant documentation material from eastern Slovakia and at the same time improve the teaching possibilities at VŠPLI. The first herbarium specimens come from the collections of assistants at the Institute of Botany, VŠPLI (M. Manica, J. Daninger, T. J. Antoš) and from student collections during their field practice “. VŠPLI was divided by a government resolution in 1952 and moved to Zvolen (College of Forestry and Wood Technology, now Technical University) and Nitra (College of Agriculture, now Slovak University of Agriculture). From 1st January 1953, the Botanical Garden passed to the Slovak Academy of Sciences, which was still prepared at that time (Mochnacký 2001). This passage has had a positive effect on herbarium enlargement, mainly due to the research programs aimed at studying weeds and to the documentary material of ecological and geobotanical research works of the collectors J. Rác, A. Laffers, A. Lihová and J. Berta.

In 1960, the Botanical Garden passed to the Pedagogical Institute and some of the staff of Slovak Academy of Science left even with their collections. Only 3,415 herbarium items remain from the rather large herbarium in Košice (Antoš 1964).

Antoš (1964) provides detailed information on the incorporation of the above-mentioned herbarium originally belonging to the seed station into the collections of the Botanical Garden: „In the years 1958-60, at the initiative of A. Brecher, the Central Agricultural Inspection and Testing Institute in Košice passed its herbaria, containing collections from eastern Slovakia and the surroundings of Košice from 1897-1943 on to the Botanical Garden. The herbarium contained 9539 specimens. They can be divided into two groups according to the nature of the material. The first group is comprised of the collections of wild species from the vicinity of Košice and eastern Slovakia. Among these there are many exsiccates of prominent botanists (Degen, Thaisz and from the younger ones Č. Deyl). Some exsiccates come from the entire Carpathian arc and include East Carpathian endemics. The second group of herbarium specimens represents the collections from the experimental fields of the research institute, where different agricultural, technical and medicinal plants were experimentally studied (M. Maloch, A. Brecher).“ These collections were

supplemented by the employees of the Botanical Garden. Their collections come mainly from the Vihorlat Mts., the Pieniny Mts., the Vysoké Tatry Mts., the Liptovské hole Mts., Juhoslovenský kras Karst, Košická kotlina Basin and the Východoslovenská nížina Lowland. The custodian of the collections from 1960 to 1984 was Ing. Adelaida Lihová. According to Antoš (1962), in 1962 there were a total of 14,000 herbarium specimens in the Botanical Garden, and in 1964 there were 16,000 (Antoš 1964) specimens of seed plants.

In addition to the specimens of seed plants, herbaria of mosses, lichens and fungi were a part of the herbarium collection already in this period. They came mostly from the collections of Miloslav Maloch (more than 1500 specimens in total from this collector, fungi themselves about 1040 specimens). In 1950-1952 Maloch's herbarium was bought by the Institute of Meadows, Pastures and Mountain Management VŠPLI, but a part of it was destroyed due to improper storage, and a part got into the collections of the herbarium of the Botanical Garden in Košice (Eliáš 2010).

Herbarium after the Botanical Garden was taken over by Pavol Jozef Šafárik University (1964)

In 1964, the Botanical Garden in Košice became a stable part of the Pavol Jozef Šafárik University. Adelaida Lihová continued as the custodian of the herbarium, however, the herbarium collection suffered because it did not have standard storage and service rooms. Herbaria were temporarily stored in the main building and in one side building under unsatisfactory conditions. The number of new specimens increased only scantily. In the 1960s the material was registered according to the Madalský system and was marked by herbarium labels with common data (Antoš 1964). During the 1970s and 1980s, the situation with the herbarium was very bad, therefore a separate institutional herbarium was established at the Department of Special Biology of the Faculty of Science. The situation began to change after Vlastimil Mikoláš started to work as custodian in 1984. His fieldworks in Slovakia and abroad resulted in thousands of new specimens for the herbarium. However, a large part of the new specimens was not accompanied by proper herbarium data labels and the herbarium specimens often had only a reference number to the handwritten notes in the collector's notebooks. However, the herbarium still did not have suitable premises.

Herbarium collections of the Botanical Garden of UPJŠ after 1990

The change in the position of director of the Botanical Garden, when Sergej Mochnacký was appointed to this position in 1989, also brought a change in the quality of the premises for the herbarium collection. He decided to rebuild certain spaces on the 2nd floor of the Botanical Garden building, which then began to serve the needs of the herbarium. The premises included 4 rooms: a study (Fig. 1), a drying room, a deposit (Fig. 2) and a quarantine room. Movable sheet metal racks were

constructed in the deposit, which enabled maximum utilization of the room space (Fig.2). The drying room was equipped by an electric dryer for the drying of plants. A computer, stereomicroscopes and other equipment were added up to the study (Mochnecký 2001). Herbarium specimens from the temporary storage rooms, as well as the herbarium of the Department of Botany, Faculty of Science of P. J. Šafárik University, which included a substantial part of Andrej Vojtuň's collections, were moved to these new premises. After a specialized computer database had been created by Pavol Mártonfi and Peter Bugata (Mártonfi & Bugata 1992), the herbarium specimens began to be registered also in electronic form. Under the management by the custodian V. Mikoláš, the herbarium started to be organized according to Dalla Torre (Dalla Torre & Harms 1908). The herbarium specimens were archived in packages with pasteboard sheets on the top and the bottom of the package, tied with coarse cord (Fig. 3a). In the 1990s, thousands of further specimens were added, mainly the collections of V. Mikoláš from Slovakia, the Czech Republic, the Balkans (mainly Bulgaria and Macedonia) and other regions of Europe (Ukraine, Turkey) and Central Asia (Tajikistan, Armenia, North Caucasus) (Mártonfiová & Mártonfi 2013). However, these new specimens were mostly not accompanied by herbarium labels with the specimen data. In the 1990s, a substantial part of the collection of the specimens of Pavol Mártonfi became a part of the herbarium.

When V. Mikoláš left the Botanical Garden after disagreements with the director at the end of 1999, the collection was reduced by thousands of his herbarium specimens (about 30,000 – 40,000 specimens, mainly specimens from Slovakia and Central Asia), which were not accompanied by herbarium data labels. In the year 2000, Lenka Mártonfiová has become the curator of the herbarium collections. Alžbeta Bakšiová, who has been working here since 1990, has remained working as a technical worker. As part of the reorganization of the herbarium, the gradual fixing of the specimens (if the condition of the specimen was satisfactory and its size convenient) to white cardboard sheets (Fig. 4) and the replacement of the bound packages by storing of the specimens in pasteboard boxes began (Fig. 3b). The arrangement of the genera in the herbarium is alphabetical. In the middle of the first decade of the 21st century, the existing database in the DOS operating system proved to be unsatisfactory. Therefore, the basis of a new database in the MS-Access product in Windows background was created with the help of Viktoriia Yanocho from Information and Communication Technology Centre of P. J. Šafárik University. This database serves to process information about herbarium specimens up to this day, and over time the collection has been digitized. Owing to the efforts of the custodian, despite the dissent of the then director, several thousands of herbarium specimens of V. Mikoláš, this time already accompanied by herbarium data labels, were gradually returned to the herbarium.



Fig. 1 Study room of the herbarium.



Fig. 2 Deposit with movable sheet metal racks.



Fig. 3. Forms of archiving of herbarium specimens. (left) Packages with pasteboard sheets on the top and the bottom of the package, tied with coarse cord – state from previous years, (right) pasteboard boxes – present state.



Fig. 4 Examples of herbarium specimens, from the left to the right: *Onosma pseudoarenaria* subsp *tuberculata* (the Zemplínske vrchy Mts., leg. Mártonfi & Bogoly 2001), *Scheuchzeria palustris* (the Vihorlat Mts., leg. Mikoláš 1992), *Sisyrrinchium montanum* (the Slanské vrchy Mts., leg. Vojtuň 1974). Herbarium specimen is fixed to the white cardboard sheet by a paper tape, herbarium label is attached by a double-sided tape (bottom left). Original herbarium data labels are fixed to the herbarium specimen sheet, too. The specimen is inserted to a paper double sheet (bottom, center). Double sheets with one species are placed together in one marked envelope (bottom right).

Even after the year 1991, when the herbarium was placed in suitable premises, problems with the drugstore beetle (*Stegobium paniceum* Linnaeus, 1758) remained in the herbarium. These were solved several times by gassing of the specimens, but such a system required closing of the whole building at the time of gassing. Instead of gassing, freezing of the deposit in winter during the harshest frosts is carried. Simple intensive airing of the premises during a few days of the freezing winter period has become effective. This management is complemented by thorough quarantine of new specimens and occasional freezing of existing specimens in a large-capacity freezer at -20 °C for at least 48 hours (modified methodology according to Lizoň 1988). We tested the effectiveness of this methodology for drugstore beetle and even after a year we did not notice any living individuals.

Approximately since 2012 Matej Dudáš has been working in the herbarium, first as a volunteer, then a doctoral student and since 2016 as an employee of the Department of Botany, Faculty of Science of P. J. Šafárik University. He coordinates some work, especially the registration and digitization of the collection. Documents for his floristic and taxonomic studies mainly in the region of Eastern Slovakia are deposited in this herbarium. His help is an important contribution to the further advance of the herbarium collection.

In 2018 there was a change at the position of the director of the BG. The position is taken by Pavol Mártonfi. As a part of the subsequent modernization of electrical and computer networks in the building in 2019, the herbarium was also modernized. After the replacement of the networks by the new ones the herbarium premises were painted, the floor coverings in the rooms and most of the old furniture were replaced by the new ones. New pasteboard boxes and herbarium paper were purchased for the gradual complete replacement of the parcel method of specimen storage. Database registration of the herbarium continues, from about 55,000 specimens approx. 34,500 are registered. At the same time, the digitization of the herbarium is also continuing – by September 2020, more than 9,000 specimens in the jpeg format with the resolution of 300 dpi had been digitized. For the next period there are several goals for the herbarium: registration of further specimens from the collection, their further digitization, increasing of the collection, especially by the specimens from the Carpathians and Pannonia, as well as making the herbarium collection visible in the online Internet.

Current state of the collections of Botanical Garden of P. J. Šafárik University

The herbarium collection is registered in the international Index Herbariorum under the abbreviation **KO** (Thiers 2021+). Of the total number of about 55,000 herbarium specimens, the registration and digitization of the herbarium progresses by approximately 1,500 specimens each year.

Within the **registered approx. 34,500** specimens, the following groups of collections can be set aside with the numbers of specimens registered by the first of September 2020:

The largest number of specimens is then from the years 1951-2000 (Tab. 1). In the herbarium there are specimens from a total of about 400 collectors. From this point of view, by the September 2020, the group of first five collectors with at least 1000 specimens had consisted of V. Mikoláš (more than 14,000 specimens), then A. Vojtuň, M. Maloch, P. Mártonfi and J. Rigler. They are closely followed by the founder of modern botany in Košice, L. Thaisz (Mikoláš 1991) with 988 registered specimens. Each collector was using his own handwritten herbarium labels (Fig. 7a), but part of the labels was rewritten into pre-printed herbarium labels in the past, and the original labels have been preserved only exceptionally (Fig. 7b). A complete survey of the first 15 collectors with the highest number of collections is given in Tab. 2. Of vascular plants, more than 1,000 specimens are included in the collections of the genera *Taraxacum*, *Sorbus*, *Rubus* and *Carex* (a broader survey of the most frequently occurring genera is given in Tab. 2).



Fig. 6 The oldest specimen from the collection of vascular plants. *Avenastrum planiculm*, Bohemia (leg. Rohrer 1830).

The collection of non-vascular plants consists of three collections. **The collection of fungi** (1,060 specimens) is represented mainly by the collections of M. and F. Maloch - these account for 98% of the entire collection. The remaining collections representing 1-3 specimens per collector are from F. M. Opiz, E. Kratzmann, J. Velenovský and others. The collections are from Slovakia and the Czech Republic.

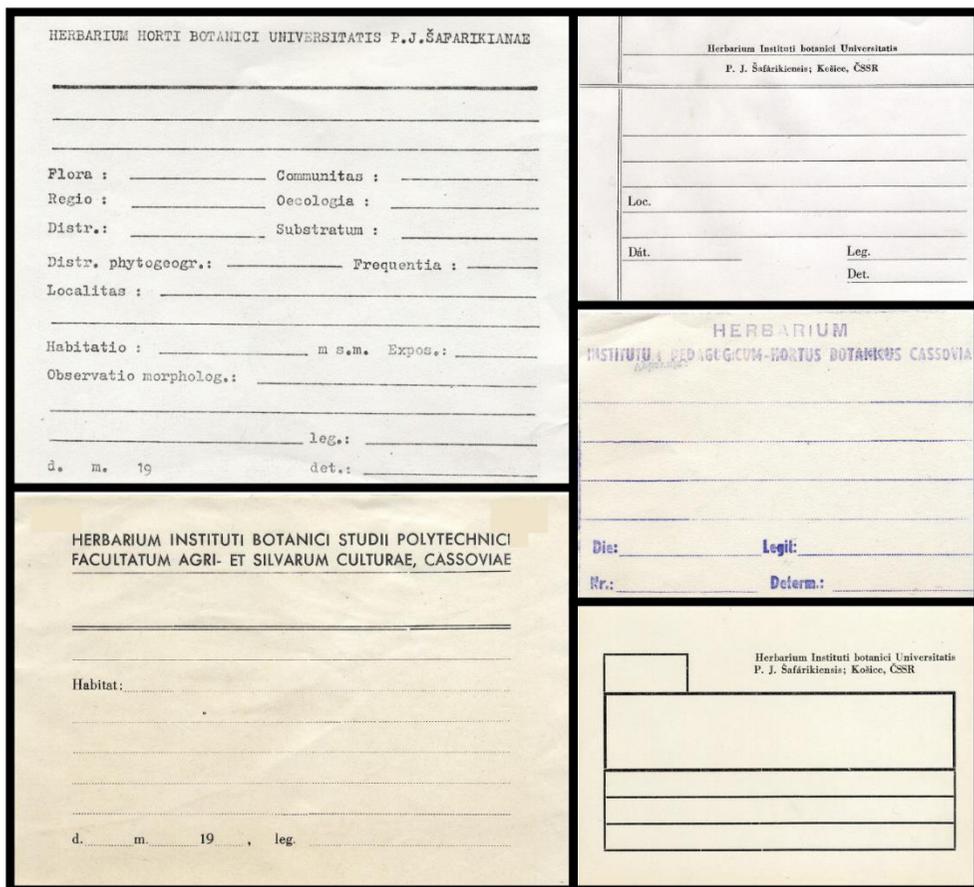


Fig. 7b. Examples of preprinted herbarium labels used in the KO herbarium in the past.



Fig. 8. A part of the collection of lichens from the collection of non-vascular plants.

Besides macroscopic fungi they include plant parasites, mildew and plant parts infested with mites, aphids and the like. **The bryophyte collection** includes approximately 650 specimens. Most of them again are the collections of M. Maloch (approx. 70%), the specimens from other collectors form the remaining part. These collections are from A. Weidmann, J. Podpěra, E. Kalenský, J. Velenovský, J. Týml, F. Kovář, J. Vilhelm, L. Fiala, R. Šoltés and A. Bayer. The collections come mainly from Slovakia (the Tatry Mts., the Fatry Mts. and Turiec region dominate) and the Czech Republic. **The lichen collection** (Bačkor & Mochnacký 2002) is represented by at least 700 specimens (Fig. 8). A part of them are the older ones collected by e. g. M. Maloch., F. Kovář, V. Kuťák, A. Oborny, J. Týml, V. Siegmund jun. (Fig. 9 left), the other part represents newer collections from M. Marcinčinová, M. Goga, M. Bačkor, M. Dudáš and others (Fig. 9 right). The collections come mostly from former Czechoslovakia between the world wars (the Czech Republic, the Slovak Republic, Transcarpathian Ukraine), the Balkans (Albania, Greece, Serbia, Northern Macedonia - more than 100 specimens), the Alps (Austria - about 30 specimens). Very valuable collection comes from Antarctica (collected by M. Bačkor during his expedition on this continent in 2017 - about 30 specimens so far).

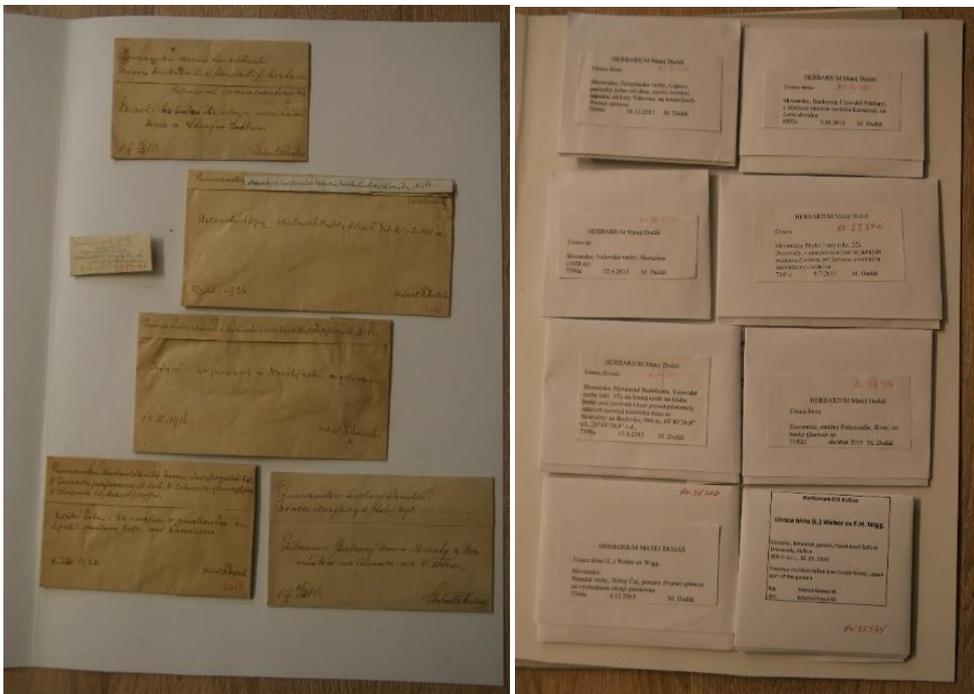


Fig. 9 The collection of lichens. The specimens are placed in folders, the older collections (left) and the collections of current staff of the Department of Botany (right).

Tab. 1 A survey of the number of databased herbarium specimens according to the collection year.

Period	Number of specimens
before 1900	67
1901-1950	8,346
1951-2000	22,544
after 2001	3,200

Tab. 2 A survey of the number of databased herbarium specimens of the most important collectors and area of collection.

Collector's name	Number of specimens	Main area of collection
Vlastimil Mikoláš	14,519	mainly E Slovakia, Central and Eastern Europe
Andrej Vojtuň	4,284	Slovenský kras Karst, Tatry Mts., Pieniny Mts.
Miroslav Maloch	2,531	Veľká Fatra Mts., Turčianska kotlina Basin
Pavol Mártonfi	1,465	Slovenský kras Karst, NE Slovakia, Scotland, S Moravia
József Rigler	1,000	Hungary
Lajos de Thaisz	988	former Austro-Hungary, former Abauj-Torna county
Matej Dudáš	880	mainly E Slovakia, SE Europe, Baltic countries
Ivan Šmidt	567	Východoslovenská nížina Lowland, Branisko Mts. Slovenské rudohorie Mts., Západné Tatry Mts.
Lenka Mártonfiová	556	Košická kotlina Basin, Slovenský kras Karst
Árpád von Degen	474	Hungary
Josef Dostál	443	former Czechoslovakia
Karel Domin	328	former Czechoslovakia
J. Greššová*	310	area of Botanical Garden, Košice
J. Brecher*	241	Hungary
Zoltán Zsák	220	Hungary, Kojšovská hoľa Mt.

* full name unknown

A separate part of the herbarium consists of type specimens, although there have been only six of them so far (Fig. 10-15, see appendix). These holotypes are concerned:

Rubus tenuimollis Mikoláš, Thaiszia – J. Bot. 27: 42 (2017), KO 33389 (Fig. 10);

Sorbus amici-petri Mikoláš, Thaiszia – J. Bot. 13: 128 (2004), KO 28231 (Fig. 11);

Sorbus dolomiticola Mikoláš, Thaiszia 6: 2 (1997), KO 11377 (Fig. 12);

Sorbus hornadensis Mikoláš, Thaiszia – J. Bot. 25: 22 (2015), KO 31137 (Fig. 13)

and isotypes:

Panicum miliaceum subsp. *agricola* H. Scholz & Mikoláš, Thaiszia 1: 33 (1992), as '*agricolum*', KO 35262 (Fig. 14);

Hypericum xcarpaticum Mártonfi, Folia Geobot. 36: 374 (2001), KO 31091 (Fig. 15).

Prospects of the herbarium collection KO

The KO herbarium is not a large herbarium. The period in the 50s-80s was difficult, because the herbarium did not have its own stable premises. It was stabilized after 1990 due to investments in the premises and the equipment. Nowadays, it provides standard services for researchers from various fields of botanical research, first of all taxonomists from various, mainly European workplaces. Currently, the biggest challenge is to move the herbaria from the bound packages to the herbarium boxes,

Tab. 3 A survey of the number of specimens according to the most frequently occurring genera with important collectors.

Genus	Number of specimens	Collector
<i>Taraxacum</i>	4,704	V. Mikoláš, M. Dudáš, R. Šuvada, J. Zámečník
<i>Sorbus</i>	1,960	V. Mikoláš
<i>Rubus</i>	1,221	V. Mikoláš
<i>Carex</i>	1,158	several collectors
<i>Thymus</i>	651	P. Mártonfi
<i>Hieracium</i>	476	several collectors
<i>Viola</i>	465	P. Mártonfi, V. Mikoláš
<i>Saxifraga</i>	443	V. Mikoláš, others
<i>Veronica</i>	421	V. Mikoláš
<i>Ranunculus</i>	369	V. Mikoláš, others
<i>Alchemilla</i>	353	V. Mikoláš, P. Frost-Olsen, others
<i>Crataegus</i>	352	V. Mikoláš, others
<i>Potentilla</i>	283	V. Mikoláš, others
<i>Poa</i>	282	V. Mikoláš, others
<i>Achillea</i>	268	V. Mikoláš, others
<i>Festuca</i>	254	V. Mikoláš, others
<i>Campanula</i>	253	V. Mikoláš, others
<i>Hypericum</i>	253	P. Mártonfi, V. Mikoláš, others
<i>Galium</i>	227	V. Mikoláš, others
<i>Senecio</i>	210	V. Mikoláš, others
<i>Trifolium</i>	201	V. Mikoláš, others
<i>Inula</i>	197	V. Mikoláš, others
<i>Rosa</i>	193	V. Mikoláš, others
<i>Chenopodium</i>	190	V. Mikoláš, M. Dudáš, others
<i>Arabis</i>	189	V. Mikoláš, others
<i>Salix</i>	188	V. Mikoláš, others
<i>Vicia</i>	178	V. Mikoláš, others
<i>Dianthus</i>	176	V. Mikoláš, others
<i>Teucrium</i>	155	P. Mártonfi, V. Mikoláš, others
<i>Geranium</i>	154	V. Mikoláš, others
<i>Pyrus</i>	153	V. Mikoláš, others
<i>Equisetum</i>	151	V. Mikoláš, others
<i>Luzula</i>	150	V. Mikoláš, others
<i>Silene</i>	150	V. Mikoláš, others
<i>Juncus</i>	150	V. Mikoláš, others

registration of the specimens in the database and the digitization of all herbarium specimens. Some of the specimens are fixed to the cardboard sheets (A. Vojtuň, I. Šmídt, P. Mártonfi, M. Dudáš), while the majority of Mikoláš's specimens is loosely placed in double sheets. Since the summer 2017, each new specimen has undergone registration, double freezing, and digitization. About 45% of the registered specimens (from the letter A to M) had been fixed to cardboard sheets by the end of 2020. All of the specimens are expected to be fixed no later than by the end of 2023. Herbarium collection KO is an important source of data for the Flora of Slovakia, which is continually supplemented with new herbarium specimens.

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Appendix



Fig. 10 *Rubus tenuimollis* Micoláš, holotype specimen.



Fig. 11 *Sorbus amici-petri* Mikoláš, holotype specimen.



Fig. 12 *Sorbus dolomiticola* Mikoláš, holotype specimen.



Fig. 13. *Sorbus hornadensis* Mikoláš, holotype specimen.



Panicum miliaceum L.
 Übergangsform zu *selya rudrale*
 (Kit.) Tavel.
 det. confirm. N. Mikoláš 1984
 MUS. BOT. BEROL.

EX MUSEO BOTANICO BEROLINENSI

MUSEUM BOTANICUM BEROLINENSE

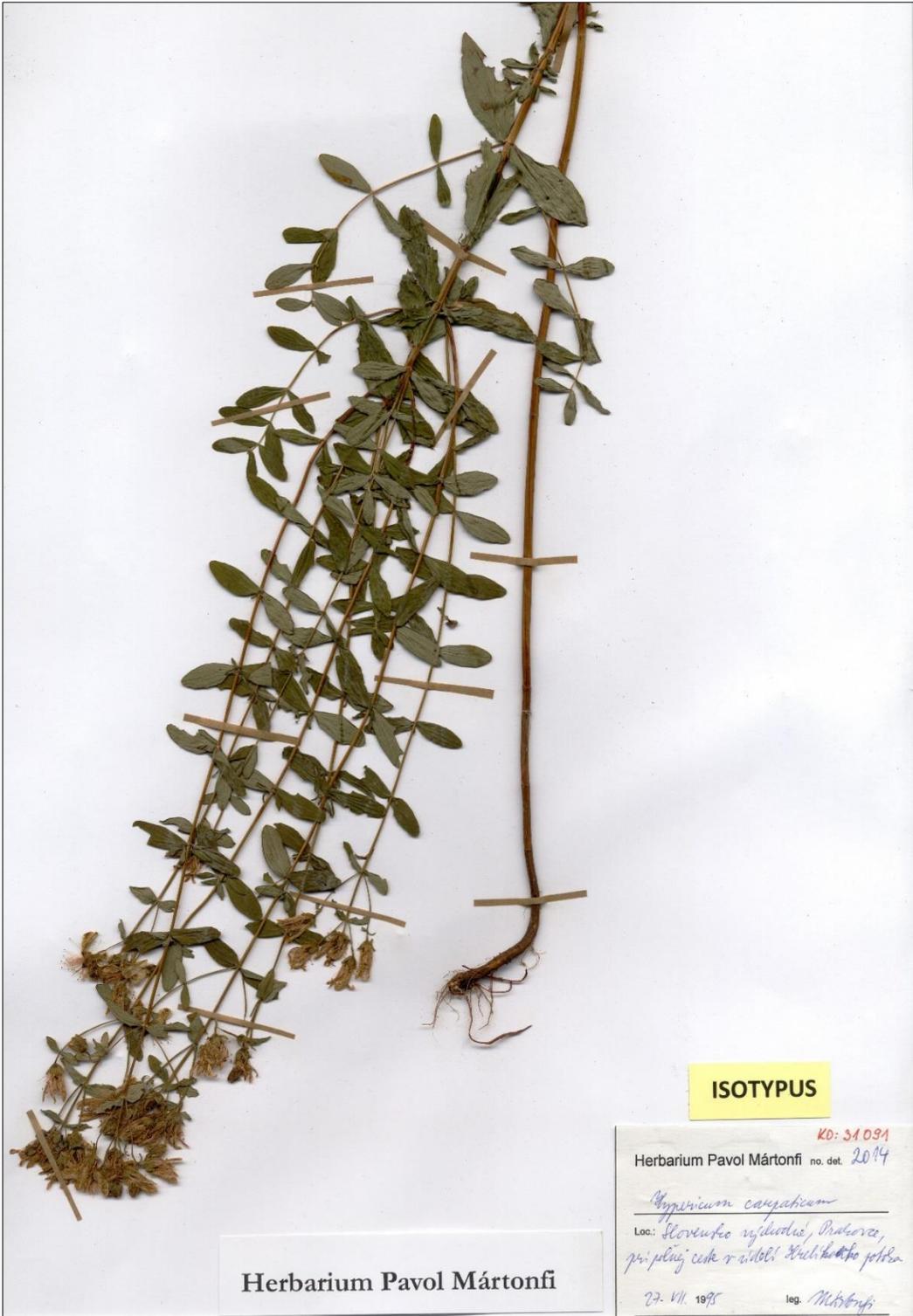
Panicum miliaceum L.
 subsp. *rudrale* (Kit.) Tavel.
 (Übergangs-Form zu subsp. *miliaceum*,
 "Falsche Unkrauthirse"; Spelzfrüchte
 ausfallend, Hüllspelzen stehbleibend)
 Österreich: Kärnten
 Im Drautal bei Spittal, an Maisfel-
 dern
 8.1984
 H. Scholz
 1984/1
 det. confirm. N. Mikoláš 1987

KD: 35262

Panicum miliaceum L.
 subsp. *agricola* H. Scholz & Mikoláš

Mus. bot. Berol.

Fig. 14. *Panicum miliaceum* subsp. *agricola* H. Scholz & Mikoláš, isotype specimen.



Herbarium Pavol Mártonfi

ISOTYPUS

KO: 31091
Herbarium Pavol Mártonfi no. det. 2014
Hypericum carpaticum
Loc.: Slovensko republiko, Bratislava,
pri juhovýchodnej ceste v blízkosti štátnej hranice
27. VII. 1978 leg. Mártonfi

Fig. 15. *Hypericum xcarpaticum* Mártonfi, isotype specimen.