UNIVERSITY OF LATVIA

International scientific conference

LIVING PLANT COLLECTIONS IN THE 21ST CENTURY

Riga, Latvia, 9-10 June 2022

BOOK OF ABSTRACTS

UNIVERSITY OF LATVIA
Botanical Garden 100

International scientific conference

LIVING PLANT COLLECTIONS IN THE 21ST CENTURY

Riga, Latvia, 9-10 June 2022

BOOK OF ABSTRACTS

Riga: Botanical Garden of the University of Latvia, 2022, 38 pages.
Editor: Signe Tomsone
Layout: Pēteris Buks

WELCOME

The Botanical Garden of the University of Latvia is the oldest botanical garden in Latvia. It was founded a century ago – only a few years after Latvia became an independent state and established its main higher education institution – the University of Latvia. The founding of the Botanical Garden in Riga was induced by the academic staff of the University for student training and research purposes. Today the Garden hosts multiple collections created at different historical times. Therefore, the conference is providing an opportunity to discover and share information among professionals, dealing with plants collections, in order to contribute their efficiency in biodiversity conservation, research and increase of public awareness. This will strengthen the community of plant collection hosts and will bring us closer to the objectives of the Global Strategy for Plant Conservation.

Dr. biol. Uldis Kondratovičs
Director
Botanical Garden of the University of Latvia

PROGRAMME

9 June 2022

Academic Centre, University of Latvia, Jelgavas 1, Room No. 701 & 702

9:30-10:00 Registration, Poster installation, Coffee & Tea

10:00 **Opening**
Uldis Kondratovičs, director of the
Botanical Garden of the University of Latvia

10:10 Plant collections & Expositions. Chair: Uldis Kondratovičs

Plant collections contribution to plant conservation */page 7*
Ludmila Vishnevska, Signe Tomsone

The collection of the genus *Rhododendron* at the Rhododendron Breeding and Testing Nursery "Babīte" of the Botanical Garden of the University of Latvia */page 8*
Gunita Riekstiņa, Rūta Katrīna Berga

Botanical-geographical exposition of subtropical plants of the O. V. Fomin Botanical Garden of the Taras Schechenko National University of Kyiv */page 9*
Oleksandr Tsybulsky, Tatjana Kolomiiets

Hornbeam *Carpinus* collection in National Botanical Garden of Latvia
Linda Strode, Daina Roze */page 10*

***Picea* plants diversity in Klaipėda University Botanic Garden**
Asta Klimienė, Laura Normantė, Jurgita Ignotienė */page 12*

11:30-12:00 Coffee & Tea

12:00 Plant collections & Expositions. Chair: Anta Sparinska

Living plant collections' mission, goals and policies in Botanical Garden of Vilnius University */page 13*
Darius Ryliškis

Conifer species of IUCN Red List of Threatened Species in National Botanic Garden of Latvia */page 14*
Linda Bērtiņa, Linda Strode

Collection of rare plants of the O. V. Fomin Botanical Garden (Kyiv, Ukraine) */page 15*
Vitalii Kolomiychuk

The reconstruction of the Rock Garden in Tallinn Botanic Garden 2020–2022 */page 17*
Krista Kirotar, Urve Sinijärv

Plant collections, plant relocation, hybridization, biodiversity risks: a brief overview in the Latvian context */page 18*
Arturs Stalažs

13:30-14:30 Lunch

14:30 Research in the institutions hosting plant collections.
Chair: Signe Tomsone

Inovative garden for education and research */page 20*
Anta Sparinska, Inese Naburga, Rafaels Joffe, Marta Saulīte, Elga Ence

Tissue culture collections of rare plant species as means for characterization of ecosystem functional diversity: response of *Armeria maritima* to salinity and heavy metals */page 21*
Līva Purmale, Una Andersone-Ozola, Astra Jēkabsone, Andis Karlsons, Gederts Ievinsh

Peatland diversity conservation experience in Latvia */page 23*
Māra Pakalne

Improving of lingonberry *Vaccinium vitis-idaea* L. propagation and cultivation techniques */page 24*
Signe Tomsone, Madara Lazdāne, Lita Zīra, Andis Karlsons

15:30-16:00 Poster session

Malus and _Pyrus ex situ_ germplasm collection as a raw material source for future breeding challenges and landfill for the development of modern technologies */page 25*
Gunārs Lācis, Baiba Lāce, Laila Ikase

The patterns of alien pest proliferation in the Botanical Garden of the University of Latvia in the last decade */page 27*
Inga Apine, Uģis Piterāns

Genetic resources of ornamental plants in Lithuania */page 28*
Gitana Štukėnienė

Companion plants in the _Ericaceae_ family collection of Vilnius University Botanical Garden */page 29*
Ramunė Žemgulytė

One garden – different aspects of the plant world */page 30*
Mateusz Sowelo, Justyna Wiland-Szymańska

Latvian rare and endagered woody plants in _ex situ_ collections */page 31*
Madara Lazdāne, Inga Apine, Linda Strode, Ludmila Višņevska, Liene Opincāne, Sanita Vaivode-Āzena

Prediction of perennial plant garden escapers by analyzing of _ex situ_ plant collections */page 32*
Inese Nāburga

Medicinal and aromatic plants conservation in Lithuania */page 33*
Laima Šveistytė

The importance of inventory of living plants in phytogeographical and park plantations of scientific institutions of Kyiv (Ukraine) */page 35*
Oleksandr Shynder, Svitlana Glukhova, Victoria Grytsenko, Yuliia Negrash, Svitlana Mykhajlyk, Svitlana Didenko, Tetyana Kostruba

Plant collections of the University of Warsaw Botanic Garden */page 37*
Agnieszka Krzyk, Monika Joanna Latkowska

16:00-16:30 Tour around the Academic Centre of the University of Latvia

10 June 2022

Excursions

9:00 Bus from the Academic Centre, University of Latvia, Jelgavas 1

9:30 **Rhododendron Breeding and Testing Nursery "Babīte", division of the Botanical Garden of the Unversity of Latvia**
Spilve, Babīte Municipality, Mārupes region

11:30 **Botanical Garden of the Unversity of Latvia**
Kandavas 2, Riga

13:00 Lunch

ABSTRACTS
Oral Communications

Plant collections contribution to plant conservation

Ludmila Vishnevska[1], Signe Tomsone[2]

[1] National Botanic Garden of Latvia, Miera 1, Salaspils, LV-2169, Latvia, ludmila.vishnevska@nbd.gov.lv
[2] Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia

By growing the actuality of biological diversity conservation, main functions of botanic gardens in the last 30 years are changed, actualizing their role in plant conservation and increasing of public awareness on biodiversity. Since the Rio de Janeiro convention on biological diversity acceptance in 1992, many documents are adopted in its framework, and some of them are especially actual for botanic gardens. First of them is the Global Strategy for Plant Conservation (GSPC), provided 16 objectives for vascular plant conservation. One of the most significant targets for botanic gardens to 2020 was target 8: at least 75% of threatened plant species in *ex situ* collections, preferably in the country of origin, and 20% available for recovery and restoration programmes. Two other international documents created in framework of Biodiversity Convention, and essential for botanic gardens, are the Cartagena Protocol on Biosafety and The Nagoya Protocol. Latvia is not among the states ratified the Nagoya Protocol, but it is mandatory for Latvia according to EU Regulation. While the GSPC targets have not been achieved in full, good progress is taking place. Besides *ex situ* conservation efforts, the increasing actions of the botanic gardens are devoted to restoring and conserving plant diversity *in situ*, that in Latvia are supported by European Union and local funds. Latvian botanic gardens: the Botanical Garden of the University of Latvia and National Botanic Garden, as well as Arboretum Kalsnava, being near to botanic garden in its functions, are making efforts to fulfil all five objectives of GSPC.

The collection of the genus *Rhododendron* at the Rhododendron Breeding and Testing Nursery "Babīte" of the Botanical Garden of the University of Latvia

Gunita Riekstiņa, Rūta Katrīna Berga

Rhododendron Breeding and Testing Nursery "Babīte", "Rododendri", Spilve, Babītes pagasts, Mārupes novads, LV-2101, Latvia, ruta.berga@lu.lv

The beginnings of the nursery's collection date back to 1957, when Rihards Kondratovičs, Director of the Botanical Garden of the University of Latvia at the time, included introduction and acclimatization of plants from the genus Rhododendron into the scientific research programme. As his intention was to create new cultivars, intensive hybridization work was started in 1971. This resulted in a large number of hybrid seedlings, which required more land to grow. Thus, it was decided to create a specialized rhododendron nursery.

Founded in 1980, the Rhododendron Breeding and Testing Nursery "Babīte" remains the only specialized rhododendron nursery in the Baltics. Within 11.8 ha, it boasts an outdoor collection of 102 species and 344 cultivars, including 131 own cultivars. The main purpose of the collection is testing winter hardiness and suitability for Latvian climate of various rhododendron species and cultivars, as well as creating new cultivars from the plant genetic resources available at the nursery.

Collection specimens are obtained through seed and plant exchanges with botanical gardens, arboretums and private collectors or purchased from commercial nurseries. One of the main criteria for selecting a species or cultivar is winter hardiness. Preference is given to seeds collected in the wild or obtained via controlled pollination and plants of known origin. Seeds of several species have been collected during expeditions to the Far East, Caucasus and the Carpathians. To document its collection, the nursery maintains a database and a digital photography library, as well as makes plant descriptions and phenological observations. The greatest challenge is balancing the functions of a public garden with scientific, educational and commercial aspirations.

Botanical-geographical exposition of subtropical plants of the O. V. Fomin Botanical Garden of the Taras Schechenko National University of Kyiv

Oleksandr Tsybulsky, Tatjana Kolomiiets

Acad. O. V. Fomin Botanical Garden of Kyiv National Taras Shevchenko University, Symon Petlura 1, Kyiv, 01032, Ukraine, acybula@ukr.net

O. V. Fomin Botanical Garden was established in 1839. Greenhouses projected by architect Max Laufer were built during 1846-1849. Since then, the tropical and subtropical plants collection started to grow in the Botanical Garden. Grand subtropical glasshouse was put into service in 1978 after the last big reconstruction, which gave it the modern look. Its height of 30 m and the overall space of over 1000 m^2 hosts many plants in soil exposition grouped by botanical and geographical principle. Plant expositions are based on the floral region according to Takhtajan system of plant classification (1997). There are more than 4000 taxa (species, subspecies, varieties, forms) nowadays in the collection.

The collections for the botanical expositions were built to include both the most typical plants of the floral region and those of morphological, systematic or ecological interest, as well as widely cultivated tropical and subtropical plants. Each exposition represents different forms of living plants: trees, bushes, lianas, epiphytes and grass. They can be grouped into decorative (68% of collection), medicinal (10%), edible (9%) and technical (7%) plants. Medicinal plants hold a special place in the collection, represented by 20 families in different life forms, dominated mostly by perennial trees and bushes.

There are 254 species and intraspecies taxa in total, belonging to 74 families and 3 divisions. *Polypodiophyta* division is represented by 8 species, *Pinophyta* – by 16. *Magnoliophyta* division has the most of all taxa planted in the glasshouse. Among the most represented families are: *Myrtaceae* – 23 species and intraspecies taxa, *Arecaceae* – 15, *Moraceae* – 14, *Lauraceae* – 13, *Oleaceae* – 12, *Amaryllidaceae* and *Solanaceae* – 9 each.

Among the most precious specimens are those living plants that grow in the Botanical Garden since it was established, unique in their age and size. Namely, *Livistona australis* (R. Br.) Mart., more than 200 years old, four specimens of *Howea forsteriana* (C. Moore et F. Muell.) Becc., more than 100 years old, *Phoenix canariensis*, more than 150 years old, and *Jubaea chilensis* (Mol.) Baill. – a South America endemic, which is practically extinct in the area of natural habitat. There is also a centenarian specimen of *Araucaria bidwillii* Hook., and several specimens of *A. heterophylla* (Salisb.) Franco that are 90 years old.

There are 12,8% of plants in the glasshouse that perform the full life cycle and 18,1% of plants that bloom, but don't bear fruit. Remaining plants (69,1%) are stuck on the vegetation stage of their development.

Hornbeam *Carpinus* collection in National Botanical Garden of Latvia

Linda Strode, Daina Roze

National Botanical Garden of Latvia, Miera 1, Salaspils, LV-2169, Latvia,
linda.strode@nbd.gov.lv

Hornbeams *Carpinus* L. belong to birch family *Betulaceae*. They are monoecious deciduous trees or shrubs with a smooth or scaly, slightly cracked bark. The leaves are simple, spirally arranged. Flowers are pollinated by the wind. The fruit is a nutlet with bracts. The fruits are arranged in drooping infructescence. The species of genus *Carpinus* L. occur across of temperate and subtropical zone of Northern Hemisphere: in Europe, Asia and North America. In the native flora of Latvia, the genus *Carpinus* is represented by one species – *Carpinus betulus* L.

The scientific collection of the genus *Carpinus* in National Botanical Garden (NBG) was started in 1961, when in the first part of the Arboretum, based on the Engler's system, 13 individuals of *Carpinus betulus* L. were planted. The seedlings were obtained in Lukna (Latvia) in 1958. The aim of creating and maintenance of the scientific collection of *Carpinus* species and ornamental cultivars in NBG is gene pool conservation. The collection has also educational and ornamental importance. At the beginning of taxonomical verification, the scientific collection consisted of 16 taxa: nine species, one variety and five cultivars.

The taxonomic inventory and verification of *Carpinus* taxa in NBG was carried out from 2016 to 2021. Theoretical background was based on literature sources and publications about morphological and ecological traits of *Carpinus*. The descriptions of 16 taxa were prepared. The descriptions of 10 taxa in Latvian are provided for the first time. The main diagnostic features are given for each taxon.

During the verification process, the taxonomic rank was changed for one taxon, the taxonomic affiliation was changed for three gene pool units, and species identification was performed for five gene pool units previously identified only at the genus level. In total, 14 taxa were verified: nine species, one subspecies and 4 cultivars – 123 individuals of 41 gene pool units. This is the richest scientific collection in Latvia in terms of wild taxa. Of particular value there are 18 gene pool units of wild provenance – 44% of all gene pool units.

When creating morphological descriptions of taxa, the authors found that the margin of the leaf, which is one of the least variable leaf morphological features, is indicated for different taxa in different sources with different degrees of accuracy. We concluded that morphological characteristics of the bracts is very important in the taxa verification process. Their presence in the seed material collected/obtained for the renewal or supplementation of the collections allows to assess the taxonomic compliance of the material already in the first stage of verification. Especially for taxa whose stable

diagnostic features, such as the number of lateral veins and the characteristics of the leaf margins, overlap.

The individuals who do not correspond to the morphological descriptions of the taxa have no scientific value and do not meet the criteria of scientific collection, so their keeping in the collection is not considered useful. The propagation of *Carpinus* cultivars from seed for the purpose of obtaining individuals of the variety is considered inefficient. Especially because the main goals of the scientific collection are conservation of the gene pool and environmental education, but not breeding work.

Picea plants diversity in Klaipėda University Botanic Garden

Asta Klimienė, Laura Normantė, Jurgita Ignotienė

Botanical Garden, University of Klaipėda, Kretingos 94,
Klaipėda, LT-92327, Lithuania, Asta.Klimiene@ku.lt

Picea trees are very important for ecosystem of boreal biogeographically zone but also for human needs. The timber is a source of paper, furniture, spruce is used for medicine and as ornamental plants as well. The data of State Forest Service for 2020 show that Lithuanian forest land covers 2200,2 thousand ha or 34.5%, including coniferous trees – 1147,4 thousand ha, but spruce occupy – 434,8 thousand ha. In 2007 spruce cover 424,7 thousand hectares area however, in the national level the composition of spruce is not analysed yet.

There are 18 species and 52 varieties – totally 70 *Picea* taxa hosted by Klaipėda University Botanic Garden in 2022. However, the number of plants growing from seeds are only 25 %, but the rest developed from seedlings. By the climatic conditions the Botanic Garden has the limited prevalence of *Picea* plants. The average precipitation per years is from 86 to 149 mm, the average air temperature are from -8 to 22 °C. From 2003 the Botanic Garden started the ordering of *Picea* seeds. Between 2003 and 2019 the seeds were ordered 72 times from 22 botanic gardens (15 countries). The germinating seeds were obtained only from nine botanic gardens. There are only five *Picea* species that were germinated, and plants afterwards have planted in the collection: *Picea koyamai* Shiras, *Picea asperata* Mast., *Picea wilsonii* Mast., *Picea maximowiczii* Regel ex Mast. and *Picea koraiensis* Nakai. Distribution of the seed orders by the countries are: 3 – from Lithuania, 2 – from Poland and 1 – Czech Republic. Totally, the biggest number of seeds was ordered from Lithuanian botanic gardens – 24 orders, but from them germinated only 20%. Only once per period seeds were ordered from Canada, Romania, France and Georgia, because, these countries are in warmer biogeographical area, except Canada. The botanic gardens from Georgia and Ukraine never sent their *Picea* seeds, but the seeds from France were not germinated. The seeds from Romania and Canada germinated and plants now are in the collection. Since 1998 the seeds of 14 *Picea* taxa are included in the *Index seminum* of Klaipėda University Botanic Garden. *Picea abie*s L., *Picea orientalis* L.*, Picea glauca* (Moench) Voss and *Picea mariana* L. are the most often ordered seeds from *Index Seminum* of Klaipėda University Botanic Garden.

Living plant collections' mission, goals and policies in Botanical Garden of Vilnius University

Darius Ryliškis

Botanical Garden of Vilnius University, Kairėnų 43, Vilnius, LT-10239, Lithuania,
darius.ryliskis@bs.vu.lt

The basis of all the world's botanical gardens is the collection of living plants. Examples can be found around the world when the botanical gardens clearly articulate the mission, goals and policies of living plant collections. The Botanical Garden of Vilnius University started creating living plant collections' policy document (as one, all – inclusive document) in 2017, and in 2019 it was clarified and expanded in order to obtain BGCI accreditation.

Currently, plant collections in the Botanical Garden are accumulated and maintained according to the following documents:

- Regulation of Department of Plant Collections (according to University requirements);
- Job descriptions of curators etc. (according to University requirements);
- Guidelines of collection development (updated every 5 years);
- Decisions of the Monitoring Committee on the Quality and Development of Plant Collections (at least 1 meeting per year), including documents (for example, recommendations) prepared by the head of the department and approved by the Committee;
- The goals of specific collections prepared by the curators.

The Monitoring Committee on the Quality and Development of Plant Collections has a great impact on the implementation of the goals and policies regulation. The Committee:

- considers and makes decisions on the development plans (i.e. guidelines) for the strategic plant collection of the Botanical Garden;
- sets up the priorities for the transformation of plant collections, improving their quality, aesthetic appearance, suitability for plant conservation programs, and educational activities;
- considers and submits the proposals for the preparation and implementation of educational, cultural, recreational, sports and tourism promotion programs in the Garden when they are related to the plant collections, expositions or their development;
- considers measures for the improvement of the plant collections;
- assess the annual reports of the units supervising the garden plant collections – the condition of the collections and their value.

The entire regulatory framework for living plant collections, including normative documents, strategic and tactical decisions, working documents and control mechanisms, is currently in place and operational in the Botanical Garden.

Conifer species of IUCN Red List of Threatened Species in National Botanic Garden of Latvia

Linda Bērtiņa, Linda Strode

National Botanic Garden of Latvia, Miera 1, Salaspils, LV-2169, Latvia,
linda.bertina@nbd.gov.lv

The main objectives of creating and maintaining of scientific plant collections in National Botanic Garden of Latvia (NBG) are:

1) species *ex situ* conservation, especially with wild origin,
2) gene pool conservation of ornamental plants,
3) public education,
4) recreation.

To conserve and propagate rare species and genetic diversity, studies about threatened species in the collection and learn threatened factors are necessary, to provide species protection. The goal includes also taxonomic studies and botanical research. The collection of NBG includes approximately 4000 taxa of woody plants, from which 900 are conifer species and forms. NBG hosts conifer species, that are Endangered (EN) – 5 species, Vulnerable (VU) – 4 species, and Near Threatened (NT) – 12 species, by IUCN Red List of Threatened Species. The oldest plants of IUCN Red List of Threatened conifer species in the collection of NBG are *Pinus peuce*, germinated in year 1958, but the newest one is *Pseudolarix amabilis,* acquired in year 2010. Most of IUCN Red List of Threatened species in NBG conifer collection gene pool units are of garden origin. Gene pool units of wild origin are represented by *Abies holophylla*.

Collection of rare plants of the O. V. Fomin Botanical Garden (Kyiv, Ukraine)

Vitalii Kolomiychuk

O. V. Fomin Botanical Garden, Taras Shevchenko National University of Kyiv, Symon Petrula 1, 01032, Kyiv, Ukraine, vkolomiychuk@ukr.net

Over 183 years of its existence, in the O. V. Fomin Botanical Garden there have been assembled various collections of open ground and under cover plants, herbarium collection, collection of tissue culture, plant seed. The leading place in the garden belongs to the collection of rare and endangered plant species of the natural flora of Ukraine. Its origin is primarily associated with the Botanical Garden arboretum development. The collection formation began in 1981. In 1986 it was designed on a separate section of the Garden on the area of 0.4 hectares. During the inventory in 2004, 79 species of vascular plants listed in the second edition of the Red Data Book of Ukraine (RDBU) were growing in this area, and at the end of 2013 there were 113 species from the 3rd edition of the RDBU, including 18 narrow endemics. There was clear dominance of species of forest and forest-steppe zones of Ukraine, with high proportion of steppe species. Over the last 10 years there was a tendency to decrease in the number of rare taxa, as well as the extinction of some species (especially species from the families *Asteraceae, Fabaceae, Gentianaceae, Ranunculaceae, Rosaceae, Orchidaceae*).

During the growing seasons of 2020-2021 we made an inventory of part of the collection of rare and endangered plant species (perennial herbaceous and shrubby plants). 78 species from the RDBU within 25 families have been identified. Good seed and partly vegetative regeneration were observed in some species of the families *Alliaceae* (*Allium ursinum* L.), *Apiaceae* (*Prangos trifida* (Mill.) Herrnst. & Heyn), *Hyacinthaceae* (*Ornithogalum boucheanum* (Kunth) Asch.), *Iridaceae* (species genus *Crocus* L., as well as in *Iris sibirica* L.), which formed stable population with a tendency to gradual increase.

Over the past 3 years, this collection has been supplemented by rare species from the Lower Dnipro region, Pryazovye, Donbass (*Allium regelianum* A. Becker ex Iljin, *Astragalus borysthenicus* Klokov*, A. pallescens* M. Bieb.*, A. ponticus* Pall.*, Calophaca wolgarica* (L.f.) DC.*, Caragana scythica* (Kom.) Pojark.*, Centaurea taliewii* Kleopow, *Mattiola fragrans* (Fisch.) Bunge, *Prathyrostachys juncea* (Fisch.) Nevski*, Stenbergia colchiciflora* Waldst. & Kit*, Tulipa scythica* Klokov & Zoz*, Tamarix gracilis* Willd.). Restored and partially expanded with seed material of populations of *Adonis vernalis* L., *Bulbocodium versicolor* (Ker Gawl.) Spreng.*, Crocus reticulatus* Steven ex Adams*, Lilium martagon* L., *Pulsatilla pratensis* (L.) Mill., *Stipa lessingiana* Trin. & Rupr.*, S. pennata* L., *S. pulcherrima* K. Koch., *S. ucrainica* P. Smirn. from the Forest-steppe Dnipro region and the Black Sea region.

Research *ex situ* and *in situ*, which is currently aimed at developing repatriation and restoration of populations of a number of rare plant species within the Kyiv region on the basis of the Chornobyl Radiation and Ecological Biosphere Reserve is continued. Reconstruction of the "Steppes of Ukraine" site is planned along with expanding the collections through the exchange of seed material with the botanical gardens of Ukraine and other scientific organizations and institutions.

The reconstruction of the Rock Garden in Tallinn Botanic Garden 2020–2022

Krista Kirotar, Urve Sinijärv

Tallinn Botanic Garden, Kloostrimetsa 52, Tallinn, 11913, Eesti,
krista.kirotar@botaanikaaed.ee

In the early 1970s, the first exposition was built for the collection of mountain plants in the Tallinn Botanic Garden. Between 1973 and 1975, this Rock Garden was planted with low-growing perennials, using a systematic approach to plant placement. The presentation provides an overview of the history of the Rock Garden and its original design, as well as points out the reasons why this exposition needed to be thoroughly reconstructed. Preparations for the renovation are discussed and an overview of the design and construction process is provided.

The presentation also addresses the changes that have taken place during the reconstruction of the Rock Garden – when placing the plants, the geographical and ecological principles were followed. Both the preparation for planting and the planting process are also introduced.

Plant collections, plant relocation, hybridization, biodiversity risks: a brief overview in the Latvian context

Arturs Stalažs

Institute of Horticulture, Graudu 1, Ceriņi, Krimūnu pagasts, Dobeles novads, LV-3701, Latvia, arturs.stalazs@llu.lv

Cultivation and domestication of plants has been around for a long time. Initially, the use of plants was more closely linked to their cultivation as agriculture developed. The history of modern botanic gardens dates back to Renaissance Italy, which was the *medical gardens* of the 16th century. The purpose, content and principles of collection of plants and the importance of modern botanic gardens have changed over time. Therefore, compared to the gardens of 16th century, a lot has changed in plant collecting, and making new thematic plant collections that are both practical and entertaining.

The first largest plant collection in Latvia that has survived today is the Skrīveri Arboretum (*Skrīveru dendrārijs*), which was started by M. von Sivers in 1891. It includes both arboretum and forest plantations. Today, it is a protected area, whose collections are practically not supplemented for a long time. The second stage in the creation of scientifically-based plant collections began with the establishment of the Botanical Garden of the University of Latvia in 1922. In the 20th century, also various larger or smaller private plant collections and plantations appeared. In most cases, they are collections created by enthusiasts, not scientific research sites. Plant collections were also formed at breeding sites, of which the first collections dedicated to fruit-crop plants were established in Pūre, where a breeding centre was founded in 1930 (now merged with Dobele as the Institute of Horticulture). The greatest opportunities for the creation of plant collections opened up during the existence of the USSR, when the National Botanical Garden (1956) and the Kalsnava Arboretum (1975) were established on the basis of the former experimental and nursery centres. At present, these are the largest plant collection centres in Latvia, including the Experimental Rhododendron Breeding Nursery "Babīte" founded in 1980. During the USSR, there was an intensive exchange of plants between the botanical gardens. There were also many expeditions, as a result of which plants, seeds and cuttings were imported into Latvia. Also, many experimental forest plantations were planted using alien species or plant material of alien origin. During this period the relocation of plants was mainly a field of state institutions, and through these institutions number of species that escaped into the wild were also introduced to Latvia. Some have become invasive now, like *Heracleum sosnowskyi* and ×*Sorbaronia mitschurinii* (in past incorrectly called as '*Aronia melanocarpa*'). In the years of the USSR, botanical gardens were involved in the introduction of some snail species into Latvia, which were imported together with plant material, such as *Krynickillus melanocephalus* (now a highly invasive), *Ambigolimax nyctelius* (in greenhouses) and

Oxychilus translucidus. Currently, the largest plant collections and experimental forest plantations include plants that may be danger as potentially invasive species (e. g. *Acer pseudoplatanus, A. tataricum, Prunus avium, P. cerasifera, Ribes uva-crispa*) or may hybridize with native species (e. g. *Picea obovata, Pinus mugo*) or hybridize with native populations (e. g. *Ribes nigrum, R. spicatum*).

However, since Latvia regained its independence, especially after joining the European Union, a free plant market has opened up within the EU. Consequently, plant collections do not currently pose the same risks as the commercial movement of plants, which is also associated with the introductions of other organisms (e. g. *Arion vulgaris*).

Innovative Garden for Education and Research

Anta Sparinska[1], Inese Nāburga[2], Rafaels Joffe[1], Marta Saulīte[1], Elga Ence[1]

[1] Bulduri Horticultural Secondary School, Biotechnology Centre, Viestura 6, Jurmala, LV-2010, Latvia, anta.sparinska@bulduri.lv
[2] Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia

The Bulduri Horticultural Secondary School is the only institution in Latvia with a wide assortment of live outdoor ornamental plants collection approved by the methodology of the vocational school study curricula. Renovation of this garden gave the possibility to build a test-bed suitable for data collecting and analyses on the field. The test-bed called "iGarden" is equipped and arranged to allow collect long-term information about plants, environmental conditions, and other indicators. There are more than 300 cultivars of annual and perennial plants planted in mixed beds and repeats, paths for easy operation are built, automatic irrigation system, internet, rooters for easy data transfer, and electricity for charging of smart devices, robots, sensors, and drones are available in every part of test-beds, servers for data storage are installed. The first plant phenotyping robot validation process has started. For this purpose, iGarden test-beds were established. Thirteen plant varieties were planted – *Achillea* 'Desert Eva Red', *Aster novi-belgii* 'Herbstgruss vom Bresserhof', *Astilbe* 'Bronzelaub', *Berberis thunbergii* 'Admiration', *Calendula officinalis*, *Hydrangea* 'Polestar' and *Echinacea* 'Primadonna Deep Rose', *Heuchera* 'Palace Purple', *Hosta* 'Fragrant Blue', *Phlox paniculata* 'Laura'; *Potentilla fruticosa* 'Goldteppich', *Thuja occidentalis* 'Smaragd', *Verbena bonariensis*. All varieties were from an assortment of common landscaping plants. The plants were arranged in six replicate plots with 5 plants for each. In 2021, according to phenological protocols generated by the robot 862 observations were made. In total, 1262 RGBcolor and 115 multispectral photos were taken of the studied plants with a remote multispectral and RGB photography method. The collected data of the sequences and photos of the phenological phases were entered into the research iGarden database on the stationary server. By phenological observation was found that there are no significant differences between the sample plots in the growth process of the studied plants, which allows them to be used for the planned testing of new technologies. For now, iGarden test-beds are open for researchers and industry to improve precise gardening and plant nursery work in the future.

The study was supported by EIP-AGRI project "Autonomous robotic platform iGarden for the sustainable development of the nursery industry", No. 18-00-A01620-000021.

Tissue culture collections of rare plant species as means for characterization of ecosystem functional diversity: response of *Armeria maritima* to salinity and heavy metals

Līva Purmale[1], Una Andersone-Ozola[1], Astra Jēkabsone[1], Andis Karlsons[2], Gederts Ievinsh[1]

[1] Faculty of Biology, University of Latvia, Jelgavas 1, Riga, LV–1004, Latvia, liva.purmale@lu.lv
[2] Institute of Biology, University of Latvia, Ojāra Vācieša 4, Riga, LV–1004, Latvia

Functional diversity of ecosystems is an emerging concept of ecosystem functioning as based on interactions between organisms and environment as well as between different groups of organisms, characterized at the level of physiological responses. Tissue culture collections of rare and endangered plant species can be used as a source of plant material for functional studies both in *in vitro* and *in planta* conditions, possibly revealing different levels of plant responses to environment. The aim of the present study was to use shoot explant culture for characterization of salinity and heavy metal tolerance as well as metal accumulation potential of two accessions of *Armeria maritima*, rare legally protected species from Latvia.

Seeds from two geographically isolated coastal populations of *A. maritima* from the territory of city of Riga (AM1 in Vecdaugava and AM2 in Buļļusala) were used for initiation of tissue culture. Established shoot cultures were used for *in vitro* studies of salinity and heavy metal tolerance, as well as for establishment of material for *in planta* experiments using soil-grown plants. For salinity tolerance studies, 1 to 5 g/l of Na (in a form of NaCl) was added to multiplication medium or soil. For heavy metal studies in tissue culture, metal salts were added to the multiplication medium: Cd (10 and 50 mg/l), Cu (25 and 125 mg/l), Mn (65 and 325 mg/l), Pb (55 and 275 mg/l), Zn (45 and 225 mg/l) and cultivated for 4 weeks. For soil-grown plants, the metal concentrations were as follows: Cd (20 and 100 mg/l), Cu (100 and 500 mg/l), Mn (200 and 1000 mg/l), Pb (100 and 500 mg/l), Zn (200 and 1000 mg/l).

Salinity tolerance was relatively similar of the two *A. maritima* genotypes tested both in tissue culture as well as in soil-grown plants. Some differences were evident between the genotypes in respect to ion accumulation. Tolerance to Na was associated with an ability to use this ion instead of K.

There was no negative effect of heavy metals Cd, Cu, Mn, Pb and Zn on growth of *A. maritima* plants cultivated in soil, but Cd, Cu and Pb had pronounced negative effect on *in vitro* grown plants. Sensitivity to Cd and Cu in tissue culture was associated with extremely high tissue accumulation potential for these metals. For soil-grown plants, heavy metals preferentially accumulated in older leaves and were excluded from generative structures. There were significant differences in metal accumulation potential

between the two genotypes. Concentration of Cd (AM2) and Cu (AM1 and AM2) in older leaves exceeded the threshold defined for hyperaccumulating plants.

A. maritima plants from a dry coastal meadow of the Baltic Sea region exhibit high salinity and heavy metal tolerance as well as metal accumulation potential. The two Latvian accessions of *A. maritima* showed pronounced differences in morphological and metal accumulation responses to salinity and heavy metals, and can be considered as different ecotypes, reflecting genetic and physiological variation in functional characteristics in similar environmental conditions.

Peatland diversity conservation experience in Latvia

Māra Pakalne

Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia,
mara.pakalne@lu.lv

Natural peatlands in Latvia, including raised bogs, transition mires and fens host high biological diversity, including rare and protected plant species. Still, part of peatlands was influenced by various human activities, like drainage and peat extraction, determining the need of their conservation and management activities, as well as increasing of public awareness on peatland habitats. There are two-way actions at the Botanical Garden of University of Latvia to conserve peatlands:

1) peatland plant collection in the Botanical Garden,
2) implementation of two LIFE programme projects to conserve peatlands in the wild.

To conserve peatland diversity and diminish the drainage influence in peatlands, European Commission LIFE programme projects were implemented in especially protected nature areas. Aim of the projects was to introduce protection and management measures to secure the most favourable conservation status for peatland habitats of European importance. Results of projects LIFE "Peat Restore", LIFE Wetlands, LIFE "Raised Bogs", starting from 2010 to 2021 were evaluated where positive peatland restoration experience was gained.

Prior to implementation of peatland restoration actions vegetation, hydrological, geological studies and monitoring was performed, including, hydro-geological modelling. Changes in plant cover and site hydrology, resulting from the water level raise in raised bog habitats in the drainage influenced areas were analysed from permanent vegetation plots and daily water level data.

To conserve plant species diversity in the calcareous fens of Engure Lake Nature Park, in 2020, restoration of peatland ecosystems was performed where overgrowing of an alkaline fen was prevented by cutting shrubs and trees in 20 ha area and, fluctuations of water table were reduced by blocking of two ditches using plastic piling. The results of peatland conservation and management show that peatland restoration actions have a positive effect on peatlands.

Improving of lingonberry *Vaccinium vitis-idaea* L. propagation and cultivation techniques

Signe Tomsone[1], Madara Lazdāne[1], Lita Zīra[1], Andis Karlsons[2]

[1] Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia, signe.tomsone@lu.lv
[2] Institute of Biology, University of Latvia, Ojāra Vācieša 4, LV-1004, Riga, Latvia

Lingonberry *Vaccinium vitis-idaea* L. is a valuable berry bush. Berries and leaves are mostly harvested in the wild. World-wide lingonberries are less cultivated comparing to highbush blueberries and cranberries. In Latvia it could be a completely new fruit-growing sector for fruit growers, as well as plant nurseries and horticulture. There is a considerable potential for lingonberry varieties cultivation as climate and peat soils in Latvia are apropriate for lingonberries growth. The aim of the study was to test different propagation methods, field cultivation and fertilization effect on the growth. For the experiments varieties of 'Koralle', 'Red Pearl', 'Runo Bielawskie', 'Rubīna lāse' and 'Erntedank' were used. The tested propogation methods were *in vitro* and several vegetative propagation methods traditionally used in horticulture as stem cuttings, layering, division of shrubs. Field trails were arranged in Jelgava district, Latvia (56°70'N, 23°59'E), experimental plot was covered by 25 cm peat layer, pH_{KCl}~3,5. Survival, plant height and shrub crown diameter were estimated. Four fertilization levels were tested, nutrien content in peat and leaves were analysed by spectroscopic, colorimetric or photometric methods.

The results showed that 75% of partly lignified cuttings had rooted. The rooting and overwintering survival is higher to the plants developed from the cuttings isolated from forced plants. The direct planting of the cuttings (isolated at the end of April) in the field resulted in 46-58% overwintering. Mound layering is a highly effective method. Plants developed using shrub division method survived 88% (after three winters). *In vitro* shoot culture was established from 2-3 nodal shoot explants. For primary shoot development and cloning the Anderson medium (1984) was used, pH 4,8-5. Shoot proliferation was stimulated by zeatine 0,75 mg/l. Rooting was performed *ex vitro* in greenhouse and it was weakest point as only 30-50% shoots rooted (depending on zeatine concentration used for *in vitro* cultivation). However survival and overvintering during field cultivation of *in vitro* propagated plantlets were 98-100%. Field trials showed that even low rates of fertilizers stimulate the lingonberry plant growth, but foliar fertilization can be used to provide adequate microelement concentration in the leaves.

The study was supported by the European Rural Development Fund for project "Development of methodology for propagation and cultivation of lingonberry (*Vaccinium vitis-idaea*) varieties", No. 18-00–A01620–000011.

ABSTRACTS Posters

Malus and _Pyrus ex situ_ germplasm collection as a raw material source for future breeding challenges and landfill for the development of modern technologies

Gunārs Lācis, Baiba Lāce, Laila Ikase

Institute of Horticulture, Graudu 1, Ceriņi, Krimūnu pagasts, Dobeles novads, LV-3701, Latvia, gunars.lacis@llu.lv

The conservation of horticultural biodiversity is an issue of increasing importance due to the acceleration of climate and societal change. Climate change has contributed to the spread of new pathogens or increased the activity of known pathogens. On the other hand, public pressure calls for a reduction in the use of pesticides and the production of products as healthy as possible, which is particularly important for fruit crops. *Ex situ* collections of genetic resources can serve as a source of raw material, offering environmentally adapted accessions with specific characteristics. *Malus* and *Pyrus* are important temperate-zone genera, include widely grown fruit species worldwide and in Latvia, and are commercially among the most important fruit crops. This is also evidenced by the representation of these genera in the germplasm collections – *Malus* and *Pyrus* are the most widely represented in the collection of the Institute of Horticulture, Latvia and includes more than 1000 accessions of *Malus* and more than 400 accessions of *Pyrus*, of which 460 and 169, respectively are a part of national genetic resources. The collection includes cultivars and hybrids bred in Latvia, landraces, introduced cultivars cultivated for a long-time in Latvia and samples of crop wild relatives collected in Latvia. The importance of genetic resources is determined by their use directly in the growing and producing niche products and as crop biology research objects. One of the research directions is the identification of trait donors important for breeding, the studies of their occurrence and heredity. For example, in project No. lzp-2019/1-0094 “Application of deep learning and data mining for the study of plant-pathogen interaction: the case of apple and pear scab”, data were summarized on the severity of apple and pear scab, obtained using an internationally accepted methodology. The study included 270 *Malus* and 252 *Pyrus* accessions from the germplasm collection, which allowed the identification of resistant forms that could potentially be included in future breeding. For a complex and multifaceted analysis of these data, an ontology was developed that summarizes data from the field evaluation, related molecular markers, and the environment, further integrated into a decision-making system based on neural network solutions. In turn, to improve the efficiency of scab severity phenotyping, the

germplasm collection was used to develop an automatic, artificial intelligence-based scab recognition application. As a result, a set of open-access datasets of annotated images was created and published in the *Kaggle* repository under the title *AppleScabLDs* and can be used globally for the deep learning approach to develop solutions for smart farming. Thereby, *ex situ* germplasm collections serve as a link between the conservation of heritage, direct use in fruit-growing, a potential source for breeding and as a landfill for the development and application of modern technologies in horticulture (including sensing technologies, software applications, communication systems, telematics and positioning technologies, hardware and software systems, data analytics solutions and knowledge linking biological information to data technologies).

The patterns of alien pest proliferation in the Botanical Garden of the University of Latvia in the last decade

Inga Apine[1], Uģis Piterāns[2]

[1] Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia, inga.apine@lu.lv
[2] The Latvian National Museum of Natural History, K. Barona 4, Riga, LV-1050, Latvia

Nowadays a spread of different living organisms outside their natural range due to the various human activities has become one of the most serious environmental problems in the worldwide. Botanical gardens play a special role in ensuring biosecurity: they host diverse plant collections monitored by the qualified personnel, which ensures rapid detection of new pests. Due to this in the last decade several notable species of plant pests have been detected in the Botanical Garden of the University of Latvia.

In 2012, broad mite *Polyphagotarsonemus latus* (Banks, 1904) was identified on *Rhododendron simsii* hybrids (greenhouse azaleas). First, typical deformed, undeveloped leaves were noticed, following that, tiny mites were identified using a stereo microscope. By now, the mite has been found on the following greenhouse plants: *Hedera, Ficus, Laurus, Fuchsia, Coffea, Fatsia, Oleander, Cuphea, Pelargonium* and others. At present it is one of the most destructive pests requiring constant monitoring and restriction.

In 2018, azalea sawfly *Nematus lipovskyi* (Smith, 1974) was identified on deciduous *Rhododendron* spp. In the two first years, insect larvae feeding on rhododendron leaves were discovered, while imago was detected only in 2020. The sawflies had used *R. calendulaceum*, *R. luteum*, *R. occidentale* and numerous hybrids as host plants. For the first time *R. albrechtii* was noticed as feeding plant for *N. lipovskyi* as well. According to currently available data, Latvia is only the second country in Europe (after the Czech Republic) where *N. lipovskyi* has been observed.

The most probable pathway of entrance in Latvia for both pests is via imported plants (most likely– greenhouse azaleas for *P. latus* and garden azaleas for *N. lipovskyi*). This experience confirms the requirement for biosecurity and quarantine for newly acquired plant accessions.

Summarizing the results, one can see clear gaps in the available information on the true distribution of invasive species worldwide. This shows the necessity for more up-to-date information on newly identified species and botanical gardens can make a major contribution in this area.

Genetic resources of ornamental plants in Lithuania

Gitana Štukėnienė[1,2]

[1] Lithuanian State Forest Service, Pramonės av. 11A, Kaunas, LT-51327, Lithuania, gitana.stukeniene@amvmt.lt
[2] Botanical Garden of Vilnius University, Kairėnų 43, Vilnius, LT-10239, Lithuania, stukeniene@gmail.com

The study and conservation of plant genetic resources (PGR) in Lithuania has a long tradition. Since 1994, the efforts on PGR have been concentrated within the National Programme on Plant Genetic Resources. In 2001, the Seimas of the Republic of Lithuania adopted the Law on National Genetic Resources of Plants, which regulates the accumulation, preservation and use of National Genetic Resources of plants and stipulates how to provide for a sparing use of these resources, protect them from devastation, extinction and compete destruction as well as to save the biological diversity. According to the provisions of this law, the genetic resources of plants, which have ecological, selective and economic value for the Republic of Lithuania, are selected and included into the central database of National Genetic Resources of Plants. This might be plant populations or their parts, single plants or their groups, or re-productional parts of plants (seeds, pollen, embryos, meristematic tissues, buds, sprouts). The Plant Gene Bank with coordination centres of different plant groups (agricultural plant, forest trees, fruits and vegetables, ornamental plants and medical plants) has been established. Later adopted the Resolution to reorganize the Plant Gene Bank by connecting it to the Lithuanian State Forest Service.

Nowadays botanical gardens have been seeking to play a key role in the conservation of the world's plant diversity. Many botanical gardens are working together or in collaboration with other institutions in order to coordinate and target their conservation activities. Numerour collections of ornamental plants have been accumulated in various Lithuanian institutions of science and studies (Vytautas Magnus University, Lithuanian Research Centre for Agriculture and Forestry, Nature Research Centre and others) as well as by private growers. Botanical gardens of Lithuania promote, collect, research and distribute ornamental plants. The Lithuania Ornamental Plant Genetic Resources Coordination Center was established at the Vilnius University. Ornamental plant cultivars created by Lithuanian plant breeders are introduced and grown in special collection nurseries in the Vilnius University Botanical Garden. At present, 458 accessions of the most valuable genetic resources of ornamental, medicinal, agricultural and other plants in Vilnius university Botanical Garden and 258 accessions in Vytautas Magnus University Kaunas Botanical garden are preserved.

Companion plants in the *Ericaceae* family collection of Vilnius University Botanical Garden

Ramunė Žemgulytė

Botanical Garden of Vilnius University, Kairėnų 43, Vilnius, LT-10239, Lithuania,
ramune.zemgulyte@bs.vu.lt

The *Ericaceae* family collection of Vilnius University Botanical Garden covers an area of approximately 1,5 ha. It was created within a natural, sparse pine forest 20 years ago. Approximately 300 taxons of genus *Rhododendron* now grow there and make up about 60 percent of the collection. Other *Ericacea* plants belong to 23 genera. Although not an equal match to rhododendrons in terms of their attractiveness for visitors, they are just as important for the collection. In addition, many other plants grow nearby, playing an important role in the structure of the area. They serve different purposes.

Ericaceae and non-*Ericaceae* plants, planted together with a particular species of rhododendron, because they grow naturally side by side in the wild or originate from the same range, usually perform both an educational and aesthetic function, mimicking natural plant communities (such as plants on the east coast of North America). Companion plants improve the growth conditions of collectibles: create a shade, form shelters, acts as a 'soft' barrier between rhododendrons and visitors. They help to retain moisture in the soil, reduce fluctuations in the soil temperature and protect against weeds (*Pinus, Euonymus, Taxus, Hedera*). Besides, the companion plants can help to create and maintain the structure of the garden: forms visual barriers and the background. They fills small or unsuitable corners and gaps between young or weak plants as well as they close unwanted passages and help to overcome erosion (*Hosta, Epimedium, Primula, Juniperus,* grasses). One of the most important is the aesthetic function: non-*Ericaceae* plants prolong the attractiveness of the garden until the full season. Some of the plants themselves are a strong attraction for visitors. Highlights the rhododendrons, provides textural and colourful contrast even during the flowering season of rhododendrons (*Prunus, Hydrangea, Magnolia*).

It can be concluded that the diverse but well-thought-out range of companion plants helps to increase the value of the *Ericaceae* family collection, making the garden a great place to study, explore and admire.

One garden – different aspects of the plant world

Mateusz Sowelo[1], Justyna Wiland-Szymańska[1,2]

[1] Botanical Garden of the Adam Mickiewicz University in Poznań, Dąbrowskiego 165, 60-594 Poznań, Poland, matsow@amu.edu.pl
[2] Department of Systematic and Environmental Botany, Faculty of Biology of the Adam Mickiewicz University in Poznań, Uniwersytetu Poznańskiego 6, 61-614 Poznań, Poland

The Botanical Garden of the Adam Mickiewicz University in Poznań was established in 1925 and currently covers an area of approx. 22 ha. The garden is situated on a gentle slope of a small river, which only part visible aboveground is raised nowadays to a pond. From the very beginning the planning of green areas in this institution was very well studied and conducted, both in regard to the general design of perspective axes, as well as species selection. Currently, the entire collection is displayed in 10 thematic sections, which diversity allows to present not only the variety of plants, but also their mutual relations and common features. The visitors have the opportunity to regard the collected taxa from many different perspectives. Particularly noteworthy is the Department of Plant Geography, in which trees and shrubs from temperate regions of Asia, North America and Europe are grouped by continents, what enables to show similarities and differences between vegetation of these areas. Similarly, plants are presented in the vast Alpinarium, where they are grouped according to the mountain ranges from which they come. The Department of Plant Systematic is presented in a classic way, grouping taxa according to their systematic affiliation. In the Department of Ecology one can admire plants associated with various habitats, e. g. wetlands. The decorative characters of plants and horticultural varieties can be admired in the Departments of Dendrology and of Ornamental Plants. One of the most important issues, permanently included in the mission of the Garden, is education of the public about plants protected by law. Regarding the plant with the awareness of its rarity and thus its uniqueness, shapes sensitivity and care in relation to the surrounding nature. These species, valuable from the nature protection point of view, are growing in the Department of Rare and Endangered Plants.

Understanding of the multitude of biological problems presented by the assembled plant collection is facilitated by the elements of the garden's infrastructure. Each department is equipped with a number of educational boards, which enable recipients to comprehend different perspectives. It is also crucial to clearly label the protected plants (in our case they have red labels). The sum of all small elements makes the collection more accessible and understandable to people who are not professionally involved with plants.

Latvian rare and endagered woody plants in *ex situ* collections

Madara Lazdāne[1], Inga Apine[1], Linda Strode[2], Ludmila Višņevska[2], Liene Opincāne[3], Sanita Vaivode-Āzena[3]

[1] Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia, madara.lazdane@lu.lv
[2] National Botanic Garden of Latvia, Miera 1, Salaspils, LV-2169, Latvia
[3] The Latvia's State Forests Kalsnava Arboretum, "Ogu īves", Jaunkalsnava, Kalsnavas pagasts, Madonas novads, LV-4860, Latvia

An important target for botanical gardens is the Goal 8th of the Global Strategy of Plant Conservation: "At least 75% of endangered plant species should be in *ex situ* collections, preferably in the country of origin." The aim of our work was to evaluate the *ex situ* collections of rare and endangered woody plants in Latvia. A common list has been created of 30 endangered woody plant species, summarizing 28 species listed in the Red Data Book of Latvia (Andrušaitis 2003) and 23 in the Annex of the Regulation of the Cabinets of Ministers No. 396 "Regulations of the list of specially protected species and specially protected species of limited use" (Cabinet of Ministers Regulations No. 396, 14.11.2000). The list was supplemented with data about accessions of species presented in the collections of the National Botanical Garden (NBG), the Botanical Garden of the University of Latvia (BGUL), and the Latvia's State Forests Kalsnava Arboretum.

At the end of 2021, there were 25 protected woody plant species in *ex situ* collection in at least one of the mentioned institutions, 23 listed in the Red Data Book of Latvia (82,1%) but 22 listed in Cabinet of Ministers Regulations No. 396. (95,7%). Accessions of 9 species are found in all 3 collections, 11 species in 2 collections, and 5 species only in one collection. Therefore, NBG, BGUL and Kalsnava Arboretum should strengthen their cooperation and ensure that accessions of protected plant species are present in all collections.

Prediction of perennial plant garden escapers by analyzing of *ex situ* plant collections

Inese Nāburga

Botanical Garden of the University of Latvia, Kandavas 2, Riga, LV-1083, Latvia,
inese.naburga@lu.lv

The trade and collections hosting alien plants are serious sources of garden escapers that naturalise in human-modified habitats and endanger local flora. The aim of the study is to identify ornamental herbal perennial plant garden escapers in the Riga region (Latvia) and taxa highly potential to become garden escapers. The phenological data collected over 20 years from the observations of the ornamental herbal perennial plant collections in the Botanical Garden of the University of Latvia were analysed to determine growth habits. From analysing 582 species introduced, several were identified as potential garden escapers. Self-sowing and intensive vegetative growth characteristics of 28 taxa - integral garden weeds that can become garden escapers: *Allium paradoxum* (M. Bieb) G. Don, *Anaphalis margaritacea* (L.) Benth. et Hook. f., *Artemisia ludoviciana* Nutt., *Asclepias syriaca* L., *Aster umbellatus* Mill., *Boltonia asteroides* (L.) L`Her, *Clematis vitalba* L., *Collomia grandiflora* Douglas ex Lindl., *Corydalis nobilis* (L.) Pers., *Cymbalaria muralis* Gottfr. Gaertn., B. Mey. et Scherb., *Eupatorium purpureum* L., *Festuca cinerea* Vill., *Helianthus* × *laetiflorus* Pers., *Heliopsis helianthoides* var. *scabra* (Dunal) Fernald, *Kalimeris incissa* (Fisch.) DC., *Montia sibirica* (L.) J. T. Howell, *Oxyria digyna* (L.) Hill., *Pseudofumaria lutea* (L.) Borkh., *Pulmonaria rubra* Schott, *Pulmonaria saccharate* Mill., *Rudbeckia laciniata* L., *Ruta graveolens* L., *Sedum spurium* M. Bieb., *Smilacina racemose* (L.) Desf., *Smilacina stellata* (L.) Desf., *Tellima grandiflora* (Pursh) Douglas ex Lindl., *Tradescantia virginiana* L., *Viola sororia* Willd. The monitoring of garden escapers in the Riga region from 2016 to 2019 resulted in the identification of eight species for the first time outside of the cultivation area, and four of them were categorised as garden weeds and potential garden escapers ahead: *Allium paradoxum, Artemisia ludoviciana, Asclepias syriaca*, *Heliopsis helianthoides* var. *scabra.*

Medicinal and aromatic plants conservation in Lithuania

Laima Šveistytė

Lithuanian State Forest Service, Pramonės av. 11A, Kaunas, LT-51327, Lithuania,
laima.sveistyte@amvmt.lt

The gathering and utilization of medicinal plants is an age-old tradition in Lithuania, especially in forested areas of the country. About 1/3 of native plant species are used in modern and traditional medicine. Investigations into medicinal plants in Lithuania were commenced in the 18th century when Botanical Garden of Vilnius University had been established. Generally, the conservation of wild plant species and their resources is regulated by the Law on Wild Vegetation (1999), Law on Protected Areas (1993, 2001), Law on National Plant Genetic Resources (2001) and supplementary legal acts. The existing system of conservation of medicinal and aromatic plants includes *ex situ* and *in situ* methods.

Ex situ conservation of medicinal and aromatic plants takes place in the Institute of Botany of the Nature Research Centre, Kaunas Botanical Garden and Agriculture Academy of Vytautas Magnus University. These institutions are engaged in the activity of collecting, investigating and conserving MAP's. The field collection of the Institute of Botany includes over 140 species of medicinal, aromatic and berry plants, about 90% of the accessions are plants of wild origin native to Lithuania, collected mainly for the purposes of research and conservation. In Kaunas Botanical Garden the plants are classified by the pharmacognostic principle in respect of the biologically active compounds. The collection of medicinal plants consists of 470 species, the indigenous species comprise one fifth of the collection. The field collection of caraway, which vary in time of flowering, colour of inflorescence and the amount of essential oils are stored in Agriculture Academy.

The long-term seed storage was established in 1997 in the National Plant Genetic Resources Coordinating Centre. At the present time seeds of 320 accessions representing 47 species of medicinal and aromatic also rare plants are put in long-term storage in the State Forest Service. The majority of the accessions are of Lithuanian origin with rare exceptions of some foreign accessions of special value to Lithuanian growing conditions. The long-term seed storage is annually supplemented with new accessions.

Selecting the area for *in situ* conservation the following criteria were considered: ecological heterogeneity of the site, phenotypic diversity and concentration of the target species, economic value of the target species, the possibility of the site control, the location of the site with regard to protected areas. Target species selected on the basis of socio-economic and scientific values are the following: *Acorus calamus* L., *Arnica montana* L., *Allium* spp., *Crataegus* L., *Origanum vulgare* L., *Thymus* spp., *Hypericum* spp., *Salvia* L., *Vaccinium* spp. and others. Among the most endangered are plant populations in the

forest ecosystems because they are greatly subject to forestry activities. In most cases *in situ* conservation of medicinal and small fruits is more reliable within the already existing network of protected areas than outside them. Today the 36 areas for *in situ* conservation of medicinal plants and small fruits as well crop wild relatives in Lithuania are selected.

Today the status of national genetic resources has been granted to 4 collections, 36 areas *in situ* and 227 accessions of medicinal and aromatic plants. The data about these national genetic resources are collected and stored in the Central Database of State Forest Service.

The importance of inventory of living plants in phytogeographical and park plantations of scientific institutions of Kyiv (Ukraine)

Oleksandr Shynder[1], Svitlana Glukhova[2], Victoria Grytsenko[1], Yuliia Negrash[1], Svitlana Mykhajlyk[2], Svitlana Didenko[1], Tetyana Kostruba[1]

[1] M. M. Gryshko National Botanical Garden of the National Academy of Science of Ukraine, Timiryazyevska 1, 01014, Kyiv, Ukraine, shinderoleksandr@gmail.com
[2] Syretsky Dendrological Park of national importance, Tyraspilska 43, 4136, Kyiv, Ukraine

One of the bases of directed introduction of plants is keeping records of taxonomic diversity of ergasiophytes. Therefore, in the case of long-term introductory activities, it is very important to conduct an inventory of the current taxonomic composition of collections. There is often a need for additional research on weeds, invasive plants, etc.

In Ukraine, the leading scientific institution in the field of plant introduction is M. M. Gryshko National Botanical Garden (Kyiv) on an area of 120 hectares. About 30% of its territory is occupied by phytogeographical plots of the Department of Natural Flora, which simulate the phytocenoses of the temperate regions of Eurasia. In 1950-1990, many alien plants were introduced here. For example, a total of more than 1,600 species were transplanted from the Caucasus to Kyiv, and more than 1,000 from Central Asia. This only partially demonstrates the scale of the great work to create collections of living plants of the Botanical Garden. However, not all plants have been successfully naturalized, and lists of plants in phytogeographical plots were mostly created in Soviet times. Therefore, the current inventory of ergasiophytes and spontaneous flora in these plots is relevant. We have been conducting the research in recent years using a large amount of literature and other sources, as well as materials from one of the largest herbariums in Ukraine – KWHA. For example, according to the results of the plant inventory in the «Caucasus» plot in 2010-2015, 406 taxa (species and subspecies) were recorded, of which 350 are part of the natural flora of the Caucasus, and 216 were transplanted directly from this geographical region. Instead, only 218 species were included in the list of living plants of the «Caucasus» plot before the inventory was conducted.

In 2021, we completed the next stage of the inventory. It was established that 347 species now grow in the “Steppes of Ukraine” plot, of which 213 are representatives of the steppe flora; 305 taxa have been recorded in the “Central Asia” plot, of which 183 are part of the natural flora of Central Asia. Similarly, an inventory of plants in the park plantations of the Syretsky Dendrological Park, which is one of the largest institutions for the introduction of plants in Ukraine, was conducted. In 2016-2017, 538 taxa of woody plants and 931 taxa of herbaceous plants were recorded here.

An important result was the clarification of the taxonomic composition of large genera in the collections, for example: *Allium*, *Tamarix*, *Tulipa*, etc. Lists of invasive plants

and naturalized ergasiophytes of the Botanical Garden and Syretsky Dendrological Park were also compiled. The most harmful are woody lianas – ergasiophygophytes. The information obtained will be used in the new edition of the Catalogue of ergasiophytes M. M. Gryshko National Botanical Garden, and the Catalogues of Plants of the Syretsky Dendrological Park have already been published. This makes a significant addition to the modern flora of cultivated plants in Ukraine.

Plant collections of the University of Warsaw Botanic Garden

Agnieszka Krzyk, Monika Joanna Latkowska

University of Warsaw Botanic Garden, Aleje Ujazdowskie 4, 00-478 Warszawa, Poland, mj.latkowska@uw.edu.pl

The University of Warsaw Botanic Garden (UWBG) occupies an area of 5.16 ha. It includes open-air collections of native plants, as well as greenhouse expositions with tropical, subtropical and succulent plants. Live collections contain *ca* 5,500 taxons. They include endangered and protected species (not only of the native flora), and rare, old cultivars of ornamental woody plants and perennials. Live collections of UWBG include the following sections: Arboretum & Climbers, Plant Systematics, Plants of Different Habitats, Plants of Polish Lowland Flora, Useful and Medicinal Plants, Ornamental Plants, Rose Garden, Plant Biology, Greenhouse Collections.

The main function of the Garden is protection of biological diversity *ex situ,* education and popularising the knowledge of endangered and protected Polish wild species. The Garden plays also an important role in the protection of endangered plant species included in the CITES list. The most important tasks of the Garden in that respect are: education and popularising the knowledge of CITES, trainings for police and customs officers, maintenance and updating collections of plants included in the convention.

UNIVERSITY OF LATVIA

SCIENTIFFIC / PROFESSIONAL COMMITTEE:

Dr. biol. Signe Tomsone, Botanical Garden, University of Latvia
Dr. biol. Uldis Kondratovičs, Botanical Garden, University of Latvia
Dr. biol. Inga Apine, Botanical Garden, University of Latvia
Dr. biol. Anta Sparinska, Bulduri Horticultural Secondary School, Biotechnology Centre

ORGANIZING COMMITTEE:

Signe Tomsone, Botanical Garden, University of Latvia - Head
Uldis Kondratovičs, Botanical Garden, University of Latvia
Kārlis Kalviș̌kis, Department of Information Technology, University of Latvia

UNIVERSITY OF LATVIA
Botanical Garden 100