



**BOTANICAL GARDENS AS PART OF EUROPEAN
CULTURAL HERITAGE**

PAEONIA

(PIVOŇKA, PIWONIA, BIJŪNAS, PFINGSTROSE)

Methodology
2020

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HOW TO USE THIS METHODOLOGY

This methodology was created within the European Union's Erasmus + international program. It is the result of cooperation between European botanical gardens, namely:

Průhonice Botanic Garden (Institute of Botany, Czech Academy of Sciences),

University of Wrocław Botanical Garden – Poland,

Vilnius University Botanical gardens – Lithuania,

Gartenkulturzentrum Niedersachsen Park der Gärten – Germany.

It aims to be an educational and informative guide for professionals and the general public as well as training material for young employees or students. It focuses on an innovative comparison of the gardens in search of similarities, inspiration and a mutual understanding of the historical, cultural, social, educational, economic and horticultural characteristics as well as practices of botanical gardens in different European countries.

Although the botanical gardens in Europe have similar historical, cultural and social roots, they also have country-specific conditions for their origin, mission and development. The botanical gardens located in different countries have a varying climate, depending on the country and specific locality, as well as soil, resources, maintenance, pests and diseases. However, they can indeed grow the same plants. There are many levels to working in a botanical garden and it can offer a multitude of opportunities for informal learning. Every botanical garden is a unique location for educating students, young people and the public.

This methodology dedicated to peonies is one part from a set of four booklets created within the project. It shall be followed up by two publications focused on significant iris and daylily plant genera, while one booklet is dedicated to the topic of botanical gardens as a part of European cultural heritage.

The booklet is divided into 4 chapters enabling the reader to understand the issue of botanical gardens and collections of peonies in terms of scientific and historical significance. The first part is dedicated to a botanical introduction of the *Paeonia* genus (peonies), the history and traditions of cultivating peonies. The second part of the booklet is about partner gardens and the items they have incorporated. It deals with history, science, culture, arts and education in the context of botanical gardens. The third part offers a list of recommended cultivars of peonies as a conclusion of information from all partner gardens from different countries. The publication also offers up examples of good practice in the basic garden maintenance of peonies, which are both important and useful for the reader. They can serve as inspiration or educational material. The last part of the methodology

offers a list of resources, along with links to websites or publications both in English and in the national languages of our partner countries.



The Virgin and Child of the Rose Bower, after Martin Schongauer, (1430–1491)
<https://www.gardnERMuseum.org/>



I. INTRODUCTION OF THE *PAEONIA* GENUS

Botanical Description


Peonies are perennial herbs, subshrubs or shrubs with thick storage roots. They have rather large compound alternate, pinnate or deeply divided leaves, without stipulae. In the tree species, the new growth emerges from scaly buds on the previous flush or from the crown of the rootstock. Flowers are monoecious, pollinated by insects. Each flower is subtended by a number of bracts with possible transitions between bracts and calyx leaves. The calyx is free, persistent and green. The crown leaves are usually large and brightly colored, rarely stiff and leathery. There are a large number of stamens. Within the circle of stamens, they are more or less prominent and lobed. Stamens of some cultural forms can be transformed into false crown leaves - staminodia or petaloids. The gynoecium is apocarpic, consisting of 2 - 15 free carpels, with thick walls and a large number of eggs. The stigmas are sessile or with very short stigma. The nectarium grows on a cushion-shaped, circular target on the basis of the pistil. The fruit is a woody follicle. The seeds are up to 1 cm in size, glossy, usually dark. Unfertilized eggs may persist as bright red, deaf seeds, very noticeable when opening the bladders.

The peony belong to a separate family of peonies (Paeoniaceae Rudolphi) in the developmental branch of saxifrage. In older botanical systems they are referred to as the subfamily Paeonioideae of the family Ranunculaceae.

There are about 35-40 peony species in nature. They come mainly from the mountainous regions of Southern Europe, Asia Minor, Caucasus and East Asia. Only two species occur on the west coast of North America. Two main groups of peonies can be distinguished: herbaceous peonies and tree peonies. Within each group there are interspecific hybrids. Intersectional (Itoh) hybrids are a botanical novelty.

In Europe, the most commonly grown peonies are the common peony, *Paeonia officinalis* and the Chinese peony, *P. lactiflora*, and their garden cultivars and hybrids. The internal systematic division of peonies is quite complex. Opinions on the position of some species and their lower taxonomic units differ dramatically among many authors.

Peonies have large seeds, so their natural spread over longer distances is problematic. In areas with significant geographical barriers (high mountain ridges, deserts), individual populations are isolated, undergoing independent development, creating new taxa. This is particularly evident for Caucasian peonies, which come from one parental species and the differences between populations are obvious but rather bland compared to other groups.



Peonies are old cultural plants, cultivated as medicines or as ornamental or iconic plants. The places, mostly monasteries in which they were grown, were often thousands of kilometers away from the original area of the species. At the same time, in some localities they have become flattened and created populations, which today are difficult to distinguish from the original site.



Distribution of wild peonies, adjusted to M. Page: The Gardener's Guide to Growing Peonies

On the other hand, peonies interbreed easily with each other. Some hybrids remain fertile and retain their properties for generations to come, and may give rise to uniform hybrid populations of even new species.



Section		Subsection	Species
Moutan	tree	Delavayanae	<i>P. delavay</i> s.l. (<i>P. lutea</i> , <i>P. potaninii</i>), <i>P. ludlowii</i>
		Vaginatae	<i>P. ×suffruticosa</i> , <i>P. rockii</i> , <i>P. ostii</i>
		Delavayanae × Vaginatae	<i>P. ×lemoinei</i>
	intersectional	Lemoine group × <i>P. lactiflora</i>	Intersectional, Itoh hybr.
Paeonia	herbaceous	Albiflorae	<i>P. lactiflora</i> , <i>P. emodii</i> , <i>P. anomala</i>
		Foliolatae	<i>P. obovata</i> , <i>P. broterii</i> , <i>P. dahurica</i> s.l. (<i>P. macrophylla</i> , <i>P. wittmanniana</i> , <i>P. caucasica</i> , <i>P. mlokosewitschii</i>), <i>P. mascula</i> s.l., <i>P. corsica</i> , <i>P. kesrouanensis</i> , <i>P. coriacea</i>
		Paeonia	<i>P. intermedia</i> , <i>P. tenuifolia</i> , <i>P. peregrina</i> , <i>P. officinalis</i> , <i>P. saueri</i> , <i>P. arietina</i>
		hybrids of species	<i>P. lactiflora</i> × <i>tenuifolia</i>
			<i>P. lactiflora</i> × <i>officinalis</i> (<i>peregrina</i>)
			<i>P. lactiflora</i> × caucasian yellow paeony
			others
Onaepia			<i>P. brownii</i> , <i>P. californica</i>

Tab. 1 Taxonomy of the *Paeonia* genus

Peonies are conservative in terms of environmental demands. They are only slowly multiplying and growing, therefore they can hardly occupy new habitats. Many species are threatened with extinction in nature.

Species	IUCN	Bern convention	NATURA 2000	Průhonice	Vilnius	Wrocław
<i>Paeonia cambessedesii</i>						
<i>Paeonia clusii</i> subsp. <i>rhodia</i>						
<i>Paeonia officinalis</i> s.l.	LC					
<i>Paeonia parnassica</i>	EN					
<i>Paeonia tenuifolia</i>						

Tab. 2 Protected European species and their representation in the collections of botanical gardens



Paeonia cambessedesii, critically endangered species, Mallorca, Balearic Islands



Paeonia peregrina var. *romanica*, Babadag, Romania

History and Traditions of Growing Peonies

According to legend, Paion (Paihon) was the apprentice of the famous doctor Asclepius. Paion was familiar with medicinal plants and soon became skilled in their use, even surpassing his teacher. But the teacher was jealous of the pupil's achievements and plotted his murder. But Hades, who was grateful to Paion for curing him when he was wounded by one of Hercules' arrows, turned him into a plant that still bears his name to this day.



Dried flowers of peonies for tea at a market, Luoyang, China

Garden, Ornamental and Medicinal Peony

If we say the rose is the queen of flowers, then the peony must be their empress. The peony has been a source of admiration and interest for centuries. It is the national flower of the People's Republic of China and was the favourite flower of Josephine - Napoleon's wife, an inspiration for poets, painters and musicians, a well-known decorative motif, especially on Chinese porcelain and silk, a symbol of female beauty, love and wealth. It is also often called the "thornless rose" and the Benedictine rose.



Peonies have been grown in China for more than a thousand years. Initially they were planted and used by monks in their traditional medicine, and it was only after a long time that they began to be appreciated and cultivated because of their beautiful flower and scent.

Due to their large, brightly coloured flowers and also for medicinal use, they have been cultivated for several thousand years and are still important ornamental and crop plants. They were cultivated in two horticultural centers: in China they are the tree peonies, *Paeonia x suffruticosa* and the Chinese peony, *P. lactiflora*, in the Mediterranean there are the common peony, *P. officinalis* and the Balcan peony, *P. peregrina*. However, other species are included in the breeding nowadays as well.

The herbal raw materials are roots (Radix Paeoniae), seeds (Semen Paeoniae) and flower (Flos Paeoniae). Due to their healing properties, peonies have many proponents of natural treatment methods, based on plant components: they are used primarily in the form of medicinal infusions, tinctures and decoctions.

The peony was known and highly valued as a medicinal plant in ancient Greece and has been used throughout the Middle Ages. Its use is mentioned by the important Roman naturalist Plinius the Elder, Dioskorides and Galenus and it is found in a number of medieval herbals, including the well-known herbarium of Matthioli. The flower of *Paeonia officinalis* (flos paeoniae) is still used in pharmacy to this day.

Paeoniae suffruticosae radice cortex (Mu Dan Pi) is a dried bark of cultivated tree peonies, which has been used in Chinese medicine for a long time. It contains the phenolic derivative paenol and its glycoside paeonoside, in smaller quantities also paeoniflorin, oxypaeoniflorin, benzoilpaeoniflorin etc. It is used for the treatment of various bleeding conditions, hemorrhoids and, on account of its antiseptic effects, also in intestinal infections. It has anti-fever effects, counteracts convulsions and prevents the formation of blood clots.

History of the Tree Peony

The first records of the cultivation of peonies as medicinal plants come from the Eastern Han Dynasty (250 AD). Xie Lingyun (Song Dynasty - 420 - 479 AD) describes the popularity of peony flowers among humans. The first records of the cultivation of peonies as ornamental plants exist from the end of the 4th century. By the time of the Tang Dynasty (618 - 907), peonies were already commonly being grown in gardens, and around the year 800 there were already several ornamental cultivars. In the 8th and 9th centuries, peonies spread rapidly throughout the country and became an object of financial speculation. From the time of the reign of Emperor Muzong (821 - 824 AD), there were records of planting full-flowered peonies in his palace. A description of 42 cultivars of peonies was known from the year 1045 and later in the 16th century there were 274 cultivars.



Peony painting in the Long Corridor of the Summer Palace, Beijing, China



Shop with peony paintings, Luoyang, China



Peonies in a Chinese painting



It is said that peonies were imported to Japan in 734 AD by a prominent Buddhist monk, Fa Hai. At first they were grown in monasteries, but they quickly became popular among people. During the 17th - 19th centuries, a number of new cultivars of Japanese origin arose. Japanese cultivars of peonies are different in flower shape and construction than their Chinese parents.

The first record of tree peonies in the western world was in 1656 from a businessman of the Dutch East Indian Company in Beijing. Later in 1787, Alexander Duncan sent the first tree peonies to the Kew Botanical Garden in England, and another shipment of peonies was brought to England in 1794. The first hybrids with a dark spot on the base of the crown leaves ('Rock's Cultivar') were imported in 1802. In the years 1860 – 1890, tree peonies became a fashionable plant and were grown in specialized nurseries all over Europe (Kelways – England, Heage & Schmidt – Germany, Krelage – Netherlands, Verdier – France). Along with cultivation, they also carried out breeding and introduced the first hybrids of European origin. Thus, in 1890, the Paillet nursery near Paris already offered 337 tree peony cultivars in its catalog.



Rivière Nursery Catalog from the year 1849

At the beginning of the 20th century, French breeders Viktor and Emile Lemoine, along with Professor Louis Henry, carried out the first hybridization between a full-flowering tree peony and a yellow or Delavay peony (*P. ×lemoinei*). Later, A. P. Saunders and W. Gratwick and N. Daphnis also dealt with the hybridization of this group.



Pivoines Rivière is one of the oldest garden nurseries dealing with peonies in Europe

History of the Herbaceous Peony



Peonies portrayed in Basillii Besleri Philiatr: Hortus Eystettensis, 1613

The common or garden peony *Paeonia officinalis* was grown as an ornamental and medicinal plant in the Middle Ages. Literary data are mostly absent, but evidence of their cultivation may be their depiction in Gothic panel paintings. Examples include the Paradise Garden (Paradiesgärtlein) painted by the Upper Rhine Master around 1410 or the paintings of Martin Schongauer (e.g. Madonna of the Rose Bush, 1473). In both pictures, it is very likely that there is a flowering peony.

Matthioli wrote in his famous herbarium (around 1554) that the full-flowering dark red peony was imported to Germany from Spain. He also mentioned a white full peony, which is a rare, white single peony and *P. peregrina*, which was imported from Constantinople.

The full-flowering dark-red blooming peony is known from Renaissance and Baroque botanical and horticultural literature (Basilus Besler: *Plantarum horti Eystaetensis*, 1612; Mathias de Lobel: *Plantarum seu stirpium historia*, 1576; John Parkinson: *Paradisi in Sole*, 1629).



Mathias de Lobel: *Plantarum seu stirpium historia*, 1576



By the 19th century, before the import of full-bloom peonies from China, a number of garden cultivars had been obtained in Europe. For example, the Paris nursery of Charles Verdier offered more than 50 cultivars in 1850.

The Chinese peony *Paeonia lactiflora* in East Asia has had a similar fate to the tree peony but were always somewhat shaded. They were known as a garden plant as early as 536 AD. Towards the end of the 16th century, Chinese nurseries offered over 30 cultivars. In Japan, about 100 cultivars were known in the Edo period (17th - 19th centuries).

While in China and Japan, peonies as herbs were and still are one of the most popular plants, in Europe they were a medical plant for only a short time, e.g. in France in the 16th-17th centuries.

Europeans first became acquainted with Chinese peony hybrids in China in the second half of the 17th century. They were imported to Europe probably in 1784. Imports of the cultivars 'Fragrans' (red-pink flowers), 'Witleyi' (simple white flowers) and 'Humei' (full, melon red), which differed significantly from old European cultivars, have become an incentive for breeders. At the beginning of the 19th century, many nurseries in France, Belgium, Netherlands and England began to breed the Chinese peony, and their peony was also renaissance. Nicolas Lemon was the first to breed herbaceous peonies in nurseries in France in the Porte St. Denis nursery near Paris. He was the first European to grow the Chinese peony from seeds and sell its cultivars like 'Edulis Superba', which is still widespread to this day. Around 1840 attempts were made for the first time to cross cultivars of the Chinese peony with other species. The first successful attempts were with *Paeonia tenuifolia*. Its cultivar 'Smoothi' bred by Smooth and Malines is still cultivated to this day. Victor Lemoine (1823-1911) and his son Emile (1862-1942) were the first to use Caucasian species, such as *P. witmanniana*, to cross. Many of their cultivars, especially with simple flowers, are still cultivated today.

Another important French nursery was the Pivoines of Michel Rivière, founded in 1849 (still owned and operated by the family). In England, the crossing of peonies was mainly devoted to the Kelway family. In 1904, they offered 294 new cultivars.

Intersectional (Itoh) Hybrids

Japanese breeder Toichi Itohu managed to cross the yellow-flowered cultivar *P. ×lemoinei* 'Alice Harding' with the white herbaceous peony 'Kakoden' in 1948. The plants first blossomed in 1963, unfortunately, Dr. Itoh died before seeing it. Itoh's assistant Shigao Oshida continued to breed. American peony breeder Louis Smirnow received permission from the family to reproduce it and patented the cultivar with R. Anderson, who worked at Callies Beautiful Gardens in Wisconsin, and he continued to breed this group of peonies.



Paeonia \times *lemoinei* 'Chromatella' (Lemoine, 1928)



Paeonia \times *lemoinei* 'Gauguin' (Daphnis, 1986)



Paeonia 'Smouthi' (Smout / van Houtte, 1843) the first interspecific hybrid in Europe



Paeonia 'Yellow Emperor' (Itoh / Smirnow, 1974) Itoh (Intersectional) group



International Peony Societies, Registration and Evaluation

The American Peony Society (APS)



It is an international non-profit organization and registration authority dedicated to promoting the culture, education, science and enjoyment of the *Paeonia* genus. Thousands of new peony species are counted in the world. About 6 819 cultivars are registered with the Peony Cultivars Registry of the American Peony Society (APS). However, this is an approximate number of derived peonies in the world, as many new cultivars are registered each year.

<https://americanpeonysociety.org/>

The American Peony Society was established in 1903 to promote cultivated peonies and foster studies to improve its worth as a garden plant. Early on, the founders recognized the need for the standardization of peony names and this initiative continues to be a major component of the APS. Numerous member-focused activities are gaining popularity at a time of a peony renaissance. One of the most popular events is the APS Convention, the largest Peony event in North America, which draws international peony enthusiasts. It is also open to the public. This free show offers an opportunity to see a dazzling array of peonies, including cut flowers, artistic floral designs and educational exhibits. Garden tours during the event give members a chance to enjoy and learn about peonies and their growers. The annual convention also features entertaining and informational seminars for beginners to experts.

The APS maintains a Registry of Peony Cultivars on its website which includes the cultivar name, breeder, group name, date of introduction, description and image. It is searchable by the first four items, and available for access to the public.

The American Peony Society grants numerous peony related awards, which have been developed and promoted over the past 100 years. These awards serve to recognize not only outstanding peony flowers and plants, but the people that have been important to this plant:

- **The Gold Medal** is awarded annually for peonies exhibiting outstanding floral qualities and in recent years has also been designated the “Peony of the Year.” These peonies are excellent for gardeners who wish to have plants that produce outstanding flowers for use as cut flowers, arranging or simple visual enjoyment.
- **Personal awards** are given to American Peony Society members that have given of themselves to promote the peony in a cultivar of ways.

- **Award of Landscape Merit** peonies are recognized for their excellence of plant habit in the landscape. Peonies with this award designation are stellar performers and superior garden plants.
- **Best in Show and Exhibition awards** are given to flowers shown at the annual American Peony Society's Flower Show which is held in conjunction with the convention. An array of awards are given at this event, but the most coveted award is the Grand Champion, representing the best in show.

Other International Peony Growers' Organizations:

- | | |
|-----------------------------------|---|
| • Canadian Peony Society | https://peony.ca/ |
| • Dansk Paeon Selskab | http://www.danskpaeonselskab.dk/ |
| • German Peony Group | http://www.paeonia.de/ |
| • Heartland Peony Society | http://www.peonies.org/index.shtml |
| • Mid-Atlantic Peony Society | http://midatlanticpeony.org/about.html |
| • Minnesota Peony Society | https://mnpeony.org/ |
| • New Zealand Paeony Society | http://www.nzpaeonies.co.nz/ |
| • Pacific Northwest Peony Society | https://www.pnwpeony.org/ |
| • Prairie Peony Society | https://www.icangarden.com/clubs/Regina%20PS/ |
| • Suomen Pionistit (Swedish) | https://www.suomenpionistit.fi/ |
| • Wisconsin Peony Society, Ltd | http://www.wipeonysociety.org/ |



An important website dealing with peonies is **Carsten Burckhardt's Web Project Paeonia** (<http://www.paeon.de/>). It is a database of species and cultivars. An overview of literature from the oldest to the present is important. Some older works and illustrations have internet links or can be downloaded directly. There is also a list of breeders.



It is also possible to view the cultivar database of *Paeonia*, *Rosa* and *Clematis* using the **Help me Find** database: (<https://www.helpmefind.com/peonies/>). There are over 9,000 peonies and more than 1,650 photos cataloged along with peony nurseries, public and private gardens, peony societies, authors, breeders, hybridizers and publications from all over the world.



Description and Evaluation of Peonies

On the preparation of the descriptor list, Průhonice Botanic Garden cooperated with the Department of Horticulture of University of Life Sciences in Prague within a thesis called **Descriptor list for cultivars of garden peonies (*Paeonia*)** in 2016. This paper was used as the basis for the final version of the classifier proposal. In 2018, the evaluation continued with some botanical species and seedlings from the Průhonice collection being described according to this descriptor list. More were needed. Another bachelor thesis, **Czech breeding of peonies and their description**, was defended in 2019 according to the descriptor list.



The descriptor list for cultivars of garden peonies is available here:

<http://www.ibotky.cz/clanky/historicke-dokumenty/316-klasifikatory-pro-kosatce-pivonky-a-denivky.html>

In the descriptor list, published in 2019, we use 74 descriptors in total. Morphological features can be divided into two groups. Classical species characteristics are usually not horticulturally or aesthetically very important, but they enable distinguishing cultivars into taxonomic groups and point to the parental species of hybrids. For example, the shape of the roots is an important feature for the identification of herbaceous peonies. The tuberous, thickened roots have plants from the group of the common peony, Balcan peony and fernleaf peony. This characteristic is inherited by hybrids, but can only be evaluated when transplanted.

The structure of the descriptor list is as follows. In the first descriptor we divide cultivars into horticultural groups according to APS. This is followed by the overall habit of the plant. A total of 10 descriptors is related to the stem, its height and the leaves mounted. 14 are for the leaves. The flower is described by 35 descriptors, mainly the colour of the individual parts and the degree of transformation of stamens and pistils. Seed pods and seeds are evaluated by four descriptors. An important feature is the time of sprouting, mainly because early sprouting taxa and cultones can be damaged by frost, from the horticultural point of view the time of flowering is also important. In the evaluation, we also pay attention to infestation with fungal diseases. Botrytis can endanger plant life, while the remaining diseases are mainly aesthetic problems.

The descriptor list deals with the following features: Horticultural groups according to APS, the habitat of the plant, 10 descriptors are related to the stem, 14 are for the leaves, 35 descriptors for the flower - mainly the colour of the individual parts and the degree of transformation of stamens and pistils, 4 descriptors for seed



GRIN Czech Release 1.10.3



Query Criteria:
Search String: Paeonia

Search For: Paeonia

Retrieve: Accessions

Accessions: Include unavailable Include historic With images With genomic data

Advanced Search Criteria

Return up to 500 accessions

Search

Alternative search method using a list of accession identifiers

Actions...

Select: All, None, Inverse, Highlighted Options: Show 25 items << 1 - 25 of 42 >> Export...

Group By:	Plant Name	Taxonomy	Origin	Material	Maintained By	Availability
Plant ID						
<input type="checkbox"/> 45DV100001	Paeonia anomala	Paeonia anomala	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100002	Paeonia daurica	Paeonia daurica	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100003	Early Caucasian	Paeonia hybr.	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100004	CH01	Paeonia hybr.	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100005	CH04	Paeonia hybr.	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100006	CH05	Paeonia hybr.	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100007	PS01	Paeonia hybr.	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100008	CH02	Paeonia lactiflora	Czech Republic	Field collection	CZE042	Add to Cart
<input type="checkbox"/> 45DV100009	CH11	Paeonia lactiflora	Czech Republic	Field collection	CZE042	Add to Cart

Catalogue of Czech Genetic Resources - GRIN Czech

Pods and seeds. Attention is also paid to the time of sprouting - mainly because of frost damage, time of flowering and infestation with fungal diseases (e.g. Botrytis)

In Lithuania the local descriptor list for peonies by Stasė Dapkūnienė is used. The descriptor list was issued by the Ministry of the Environment in 2013. The Lithuanian descriptor list is focused mostly on the evaluation of this group, lacking features of other groups. A total of 19 morphological characteristics are evaluated. Of the horticulturally interesting features, there is a descriptor of flowering abundance, the ratio of flowering stems to all stems. In our experience, however, this feature depends significantly on the condition of the plant. The flower shape is characterized by 15 descriptors, in addition to the numerical series there are also letters. This is non-standard when evaluating and for recording in tables and may present a problem in the transfer to electronic databases.



A seedling from the Průhonice collections named 'Chlupáček' (meaning hairy one in Czech) is interesting on account of the densely furry leaf surface. It is most likely a hybrid of *P. officinalis* and *P. arietina*



II. PEONIES IN BOTANICAL GARDENS

Průhonice Botanic Garden, Czech Republic

History and Traditions of Growing Peonies in the Czech Republic

Peonies have been grown in the Czech lands since at least the end of the Middle Ages as ornamental and medicinal plants in monasteries, aristocratic residences and later also in rural gardens. Species and cultivars of European origin were commonly grown in Bohemia. This was mainly *Paeonia officinalis* and later also the full-flower *Paeonia* 'Rubra Plena'.

The Index Plantarum of the Botanical Gardens of Charles University in Prague, from 1844, lists 28 cultivated species. However, without a revision of plant material, it is not possible to determine the exact number because some names are, according to today's opinions, synonymous. Species from all over Eurasia are represented.

The botanical literature of the 19th and early 20th centuries also mention in the botanical keys and floras *Paeonia peregrina*, *P. tenuifolia* and *P. x suffruticosa*, as evidenced by their introduction and cultivation. In 1925, Josef Vaněk, prominent Czech landscape architect and gardener, recommends the cultivation of 33 cultivars of *P. lactiflora*, three cultivars of hybrid herbaceous peonies, four tree peonies and several botanical species.

According to historical records, there were 600 clumps of herbaceous peonies in the Průhonice Park at the turn of the 19th and 20th centuries. In 1927, the catalog of the Průhonice Guild Gardens offers a total of 42 cultivars of herbaceous peonies, most of which are derived from *P. lactiflora*.

During the First Republic era, tree peonies were grown by several horticultural nurseries. Most of these were sowing seeds obtained from foreign nurseries, with the plants being sold as unnamed seedlings. The situation was similar after the war. We can still see old specimens of tree peonies in the parks (e.g. the gardens of the Prague Castle) and private gardens, which have interesting flowers but do not correspond with more commonly grown European cultivars.

Peonies were grown and sought after as ornamental plants, but their breeding was not purposefully dedicated to by any gardening company in our country. Even in the 1970s and 1980s, when many amateurs devoted themselves to plant breeding - irises, roses, lilies, daylilies, gladiolus, dahlias, daffodils - nobody specialized in peony breeding.

In the 1970s and 1980s, and later on, many Czech collectors imported peonies from the nature in the Balkans, Caucasus or Siberia. These used to be offered on




Litomyšl Nurseries (Školky Litomyšl, s.r.o.) is one of the largest Czech producers of peonies

exchanges of Rock Gardeners Clubs and spread relatively quickly among growers. The greatest interest was in the yellow flowering *P. mlokosewitschii*. Unfortunately the plants were further multiplied by sieves. Because peonies easily cross each other, many plants of subsequent generations are already hybrid with pinkish flowers.

Peony Projects and Organizations in the Czech Republic

There is no organization in the Czech Republic that would independently support peony growers. However, assortment exhibitions are organized by some organizations of the **Czech Gardening Association** (e.g. Iris Hlučín). The exhibitions were also prepared by the Fruit and Ornamental Nurseries in Litomyšl, the Czech University of Agriculture and occasionally botanical gardens.

In the Czech Republic, the breeding of tree peonies is dealt with by the nurseries Okrasné Rostliny Řež and the Horákovy školky in Bystřice pod Hostýnem. Herbaceous peonies are reproduced by Fruit and ornamental nurseries Litomyšl. Several traditional cultivars of peonies and some nurseries dealing with perennials are grown in smaller quantities. Yet most of the assortment offered by garden nurseries and garden centers is of a foreign origin.



In 2015, the Council of Plant Genetic Resources agreed to include the *Paeonia* (peony) genus into the collections of genetic resources of the National Program. In addition to the selection of plants suitable for the National Program, we started to prepare descriptor lists for these genera.

The National Programme on the Conservation and Utilization of Plants, Animals and Microbial Genetic Resources Important for Nutrition and Agriculture (NP) has included the selection of paeonies cultivars since 2015. It consists of a collection focused mainly on gene-pool resources of Czech origin. There are records of 42 paeonies species and cultivars accessible in the Grin Czech database, preserved under the rules of on farm conservation of the NP. For more details about the genetic resources included in the GRIN Czech database search, see: <https://grinczech.vurv.cz/gringlobal/search.aspx>

Collections of Peonies in Czech Botanical Gardens

Průhonice

Peonies, both tree and herbaceous, were used in the planting of Průhonice Park at the turn of the 19th and 20th century. According to recorded assortment lists, 600 clumps of herbaceous peonies grew in the park at the turn of the century. Today, only a small sample of the historical planting of peonies in the park can be seen. Many botanical species are also planted in the Alpium of Průhonice Park.

A larger assortment of peonies was also grown in the garden of the Dendrological Society. In 1927, the catalog of the Průhonice Guild Gardens offered a total of 42 cultivars of herbaceous peonies, most of which are derived from *Paeonia lactiflora*. In 1936, it was already 61 cultivars of *P. lactiflora*, 3 cultivars of *P. officinalis* and two other botanical species.

In the years 1956 – 1975, the assortment of peonies underwent assortment research lead by Ing. Milada Opatrná at the Ornamental Gardening Research Institute in Průhonice. Plants that survived the war on the grounds of the Dendrological Society or the Průhonice Park, as well as newly purchased species and cultivars, were evaluated. These were 170 cultivars in total. After the research was completed, the collection was partly transferred to selected horticultural companies, partly taken over by the Průhonice botanical garden and the non-promising cultivars were banished.

The collection of peonies in the Botanical Garden of the Czechoslovak Academy of Sciences (today Průhonice Botanic Garden, Institute of Botany CAS, v.v.i.) was founded from 1968 to 1969 by doc. J. Hofman, head of the garden at that time. In the 1980s, the collection was revised and Ing. Uljana Blažková completed the collection mainly with interspecific hybrids of herbaceous peonies.



Exposition of peonies in Průhonice Botanic Garden in 2009

The collection was based on plants from the neighboring Ornamental Gardening Research Institute, purchases from local nurseries, which at that time were devoted to the propagation of peonies in former Czechoslovakia (School Farm AF VŠZ Lednice - Olomučany, nursery in Žehušice, Vejtasa's nursery in Jaroměřice) and purchases from abroad (Gilbert H. Wild and son, USA; Gräfin von Zeppelin, Germany; Stauden Feldweber, Austria; Staudengärtnerei Klose, Germany). In the 1970s, it was listed that the collection consisted of 180 taxa and cultures. When revised in 1982, the collection had 217 cultivars and 10 wild taxa.

After 2000, the collections were gradually updated thanks to cooperation with the Prague Botanical Garden, the Beijing Botanical Garden, Institute of Botany, CAS (China), the Vilnius University Botanical Garden (Lithuania), University of Wrocław Botanical Garden (Poland) and The Botanical Gardens of the M.V. Lomonosov Moscow State University (Russia). Wider cooperation also took place with the Dutch company Green Works. In addition, the collection was expanded by purchases, mainly from Pivoines Rivière (France) and Rare Bulb Nursery (Jānis Rukšāns & Līga Popova - Latvia).

Prague Botanical Garden

The collection of peonies in the garden was founded around 1997 by Pavel Sekerka. The plants were used primarily to create a display called Peony Meadows also as a supplement in the Japanese Garden.

The collection was based on cultivars from nurseries in Litomyšl, Půhonice, and a large part of them was gradually acquired by purchases from world famous nurseries (Callie's Beaux Jardin, USA; Caprice Farm Nursery, USA; Kelways Ltd., England; Klehm Nursery (today Klehm's Song Sparrow), USA; Kotobuk-bussan, Japan; Pivoines Rivière, France). It is the first institution in the Czech Republic to import hybrids of tree and herbaceous peonies - intersectional (Itoh) group. The tree peony garden was purchased by Heze East Flower Co. (China) and Kotobuki-bussan (Japan) and in exchange from the Beijing Botanical Gardens.

The botanical garden regularly organizes collecting expeditions to the Mediterranean, Turkey and China. Among the incomers were a number of wild peonies, which are part of the garden displays.

More information is available at: <https://www.botanicka.cz>



Peonies are presented in the Prague Botanical Garden in the Peony Meadow display



Collections of peonies in other Czech botanical gardens

- Zahrada léčivých rostlin, Hradec Králové
(<https://www.faf.cuni.cz/Zahrada-lecivych-rostlin/>)
- Botanická zahrada a arboretum Mendelovy univerzity Brno
(<http://arboretum.mendelu.cz/cz>)
- Výstaviště Flora Olomouc
(<https://www.flora-ol.cz/botanicka-zahrada-a-zahrada-smyslu>)
- Dendrologická zahrada Průhonice (<https://dendrologickazahrada.cz/>)

Public or Other Events Related to Peonies

Herbaceous peonies, thanks to their large and conspicuous flowers, are often part of flower exhibitions either focused alone on peonies or in combination with other late spring flowers. The exhibitions are mostly organized by local organizations of the Czech Horticultural Association. For example, they are regularly organized by Iris Hlučín – “Exhibition of Irises and Peonies”. In 2014 and 2016, large exhibitions of assortments from the collections of doc. Zdeněk Havlíček were at the Czech University of Life Sciences. Z. Havlíček had a large collection, which contained about 600 items. The assortment of peonies was also regularly at exhibitions prepared by one of the largest Czech assortment horticultures in Litomyšl. In the Průhonice Botanic Garden, we had prepared an exhibition of assortments and photographs of peonies in 2017 in the Nature Gallery in the Průhonice Castle.

On the first weekend in June, a **Japanese day** is regularly held in the Průhonice Botanic Garden. There is also an exhibition of ikebana, a Japanese style flower arrangement usually with an arrangement workshop. Peonies are often part of the arrangements. There is also a regular children's painting competition in the garden.

In the Prague Botanical Garden and in the Průhonice Botanic Garden during the flowering period of the collections, guided walks are usually organized. They are led by the curators of the collections.



Arrangement of peonies at the exhibition at Průhonice Castle



Every year there is a children's competition „Painting in the garden“ in the Průhonice Botanic Garden

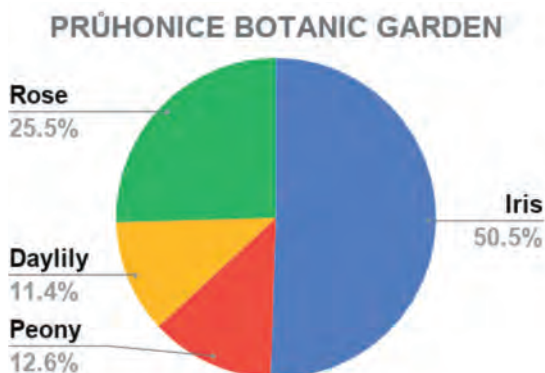


Exhibition of horticultural assortment, Litomyšl, 2016



Exhibition of peony assortment, Galerie Natura, Průhonice Castle, 2017

Introduction of Průhonice Garden Assortment



As of December 2019, the peony collection is comprised of:

- 42 select taxons of peonies
- 460 cultivars of *Paeonia lactiflora*
- 6 cultivars of *P. officinalis*
- 85 herbaceous paeonia hybrids
- 24 Itoh hybrids
- 116 cultivars of *P. ×suffruticosa*
- 59 of these are herbaceous peony
- 20 tree peony seedlings and cultivars are
- 24 named seedlings of Czech origin

The aim of the Průhonice botanic garden peony collection is to show the full range of the genus. At the same time, it serves for the conservation of wild species, of the oldest cultivars and of Czech breeding. The current state is that we have three individuals from the collection of wild species, as well as for the cultivars included in the National Program. We plan to grow other cultivars in two individuals and tree peonies in one individual.



Most wild species grown in the garden have a known origin in nature. Among the cultivars bred in Europe (Great Britain, France, Netherlands, Germany, Poland, Lithuania, Russia) there are also American, Chinese and Japanese cultivars, especially of the tree peony presented.

The first peony to bloom in our collection in Průhonice is *Paeonia kesrouanensis*; 31.3. 2020

The collection includes cultivars of different types of flowers

The aim of the collection is that all shapes and colors of flowers are represented. Among visitors, the most popular are Japanese peonies with differently colored petaloids compared to the crown.

- **Single peonies** – wild species along with cultivars like 'Barrington Belle' (Klehm, Carl G., 1972), 'Gedenken' (Zeppelin, 1990), 'Moonrise' (Saunders, 1949). From Czech cultivars 'Early Caucasian', 'French Poppy', 'Czech Poppy', 'Silesian Poppy', 'Anna Falcká', 'Noble Carmen'.
- **Japanese peonies** or **anemone peonies**: 'Chocolate Soldier' (Auten, 1939), 'Lilac Times', 'Neon' (Nicholls, 1941), 'Nippon Beauty' (Auten, 1927), Czech cultivar 'Cassiopeia'.
- **Semi-double** – 'Coral Sunset' (Wissing, 1965), Czech cultivar 'Moonlight Sonata'.
- **Double** – 'Félix Crousse' (Crousse, 1881) 'Festiva Maxima' (Miellez, Francja, 1851).
- **Bomb-type** - 'Red Charm' (Glasscock, 1944), 'Solfatare' (Calot, 1861), Průhonice seedlings CH 21, CH 24.
- **Chrysanthemum or monstrous**: 'Spider Green' (Krekler/Klehm, 2003), 'Twitterpated' (Klehm, 1995) or Průhonice seedlings CH 51 – CH 56.



Some hybrids especially of *Paeonia peregrina* change color e.g. 'Coral Sunset' (Wissing, 1965)



The two-colored ancient Japanese cultivar *Paeonia* × *suffruticosa* 'Shima Nishi' is a plant chimera



One of the few green flowering peonies is the ancient Chinese cultivar *Paeonia* × *suffruticosa* 'Dou Lu'

Atypical monstrous flowers of *Paeonia lactiflora* cultivars



Paeonia lactiflora 'Daisy Coronet' (Klehm, R.G., 1995)



Paeonia lactiflora 'Spider Green' (Krekler / Klehm, R.G., 2003)



Paeonia lactiflora 'Pink Spritzer' (Klehm, R.G., 1999)

For a complete list of *Paeonia* in the Průhonice Botanic Garden see:



<http://www.florius.cz/botanickyustav/l.dll?h%7E=&D-D=1&H1=Paeonia&V1=z&P1=2&H2=&V2=z&P2=5&H3=&V3=z&P3=255&H4=&V4=z&P4=258&H5=&V5=z&P5=126>

Czech National Breeding Development

Czech peony cultivars are relatively young, but some of them are already on the Czech market.

In the years 1939-42, A. Horák from a nursery in Bystřice pod Hostýnem, selected a seedling with a semi-full bloom, in pink color with a hint of orange and distinctly yellow stamens. Named as 'Líba', this peony is also grown under the name 'Madame Horák'. It is the first Czech named cultivar of peony.



Breeding of Peonies in Průhonice Botanic Garden

The Průhonice collections, which represents a cross-section of the contemporary assortment, including interspecific hybrids, are also a good basis for experimental crossings. In the 1980s and 1990s, Ing. Uljana Blažková sowed seeds obtained by self-pollination, especially from hybrid peonies and cultivars of *Paeonia lactiflora* with a Japanese flower shape. Some of the obtained individuals showed high quality. The first stage selection covered about 50 plants and, in the second stage (2011), 31 individuals of peony plants were selected and further propagated and evaluated.

In cooperation with the Litomyšl Nursery (2017, 2018), three seedlings of *Paeonia lactiflora* were selected and named after wives of the emperor Charles IV:

- 'Blanka z Valois' (CH20) – full double, dark red
- 'Anna Svidnická' (CH26, seedling from the cultivar 'Watteau') – simple light pink
- 'Anna Falcká' (CH09 - seedling from 'L'Étincelante') – simple, pink

Other interesting *P. lactiflora* seedlings were named:

- 'Andromeda' (CH10, seedling from 'O Sho-kun'), large, single-flowered, Japanese flower type with yellow petaloids
- 'Moonlight Sonata' (CH11 – 'La Financée' seedling), lower, early, semi-double, white, with sepals mixed with stamens
- 'Salamandr' (CH15), plants with purple-coloured stems, while the flowers and leaves sprout in purple colour and remain dark coloured for a long time, the flower is unstable semi-double to double
- 'Noble Carmen' (CH18) – a robust plant with large single to semi-double dark red flowers with a smaller yellow center

Other important peonies are:

'French Poppy' (CH01)

'Czech Poppy' (CH04, 'Gedenken' seedling)

'Silesian Poppy' (CH05)

Currently, in cooperation with Green Works, a Dutch company, an evaluation of the above mentioned plants is carried out in the Netherlands with the possibility of their registration as new cultivars. But we are not sure whether the company will accept the names.

Interspecific hybrids developed in the Průhonice Botanical Garden include:

- *Paeonia obovata* × *P. tenuifolia* 'Erotikon', a gracilous plant with bright pink flowers and a distinctive cheek, appears to be promising.
- *P. anomala* × *P. tenuifolia* gave rise to more vigorously growing peonies with delicate foliage and single red flowers, approximately half of the seedlings have red stems.
- Another interesting group is very early flowering hybrids of *P. rossii* × 'Early Caucasian'.



Paeonia lactiflora 'Noble Carmen'



Paeonia lactiflora 'Alžběta Pomořanská'



Paeonia lactiflora 'Blanka z Valois'



Paeonia lactiflora 'Andromeda'



Paeonia lactiflora 'Moonlight Sonata'



Paeonia lactiflora 'Anna Falcká'



Paeonia hybr. 'Silesian Poppy' is peony from the Průhonice breeding

Breeding of Peonies at Prague Botanical Garden

In terms of the National Program for Genetic Resources, in 2015 we also included plants from breeding in the Prague Botanical Garden. Trojan breeding is a selection of seedlings derived from a mixture of seeds obtained by self-pollination from cultivars purchased from the Chinese company He Ze East Flowers at the City of Prague Botanical Garden. Sowing took place at around 2000 and the plants bloomed around 2005. Sowing and selection was carried out by Pavel Sekerka. The assortment has been propagated and offered by Martin Lemon and Petr Beran – Czech nursery Okrasné Rostliny Řež.



Mother plants of tree peonies in the Prague Botanical Garden

Introduction of Czech Peony Cultivars



***Paeonia mlokosewitschii*-hybr. 'Early Caucasian'**

Seedling of *P. mlokosewitschii* from Prague Botanical Garden. Vigorous plant, at the time of flowering 60cm high. The leaves are faintly purple at the time of flowering. One flower on the stem. The average diameter of the flower is 14cm. The flower is single, up facing, very early. The primary petal color is greyed yellow (RHS 160D) with a light purple flare (71C).



***Paeonia* hybr. 'French Poppy' (CH01)**

A vigorous, mighty plant. At the time of flowering, 80cm high. One flower on the stem. The average diameter of the flower is 19 cm. The flower is single, up facing, blooms early. The primary petal color is red (RHS 46B).



***Paeonia* hybr. 'Czech Poppy' (CH04)**

Vigorous 'Gedenden' seedling, mighty plant, at the time of flowering 75cm high. One flower on the stem. The average diameter of the flower is 16 cm. The flower is single, up facing, blooms early. The primary petal color is red purple (RHS 57B).



***Paeonia* hybr. 'Silesian Poppy' (CH05)**

Vigorous, mighty plant, at the time of flowering 85cm high. One flower on the stem. The average diameter of the flower is 23cm. The flower is single, up facing, blooms early. The primary petal color is red purple (RHS 63C), changes to red (56C).



***Paeonia obovata* × *P. tenuifolia* 'Erotikon'**

Interesting, unusual, finely leafed peony, at the time of flowering 45cm high. One flower on the stem. The average diameter of the flower is 9cm. The flower is single, up facing, blooms very early. The primary petal color is red purple (RHS 67A).



***Paeonia lactiflora* 'Salamandr' (CH15)**

An interesting peony because the dark purple color of the leaves stays for a long time, until flowering. At the time of flowering, 90cm high. The average diameter of the flower is 9cm. The flower is single to semi - double, up facing, blooms middle. The primary petal color is red purple (RHS 64A).



Maintenance of the Peony Collection in the Průhonice Botanic Garden

Climatic conditions

- Climate: humid continental (Köppen climate classification Dfb)
- Average annual temperature: 8,5°C
- USDA hardiness zone: 6b
- Average annual rainfall: around 570 mm
- Altitude: 305 m above sea level
- Soil types: modal brown soil, gleyed brown soil is present


Plants are mainly grown in single-type beds without combination with other plants. This method of cultivation is easier in this case for mechanical and chemical maintenance.

The beds are in an open area. Before planting, the ground is engraved and enriched with compost. The surface is lightly covered with bark or wood chips, but a larger layer of mulch supports the spread of botritis. Plants are replanted as needed, while the oldest plantings have been on the site for 15 years and still grown without problems.

Wild species from the group *Mascula* and *Dahurica*, *Paeonia obovata*, *P. kesrouanensis* and *P. mairei* are grown in semi-shade in soil more enriched with humus components. This planting is combined with other plant species, especially *Adonis amurensis*, *Clematis*, *Helleborus* and bulbs (*Arum*, *Cyclamen*, *Galanthus*, *Leucorum*, *Lilium*). *Paeonia tenuifolia*, *P. officinalis* subsp. *huthii*, *P. parnassica* are grown in full sun near an iris rock garden in lighter soil with sand.

Tree peonies are grown in a light shade of trees both in the flower bed and solitarily in the lawn. The plants are planted deeply so that the grafted branches make their own roots. If possible, cover them in the winter with compost and fertilize before the beginning of the vegetative season with full fertilizer. Plants in the garden are still young, they do not require pruning.

- Transplanting period - peonies don't require regular transplanting.
- Fertilizing - culture does not require frequent cultivation interventions. During winter (February) we fertilize with full NPK fertilizer (Ceririt).
- Irrigation – automatic irrigation isn't present. In the local climatic conditions, mature plants of peonies do not require additional irrigation. For new plantings, portable water pipes are used.

- 
- Dead-heading - not performed, after all plants finish blooming and before seed pods are ripe, the stalks are removed. Seedlings from open pollination can degrade high standards of gene pool collection and discredit verification of species and cultivars.
 - Autumn cleaning - In October - November at the time of the yellowing of the leaves, we cut the stems near the ground.
 - Weed control - in winter (February) we treat the plot with total glyphosate herbicide (Roundup) and anti-germination herbicide with active substance pendimethalin (Stomp).
 - Diseases - the most serious disease is **Botrytis paeoniae**. Peonies are often affected by the disease, especially in the longer rainy season. We dispose of the infested stems. We preventively treat endangered groups of species or cultivars (*Paeonia mascula* and *P. dahurica* group, hybrids and young tree peony) with fungicides - Mythos® 30SC (pyrimethanil) or Signum® (boscalid + pyraklostrobin). A powdery mildew (*Sphaerotheca* or *Erysiphe*) appears on the leaves of intergroup and some hybrid peonies in the Prague Botanical Garden. It does not occur in Průhonice. Other diseases (*Graphiopsis chlorocephala* (syn.: *Cladosporium paeoniae*) and *Cronartium flaccidum*) appear after flowering and are more of an aesthetic matter.
 - Pests - Significant pests do not occur. The flowers are visited by ants and beetles. We do not treat them with insecticides against them.

Recommendation: why peonies don't bloom – bud-blast

Anything that stresses the plant could result in bud-blast, a condition where the peony flower buds fail to open.

- infertile soil
- too-deep planting of herbaceous peony
- immature plants
- too much shade, drought
- late spring frosts
- botrytis blight in rainy weather



Frost causes the stem to wither. However, it is usually without consequences, Průhonice 25. 4. 2016



Damage to peony by high concentration of pendimethalin herbicide



Damage to tree peony by glyphosate herbicide



Frost damage on tree peonies causes the edges of the leaves to dry out, Průhonice 31. 3. 2020

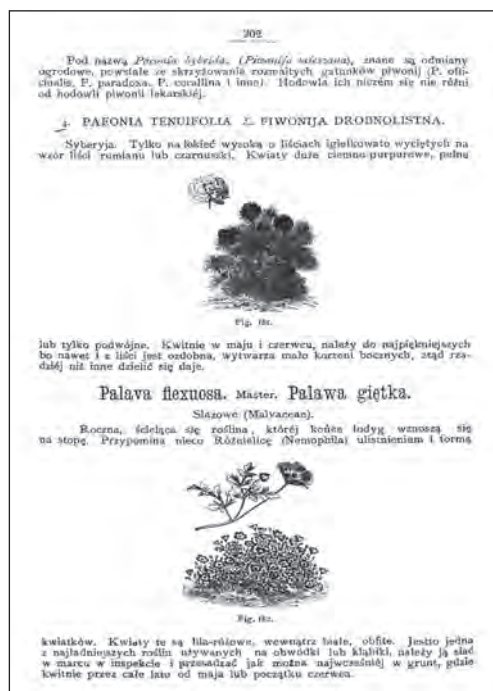
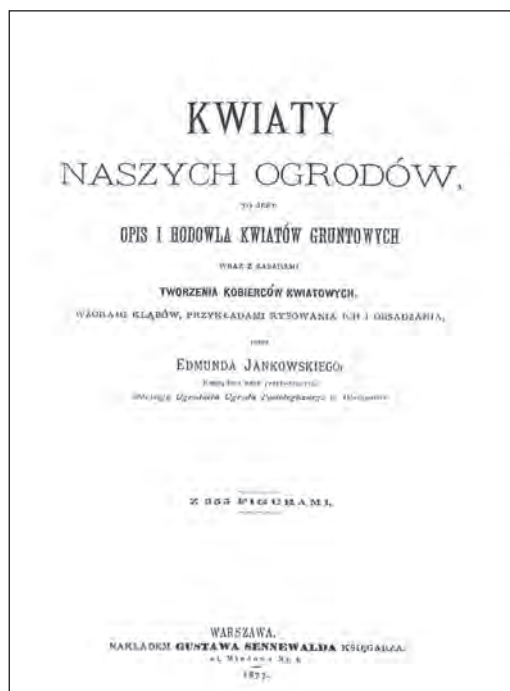


University of Wrocław Botanical Garden - Arboretum Wojstawice

University of Wrocław Botanical Garden, Poland

History and Traditions of Growing Peonies in Poland

In Poland, peonies have been cultivated since the Middle Ages, mainly in monastery gardens as medicinal and ornamental plants. In later epochs, peonies were used as decorative plants in residential and court gardens. They were also frequently cultivated in rural gardens in the vicinity of mallows, lilies, delphiniums and marigolds. Peony petals were used in traditional ceremonies of spreading flowers during the Corpus Christi procession. That custom has survived until the present. Numerous sources mention that peonies were used in gardens and landscape parks, which were commonly established in Poland in the 19th century. Edmund Jankowski (1849-1938) - Polish biologist, gardener, orchard science specialist, in his 1877 publication "Flowers of our gardens", recommends the cultivation of Chinese peony, tree peony, common peony and fernleaf peony. It lists 14 cultivars of Chinese peony recommended by the French company Andrieux-Vilmorin: 'Abel Carrière' (Verdier, 1831), 'Beauté de Villecante' (Gombault, 1865), 'Boule de Neige' (Calot, 1867), 'Chrysanthemiflora' (Guérin, 1842), 'Dr. Caillot'



In the publication *Kwiaty Naszych Ogrodów* (The flowers of our Gardens), Edmund Jankowski also describes peony species

(Verdier, 1856), 'Faust' (Miellez, 1855), 'Festiva Maxima' (Miellez, 1851), 'Madame Calot' (Miellez, 1856), 'Madame Furtado' (Guérin, 1856), 'Madame Lemoine' (Sénéclauze, 1889), 'Modeste Guérin' (Guérin, 1845), 'Prince Troubetzkoy' (Guérin, 1853), 'Rubra Triumphans' (Delâche, 1854), 'Sulphurea' (Lémon, 1830). In the post-war period, one of the nurseries that has been offering different cultivars of herbaceous peonies in Poland is Gospodarstwo Ogrodnicze Elżbieta and Zbigniew Bilsy. The company has been producing decorative perennials since 1975. Peonies are grown for container sale and for cut flowers.

History of the Peony Collection in the University of Wrocław Botanical Garden

The Botanical Garden in Wrocław has two collections of peonies - a collection of botanical species of the *Peonia* genus and a collection of herbaceous cultivars of peonies, which is a part of the National Collection of Peonies. A National Collection is the richest, systematic plant collection, properly documented, labelled in a standardised way and maintained by specialists. The idea of creating this type of collection was born in the UK in 1981. In 2002, a group of Polish scientists -




National Collection of Herbaceous Peony Cultivars in Wrocław

Jerzy Tumiłowicz, Tomasz Nowak, Wiesław Podyma and Hanna Werblan-Jakubiec - created a definition and criteria for the recognition of a collection as national. A national collection, otherwise known as the model collection, is a plant collection, comprised of various systematic units. National collections are approved and validated by a committee, initially appointed by the Polish Botanical Gardens Society and now by the Polish Dendrological Society. The beginnings of the collection of peonies in the Botanical Garden, both species and cultivars, dates back to the late 1980s. Many of the taxa came from the Garden of Medicinal Plants of the Medical Academy. Jolanta Kozłowska-Kalisz - the then curator of the Ground Ornamental Plants Department, initiated the collection.

The first plants were imported from the Experimental Station of Cultivar Assessment in Śrem Wójtostwo in 1989. The collection of cultivars of ornamental plants, registered at the Station, was liquidated. Some of the plants were moved to the Wrocław Garden. After the cooperation with the Botanical Garden of the Academy of Sciences in Kiev had begun, the collection was expanded in 1991. Later in 2007, more peony cultivars from the group of *Paeonia officinalis* × *P. lactiflora* hybrids and *P. lactiflora* cultivars were brought from Kiev. In 2001, the Wrocław Botanical Garden collection was complemented by cultivars from the Department of Ornamental Plants of the Agricultural Academy in Poznań. The department liquidated its collection of peonies. In 2015, new cultivars of *P. lactiflora*, were purchased at the Elżbieta and Zbigniew Bilski Horticultural Farm.



Peony collection in Arboretum Wojstawice



In September 2011, the collection of herbaceous peony cultivars in the Botanical Garden in Wrocław, which at that time amounted to 160 taxa, was verified and assessed, and the collection was recognized as the **National Collection of Herbaceous Peony Cultivars**. The collection in cultivation at the Arboretum Wojstawice has been enlarged in an impressive way. In consequence, a request was sent, with the aim to change the status of the National Collection of the Botanical Garden of the University of Wrocław and the inclusion of specimens growing in the Arboretum Wojstawice, composed of (apart from herbaceous taxa) species and cultivars of tree peonies and Itoh and Sonoma hybrids.

History and Traditions of Peony Cultivation in the Arboretum Wojstawice

Peony *Paeonia* cultivation in the University of Wrocław Botanical Garden - Arboretum Wojstawice has a long tradition. These plants were one of Fritz von Oheimb's many passions. It is known that in 1921 he had more than 500 cultivars of peonies, from three to seven plants of each cultivar. However, it is unknown what the exact composition of his collection was and how many botanical species it included. According to Oheimb, the most representative and impressive were 8-12-year old peonies, planted one meter from an alleyway, with a green lawn in the background. He believed that only about 30 cultivars of his immense collection were valuable.

Among the many very good ones, he ranked the following cultivars as

- Excellent: 'Jeanne d'Arc', 'La Tendresse', 'La Tulipe', 'Fraicheur', 'Mme Costé', 'Mme de Galhau', 'Enfant de Nancy', 'Duchesse de Nemours', 'Straßburg', 'Mme Forel', 'Mme Jules Dessert', 'M. Krelage'.
- He considered cultivars from the species *Paeonia vittmanniana* Hartwiss ex Lindl. (currently *P. daurica* subsp. *vittmanniana*), *P. tenuifolia*, *P. officinalis*: 'Mlle Rousseau', 'Belle Mauve', blooming in May, the most valuable very early peonies.
- Among late blooming peonies, he recommended cultivating the following ones: 'Wiesbaden', 'Mireille', 'Marguerite Gérard', 'Marie', 'Mme Geissler', 'Whitleyi Major', 'Edulis Superba'.
- Oheimb particularly valued low, short-shoot cultivars, wind or rain-tolerant: 'Mme Geissler', 'Gretchen', 'Wiesbaden'.
- However, he also encouraged to keep cultivating wonderful high cultivars: 'Belle Mauve', 'Festiva Maxima', 'Jeanne d'Arc', 'Mme Jules Elie', 'Mme de Galhau', 'Mme Costé', 'Mireille'.
- He also liked single Japanese peonies, which were no longer fashionable at that time, and those with a strong, tea rose or white lily fragrance.




Despite his great love for peonies, he complained about the enormous amount of work involved in maintaining them and about how difficult it was to label them properly in such a large collection, even though he used labels embossed of a metal sheet, fixed on wooden pegs or permanent bars.



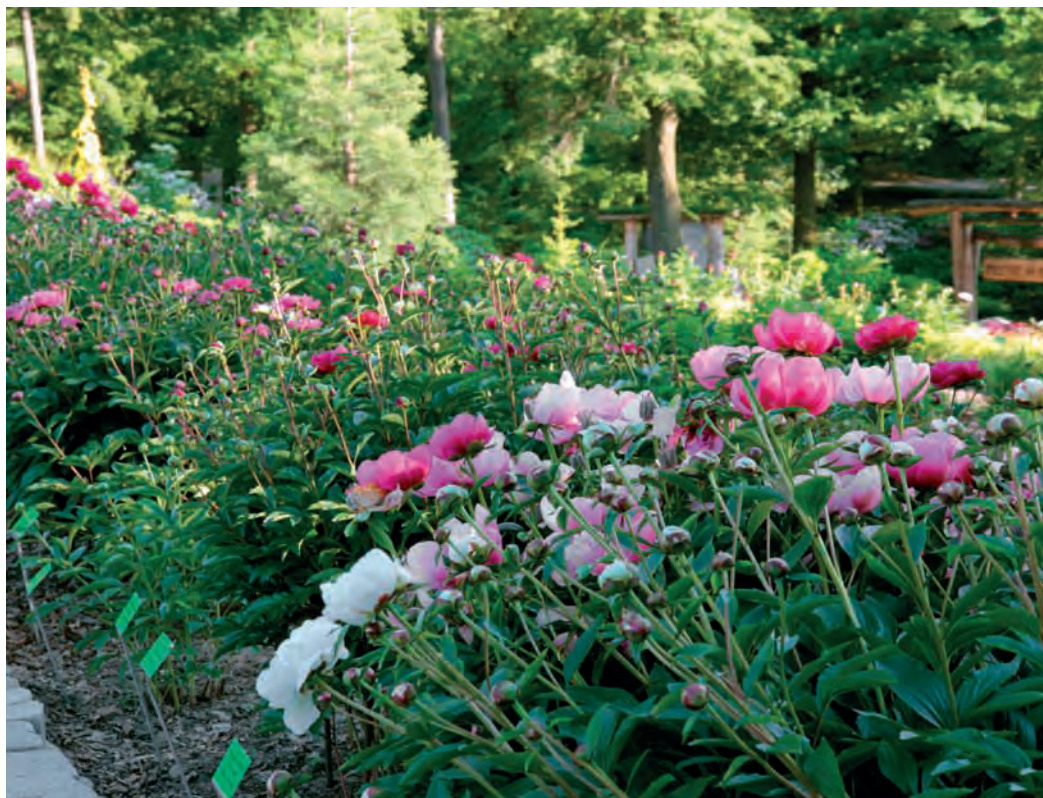
Excerpt from the article "Von Oheimb / Paeonien" in a German magazine from 1921

Nowadays there is no trace left of the old collection of perennial peonies. Only one specimen of tree peony lived to an old age and in 1996 it was labelled by John Sales, an English specialist from The National Trust for Places of Historic Interest or Natural Beauty, as *Paeonia suffruticosa* 'Joseph Rock'. Unfortunately, in 2019, after the winter - the peony did not start to grow again - the roots were entirely eaten by rodents.

The new collection of the Botanical Garden at the Arboretum Wojstawice has 410 taxa. The year 1993 is considered to be its beginning. It was then, when the first cultivars of the Chinese peony *Paeonia lactiflora* were planted. They were obtained from the home site - the Botanical Garden in Wrocław. In 2013, the collection developed significantly and continues until now. In 2012, Tomasz Dymny M.Sc. with the support of perennial specialist, Dr. Jolanta Kozłowska-Kalisz, took over responsibility for their cultivation. Every year, several dozen new cultivars are planted. The seedlings are obtained from Polish and foreign botanical gar-



dens, perennial nurseries, as well as from private collections. In 2019, cooperation was established with Monika Czupińska - owner of PeonyMAX nursery, which led to the creation of the largest Itoh group peony collection in Poland.




Collection of herbaceous peony cultivars in Arboretum Wojstawice

Public Events Related to Peonies

This peony collection is popularized by botanical gardens, which organize various theme walks and festivals. Smaller collections of peonies can be seen in the Botanical Garden in Łódź, the Botanical Garden of the Maria Curie-Skłodowska University in Lublin, the Arboretum and Physiography Department in Bolestraszyce, the Botanical Garden of the Polish Academy of Sciences in Powsin.

In the Botanical Garden of the University of Wrocław, in June, there are thematic walks dedicated to peonies, and since 2016 at the beginning of June in



the Arboretum Wojstawice, a **Peony Day** has been organised. During the event, organised on a regular basis, in the gallery building visitors can admire the thematic - floral exhibition of these noble flowers, seeking advice from specialists on cultivation, disease and pest control. During that day, it is possible to participate in a wide range of attractions, including: calligraphy workshops, learning Chinese, taking part in "Gong-fu cha" - a tea ceremony, as well as preparing peony soaps. A traditional guided walk – a presentation of the peony collection, is another attraction of that day. The Peony Day is accompanied by a plant fair, where it is possible to purchase different unique plants, including the latest peony cultivars. From the very beginning, the event has been co-organized with Agnieszka and Patrick Brama from HORTIPOL Horticultural Farm. In 2018 the Confucius Institute of the University of Wrocław joined the group of organizers, and in 2020 - PeonyMax company. In 2019, in the parent unit in Wrocław, where the Plant of the Year is chosen for each gardening season, the "Year of Chinese Plants" exhibition was organized. Peony had a special place in the exhibition. The Inauguration of the Year of Chinese Plants took place on 26 May, which could take place as a result of the cooperation with the Confucius Institute of the University of Wrocław. On that day, it was possible to take part in lectures given by scientists from both Poland and China, and in workshops on Chinese calligraphy, creating Chinese fans, painting patterns on Chinese porcelain and trying on a traditional Chinese costume. There were also shows of Chinese art, such as Chinese dance, a flute concert, Guzheng, Opera Huangmei, Guqin and taichi. In addition, there was an opportunity to see a tea ceremony with a tea tasting. The garden guests also had the opportunity to buy peonies and other plants at the plant fair.

Collections of peonies in other Polish botanical gardens

- Łódzki Ogród Botaniczny
(<https://www.botaniczny.lodz.pl>)
- Ogród Botaniczny Uniwersytetu Marii Curie-Skłodowskiej w Lublinie
(<https://www.umcs.pl/pl/ogrod-botaniczny.htm>)
- Arboretum i Zakład Fizjografii w Bolestraszycach
(<https://bolestraszyce.com.pl/kontakt>)
- Polska Akademia Nauk, Ogród Botaniczny, Centrum Zachowania Różnorodności Biologicznej
(<https://www.ogrod-powsin.pl>)



Peony Day exhibition in Arboretum Wojstawice



Presentation of the peony collection during Peony Day in Arboretum Wojstawice



Peony Day exhibition in Arboretum Wojstawice



Gong-fu cha - a tea ceremony during Peony Day in Arboretum Wojstawice



The tea ceremony during the Inauguration of the Year of Chinese Plants in Wrocław



Creating Chinese fans during the Inauguration of the Year of Chinese Plants in Wrocław

Peony Projects and Organizations in Poland

So far, no official national associations or projects dealing with the subject of peonies have been established. However, on social media, there are groups of enthusiasts of this group of plants. As a way of example the Facebook groups "Peony dizziness" or "Peonies in Poland peonophiles" can be listed. The groups are created by plant nursery owners, professional gardeners and amateur gardeners. In the groups, it is possible to find tips and advice on how to cultivate peonies, obtain information about new cultivars, share observations, discuss and exchange experiences.



Successive horticulture steps in peony production in a nursery – Elżbieta and Zbigniew Bilscy Horticultural Farm



Cut flowers of peonies prepared for transport - Elżbieta and Zbigniew Bilscy Horticultural Farm

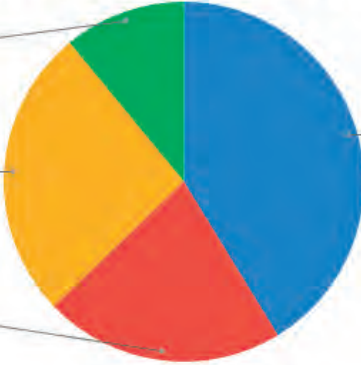
Introduction of the University of Wrocław Botanical Garden Peony Assortment

UNIVERSITY OF WROCLAW

Rose
10.9%

Daylily
26.2%

Peony
21.6%



Iris
41.3%

The collection has 215 taxa and consists of two parts:

Botanical species of peonies: 22 taxa

Cultivars: 193 items

The collection of botanical peonies is located in the Plant Taxonomy Department and is included in the planting plan based on the classification system of Adolf Engler. The flower bed with peonies is provided with a board describing the peony family Paeoniaceae. Both herbaceous (perennial) peonies, such as: *Paeonia anomala* subsp. *veitchii*, *P. peregrina*, *P. tenuifolia*, and tree peonies: *P. delavayi*, *P. ludlowii*, *P. ostii*, grow there.



Paeonia anomala subsp. *veitchii*



Paeonia mascula subsp. *arietina*



Paeonia peregrina



Paeonia delavayi var. *angustiloba* f. *trollioides*




Paeonia ludlowii



Paeonia ostii



Paeonia potaninii



Ornamental peonies are planted in three flower beds, in the vicinity of collections of bearded irises, daylilies and cannas, belonging to the Ground Ornamental Plants Department. The collection in Wrocław contains both cultivars of *Paeonia lactiflora*, *P. officinalis* and hybrids. An important part of the collection are Polish peony cultivars, such as: 'Barbara', 'Ewelina', 'Hania', 'Krystyna', 'Jadwiga', 'Prof. Wóycicki', 'Ursyn Niemcewicz', 'Ursynów' and 'Władysława'.



Paeonia lactiflora 'Jadwiga' (Karpow-Lipski, 1977)

The collection includes cultivars of the following breedings:

- Poland: 'Barbara', 'Ewelina', 'Jadwiga' (Mikołaj Karpow-Lipski, 1977), 'Ursynów' (Stanisław Wóycicki, SGGW, 1977)
- Ukraine: 'Vesilna', 'Chervoni Vitryla' (Gorobets, 1994), 'Zhemchuzhnaya Rossyp' (Gorobets-Tyran, 1989)
- France: 'Amabilis' (Calot, 1856), 'Albert Crousse' (Crousse, 1893), 'Alice Harding' (Lemoine, 1922), 'Mai Fleuri' (Lemoine, 1905)
- England: 'Baron James de Rothschild', 'Baroness Schröder', 'Lady Alexandra Duff' and 'Una Howard' (Kelway)

- Netherlands: 'Alexander Fleming' (Blonk, przed 1950), 'Bowl of Beauty' (Aart Hoogendoorn, 1949), 'Miss Eckhart' (Roelof-Arendsveen van der Meer, 1928)
- Germany: 'Holbein', 'Murillo', 'Schwindt' (Goos & Koenemann, 1910),
- Russia (USSR) - 'Moskvitch', 'Pamjati Gagarina' (Krasnowa, 1957), 'Yubileynij' (Krasnowa, 1959)
- USA: 'Buckeye Belle' (Mains, 1965), 'Coral Sunset' (Samuel E. Wissing, Lombard, 1965), 'Diana Parks' (Bockstoce, 1942), 'Legion of Honor' (Saunders, 1941)
- Japan: 'Higuchi-hybrid' (Yugen Higuchi, 1956), 'Kame-no-kegoromo' (unknown breeder, before 1913), 'Kinsui' i 'O-sho-kun' (unknown breeder)

The collection includes cultivars of different types of flowers:

- **Single peonies** – single or double layer of wide petal, fertile stamens; pistils are visible: 'Early Scout' (Auten, 1952), 'O-sho-kun' (Japan), 'Schwindt' (Goos & Koenemann, 1910)
- **Japanese peonies** – a single or double layer of wide petals surrounds widened staminodes, they can have stamens with pollen in the outer circle; pistils are visible: 'Akron' (Krekler 1962), 'Ewelina' (Karpow-Lipski, 1977), 'Gold Standard' (Rosenfield, 1934), 'Hit Parade' (Nicholls, 1965)
- **Anemone peonies** – a single or double layer of wide petals surrounds widened petal-like structures (staminodes); no fertile stamens, pistils are visible: 'Barbara' (Karpow-Lipski, 1977), 'Nippon Parade' (Auten, 1935), 'Noémie Demay' (Calot, 1867)
- **Semi-double** – a single or double layer of wide petals surrounds staminodes of the same width, arranged alternately with fertile stamens: 'Ann Zahller' (Mains, 1965), 'Chervonnyj Oksamit' (Gorobets, 1952)
- **Double** – the flower consists only of many wide petals, including those which are probably transformed stamens: 'Félix Crousse' (Crousse, 1881), 'Festiva Maxima' (Miellez, 1851), 'Guidon' (Nicholls, 1941)
- **Bomb-type** - a single layer of wide petals surrounds a shorter dense pompon of narrower petals: 'Red Charm' (Glasscock, 1944), 'Red Grace' (Glasscock / Klehm, 1980), 'Solfatare' (Calot, 1861)



Paeonia lactiflora 'Holbein' (Goos & Koenemann, 1910) - type of flower: single



Paeonia lactiflora 'Akron' (Krekler, 1962) - type of flower: Japanese



Paeonia lactiflora 'Many Happy Returns' (Hollingsworth, 1986) - type of flower: anemone



Paeonia 'Ann Zahller' (Mains, 1956) - type of flower: semi-double



Paeonia lactiflora 'Dresden Pink' (Wild & Son, 1957) - type of flower: double



Paeonia lactiflora 'Madame de Vernéville' (Crousse, 1885) - type of flower: bomb-type

The blooming period of individual herbaceous peonies is relatively short, lasting from 7 to 10 days. However, there are cultivars with different blooming dates, therefore, given the earliest and latest blooming cultivars, the total blooming time can take about 6 weeks.

The collection includes cultivars of different blooming periods:

- **Early cultivars - blooming in late May:**

'Buckeye Belle' (Mains, 1956), 'Chervoni Vitryla', 'Early Scout' (Auten, 1952), 'Hohloma' (Gorobets, 1986), 'Ophelia' (Gorobets, 1998), 'Professor Wóycicki'. (Stanisław Wóycicki, 1980)

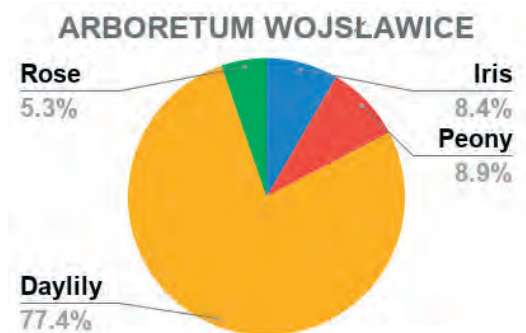
- **Mid-early cultivars - blooming in the first decade of June:**

'Général Bertrand' (Guérin, 1846), 'Ewelina' (Karpow-Lipski, 1977), 'Paula Fay' (Orville W. Fay, 1968), 'Red Charm' (Glasscock, 1944), 'Władysława'. (Stanisław Wóycicki, 1980)

- **Late cultivars - blooming in the second decade of June:**

'Barbara' (Mikołaj Karpow-Lipski, 1977), 'Duchesse d'Orléans' (Guérin, 1846), 'Florence Nicholls' (Nicholls, 1938), 'Jadwiga' (Mikołaj Karpow-Lipski, 1977), 'Ursynów', (Stanisław Wóycicki, 1977)

Introduction of Peony Assortment in the University of Wrocław Botanical Garden - Arboretum Wojsławice



The peony collection consists of 411 taxa.

Peony collection as of 1 March 2020

Botanical species: 23

Herbaceous peonies: 327

Tree peonies: 19

Itoh group: 41

Peonies growing in the Arboretum are located on mellow southern slopes of the Oak Hills (altitude 273.6 - 297.7 m) in extensive flower beds, available to visitors. They are divided into five groups:

- 1) **Herbaceous peonies** (the oldest collection), to facilitate observation, the plants were planted in alphabetical order.

For instance cultivars: 'Akro' (Krekler, 1962), 'Better Times' (Franklin, 1941), 'Dürer' (not in registry), 'Cornelia Shaylor' (Shaylor, 1917).

- 2) **Late blooming species, subspecies, cultivars, botanical forms and cultivars:**
e.g. 'Elsa Sass' (Sass, H.P., 1930), 'Pink Giant' (not in registry), 'Glory Hallelujah' (Klehm, Carl G., 1970), 'Solange' (Lemoine, 1907), 'Princess Margaret' (Mura-wska, 1960).
- 3) **Early blooming species and cultivars.** Peonies in general bloom in early summer. However, there is a group of species like *Paeonia peregrina*, *P. mlokose-witschii*, *P. obovata*, *P. veitchii*, *P. rockii*, *P. ×smouthii* and their cultivars (e.g. 'Nova' (Saunders, 1950) as a cross between *P. mlokosewitschii* × *P. macro-phylla*), which bloom already in spring.
 - At the beginning of May at the earliest, fernleaf peony (*P. tenuifolia*) and inter-species hybrids obtained with its participation, e.g. 'Earlybird' (Saunders, 1951), 'Early Scout' (Auten, 1952), 'Nosegay' (Saunders, 1950), are in bloom.
 - In mid - May, the common peony *P. officinalis* and its cultivars are in bloom, among them the full, purple cultivar 'Rubra Plena' (European ancient culti-var), very popular in old, rural gardens.
- 4) **Peonies from the Itoh group**, 'Julia Rose', 'Prairie Charm' (Hollingsworth, 1992), 'Sonoma Floozy' (Tolomeo, 2001).
- 5) **Tree peonies, among others:** 'Amazing Beauty' (Irvine/Sutherland, 2001), 'Château de Courson' (not in registry), 'Reine Elisabeth' (not in registry), 'Shima-nishiki' (ancient Japanese cultivar), 'Yin Hong Qiao Dui' (Chinese cultivar).



Paeonia 'Julia Rose' (Anderson, 1999), Itoh (Intersectional) group



Paeonia 'Prairie Charm' (Hollingsworth, 1992), Itoh (Intersectional) group

At the Arboretum Wojślawice there are peonies of the following breedings:

- **Poland:** 'Barbara', 'Hania'. (Mikołaj Karpow-Lipski, 1977) and 'Prof. Wóycicki' (Stanisław Wóycicki, Hanna Ładyżyńska, Halina Owsianik, Bolesław Chlebowski, 1997)
- **France:** 'Festiva Maxima' (Mieliez, 1851), 'Mme Emile Galle' (Crousse, 1881), 'Mme Gaudichau' (Millet, 1902), 'Modeste Guérin' (Guérin, 1845), 'Nanette' (Doriat, 1924), 'Primevère' (Lemoine, 1907), 'Virgo Maria' (Calot, 1859)
- **Germany:** 'Dürer' (Goos & Koenemann, Germany, 1910)
- **England:** 'Lady Alexandra Duff' (Kelway, 1902), 'Whitley Major' (Whitley, 1808), 'Otto Fröbel' (Peter Barr, 1898)
- **Italy:** 'Reine Elisabeth' (Casaretto, before 1846)
- **Belgium:** 'François Ortegat' (Parmentier, 1850)
- **Ukraine:** 'Vesilna' (Gorobets, 1994)
- **Netherlands:** 'Fokker' (Ruys, 1928), 'Miss Eckhart' (Roelof-Arendsveen van der Meer, 1928), 'Vogue' (Hoogendoorn, 1949)
- **Russia:** 'Iceberg' (A.A. Sosnowiec 1961)
- **USA:** 'Ann Zahller' (Mains, 1965), 'Do Tell' (Auten, 1946), 'Stellar Charm' (Don Hollingsworth, 2005), 'Sonoma YeDo' (Irene Tolomeo, 2010)
- **China:** 'Yin Hong Qiao Dui' (1966)
- **Japan:** 'Yellow Crown' (Toichi Itoh, 1964), 'Shimadaijin' (K. Ikeuchi, 1952)
- **New Zealand:** 'Amazing Beauty' (Sutherland, 2001)



Paeonia lactiflora 'Kabata' (Wóycicki, 1997)



Paeonia lactiflora 'O-sho-kun' is an ancient Japanese peony



Paeonia lactiflora 'Shirley Temple' (from Netherlands bef. 1952)



Paeonia lactiflora 'Germaine Bigot' (Dessert, 1902)

The oldest, historical cultivar in our collection is a Chinese peony with single white flowers – *Paeonia lactiflora* 'Whitleyi Major' (Whitley, England, 1808), and one of the youngest - the Dutch cultivar registered in 2011. - *P. lactiflora* 'White Sarah Bernhardt™ 'HR 01', with double white flowers.



For a complete list of peonies grown in Arboretum Wojstawice visit:

<http://arboretumwojstawice.pl/index-plantarum/index-plantarum-byliny/>

Polish National Breeding Development

Polish breeders selected new peony cultivars in the second half of the 20th century. Mikołaj Karpow-Lipski and the team of Prof. Stanisław Wóycicki from the Department of Ornamental Plants of the Institute of Horticultural Production of the Warsaw University of Life Sciences carried out the selection process.

- Mikołaj Karpow-Lipski (1896-1981) - bred the following cultivars: 'Barbara', 'Ewelina', 'Jadwiga', 'Krystyna' and 'Hania', 1977.
- TEAM I: Stanisław Wóycicki (1897-1970), Hanna Ładyżyńska, Halina Owsianik, Bolesław Chlebowski (Department of Ornamental Plants of the Institute of Horticultural Production of the Warsaw University of Life Sciences) - introduced the following cultivars: 'Ursyn Niemcewicz', 'Ursynów' and 'Professor Wóycicki' in 1997.
- TEAM II: Stanisław Wóycicki, Hanna Ładyżyńska, Halina Owsianik (Warsaw University of Life Science) - bred the following cultivars: 'Wladyslawa', registered in 1997, and probably 'Kabata' (?).

There were three cultivars known, which can be considered as achievements of Polish breeders (before 1939), however nowadays, unfortunately, they are considered as lost. These are as follows: '**Hoseriana**' - dark amaranth, '**Matejko**' - dark crimson and '**Moniuszko**' - crimson-violet.

Currently there is no peony breeding conducted in Poland.

Recommended Polish Peony Cultivars



Paeonia lactiflora 'Ewelina'

Created in 1977. Breeder: Mikołaj Karpow-Lipski. Height 80-120cm. Single flowers with creamy petals and a heart of the flower with yellow-pink long stamens. Freshly developed flowers are flesh pink in colour, then white. Flower type: Japanese.



***Paeonia lactiflora* 'Krystyna'**

Created in 1977. Breeder: Mikołaj Karpow-Lipski. Height 80-100 cm. Cultivar with large, fragrant, double, shiny, cherry-amaranth flowers. Petals strongly frayed, very densely filling the interior of the flower.



***Paeonia lactiflora* 'Ursyn Niemcewicz'**

Created in 1977. Breeders: Stanisław Wóycicki, Hanna Ładyżyńska, Halina Owsianik, Bolesław Chlebowski (Department of Ornamental Plants, Institute of Horticultural Production, Warsaw University of Life Sciences). Height about 100 cm. Single amaranth-purple flowers, yellowish stamens, large carmine anthers, light pollen. Flower type: Japanese.



***Paeonia lactiflora* 'Ursynów'**

Created in 1977. Breeders: Stanisław Wóycicki, Hanna Ładyżyńska, Halina Owsianik, Bolesław Chlebowski (Department of Ornamental Plants of the Institute of Horticultural Production, Warsaw University of Life Sciences). It grows to about 90 cm. Strong, slightly branched shoots. Full. Slightly flattened flowers, pale pink, with a slightly silvery sheen.



***Paeonia lactiflora* 'Władysława'**


Created in 1980. Growers: Stanisław Wóycicki, Hanna Ładyżyńska, Halina Owsianik (Department of Ornamental Plants, Institute of Horticultural Production, Warsaw University of Life Sciences).

Height about 70 cm. Pale pink-violet flowers with numerous pale yellow pistils, sweet fragrant. Flower type: Japanese.

Maintenance of the Peony Collection in the Wrocław University Botanical Garden

Climatic conditions

- Climate: temperate oceanic (Köppen climate classification Cfb)
- Altitude:
Arboretum Wojstawice 213 to 320m above sea level (valley, on the northern slopes of the Oak Hills)
Botanical Garden in Wrocław 116 to 120m above sea level (Silesian Lowland)
- Average annual temperature:
Arboretum Wojstawice 8°C
Botanical Garden in Wrocław 8,4°C
- Hardiness zone:
Arboretum Wojstawice 6B
Botanical Garden in Wrocław 7A
- Average annual rainfall:
Arboretum Wojstawice – around 571 mm
Botanical Garden in Wrocław – around 551 mm
- Soil types:
Arboretum Wojstawice – acidic brown soil is dominant (pH 3,8-4,7)
Botanical Garden in Wrocław – largely changed – artificially imported, alluvial

- 
- Planting** – Peonies in the Botanical Garden in Wrocław and in the Arboretum Wojstawice grow in groups in flower beds, where they are planted in rows, alternately, at a distance of 70 x 70 cm (herbaceous) 150 x 150 cm (tree). Planting the collection in groups, composed of one species, facilitates their care. Peonies grow well in sunny or slightly shaded positions and require fertile, clay-sandy and humus-rich soils, warm, pH 6,5-7 on a well-drained substrate. Plants in the botanical garden are planted and replanted starting from the second half of August to the end of September. Planted later, they may not bloom the following spring, and sometimes for several years. Planting in spring is not beneficial because the upper part of the plant starts to grow intensively, while the roots are not well regenerated yet. A peony stand should be dug at least one spade deep and enriched with fertile compost soil. A well composted manure is placed at the bottom of the pit and covered with a 5-cm layer of substrate, so that the peony roots do not come into direct contact with the manure. **Herbaceous peonies** should be planted so that the substitute grafts are about 3 cm below the ground surface. Plants that are planted too deep may not bloom for many years. For the same reason, they should not be mulched too thickly.

Tree peonies are planted so that the graft site (which is visible as a thickening on the main stem) is 4-6 cm below the ground surface. This helps scions form their own roots. Itoh peonies are planted in such a way, that the first bud is either on the level of the ground surface or not more than 3 cm below.
 - Spring cleaning** - Tree peonies, before the start of the growing season, are cleaned of the remains of last year's leaves and dead dry shoot are removed.
 - Fertilizing** – Peonies are fertilised in April, with long-acting mineral fertilisers (Osmocote, Plantacote). In the event of visible symptoms of micronutrient deficiencies, liquid fertilizer with micronutrients (Mikrovit) can also be applied on an occasional basis. Every few years, the soil surface beneath the plants is mulched with compost soil.
 - Dead-heading** – Spent flowers are removed before seed pods start to grow.
 - Pruning** - In the case of herbaceous peonies, in the autumn (end of October - beginning of November), dried out, above-ground parts are removed. Unlike herbaceous peonies, tree peonies are not pruned, however, if it is necessary, the procedure should be done immediately after blooming, as these plants bloom on last year's shoots. Occasionally it may be necessary to carry out corrective pruning - to remove damaged or broken shoots. As tree peonies are grafted on herbaceous peonies roots, it may happen that at the base of the plant, shoots will grow out of the rootstock, and they should also be removed. Itoh peonies are also pruned in the autumn, when the leaves clearly start to die. Plants are pruned just above a well-developed substitute bud. Itoh peony

shoots are more brittle than in the case of tree peonies. If such a shoot breaks, it should be pruned to prevent fungal infection.

- **Pests** – Occasionally, rose chafer *Cetonia aurata* appears on peony flowers, and its beetles can damage petals. As the damage is imperceptible, insecticides are not used.
- **Diseases** - Grey mould *Botrytis paeoniae* is the most common, it appears in spring, when the first shoots begin to grow. Rust infestation, during the growing season of peony *Cronartium flaccidum* and septoriosis *Septoria paeoniae* var. *berolinensis* are slightly less frequent. Prevention – spring treatment with Miedzian® 50 WP. In case of the first symptoms of disease, Amistar 250 S.C., Previcur Energy 840 SL, Falcon 460 EC are used for spraying infected plants.
- **Weed control** – The top layer of the ground of all, perennial peonies, Itoh peonies and tree peonies is mulched with finely milled composted bark. Manual weeding is carried out regularly throughout the growing season.
- **Irrigation** - During the growing season, peonies are watered by a system of micro sprinklers activated manually, if necessary.



Peony maintenance – iron ring to support flowering stems, Arboretum Wojstawice



Deadheading of peonies in Arboretum Wojstawice



Paeonia lactiflora 'Garbė Motinai' (Ona Skeivienė, 1979)



Vilnius University Botanical Garden, Lithuania

History and Traditions of Growing Peonies in Lithuania


Lithuanians have preserved their unique history, culture and mode of life where plants have played an important role. Peonies in Lithuania are ethnographic perennial flowers. They were one of the most valued plants in Lithuania. They are perennial decorative plants that have adapted to Lithuania's natural conditions. Flower gardens in Lithuanian villages could have first appeared around the 15th -16th century together with the establishment of the first monasteries. In their gardens, various medicinal plants had been grown and decorative plants were usually planted in palace gardens. Seeing well maintained manor parks and their decorative exotic plants, villagers also wanted to recreate some of that in their homesteads. Plants introduced in monastery, clergy and manor parks and gardens had spread to village gardens, peonies among them. As far as it is known from stories, the common peonies *Paeonia officinalis* were the first mentioned, but they were often mixed up with the Chinese peony *P. lactiflora*. Therefore to say exactly when, where and what species were grown is difficult. It is difficult to differentiate which peony was growing since both the common peony and Chinese peony were usually planted in the same spot and called by the same name. S. B. Jundzill wrote that the *P. officinalis* is planted everywhere for its blossoms but is rarely used as a medicinal plant. J. Strumila in his 1834 work mentions that it is very common and is grown as a decorative plant. Roots were used for medicine, seeds were hung on children's necks to ease the teething. Agronomist J. Strazdas in 1930 wrote: "peonies are liked by all, so we will not find a flower garden without them." In a book *My garden* published in 1939, J. Klivečka states: "There



Paeonia officinalis



Paeonia tenuifolia



are several species of peonies. There are a few that grow here: common peony (*Paeonia*) – (*P. officinalis*), Chinese peony (*P. albiflora* – now *P. lactiflora*), fern leaf peony - (*P. tenuifolia*)."

The planting and care of peonies in those days was riddled with many myths and superstitions. It was known that when planted on sandy soil, they grew poorly, they became poor, and so clay was placed under their roots. Elena Kudrevičienė (born 1921, remembers how she once dug up a pit 1 meter deep where clay was added and topped off with garden ground. Since peony is a cherished flower, when planting it, it is common to place something under the roots - money or black bread for the plant to prosper better, grow and bloom. Usually a slice or crust of bread was used, but sometimes even a whole loaf. Sprinkling with holy water or signing the cross over it was not unusual. Others covered roots in oats and gnawed them after germination. Some people put in a piece of homemade woolen knit glove, sock or a piece of torn sweater, or a silk scarf. By superstition, when planting peonies, a head of a herring or a head of a beetle, even a fly, had to be placed under the roots. If not, then the men of the house would leave and die: "Place a head, so a head wouldn't be needed". The peonies were transplanted after the August harvest.

Usually, fresh horse manure was put on the stake before winter. Peonies were also fertilized with soot. In the autumn, when cleaning chimneys, the soot was spread around the plants. In the northern part of Lithuania, in the spring, peonies were covered with old baskets without bottoms to keep them from falling over and growing straight. As the plant grew, the basket was also raised up. In many places, peonies were planted in the centre of a flower garden.

In the 2nd and 3rd decades of the 20th century, particularly in independent Lithuania, common peonies *P. officinalis* were replaced by the much more ornamental Chinese peony *P. lactiflora* and its cultivars. In Lithuania the old cultivars from the last century of *P. lactiflora* are the most widespread: 'Edulis Superba' (Lémon, 1824), 'Festiva Maxima' (Miellez, 1851), 'Jeane d'Ark' (Calot, 1858). The ancient cultivar *P. officinalis* 'Rubra Plena' an early-flowering common peony is also widely cultivated. Tree peony species are not widely distributed in Lithuania. The most common in Lithuania is the bush-type peony *P. xsufruticosa*. In 1974, the first national peony exhibition was organized in Kaunas city. The number of exhibited cultivars was not remarkable. In public spaces, peonies occupy only a marginal position, although the situation is changing.

In Vilnius University Botanical Garden, for over 28 years, the flowerbeds have grown more than tenfold and now occupy an area of 8 ha. Creating exhibits sought to combine systematic, bio-ecological and aesthetic principles. On the terrace of three ponds, the so-called "Great Valley of Flowers", blossoming flower beds were created for each season - flower beds of ornamental plants that flower in spring,




Peony collection at the Vilnius University Botanical Garden

summer and autumn. Since 1992, Lithuanian breeding material of herbaceous ornamental plants (flowers) has been accumulated. Flower collectors and breeders P. Balčikonis, E. Tarvidiene, J.Tarvidas, L. Ciplijauskienė and P. Ciplijauskas, A. Markevičius, J. A. Liutkevičius, A. Gražys, O. Griciuvienė and others have kindly donated their plants.



Aerial view at the Floriculture Department of Vilnius University Botanical Garden



Field collections of peonies can be seen in the Botanical Gardens of Vilnius, Šiauliai, Klaipėda Universities and Kaunas Botanical Garden of Vytautas Magnus University (VMU). These gardens contain not only large collections of peonies, but also local peonies (folk breeding) and modern cultivars, interbred hybrids, species and other breeding material of a Lithuanian and foreign origin. All collections provide not only scientific, aesthetic and educational value, but also are freely accessible to visitors.

In public gardens, one will not encounter such a large number of peonies; most of the peonies are planted in small groups in town squares, parks. Species diversity is poor as well. Two Lithuanian cities: Telšiai and Tauragė could be called peony cities. On September 16, 2017, Telšiai townsfolk started to realize the vision of prosperous peonies in the city. The vision of the city to become a “peony city” came after a long time when the peony, as a symbol of the city, appeared for the first time in Telšiai in 2009. Peonies were planted in all urban spaces. Another city in Lithuania, Tauragė, planned a beautiful campaign in 2018 to plant 100 peonies on the occasion of the centenary of the Lithuanian state. During the campaign, not 100, but 200 plants were donated and were all planted in the city park.

Famous peony collections are not only owned by Lithuanian botanical gardens, but also by individual flower collectors living in different regions of Lithuania. Some of them are not only peonies collectors, but also breeders: Eglė Gintauskienė, Darius Gusas, Gediminas Siudikas, Giedrius Rumė, Kęstutis Vyšniauskas, Pranciškus Puidokas, Vitalijus Dereškevičius, Dambrauskienė, Lionė Ciplijauskienė and Paulius Ciplijauskas. They all sell peony seedlings, but not all of these collections can be visited.

The only registered peony farm in Lithuania that sells peony flowers is Rūta gardens (<https://rutagardens.lt/>). The farm has herbaceous peonies, Itoh hybrids and tree peonies. The collection consists of over 100 different cultivars. In 2017, a field for peony cut flowers was planted with 2 000 plants. The first season of selling freshly cut peonies grown in Lithuania was in 2019.



Paeonia lactiflora 'Eleanor'
(Winchell, 1946)

The largest peony collections in Lithuania

- Vilnius University Botanical Garden - has about 270 taxa
- VMU Kaunas Botanical Garden - holds about 300 specimens

The largest collections in the Baltics


- Tallinn Botanical Garden, Estonia - 313 cultivars and species of peonies
- Kalsnava Arboretum, Latvia - which currently has 180 cultivars



Curators from Prūhonice Botanic Garden visiting Botanical Garden of Vytautas Magnus University in Kaunas, Lithuania. *Paeonia lactiflora* 'Prof. K. Grybauskas' (Ona Skeivienė, 1958)

Beginnings of Growing Peonies in Vilnius University Botanical Garden

Originally the floriculture consisted of a "bed farm", as the most important thing was to accumulate collections. Peonies have been collected, researched and



evaluated since 1992. Constant maintenance and the search for new cultivars have been carried out. Plant acclimatization has been observed. Special attention was paid to Lithuanian breeders. Today, the Botanical Garden of Vilnius University has accumulated a valuable gene pool of ornamental plants. In 1994, the Floriculture Department joined the **Genetic Resources Research and Conservation Program**. Initially it was necessary to accumulate the largest possible gene pool of cultivars and hybrids created by Lithuanian breeders and amateurs. Therefore, it has become the focus of the new research of the botanical garden: plant collection, conservation, research and evaluation of genetic resources, training and education.




Peony collection at the Vilnius University Botanical Garden

To increase the popularity of plants, the employees organized dozens of flower exhibitions of national and local importance. For instance in Vilnius, Kaunas, Klaipėda, Kretinga or Marijampolė. Plants grown in the Botanical Garden have been exhibited at international flower shows in Lithuania and abroad.

Purposes of Peony Collections

The aim is to collect a collection of peonies suitable for growing in Lithuanian climatic conditions. This collection would represent a cultivar of ornamental features and taxonomic cultivar of peony plants. Another goal is to gather representatives of foreign and Lithuanian varieties with the most decorative qualities. It is important that ornamental collectible plants (e.g. peonies) are promoted for



the necessity and benefits of the greening of urban areas and also, by providing information on the potential of the plants in the garden collections, to be used in educational gardening programs available to all media.


The first registered cultivar in the garden's electronic database was *Paeonia lactiflora* Pall. 'Perrette' (Auguste Dessert 1921, France) in September, 1978. Seedling was obtained from University botanical garden in Riga, Latvia. The first peonies registered in the Kairėnai unit were brought from Belarus, Minsk HBC in 1993. Nine cultivars were brought: 'Illini Warrior' (Glasscock/Falk, 1955), 'Chochloma' (Vasyl Gorobets), 'Cytherea' (Saunders, 1953.), 'Novost Altaja' (Lutchnik, 1963), 'Orliok' (Fomitcheva, 1963), 'Blaze' (Fay / Reath, DL 1973) 'Black Monarch' (Glasscock, 1939), 'Kazaciok' (Hancencko / Tirana, 1982), 'Ellen Cowley' (Saunders, 1940).

Public or Other Events Related to Peonies

Every year Vilnius University Botanical Garden organizes an educational event "Peonies", which aims to introduce these plants to the general public and promote them in our country. A guided walk takes place in the peak flowering season of peonies. During the educational tour, the plant taxonomy, the species and cultivars growing in the botanical garden are introduced, the cultivar of decorative features is shown and the Lithuanian cultivars and breeders are introduced. Information on planting, cultivation and care, most common diseases, pests and ways to fight them are also provided.



Peony flower exhibition in Vilnius University Botanical Garden in June 2018 when hosting the convention of the Middle European Iris Society



There are no peony societies in Lithuania or special seminars on this topic. The Florists' Union was founded 25 years ago and unites all florists, breeders and collectors. The Society brings together people interested in the selection, collection, reproduction, distribution and other floricultural issues of flowers and other ornamental plants who wish to improve in this field, cooperate and contribute to the development of floriculture in Lithuania.



Flower exhibition in Vilnius Municipality



Attendants of the MEIS convention in 2018 visiting the peony collection in Vilnius University Botanical garden

Peony Projects and Organizations in Lithuania



Paeonia lactiflora 'Lotus Queen' (Muraswka, 1949)



Paeonia lactiflora 'Mlle Jeanne Rivière' (Rivière, 1908)

Comprehensive studies of peonies in the **Vilnius University Botanical Garden** started in 1999 to assess the ornamentality, suitability for planting and selection of individual species and cultivars, their morphology and biological-phenological observations. Selective work is carried out in the fields of disease resistance, flowering continuity, bush and flower decoration. Five-year observations, coupled with meteorological data, showed that spring frosts, early spring, an insufficient temperature and the number of sunny hours during vegetation adversely affected the growth and development of the species.

It has been noticed that the cultivars of peonies created by breeders of different countries have a lower survival rate over winter in our climatic conditions, suffer more from diseases and lose their decorative features.

Since 2007, a unique gene pool of peonies has been stored in our country. It is stored indefinitely. In 2010, the best plants were granted the status of national genetic resources of plants by the order of the Minister of Environment of the Republic of Lithuania (Valstybės žinios, 2010, No.155-7906) (http://www.agb.lt/dekor_aug_kc.htm 2018 02 26 12:41).

The granted peonies are 44 cultivars of *Paeonia lactiflora*:

- 19 cultivars by Ona Skeivienė ('Virgilijus', 'Garbė Motinai', 'Professor K. Grabauskas', 'Maironis', 'Freda', 'Darius-Girėnas', 'Skeivienės Vėlyvasis', 'Žilvinas', 'Elena', 'Rytas', 'Kastytis', 'Ona', 'Jadvyga', 'Ramunis', 'Vakaris', 'Danutė', 'Jonas', 'Tadas', 'Regina')
- 25 cultivars by Emilija Tarvidienė and Jonas Evaldas Tarvidas ('Meilutis', 'Jaunuolis', 'Kaunietis', 'Senolis', 'Kvieslys', 'Labutis', 'Skaisitis', 'Vilnietis', 'Kaukutis', 'Aistis', 'Dainius', 'Našutis', 'Klajūnas',

'Laimikis', 'Žynys', 'Lakūnas', 'Keleivis', 'Gražuolis', 'Stipruolis',
'Veikėjas', 'Žygūnas', 'Kėdainietis', 'Švyturys', 'Šaunuolis', 'Svečias')
(http://www.agb.lt/dekor_aug_kc.htm 2018 02 26 12:49)

Together with the cultivars, 13 species are stored in four field *ex-situ* collections, which have been granted the status of plant genetic resources: Field collection of cultivars and breeding lines of *Paeonia lactiflora* at Kaunas Botanical Garden of Vytautas Magnus University. Field collection of selected and Lithuanian tree peonies (*P. x suffroticosa*) at the Lithuanian Institute of Horticulture under the Lithuanian Agricultural and Forestry Science Center (LAMMC). Field collection of *Paeonia lactiflora* at Kaunas Botanical Garden. Field collection of Lithuanian *Paeonia lactiflora* cultivars at Vilnius University Botanical Garden.



Paeonia lactiflora 'Gražuolis' (Emilija Tarvidienė and Jonas Evaldas Tarvidas, 1979) at the beginning of flowering

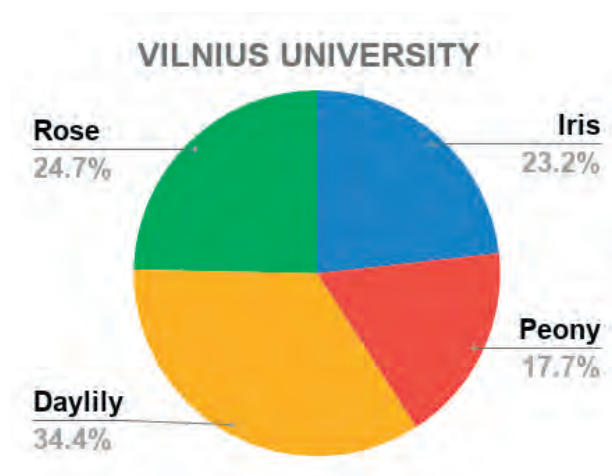


Flowering progress of *Paeonia lactiflora* 'Professor K. Grybauskas' (Ona Skeivienė, 1958)



Paeonia lactiflora 'Virgilijus' (Ona Skeivienė, 1958)

Introduction of the Vilnius University Botanical Garden Assortment of Peonies



As of December 2019,

the peony collection is comprised of:


- 17 select species of peonies
- 259 *Paeonia lactiflora* hybrids
- 21 Lithuanian seedlings (without names)
- 44 Lithuanian cultivars
- 79 cultivars from USA
- 58 French cultivars
- 22 Russian cultivars
- 10 English cultivars
- 9 Dutch cultivars
- 6 Ukrainian cultivars
- 3 Polish cultivars
- 2 German cultivars
- 11 cultivars of unknown origin

Most of the seedlings were purchased from Minsk, Moscow, Novosibirsk, VMU Botanical Gardens, Outdoor Floral Experiment Station in Vilnius and Dontnuva, obtained by exchange from Latvian, Polish, German, Ukrainian and Belarussian botanical gardens. Selected peonies are grown from seed exchange and obtained as seedlings from other botanical gardens.

There are 176 samples of foreign cultivars in the Peony Collection. Divided into 3 main breeding periods: 1800-1900, 1900-2000 and cultivars derived after the year



Paeonia lactiflora 'Akron' (Krekler, 1962)



2000. There are almost none of the most recent cultivars in the collection, except for one cultivar, 'Charismatic' (Krekler/Klehm, 2003).

Peonies come in a cultivar of colours and shades, from white to bright red. The collection comes in all three basic colours: white, pink and red. White shades make up about 23% of the collection, while most of the spectrum is pink, with 52%, reds about 23%, and other shades (yellows, drops, bi-colours) make up just 1%.

Peonies are divided into 5 groups according to the blossom shape: single (8% of the collection), Japanese (4%), anemone (7%), semi-double (17%) and double blossoms (64%).

The collection includes 12 peony specimens awarded the Gold Medal of the American Peony Society: 'Mrs. J.V. Edlund' - 1933 (Franklin / Edlund, 1929), 'Nick Shaylor' - 1941 (Shaylor / Allison, 1931), 'Hansina Brand' - 1946 (Brand, A.M., 1925), 'Kansas' - 1957 (Bigger, 1940), 'Red Charm' 1969 (Glasscock, 1944), 'Cytherea' - 1980 (Saunders, 1953), 'Coral Charm' 1986 (Wissing, 1964), 'White Cap' - 1991 (Winchell, 1956), 'Coral Sunset' - 1993 (Wissing, 1965), 'Pink Hawaiian Coral' - 2000 (Klehm, R.G., 1981), 'Early Scout' - 2001 (Auten, 1952), 'Bartzella' - 2006 (Anderson, R.F. 1986).



Paeonia lactiflora 'Gladys Hodson'
(Krekler, 1961)



Paeonia lactiflora 'M-me de Verneville'
(Crouse, 1907)



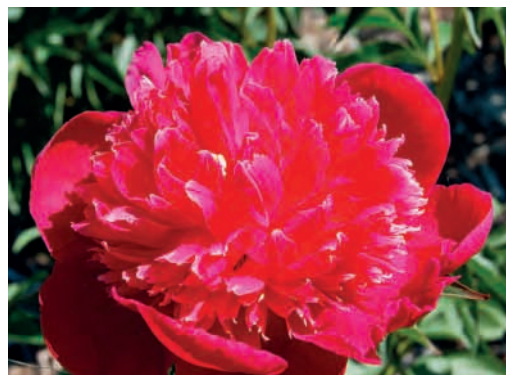
Paeonia lactiflora 'Katrin Choveiner'
(unknown originator)



Paeonia lactiflora 'Cornelia Shaylor'
(Shaylor, 1917)



Paeonia lactiflora 'Gilbert Barthelot'
(Doriat, 1931)



Paeonia lactiflora 'Mrs. Wilder Bancroft'
(Nicholls, 1935)

For a complete list of *Paeonia* in Vilnius University Botanical Garden visit:



<http://www.botsodas.lt/indexplantarum>

In 1986, the Garden started creating a new database system for the accounting of plants in collections. However, there were very poor technical possibilities to develop modern database. Nevertheless, a database containing information of all plants collections was developed in 2003. This program is used for the Garden collections data to this day without significant changes. The database is partly open for the public, using the internet address: <http://www.botsodas.lt/indexplantarum>.

In Lithuanian green areas, the use of QR is not widespread. It started as early as 2014 in the territories of Vilnius University Botanical Garden. When used for educational purposes, the code is one of the simplest and most convenient ways to provide various types of information about plants. It works really fast and today's youngsters enjoy it. Information on the webpage could be provided in Lithuanian and English. In 2017, links to plants have been opened 3 000 times. Nevertheless, QR codes are not yet popular in Lithuania.

Paeoniaceae

299/94

**Puikūsis bijūnas
'Coral Queen'**

Paeonia lactiflora Pall. 'Coral
Queen'



Sass, H.P. 1937 m. JAV

Plant label with QR code for additional information

Lithuanian National Breeding Development

Lithuanian horticulturists have reached some achievements in the selection of peonies. Lithuanian flower-lovers are also engaged in peony hybridization, the selection of cultivars and species.

Dr. Ona Skeivienė was the first person in our country to start breeding. Characterization of the 44 Lithuanian cultivars of *Paeonia lactiflora* available in the collection: 19 by Ona Skeivienė and 25 by Emilija Tarvidienė and Jonas Evaldas Tarvidas, with a great cultivar of decorative features. The flowering time of the plants lasts from 6 to 18 days. Peony flowering productivity increases with the age of the cultivar. It depends on the genotype (up to 41.6%) as does the height of the flower and the diameter of the flowers. Lithuanian peonies are characterized by longevity, resistance to adverse conditions and low maintenance.

Dr. Skeivienė (1912-1988) spent her entire life on the selection of herbaceous peonies, the creation of hybrids of Chinese peonies and on the collection of peonies. In 1953-1958, she made a comparative evaluation of breeding lines and used the inbreeding hybridization method to introduce new cultivars. Her aim was to develop Lithuanian white-flowered peony cultivars, which have better decorative properties, a long flowering period, are resistant to fungal diseases and more adapted to local agro-meteorological conditions.

- These peonies were copyrighted in 1979. The best of the hybrids: 'Maironis', 'Freda', 'Darius-Girėnas', 'O. Skeivienės Vėlyvasis', 'Žilvinas', 'Elena', 'Rytas', 'Kastytis', 'Ona', 'Jadvyga', 'Ramūnis', 'Vakaras', 'Danutė', 'Jonas', 'Tadas' and 'Regina'.

- 6 cultivars of *O. Skeivienė* are registered in the (APS) registry: 'Darius-Girėnas', 'Freda', 'Garbė Motinai', 'Professor K. Grybauskas', 'O. Skeivienės Vėlyvasis' and 'Virgilijus'.

Since 1970, herbaceous peony breeding was conducted by breeders-collectors from the Lithuania Flower Breeders Association.

- Emilija Tarvidienė and Jonas Evaldas Tarvidas. In 1957, they started collecting ornamental plants on their personal plot at the Academy. They started breeding the herbaceous *P. lactiflora* in 1970. From a vast number of their seedlings and cultivars, 25 peony cultivars created by E. Tarvidienė and J. Tarvidas were recognized as suitable for the plant's national genetic resources.
- Semion Eicher-Lorka (1913-1977) has been engaged in the breeding of tree peonies (*P. ×suffroticosa*) in Vilnius since 1961. He began crossbreeding with two double and one semi-double blossomed breed. 56 light-toned semi-double seedlings were obtained where the diameters of the blossoms ranged from 10 to 25 cm. Among the reddish semi-double seedlings were 'Otkrovenije', 'Ulybka Dedushki' and 'Viktor Orechov', the best ones were 'Justas Paleckis', 'Esperansa', 'Spruce', 'Norma', and also white 'Odeta' and 'Maya Plisecjala'. In 1974, five cultivars were awarded first-degree diplomas at the USSR People's Economy Achievement Exhibition. In 2007, four tree peonies created by S. Eicher - Lorka were granted the status of National Plant Genetic Resources.
- Agronomist breeder Pranciškus Puidokas crossed two Lithuanian peonies 'Garbė Motinai' and 'Maironis'. Hybrid seedlings of Chinese peonies were obtained. In 2018, he registered two new cultivars in the International Registry of Peonies: 'Lietuvos Ateitis' and 'Lietuvos Patriotas'. Two more cultivars will be registered in 2020.
- Florist, breeder, collector Kęstutis Vyšniauskas has produced several inter-species peonies hybrids: 'Pink Symphony', 'Caucasian Sunrise', 'Pink Spring', 'Bee May', hybrid no. 6 and other seedlings. Only 3 cultivars of K. Vyšniauskas are protected and studied at the VMU Kaunas Botanical Garden: *P. ×hybrida* 'Bitė Maja', *P. lactiflora* 'Rožinės Ramunės', *P. peregrina* 'Indri Tail'. These cultivars are not registered in any international registry.



MEIS convention attendants admiring the peony collection in Vilnius University Botanical Garden, June 2018

Recommended Lithuanian Cultivars



Paeonia lactiflora 'Lietuvos Ateitis'

Breeder - P. Puidokas. Parentage: 'Maironis' (O. Skeivienė, 1964) × 'Garbė Motinai' (O. Skeivienė, 1958). Mid-season bloom period. Double flowers 16 cm in size, 3-4 per stem. Petals are soft lilac-pink, fading lighter towards the edges. Guard petals are 5 cm in size, generally rounded but delicately ruffled. Average of 3 moderately hairy, light yellowish-green carpels. Stigmas are dark purplish-red and fertile. Pollen bearing

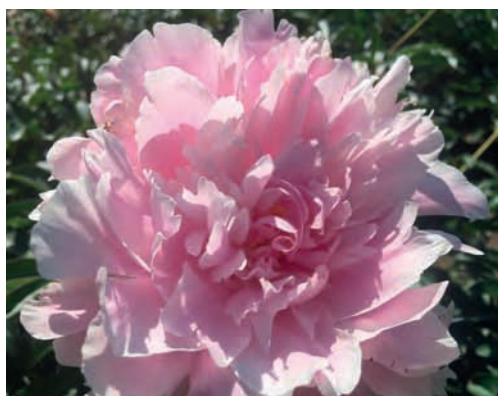
stamens have vivid yellow filaments at the base, light yellowish-green towards the tips. Pleasant fragrance. Foliage emerges as a deep purplish red, matures to green. Upright growth up to 100 cm, but benefits from support when in bloom.



***Paeonia lactiflora* 'Lietuvos Patriotas'**

Breeder – P. Puidokas. Parentage: 'Mai-ronis' (O. Skeivienė, 1964) × 'Garbė Motinai' (O. Skeivienė, 1958). Mid-Late season bloom period. Double flowers 17 cm in size, 3-4 per stem. Petals are a vivid red-dish purple, fading lighter towards the edges. Guard petals are 6 cm in size, generally rounded, shallowly notched. Average of 3 moderately hairy, yellowish-green carpels. Stigmas are a vivid purplish-red and are fertile. Pollen bear-

ing stamens have brilliant yellow filaments at the base, fading lighter towards the tips. Pleasant fragrance. Foliage emerges as a deep purplish red, matures to green. Narrow upright growth up to 110 cm, but benefits from support when in bloom.



***Paeonia lactiflora* 'Garbė Motinai'**

Breeder – O. Skeivienė. Parentage: ('Pierre Reiquoux' × 'Germaine Burgos') was created in 1958. The stalk is compact, the stems are sturdy, the average height is up to 80 cm, the total number of stems is 68, and the number of flowering stems is 66. The rings are light pink, purple, double, 19 cm in diameter. 2-3 flowers per stem. Belongs to a group of double – semicircular peonies. Average flowering time, average flowering duration.



***Paeonia lactiflora* 'Prof. K. Grybauskas'**

Breeder – O. Skeivienė. Parentage: ('General Mac Mahon' × 'Perette') was created in 1958. The stalk is semi-elongated, the stems are firm, up to 110 cm high, the total number of stems is 50, and the number of flowering stems is 46. The rings are very compact, dark red with light narrow edges of the petals, double, medium size 14 cm in diameter. 2-3 flowers per stem. Belongs to a group of double – semicircular peonies. Medium late cultivar, long flowering duration.



***Paeonia lactiflora* 'Freda'**

Breeder – O. Skeivienė. Parentage: ('Auguste Dessert' × 'Perette'), created in 1964. The spear is compact, the stems are firm, the average height up to 80 cm, the total number of stems 42, the number of flowering stems 38. The rings are light pink, full-bodied, with a strong scent, and large 18 cm in diameter. 4 flowers per stem. Belongs to double crown peonies. According to flowering time - medium early, flowering duration - medium.



***Paeonia lactiflora* 'Darius-Girėnas'**

Breeder – O. Skeivienė. Parentage: ('Germaine Burgos' × 'Madame Calot') was created in 1964. The spear is compact, the stems are firm, and the average height is up to 73 cm, the total number of stems 24, number of flowering stems 23. Blossoms are pink, double, medium size 15 cm in diameter. 2-3 flowers per stem. Belongs to double, semicircular peonies. By flowering time - moderately late.



***Paeonia lactiflora* 'Klajūnas'**

(Emilija Tarvidienė and Jonas Evaldas Tarvidas, 1979). The body is compact with very tall stems - over 100 cm. Total number of stems 34, flowering stems 20. Flower stalks 1,0-1,2 cm in diameter. The leaves are bright green, shiny, medium. Blossoms are semi-double, light pink, medium 11-16 cm. The outer petals are elliptical; the inner petals are of a different shape. Stamens are yellow, short 1-2 cm. Pistils 4-6. Flowering time - moderately late. Flowering duration 11-14 days.



***Paeonia lactiflora* 'Keleivis'**

(Emilija Tarvidienė and Jonas Evaldas Tarvidas, 1979). The bush is scattered, the stems are very tall 81-100cm. The total number of stems is 44, flowering stems 30. Flower stalks 1,0-1,2cm in diameter. The leaves are bright green, shiny, medium. Blossoms are double semicircular, light lilac-pink, medium 11-16cm. The outer petals are elliptical; the inner petals are of a different shape. Stamens are yellow, short 1-2cm. Pistils 3-5. Flowering time - moderately late. Flowering duration is 15-18 days.



***Paeonia lactiflora* 'Gražuolis'**

(Emilija Tarvidienė and Jonas Evaldas Tarvidas, 1979). The bush is semi-scattered, the stems are very tall - over 100cm. Total number of stems 60, flowering stems 32. Flower stalks are thin, 0,7-0,9cm in diameter. The leaves are bright green, shiny, medium. Blossoms are double pink, salmon pink, medium 11-16cm. The outer petals are elliptical; the inner petals are of a different shape. Flowering time - very late. Flowering duration is 15-18 days.



***Paeonia lactiflora* 'Našutis'**

(Emilija Tarvidienė and Jonas Evaldas Tarvidas, 1994). The bush is semi-scattered, the stems are very tall - over 100cm. Total number of stems is 23, flowering stems 19. Flower stalks are 1,0-1,2cm in diameter. The leaves are bright green, shiny, medium. Blossoms are semi-double, light pink, medium 11-16cm. The outer petals are elliptical; the inner petals are of a different shape. Stamens are yellow, short 1-2cm. Pistils 3-4. Flowering time - early. Flowering duration is 15-18 days.



Maintenance of Peony Collection in Vilnius University Botanical Garden

Climatic conditions

- Climate: humid continental (Köppen climate classification Dfb)
- Average annual temperature: 6,4 °C
- Hardiness zone: 6a
- Average annual rainfall: around 655 mm
- Altitude: 112 m above sea level
- Soil types: generally sand to sandy loam, the area of the collection is located on turfy, gleyic, loamy, light loamy soil, pH 5,6
- **Planting** – Heavy equipment is used to prepare a new peony display. Because the location for it contained heavy clay, it was decided to prepare pits of 2 x 2 m and 1 - 1.5 m deep. The pits were filled with a mixture of sludge (50%), compost (30%) and peat (20%). The collection was planted the following year when the soil had settled.
- **Transplanting period** – Peonies grow 20 to 30 years without being transplanted.
- **Fertilizing** – The soil is fertilized in the autumn by adding 20 - 25 kg per square meter of seasoned manure or compost every 3 years, and 1 - 1.5 kg of dry clay on sandy soils. Calcium nitrate (20-30 g per plant) should be added in April and slowly dissolving complex fertilizers with microelements (20 g per plant) in May.
- **Irrigation** – If dry and hot weather occurs, plants have to be watered once a week.
- **Dead-heading** – Performed.
- **Autumn cleaning** – The stems of herbaceous peonies are cut and destroyed when their vegetation is complete to prevent the spread of disease and the transmission of infections through tools. Plants can be mulched with compost or peat. Fresh manure is unsuitable for this because it allows the development of fungal diseases. The latter are harvested in the spring and the compost is scattered around. Tree peonies are wrapped in straw, fir branches or wrapped in cloth for the winter.
- **Weed control** – systematic hand weeding throughout the growing season.
- **Diseases** – Viral infection – plants should be removed and destroyed. *Botrytis*

paeoniae – treated with Previcur Energy (active substances: azoxystrobin, difenokonazol). Leaf Spot of peony - Bordeaux mixture (antifungal agent consisting of a solution of copper sulphate and quicklime) is used.

- **Pests** - Ants - cause mostly minor damage.



Preparations for a new peony display in Vilnius University Botanical Garden




Dead-heading of spent flowers

III. RECOMMENDED GARDEN CULTIVARS OF PEONIES

				IBOT	UWR	VU
Species	Cultivar Name	Breeder	Intr.			
<i>Paeonia lactiflora</i>	Akron	Krekler 1962 m. JAV	1962		X	X
<i>Paeonia lactiflora</i>	Alexander Fleming	Unknown		X	X	X
<i>Paeonia lactiflora</i>	Avalanche	Crousse	1886	X	X	
<i>Paeonia lactiflora</i>	Bowl of Beauty	Hoogendoorn	1949	X	X	
<i>Paeonia lactiflora</i>	Bunker Hill	Hollis	1906	X	X	
<i>Paeonia lactiflora</i>	Cornelia Shaylor	Shaylor	1917		X	X
<i>Paeonia lactiflora</i>	Duchesse de Nemours	Guérin	1840	X		X
<i>Paeonia lactiflora</i>	Edulis Superba	Lémon	1824	X	X	
<i>Paeonia lactiflora</i>	Festiva Maxima	Miellez	1851	X	X	X
<i>Paeonia lactiflora</i>	Kame-no-Kegoromo	Unknown		X	X	
<i>Paeonia lactiflora</i>	Kansas	Bigger	1940	X	X	
<i>Paeonia lactiflora</i>	Neon	Nicholls	1941	X		X
<i>Paeonia lactiflora</i>	Sarah Bernhardt	Lemoine	1906	X	X	X
<i>Paeonia lactiflora</i>	Shirley Temple	from Netherlands	1952	X	X	
<i>Paeonia lactiflora</i>	Thoma	Goos & Koenemann	1919	X	X	
<i>Paeonia hybr.</i>	Pink Hawaiian Coral	Klehm, R.G.	1981	X	X	
<i>Paeonia ltoh hybr.</i>	Bartzella	Anderson, R.F.	1986	X	X	X
<i>Paeonia officinalis</i>	Rubra Plena			X	X	X
<i>Paeonia mlokosewitschii</i>				X	X	
<i>Paeonia tenuifolia</i>				X	X	X

GARDEN'S CHOICES OF PEONIES

				IBOT	UWR	VU
Species	Cultivar name	Breeder's name	Intr.			
<i>Paeonia lactiflora</i>	Adorable	Nicholls / Wild & Son	1962	X		
<i>Paeonia lactiflora</i>	Couronne dOr	Calot	1873	X		
<i>Paeonia lactiflora</i>	Félix Crousse	Crousse	1881	X		
<i>Paeonia lactiflora</i>	Jan van Leeuwen	van Leeuwen	1928	X		
<i>Paeonia lactiflora</i>	Nippon Beauty	Auten	1927	X		
<i>Paeonia lactiflora</i>	Solange	Lemoine	1907	X		
<i>Paeonia hybr.</i>	Coral Sunset	Wissing	1965		X	
<i>Paeonia lactiflora</i>	Better Times	Franklin	1941		X	
<i>Paeonia lactiflora</i>	Dresden Pink	Wild & Son	1957		X	
<i>Paeonia lactiflora</i>	Guidon	Nicholls	1941		X	
<i>Paeonia lactiflora</i>	La Perle	Crousse	1886		X	
<i>Paeonia lactiflora</i>	Miss America	Mann / van Steen	1936		X	
<i>Paeonia lactiflora</i>	Primevère	Lemoine	1907		X	
<i>Paeonia hybr.</i>	Ellen Cawley	Saunders	1940			X
<i>Paeonia lactiflora</i>	Albatre	Crousse	1885			X
<i>Paeonia lactiflora</i>	Coral Queen	Sass, H.P.	1937			X
<i>Paeonia lactiflora</i>	Mlle Mademoiselle Jeanne Rivière	Rivière	1908			X
<i>Paeonia lactiflora</i>	M-me de Verneville	Crousse	1885			X
<i>Paeonia lactiflora</i>	Myrtle Gentry	Brand, A.M.	1925			X
<i>Paeonia lactiflora</i>	Voque	Hoogendoorn	1949			X



The Association of Czech Perennials (Spolek českých perenářů) prepared the recommended assortment of perennials in 2020. The list includes two wild species, one cultivar of *Paeonia officinalis*, one cultivar of *P. tenuifolia*, one intersectional hybrid, three cultivar of herbaceous hybrids and twenty cultivars of *P. lactiflora*. There is no Czech peony in the list. This is because Czech breeding is not yet commercially available. Nevertheless, some cultivars are interesting and it would be appropriate to include them in the recommended range.

- *Paeonia mlokosewitschii*
- *Paeonia tenuifolia*
- *Paeonia tenuifolia* 'Plena'
- *Paeonia lactiflora* 'Adolphe Rousseau'
- *Paeonia lactiflora* 'Avalanche'
- *Paeonia lactiflora* 'Bowl of Beauty'
- *Paeonia lactiflora* 'Bunker Hill'
- *Paeonia lactiflora* 'Dr. Alexander Flemming'
- *Paeonia lactiflora* 'Duchesse de Nemours'
- *Paeonia lactiflora* 'Edulis Superba'
- *Paeonia lactiflora* 'Felix Crousse'
- *Paeonia lactiflora* 'Festiva Maxima'
- *Paeonia lactiflora* 'Flame'
- *Paeonia lactiflora* 'Jan van Leuven'
- *Paeonia lactiflora* 'Kame-no-Kegoromo'
- *Paeonia lactiflora* 'Kansas'
- *Paeonia lactiflora* 'L'Etincelante'
- *Paeonia lactiflora* 'Laura Dessert'
- *Paeonia lactiflora* 'Le Cygne'
- *Paeonia lactiflora* 'Mons. Jules Elie'
- *Paeonia lactiflora* 'Neon'
- *Paeonia lactiflora* 'Nippon Beauty'
- *Paeonia lactiflora* 'Sarah Bernhardt'
- *Paeonia lactiflora* 'Shirley Temple'
- *Paeonia officinalis* 'Rubra Plena'
- *Paeonia hybr.* 'Early Scout'
- *Paeonia hybr.* 'Chocolate Soldier'
- *Paeonia hybr.* 'Walter Mains'
- *Paeonia intersectional hybr.* 'Bartzella'



Paeonia lactiflora 'Flame' (Glasscock, 1939)



IV. SUMMARY AND RECOMMENDATIONS OF THE GARDEN MAINTENANCE OF THE PEONY

Peonies like fertile, moist, light, loose soil. They are resistant to polluted city air, diseases, pests. In colder winters, they can suffer frostbite. The planting site should be sunny and protected from the winds. They are planted singly or in groups. Peonies bloom for about two weeks.

Peonies grow best in sunny places and do not bloom or bloom poorly in shady places. The exception is some natural species that grow among trees and shrubs in natural habitats and are adapted to shady conditions (*Paeonia wittmanniana*). It is not advisable to plant peonies close to buildings and trees. Peony roots reach up to 1 meter deep and therefore need deeply cultivated soil fertilized with manure. The best soil is acid-free pH 6-6.5. Peonies can grow on almost any soil, but the best is moderately heavy, fertilized clay loam or fertile sandy loam, which does not retain heavy rainfall or snow-melting water.




Tuberous roots of *Paeonia officinalis*, *P. peregrina*, *P. tenuifolia* and their hybrids make adventitious buds, when broken off



Divided clump of *Paeonia lactiflora* cultivar. Roots are thick pointing vertically and sideways. Young sucker roots begin to grow in the fall

Planting Peonies

The area for planting peonies is being prepared gradually. During the planting year, it is better to keep black fallow and try to eradicate weeds, while the short term culture of legumes is suitable. Peony expositions are prepared for a long period, as they grow 20 to 30 years without being transplanted. The pits are prepared a month or one and a half months before planting to allow the ground to settle. Pits for peonies are dug from a depth of 50 to 60cm, 60 - 80cm in diameter. The bottom is covered with drainage of coarse gravel, crushed stone. Two-thirds of the pit is



filled with fertile compost soil mixed with manure and fine sand. Crushed clay can be added to light soils. Everything is mixed by digging with a shovel. 200 to 400g of bone meal, 50 - 60g calcium chloride, 100 - 200g superphosphate, and in acidic soil 100 - 200g lime or chalk can be added to the bottom of the pit. The top of the pit is filled with top soil. The seedling should be planted in such a way that the following year's growth buds would only be 3 to 5cm below the soil surface. When planted too deep, peonies usually have many thin stems and do not bloom. After planting, it is necessary to water well. Peony roots should not reach the soil mixture with fertilizers as they can burn and rot in consequence. Peonies are planted at different distances, depending on the species and on the plantation. On floricultural farms, they are planted 90 x 90 cm, 70 x 100 cm, 70 x 70 cm, 35 x 70 cm. Plants planted more scarcely grow better, healthier, larger and more productively.

The best time to plant or transplant peonies is from the second half of August to the middle of September. When planting late in the fall, the young sucker roots which have grown in the fall during the second root growth, fall away. Transplanted plants do not have time to grow new roots again before frost, so they will be weak and have a worse survival rate. In the early spring, only single sprouts are transplanted. However, transplanting in the spring is not advisable because flowering is disturbed. Peonies start their vegetation early, grow young, fragile shoots, which inevitably break during planting, new root growth is hindered - small nourishing roots do not form until the onset of heat, so plants often die.

The plants reach their characteristic height and start flowering normally only in their third and fourth years. The buds of the first year (and sometimes the second, depending on growth) are picked off for quicker firming. There are usually sufficient nutrients for the first and second years, and fertilization should begin in the third year after transplanting.

During peony growth, renewal buds form in late summer and this requires quite a lot of moisture. If dry and hot weather occurs, plants have to be watered once a week.

Propagation of Peony Plants

Herbaceous peonies are propagated in a cultivar of ways: by seed, green stem and leaf cuttings, vertical layers, tuber pieces, by grafting, germination and meristematic propagation, and by bred peonies through grafting, seeds and sowing only. In most cases, the simplest method of vegetative propagation is chosen - the division of the plant. But only a very limited number of plants can be reproduced this way and breeders will not do without seedling cultivation and selection.

Vegetative Propagation – by Division of Clumps

Vegetative propagation by splitting the parent plant is carried out in the case of herbaceous peonies, It is carried out from the second half of August to the end of



September. The mother plant must be dug up so as to damage its roots as little as possible. After clearing the parent plant, fragments of the parent plant are cut off. Cuttings should have at least 3-4 healthy, undamaged buds. This size of cuttings will most likely bloom in the second year after planting.

This is the most popular method of propagation. The clumps are divided in late August. The peony shrub is dug out, the soil is washed, and then it is divided into several pieces with a sharp knife. Each part should have at least 3 to 5 regeneration buds and the same number of shortened roots up to 15 cm long. Thick roots should be significantly shortened to allow the formation of thin roots. Large plants with long roots should not be planted, as such plants will use the nutrients accumulated in the roots in the first year. It will grow large and even bloom, but new roots will develop poorly due to malnutrition and the plant will decay. Properly prepared roots with 3 to 5 regeneration buds quickly form a new strong root system. Before planting, seedlings are soaked for 30 minutes in a clay puree to which 0,5 - 1% of a fungicide is added. It protects the roots from overdrying and at the same time acts as a protective agent against diseases. If not soaked in clay puree, root wounds are sprinkled with crushed carbon powder and dry fungicides. During division, non-viable, unhealthy and injured roots are removed.

Tree peonies are propagated by shoot cuttings, earth and air layering and grafting. In the case of grafting onto rootstocks, the roots of the Chinese peony or common peony are used. Plants propagated in such a way bloom 3-4 years later.

The most complex is the meristematic method of vegetative propagation, where new plants are grown from microscopically small cell tissues. The only institution in Lithuania that uses new propagation technology is the Lithuanian Institute of Horticulture in Babtai.

Generative Propagation – by Seeds

Propagation from seeds can be applied for peony species. Plants from seeds will bloom after they have been cultivated for 4-7 years. If feasible, sterile substratum, consisting of compost soil and sand is prepared for sowing. Seeds should be sown in the autumn, immediately after they have been collected. Seeds sown in spring may germinate only after 2 or even 3 years.

Peony seeds are harvested when they are not fully mature and sown immediately, before the seed coat hardens. Seeds maintained throughout the winter and sown in spring take a long time to germinate. The seeds are stored in moist sand. Seeds stored in the refrigerator (5° C) when sown in the spring germinate after only one year. For faster germination, the seeds are stored for 60 days (until the emergence of the root) at a variable temperature of 15-30

°C per day, i.e. day temperature at 30° C and night at 15° C. Then they are kept for 45 days at a low positive temperature of 1-4 °C (for stem axis growth). After 10-15 days, the seeds release sprouts in a greenhouse at 16-18 °C. By the way, the seeds of bush-type peonies germinate the longest. When the roots appear, they are covered with soil and then boxes are taken out to the cellar and stored at 2-8 °C for 2,5 - 3 months, until the first sprouts appear (figure 5). In the spring, the sprouts are transferred to seed-beds. Seedlings begin to bloom when the thickened roots have sufficient nutrients. By the fifth year, 54 to 100% of the seedlings are in bloom.



Peony from seeds




Peony from seeds



Only *Paeonia tenuifolia* germinates epigeically, has cotyledons above the ground



Other species of peonies germinate hypogeically, with only true leaves appearing above the ground



Selected species of peonies are propagated by seeds, and cultivars are only propagated for breeding purposes because they do not transmit the characteristics of the cultivar.

Peony Diseases and Pests

Physiological injuries. In the spring, prolonged cold weather can cause peony leaf chlorosis. This is a physiological phenomenon because, at low ambient temperatures, the plant is unable to absorb nutrients and in this situation the leaves become yellowish, pale greenish. Leaves grown in warmer weather have no such signs. Next year, these peonies may be inferior, with less blooming, and more vulnerable to various plant pathogens.

Viral Diseases




Tobacco rattle virus (TRV) and **Paeony ring spot virus (PRSV)**.

The viral infection damages peony leaves by creating a mosaic pattern that resembles flowers, of a light green or yellowish colour. Diseased plants should be removed and destroyed. The tools must be disinfected with one of the disinfectant fluids: 10% sodium hypochlorite solution, 70% ethyl alcohol or other.

Bacterial Diseases



Bacterial Cancer (*Agrobacterium tumefaciens*). Mostly plants growing in moist soils are vulnerable. The pathogen enters the plant through rhizome wounds, where it reproduces very rapidly and forms a growth. The disease spreads through damaged rhizomes, transmitted by worms, pests or raindrops in the soil and remains in plant remains. The affected plants are abnormally branching, the individual stems



rot off at first and then the whole plant dies. The disease is detected only after the plant has been dug. The rhizome forms a growth. They can take many forms not of the same size. Precautions: Do not plant peonies in the same place for 3-4 years, do not fertilize with nitrogen fertilizers.

Bacterial blight (*Xanthomonas hortorum*) may cause deformation and drying of parts of the leaves. It can rarely appear on leaves also *Pseudomonas syringea*.

Fungal diseases



Botrytis paeoniae

Peonies are often affected by the disease, especially when humid, foggy weather persists. The symptoms of the disease, as well as the harmfulness and methods of protection, are similar to those of other plants with *Botrytis cinerea*. In the spring, the damaged young shoots rot at the base, causing them to fall and die.

Phytophthora cactorum causes **phytophthora blight**. Fungus lives in moist soils, flooded and saturated soil conditions are especially conducive to the spread of phytophthora blight. The stems around the soil-line may appear darkened and leathery; they may wilt and die. The plant can develop root and crown rot causing the entire plant to rot.


Rhizoctonia solani (teleomorph: *Thanatephorus cucumeris*) also may cause root rot.

Rust (Scots pine blister rust, *Cronartium flaccidum*) - the spots are brown on both sides of the sheet, with purple edges on the top. Small, yellow, dusty pustules form



on the underside of the leaf. In autumn, pointed carp form with wintering spores. The leaves may dry out prematurely. Spermagonia and Aecia are formed on pines, uredinia, telia and basidia on alternative hosts including peonies.

Powdery mildew produce a light gray or whitish powder on the surface of leaves, young stems, and flowers. The flowers and leaf may be deformed. Patches may grow and completely



cover both sides of the leaves. The disease is considered more a cosmetics problem. The death of the plant is rare. It more often attacks hybrid peonies and older cultivars from the Itoh group at Prague Botanical Garden.

Red spot of Peony, peony leaf blotch, antracnose (*Cladosporium paeoniae*, *Graphiopsis chlorocephala*) initial symptoms typically develop after bloom. Small reddish circular spots form on the foliage, lesions may coalesce making blotchy patches. The upper surfaces of infected leaves become a dark purple color, while the lower surface is brown. Foliage that is infected before it is fully expanded may become slightly distorted. Infection of stems causes reddish streaks. Spread: This fungus survives on dead plant debris and in soil. Spores are spread by rain or wind. Remove and destroy infected plant material. Avoid overhead irrigation or carefully time irrigation so that the duration of leaf wetness is minimized.

Leaf Spot of peony, Stem Canker, septoria (*Septoria paeoniae* var. *berolinensis*) have a red-brown patch on the upper side and a brownish-gray plaque on the underside of their leaves. Spots often blur and leaves often become punctured.

The leaves of peonies infected with *Gloeosporium* sp. and *Colletotrichum* sp. Lesions and cankers on all aboveground parts of the peony. On stems, cankers are elongate and gray in color and often cause severe twisting or curling of the stem. Pink-colored fruiting structures (acervulus) can sometimes be observed in the cankers. Foliar leaf spots and infections of flowers and flower buds are, similarly gray in color and can cause the irregular growth of plant tissues or interfere with flower development.

Pests

Northern root-knot nematode (*Meloidogyne hapla*).


The roots form irregularly shaped tubers of 3-5 mm in length caused by microscopic roundworms - nematodes. Plants grow poorly, suffer from root rot and do not bloom. Infected plants should be removed along with the soil around the plant.



It is advisable to soak the plant material for 30 minutes in 46 °C water, or remove diseased plants with the tuber of soil near the roots and burn. Remove and destroy diseased leaves.

Ants

Peonies are one of the few flowers where ants do direct damage. Peony flower buds produce sweet secretions which ants are very fond of. They harm



peonies by not only collecting the sweet substances on the outside of the blossom bud, but, by searching for more nectar, they prune out buds and damage the petals. Ants can also carry fungal diseases. Precautions: Use insecticides.

General Recommendations

- We are frequently asked by visitors „Why our peonies flower little or not at all?“ One should look for a problem, for example, blackened, withered, very small buds may be due to the very age of the shrub itself. The bush should be dug up and distributed
- unsuitable site for growth: ground water too high, surface water retention too long, soil reaction too acidic; planted in the shade or overgrown with trees and shrubs planted nearby
- planted too deep or too shallow
- planted in too large parts or had not been spread at all
- not fertilized every year and the peony lacks nutrients
- suffering from botrytis bunch rot, sprouts wither in spring and fall out, therefore the use of fungicides is required
- old shrubs (10 years old) bloom poorly unless you replant them in multiples
- more than 50% of flowering stems are picked off
- low ornamental, little flowering cultivars are grown

Table of Garden Maintenance of Peonies

	Průhonice BG	Wroclaw University BG	Vilnius University BG
Are the follicles cut off after flowering?	YES	YES	YES
Are dry foliage and stems removed in autumn?	YES	YES	YES
Are dry foliage and stems removed in spring?	NO	NO	NO
Are some species damaged by frost in the spring?	YES - late frost in April damages tree peonies and some herbaceous species from the Mediterranean (<i>P. kesrouaensis</i>)	YES - some herbaceous species growing naturally in the winter hardiness zone 8 and more (e.g. <i>P. cambessedesii</i>)	YES
Do you protect some species from frost in winter and spring?	YES - young or sensitive species according to the weather forecast	YES - some herbaceous species growing naturally above the hardiness zone 7 (e.g. <i>P. cambessedesii</i>)	YES young plants
What method of frost protection do you use (mulch, textiles)?	covering the budding plants with a container	tissue fleece screen	mulch is used
Do you transplant peonies in the regular period?	NO	NO	NO
How long have you grown peonies in one place?	herbaceous peonies for over ten years in one place, we do not transplant tree peonies	10 years or more, the oldest specimens grow in one place 20 years	herbaceous peonies after 10 and more years, we do not transplant tree peonies
What kind of fertilizer do you use for daylilies? (mineral, compost)	herbaceous peonies - full mineral fertilizer (Cerit); tree peonies - full mineral fertilizer and compost mulch	Spring long-acting fertilizer - NPK: 12-7-18. If necessary, liquid fertilizers with microelements. Manure before planting, every few years mulching with compost soil	herbaceous peonies - full mineral fertilizer; tree peonies - full mineral fertilizer
When is the fertilising done?	compost in autumn, mineral fertilizer at the end of winter (February/March)	spring (March/April)	Fertilize once in spring and once in autumn
What kind of (chemical) protection do you use against leaf spot?	NO	Preventive Miedzian® 50 WP. -Cure with Amistar 250 S.C., Previcur Energy 840 SL, Falcon 460 EC	Bordeaux mixture (antifungal agent consisting of a solution of copper sulphate and quicklime)
What kind of (chemical) protection do you use against botritis?	After the appearance of the first disease symptoms Mythos®. 30 SC, Signum® 33 WG	Preventive Miedzian® 50 WP Cure with Signum® 33 WG, Topsin® M 500 S.C.	Previcur energy



Paeonia lactiflora 'Salamander' has dark purple foliage until flowering time



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