PEONY (*PAEONIA* L.) COLLECTION AT THE KAUNAS BOTANICAL GARDEN OF VYTAUTAS MAGNUS UNIVERSITY

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Abstract

During 1933–2015, Kaunas Botanical Garden of Vytautas Magnus University has accumulated the collection of Paeonia L. consisting of 258 collection numbers. They include 11 species and intraspecific taxa, 48 Lithuanian cultivars and 199 cultivars originated in other countries. The majority of peony cultivars is originated from 1900–2000. Cultivars originated until 1900 are protected in Kaunas Botanical Garden. The collection of Kaunas Botanical Garden contains more than 90% of the cultivars of Lithuanian peonies. Currently, the collection of Lithuanian peonies consists of plants originated by four Lithuanian plant breeders: Ona Skeivienė, Jonas-Evaldas Tarvidas, Emilija Tarvidienė and Kęstutis Vyšniauskas. The article presents the results of peony introduction in Kaunas Botanical Garden and investigations of Lithuanian cultivars peonies.

Key words: *peony, introduction, collection, Lithuanian cultivars, selection*

1. INTRODUCTION

Paeonia L. is a perennial herbaceous and woody plant genus in the *Paeoniaceae* Raf. family. According to taxonomic standardization of plant species names (The Plant List), *Paeonia* L. genus includes 167 scientific plant names of species rank, but just 36 of these are accepted species names (Cayuela & Oksanen 2016). Peonies are mainly distributed in the alpine regions of Asia and Europe. China is a major production area of peonies (Babili et. al 2013). Jakubowski (2008) listed the names and descriptions of 7995 peony cultivars worldwide. Many more cultivars have been named each year since then.

Peonies were first recognized as a medicinal plant in Asia several thousand years ago. In the late 1700's, peonies were imported from Asia and Europe into North America for use as a garden flower (Gilmore et. al 2013). Peonies are heritage perennial flowers that hold special cultural value. These plants are produced as a commercial nursery crop, and the blooms are a significant component of the cut flower industry. Peony flowers have been widely sold in European markets for centuries. Commercial production is found on every continent. Peonies are of interest to gardeners, growers, and nursery producers (Gilmore et. al 2013). Herbaceous peonies can be widely grown in temperate climate regions. Peonies generally bloom from early May to late June in different regions. Blooming of one cultivar usually lasts for 5–7 days; it is too short for successful marketing (Fangyun et. al 2009).

Peony is one of the most treasured plants in Lithuania (Klimienė, Vainorienė & Grigaitė 2009). Chinese peony (*Paeonia lactiflora* Pall.) and tree peony (*Paeonia suffruticosa* Andrews) are the most popular in Lithuania. *Paeonia officinalis* L. is cultivated in Lithuania since the 18th century. *P. officinalis* L. was valued for medicinal and decorative qualities (Bumblauskas, Burinskaitė & Žumbakienė 2008). The pioneer of the selection of herbaceous peonies in Lithuania was Dr. Ona Skeivienė. O. Skeivienė originated cultivars of the Lithuanian herbaceous peonies in Kaunas Botanical Garden of Vytautas Magnus University in 1953–1958 by using an intervarietal hybridization method. Since 1970, the selection of herbaceous peonies in Lithuania was carried out by Emilija Tarvidienė and Jonas-Evaldas Tarvidas and the selection of tree peonies by Semionas Eicher-Lorka. At present, the selection of peonies is carried by Kęstutis Vyšniauskas and researchers of Kaunas Botanical Garden. In total, Ona Skeivienė has originated 19 cultivars of peonies, Emilija Tarvidienė and Jonas-

Evaldas Tarvidas – 25, Semionas Eicher-Lorka – 5 cultivars and Kęstutis Vyšniauskas – 3 cultivars. Kaunas Botanical Garden is a place, where Lithuanian cultivars of peonies are protected by National Plant Genetic Resources Law (Dapkūnienė 2007, 2013). Peony collection is maintained for conservation, scientific and educational purposes. It is also maintained for their ornamental, cultural and historical values.

2. MATERIAL AND METHODS

Peonies were starting to collect since 1923, when Kaunas Botanical Garden (at present, Kaunas Botanical Garden of Vytautas Magnus University) was established (Dapkūnienė 2013). Herbaceous peonies comprise the majority of all peonies in the Botanical Garden. Species and infraspecific taxa were collected by seed exchange with other botanical gardens. The first cultivars (1.2%) ('Aviateur Lindbergh', 'Grover Cleveland' and 'Perrette') were acquired in 1933 from the botanical gardens in Germany and France (Figure 1). 'Perrette' was used to create Lithuanian cultivar 'Freda'. The majority of cultivars – 68 collection numbers were acquired from Moscow State University Botanical Garden (Moscow, Russia) in 1974–1979. Since 2014, herbaceous, intersectional (itoh) and tree peonies originated in France, US, UK are collected. The selection of Lithuanian cultivars started in Kaunas Botanical Garden of Vytautas Magnus University in 1953. 19 cultivars, originated by Dr. Ona Skeivienė were created during 1953–1958. During 1953–2015, 48 Lithuanian cultivars were collected. The majority of all collection numbers (20.4%) was collected in 2014 (Figure 1). At present, 11 species and infraspecific taxa, 48 Lithuanian and 199 cultivars, originated in other countries are cultivated in a Botanical Garden.

The biggest number of the cultivars of peonies (143) was originated from 1900–2000. Cultivars originated until 1900 are represented by 19 cultivars. There are 3 cultivars, originated after 2000 (Table 1).

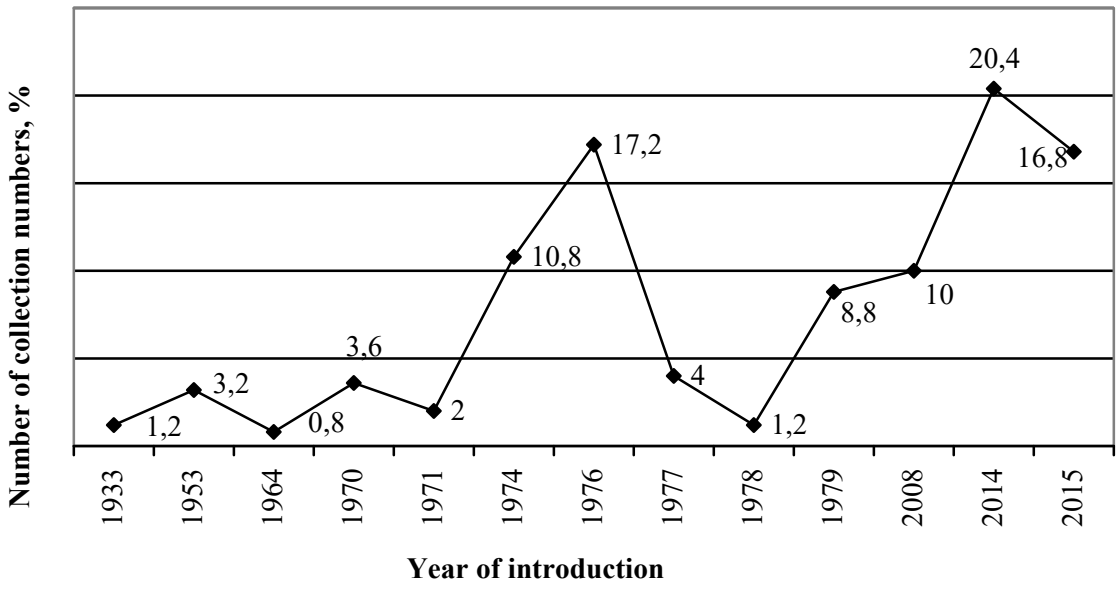


Figure 1. The year of introduction of peonies in Kaunas Botanical Garden

Table 1. Kaunas Botanical Garden peonies origination data

Year of origination	**Plant name (originator and year of origination)**	
Cultivars, originated after 2000	*P. x hybrida*	'Bitė Maja' (Vyšniauskas 2013), 'Peaches & Cream' (Sutherland 2002)
	P. lactiflora	'Rožinės Ramunės' (Vyšniauskas 2014)
Cultivars, originated 1900-2000	*P. x hybrida*	'Bravura' (Saunders 1943), 'Bartzella' (Anderson 1986), 'Canary Brilliants' (Anderson 1999), Carol' (Bockstone 1955), 'Cora Louise' (Anderson 1986), 'Coral Charm' (Wissing/Klehm 1964), 'Coral Sunset' (Wissing/Klehm 1981), 'Coral Supreme' (Wissing/Klehm 1981), 'Diana Parks' (Bockstoce 1942), 'Gardenia' (Lins 1955), 'Hillary' (Anderson 1999), 'Julia Rose' (Anderson 1991), 'Many Happy Returns' (Hollingsworth 1986), 'Old Faithful' (Glasscock/Falk 1964), 'Old Rose Dandy' (Laning 1993), 'Paula Fay' (Fay 1968), 'Pink Hawaiian Coral' (Klehm 1981),'Red Charm' (Glasscock 1944), 'Yellow Crown' (Itoh/Smirnow 1974)
	P. lactiflora	'Agida' (Originator unknown 1930), 'Aistis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Alsace Lorraine' (Lemoine 1906), 'Angel Cheeks' (Klehm 1970), 'Argentine' (Lemoine 1924), 'Avant Garde' (Lemoine 1907), 'Aviateur Lindbergh' (Dessert/Doriat 1927), 'Big Ben' (Auten 1943), 'Black Beauty' (Originator unknown 1985), 'Bunker Hill' (Hollis 1906), 'Bu-Te' (Wassenberg 1954), 'Chervony'j Oksamit' (Gorobec/Tirana 1984), 'Coral Queen' (Sass/Interstate 1937), 'Dainius' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Danutė' (Skeivienė 1970), 'Darius-Girėnas' (Skeivienė 1964), 'Dawn Pink' (Sass 1946), 'Early Daybreak' (Saunders 1949), 'Early Scout' (Auten 1952), 'Elbrus' (Krasnova 1958), 'Elena' (Skeivienė 1970), 'Ella Christiansen' (Brand 1925), 'Ellen Cowley' (Saunders 1940), 'Enchantresse' (Lemoine 1908), 'Felix Supreme' (Kriek 1955), 'Frances Mains' (Mains 1955), 'Freda' (Skeivienė 1964), 'Garbė Motinai' (Skeivienė 1958), 'George W. Peyton' (Nicholls 1938), 'Germaine Bigot' (Dessert 1902), 'Gladys Hodson' (Krekler 1961), 'Globe of Light' (Kelway 1928), 'Golden Bracelet' (Brand 1939), 'Gražuolis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Grover Cleveland' (Terry 1904), 'Henry Sass' (Sass/Interstate, 1949), 'Herald' (Saunders 1950), 'Huang Jin Lun' (Chinese selection 1930), 'Jadvyga' (Skeivienė 1970), 'Jaunuolis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'John van Leeuwen' (Van Leeuwen 1928), 'Jonas' (Skeivienė 1970), 'Jubileinij GBD' (Krasnova 1960), 'Kansas' (Bigger 1942), 'Karl Rosenfield' (Rosenfield 1908), 'Kastytis' (Skeivienė 1964), 'Kaukutis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Kaunietis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Keleivis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Kelway's Glorious' (Kelway 1909), 'Kėdainietis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Klajūnas' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Koningin Wilhelmina' (Krelage 1912), 'Kosmos' (Sosnovec 1961), 'Kvieslys' (J. E. Tarvidas/ E. Tarvidienė 1979), 'La Lorraine' (Lemoine 1901), 'La Pionce' (Kelsey 1937), 'Labutis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Laddie' (Glasscock 1941), 'Lady Alexandra Duff' (Kelway 1902), 'Lady Kate' (Vories 1924), 'Laimikis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Lakūnas' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Laura Dessert' (Dessert 1913), 'Le Cygne' (Lemoine 1907), 'Lillian

		Gumm' (Gumm 1921), 'Lord Kitchener' (Kelway 1916), 'Lotus Queen' (Murawska 1947), 'Madelon' (Dessert 1922), 'Maironis' (Skeivienė 1964), 'Marcella' (Lins 1952), 'Meilutis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Miss Eckhart' (Van der Meer 1928), 'Myrtle Gentry' (Brand 1925), 'Mlle Jeanne Riviere' (Riviere 1908), 'Moon of Nippon' (Auten, R. W./Auten, E. Jr. 1936), 'Moskvitch' (Krasnova 1957), 'Mrs. Edward Harding' (Shaylor 1918), 'Mrs. J. V. Edlund' (Franklin/Edlund 1929), 'Nancy Nicholls' (Nicholls 1941), 'Našutis' (J. E. Tarvidas/ E. Tarvidienė 1994), 'Neon' (Nicholls 1941), 'Ona' (Skeivienė 1970), 'Pageant' (Saunders 1941), 'Perlamutr' (Sosnovec 1967), 'Peter Brand' (Brand 1937), 'Pink Delight' (Klehm 1995), 'Pobeda' (Kupolans 1957), 'President Taft' (Blaauw 1909), 'Primevere' (Lemoine 1907), 'Prof. K. Grybauskas' (Skeivienė 1958), 'Ramunis' (Skeivienė 1970), 'Red Red Rose' (Saunders 1942), 'Regina' (Skeivienė 1970), 'Reward' (Saunders 1941), 'Rytas' (Skeivienė 1970), 'Rosemarie Lins' (Lins 1958), 'Sable' (Glasscock 1943), 'Sarah Bernhardt' (Lemoine 1906), 'Senolis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Shirley Temple' (Niderlande 1952), 'Skaistis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Skeivienės Vėlyvasis' (Skeivienė 1964), 'Snegurochka' (Krasnova 1957), 'Solange' (Lemoine 1907), 'Solnyshko' (Sosnovec 1960), 'Stipruolis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Susan B. White' (Brand 1933), 'Svečias' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Šaunuolis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Švyturys' (J. E. Tarvidas/ E. Tarvidienė 1979), 'The Fawn' (Wright 1980), 'The Fleece' (Kelsey 1936), 'Top Hat' (Reynolds 1971), 'Vakaris' (Skeivienė 1964), 'Varenka' (Krasnova 1960), 'Veikėjas' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Vesenniy' (Krasnova 1959), 'Victoire de la Marne' (Dessert 1915), 'Vilnietis' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Virgilijus' (Skeivienė 1958), 'Vostok' (Krasnova 1957), 'Vulkan' (Krasnova 1957), 'Waikiki' (Lins 1967), 'Walter Faxon' (Richardson 1904), 'Whitleyi Major' (Pirms 1928), 'Zemchuznaja Rossip' (Gorobec/Tirana 1989), 'Žilvinas' (Skeivienė 1964), 'Žygūnas' (J. E. Tarvidas/ E. Tarvidienė 1979), 'Žynys' (J. E. Tarvidas/ E. Tarvidienė 1989),
Cultivars, originated to 1900	*P. lactiflora*	'Adolphe Rousseau' (Desert & Mechin 1890), 'Albert Crousse' (Crousse 1885), 'Baronessa Schroeder' (Kelway 1889), 'Felix Crousse' (Crousse 1881), 'Festiva Maxima' (Miellez 1851), 'Francois Ortegat' (Parmentier 1850), 'General McMahon' (Calot 1867), 'Louis van Houtte' (Calot 1867), 'Marguerite Gerard' (Crousse 1892), 'Madame de Verneville' (Crousse 1885), 'Monsieur Andre' (Guerin 1862), 'Monsieur Jules Elie' (Crousse 1888), 'Monsieur Martin Cahuzac' (Dessert 1899), 'Mont Blanc' (Lemoine 1899), 'Noemie Demay' (Calot 1867), 'Philomele' (Calot 1861), 'Reine des Roses' (Modeste Guérin before 1846), 'Solfatare' (Calot 1861)
	P. peregrina	'Otto Froebel' (Barr, 1898)

There are collected about 90% of the Lithuanian cultivars of peonies in Kaunas Botanical Garden. The plants are originated by four Lithuanian plant breeders: Ona Skeivienė, Jonas-Evaldas Tarvidas, Emilija Tarvidienė and Kęstutis Vyšniauskas. Currently, the collection of Lithuanian peonies consists of three species: *Paeonia lactiflora* Pall., *Paeonia* x *hybrida*, *Paeonia peregrina* Mill. The majority of the collection is represented by *Paeonia lactiflora* Pall. cultivars (95.8%) (Table 2).

Table 2. The origin of the Lithuanian varieties of peonies

Plant name	**Originator, year and country of origination**
P. x *hybrida* 'Bitė Maja'	Kęstutis Vyšniauskas, 2013 (LT)
P. lactiflora 'Aistis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora BT-6	Jonas-Evaldas Tarvidas, year of origination unknown (LT)
P. lactiflora 'Dainius'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Danutė'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Darius Girėnas'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Elena'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Freda'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Garbė Motinai'	Ona Skeivienė, 1958 (LT)
P. lactiflora 'Gražuolis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Jadvyga'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Jaunuolis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Jonas'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Kastytis'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Kaukutis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Kaunietis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Keleivis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Kėdainietis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Klajūnas'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Kvieslys'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Labutis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Laimikis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Lakūnas'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Maironis'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Meilutis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Našutis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1994 (LT)
P. lactiflora 'Ona'	Ona Skeivienė,1970 (LT)
P. lactiflora 'Prof. K. Grybauskas'	Ona Skeivienė, 1958 (LT)
P. lactiflora 'Rožinės Ramunės'	Kęstutis Vyšniauskas, 2014 (LT)
P. lactiflora 'Ramunis'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Regina'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Rytas'	Ona Skeivienė, 1970 (LT)
P. lactiflora 'Senolis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Skaistis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)

P. lactiflora 'Skeivienės Vėlyvasis'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Stipruolis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Svečias'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Šaunuolis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Švyturys'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Tadas'	Ona Skeivienė, year of origination unknown (LT)
P. lactiflora 'Vakaris'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Veikėjas'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Vilnietis'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Virgilijus'	Ona Skeivienė, 1958 (LT)
P. lactiflora 'Žilvinas'	Ona Skeivienė, 1964 (LT)
P. lactiflora 'Žygūnas'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1979 (LT)
P. lactiflora 'Žynys'	Jonas-Evaldas Tarvidas and Emilija Tarvidienė, 1989 (LT)
P. peregrina 'Indri Tail'	Kęstutis Vyšniauskas (LT)

The investigations were carried out in the collection of peonies in Kaunas Botanical Garden during 2013–2015. The data of peonies origination were analysed using Jakubowski registered peony cultivars and descriptions (2008). Phenological observations of peonies (the blooming period (beginning, massive flowering and the end of blooming period)) and biometric measurements (height of plant and foliage zone (cm), quantity of vegetative and generative stems (units per plant), diameter of inflorescence) were performed according to methodology of Lithuanian researcher Jonas Vaidelys (2005). The beginning and massive period of blossom refers to 10% and 50% of blooming plants. The end of the blooming period refers to 10% of blooming plants. The obtained results were analysed using Statistica 6.0 (Statsoft, Inc. Tulsa). The following analyses were carried out: Pearson correlation, differences of means and the analysis of variance (Anova).

3. RESULTS AND DISCUSSION

The typical types of inflorescences are single and double (17 and 17 cultivars), while anemone and semi-double types are rare (2 and 1 cultivars, respectively). Pink is the usual colour of inflorescences (30 cultivars) with cultivars of pale pink, dark pink, pink salmon, pink lilac and pale pink lilac. White (pure white and white pink) inflorescences are typical for 5 cultivars and red (red and dark red) for 2 cultivars (Table 3).

The height of plant of 37 cultivars of peonies cultivated in Kaunas Botanical Garden is shown in Figure 2 and Table 3. The height of plants varies from the lowest 60.7 ± 2.9 cm ('Jadvyga') to the highest 124.0±2.0 cm ('Keleivis'). The average height of plants is 84.3 ± 2.4 cm. The plants with double flower type usually are of greater height (76.6 ± 3.0 and 91.6 ± 2.8 cm, respectively, p=0.00) than peonies with single flower type.

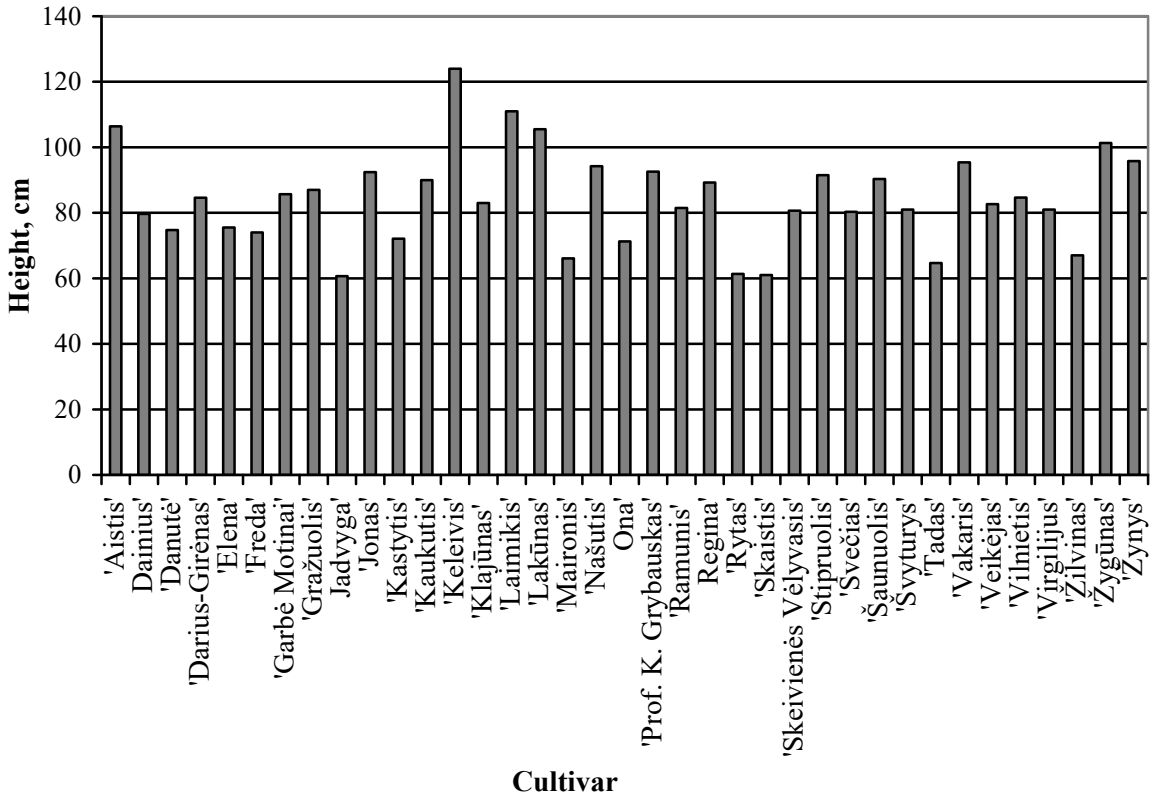


Figure 2. Plant height (cm) of Lithuanian peony cultivars cultivated in Kaunas Botanical Garden (2013–2015)

The height of the foliage zone of peonies ranges from the lowest 46.3 ± 2.3 cm ('Našutis') to the highest 88.3 ± 0.9 cm ('Aistis'). The average height of foliage zone is 64.8 ± 1.9 cm (Table 3). There is a direct link ($r = +0.81$, $p = 0.00$) between the height of investigated plants and the height of foliage zone.

The quantity of vegetative and generative stems varies greatly among the cultivars of peonies (Table 3). The cultivars 'Laimikis', 'Lakūnas', 'Žygūnas' and 'Žynys' had only one vegetative stem, while 'Garbė Motinai' and 'Stipruolis' – 12.7 ± 2.3 and 13.7 ± 1.8, respectively. The lowest number of generative stems is typical for 'Ramunis' (1.5 ± 1.5) and highest – 55.0 ± 4.0 for 'Regina'. Higher number of generative stems ($p = 0.05$) are typical for plants with single flower type (26.2 ± 3.4 and 18.3 ± 2.4, respectively).

Table 3. Characteristics of vegetative parts of the Lithuanian cultivars of peonies (2013–2015)

Name of cultivar	Color of inflores-cences	Type of inflor-escen-ces	Cultivar parents	Plant height, cm	Foliage zone height, cm	Vegeta-tive stem quantity, unit per plant	Genera-tive stem quantity, unit per plant
'Aistis'	Pale pink	S		106.4±1.6	88.3±0.9	2.0±0.6	23.0±3.2
Dainius'	Pale pink	A		79.7±7.4	59.3±4.7	3.7±1.2	13.3±0.3
'Danutė'	Pale pink	S		74.8±2.5	60.0±2.9	6.0±0.6	44.8±4.2
'Darius-Girėnas'	Pink	D	'Germaine Burgos' x 'Madame Calot'	84.6±1.7	62.2±1.2	2.0±0.7	12.0±2.3
'Elena'	Pale pink	S		75.5±5.1	57.5±1.5	9.3±0.9	37.3±6.0
'Freda'	Pale pink	D	'Auguste Dessert' x 'Perette'	74.0±3.0	57.9±3.6	21.0±2.6	10.2±0.9
'Garbė Motinai'	Pale pink	D	'Pierre Reiqnoux' x 'Germaine Burgos'	85.7±1.5	65.4±1.2	12.7±2.3	36.0±8.5
'Gražuolis'	Pink salmon	D		87.0±3.1	68.7±1.7	3.7±0.3	8.0±3.0
Jadvyga'	Pale pink	S		60.7±2.9	49.0±1.3	5.4±0.5	33.0±5.5
'Jonas'	Pale pink lilac	S		92.4±5.0	74.3±0.9	4.7±0.3	37.5±1.7
'Kastytis'	Dark pink	S		72.1±2.9	60.0±2.5	2.0±0.0	27.0±4.9
'Kaukutis'	Pink	S		90.0±4.6	75.8±2.7	0.7±0.3	22.3±1.4
'Keleivis'	Pale pink lilac	D		124.0±2.0	86.00±0.6	2.0±0.0	11.3±3.5
'Klajūnas'	Pale pink	SD		83.0±5.4	66.0±5.9	9.0±2.1	8.7±2.0
'Laimikis'	White pink	D		111.0±6.1	83.3±4.8	1.0±0.6	28.7±2.9
'Lakūnas'	White pink	D		105.5±2.2	76.7±3.3	1.0±0.0	29.3±3.5
'Maironis'	White	S		66.1±1.5	50.8±1.4	3.2±0.5	19.4±3.6
'Našutis'	Pale pink	SD		94.2±3.8	46.3±2.3	0.3±0.3	7.3±3.2
Ona'	Pale pink	S		71.2±0.6	57.8±0.8	6.0±1.2	43.0±0.6
'Prof. K. Grybauskas'	Dark red	D	'General McMahon' x 'Perette'	92.6±1.2	64.0±5.6	7.7±1.4	26.7±3.0

'Ramunis'	Pink lilac	S		81.5±0.5	54.0±1.0	2.5±1.5	1.5±1.5
Regina'	Pale pink lilac	S		89.2±2.0	72.8±1.1	6.0±0.4	55.0±4.0
'Rytas'	Pale pink	S		61.3±0.7	47.7±4.3	9.3±1.2	10.3±4.7
'Skaistis'	White pink	S		61.0±2.3	51.0±1.0	1.5±0.5	9.5±2.5
'Skeivienės Vėlyvasis'	Pale pink	D	'Eugene Verdier' x 'Germaine Bigot'	80.7±2.03	76.4±1.0	4.7±1.4	5.3±1.2
'Stipruolis'	Pale pink	D		91.5±9.1	63.0±8.5	13.7±1.8	16.0±5.6
'Svečias'	Dark pink	D		80.3±0.9	62.0±1.2	3.7±0.3	15.0±2.1
'Šaunuolis'	Dark pink	D		90.3±0.9	63.5±1.4	0.3±0.3	17.3±2.4
'Švyturys'	Pink lilac	D		81.0±5.5	50.0±2.9	1.7±1.7	13.7±2.9
'Tadas'	Red	S		64.7±0.3	53.7±0.9	0.7±0.3	27.7±1.2
'Vakaris'	Pink	D		95.4±2.6	72.5±1.0	1.7±0.3	37.2±4.0
'Veikėjas'	White pink	D		82.7±3.7	67.33±4.1	1.0±0.3	9.3±0.3
'Vilnietis'	Pale pink	S		84.7±4.8	73.2±1.8	2.3±0.3	28.7±2.3
'Virgilijus'	Pink	S	'Pierre Reiqnoux' x 'Auguste Dessert'	81.0±2.3	67.7±0.3	2.3±0.3	29.3±1.7
'Žilvinas'	Pale pink	S		67.0±0.0	52.0±0.0	2.0±0.0	8.0±0.0
'Žygūnas'	Pale pink lilac	D		101.3±3.5	82.0±1.5	1.0±0.6	33.3±3.2
'Žynys'	Pale pink	D		95.8±2.0	81.0±2.5	1.0±0.0	22.3±2.2

Abbreviations: A – anemone type, D – double, S – single, SD- semi-double.

The majority of investigated cultivars of peonies, except 'Skeivienės Vėlyvasis' (on the 19th of June, on average), starts to bloom in the first half of June (Table 4). The massive blooming starts in 2–4 days following the onset of blooming. The blooming ceases after 12.3 ± 0.8 days and lasts for 7.4 ± 0.2 days, on average. The longest time of blossom is typical for 'Virgilijus' and 'Prof. K. Grybauskas' (10 and 12 days, respectively), while the shortest for 'Žilvinas' (4 days). The onset and cease time of flowering of the cultivars of double inflorescences type is later ($p = 0.01$) than cultivars with single inflorescences type (3rd – 7th and 10th – 15th of June on average, respectively). The significance of the differences of means is also confirmed by the analysis of variance (ANOVA, $R^2 = 0.55$, $F= 3.20$, $p = 0.01$). The duration of flowering is also longer ($p = 0.01$) for the cultivars with double inflorescences type in comparison with single inflorescences type (8.1 and 6.8 days on average, respectively).

The average diameter of inflorescences is 16.0 ± 0.3 cm (Table 4, Figure 3). The smallest inflorescence (12.4 ± 0.3 cm) is typical for 'Prof. K. Grybauskas', and biggest – 19.4 ± 0.71 cm for 'Kaukutis' (Figure 3). The greater diameter of inflorescences ($p = 0.00$) is common to the cultivars of a

single inflorescences type (17.4 ± 0.3 and 14.7 ± 0.3 cm, respectively). The significance of the differences of means is also confirmed by analysis of variance (ANOVA, R^2 = 0.50, F= 4.12, p = 0.00).

Table 4. Characteristics of inflorescences and the time of blooming of the Lithuanian cultivars of peonies (2013–2015)

Name of cultivar	Year of origination	Beginning of blooming period (10%)	Massive blooming period (50%)	End of blooming period (10%)	Diameter of inflorescence, cm
'Aistis'	1979	June 4	June 6	June 11	18.1±0.4
Dainius'	1979	June 4	June 6	June 11	15.3±0.6
'Danutė'	1970	June 2	June 5	June 9	17.4±0.8
'Darius-Girėnas'	1964	June 13	June 16	June 20	14.1±0.2
'Elena'	1970	June 3	June 6	June 11	18.0±0.3
'Freda'	1964	June 6	June 8	June 12	13.2±0.3
'Garbė Motinai'	1958	June 4	June 8	June 13	16.3±0.5
'Gražuolis'	1979	June 14	June 18	June 25	15.0±0.0
Jadvyga'	1970	June 2	June 5	June 10	17.2±0.3
'Jonas'	1970	June 2	June 4	June 9	18.7±0.4
'Kastytis'	1964	June 3	June 6	June 10	15.9±0.6
'Kaukutis'	1979	June 3	June 5	June 9	19.4±0.7
'Keleivis'	1979	June 4	June 6	June 13	15.6±0.2
'Klajūnas'	1979	June 6	June 10	June 13	12.5±0.5
'Laimikis'	1979	June 5	June 7	June 14	13.0±0.4
'Lakūnas'	1979	June 4	June 7	June 12	13.4±0.4
'Maironis'	1964	June 2	June 5	June 10	17.2±0.3
'Našutis'	1994	June 4	June 6	June 13	15.7±0.5
Ona'	1970	June 2	June 5	June 8	16.8±0.4
'Prof. K. Grybauskas'	1958	June 14	June 19	June 26	12.4±0.3
'Ramunis'	1970	June 6	June 9	June 12	18.7±0.9
Regina'	1970	June 2	June 6	June 10	18.2±0.4
'Rytas'	1970	June 6	June 8	June 11	14.4±0.4
'Skaistis'	1979	June 3	June 6	June 8	17.3±0.5
'Skeivienės Vėlyvasis'	1964	June 19	June 22	June 27	14.8±0.4
'Stipruolis'	1979	June 4	June 7	June 12	14.7±0.4

'Svečias'	1979	June 3	June 5	June 9	16.1±0.4
'Šaunuolis'	1979	June 3	June 5	June 10	14.9±0.3
'Švyturys'	1979	June 3	June 6	June 10	14.9±0.5
'Tadas'	No data	June 3	June 6	June 11	15.7±0.4
'Vakaris'	1964	June 2	June 6	June 10	15.5±0.2
'Veikėjas'	1979	June 5	June 7	June 12	15.1±0.6
'Vilnietis'	1979	June 3	June 5	June 8	18.8±0.5
'Virgilijus'	1958	June 1	June 5	June 11	16.7±0.2
'Žilvinas'	1964	June 6	June 8	June 10	18.5±1.5
'Žygūnas'	1979	June 6	June 10	June 13	15.1±0.5
'Žynys'	1989	June 3	June 6	June 11	17.0±0.3

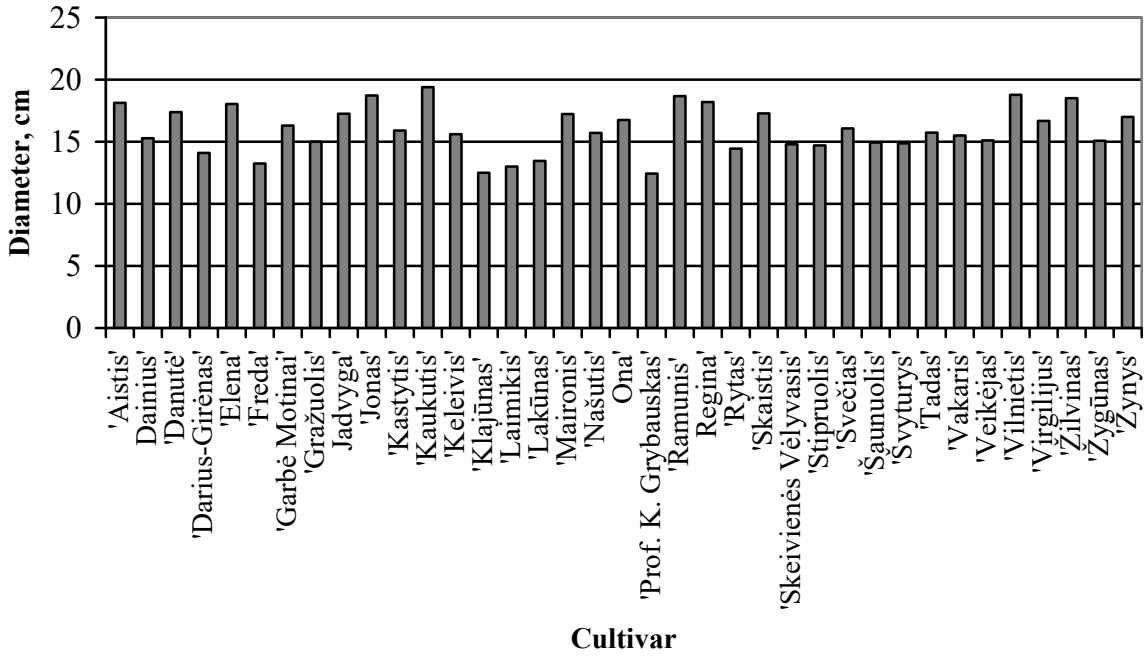


Figure 3. Diameter of inflorescence (cm) of Lithuanian peony cultivars cultivated in Kaunas Botanical Garden (2013–2015)

CONCLUSIONS

1. The collection of peonies in Kaunas Botanical Garden of Vytautas Magnus University consists of 4.3% species and infraspecific taxa, 18.6% Lithuanian cultivars and 77.1% cultivars, originated in France, Russia, US, UK, etc.
2. Kaunas Botanical Garden collected about 90% of all Lithuanian peony cultivars. It is the biggest genetic database of Lithuanian peony cultivars.
3. Summarizing investigations, performed on Lithuanian peony cultivars, we can state, that:
    - Pink is the typical colour of inflorescences of the investigated cultivars of peonies in Kaunas Botanical Garden.

- The average height of peonies cultivated in Kaunas Botanical Garden is 84.3 cm and the average height of foliage zone – 64.8 cm. The plants with double inflorescences type are of greater height (p=0.00). The height of investigated plants and the height of foliage zone is positively correlated (p = 0.00).
- Higher number of generative stems (p = 0.05) are typical for plants with single inflorescences type.
- The onset of blooming for the majority of investigated cultivars of peonies is the first half of June. The blooming lasts for 7 days, on average. The cultivars of double inflorescences type start and cease the flowering later than cultivars with single inflorescences type. The duration of flowering is also significantly longer for the cultivars with double inflorescences type.
- The average diameter of inflorescences is 16.0 cm. The greater diameter of inflorescences is common to the cultivars of a single inflorescences type (p = 0.00).

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