VILNIUS UNIVERSITY
INSTITUTE OF BOTANY OF THE NATURE RESEARCH CENTRE

Aurelija Malciūtė

RHODODENDRONS AT ŠIAULIAI UNIVERSITY BOTANICAL GARDEN: CONDITION, RHYTHMICS OF SEASONAL DEVELOPMENT AND GENERATIVE PROPAGATION

Summary of doctoral dissertation
Biomedical sciences, botany (04 B)

Vilnius, 2010

Dissertation was prepared at Vilnius University in 2006–2010.

Scientific advisor:

Prof. habil. dr. Jonas Remigijus Naujalis (Vilnius University, Biomedical sciences, Botany – 04 B).

Advisor:

Assoc. prof. dr. Ingrida Šaulienė (Šiauliai University, Biomedical sciences, Botany – 04 B).

Chairman:

prof. habil. dr. Vytautas Rančelis (Vilnius University, Biomedical sciences, Biology – 01 B).

Members:

prof. habil. dr. Romualdas Juknys (Vytautas Magnus University, Biomedical sciences, Ecology and environmental sciences – 03 B);

dr. Sigita Jurkonienė (Institute of Botany of the Nature Research Centre, Biomedical sciences, Botany – 04 B);

prof. habil. dr. Remigijus Ozolinčius (Institute of Forestry, Lithuanian Research Centre for Agriculture and Forestry, Biomedical sciences, Botany – 04 B);

dr. Jolita Radušienė (Institute of Botany of the Nature Research Centre, Biomedical sciences, Botany – 04 B).

Official opponents:

prof. habil. dr. Eugenija Kupčinskienė (Vytautas Magnus University, Biomedical sciences, Botany – 04 B);

doc. dr. Juozas Raugalas (Vilnius University, Biomedical sciences, Biology – 01 B).

Defence of dissertation will take place at the public meeting of the Council of Botany at 14 p.m. on 29 September 2010 in the Didžioji auditorium of the Department of Natural Sciencies of Vilnius University

Please send your comments to Vilnius University, Faculty of Natural Sciences, Department of Botany and Genetics, M. K. Čiurlionio Str. 21/27, LT-03101, Vilnius, Lithuania.

The summary of doctoral dissertation was distributed on....of August 2010.

The doctoral dissertation is available in the libraries of Vilnius University and Institute of Botany of the Nature Research Centre.

VILNIAUS UNIVERSITETAS
GAMTOS TYRIMŲ CENTRO BOTANIKOS INSTITUTAS

Aurelija Malciūtė

ŠIAULIŲ UNIVERSITETO BOTANIKOS SODO RODODENDRAI: BŪKLĖ, SEZONINĖS RAIDOS RITMIKA IR GENERATYVINIS DAUGINIMAS

Daktaro disertacijos santrauka
Biomedicinos mokslai, botanika (04 B)

Vilnius, 2010

Disertacija parengta 2006–2010 metais Vilniaus universitete.

Mokslinis vadovas:

prof. habil. dr. Jonas Remigijus Naujalis (Vilniaus universitetas, biomedicinos mokslai, botanika – 04 B).

Konsultantė:

doc. dr. Ingrida Šaulienė (Šiaulių universitetas, biomedicinos mokslai, botanika – 04 B).

Disertacija ginama Vilniaus universiteto Botanikos mokslo krypties taryboje:

Pirmininkas:

prof. habil. dr. Vytautas Rančelis (Vilniaus universitetas, biomedicinos mokslai, biologija – 01 B).

Nariai:

prof. habil. dr. Romualdas Juknys (Vytauto Didžiojo universitetas, biomedicinos mokslai, ekologija ir aplinkotyra – 03 B);

dr. Sigita Jurkonienė (Gamtos tyrimų centro Botanikos institutas, botanika – 04 B);

prof. habil. dr. Remigijus Ozolinčius (Lietuvos agrarinių ir miškų mokslų centro Miškų institutas, biomedicinos mokslai, botanika – 04 B);

dr. Jolita Radušienė (Gamtos tyrimų centro Botanikos institutas, biomedicinos mokslai, botanika – 04 B).

Oficialieji oponentai:

prof. habil. dr. Eugenija Kupčinskienė (Vytauto Didžiojo universitetas, biomedicinos mokslai, botanika – 04 B);

doc. dr. Juozas Raugalas (Vilniaus universitetas, biomedicinos mokslai, biologija – 01 B).

Disertacija bus ginama viešame Botanikos mokslo krypties tarybos posėdyje, kuris vyks 2010 m. rugsėjo 29 d. 14 val. VU Gamtos mokslų fakulteto Didžiojoje auditorijoje.

Atsiliepimus prašome siųsti adresu: Vilniaus universitetas, Gamtos mokslų fakultetas, Botanikos ir Genetikos katedra, M. K. Čiurlionio g. 21/27, LT-03101, Vilnius, Lietuva.

Disertacijos santrauka išsiuntinėta 2010 m. rugpjūčio ... d.

Su disertacija galima susipažinti Vilniaus universiteto ir Gamtos tyrimų centro Botanikos instituto bibliotekose.

INTRODUCTION

In Lithuania in recent years, bushes and shrubs of rhododendron (*Rhododendron* L.) genus have been undoubtedly becoming exceptionally popular introduced ornamental plants, cultivated more and more often and extensively not only in botanical gardens, but also in a variety of public and private green plantations. On the other hand, rhododendron growers often suffer great material and intangible losses due to fast decrease in oranamentality or even death of these plants.

The main difficulties limiting the possibilities of rhododendron introduction and acclimatization in Lithuania are a) insufficient tolerance to low and subzero temperatures and b) unfavourable growing and care conditions (planting time, soil pH and characteristics, light and moisture conditions, mineral feeding, fight with diseases and vermin). Very often rhododendron growers simply lack biology knowledge on rhododendrons, the majority of which are mountain bushes and shrubs. Therefore there is a need for thorough diversified research which would enable one to assess objectively: (1) seasonal development of the cultivated rhododendrons, which is especially dependent on the changed conditions in new locations, (2) general condition of rhododendrons, (3) needs of rhododendrons related to environmental factors, (4) application of proper farming techniques for the cultivated rhododendrons, and (5) the prospects of rhododendron growing. In case of not very favourable growth conditions, the viability of rhododendrons may decrease rapidly; consequently their most valuable ornamental qualities disappear and the plants themselves become non-resistant to diseases and vermin.

Acclimatization investigations of rhododendron genus conducted at the Šiauliai University (hereinafter – SU) Botanical Garden are definitely of great value not only in scientific respect, but they are also significant for the promotion of ornamental gardening. However, only possessing reliable data of special research it is possible to select rhododendrons that are not only ornamental, but also tolerant to low and subzero temperatures and suitable for growing in different green plantations of Lithuania. For all the above reasons, diversified investigations on rhododendrons are especially relevant at this time. The investigations will continue in this way in the future, since the popularity of rhododendrons among professional and amateur gardeners due to their incredible variety and exceptional ornamentality is constantly increasing.

The aim of the study is to conduct the research of composition, condition assessment, seasonal development and generative propagation of rhododendron collection at the SU Botanical Garden.

Objectives of the dissertation: 1) to make diagnostic tables designed for the description of rhododendron taxa and cultivars at the SU Botanical Garden; 2) to evaluate general condition of rhododendrons cultivated at the Botanical Garden; 3) to assess the tolerance of rhododendrons to low and sub-zero temperature; 4) to define blooming peculiarities of rhododendrons according to the visual scale; 5) to evaluate the prospectivity of cultivating rhododendrons in green plantations; 6) to define the peculiarities of rhododendron seasonal development; 7) to conduct investigations on generative propagation of rhododendrons; 8) to collect and process the research data in the original computer database *Rhododendrons*.

Statements defended. 1) Special original tables designed for the description of rhododendrons morphological features are suitable for getting to know better these introduced taxa of bushes and shrubs and cultivars; 2) an annual condition evaluation of

plants collection is an objective acclimatization level indicator of introduced rhododendrons that allows to forecast further cultivation perspectives of cultivated bushes and shrubs for ornamental purposes; 3) late spring frosts are one of the most important climatic factors that reduces ornamental features of cultivated rhododendrons in Lithuania; 4) the distribution of rhododendrons into phenorythmotype groups allows summarize and evaluate seasonal development of plants according to indicators. Phenorythmotype groups of rhododendrons can be more various and in ornamental regard more attractive basis in grouping collections or green plantations; 5) the substratum is not the main factor of germination of rhododendron seeds; however, sprout viability and growth are directly dependent on the nature of substratum.

Novelty of the study. For the first time in Lithuania has been presented and explored a study based on collection of rhododendrons. In the paper, the summarised data of the study of the years 2003–2009 on annual condition evaluations about cultivated rhododendron collection of bushes and shrubs, peculiarities of seasonal development and phenorythmotype groups at the SU Botanical Garden. Taking into consideration cultivated rhododendrons which are grouped in various collections by some kind of indicators might be the basis for ornamental purposes.

Special original tables designed for the description of rhododendron taxa and cultivars according to diversity of morphological features of bushes and shrubs at the SU Botanical Garden are provided in the paper.

The variant of original unified system of evaluating rhododendron condition has been created and presented in the dissertation. Using such system for scientific and practical problems-solving of ornamental gardening, enables to forecast objectively the possibilities of cultivating rhododendrons in green plantations of Lithuania.

Practically tested methodologies of generative propagation of rhododendrons which basis can be successfully used in solving the germination of rhododendron seeds and proper selection of substratum for the development of seedlings have been provided in the paper.

The study data analysis of rhododendrons has been performed and a specially designed computer database has been based on *Rhododendrons*. In the future, such database could become a unified computer system connecting studies of some kind of rhododendrons in Lithuania.

The study book “Rhododendrons in Ornamental Gardening”, released in 2010 was based on the study basis of rhododendrons.

Scientific and practical importance of the dissertation. Upon the changes in climatic conditions, the introduced varieties, including rhododendrons, inevitably face the new effect of environmental factors and adapt under artificially created conditions. The analysis of systematic investigations on rhododendrons conducted in the years 2003–2009 has been carried out. The obtained results of investigations lead to certain generalisations on relevant problems of rhododendron introduction in Lithuania.

The collection of plants of this genus gathered at the SU Botanical Garden is valuable not only in scientific, recreational and economical aspects, but it also helps to promote a proper view on rhododendrons as ornamental plants in Lithuania. Investigations of different nature on the plants of rhododendron genus at the Botanical Garden are not accidental; they are timely and both scientifically and practically relevant. The investigations have shown that the rhododendron collection at the SU Botanical Garden is being formed in the right direction. The suitability of the majority of introduced rhododendrons for cultivation at the SU Botanical Garden under artificially

created conditions has already helped to select and offer potential rhododendrons for different types of green plantations. According to the indexes of seasonal development investigations, the collection rhododendrons have been classified into phenorythmotype groups. The results of the investigations may become basis for the introduction of other rhododendron taxa and cultivars. All the results of investigations are collected and processed in the specially developed database.

Approbation of the study results. The results of the investigations were presented and discussed at 3 international conferences, also at 2 local conference held in Lithuania. The results of the study were annually discussed at the meetings of Botany and Genetics Department of Vilnius University Faculty of Natural Sciences, during the annual attestations of doctoral students.

Publications. The results of investigations on rhododendrons have been published in 4 publications, included in the list of the Institute for Scientific Information (ISI): "Notulae Botanicae Horti Agrobotanici Cluj-Napoca" (1), „Acta Horticulture" (1) and „Botanica Lithuanica" (2); 2 Lithuanian reviewed periodical scientific publication, which are included intoInternational Scientific Data Bases, the list of which is approved by Lithuanian Scientific Council: „Jaunųjų mokslininkų darbai"; 2 Lithuanian reviewed periodical scientific publication: „Jaunųjų mokslininkų darbai" (1) ir Botanica Lithuanica" (1). The theses of the results of scientific investigations have been announced in the material of 8 conferences.

A study book "Rhododendrons in Ornamental Gardening" was published; the book provides a variety of literature and original research materials on rhododendrons.

Volume of the work. The dissertation is comprised of the Introduction, review of literature sources, investigation material, object and methodology, results of the work, the list of scientific works on the topic of the dissertation. The volume of the dissertation is 242 pages. The paper has been illustrated with 29 tables and 30 pictures. The list of 151 reference sources is provided in the list of literature. 8 tables are provided in the annex.

THE OBJECT, CONDITIONS AND METHODS OF INVESTIGATIONS

Investigation material. In the paper, the data of investigations carried out at the SU Botanical Garden in 2003–2009 are summarised. In 2009, rhododendrons of 178 taxa and cultivars thrived in the SU Botanical Garden. During the investigations, only rhododendrons of 126 taxa and cultivars that have reached the generative status of biological maturity were assessed in different aspects. From 1 to 7 individuals of each such taxon or cultivar were studied.

Object of the investigations. The Rhododendron (*Rhododendron*) genus includes 600 to 1300 species of evergreen, semi-evergreen or deciduous shrubs, bushes or even trees. Rhododendrons of just a few species growing in Central Europe are classified as chamaephytes. In botanical and geographical aspect, rhododendrons are mostly plants of moderate climate zones of the Northern hemisphere the majority of which thrive in mountainous regions.

Methodology of investigations.

The principles of making biological characteristics of rhododendrons grown in the botanical garden. When collecting data for making biological characteristics, the rhododendron greening form, leaf shape, leaf length and width, leaf colour, leaf and leaf stalk hairiness/tomentousness/scaliness, the number of flowers per truss, diameter of flowers, shape and colour of corolla and the number of stamens was specially assessed at the SU Botanical Garden. Besides morphological and closely related to them features, the information of geographical nature was used in making biological characteristics of rhododendrons as well.

Criteria and scales of evaluating some biological indexes of rhododendrons. Multilateral investigations of the plants in the rhododendron collection at the SU Botanical Garden have been carried out since 2003. During such investigations the following was determined annually by the scales of visual assessment: 1) general condition of rhododendrons, 2) tolerance of rhododendrons to low and subzero temperature, 3) flowering intensity of rhododendrons, and 4) prospectivity of growing rhododendrons in green plantations.

At the beginning of investigations, the condition of rhododendrons of the collection was determined by applying the scales developed for evaluating ligneous plants by other scientists (JANUŠKEVIČIUS, BUDRIŪNAS, 1987; JANUŠKEVIČIUS et.al., 1990; LUKASIEWICZ, 1992; NAVYS, 1999). Practical application of the scales already created for evaluation of collection rhododendron condition encouraged the transformation of visual evaluation scales of ligneous plants developed by the different scientists of foreign countries and Lithuania by applying them specially for the evaluation of rhododendrons (MALCIŪTĖ, NAUJALIS, 2009; 2010 a).

Indexes characterising the seasonal development of rhododendrons. In 2007–2009, special investigations on rhododendron seasonal development were carried out, the main attention whereof was paid to (1) recording the beginning and ending of rhododendron foliation; (2) recording the beginning and end of rhododendron flowering, and (3) evaluation of the growth of annual shoots.

The beginning of rhododendron foliation is the time when after the leaves start growing in spring, their surface area becomes clear, and though the very leaf is not of characteristic dimensions yet, it becomes of the shape which is typical to the taxon or cultivar. The criterion for the end of rhododendron foliation is seasonal loss of about 50 % of the plant leaves.

Rhododendron flowering duration is the period form appearance of the first blossom until the death of the last one. Investigations of rhododendron shoot growth were carried out at the end of summer/at the beginning of autumn, upon the end of vegetation period of these plants.

During the investigations, eight annual shoots of each rhododendron were measured with a measuring tape. Rhododendrons grown at SU Botanical Garden were classified into certain phenorythmotype groups according to the indexes of their seasonal development.

Investigations on generative propagation of rhododendrons. Investigations on rhododendron generative propagation were carried out by using seed samples of 12 evergreen, semi-evergreen and deciduous species and subspecies of rhododendrons. Such investigations were conducted in three stages. During the firs stage, laboratory germination of rhododendrons obtained by exchange was tested (the sample size was 100 seeds per taxon). In the second stage the rhododendron seeds were sowed in

experimental and control substrates (the sample size was 100 seeds per taxon). During the third stage of investigations, peculiarities of rhododendron seedling development were determined by prickling out the young plants into different substrates (the sample size was 30 plants per taxon).

The system, structure and main functions of the database *Rhododendrons*. The computer database *Rhododendrons* was developed to collect and multilaterally process the results of investigations on rhododendrons cultivated at the SU Botanical Garden. The database was developed in the environment of *ACCESS* database management system. The tables of the database may be structurally grouped into two main blocks: help blocks and blocks of entering and arranging the research results. The systemic archive of the database may function as scientific index facilitating the fast search for information on rhododendrons grown at the Botanical Garden.

RESEARCH RESULTS

Biological characteristics of rhododendrons cultivated at the SU Botanical Garden. Special tables have been provided to characterise taxa and cultivars of rhododendrons grown at the SU Botanical Garden. The main diagnostic features of distinguishing rhododendron taxa from each other are the character of leaf greening, leaf shape, length, colour, the level of hairiness/tomentousness or scaliness of central structures, flower diameter, shape of corolla and the length of stamens.

The analysis of biological characteristics of the investigated rhododendrons has shown that according to the form of greening, 76 rhododendrons out of 126 species, subspecies or cultivars are evergreen, 11 are semi-evergreen, and 38 are deciduous. Shoots of app. 42 % of the SU Botanical Garden rhododendrons are smooth and not hairy. Hairy shoots are characteristic to 37 % of rhododendrons. Young shoots of the majority of rhododendrons (app. 93 %) are green or brown. Elliptical, oblong- or round-elliptical leaves are characteristic to app. 42 % of rhododendrons. Rhododendron leaves vary by their dimensions; they may be up to 12.5 cm long and sharply pointed or blunt at the apex. Leaves may be light or dark green, greyish-green, hairy or smooth, not hairy. Flower diameter varies from 1.3 cm to 9.5 cm. Flower diameter of the majority of studied rhododendrons (app. 55 %) is of medium size, i.e. of 3.5–6 cm. According to the flower corolla colour there are mostly rhododendrons with blooms of (app. 57 %) purple or pink colour in the collection. Rhododendrons with the corolla shape of wide, open or pipy funnel dominate (app. 76 %).

Condition evaluation of plants comprising the rhododendron collection. The vitality level of rhododendrons at the SU Botanical Garden is becoming higher every year; general condition of the majority of rhododendrons (66 %) is very good. General condition of the part of rhododendrons is good or average. The investigations have shown that the main reasons for average or average-to-bad condition of rhododendron condition is mostly subject to environmental conditions, such as 1) too low level of lighting, 2) too high level of lighting, and 3) unfavourable thermal conditions. Vitality of such rhododendrons usually recovers to the normal level even in the same period of vegetation; however flowering of certain bushes or shrubs is usually average. Thus, microclimatic conditions undoubtedly play a significant role to the general condition of rhododendrons grown at the SU Botanical Garden.

The majority (app. 80 %) of rhododendrons studied at the SU Botanical Garden are especially tolerant to winter frost or suffer a little in winter. The vitality of

rhododendrons with features of injury after winter usually regain a normal level in one season of vegetation. Among the rhododendrons of the collection, the evergreen plants suffer from low and subzero temperature the most. App. 24 % of such rhododendrons showed the injuries of vegetative and generative structures almost every year. Another 4% suffered from the injuries of generative structures after late spring frosts. Deciduous rhododendrons of the collection are especially tolerant to low and subzero temperature, since different damage forms caused by unfavourable thermal conditions appear in these rhododendrons only in some years and only among single plants.

Indicators characterising the flowering intensity of the studied rhododendrons are not stable and they vary every year. During the research period, app. 37 % of rhododendrons flowered especially abundantly, and abundant flowering was characteristic to app. 30 % rhododendrons of the collection. The reasons for weak or unstable flowering are mostly conditioned by the young calendar age of the plants and generative injuries of buds. A large number of rhododendrons of the collection (*R. searsiae* Rehder. et Wilson, *R. vernicosum* Franch. et al.) are just 5–7-year-old bushes and shrubs. Only *R. aureum* Georgi out of all rhododendrons did not flower at all during the entire period of the research. In 2003–2006, this rhododendron was of medium or bad condition already, apparently due to the too low lighting.

During the investigation, rhododendrons of ten taxa flowered twice in the same vegetation season. Re-flowering of rhododendrons is a rather risky phenomenon for the plants because during such process bushes and shrubs use up the excessive amount of accumulated nutrients and thus do not prepare sufficiently for the dormant period. However, the research results obtained in the years 2007–2009 showed that re-flowering of single rhododendrons did not have any significant effect on the production of generative structures of the following year, since plants that had flowered twice produced abundant or especially abundant generative structures after the winter. Primary flowering of rhododendrons usually lasted longer than the secondary flowering.

Rhododendrons of app. 61 % taxa and cultivars at the SU Botanical Garden have prospects of being grown in different kinds of green plantations. Generative and vegetative structures of such rhododendrons after winters usually remain undamaged, and the plants themselves are especially ornamental every year, they are of good vitality, with especially abundant or abundant generative structures. Rhododendrons of average prospects for being grown in green plantations show leaf injuries and average flowering intensity after some winters, although abundant flowering is usually characteristic to these rhododendrons. In most cases even the vitality of rhododendrons that were damaged after winter gradually reaches the normal level in the course of vegetation season. Vitality, flowering intensity and tolerance to winter frosts of rhododendrons that have average or low prospects varied a lot in certain years, therefore further research is necessary to obtain more accurate and reliable evaluations of these rhododendrons.

Seasonal rhythm peculiarities of rhododendrons grown at the Botanical Garden. At the SU Botanical Garden, the rhododendrons start foliating on the first days of May, usually on the 127th day of the year. The first rhododendrons that start foliating at the SU Botanical Garden are *R. canadense* (L.) Torr. var. *album*. A 9–13 day difference is between the rhododendrons that start foliating at the earliest and at the latest. The majority of deciduous rhododendrons finally foliate at the end of May or at the beginning of June. According to the character of seasonal foliation, the studied deciduous rhododendrons may be grouped into phenorythmotype groups of 1) early foliating (127th–129th days of the year) and 2) late foliating (130th–134th days of the year)

rhododendrons. During some years of investigation, some deciduous rhododendrons foliated rather late, however the investigation data of several years show that those were probably accidental cases and not regularity (Fig 1).

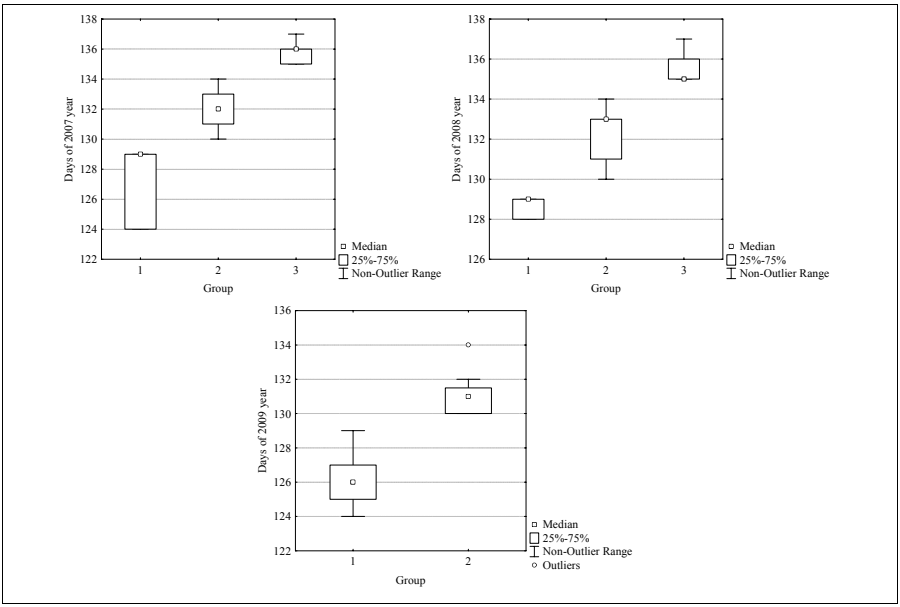

Fig. 1. Distribution of the deciduous rhododendrons according to the character of seasonal foliation. Phenorythmotype groups of rhododendrons: 1) early foliating; 2) late foliating and 3) rather late foliating

The indicators showing the end of foliation of deciduous rhododendrons demonstrate that at the latest the leaves of these plants start falling during the first ten days of November. Whereas at the earliest the leaves of rhododendrons start falling in the middle of October. Thus, according to the research data of the years 2007–2009, among the rhododendrons at SU Botanical Garden the following phenorythmotype groups of rhododendrons may be distinguished according to the indicators of the end of foliation: 1) rhododendrons that finish foliating early (284^{th}–289^{th} days of the year), 2) rhododendrons that finish foliating medium early (290^{th}–300^{th} days of the year), rhododendrons that finish foliating rather late (302^{th}–310^{th} days of the year).

To group such rhododendrons according to the time of the beginning and end of their foliation in the years 2007–2009, the method of cluster analysis full link was applied. Intersimilarity of rhododendrons according to the time of the beginning and end of their foliation was assessed in Euclidian distances. After carrying out the cluster analysis, four groups of rhododendron clusters were distinguished (Fig. 2).

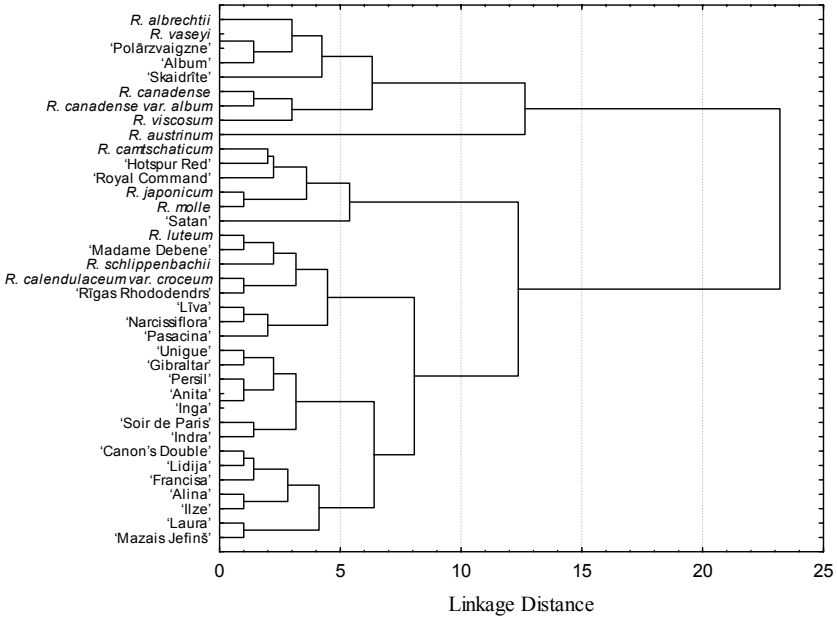

Fig. 2. Link dendrogram of rhododendrons of deciduous taxa and cultivars (similarity in Euclidean distances) according to foliation peculiarities

Thus, according to the indicators of average foliation duration, deciduous rhododendrons may be classified into phenorythmotype groups of 1) short foliation (151–160 days), 2) medium foliation duration (161–170 days), and 3) long foliation (171–177 days) (Table 1).

Table 1

Phenorythmotype groups of deciduous rhododendrons of the SU Botanical Garden by the duration of foliation

Phenorythmotype type group	Diagnosis	Typical example
1	Short foliation (151–160 days)	*R. albrechtii*, *R. austrinum*, *R. vaseyi*, *Rhododendron* 'Polārzvaigzne', *Rhododendron* 'Skaidrīte'
2	Medium duration of foliation (161–170 days)	*R. canadense*, *R. japonicum*, *R. luteum*, *R. schlippenbachii*, *R. viscosum*, *R. calendulaceum* var. *croceum*, *R. canadense* var. *album*, *R. gandavense* 'Unigue', *R. japonicum* 'Album', *R. luteum* 'Gibraltar', *R. viscosum* 'Soir de Paris', *Rhododendron* 'Alina', *Rhododendron* 'Francisa', *Rhododendron* 'Ilze', *Rhododendron* 'Indra', *Rhododendron* 'Laura', *Rhododendron* 'Līva', *Rhododendron* 'Mazais Jefiņš', *Rhododendron* 'Madame Debene', *Rhododendron* 'Narcissiflora', *Rhododendron* 'Pasacina', *Rhododendron* 'Rīgas Rhododendrs'

3	Long foliation (171–177 days)	*R. camtschaticum*, *R. molle*, *R. luteum* 'Canon's Double', *R. luteum* 'Persil', *R. luteum* 'Royal Command', *R. molle* 'Satan', *Rhododendron* 'Anita', *Rhododendron* 'Hotspur Red', *Rhododendron* 'Inga', *Rhododendron* 'Lidija'

Rhododendron flowering analysis has shown that some semi-evergreen rhododendrons (*R. mucronulatum* Turcz. and *R. dauricum* L. – on average on the 112th and 113th days of the year) and some deciduous rhododendrons (*R. canadense* and *R. canadense* var. *album* – on average on the 122nd and 123rd days of the year) are the first to flower at the SU Botanical Garden. On average a 41-day difference between deciduous rhododendrons that are the earliest to start flowering and the ones that are the latest to start flowering appears every year, and the same number among evergreen and semi-evergreen rhododendrons is 89 days. Every year the latest to start flowering among the deciduous rhododendrons is *R. viscosum* (L.) Torr., on average on the 163rd day of the year. Among the evergreen rhododendrons *R. caucasicum* Pall is the latest to start flowering, i.e. on the average on the 201st day of the year. Mass flowering of the studied evergreen rhododendrons starts in the second half of May – at the beginning of June.

Thus according to the indicators of flowering start, the rhododendrons of the SU Botanical Garden may be classified into phenorythmotype groups of 1) flowering especially early (deciduous – on 118–129, evergreen – on 102th –129th days of the year), 2) flowering early (on 130th –139th days of the year), 3) flowering rather late (deciduous – on 140th –159th, evergreen – on 140th –156th days of the year), and 4) flowering especially late (deciduous – on 160th –165th, evergreen – on 158th –167th or 187th –211th days of the year) rhododendrons. A 57-day difference between deciduous rhododendrons that are the earliest to start flowering and the ones that are the latest to start flowering, and the same number among evergreen and semi-evergreen rhododendrons is 80 days.

Every year the earliest end of flowering of the deciduous rhododendrons is typical to *R. canadense* and *R. canadense* var. *album* (on 134th–136th days of the year). Every year the latest to start flowering *R. viscosum* is also the latest to end flowering, on the 191st day of the year. The earliest end of flowering among the evergreen and deciduous rhododendrons is typical to *R. dauricum* (125th day of the year) and *R. forrestii* var. *repens* 'Elviira' (127th day of the year). Every year the latest to start flowering *R. caucasicum* is also the latest to end flowering, on the 215th day of the year.

Thus according to end of flowering indicators, the rhododendrons of the SU Botanical Garden may be classified into phenorythmotype groups of 1) ending flowering especially early (deciduous – on 132nd–139th, evergreen – on 110th–144th days of the year), 2) ending to flower early (on 145th–159th days of the year), 3) ending to flower rather late (on 160th–156th days of the year), and 4) ending to flower especially late (deciduous – on 184th–197th, evergreen – on 180th–196th or 215th–225th days of the year) rhododendrons.

Hence, according to the flowering duration the deciduous, semi-evergreen and evergreen (Table 2) rhododendrons of the SU Botanical Garden may be classified into phenorythmotype groups of rhododendrons of 1) short flowering duration (deciduous 11–15, evergreen 9–15 days), 2) of medium flowering duration (deciduous and evergreen rhododendrons the flowering duration whereof is 16–25 days), and 3) of long flowering duration (deciduous 26–34 days, evergreen 26–29 days). The majority of

deciduous and evergreen rhododendrons from the studied collection are plants of medium flowering duration.

Table 2

Phenorythmotype groups of evergreen and semi-evergreen rhododendrons of the SU Botanical Garden by flowering duration

Phenorythmotype group	Diagnosis	Typical example
1	Short flowering duration (9–15 days)	*R. caucasicum*, *R. dauricum*, *R. mucronulatum*, *R. smirnowii*, *R. wardii*, *R. aureum* var. *aureum*, *R. dichroanthum* 'Karibia', *R. forrestii* 'Bengal', *R. forrestii* var. *repens* 'Elviira', *R. yakushimanum* 'Kullervo', *R. smirnowii* 'Hellikki', *Rhododendron* 'Gold Crone'
2	Medium flowering duration (16–25 days)	*R. brachycarpum*, *R. catawbiense*, *R. ferrugineum*, *R. fortunei*, *R. hirsutum*, *R. impeditum*, *R. yungningense*, *R. maximum*, *R.* × *obtusum*, *R. orbiculare*, *R. oreotrephes*, *R. racemosum*, *R. searsiae*, *R. vernicosum*, *R. williamsianum*, *R. calostrotum* ssp. *keleticum*, *R. degronianum* var. *heptamerum*, *R. yakushimanum* ssp. *makinoi*, *R. yedoense* var. *poukhanense, R. minus* var. *album*, *R. nitidulum* var. *omeiense*, *R. brachycarpum* ssp. *tigerstedtii* 'Haaga', *R. brachycarpum* ssp. *tigerstedtii* 'Helsinsigin Yliopisto', *R. brachycarpum* ssp. *tigerstedtii* 'P. M. A. Tigersted', *R. catawbiense* 'Calsap', *R. catawbiense* 'Gomer Waterer', *R. catawbiense* 'Hachman's Charmant', *R. catawbiense* 'Nova Zembla', *R. catawbiense* 'Uldis', *R. caucasicum* 'Pohjolan Tytär', *R. forrestii* 'Baden Baden', *R. impeditum* 'Bili Nowinka', *R. impeditum* 'Moerheim', *R. yakushimanum* 'Blurettia', *R. yakushimanum* 'Bohlken's Juditha', *R. yakushimanum* 'Fantastica', *R. yakushimanum* 'Flava', *R. yakushimanum* 'Kalinka', *R. yakushimanum* 'Koichiro Wada', *R. yakushimanum* 'Percy Wiseman', *R. yakushimanum* 'Polaris', *R. obtusum* 'Geisha', *R. obtusum* 'Kermesina Rosea', *R. obtusum* 'Maruschka', *R. smirnowii* 'Dace', *R. wardii* 'Goldbukett', *R. wardii* 'Lachsgold', *R. williamsianum* 'Gartendirektor Rieger', *Rhododendron* 'Album Novum', *Rhododendron* 'Bielicy', *Rhododendron* 'Blaauw's Pink', *Rhododendron* 'Corinna', *Rhododendron* 'Erich', *Rhododendron* 'Germania', *Rhododendron* 'Gertruda', *Rhododendron* 'Ginta', *Rhododendron* 'Irina', *Rhododendron* 'Kārlis', *Rhododendron* 'Lavanda', *Rhododendron* 'Mikkeli', *Rhododendron* 'P. J. Mezitt', *Rhododendron* 'Praecox', *Rhododendron* 'Rasputin', *Rhododendron* 'Schneekrone', *Rhododendron* 'Scintillation', *Rhododendron* 'Sprīdītis'
3	Long flowering duration (26–29 days)	*R. micranthum*, *R. catawbiense* 'Humboldt', *R. caucasicum* 'Cunningham's White', *R. indicum* 'Macrantha', *R. ponticum* 'Chionoides', *Rhododendron* 'Catawbiense Grandiflorum', *Rhododendron* 'Emīls', *Rhododendron* 'Eskimo', *Rhododendron* 'Jānis', *Rhododendron* 'Lita'

Shoot development of rhododendrons starts in the first half of May and ends at the end of summer when generative or vegetative buds emerge. The analysis of the research that was carried out for several years has shown that from the rhododendrons of the SU Botanical Garden, the following phenorythmotype groups of deciduous, evergreen and semi-evergreen rhododendrons may be distinguished according to the average annual shoot increment: 1) of very small increment (up to 5 cm), 2) of medium increment (5.0–9.9 cm), 3) of large increment (10.0–14.9 cm) and of very large increment (deciduous 15.0–25.0 cm, evergreen 15.0–32.0 cm). The analysis of the research results has shown that large shoot growth is typical to deciduous, evergreen and semi-evergreen rhododendrons of the SU Botanical Garden every year.

Generative propagation of rhododendrons: seed germination and seedling development. The results of rhododendron generative propagation have shown that the seed germination of only some of rhododendron taxa may be really directly dependant on their calendar age. Practically all used experimental substrates are suitable for generative propagation of these plants, since rhododendron seed germination in all the substrates was fairly high (Fig. 3).

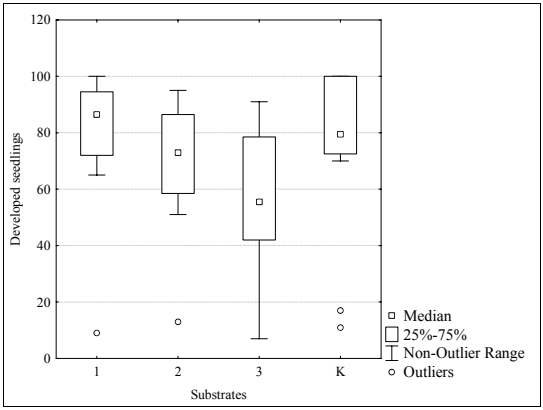

Fig. 3. Distribution of the studied rhododendrons by seed germination in experimental substrates: the first substrate – industrial with peat-moss additive; the second substrate – industrial with rotten oak leaves; the third substrate – industrial with pine needle additive; control substrate – industrial substrate without additives.

In all substrates, a very high seed germination was typical to *R. dauricum*, *R. insigne* Hemsl. et Wilson and *R. canadense* var. *album*, the poorest seed germination was shown by *R. schlippenbachii* Maxim. The conducted investigations lead to the statement that the optimum substrate for rhododendron seed germination and development of sprouted seedlings is the substrate with peat-moss additive. The control substrate is of similar nature. The results obtained during the generative propagation research have shown that there is direct dependence between the vitality and development of rhododendron seedlings and the type of the substrate.

The primary and the second recording of rhododendron seedlings have shown that the fastest development rates are typical to the seedlings of *R. canadense* var. *album*, *R.*

mucronulatum and *R. dauricum.* Whereas the lowest rate of development under the same conditions are characteristic to the seedlings of *R. maximum* L. and *R. smirnowii* Trautv. It is possible that seedling development of these rhododendrons was unfavourably affected by pathogen *Botrytis cinerea*. The research results have shown that the development rate of young deciduous rhododendrons growing under the same conditions is approximately three times faster than that of evergreen rhododendrons irrespective of the substrate nature. During the experiment, a part of rhododendron seedlings died due to unfavourable thermal conditions as well.

The rhododendron research results of several years have shown that the introduction of these ornamental plants in Lithuanian climatic conditions faces a number of problems, since these mountain-native bushes and shrubs need specific conditions of acclimatization, cultivation and care. The vitality of rhododendrons under growing conditions that are not very favourable may decrease rapidly; consequently, ornamental qualities of these plants are lost.

CONCLUSIONS

1. The rhododendron collection of the SU Botanical Garden which was started to be developed in 2001, consists of 76 evergreen, 11 semi-evergreen and 38 deciduous ornamental bushes and shrubs of 178 taxa and cultivars. Since 2003, 126 taxa and cultivars of rhododendron only of generative maturity were studied in different aspects. Specially designed tables for the description of rhododendron at Botanical Garden allowed highlight diagnostic features of introduced rhododendrons.
2. General condition of the collection of rhododendrons (app. 66 %) is very good. The main reasons for average or average-to-bad condition of rhododendrons are (a) not proper level of lighting; (b) annual injuries of vegetative and generative structures and (c) a young calendar age of the plants, determines a poor tolerance to winter frosts and a weaker flowering comparing with other rhododendrons which have reached generative maturity.
3. 80 % of rhododendrons of the collection are especially tolerant to winter frosts or almost do not suffer in winter, since their vitality indexes regain a normal level of development in one season of vegetation. Injuries of different types of leaves, annual shoot or generative structures are typical to app. 24 % of rhododendrons after almost every winter. During the late spring frosts when the soil surface temperature drops to app. –2.5 to –6.6 °C, every year generative buds or flowers of rhododendrons are injured. Such rhododendrons make app. 4 % of the collection.
4. 67 % of rhododendrons of the collection flower especially abundantly or abundantly every year. The main reasons for weak or unstable flowering of rhododendrons are mostly conditioned by the young calendar age of the plants and various reasons resulted from generative injuries of buds.
5. Ten taxa and cultivars of rhododendrons of the collection were characterized by re-flowering in the same season of vegetation, produced average or abundant generative structures.
6. 61 % of rhododendrons of the collection have prospects of being grown in different kinds of green plantations. Such plants have a high level of decorativeness and they are of good vitality, with especially abundant or abundant

vegetative and generative structures which after winter usually remain undamaged.

7. Researches, made at the SU Botanical Garden, have showed that the main phenorythmotype groups of rhododendron are distinguished by these indicators of seasonal development: 1) beginning, end and duration of the foliation; 2) beginning, end or duration of the flowering; 3) an average annual shoot increment.
8. Phenorythmotype groups of deciduous rhododendrons are distinguished by the indicators of average foliation duration: 1) short foliation (151–160 days), 2) medium foliation duration (161–170 days) and 3) long foliation (171–177 days). 60 % of deciduous rhododendrons of studied collection have medium foliation duration.
9. Phenorythmotype groups of rhododendron are also distinguished by the indicators of flowering duration: 1) short flowering duration (deciduous 11–15, evergreen and semi-evergreen 9–15 days), 2) medium flowering duration (deciduous, evergreen and semi-evergreen 16–25 days) and 3) long flowering duration (deciduous 26–34 days, evergreen and semi-evergreen 26–29 days). 59 % of deciduous and 75 % of evergreen and semi-evergreen rhododendrons of the collection have the medium flowering duration.
10. Phenorythmotype groups of rhododendron are distinguished by 1) very small (up to 5 cm long), 2) medium (5.0–9.9 cm), 3) large (10.0–14.9 cm) and 4) very large (deciduous- 15.0–25.0 cm, evergreen and semi-evergreen- 15.0–32.0 cm) average annual shoot increment. A large annual shoot increment is typical of 59 % of deciduous and 35 % of evergreen and semi-evergreen rhododendrons of the collection.
11. Results of generative reproduction showed that seed germination only of some rhododendrons is directly dependent on their calendar age. Seed germination of the majority of rhododendron was high or very high (61–100 %) in all used experimental substrates. Sprouts of rhododendron distinguished for the most rapid development in the substrate with peat-moss additive. Having identical substrate conditions, deciduous and semi-evergreen rhododendrons in all cases of their development pace almost three times excelled evergreen rhododendrons.

APPROBATION OF STUDY RESULTS

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1. MALCIŪTĖ A., NAUJALIS J. R., SVIRSKIS A., 2008: Resistance to low temperature of rhododendrons (*Rhododendron*) in the Botanical Garden of Šiauliai University in 2002–2007. – Notulae Botanicae Horti Agrobotanici Cluj-Napoca, **36(1)**: 59–62.
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1. MALCIŪTĖ A., NAUJALIS J. R., 2009: Rododendrų (*Rhododendron*) kolekcijų kai kurių biologinių rodiklių vertinimo kriterijai ir skalės. – Jaunųjų mokslininkų darbai, **3(24)**: 190–194.
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MALCIŪTĖ A., NAUJALIS J. R., 2010: Rododendrai dekoratyvinėje sodininkystėje. Vilnius.

ACKNOWLEDGEMENTS

I sincerely appreciate the assistance of the dissertation advisor prof. J. R. Naujalis in writing this paper and sharing his precious time for consultations and advice.

I would also like to thank sincerely the consultant of the dissertation assoc. prof. dr. I. Šaulienė and assoc. prof. dr. Z. Gudžinskas for help, valuable comments and continuous support.

I am grateful to the staff of VU GMF Botany and Genetics Department for valuable remarks and support in preparing this work.

SANTRAUKA

Darbas yra atliktas ŠU Botanikos sode 2003–2009 metais.

Darbo tikslas – atlikti ŠU Botanikos sodo rododendrų kolekciją sudarančių krūmų ir krūmokšnių sudėties, būklės vertinimo, sezoninės raidos ir generatyvinio dauginimo tyrimus.

Darbo uždaviniai: 1) sudaryti diagnostines lenteles, skirtas ŠU Botanikos sodo rododendrų taksonams ir veislėms apibūdinti; 2) įvertinti Botanikos sode augančių rododendrų bendrąją būklę; 3) įvertinti rododendrų pakantumą žemai ir neigiamai temperatūrai; 4) nustatyti rododendrų žydėjimo ypatumus pagal vizualinę skalę; 5) įvertinti rododendrų auginimo želdynuose perspektyvumą; 6) nustatyti rododendrų sezoninės raidos ypatumus; 7) atlikti rododendrų generatyvinio dauginimo tyrimus; 8) tyrimų duomenis kaupti ir apdoroti originalioje kompiuterinėje duomenų bazėje *Rododendrai*.

Ginami teiginiai. 1) Pagal rododendrų morfologinius požymius sukurtos specialios originalios apibūdinimo lentelės yra tinkamos šių introdukuotų krūmų ir krūmokšnių taksonams ir veislėms pažinti; 2) kolekciją sudarančių augalų būklės kasmetinis įvertinimas yra objektyvus introdukuotų rododendrų aklimatizacijos lygio rodiklis, leidžiantis prognozuoti šių dekoratyviniais tikslais auginamų krūmų ir krūmokšnių tolesnes auginimo perspektyvas; 3) vėlyvos pavasarinės šalnos yra vienas svarbiausių klimato veiksnių, mažinančių Lietuvoje auginamų rododendrų dekoratyvines savybes; 4) rododendrų skirstymas į fenoritmotipines grupes leidžia apibendrintai įvertinti šių augalų sezoninę raidą apibūdinančius rodiklius, rododendrų fenoritmotipinės grupės gali būti šių augalų įvairiapusiškesnio ir dekoratyviniu atžvilgiu patrauklesnio grupavimo kolekcijose ar želdynuose pagrindas; 5) substratas nėra pagrindinis rododendrų sėklų daigumo veiksnys, bet šių augalų daigų gyvybingumas ir jų raida tiesiogiai priklauso nuo substrato pobūdžio.

Darbo naujumas. Pirmą kartą Lietuvoje pristatyta mokslinių tyrimų pagrindu išnagrinėta rododendrų kolekcija. Darbe apibendrinti 2003–2009 metų tyrimų duomenys apie ŠU Botanikos sode auginamų rododendrų kolekciją sudarančių krūmų ir krūmokšnių būklės kasmetinius įvertinimus, šių augalų sezoninės raidos ypatumus ir fenoritmotipines grupes. Tokio pobūdžio rodikliai gali būti dekoratyviniais tikslais auginamų rododendrų grupavimo įvairiose kolekcijose pagrindas.

Darbe pateiktos specialios originalios lentelės, skirtos ŠU Botanikos sode auginamų rododendrų taksonams ir veislėms apibūdinti pagal krūmų ir krūmokšnių morfologinių požymių įvairovę.

Disertacijoje pristatytas atliktų tyrimų pagrindu sukurtas originalus bendros rododendrų būklės vertinimo sistemos variantas. Tokios sistemos panaudojimas moksliniams ir praktiniams dekoratyvinės sodininkystės uždaviniams spręsti turėtų leisti patikimai prognozuoti introdukuotų rododendrų auginimo galimybes Lietuvos želdynuose.

Darbe pateikta praktiškai išbandyta generatyvinio rododendrų dauginimo metodika, kurios pagrindu gali būti sėkmingai sprendžiamos rododendrų sėklų sudaiginimo ir tinkamo šių augalų daigų raidai substrato parinkimo problemos.

Rododendrų tyrimo duomenų analizė atlikta specialiai sukurtos kompiuterinės duomenų bazė *Rododendrai* pagrindu. Ateityje ši duomenų bazė galėtų tapti bendra tokio pobūdžio rododendrų tyrimus Lietuvoje jungiančia kompiuterine sistema.

Atliktų rododendrų tyrimų pagrindu parengta ir 2010 metais išleista A. Malciūtės ir J. R. Naujalio mokomoji knyga „Rododendrai dekoratyvinėje sodininkystėje“.

Mokslinė ir praktinė darbo reikšmė. Šiame darbe atlikta sistemingų rododendrų tyrimų analizė. Gauti tyrimų rezultatai jau leidžia padaryti tam tikrus apibendrinimus apie rododendrų introdukcijos Lietuvoje aktualias problemas.

ŠU Botanikos sode sukaupta rododendrų kolekcija vertinga ne tik moksliniu, rekreaciniu ir ekonominiu atžvilgiais, bet ir padeda propaguoti tinkamą požiūrį į rododendrus kaip dekoratyvinius augalus Lietuvoje. Tyrimų rezultatai gali tapti pagrindu, introdukuojant kitus rododendrų taksonus ir veisles.

Tyrimų rezultatai.

2001 metais pradėtą kurti ŠU Botanikos sodo rododendrų kolekciją sudaro 178-iems taksonams ir veislėms priklausantys dekoratyviniai krūmai ir krūmokšniai. Nuo 2003 metų įvairiais aspektais buvo tiriami tik biologinę brandą pasiekę generatyvinės būklės 32 rūšių, 2 porūšių, 7 varietetų ir 84 veislių višžaliai, pusiau višžaliai ir vasaržaliai rododendrai. Specialiai Botanikos sodo rododendrams pažinti sudarytos apibūdinimo lentelės leido išryškinti introdukuotų rododendrų diagnostinius požymius. Svarbiausi diagnostiniai požymiai, leidžiantys atskirti vienus rododendrų taksonus nuo kitų, yra žaliavimo tipas, lapų forma, ilgis, spalva, ašinių struktūrų plaukuotumo/pūkuotumo ar žvynuotumo apaugimo lygmuo, žiedų skersmuo, žiedų vainikėlių forma, spalva ir kuokelių ilgis.

Kolekciją sudarančių 66 % rododendrų bendroji būklė yra labai gera. Pagrindinės rododendrų vidutinės ar vidutinės–blogos būklės priežastys yra (a) ne visai tinkamas šviesos režimas; (b) kasmetinės vegetatyvinių bei generatyvinių struktūrų pažaidos ir (c) jaunas augalų kalendorinis amžius, sąlygojantis nepakankamą pakantumą žiemos šalčiams bei silpnesnį žydėjimą, lyginant su kitais generatyvinę brandą pasiekusiais rododendrais. Taigi, mikroklimato sąlygos neabejotinai turi itin didelę reikšmę ŠU Botanikos sodo rododendrų bendrajai būklei.

Apie 80 % kolekcijos rododendrų yra ypač pakantūs žiemos šalčiams arba žiemos metu beveik nenukenčia, kadangi jų gyvybingumo rodikliai normalų raidos lygį paprastai pasiekia per vieną vegetacijos sezoną. Įvairaus pobūdžio lapų, metūglių ar generatyvinių struktūrų pažaidos po kiekvienos žiemos būdingos 24 % višžalių rododendrų. Vėlyvųjų pavasarinių šalnų metu, kai dirvožemio paviršiuje temperatūra nukrinta nuo maždaug –2,5 iki –6,6 °C, kasmet pažeidžiami rododendrų (*R. dauricum*, *R. mucronulatum*, *R. forrestii* var. *repens* ‘Elviira’ ir *Rhododendron* ‘Praecox’) generatyviniai pumpurai ar žiedai. Tokių augalų kolekcijoje yra apie 4 %.

Rododendrų žydėjimo intensyvumas yra nepastovus ir kasmet kintantis. ŠU Botanikos sode 67 % rododendrų kasmet žydi itin gausiai ar gausiai. Pagrindinės silpno ar nestabilaus rododendrų žydėjimo priežastys yra nulemtos augalų jauno kalendorinio amžiaus ir dėl įvairių priežasčių atsirandančių generatyvinių struktūrų pažaidų. Tyrimų laikotarpiu visiškai nežydėjo tik *R. aureum*.

Tyrimų metais pakartotinis žydėjimas buvo būdingas dešimties taksonų ir veislių rododendrams. Atskirų rododendrų pakartotinis žydėjimas įtakos kitų metų generatyvinių struktūrų produkavimo intensyvumui neturėjo. Kitais metais pakartotinai žydėję rododendrai vėl produkavo gausias ar itin gausias generatyvines struktūras. Tik *R. ferrugineum* po pakartotinio žydėjimo kitais metais žydėjo vidutiniškai, tačiau to priežastis generatyvinių struktūrų pažaidos po žiemos. Beveik visada rododendrų pirminis žydėjimas buvo kelis kartus intensyvesnis už pakartotinį.

Kolekciją sudarančių 61 % rododendrų yra perspektyvūs auginti įvairaus pobūdžio želdynuose: augalai aukšto dekoratyvumo lygio, gero gajumo, su itin

gausiomis ar gausiomis vegetatyvinėmis ir generatyvinėmis struktūromis, kurios po žiemos paprastai išlieka nepažeistos.

ŠU Botanikos sode atlikti tyrimai parodė, kad pagrindinės rododendrų fenoritmotipinės grupės išsiskiria pagal šiuos sezoninės raidos rodiklius: 1) lapojimo pradžia, pabaiga ar lapojimo trukmė; 2) žydėjimo pradžia, pabaiga ar žydėjimo trukmė ir 3) vidutinis ūglių metinis prieaugis.

Kasmetinis vasaržalių rododendrų lapojimas paprastai prasideda gegužės pirmosiomis dienomis. Tarp tirtųjų vasaržalių rododendrų pagal sezoninio sulapojimo pobūdį išsiskiria 1) anksti lapojančių (127–129 metų dienos) ir 2) pusanksčiai lapojančių (130–134 metų dienos) fenoritmotipinės grupės. Dauguma tokių rododendrų visiškai sulapoja gegužės pabaigoje ar birželio pradžioje. Lapojimo pabaigos rodikliai rodo, kad anksčiausiai rododendrai lapus pradeda mesti spalio viduryje, paskiausiai – lapkričio pirmąjį dešimtadienį. ŠU Botanikos sode tarp vasaržalių rododendrų pagal lapojimo pabaigos rodiklius išsiskiria 1) anksti baigiančių lapoti (284–289 metų dienos), 2) pusanksčiai baigiančių lapoti (290–300 metų dienos) ir 3) vėlokai baigiančių lapoti (302–310 metų dienos) fenoritmotipinės grupės. Pagal vidutinės lapojimo trukmės rodiklius išsiskiria 1) trumpai lapojančių (151–160 dienų), 2) vidutinės lapojimo trukmės (161–170 dienų) ir 3) ilgai lapojančių (171–177 dienų) vasaržalių rododendrų fenoritmotipinės grupės. 60 % tirtosios kolekcijos vasaržalių rododendrų yra vidutinės lapojimo trukmės.

Anksčiausiai ŠU Botanikos sode pražysta pusiau visžaliai (*R. mucronulatum* ir *R. dauricum*) ir vasaržaliai (*R. canadense* ir *R. canadense* var. *album*) rododendrai. Paskiausiai žydėti kasmet pradeda *R. caucasicum*. ŠU Botanikos sode tarp rododendrų pagal žydėjimo pradžios rodiklius išsiskiria 1) ypač anksti žydinčių (vasaržaliai 118–129, visžaliai 102–129 metų dienomis), 2) anksti žydinčių (130–139 metų dienomis), 3) vėlokai žydinčių (vasaržaliai 140–159, visžaliai – 140–156 metų dienomis) ir 4) ypač vėlai žydinčių (vasaržaliai 160–165, visžaliai – 158–167 ar 187–211 metų dienomis) rododendrų fenoritmotipinės grupės. Pagal žydėjimo pabaigos rodiklius išsiskiria 1) ypač anksti baigiančių žydėti (vasaržaliai 132–139 dienomis, visžaliai – 110–144 metų dienomis), 2) anksti baigiančių žydėti (145–159 metų dienomis), 3) vėlokai baigiančių žydėti (160–178 metų dienomis) ir 4) ypač vėlai baigiančių žydėti (vasaržaliai 184–197, visžaliai – 180–196 ar 215–225 metų dienomis) rododendrų fenoritmotipinės grupės. Pagal žydėjimo trukmės rodiklius išsiskiria 1) trumpai žydinčių (vasaržaliai – 11–15, visžaliai ir pusiau visžaliai – 9–15 dienų), 2) vidutinės trukmės (vasaržaliai, visžaliai ir pusiau visžaliai 16–25 dienos) ir 3) ilgai žydinčių (vasaržaliai 26–34, visžaliai ir pusiau visžaliai – 26–29 dienos) rododendrų fenoritmotipinės grupės. 59 % tirtų vasaržalių ir 75 % visžalių ir pusiau visžalių rododendrų yra vidutinės žydėjimo trukmės.

Pagal vidutinį ūglių metinį prieaugį išsiskiria 1) labai mažo prieaugio (iki 5 cm ilgio), 2) vidutinio prieaugio (5,0–9,9 cm), 3) didelio prieaugio (10,0–14,9 cm) ir 4) labai didelio prieaugio (vasaržaliai – 15,0–25,0 cm, visžaliai ir pusiau visžaliai – 15,0–32,0 cm) rododendrų fenoritmotipinės grupės. 59 % vasaržalių ir 35 % visžalių bei pusiau visžalių kolekcijos rododendrų būdingas didelis metinis ūglių prieaugis.

Generatyvinio dauginimo rezultatai parodė, kad tik kai kurių rododendrų sėklų daigumas išties tiesiogiai gali priklausyti nuo jų kalendorinio amžiaus. Daugumos rododendrų sėklų daigumas visuose naudotuose eksperimentiniuose substratuose buvo aukštas ar labai aukštas (61–100 %). Sparčiausia raida pasižymėjo rododendrų daigai substrate su kiminų priedu. Žemiausi rododendrų pradmenų daigumo rodikliai būdingi substrate su pušies spyglių priedu. Identiškų substratų sąlygomis augantys vasaržaliai ir

pusiau višžaliai rododendrai savo raidos tempais visais atvejais beveik tris kartus lenkia višžalius rododendrus. Pagrindinės rododendrų daigų ir šios genties jaunų augalų žūties priežastys yra nepalankus temperatūrinis režimas ir patogeniniai organizmai. Rododendrų daigų raidą nepalankiai veikia patogenas *Botrytis cinerea*. Ypač neatsparūs šio patogeno neigiamam poveikiui yra *R. maximum* ir *R. smirnowii* daigai. Šio patogeno pažeistų rododendrų ūgliai išsausėjo, pernelyg anksti nukrito lapai ir galiausiai didžioji dauguma daigų žuvo. Dalis *R. schlippenbachii* ir *R. viscosum* daigų žūsta ir dėl nepalankaus temperatūrinio režimo.

ABOUT THE AUTHOR

Aurelija Malciūtė was born on 20 08 1982 in Kaunas. The author works as an assistant at the Department of Environmental Research at the Faculty of Natural Sciences of Šiauliai University and is a junior research assistant of the Botanical Garden of the same university.

In 2000, the author finished Rokiškis "Romuvos" gymnasium and in the same year started her studies at the Department of Environmental Research of the then Faculty of Physics and Mathematics of Šiauliai University. In 2004, the author acquired bachelor's degree in Ecology and Environmental Research. In 2004-2006, she continued her studies at Vilnius University Faculty of Natural Sciences in the master degree program of Botany studies. After graduation she acquired Master's degree in Biology.

Since 2002 the author has been conducting different investigations on the plants of rhododendron genus cultivated at the Botanical Garden of Šiauliai University.

A. Malciūtė has published 8 scientific articles on the topic of the dissertation in reviewed scientific publications of foreign countries and Lithuania. Together with prof. habil. dr. J. R. Naujalis has published a study book "Rhododendrons in Ornamental Gardening".

TRUMPOS ŽINIOS APIE AUTORĘ

Aurelija Malciūtė gimė 1982 08 20 Kaune. Šiaulių universiteto Gamtos mokslų fakulteto Aplinkotyros katedros asistentė ir to paties universiteto Botanikos sodo jaunesnioji mokslo darbuotoja.

2000 m. baigė Rokiškio „Romuvos" gimnaziją ir tais pačiais metais pradėjo studijas Šiaulių universiteto tuometinio Fizikos ir matematikos fakulteto Aplinkotyros katedroje. 2004 m. gavo ekologijos ir aplinkotyros bakalauro kvalifikacinį laipsnį. 2004–2006 m. tęsė studijas Vilniaus universiteto Gamtos mokslų fakulteto Botanikos studijų programos magistrantūroje. Baigusi studijas įgijo biologijos magistro kvalifikacinį laipsnį. Nuo 2006 m. studijuoja Vilniaus universiteto botanikos krypties doktorantūroje.

Nuo 2002 metų vykdo įvairaus pobūdžio tyrimus su rododendro genties augalais, auginamais Šiaulių universiteto Botanikos sode.

A. Malciūtė yra paskelbusi 8 mokslines publikacijas disertacijos tema recenzuojamuose užsienio ir Lietuvos moksliniuose leidiniuose. Taip pat kartu su prof. habil. dr. J. R. Naujaliu išleido mokomąją knygą „Rododendrai dekoratyvinėje sodininkystėje".