BIOMORPHOLOGICAL STRUCTURE OF ABOVE-GROUND PART OF EAST ASIAN SPECIES OF THE RHODODENDRON L. GENUS IN KIEV'S CONDITIONS

I. O. Sydorenko, associate professor

The results of the study of biomorphological structure of above-ground plant part of East Asian species of rhododendrons in Kyiv's conditions are given.

Life forms, biomorphological structure and ecological plasticity, ecobiomorph, species, rhododendron.

Morphological differences of plants are conditioned to species' environmental heterogeneity. Biomorphologically similar species are attributed to certain biologic types of plants called life forms. Study of plants' life forms begins with Theophrastus. He is the first who gave detailed description of separate plant species that belong to different groups ranging from trees and finishing with grass. These groups were the basis for the systematization of that period [7]. At the present day there are two main directions in geobotanics that differentiate plants' life forms: ecocoenotic introduced by C. Raunkiær [1] and the ecomorphological introduced by I. G. Serebriakov [8].

The main results of the structure the morphological formation of the Rhododendron L. and its ecological plasticity study belong to M. T. Masurenko [3, 4] A. P. Hohriakov [9, 10]. Different phases of ontogenetic development of various ecobiomorphes of rhododendrons during their growth in natural conditions are examined in these studies. Mixed type of growth of shoots such as sympodial-monopodial type in most of biomorphological types of rhododendrons, large variation and high plasticity of species in response to the reaction of adaptation to the environment are mentioned. For example, M. T. Masurenko [3] identifies four types of ecomorpf of *Rh. adamsii* Rehd., five of *Rh. mucronulatum, Rh aureum* Georgi, six of *Rh. sichotense* etc. Our research consists in the study of the morphological structure of a particular group of the Rhododendron L., notably East Asian species in Kyiv's conditions during the introduction experiment.

The purpose of the research is to determine the variety of forms' types of East Asian groups of Rhododendron L. species in Kyiv's conditions and possible changes in comparison with natural conditions of growth.

Materials and methods of the research. Research is conducted within the present collection material of the A.V. Fomin Botanical Garden, where this group of plants in Kyiv's conditions is represented most widely and slowly growing.

Analysis of the structure of this group of plants that have grown in a culture doesn't make it possible to fully consider the variety of types of forms within the same species, rather it is focused on classification of the presented collection of material for compliance with the various units of the classification units of certain types of plants' life forms and analysis of their similarities and differences with the types of life forms of these species in the natural conditions.

Results of the research. We found that due to the system of C. Raunkiær's life forms which is based on consideration of the position of bud recovery plants due to the soil surface, the East Asian species of rhododendrons belong to a type of evergreen and deciduous phanerophytes. There is a number among them that refers to an intermediate form that is between microphanerophytes (life forms of plants, which restoration buds are placed at a height of 2-8 m) and nanophanerophytes (life forms of plants restoration buds are placed at a height up to 2 m) up to nanophanerophytes [1].

According to I. G. Serebriakov's system of life forms [6, 8] all kinds of exotic East Asian Rhododendron from the A.V. Fomin Botanical Garden collection belong to phanerophytes and are in Kyiv's conditions belong to the type of bushes and shrubs. By-turn, collection's shrubs belong to the class of shrubs with completely lignified shoots, erecta (orthotropic) shrubs subclass; shoot generated in air shrubs group (with the above-ground axes branching that start close to the ground to form a more vertical or inclined axis, a transitional form between the trees and shrubs); subgroups loose shoot generated in air shrubs (close to small stem or shrubs-like trees) and pillowshaped shoot generated in air shrubs (with small, approximately the same increments for all the shoots and dense deployment

of skeletal axes and branches with more or less flat surface) and group of shoot generated in soil (plants with underground branching axes that form long-lasting lignified axis – ksylopodiy, from which thinner subaerial axis depart) [6, 8] (Pic. 1). The plants that would have belonged to a subclass of halfuprights and procumbent shrubs from East Asian collections of rhododendrons in Kyiv's conditions weren't found.

Plants collections belong to class of shrubs with lignified stems and to subclas erecta shrublets, shoot generated in air shrubs group, subclass pillowshaped shoot generated in air shrubs, that is notable for miniscule increments with densely placed axes and branches and more or less plane surface (Pic. 1).

Some morphometric parameters and groups of life forms with biomorphological structure of East Asian species of the A.V. Fomin Botanical Garden collection according to the I. G. Serebriakov's system [5] are given in the table. Most of the studied species are erecta shrubs, 36 of which refer to a type of loose shoot generated in air crumb, seven refer to the pillowshaped shoot generated in air type and two refer to the type of shoot generated in soil shrubs. From the three species of erecta shrubs one belongs to a group of loose shoot generated in air, two belong to pillowshaped shoot generated in air shrubs.

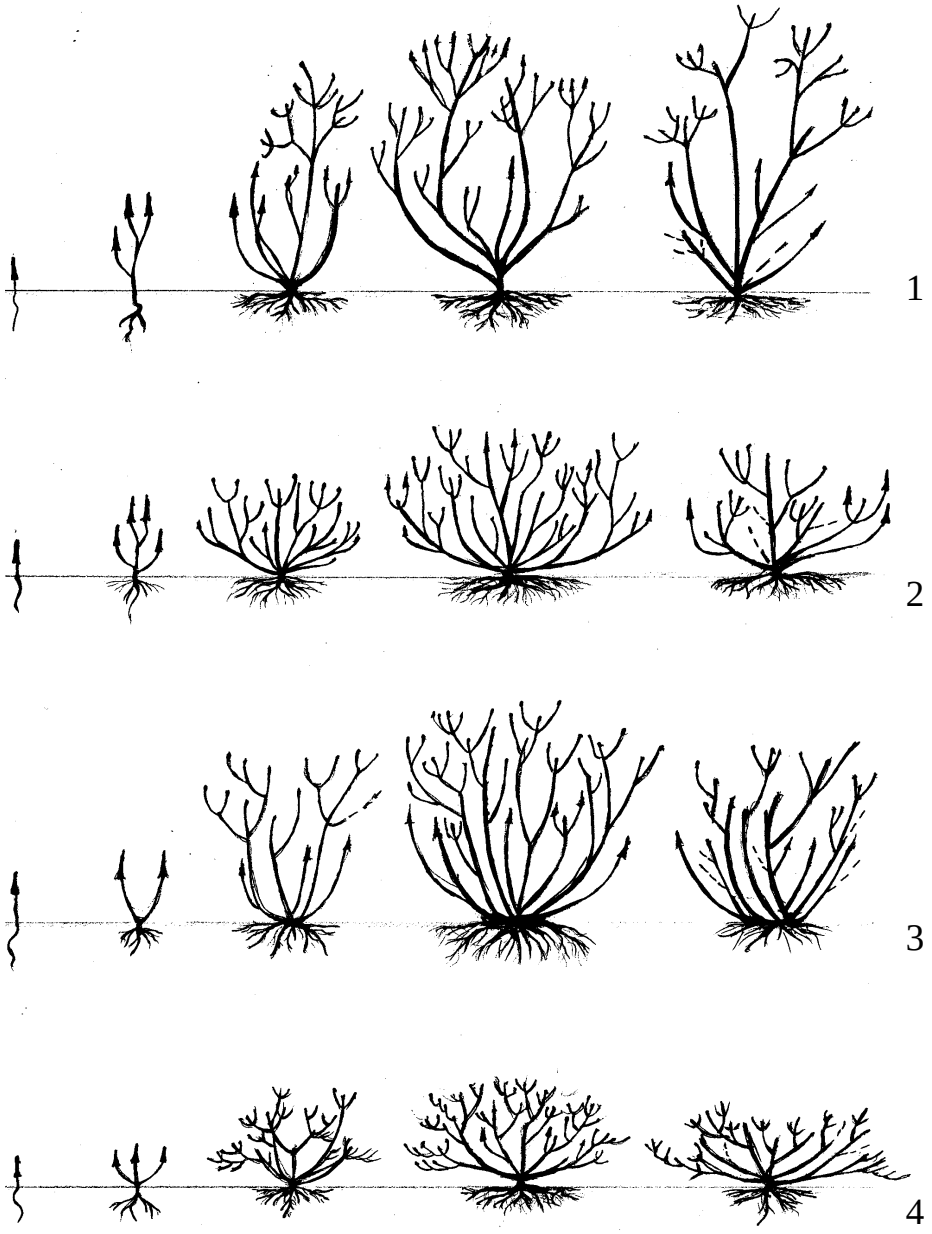

Fig. 1. The main stages of ontogeny different types of life forms rhododendrons (1 – loose shoot generated in air shrubs; 2 – pillowshaped shoot generated in air shrubs; 3 – shoot generated in soil shrubs; 4 – pillowshaped shoot generated in air shrublets)

All investigated species rhododendrons preserve their form of growth and provide regular increments, but some species (*Rh. davidsonianum, Rh. Desquamatum, Rh. Racemosum, Rh. Rubiginosum*) during adverse winter conditions lose their habitus due to icing of shoots. These types often renew their growth by dormant buds located in the lower parts of the crown. Some of them in

the next vegetation period give a fairly large increments of shoots and in the future develop more quickly subaerial parts, although the size they reach in nature, they can not reach in a culture. For example, *Rh. davidsonianum* in natural conditions reaches 250 cm, in collection at the age of 26 reaches up to 70 cm, *Rh. desquamatum* in natural conditions reaches 150cm, in collection at the age of 23 reaches up to 70 cm, *Rh. rubiginosum* in natural conditions reaches 100-200 cm collection at the age of 32 reaches up to 60 cm (see table).

However, there are specimens that after reaching maturity period currently already exceed the average size of plants developing natural conditions. This is especially true concerning alpine species of shrubs (*Rh. fastigiatum, Rh. Keleticum, Rh.impeditum*), for which culture conditions are more favorable than the Highlands' conditions (see table).

Some morphometric parameters and groups of life forms of East Asian species of the Rhododendron L. in Kyiv's conditions

Names of species	Age of plants	The diameter of the bush in a culture	The height of the bush in a culture	The height of the bush in the natural conditions	Type and subgroups of life forms (Serebriakov, 1964)
1. *Rh. albrechtii* Maxim.	34	210	190	100–150	Loose shoot generated in air shrubs
2. *Rh. ambiguum* Hemsl.	36	60	30	100–150	Loose shoot generated in air shrubs
3. *Rh. amesiae* Rehd. et Wils.	36	160	180	300	Loose shoot generated in air shrubs
4. *Rh. augustinii* Hemsl.	36	190	210	150–200	Loose shoot generated in air shrubs
5. *Rh.brachycarpum* D. Don ex G. Don	27	170	230	200–400	Loose shoot generated in air shrubs
6. *Rh. clementinae* Forrest.	26	160	180	100–200	Loose shoot generated in air shrubs
7. *Rh. cuneatum* W.W. Smith	28	60	70	100	Loose shoot generated in air shrubs
8. *Rh. dauricum* L.	27	200	230	50–200	Loose shoot generated in air shrubs
9. *Rh. davidsonianum* Rehd. et Wils	26	70	60	250	Loose shoot generated in air shrubs
10. *Rh. decorum* Franch.	23	40	50	200–300	Loose shoot generated in air shrubs
11. *Rh. desquamatum* Balf. f. et Forrest	23	70	90	150	Loose shoot generated in air shrubs

12. *Rh. discolor* Franch.	29	100	150	600	Loose shoot generated in air shrubs
13. *Rh. fargesii* Franch.	30	300	200	500	Loose shoot generated in air shrubs
14. *Rh. fastigiatum* Franch.	22	90	85	50	Loose shoot generated in air shrubs
15. *Rh. fortunei* Lindl.	29	220	220	300–400	Loose shoot generated in air shrubs
16. *Rh. impeditum* Balf. f. et W. W. Smith	24–27	70	30	30–60	Pillowshaped shoot generated in air shrublets
17. *Rh. insigne* Hemsl. et Wils.	36	290	340	100–400	Loose shoot generated in air shrubs
18. *Rh. japonicum* (A. Gray) Suring.	42	250	200	100–200	shoot generated in soil shrubs
19. *Rh. keleticum* Balf. f. et Forrest	24	60	30	15	Pillowshaped shoot generated in air shrublets
20. *Rh. ledebourii* Pojark.	28	300	220	50–125	shoot generated in soil shrubs
21. *Rh. metternichii* Sied. et Zucc.v	34	230	200	100–250	Loose shoot generated in air shrubs
22. *Rh. micranthum* Turcz.	26	180	110	250	Loose shoot generated in air shrubs
23. *Rh. molle* (Blume) G. Don	23	220	260	100–300	shoot generated in soil shrubs
24. *Rh.mucronulatum* Turcz.	35	220	230	100–300	Loose shoot generated in air shrubs
25. *Rh. mucronulatum* Turcz. var. Pentamerum Nakai	25	240	170	100–300	Loose shoot generated in air shrubs
26. *Rh. orbiculare* Decne.	23	250	150	200–300	Loose shoot generated in air shrubs
27. *Rh. oreotrephes* W.W. Smit	20	120	110	150	Loose shoot generated in air shrubs
28. *Rh. poukhanense* Levl.	38	120	90	60–100	Pillowshaped shoot generated in air shrubs
29. *Rh. quinquefolium* Bisset et Moore	20	40	50	500	Loose shoot generated in air shrubs
30. *Rh. racemosum* Franch.	26–32	90	30	50–100	Loose shoot generated in air shrubs
31. *Rh. rubiginosum* Franch.	32–29	50	60	100–200	Loose shoot generated in air shrubs
32. *Rh. schlippenbachii* Maxim.	35	300	280	500	Loose shoot generated in air shrubs
33. *Rh. searsiae* Rehd. et Wils.	37	80	60	500	Loose shoot generated in air shrubs
34. *Rh. sichotense* Pojark.	35	300	220	200	Loose shoot generated in air shrubs
35. *Rh. simsii* Planch.	38	90	80	300	Pillowshaped shoot generated in air shrubs

36. *Rh. souliei* Franch.	23	60	50	100–250	Loose shoot generated in air shrubs
37. *Rh. sutchuenense* Franch.	36	180	140	200–300	Loose shoot generated in air shrubs
38. *Rh. wardii* W.W. Smith	32	220	190	500	Loose shoot generated in air shrubs
39. *Rh. williamsianum* Rehd. et Wils.	25	150	80	50–150	Loose shoot generated in air shrubs
40. *Rh. yedoense* Maxim.	38	250	140	100	Pillowshaped shoot generated in air shrubs

An important factor in the formation of above-ground parts of the plant is magnitude and regularity of growth of shoots. In the evaluation of the result of introduction according to [2] it is observed that the regularity of growth indicates the normal passage of plant adaptation processes, and its magnitude indicates the preservation of inherent plant growth forms. However, as can be seen from the analysis above, this is not a major factor because plants damaged by winter conditions also give growth, but this growth of some species that have suffered the extensive damage is not sufficient for full plant's recovery of the habitus even in later years. In Kyiv's conditions all investigated species of rhododendrons provide regular increments, the magnitude of which depends on the individual peculiarities of species and on belonging to certain groups of life forms and environmental conditions of the year.

Conclusions

Thus, it is found that the I. G. Serebriakov's system of life forms all kinds of exotic East Asian rhododendrons collections from the A.V. Fomin Botanical Garden KNU belong to phanerophytes: loose and pillowshaped shoot generated in air shrubs, orthotropic shrubs and shrublets and shoot generated in soil shrubs.

Some species such as R*h. davidsonianum, Rh. desquamatum*, *Rh. rubiginosum* in natural conditions reach much larger sizes, as in Kyiv city they suffer from severe freezing, but by active regrowth of shoots they recover and preserve vital form.

Species whose natural habitat is the alpine meadows, such as pillowshaped shoot generated in air shrubs *Rh. fastigiatum* and pillowshaped shoot generated in air shrublets *Rh. keleticum, Rh. impeditum* exceed size of that plants that develop in natural conditions without changing the structure of the subaerial parts.

References

1. Григора І. М. Геоботаніка: Навчальний посібник / І.М. Григора, Б. Є. Якубенко, М. Д. Мельничук. – К.: Арістей, 2006. – 448 с.
2. Лапин П.И. Оценка перспективности интродукции древесных растений по данным визуальных наблюдений / П. И. Лапин, С. В. Сиднева // Опыт интродукции древесных растений. – М.: Изд. Главн. бот. сада АН СССР. – 1973. – С. 7–67.
3. Мазуренко М. Т. Рододендроны Дальнего Востока, структура и морфогенез / М. Т. Мазуренко. – М.: Наука, 1980. – 232 с.
4. Мазуренко М.Т. Структура и морфогенез кустарников / М.Т. Мазуренко, А.П. Хохряков. – М.: Наука, 1977. – 160 с.
5. Серебряков И. Г. Морфология вегетативных органов высших растений / И. Г. Серебряков – М.: Советская наука, 1952. – 391с.
6. Серебряков И. Г. Экологическая морфология растений / И. Г. Серебряков. – М.: Высшая школа, 1962. – 378 с.
7. Серебряков И. Г. Жизненные формы высших растений и их изучение / И. Г. Серебряков. – В кн.: Полевая геоботаника. – М.-Л.: Наука, 1964. – Т. 3. – С. 146–208.
8. Хохряков А. П. Направления эволюции форм роста растений в экстремальных условиях / А. П. Хохряков. – В кн.: Почвы и растительность мерзлотных районов СССР. – Магадан: ДВНЦ АН СССР, 1973. – С. 225–233.
9. Хохряков А. П. Эволюция биоморф растений / А. П. Хохряков. – М.: Наука, 1981. – 168 с.