

REPUBLIC OF AZERBAIJAN

On the rights of the manuscript

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy in Biology

**ECOBIOLOGICAL, PHYTOCENOLOGICAL
CHARACTERISTICS AND PROSPECTS OF USE OF WOODY
SPECIES OF THE ROSE FAMILY (*ROSACEAE* JUSS.)
DISTRIBUTED IN MOUNTAIN-XEROPHYTE AND STEPPE
VEGETATION OF NAKHCHIVAN AUTONOMOUS
REPUBLIC**

Specialty: 2417.01 – Botany

Field of science: Biology

Applicant: **Safura Rahim Babayeva**

Baku – 2023

The dissertation work was performed at the Department of Biology of Nakhchivan State University.

Scientific supervisor:

Doctor of biological sciences, associate professor
Dashgin Shahbaz Ganbarov

Official opponents:

Doctor of biological sciences, associate professor **Aydin Musa Askarov**

Doctor of biological sciences, associate professor **Anvar Mehti Ibrahimov**

Doctor of philosophy in biology, associate professor
Abbas Haji Ismayilov

Dissertation council of ED1.26 of the Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at the Institute of Botany, Ministry of Science and Education of the Republic of Azerbaijan.

Chairman of the
Dissertation Council:

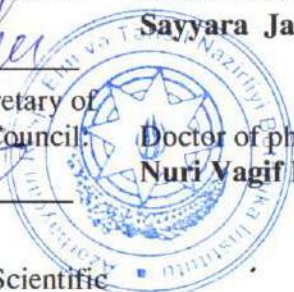
Doctor of Biological Sciences, Professor
Sayyara Jamshid Ibadullayeva

Scientific secretary of
Dissertation Council:

Doctor of philosophy in biology
Nuri Vagif Movsumova

Chairman of Scientific
Seminar:

Doctor of Biological Sciences, associate professor **Naiba Pirverdi Mehdiyeva**



INTRODUCTION

Relevance and degree of development of the topic. The geographical location, relief, unique flora of the Nakhchivan Autonomous Republic has developed its richness and diversity over time. Unlike other botanical and geographical regions of Azerbaijan, the vegetation of the mountainous zone of the Nakhchivan MR is richer. The rich xerophytic flora of the region historically developed in a close genetic relationship with the flora of Western Asia, the Mediterranean Sea and Iran, which led to a clear division of the vegetation into distinct zones. Since the ancient times, a number of botanists, florists, in their studies of plant diversity in the area, the main goal was to introduce new taxa to the local flora and to study the useful properties of a number of different species, genera and families.

Human material and spiritual needs are closely related to the environment. The constant increase of anthropogenic factors, as well as the drastic change of environmental conditions, have led to the narrowing of the range of many species of cultivated and wild plants, and some of them are in danger of extinction and disappearance. Wild and cultivated plant biodiversity has been constantly affected by anthropogenic and environmental influences. People destroy the habitats of plants for various purposes, stop the natural recovery by intensive mowing in the meadows around the forests and forest glades, and keep livestock in excess of the norm in the hayfields and pastures, which are the main fodder of livestock, and as a result, the vegetation is destroyed and the soil becomes saline and degraded.

In such areas, the composition of the plant groups of meadows, forests, and pastures changes, and their place is replaced by poisonous, harmful, and weed plants of secondary importance. As a result, rare and endemic species are destroyed ^{1,2}.

¹ Talıbov, T.H., İbrahimov, Ə.Ş., İbrahimov, Ə.M. Naxçıvan Muxtar Respublikasının bitki örtüyü //– Naxçıvan: Əcəmi NPB, Naxçıvan Muxtar Respublikasının coğrafiyası. Fiziki coğrafiya. – 2017. – s. 332-352.

² Seyidov M., Şahbuz Dövlət Təbiət Qoruğunun flora və bitkiliyi / M.Seyidov, S.İbadullayeva, H.Qasımov [və b.]. -Naxçıvan: Əcəmi NPB, -2014, -524 s.

Therefore it is considered important to reveal the taxonomic composition, bioecological characteristics, life forms, botanical-geographical analysis and distribution by altitude zones of the woody species of the rose family distributed in the territory of the autonomous republic. Also, it is planned to carry out research in order to investigate the modern typological and phytocenological composition of vegetation types, to study the modern status of rare and endangered species, their effective use and ways to protect them.

The object and subject of the research. The object of the research is the woody species of the rose family, distributed in mountain-xerophytic and steppe vegetation of the flora of the Nakhchivan Autonomous Republic. Its subject is to determine the taxonomic composition of the studied genera and to study the perspective of use.

Purpose and objectives of research. The main purpose of the research is to find out the species composition of the woody plants of the rose family distributed in Nakhchivan AR, their role in the vegetation type, distribution patterns in the mountain-xerophyte and steppe vegetation, the distribution of the studied species across altitude zones, as well as development of recommendations the collection, efficient use and protection of the gene pool.

In order to achieve the stated goal, the following tasks have been set:

- Determining the taxonomic structure of the woody species of the *Rosaceae* family distributed in the mountain-xerophyte and steppe vegetation of Nakhchivan AR;
- Systematic structure of genera and species and analysis of their bioecological characteristics;
- Botanical-geographical analysis of studied species;
- Distribution of species by altitude zones;
- Study of the structure and phytocenological characteristics of some populations;
- Collection and protection of the gene pool of the studied species;
- Study of the useful properties of species and new ways to use them.

Research methods. A number of modern botanical and classical methods were used during the research. Determination of life forms, identification of geographical elements, areal types, distribution

patterns of the plant in zones, natural conditions of habitats where species spread and the phytocenoses, formations, associations formed by them using experimental methods have been studied.

Main provisions put on defense:

- It is necessary to develop a systematic analysis and conspectus of woody species of the *Rosaceae* family, distributed in the mountain-xerophyte and steppe vegetation in Nakhchivan AR;
- Determination of plants with rare status in the studied species is considered important;
- Modern typological and phytocenological investigation in vegetation types of species is of great importance;
- Determination of the useful properties of the studied species create basis for their use;

Scientific novelty of the study. As a result of the conducted research, for the first time, the taxonomic spectrum of the woody species of the *Rosaceae* family distributed in the mountain-xerophytic and steppe vegetation of Nakhchivan AR was clarified, and a conspectus of 79 species belonging to 12 genera of 1 family was developed.

For the first time, the new areals of the studied species for the region flora were studied and the diapozone of distribution in the area was determined by altitude zones.

The areal types and phylogeny of the studied species were studied, and the areal classes and groups of those species were determined.

For the first time, 4 formation classes, 13 formations, 39 associations and 12 subassociations were determined in the mountain-xerophyte and steppe vegetation of the woody species of the *Rosaceae* family and a phytocenological classification of the vegetation was presented. Also, for the first time, subassociation was used as a unit in vegetation.

Theoretical and practical significance of the research. The species composition of the woody plants of the *Rosaceae* family distributed in the territory of Nakhchivan AR is an important scientific basis for the disclosure of distribution patterns in mountain-xerophyte and steppe vegetation.

Research materials and obtained results can be used in the compilation of regional "Flora", monographic collections, complex programs for environmental protection, practical measures for the protection of rare and endangered species, and solving ecological-geographical problems of plant systematics.

The materials of the research can be used in the teaching of students of Botany, Biology, Biology-teaching, Master's programme and faculty specialties, as well as in the determination of the flora biodiversity of Nakhchivan AR and in the compilation of determinants.

Approbation and application. The main results were reported at International conference on "Actual problems of modern natural sciences" dedicated to the 97th anniversary of national leader Heydar Aliyev (Ganja-2020); at the international conference "Concept, theory and methodology of fundamental and applied scientific research" (Russian-2021); at the international scientific conference "Materials of the VII Republican Scientific Resources Conference" (Baku-2022), at the Department of Biology of Nakhchivan State University; in seminars on the results of the scientific-research works held in the Scientific Council of the faculties (2019-2022), also, in the seminar council of the Institute of Botany of Azerbaijan NAS.

On dissertation work ten scientific articles, three theses (5 articles, 2 theses in Azerbaijan, 2 articles in India, 3 articles, 1 thesis in Russian) were published.

The organization where the dissertation work is carried out. The dissertation work was carried out at the Department of Biology of Nakhchivan State University.

The structure and volume of dissertation. The dissertation consists of the introduction (7979 characters), 6 chapters (Chapter I-16164 characters, Chapter II-4096 characters, Chapter III-32311 characters, Chapter IV-102712 characters, Chapter V-55514 characters, Chapter VI-26842. characters), main results (2199 characters), proposals and recommendations (958 characters), list of references with 142 titles. The dissertation consists of 194 pages, including 12 tables, 4 schemes, 1 map and 55 (with appendices) figures.

I CHAPTER. THE HISTORY OF THE STUDY OF WOODY SPECIES OF THE *ROSACEAE* FAMILY IN THE NAKHCHIVAN AUTONOMOUS REPUBLIC

The research studies in the direction of studying the woody species of the *Rosaceae* family, distributed the world and the mountain-xerophyte and steppe vegetation of Nakhchivan AR, were comparatively analyzed and reflected in the dissertation work.

II CHAPTER. RESEARCH MATERIAL AND METHODOLOGY OF

Since 2019, the study of woody species of the family *Rosaceae* has been started in the territory of Nakhchivan AR. In order to determine the taxonomic composition of woody species of the family in the territory of the region, expeditions were organized and herbarium specimens were collected, and on the basis of which the species was determined.

In determining species, clarifying their names and nomenclature changes were done using the works of A.M.Asgarov "The plant World of Azerbaijan" (2016), T.H.Talibov, A.Sh.Ibrahimov "Taxonomic spectrum of flora of Nakhchivan AR" (2021), "Flora of Azerbaijan" (1954), "Flora of the USSR" (1946), S.K.Chهرانov (1995) and A.A. Grossheim "Analysis of the flora of the Caucasus" (1952)^{3,4}. In the classification of the vegetation, the principles of ecological-phytocenological, dominance were taken as a basis and the methodology by V.V.Alyoxin and the works by R.D.Yaroshenko (1967), A.R.Shennikov (1950, 1964), B.A.Bikov (1960, 1962, 1965), L.I.Prilipko (1939, 1970), A.Sh.Ibrahimov (2013) and other researchers were used. Methods of V.V.Alyoxin (1950), G.I.Poplavskaya (1948), G.N.Visochiski (1909) and V.N.Sukachev (1945) were taken as the basis in the study of the subassociations^{5,6}.

³ Флора Азербайджана: [в 8 томах]. – Баку: Азерб. ССР, – т. 5. – 1954. – с. 28-196.

⁴ Флоры Кавказа: [в 5 томах] Москва, –1952. – с. 7-140.

⁵ Алехин, В.В. География растений (основы фитогеографии, экологии и геоботаники). / В.В. Алехин, -М.: Учпедгиз, –1950, - с. 420.

⁶ Сукачев, В.Н. Биогеоценология и фитоценология // Докл. АН СССР. –1945. Т. 47, № 6. -с. 447–449.

Division by C.R.Raunkiaer (1934), I.G.Serebryakov (1964) was used in the determination of the life forms of plants, A.A.Grossheim (1939) and N.N.Portenier (2000) schemes etc. in the identification of geographical elements and areals types ⁷.

III CHAPTER. FLORISTIC ANALYSIS OF WOODY SPECIES OF THE *ROSACEAE* FAMILY

As a result of the processing of literature data and personal field research materials, the woody species of the *Rosaceae* family in the territory of Nakhchivan AR are characterized by 79 species belonging to 12 genera of 1 family ⁸.

Table 1.
Analysis of woody species included in the family *Rosaceae* on the genera

№	Genera	Number of species	According to the total number, in %
1	<i>Amelanchier</i> Medik.- Shadbush	1	1,26
2	<i>Cotoneaster</i> Medik.- Cotoneaster	5	6,32
3	<i>Crataegus</i> L.- Hawthorn	13	16,45
4	<i>Louiseania</i> Carr.- Louiseania	1	1,26
5	<i>Malus</i> Mill.-Apple	1	1,26
6	<i>Prunus</i> L.- Plum	8	10,12
7	<i>Pyracantha</i> M.Roem.- Pyracantha	1	1,26
8	<i>Pyrus</i> L. – Pear	9	11,39
9	<i>Rosa</i> L.- Rosehip	29	36,70
10	<i>Rubus</i> L.- Blackberry	3	3,79
11	<i>Spiraea</i> L.- Spirea	2	2,53
12	<i>Sorbus</i> L. – Mountain ash	6	7,59
TOTAL:		79	100

When the woody species included in the *Rosaceae* family of the studied area were characterized by genus, it was found that there are

⁷ Портениер, Н.Н. Система географических элементов флоры Кавказа // – Ленинград: Ботанический журнал, – 2000, №9, – с. 26-33.

⁸ Babayeva, S.R. Naxçıvan Muxtar Respublikasının Gülçiçəklilikimilər (*Rosaceae*) fəsiləsinin oduncaqlı növlərinin taksanomik tərkibi // Naxçıvan Dövlət Universiteti, Elmi Əsərlər Təbiət və Tibb Elmləri Seriyası, -2020. №3 (104), s. 56-60.

29 (36,70%) species of *Rosa*, 13 (16,45%) of *Crataegus*, 9 (11,39%) of *Pyrus*, 8 (10,12%) of *Prunus*, 6 (7,59 %) of *Sorbus*, 5 (6,32%) of *Cotoneaster*, 3 (3,79%) of *Rubus*, 2 (2,53%) of *Spiraea* genus. The remaining genera are monotypic and are represented by 1 (1,26%) species each.

Life forms are an inherited external appearance that demonstrates the adaptation of different species to similar conditions under the influence of environmental factors. The classification of life forms was based on the structure of vegetative organs and reflects parallel, convergent paths of ecological evolution.

Taking into account the above, the woody species included in the family of *Rosaceae* in the studied area can be grouped into 3 subtypes of phanerophytes.

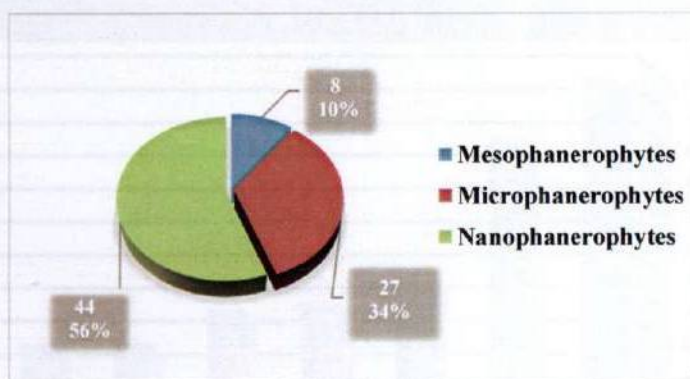


Figure 1. Life forms of woody species included in the family of *Rosaceae*

Mesophanerophytes. They are trees with a height of 8-30 m. This subtype includes *Pyrus syriaca*, *P.voronovii*, *P. oxyprion*, *P. salicifolia*, *P. medvedevii*, *P. georgica*, *Crataegus cinovskisii*, *Prunus divaricata* of the woody species included in the family of *Rosaceae*.

Microphanerophytes. They are trees and shrubs with a height of 2-8 m. In the territory of Nakhchivan AR, this subtype includes species such as *Pyrus raddeana*, *P. megrica*, *P. acutiserrata*, *Sorbus persica*,

S. greace, *S. luristanica*, *S. turcica*, *S. roopiana*, *S. takhtajanii*, *Crataegus armena*, *C. orientalis*, *C. meyeri*, *C. caucasica*, *C. pseudoheterophylla*, *C. szovitsii*, *Rosa multiflora*, *R. corymbifera*, *P. mahaleb* etc.

Nanophanerophytes. Shrubs with a height of less than 2 m. This subtype includes species such as *Amelanchier ovalis*, *Cotoneaster melanocarpus*, *C. integerrimus*, *C. multiflorus*, *Pyracantha coccinea*, *Crataegus zangezura*, *Rubus ibericus*, *R. caesius*, *R. anatolicus*, *Prunus microcarpa*, *P. araxina*, *P. incana*, *Spiraea crenata*, *S. hypericifolia*, *Rosa canina*, *R. teberdensis*, *R. floribunda*, *R. boissieri*, *R. tomentosa*, *R. orientalis*, *R. villosa*.

Figure 2 reflects the distribution of woody species included in the family of *Rosaceae* according to altitude zones.

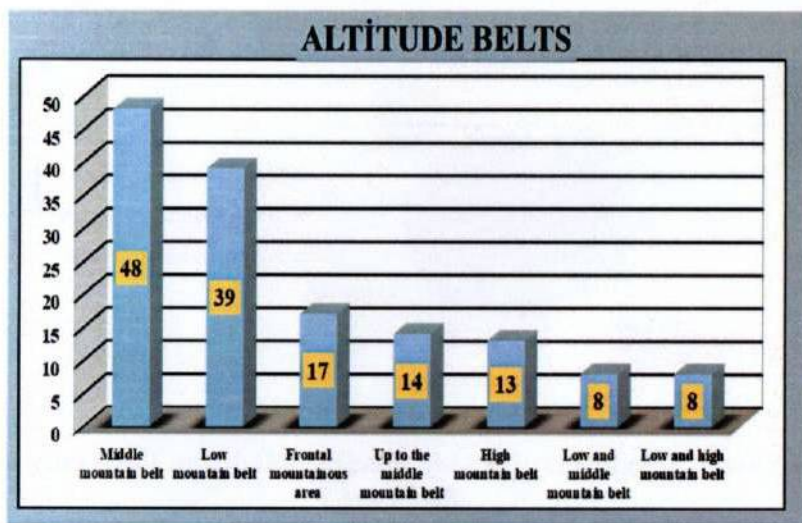


Figure 2. Distribution of woody species included in the family *Rosaceae* on altitude zones

It was revealed that, 8 (10.12%) species are found in the lower and middle mountainous belt, 8 (10.12%) in the low-mountainous and high-mountainous zone, 13 (16.45%) in the high-mountainous zone, 14 (17.72%) up to the middle mountain belt, 17 (21.51%) in front

highland, 39 (49.36%) in the lower mountainous belt and 48 (60.75%) in the middle mountainous belt.

Depending on the need for water, plants are divided into several different ecological groups. The distribution of woody species of the *Rosaceae* family of Nakhchivan AR by ecological groups was carried out according to Shennikov's classification system⁹.

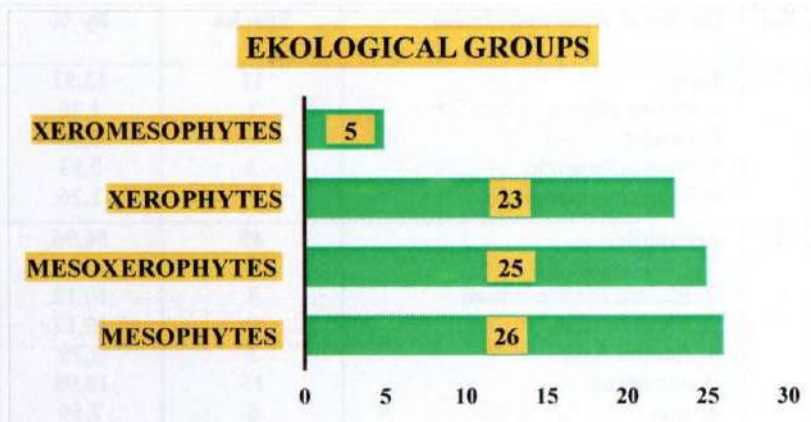


Figure 3. Ecological groups of woody species of the *Rosaceae* family

Mesophytic species includes species such as *Amelanchier ovalis*, *Malus orientalis*, *Crataegus cinovscisii*, *Rosa corymbifera*, *R. foetida*, *R. nisami*, *Prunus divaricata*, *P. communis*, *Sorbus graeca*, etc., mesoxerophytes - *Crataegus meyeri*, *C. pontica*, *Rosa buschiana*, *R. sosnovskyana*, *Pyrus raddeana*, *Spiraea crenata*, *S. hypericifolia* etc., xeromesophyte woody species *Crataegus caucasica*, *C. eriantha*, *Rosa tuschetica*, *Sorbus luristanica*, *S. takhtajanii* etc., xerophytic woody species-*Cotoneaster integerrimus*, *C. suavis*, *Crataegus zangezura*, *Prunus araxina*, *P. fenzliana*, *P. nairica*, *Rosa hracziiana*, *R. orientalis*, *Pyrus oxyprion*.

⁹ Babayeva, S.R. Naxçıvan Muxtar Respublikası florasında yayılan Gülçiçəklilər fəsiləsinin oduncaqlı növlərinin floristik təhlili // -Gənçə: Azərbaycan Texnologiya Universiteti, Elmi xəbərlər, -2022, № 1/38, -s. 177-187.

The table below gives the analysis of the woody species of the *Rosaceae* family based on zonal and regional principles on 5 geographical areal types and 15 areal classes ¹⁰.

Table 2.

Distribution of woody species of the family *Rosaceae* by geographical areal types

No.	The Areal types and classes	Species	By %
1	Boreal	11	13,92
	1. Paleoarctic	1	1,26
	2. Europe	7	8,86
	3. West poleoarctic	2	2,53
2	4. Southern poleoarctic	1	1,26
	Xerophile	45	56,96
	1. Meditterrian sea	1	1,26
	2. Eastern Mediterranean	8	10,12
	3. Western Asia	8	10,12
	4. Central Asia	3	3,79
	5. Atropatan	15	18,98
6. Iran	6	7,59	
3	7. Asia Minor	4	5,06
	Desert	2	2,53
4	1. Eastern Pont	1	1,26
	2. Pontic Sarmat	1	1,26
5	Caucasus	12	15,18
	1. Alban	2	2,53
5	2. Caucasus	10	12,65
	Unknown	9	11,39
Total:		79	100

Among the woody species of *Rosaceae* plants, xerophilous flora species represent 59.49% of the total plants. Mediterranean group makes up (1 species) 1.26%, East Mediterranean group (8) 10.12%,

¹⁰ Ganbarov, D.Sh., Babayeva, S.R. Systematical structure geographical areal classes and ecological groups of *Rosa* L. genus spreading in the flora Nakhchivan Autonomous Republic // Bulletin of Science and Practice, -2020, v.6., is.6, s. 55-60.

Western Asia (8) 10.12%, Atropatan (15) 18.98%, Iranian group (6) 7, 59%, Asia Minor (4) 5.06%, Central Asia (3) 3.79%. Some species included in this type are important in the formation of local flora.

IV CHAPTER. THE METHOD OF DETERMINING THE WOODY SPECIES OF THE FAMILY *ROSACEAE* IN MOUNTAIN-XEROPHYTE AND STEPPE VEGETATION OF NAKHCHIVAN AUTONOMOUS REPUBLIC AND ITS BIOECOLOGICAL FEATURES

Considering the regional characteristics of Nakhchivan Autonomous Republic, this chapter of the dissertation provides wide information on the botanical description of the woody species of the *Rosaceae* family, their growing place, bioecological characteristics and geographical distribution. For each species distributed in the area, the main synonyms, names in Latin and Azerbaijani languages are given, and the determination key is defined. Within genera, species are listed in alphabetical order.

V CHAPTER. PHYTOCENOLOGICAL CHARACTERISTICS OF THE WOODY SPECIES OF THE *ROSACEAE* FAMILY IN THE MOUNTAIN-XEROPHYTE AND STEPPE VEGETATION OF NAKHCHIVAN AUTONOMOUS REPUBLIC

If the territory of the region is considered both horizontally and vertically, it is noticeable that in the areas higher than 1500 m above sea level, mountain-steppe-type formations gradually develop mixed with shrub vegetation. In fact, the composition of this type of vegetation gradually changes and diversifies with the influence of the existing ecological conditions of the area as it rises to the altitude. Most of the time, its composition manifests itself in the form of a mixture of two main typological components-shrub and steppe elements. In fact, in this zone, both components are in direct contact as a whole, and there is always a unique "introduction" dynamic between the shrub and steppe plants. On this basis, large ecological-geographical groups consisting of typical steppe shrubs, dwarf shrubs and grasses forming the shrub-steppe complex were formed. Shrub

vegetation formed with the edificator of the woody representatives of the Rose family are common in the form of small fragments in river valleys and ravines in the composition of mountain xerophyte, steppe and shrub vegetation.

A large number of researches have been devoted to the study of the composition, structure and dynamics of vegetation cover. However, little attention has been paid to the characteristics of mountain-xerophytic and steppe shrubs. Be it shrub vegetation, shrubwood around the forest, or steppe vegetation, it is obvious that the basis of the main shrub elements of each shown phytocenosis is formed by the woody elements belonging to the family *Rosaceae*. As a result of the conducted research, the analysis of the distribution of 79 species of woody species belonging to the family *Rosaceae* showed that the most widespread shrub plants in the studied area are the species that are the edificators of shrub formations in the typical mountain steppe vegetation. These species include *Prunus*, *Spiraea*, *Crataegus*, *Rosa* and, to a lesser extent, *Pyrus* species. Due to these specified species, *Sorbus*, *Malus*, *Cotoneaster* and other species are rare. Mesoxerophilic shrubs such as *Rubus* and *Amelanchier* are less common. From this point of view, it is considered appropriate to study the woody species belonging to the *Rosaceae* family in the composition of the shrub vegetation of the region, as well as to determine the role of these plants in the composition of the shrub vegetation of the region. During the study, the separation of formations in the shrub vegetation was carried out according to the dominant species that make up the main tier (solid, layer). Dominant species are species that participate in the grouping by 50% or more. Species with 10% participation are considered as subdominants, and other species as assectors. Within associations in plant groupings, subassociations were found and distinguished. The selection of these categories is carried out in order to reflect the dynamic processes in the groupings, and the variability of species composition and ecological characteristics was taken into account when defining sub-associations within the groupings. Subassociations are defined based on the secondary subdominants included in the association. In this case, a different ecological version of the association is taken as the basis, which is the internal taxonomic

unit of the association. When determining the taxonomic variants, the closure of the layers, the average age of trees and shrubs were considered. In order to more accurately and clearly characterize the general characteristic of shrub vegetation, we preferred to indicate subassociations that differ in ecological, edaphic and other characteristics in their composition to show more prominently the common features of individual associations. By using the different features shown and based on some regularities, we could distinguish several subassociations that replace each other within an association.

The shrub vegetation type of the studied area was divided into 4 classes according to the groupings they formed, and within these classes, the formation, association, and sub-associations given by us for the first time, formed by the woody species of the *Rosaceae* family were studied. These classes are defined as follows:

1. Shrub plants of river valleys and ravines
2. Shrub plants of rocky areas and screes
3. Shrub plants of shrubbery around the forest
4. Shrub plants of high mountain steppe

Shrub vegetation of river valleys and ravines. Arpachay, Nakhchivanchay, Alinchachay, Havushchay and Gilanchay valleys are taken as the main research object for studying this vegetation group. Also, the river valleys of other areas of Sharur, Shahbuz, Julfa and Ordubad regions were studied at the same time.

In general, the woody species of the *Rosaceae* family have never been evenly distributed, be it on river and valley edges, rocky areas and screes, or high mountain steppes. This is primarily explained by the spread of shrub communities in the form of separate massifs or small glades, and by the strong fragmentation of the indicated areas and fields into ravines and valleys. This has led to the diversity and richness of the species composition in the shrubland. Shrubs found in the sandy areas of the banks of rivers and valleys, as well as on the mountain slopes on the right and left banks of the rivers, differ sharply in terms of their species composition. Of course, this depends first of all on the diversity of the ecological environment of those areas, and secondly on the geographical conditions in which the areas are located, that is, the exposure of the areas. The composition of the shrub

phytocenoses of the sandy areas of the riverbanks can sometimes undergo serious changes depending on the water regime of the river. In particular, the increase in the water level in the rivers due to the increase of snow and rainwater in spring has a strong effect on riverside phytocenoses. That is, the increase in water causes the territories and at the same time phytocenoses to be washed away. In general, the composition of these phytocenoses is enriched with species such as *Prunus microcarpa*, *P. divaricata*, *Rosa canina*, *R. floribunda*, *R. karjaginii*, *Rubus ibericus*, *Pyrus salicifolia*, *Crataegus caucasica*, *C. meyeri*, *C. orientalis*, *Cotoneaster integerrimus*, *C. melanocarpus*, *C. multiflorus* belonging to the family of *Rosaceae*. It should be noted that representatives of the *Rosaceae* family form the basis of the shrub vegetation in all areas. In all shrub vegetation, these elements act as either dominant or edificator or at least assectors. Six formations are found in the shrub vegetation of river valleys and ravines.

Formation: 1. Rosehip (*Rosa canina*).

Two associations are found in this formation.

Association: 1. Forb-hawthorn-cherry-rosehip (*Rosaetum-prunoso-crataegueso varioherbosum*)

Association: 2. Forb-willow-rosehip (*Rosaetum-salicoso-varioherbosum*)

Formation: 2. Meyer hawthorn (*Crataegua meyeri*).

Two associations were determined in this formation.

Association: 1. Forb-various shrub-hawthorn
(*Crataeguetum-fruticoso varioherbosum*)

Association: 2. Rare herb-honeysuckles-buckthorns-hawthorn
(*Crataeguetum-rhamnoso-loniceroso-parvoherbosum*)

Formation: 3. Fenzlian almond (*Pruneta fenzlianae*).

Four associations were determined within the formation.

Association: 1. woodreed-forb-rosehip-almond
(*Prunetum-varioherboso-rososo-calamagrostesum*)

Association: 2. Hawthorn-buckthorn-almond (*Prunetum-rhamnoso-crataeguesum*)

Association: 3. Forb-rosehip-honeysuckle-almond
(*Prunetum-loniceroso-rososo-varioherbosum*)

Subassociation: 1. *Prunetum-loniceroso-rososum subass. parvoherbosum*

Formation: 4. Hawthorn (*Cratageta*)

Association: 1. Viburnum-mountain ash-hawthorn (*Crataguetum-sorboso-viburnosum*)

Association: 2. Almond-honeysuckle-rosehip-hawthorn (*Crataguetum-rososo-loniceroso-prunosum*)

Association: 3. Various shrub-sea buckthorns-hawthorn (*Crataguetum-hippophoso-varioherboso*)

Formation: 5. Mountain ash-cotoneaster (*Cratageta cotoneasterosum*)

Association: 1. Forb-barberry-mountain ash-cotoneaster (*Cotoneastetum-sorboso-berberoso-varioherbosum*)

Association: 2. Milkvetch-barberry-mountain ash-Cotoneaste (*Cotoneastetum-sorboso-berberoso astragalosum*)

Formation: 6. Microcarpous plum (*Pruneta microcarpae*)

Association: 1. Almond-shadbush-plum (*Prunetum (microcarpae)-amelancheroso-prunosum (fenzlianae)*)

Shrub vegetation of rocks and screes. This type of vegetation is found on the rocky areas and screes of all mountainous zones and is characterized by various shrub plants. It is considered appropriate to study these areas in the form of 2 groupings: shrubby vegetation, shrubby of rocky areas and shrubby of screes. Because, as a result of the research, it is determined that the composition of these groupings are almost quantitatively and qualitatively different from each other. In fact, these groups differ from each other due to their appearance. Rocky areas often rise to the watersheds of high mountain belts and give the region a special look with its unique vegetation. Harder rocks are almost completely devoid of vegetation. Only in some cases, representatives of some grass polycarpia are noticeable in the form of small glades in rock cracks. It should be noted that depending on the geographical location of the areas, rock plants often differ in quantity and quality. Screes are formed as a result of accumulation of materials brought in by various natural causes (collapse, floods and erosion) in certain areas. The materials brought are collected in different ways depending on the inclination of the area.

Thus, large erosion materials are collected in different areas of the collection area depending on their size and weight. Since heavier and larger materials are collected in the lower areas of the scree - at the foot of the screes, the vegetation of these areas is also becoming impoverished. Depending on the thickness of the soil cover, vegetation can develop relatively well in fine soil areas.

Two formations, seven associations and seven subassociations were identified in the studied vegetation type and its phytocenological classification was given ¹¹.

Formation: 1. Juniper-hawthorn-rosehip (*Roseta-crataegeso-juniperiesum*)

Association: 1. Forb-juniper-hawthorn-rosehip
(*Rosetum-crataegeso-juniperieso-varioherbosum*)

Association: 2. Various shrub-ephedra-juniper-hawthorn
(*Crataetum-juniperioso-efedroso-variofruticosum*)

Association: 3. Forb-juniper-rowan-hawthorn-pear
(*Pyruetum-crataegeso-sorboso-yuniperioso-varioherbosum*)

Formation: 2. Crenate spiraea (*Spiraeta crenatae*)

Association: 1. Forb-hawthorn-rosehip-spiraea
(*Spiraetum-rososo-crataegeso-varioherbosum*)

Subassociation: 1. *Spiraetum-rososo-crataegeso-varioherbosum*
subass. *prunetosum*

Subassociation: 2. *Spiraetum-rososo-crataegeso-varioherbosum*
subass. *rhamnosum*

Subassociation: 3. *Spiraetum-rososo-crataegeso-varioherbosum*
subass. *parvoherbosum*

Association: 2. Forb-cherry-rosehip-spiraea (*Spiraetum-rososo-prunoso-varioherbosum*)

Subassociation: 1. *Spiraetum-rososo-prunoso-varioherbosum*
Subass. *parvoherbosum*

Association: 3. Rare herb-cotoneaster-rowan-spiraea

¹¹ Qənbərov, D.Ş., Naxçıvan Muxtar Respublikası florasında yayılan Gülçiçəklilər fəsiləsinin oduncaqlı növlərinin qaya və töküntülərinin kolluq bitkiliyi // S.R. Babayeva. Təbiət və Elm beynəlxalq elmi jurnal, 2022. s. 20-25

(*Spiraetum-sorboso-cotoneasteroso-parvoherbosum*)

Association: 4. Forb-pear-rowan-plum-spiraea

(*Spiraetum-sorboso-cotoneasteroso-parvoherbosum*)

Subassociation: 1. *Spiraetum-sorboso-cotoneasteroso-parvoherbosum* subass. *parvoherbosum*

Subassociation: 2. *Spiraetum-sorboso-cotoneasteroso-parvoherbosum* subass. *urticosum*

Subassociation: 3. *Spiraetum-sorboso-cotoneasteroso-parvoherbosum* subass. *ribes nigrumosum*

Shrubs around the forest. Shrubs around the forest are the areas that start after the upper and lower borders of the forests and are the most common areas of the *Rosaceae* family. In forest-shrub areas, both components are in direct contact as a whole, there is a kind of “introduction” dynamic between forest and shrub. This is due to the fact that shrub species to one degree or another penetrate into the sufficiently lighted and open mesophytic areas of forests, and at the same time, light-loving forest species find their ecological niche and settle in meadows and among shrubs at the edge of the forest. Based on this, numerous ecological and geographical groups of shrubs and grasses are formed in the typical shrubbery around the forest that make up the forest-shrub complex. Currently, in only a few areas (Shahbuz and Ordubad districts) only fragments of shrub natural plant groupings around forest. The natural vegetation cover of open treeless areas has been almost completely destroyed. Only in Shahbuz and Ordubad districts of the protected natural areas, the most perfect landscapes which is characteristic of the shrubbery complex around the forest have been preserved. Although the shrubberies around the forest consisting of forest, shrub and xerophytic herbaceous plant elements are stable forests, their further development dynamics may change depending on the geographical location and ecological conditions of the area. In particular, as a result of these areas being more exposed to anthropogenic influences, and as a result of long-term and regular grazing of the areas, xerophytization is accelerated, which has a negative effect on the development dynamics of coenoses. Almost all woody shrub plants belonging to the *Rosaceae* family can be found in the shrublands around the forest. In fact, the edificators of these

shrublands are representatives of this family. Tree and shrub species such as *Quercus macranthera*, *Fraxinus exelsor*, *Euonymus verrucosa*, *Euonymus europaea*, *Pyrus nutans*, *P. syriaca* and etc, which are forest builders, are sometimes found in the shrublands around the forest. Ecologically, area plants are composed of mesophyte, mesoxerophyte and xerophyte elements.

Formation: 1. Meyer hawthorn (*Cratageta meyerae*)

Association: 1. Forb-pear-plum hawthorn (*Crataguetum-prunoso-pyroso-varioherbosum*)

Subassociation: 1. *Crataguetum-prunoso-pyroso-varioherbosum* subass. *parvoherbosum*

Subassociation: 2. *Crataguetum-prunoso-pyroso-varioherbosum* subass. *stipa pulcherrimosum*

Association: 2. Forb-rosehip-plum hawthorn (*Crataguetum-rososo-prunoso-varioherbosum*)

Subassociation: 1. *Crataguetum-rososo-prunoso-varioherbosum* subass. *calamagrostosum*

Association: 3. Forb-rosehip-plum-apple-hawthorn

(*Crataguetum-rososo-prunoso-maloso-varioherbosum*)

Formation: 2. Pure rosehip (*Rosoeta*)

Association: 1. Forb-plum-rosehip (*Rosoetum-prunoso-varioherbosum*)

Association: 2. Forb-plum-pear-rowan-rosehip

(*Rosoetum-pyroso-sorboso-prunoso-varioherbosum*)

Association: 3. Grass-sedge-forb-rosehip (*Rosoetum-varioherboso-carexosopoaosum*)

Shrub vegetation of high mountain steppes. High mountain steppes are a natural grouping of natural grass communities dominated by xerophytes with various shrub plants, covering large areas in the region form a zone. Typical high mountain steppes are found mainly on the steep southern slopes of mountains, hills, ravines and valleys. Regardless of the location, high mountain steppe plants in all areas are constantly in contact with woody plants of the family *Rosaceae* and form different groupings. High mountain steppe vegetation can be divided into two groups, typical mountain steppes and high mountain meadows. High mountain meadows are found mainly in humid areas.

Along with turf-forming grasses, which are the main inhabitants of the steppes, multi-species, almost always abundant, sparsely turfing and rhizomatous gramineous plants make up the basis of the grass cover in the meadow steppes. These phytocenoses often form completely independent, diverse groups. It should be noted that the ecosystems of the shrub-steppe complex formed in conditions not exposed to anthropogenic influences have an extremely high diversity. It is obvious that, this is due to both optimal soil-climatic conditions and strong fragmentation of the relief, creating a large number of different ecotopes. The specificity of the conditions created in certain ecotopes allows the shrub plants of different ecological and phytocenotic groups to compete with the herbaceous plants existing in the inhabited areas. The main creators of groupings in the bush-steppe zone are the following species: *Spiraea crenata*, *Prunus divaricata*, *Cotoneaster integerrimus*, *C. melanocarpus*, *C. multiflorus*, *C. suavis*, *C. saxatilis*, *Crataegus*, *Pyrus*, *Rosa cinsinə daxil olan növlər*, *Sorbus graeca*, *S. persica*, *S. luristanica*, *S. roopiana*, *S. takhtajanii*, *S. turcica*, *Spiraea crenata*, *S. hypericifolia*, *Malus orientalis*. All these species belong to different ecological groups. During some drought years, in the steppe areas, xerophilous conditions are periodically created, such as a lack of water for plants. But among these species mentioned above, xerophytes are less than mesophytes. This is due to the fact that shrub plants have highly developed root systems. Whether typical mountain steppes or high mountain meadows, they are rich in woody plant species of *Rosaceae*.

Formation: 1. *Pruneta divaricatae*.

We have determined four associations within the formation.

Association: 1. Grass-forb-plum (*Prunetum varioherboso-graminosum*)

Association: 2. Forb-hawthorn-plum (*Prunetum-crataegoso varioherbosum*)

Association: 3. Forb-hawthorn-rosehip-plum (*Prunetum-rososo-crataegoso varioherbosum*)

Subassociation: 1. *Prunetum-rososo-crataegoso varioherbosum*
subass. *parvoherbosum*

Association: 4. Forb-grass-legume-plum (*Prunetum-faboso-*

poaoso-varioherbosum)

Formation: 2. Pure hawthorn (*Crataegua*)

Association: 1. Grass-Forb-hawthorn

(*Crataeguetum-varioherboso-poaosum*)

Association: 2. Rare-grass-rosehip-hawthorn

(*Crataeguetum-rososo-parvoherbosum*)

Association: 3. Bushlike hawthorn (*Crataeguetum fruticosum*)

Formation: 3. Pure rosehip (*Rosoeta*)

Association: 1. Woodreed-forb-rosehip (*Rososum-varioherboso-calamagrostosum*)

Association: 2. Bromes-forb-rosehip

(*Rososum-varioherboso-bromosum*)

Association: 3. Forb-hawthorn-rosehip (*Rosoeto-crataegua varioherbosum*)

Association: 4. Forb-nettle-rosehip (*Rosoeto-Prunetum urticoso-varioherbosum*)

Association: 5. Forb-willow-cherry plum-rosehip

(*Rosoeto-prunetum-salicoso-varioherbosum*)

Association: 6. Yarrow-cock's-foot-vetch-rosehip

(*Rosoeto-dactuloso-vicioso-achillosum*)

Four formation classes and 13 formations, 39 associations and 12 subassociations were determined for the woody species of the *Rosaceae* family. It should be noted that for the first time subassociation was used as a unit in vegetation.

VI CHAPTER. PROSPECTS FOR THE USE OF WOODY SPECIES OF THE ROSACEAE JUSS. FAMILY DISTRIBUTED IN THE FLORA OF THE NAKHCHIVAN AUTONOMOUS REPUBLIC

Woody species of the rose family, distributed in the territory of the Nakhchivan Autonomous Republic, are widely used in medicine, food and fodder, decoration, dye and phytomelioration measures. Also, woody species of the family that give honey and pollen are of great importance in the national economy.

Medicinal plants are a large group of plants used in the treatment and prevention of various diseases. As it is known, many of the woody

species of the *Rosaceae* family, included in the flora of Nakhchivan, are medicinally important, and people have used them in the treatment of one or another disease since ancient times. *Crataegus monogyna*, *Malus orientalis*, *Prunus divaricata*, *P. communis*, *Pyrus raddeana*, *Rosa canina*, *R. corymbifera*, *R. zangezura*, *R. tomentosa*, *Rubus anatolicus*, *Sorbus takhtajanii* and others included in this group are recognized as valuable medicinal plants in folk medicine.

In addition, as a result of the conducted research and experiments, from the medicinally important species of the *Rosa* genus, Broterusov roship (*R. brotherorum*), Marshal roship (*R. marschalliana*), Nizami roship (*R. nisami*), Rapin roship (*R. rapinii*), Sosnovskiy roship (*R. sosnovskyana*), Teberdin roship (*R. teberdensis*) and pillose itburnunun (*R. villosa*) species have been proven to be medicinally important, and dissertation reflects information about the importance of those species.

Giving beauty is the main task of all ornamental plants. Plants of decorative origin are of special importance in creating magnificent landscapes in nature and designing beautiful gardens, decorating roadsides, gardens and parks, and building living fences. Among the woody species of the family, species such as *Amelanchier ovalis*, *Cotoneaster melanocarpus*, *Spiraea crenata*, *Rosa brotherorum*, *R. marschalliana*, *R. Hracziana*, *R. corymbifera*, *R. floribunda*, *R. foetida*, *R. chomutoviensis*, *R. sachokiana*, *R. orientalis*, *R. spinosissima*, *R. tuschetica*, *R. tomentosa*, *Pyracantha coccinea*, *Prunus mahaleb* etc. are ornamental plants.

Most of the plants common in our republic have been of great importance as food plants in people's lives since ancient times. In the food ration, *Crataegus meyeri*, *C. pontica*, *Malus orientalis*, *Prunus communis*, *Pyrus megrica*, *P. raddeana*, *S. roopiana*, *Rubus ibericus* and other species belonging to the woody species of the *Rosaceae* family have a special place.

The main focus on the plantation of woodlands against erosion in the flora of Nakhchivan AR was given to the trees and bushes. Caucasian hawthorn (*C. caucasica*), Armenian hawthorn (*Crataegus armena*), Meyer hawthorn (*C. meyeri*), Sinovski hawthorn (*C. cinovskisii*) species of *Crataegus* genus are very promising in planting

crops against erosion. The Kazarian rosehips (*R. kazarjanii*) and Azerbaijan rose hips (*R. pulverulenta*) of the family are widely used in the restoration of degraded areas as good soil protectors. These species of the genus grow quickly in the areas, strengthening the soil with their roots, preventing shifting sands and landslides on the slopes. The conducted research gives reason to come to the conclusion that these species are widely used in the areas as forest protecting and soil protecting.

Plants that produce honey and pollen are widespread in Nakhchivan AR. Bees collect pollen and nectar from these plants. Trees and shrubs are of great importance for beekeeping. Taking into account the characteristics of honey-bearing plants, plants with a high honey yield are cultivated in our republic.

Nectariferous plants can be found in species belonging to many families. One of those families is the *Rosaceae* family. The nectariferous woody species of the family are widely used. The rate of nectariferous of plants depends less on the morphological structure of flowers, the amount of nectar secreted from the flower, and more on the chemical composition of the nectar secreted by the flowers. The amount of glucose, fructose and saccharose contained in the nectar of flowers has a great influence on the working principle of bees collecting nectar in that flower. Bees collect more nectar from plants where nectar content is high in glucose and fructose and low in sucrose. If there is a lot of sucrose among the sugars in the nectar, the bees, activity in these plants is either very weak or not at all. Melliferous plants belonging to the rose family can be grouped as nectar-producing, pollen-producing, and both nectar- and pollen-producing plants. In the group of such plants, the role of species such as *Rosa corymbifera*, *Spiraea hypericifolia*, *Sorbus luristanica*, *Prunus avium*, *P. communis*, *P. divaricate*, *Rubus anatolicus* etc. is irreplaceable.

RESULTS

1. As a result of the conducted research, for the first time, the woody species of the *Rosaceae* family of the region were studied in detail, the taxonomic spectrum of 79 species belonging to 12 genera of

the family was prepared, and a new key of genera and species was drawn up.

2. When the woody species included in the *Rosaceae* family of the studied area were characterized by genus, it was found that there are 29 (36,70%) species of *Rosa*, 13 (16.45%) of *Crataegus*, 9 (11.39%) of *Pyrus*, 8- (10.12%) of *Prunus*, 6 (7.59%) of *Sorbus*, 5 (6.32%) of *Cotoneaster*, 3 (3.79%) of *Rubus*, 2 (2.53%) of *Spiraea* genus. The remaining genera are monotypic and are represented by 1 (1.26) species each.
3. The analysis of the life forms shows that the woody species included in the *Rosaceae* family are grouped into 3 subtypes of phanerophytes. It was found that mesophanerophytes are represented by 8 (10.12%), microphanerophytes by 27 (34.17%), and nanophanerophytes by 44 (55.69%) species. According to their ecological groups, mesophytes are represented by 26 (32.91%), mesoxerophytes 25 (31.64%), xerophytes 23 (29.11%), xeromesophytes 5 (6.32%) species.
4. In order to clarify the genesis and ways of formation of the woody plants of Nakhchivan AR, which are included in the *Rosaceae* family, the studied species were grouped according to their habitat types. It was found that the xerophilic areal type is represented by 45 species, the Caucasian areal type by 12, the Boreal areal type by 11, and the desert areal type by 2 species. The areal type of 9 species has not been determined.
5. When determining the distribution of woody species included in the family of *Rosaceae* according to height zones, 7 vertical zones that differ from each other were taken and their distribution heights were determined. It was revealed that, 8 (10.12%) species are found in the lower and middle mountainous belt, 8 (10.12%) in the low-mountainous and high-mountainous zone, 13 (16.45%) in the high-mountainous zone, 14 (17.72%) up to the middle mountain belt, 17 (21.51%) in front highland, 39 (49.36%) in the lower mountainous belt and 48 (60.75%) in the middle mountainous belt.
6. For the first time, 4 formation classes, 13 formations, 39 associations and 12 subassociations were determined in the mountain-xerophyte and steppe vegetation of the woody species of

the *Rosaceae* family and a phytocenological classification of the vegetation was given.

7. Based on the conducted studies, it was determined that 40 species of woody plants of the family of *Rosaceae* distributed in the territory of Nakhchivan AR are used as medicine, 52-food and fodder, 31-phytomeliorative, 47-decorative and greening, 70-polliniferous, 50-nectariferous useful plants.

PROPOSALS AND RECOMMENDATIONS

1. Since most of the studied species are important for food and medicine, it is appropriate to carry out the purposeful collection by the local population and to create mini-production in areas with abundant natural resources.
2. As *Sorbus graeca*, *Rosa floribunda*, *Rosa nizami* species are found individually in the distribution areas, the populations should be under constant control.
3. The materials of the research (*Crataegus caucasica*, *C. cinovskissi*, *Prunus incana*, *Rosa kazarjanii*, *R. pulverulenta*) and the obtained results can be used in the implementation of integrated measures aimed at the inventory of territorial soils, prevention of degradation of soil cover, as well as erosion of landslide-prone areas and mountain soils.
4. It is appropriate to use *Cotoneaster multiflorus*, *C. melanocarpus*, *Rosa corymbifera*, *Rubus anatolicus*, *Spiraea crenata*, *S. hypericifolia*, *Sorbus luristanica* etc. decorative species in greening the surroundings of parks, alleys, newly built residential and non-residential massifs.

Dissertasiyanın mövzusunə uyğun çap olunmuş elmi əsərlər

1. Babayeva, S.R. Ecological groups of woody species of the *Rosaceae* family spreading in the flora of the Nakhchivan autonomous republic // International Journal of Botany Studies, -2020, -s. 605-607.
2. Babayeva, S.R. Naxçıvan Muxtar Respublikası ərazisində yayılan Gülçiçəklilikimilər fəsiləsinin oduncaqlı növlərinin endemizmi // Müasir Təbiət Elmlərinin aktual problemləri, Gəncə Dövlət Universiteti, -2020, -s. 9-11.
3. Babayeva, S.R. Naxçıvan Muxtar Respublikasının Gülçiçəklilikimilər (*Rosaceae*) fəsiləsinin oduncaqlı növlərinin taksonomik tərkibi // Naxçıvan Dövlət Universiteti, Elmi Əsərlər Təbiət və Tibb Elmləri Seriyası, -2020. №3 (104), -s. 56-60.
4. Ganbarov, D.Sh., Babayeva, S.R. Systematical structure geographical areal classes and ecological groups of *Rosa* L. genus spreading in the flora Nakhchivan Autonomous Republic // Bulletin of Science and Practice, -2020, v. 6, is. 6. -s. 55-60.
5. Ganbarov, D.Sh., Babayeva, S.R. Taxonomic composition and vital forms of woody species of *Rosaceae* family in the Nakhchivan Autonomous Republic flora // International Journal of Botany Studies, -2020, -s. 267-268.
6. Qənbərov, D.Ş., Babayeva, S.R., Quliyeva, S.Q. Naxçıvan Muxtar Respublikası florasında yayılan armud (*Pyrus*) növlərinin müasir vəziyyəti // Mərkəzi Nəbatət Bağının Elmi Əsərləri, -2020, -s.17-21.
7. Babayeva, S.R. Naxçıvan Muxtar Respublikası florasında yayılan Gülçiçəklilikimilər fəsiləsinin nektarlı və çiçək tozu verən oduncaqlı növləri // Naxçıvan Dövlət Universiteti Elmi Əsərlər, Təbiət və Tibb Elmləri Seriyası, -2021. №3 (112), -s. 45-48.
8. Babayeva, S.R. Perspectives of use of the *Rosa* L. species spreading in the flora of the Nakhchivan Autonomous Republic // Международной научно-практической конференции, Концепции, теория и методика фундаментальных и прикладных научных исследований, -2021, s. 5-8.

9. Babayeva, S.R. Contemporary Situation of the *Rosaceae* Family Tree Crops in the Nakhchivan Flora // Bulletin of Science and Practice, -2022, T. 8. №12. -s. 104-110.
10. Babayeva, S.R. Naxçıvan Muxtar Respublikası florasında yayılan böyürtkən (*Rubus* L.) növlərinin əhəmiyyəti // VII Respublika Elmi qaynaqlar konfransı, -Bakı: -2022, -s. 98-100.
11. Babayeva, S.R. Naxçıvan Muxtar Respublikası florasında yayılan Gülçiçəklilikimilər fəsiləsinin oduncaqlı növlərinin floristik təhlili // Azərbaycan Texnologiya Universiteti, Elmi xəbərlər, -Gəncə: -2022, № 1/38, -s. 177-187.
12. Ganbarov, D.Sh., Babayeva, S.R. Ecobiological features of the *Crataegus* L. species spreading in the mountainous-xerophit and flora of the Nakhchivan Autonomous Republic // Естественные и технические науки, -2022, №10, -s. 51-55.
13. Qənbərov, D.Ş., Babayeva, S.R. Naxçıvan Muxtar Respublikası florasında Gülçiçəklilikimilər fəsiləsinin oduncaqlı növlərinin qaya və töküntülərinin kolluq bitkiliyi // Təbiət və Elm beynəlxalq elmi jurnal, -2022. c.2, n. 2, - s.20-25.



The defense of dissertation will be held on June 14, 2023 at 11⁰⁰ at the meeting of the Dissertation council ED1.26 operating at the Institute of Botany of Ministry of Science and Education of the Republic of Azerbaijan.

Address: Badamdar highway 40, AZ1004, Baku, Azerbaijan

Dissertation is accessible at the Library of the Institute of Botany of Ministry of Science and Education of the Republic of Azerbaijan.

Electronic versions of dissertation and its abstract are available on the official website of the Institute of Botany of Ministry of Science and Education of the Republic of Azerbaijan (<http://www.botany.az/>).

The abstract was sent to the necessary addresses on May 12, 2023.

Signed for print: 12.05.2023

Paper format: A5

Volume: 36136

Number of hard copies: 20