UDC 581: 582
AGRIS F50
https://doi.org/10.33619/2414-2948/83/02

FLORISTIC ANALYSIS OF THE DISTRIBUTION OF THE *Crataegus* L. GENUS IN THE MOUNTAIN XEROPHYTE AND STEPPE VEGETATION OF NAKHCHIVAN

©Ganbarov D., *Nakhchivan State University, Nakhchivan, Azerbaijan, qenberov71@mail.ru*
©Babayeva S., *Nakhchivan State University, Nakhchivan, Azerbaijan, safuraaliyeva1991@gmail.com*

ФЛОРИСТИЧЕСКИЙ АНАЛИЗ РАСПРОСТРАНЕНИЯ РОДА *Crataegus* L. В ГОРНОЙ КСЕРОФИТНОЙ И СТЕПНОЙ РАСТИТЕЛЬНОСТИ НАХИЧЕВАНИ

©Ганбаров Д. Ш., *Нахичеванский государственный университет, г. Нахичевань, Азербайджан, qenberov71@mail.ru*
©Бабаева С. Р., *Нахичеванский государственный университет, г. Нахичевань, Азербайджан, safuraaliyeva1991@gmail.com*

Abstract. The article examines the floristic analysis of species belonging to the *Crataegus* L. genus in the mountain-xerophyte and steppe vegetation of Nakhchivan. As a result of the research, it was determined that 13 species of the *Crataegus* L. genus are found in the mountain xerophytes and steppe vegetation of the studied area. According to the analysis of life forms, the studied species are grouped into 3 subtypes of phanerophytes (mesophanerophytes, microphanerophytes and nanophanerophytes). According to the analysis of ecological groups, there are 7 species of mesoxerophytes, 4 species of xerophytes and 2 species of mesophytes. According to the analysis of geographical habitat types, xerophilic habitat type includes 8 species, Caucasian habitat type includes 2 species, and the remaining types are represented by 1 species as monotype.

Аннотация. В статье проводится флористический анализ видов рода *Crataegus* L. в горно-ксерофитной и степной растительности Нахичевани. В результате исследований установлено, что 13 видов рода *Crataegus* L. встречаются в горных ксерофитах и степной растительности изучаемой территории. По анализу жизненных форм изученные виды группируются в 3 подтипа фанерофитов (мезофанерофиты, микрофанерофиты и нанофанерофиты). По анализу экологических групп выделяют 7 видов мезоксерофитов, 4 вида ксерофитов и 2 вида мезофитов. Согласно анализу географических типов местообитаний, ксерофильный тип местообитаний включает 8 видов, кавказский тип местообитаний включает 2 вида, а остальные типы представлены 1 видом как монотипы.

Keywords: habitats, xerophytes, alpine grasslands, steppes, *Crataegus*.

Ключевые слова: местообитания, ксерофиты, альпийские луга, степи, боярышник.

Introduction

Nakhichevan, which is part of the Republic of Azerbaijan, is a harsh continental mountainous region located in the southwest of the Lesser Caucasus. Mountain-xerophyte (friganoid) vegetation

Т. 8. №10. 2022
https://doi.org/10.33619/2414-2948/83

is found in the studied area in the middle mountain belt (1200–1500 m), in the foothills, where mountain-xerophyte vegetation makes contact with semi-desert.

In the lower foothills, the mountain-xerophyte vegetation forms mixed transitional groups with semi-deserts, and as mountain xerophytes form mixed groups at altitudes of 1,700 to 1,900 meters above sea level as they ascend to the highlands.

Shrubs in the region form a transition from mountain-xerophytic vegetation. This is because this type of vegetation covers areas from rocky areas to the border of the subalpine and alpine belts. Towards the high mountain range, especially in the mountain steppes, alpine and subalpine meadows, the plant densities are high, while in the mountain xerophyte (frigana) plants the plants are more or less far from each other, and although their effects are very weak, the floristic composition of frigans is very colorful.

The steppe vegetation generally loses its zonation due to the fact that it is found in the form of steppes in the subalpine and alpine zone, while forming a zoning covering large areas at an altitude of 1500–2400 m.

V. V. Hatamov, who studied the steppe vegetation of Azerbaijan, shows that there are 336 species of flowering plants belonging to 190 genera of 44 seasons in the steppe vegetation of Nakhchivan [2]. While studying “Vegetation of Nakhichevan and its importance in the national economy” A. S. Ibrahimov notes that the composition of steppe vegetation includes 3 subtypes, 6 formation classes, 21 formations and 24 associations [3]. That is why we consider the study of floristic analysis of the genus *Crataegus* L. in mountain xerophytes and steppe vegetation of Nakhchivan relevant.

Research Material and Methodology

In 2018, the study of woody species of the Rosaceae family began in the territory of Nakhichevan. Taking into account the width of the area, the richness of vegetation and the diversity of the distribution zones of woody species of the season, the main advantage in conducting field research was given to the route method. Zonal distribution and botanical-geographical features of the area vegetation were taken into account during the selection of routes. During the expeditions, the species composition and distribution zones of woody species of the *Rosaceae* family were specified, and their seasonal shift of dynamics was ascertained over the years.

In determining the species Flora of the USSR [14], A. A. Grossheim’s Flora of the Caucasus [5, 6], Flora of Azerbaijan [12, 13] and many other determinants, works of L. I. Prilipko [9, 10], flora of Iran and Turkey, as well as works and methodical instructions of Azerbaijani botanists were used [1, 4]. It is based on the latest taxonomic additions and changes to The Euro + Med Plantbase Project (https://clck.ru/32Bhj4).

Discussion and Results of the Research

As a result of reference data and research, it was determined that 20 species of this genus are spread in Nakhichevan, and 7 species of these genus are found in forest ecosystems, and 13 species in mountain-xerophytes and steppe vegetation of the study area.

Hawthorns are trees and shrubs from 3–5 m to 10–12 m in height. The bark is gray or brown and belongs to irregular layers. The leaves are alternately arranged, sliced or divided, toothed. The flowers are grouped in a complex shield or yellow umbrella. The fruits come in different colors and different shapes.

Plants must adapt to all the complex conditions of the environment in which they live, grow and spread. Because environmental factors do not affect plants in isolated conditions but affect them in a complex way. In this case, the adaptation of plants to the external environment is manifested not

Т. 8. №10. 2022
https://doi.org/10.33619/2414-2948/83

only in physiological processes, but also in the anatomical structure and external morphological features of the organs. The adaptation of plants to all complex environmental conditions is reflected in their life forms. The classification of life forms is based on the structure of vegetative organs and reflects the parallel and convergent paths of ecological evolution.

Geobotanists have developed various systems of life forms that take into account all the morphological features of plants and are based on different principles.

The famous Danish botanist E. Warming explained the concept of "life form" in the 80s of the last century. He meant the "life form" in which the plant's vegetative organs were in harmony with the environment throughout their lives, from seed to extinction. Because the life form of the individual, i. e. the shape of the vegetative organs, does not remain constant, it changes in the process of plant growth and aging.

E. M. Lavrenko, preferring the concept of "ecobiomorph", showed that ecobiomorphs are "systems of adapted organisms that exist under certain environmental conditions".

The classification system of I. G. Serebryakov and Ch. Raunkiaer was mostly used in the study of life forms in plants. I. G. Serebryakov called the peculiar appearance of a certain group of plants formed in the process of growth and development in certain conditions of the environment, ontogeny, "life form". I. G. Serebryakov notes that there are ecological, morphological and ecological-coenotic regularities in the study of life forms. The first approach shows the superiority of the life forms of seed plants, and the second approach shows the advantage of the distribution of plants according to certain habitats and floristic studies in the areological analysis [11, 16].

The classification of life forms proposed by the famous Danish botanist Ch. Raunkiaer was met with great sympathy by botanists. Among all the signs of life forms, Raunkiaer has selected many important signs that characterize plants that adapt to the cold or dry season of the year. One of these features is that the shoots in the plant adapt to the level of the soil and snow cover and protect themselves [16].

Taking into account the research of botanists, the life forms of woody species belonging to the *Crataegus* L. genus distributed in Nakhchivan can be shown as follows.

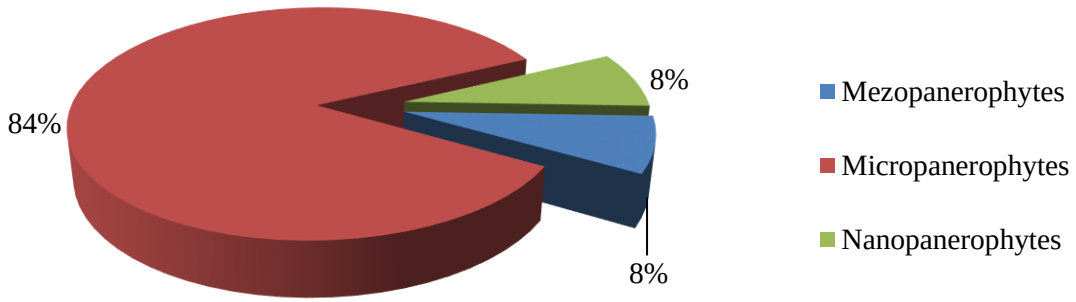

Figure 1. Vital forms of woody species belonging to the *Crataegus* L. genus

In phanerophytic plants, shoots overwinter or spend the drought period "in the open condition", above the ground (trees). Due to this, they are protected by special bud shells. Woody species of the *Crataegus* L. genus can be grouped into 3 subtypes of phanerophytes.

Mesophanerophytes. They are 8–30 m tall trees. In the territory of Nakhchivan this subspecies includes the genus *Crataegus cinovskisii* T. A. Kasumova, 1985.

Microphanerophytes. They are trees and shrubs up to 2–8 m high. In cold and temperate climates, these shoots often overwinter under the snow. *Crataegus* ×*armena* Pojark., *C. orientalis* Pall. ex M. Bieb., *C. meyeri* Pojark., *C. caucasica* C. Koch, *C. pseudoheterophylla* Pojark.,

C. szovitsii Pojark., *C. pojarkoviae* Kossych, *C. monogyna* Jacq., *C. pontica* C. Koch, *C. pallasii* Griseb., *C. eriantha* Pojark. belong to this subtype.

Nanophanerophytes. They are shrubs less than 2 m high. This subtype includes the *Crataegus* ×*zangezura* Pojark.

The diversity of climatic conditions has led to the adaptation of plants to these conditions and their different distribution at different altitudes [7]. The division of the territory of Nakhchivan into altitude zones differs according to the international distribution system.

Species belonging to the *Crataegus* L. genus were divided into 4 vertical zones, which differed from each other by physical and geographical conditions, and the vegetation of each of these zones was studied separately, the heights of the zones were determined and the distribution of species belonging to the genus was determined.

The vertical change of vegetation cover on the belts is based on the composition of the air, the diversity of precipitation, the difference in solar radiation, more precisely the influence of biotic and abiotic factors, depending on the difference in height between areas. The distribution of species along the vertical heights is shown in the diagram.

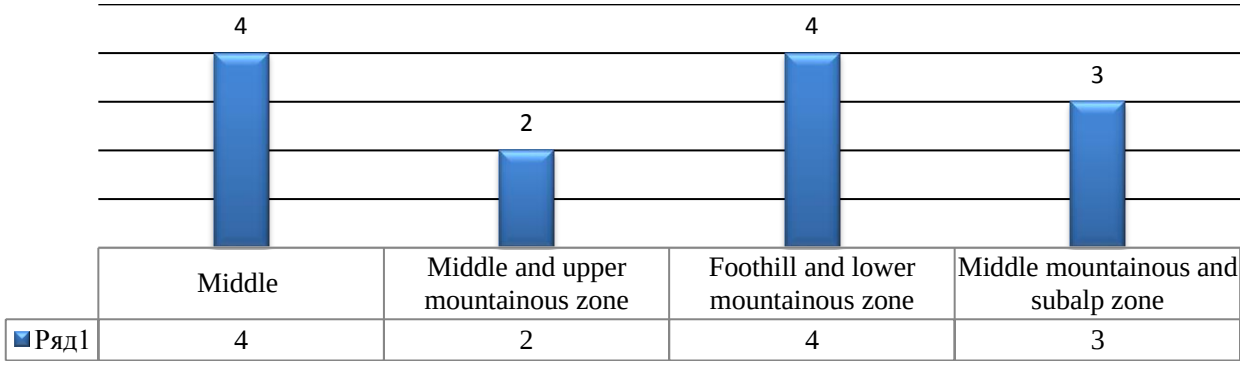

Figure 2. Distribution of species belonging to the *Crataegus* L. genus by altitude

There are a number of difficulties in determining the exact boundaries of the species in these zones. As can be seen from the diagram, some species are found in only one zone, in several zones.

Less vegetation than the middle mountain range characterizes the lower mountain range. *C. cinovskisii, C. eriantha, C. monogyna, C. pojarkoviae* are widely distributed in the foothills and lowlands.

The middle mountain belt is a cool zone, characterized by droughts in June, July and August. Rocky areas and mesophyte-steppe vegetation dominate in this zone. Species such as *Crataegus caucasica, C. pallasii, C. pontica, C. szovitsii,* etc., are widespread in this zone.

The upper mountain belt has more intensive mechanical, chemical abrasion and erosion than other belts. *Crataegus* ×*armena* and *C.* ×*zangezura* are species common in this zone.

The subalpine belt is a relatively flat high mountainous area. Erosion and abrasion are very rare in these areas. *Crataegus meyeri*, *C. orientalis* and *C. pseudoheterophylla* species are widespread in this zone.

Water is one of the most important environmental factors in plant life. Water has a great influence on the distribution and grouping of plants on a large geographical scale, both in different and in the same climatic conditions. The adaptation of plants to habitats with different degrees of humidity and the acquired adaptation traits divide them into different ecological groups [15] (Table).

Т. 8. №10. 2022
https://doi.org/10.33619/2414-2948/83

Table

ECOLOGICAL GROUPS OF SPECIES BELONGING TO THE GENUS *Crataegus* L.

Ecological groups	*The number of species*	*General number in %*
Xerophytes	4	30.8
Mesoxerophytes	7	53.8
Mesophytes	2	15.4
Total:	13	100

Xerophytic species are mainly plants that grow in dry areas. Xerophytic species are mainly found on the more heated and least humid slopes. This ecological group includes species such as *Crataegus eriantha*, *C. monogyna*, *C. pojarkoviae* and *C. ×zangezura*.

Mesoxerophytes are more prevalent in more humid areas than xerophytic plants and drier areas compared to mesophytes. Mesoxerophyte species are dominant among other groups in terms of distribution and account for 53.8% of the total flora. Species such as *Crataegus ×armena*, *C. caucasica*, *C. meyeri*, *C. orientalis*, *C. pontica*, *C. pseudoheterophylla*, *C. szovitsii* are found in this ecological group.

Mesophytic plants differ under the influence of the natural nutrient environment, according to the number of species and different ecological characteristics. Due to their water requirements, mesophytes have an intermediate position between hygrophytic plants and xerophytic plants. The mesophyte group includes *Crataegus cinovskisii* T. A. Kasumova, 1985 and *C. pallasii*.

The study of spatial distribution and genesis of species belonging to the genus *Crataegus* is of great importance. Thus, while the habitat of one species sometimes includes the flora of a certain area, on the contrary, others cover the entire area and spread beyond its borders. Area classification is a very complex process and is found in the works of many researchers [8]. Taking into account the distributions given by the researchers, the species of *Crataegus* L. distributed in the study area were analyzed on the basis of zonal and regional principles in 4 geographical area types and 8 habitat classes and groups.

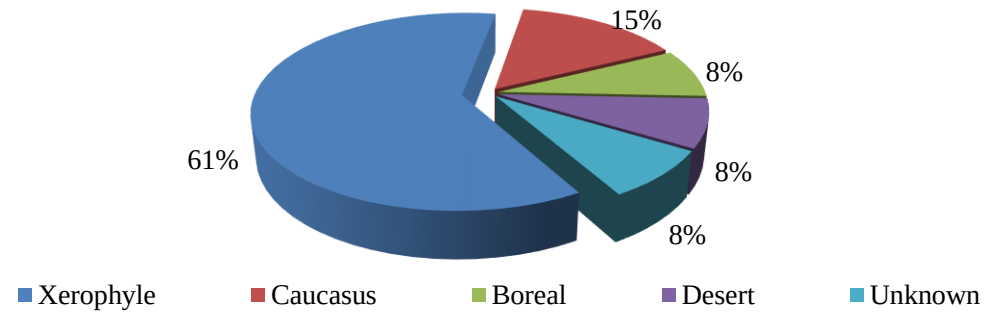

Figure 3. Distribution of species belonging to the genus *Crataegus* L. by geographical area types

The xerophilic areal type is represented by 8 species, including xerophytes and mesoxerophytes. *C. caucasica* and *C. cinovskisii* of the Atropatene group, *C. szovitsii* of the Asia Minor group, *C. orientalis* and *C. pojarkoviae* of the Eastern Mediterranean group, *Crataegus meyeri* and *C. pseudoheterophylla* of the East Asian group, Iranian group includes *C. pontica* type.

The Caucasian habitat type includes alpine, forest and mountain xerophytic plants extending to Zangezur, Daralayaz, Iran and Asia Minor. The Caucasian range includes *Crataegus ×armena* and *C. ×zangezura.*

Т. 8. №10. 2022
https://doi.org/10.33619/2414-2948/83

Species belonging to the boreal habitat type are distributed in North Africa, Europe and North America, and the plants included in the type are mesophytic plants that are part of the subalpine and alpine meadows and are distributed in the forest zone of the northern hemisphere. As can be seen from the diagram, the Boreal area type includes 1 species (*C. monogyna*).

The desert area type includes *Crataegus pallasii*, and the unknown group includes *Crataegus eriantha* species.

Thus, the above-mentioned species do not fully reflect the mountain-xerophytic and steppe vegetation of the study area. In our future research, a comprehensive study of woody species of the Rosaceae family is considered expedient.

Conclusions

1. For the first time, 13 species of *Crataegus* L. are found in the mountain xerophytes and steppe plants of the region. According to the analysis of life forms, these species are represented in 3 subtypes (mesophanerophytes, nanophanerophytes and microphanerophytes). According to the analysis of ecological groups, there are 7 species of mesoxerophytes, 4 species of xerophytes and 2 species of mesophytes.

2. In determining the distribution of the studied species according to sea level, 4 vertical belts, which differed from each other by physical-geographical and ecological conditions, were taken, and the heights of their distribution were specified. In the territory of the Autonomous Republic, 4 species of *Crataegus* L. are found in the middle mountain belt, 4 in the foothills and lower mountains, 2 in the middle and upper mountains and 3 in the middle mountains and subalpine zone. According to the analysis of geographical habitat types, xerophilic habitat type includes 8 species, Caucasian habitat type includes 2 species, and the remaining types are monotype.

References:

1. Askerov, A. M. (2011). Konspekt flory Azerbaidzhana. Baku.

2. Khatamov, V. V., & Alieva, M. G. (1999). Nekotorye fitotsenologicheskie i floristicheskie osobennosti stepnykh rastenii Azerbaidzhana. In *Ispol'zovanie i okhrana flory Azerbaidzhana,* Baku.

3. Ibragimov, A. Sh. (1980). Ispol'zovanie ot vysokogornykh rastitel'nykh pokrovov v narodnom khozyaistve. *Informatsionnyi listok Azerb. NIINTI,* (86), 4. (in Russian).

4. Seidov, M. M., Ibadullaeva, S., Gasymov, Kh., & Salaeva, Z. (2014). Flora i rastitel'nost' Shakhbuzskogo gosudarstvennogo prirodnogo zapovednika. Nakhichevan.

5. Grossgeim, A. A. (1936). Analiz flory Kavkaza. Baku. (in Russian).

6. Grossgeim, A. A. (1950). Flora Kavkaza. Moscow. (in Russian).

7. Medvedev, Ya. S. (1915). Rastitel'nost' Kavkaza: Opyt botan. geografii Kavk. Tiflis. (in Russian).

8. Portenier N. N. 2000. Sistema geograficheskikh elementov flory Kavkaza. *Botanicheskii zhurnal, 85*(9), 26-33. (in Russian).

9. Prilipko, L. I. (1939). Rastitel'nye otnosheniya v Nakhichevanskoi ASSR. Baku. (in Russian).

10. Prilipko, L. I. (1970). Rastitel'nyi pokrov Azerbaidzhana. Baku. (in Russian).

11. Serebryakov, I. G. (1964). Zhiznennye formy vysshikh rastenii i ikh izuchenie. In *Polevaya geobotanika, 3*, 146-205. (in Russian).

12. Flora Azerbaidzhana (1950-1961). Baku, (1-8). (in Russian).

13. Flora Azerbaidzhana (1954). Baku, (5). (in Russian).

14. Flora SSSR (1934-1967). Moscow. (in Russian).

15. Shennikov, A. P. (1950). Ekologiya rastenii. Moscow. (in Russian).

16. Raunkiaer, Ch. (1934) The Life Forms of Plants and Statistical Plant Geography. London, Oxford University Press.

Список литературы:

1. Аскеров А. М. Конспект флоры Азербайджана. Баку, 2011. 202 с.
2. Хатамов В. В., Алиева М. Г. Некоторые фитоценологические и флористические особенности степных растений Азербайджана // Использование и охрана флоры Азербайджана. Баку: Вяз, 1999.
3. Ибрагимов А. Ш. Использование от высокогорных растительных покровов в народном хозяйстве // Информационный листок Азерб. НИИНТИ. 1980. №86. С. 4.
4. Сеидов М. М., Ибадуллаева С., Гасымов Х., Салаева З. Флора и растительность Шахбузского государственного природного заповедника. Нахичевань, 2014.
5. Гроссгейм А. А. Анализ флоры Кавказа. Баку, 1936. 257 с.
6. Гроссгейм А. А. Флора Кавказа. М.: Изд-ва Акад. наук СССР, 1950.
7. Медведев Я. С. Растительность Кавказа: Опыт ботан. географии Кавк. Тифлис, 1915.
8. Портениер Н. Н. Система географических элементов флоры Кавказа // Ботанический журнал. 2000. Т. 85. №9. С. 26-33.
9. Прилипко Л. И. Растительные отношения в Нахичеванской АССР. Баку, 1939. 198 с.
10. Прилипко Л. И. Растительный покров Азербайджана. Баку: Вяз, 1970. 170 с.
11. Серебряков И. Г. Жизненные формы высших растений и их изучение // Полевая геоботаника. 1964. Т. 3. С. 146-205.
12. Флора Азербайджана. Баку, Т. I-VIII, 1950-1961.
13. Флора Азербайджана. Т. V. Баку, 1954. 579 с.
14. Флора СССР. Т. 13. М.-Л.: Изд. Академия наук СССР, 1934-1967.
15. Шенников А. П. Экология растений. М.: Сов. Наука, 1950. 375 с.
16. Raunkiaer Ch. The Life Forms of Plants and Statistical Plant Geography. London: Oxford University Press, 1934.

Работа поступила
в редакцию 04.09.2022 г.

Принята к публикации
09.09.2022 г.

Ссылка для цитирования:

Ganbarov D., Babayeva S. Floristic Analysis of the Distribution of the *Crataegus* L. Genus in the Mountain Xerophyte and Steppe Vegetation of Nakhchivan // Бюллетень науки и практики. 2022. Т. 8. №10. С. 27-33. https://doi.org/10.33619/2414-2948/83/02

Cite as (APA):

Ganbarov, D., & Babayeva, S. (2022). Floristic Analysis of the Distribution of the *Crataegus* L. Genus in the Mountain Xerophyte and Steppe Vegetation of Nakhchivan. *Bulletin of Science and Practice, 8*(10), 27-33. https://doi.org/10.33619/2414-2948/83/02