

Study on the species Juncaceae and Poaceae distributed in lowland areas of Karabakh and their ethnobotanical characteristics

Fatmakhanim K. Nabiyeva¹

Farah F. Amrahova

*Institute of Botany, Ministry of Science and Education of the
Republic of Azerbaijan, A. Abbaszade str., entr. 99, AZ1004,
Baku, Azerbaijan*

Abstract: This article presents data on the species diversity of Juncaceae and the Poaceae families, widespread in the natural lowland ecosystems of Karabakh. An attempt has been made to enlighten their phytocenological features and ethnobotanical characteristics as reflected in their use among the population. Based on the geobotanical studies carried out, the current state and taxonomic composition of natural phytocenoses was established. The species distribution was recorded, herbarium specimens collected, analyzed and identified. The composition and structure of phytocenoses and taxonomic status of genera and species was pooled up. In the light of findings collected from the literature and research conducted in the lowland regions of Karabakh, it was established that family Poaceae is represented by 108 species belonging to 55 genera, and family Juncaceae Juss. includes 12 species belonging to two genera. On the basis of ethnobotanical surveys, information was obtained about a number of useful plants used by the population. *Juncus* species are mainly used as fodder plant and in basket weaving. Whole aerial parts of *J. articulatus* are used for diseases of the gastrointestinal tract, liver disorders and as a choleric and expectorant, as well as for skin diseases, tumors, and promoting the healing of purulent wounds. The species present in the study area are also utilized as food, in animal husbandry, agriculture, and as building materials. Analysis across 18 different age groups revealed that many medicinally significant grass species common in the area remain unused.

Keywords: areal types, ethnobotany, geobotanical study, Juncaceae, local population, phenological observation, plants, rare

INTRODUCTION

Karabakh is a historical and geographical part of Azerbaijan, located in the southeastern part of the Lesser Caucasus. This region covers the territory between the

Lesser Caucasus Mountains and the Kura-Araz Rivers. The relief is predominantly mountainous [Museibov 1998]. The districts of Tartar, Barda, Agjabadi are located in the lowland area, Jabrayil, Agdam and Fuzuli fall into both mountainous and lowland areas. Agjabadi district is plain, and part of it falls into the Mil Plain [Babayev et al., 2006].

The climate of the area is mild, warm and dry subtropical with average temperatures ranging between 25.6-30 °C in July, and winters are dry with temperatures of 1.2-1.8 °C in January. Annual precipitation is 250-350 mm. Gray meadows and gray soils are common in some places, saline and brackish soil is also found. Natural vegetation is mainly dry steppe and semi-desert type. There are sparse Tugay forests on the banks of the Kura River [Nabiyeva, 2008]. The area is also occupied by the part of the Barda State Nature Reserve.

One of the main features of Karabakh Plain region is the sparse distribution of oak and oak-elm forests in the semi-deserts. Mulberry and tamarisk species are found in some low-lying areas. In the forest stands we come across willow, long-stalked oak, elm, mulberry, and buckthorn. The undergrowth shrubs present here are tamarisk, oleaster, pomegranate, hawthorn, medlar, Christ's thorn and others. The plant communities found in the depressions and marshlands are also widespread in the area. In humid places, *Xeranthemum squarrosum* Boiss., *Rubus saxatilis* L. are found. In the study areas, a mixed forest of *Pistacia lentiscus* L. and *Quercus robur* L. are found near the place, where the Tartarchay river merges with the Kura; other species are *Salix alba* L., *Populus nigra* L., *Morus alba* L., *Pistacia atlantica* Desf. (= *P. mutica* C.A.Mey.), *Tamarix meyeri* Boiss., *Ulmus glabra* Huds.; together with a dense grass cover of bluegrass, fescue, wormwood, geranium, caperbush, dandelion. (*Alhagipseudalhagi* (M.Bieb.) Desv ex Wangerin, *Daucus carota* L., *Cynanchum acutum* L., *Sambucus ebulus* L., *Tribulus terrestris* L., *Phragmites australis* (Cav.) Trin. ex Steud., *Persicaria hydropiper* (L.) Delabre, *Glycyrrhiza glabra* L.) are also common [Nabiyeva, 2008].

Poaceae is one of the largest families of flowering plants [Hodkinson 2018, GPWG III, 2025; Sayed, Masrahi, 2025]. The family members are mainly annual,

¹E-mail: fatmakhanym_58@mail.ru

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biennial, or perennial grasses; found wherever they can grow and often spread over large areas. Their role is especially great in meadows, fields, steppes, and grass cover. The family includes up to 11,783 species grouped under 789 genera in the world [Soreng et al., 2022]. There are 317 species belonging to 94 genera in Azerbaijan [Flora..., 1939]. Juncaceae possess 555 species belonging to six genera, three subgenera and seven sections in the world [Kirschner et al., 2002; Xu, Chang, 2017; Proćków, Drábková, 2023] and 2 genera and 21 species in Azerbaijan [Flora..., 1939].

The main purpose of the research is to investigate the current natural state, phytocenological characteristics and ethnobotanical uses of species of the families Juncaceae and Poaceae, which are common in the plain part of Karabakh, these have not been evaluated much before.

MATERIAL AND METHODS

Plant resources. This study included investigations on the species of families Juncaceae and Poaceae. The specimens were selected from the Herbarium of the Institute of Botany (BAK). Available literature regarding the species was searched and critically analyzed. A species list occurring in the area was compiled. The species composition was determined according to the keys on local flora [Grossheim, 1945; Flora..., 1939; Hajiyev, 1970, Musayev, 1997, Asgarov, 2011], the taxonomy and nomenclature were checked using plant database [WFO, 2025].

Study methods. The methods used were generally those accepted in earlier floristical, geobotanical and bioecological methods as per the available literature [Raunkier, 1937; Serebryakov, 1964]. The phenological observations were recorded [Field Geobotany, 1959-1976], geobotanical studies conducted according to P.D. Yaroshenko [1969] and L.G. Ramenskii [1971]. The life forms of species were clarified according to C.C. Raunkier [1934] and I.G. Serebryakov [1964].

Geographical areal types were defined according to Grossheim [1939]. The ethnobotanical survey included interviews with local middle-aged people. The survey data was obtained using video and audio recordings in the study area and subsequently analyzed.

RESULTS

Study area. Plant specimens were collected and GPS coordinates recorded in the districts of Tartar (N40°20'07", E46°55'49"), Barda (N40°22'59", E47°07'07"), Aghdam (N40°63'57", E47°63'02"), and Aghjabadi (N40°03'10", E47°27'41"). The expeditions

were carried out in order to investigate the current state of species belonging to the families Poaceae Barnhart and Juncaceae Juss. In order to reveal their phytocenological characteristics, and ethnobotanical ways of use the ethnobotanical surveys were conducted among the population.

Taxonomic studies. In all 70 herbarium specimens were prepared from plants collected from the study area. During the expedition, ethnobotanical surveys were conducted among local populations of different ages. As a result, the distribution of 108 species belonging to 55 genera of the Poaceae family in the plain areas of Karabakh were determined. The photographs of the most common species in the area are given in Figure 1.

Juncaceae or the rush family has 21 species belonging to two genera in the lowland areas of Karabakh. The genus *Juncus* L. contains 250 species distributed worldwide (Fig. 2).

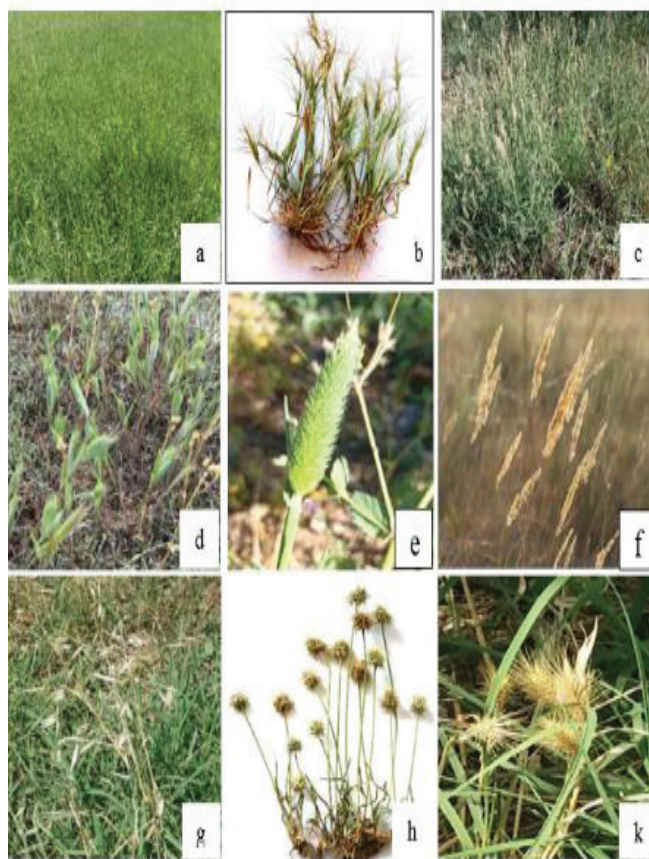


Figure 1. Most common species: a) Grass-forb meadow; b) *Aegilops biuncialis*; c) *Phalaris minor* Retz; d) *Eremopyrum triticeum* (Gaertn.) Nevski; e) *Aeluropus lagopoides*; f) *Calamagrostis epigojos* (L.) Roth.; g) *Avena fatua* L.; h) *Echinaria capitata* (L.) Desf.; k) *Hordeum murinum* L.

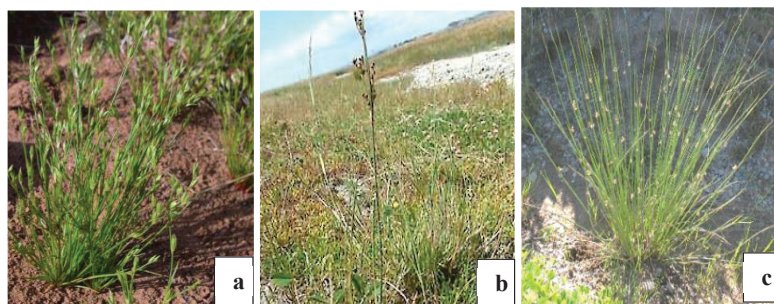


Figure 2. *Juncus* species: a - *Juncus bufonius* L.; b - *Juncus jerardii* L.; c - *Juncus effusus* L.

The genus *Luzula* DC., name of which in Azerbaijani is given as “Shigotu” in some books, actually has an Italian origin, “luceiola” meaning shining, radiant, which comes from the fact that the hairs covering it sparkle with dew drops. There are six species in Azerbaijan and 3 occur in the study area [Flora of the Caucasus v 2, 1939]. Species of the genus *Luzula* are used to stabilize slopes. It is eaten by animals as a forage plant during the



Figure 3. *Juncus* species: a - *Juncus bufonius* L.; b - *Juncus jerardii* L.; c - *Juncus effusus* L.

non-flowering period (Fig. 3).

Geographical areal types. In our analyses the geographical areal types of 108 grass species were determined and these are represented as follows: Mediterranean-Iran-Turan, Mediterranean with radiation 9 (8.7%); Mediterranean, Palearctic, Iran-Turan – 8 (7.4%); Eastern-Mediterranean-Iran-Turan – 6 (5.6%); Mediterranean-Iran – 5 (4.6%); Western Palearctic – 4 (3.7%); European forest, Turan, Palearctic forest, Sarmatian with irrigation, Boreal tropical, East-Mediterranean, East-Transcaucasia, Cosmopolitan, Cultural – 2 each (1.85%); Holarctic, Holarctic forest, Mediterranean-Iran-Turan with irrigation, Europe – 3 (2.77%); West Asia, West Asia Highland, East-Mediterranean-Iranian, Mediterranean-Turanian, Mediterranean-Iranian-Sindian, Mediterranean-Subtropical, Mediterranean-European, Mediterranean-

Sarmatian, Mediterranean-Sarmatian with irrigation, European-Mediterranean with irrigation, Boreal-Subtropical, Armenian-Iranian highland, East-Mediterranean-Iranian with irrigation, Adventiv. Pannonian-Sarmatian, Central-Asiatic, South-Palearctic-Subtropical, Palearctic with Irrigation, West-Palearctic (South), Native American each as appropriate – 1 (0.93%) (Fig. 4).

According to the analysis of life forms, annuals account for the majority of species in the flora of the area with 59 species (54.6%), perennials with 48 (44.4%) and annuals-biennials with 1 (0.9%) (Fig. 5).

All species are perennials. The species of the rush family includes *Juncus bufonius* L. belonging to the Holarctic with radiation, *J. compressus* Jacq. to Palearctic, *J. gerardii* Loisel., *J. articulatus* L., *J. effusus* L., *Luzula multiflora* (Ehrh.) Lej. to Western Palearctic, *J. inflexus* L. to Mediterranean-Europe, *J. filiformis* L. to Holarctic, *J. subulatus* Forssk. To Mediterranean Sea, *J. littoralis* C.A. Mey. to Hyrcanian littoral, *J. maritimus* Lam. to Mediterranean-Atlantic lithopal, *L. forsteri* (Sm.) DC. to Mediterranean-ancient, *L. campestris* (L.) DC. to European geographical area type (Fig. 6).

Ethnobotanic studies. There are many useful and important plants from the grass family. The wheat, rice, maize, oats, rye, barley, millet, sorgho and sugar cane play an important role in people's lives. Grasses, as technical crops, also play an important role in industry, they are used in the production of starch, alcohol, paper, edible and aromatic oils, as construction materials, ropes, mats, brushes, etc. They are also used in beverage production and as medicinal and ornamental plant. Many species (perennial ryegrass, dogtooth grass, bluegrass species, wheat-grass, bentgrass) are used to strengthen loose soils, sandy areas, and create lawns. The family also includes harmful weeds such as wild oats, couch grass, dogtooth grass, etc. Wild and cultivated grasses are very important as food for animals.

Zea mays L., *Elymus repens* (L.) Gould, *Triticum*

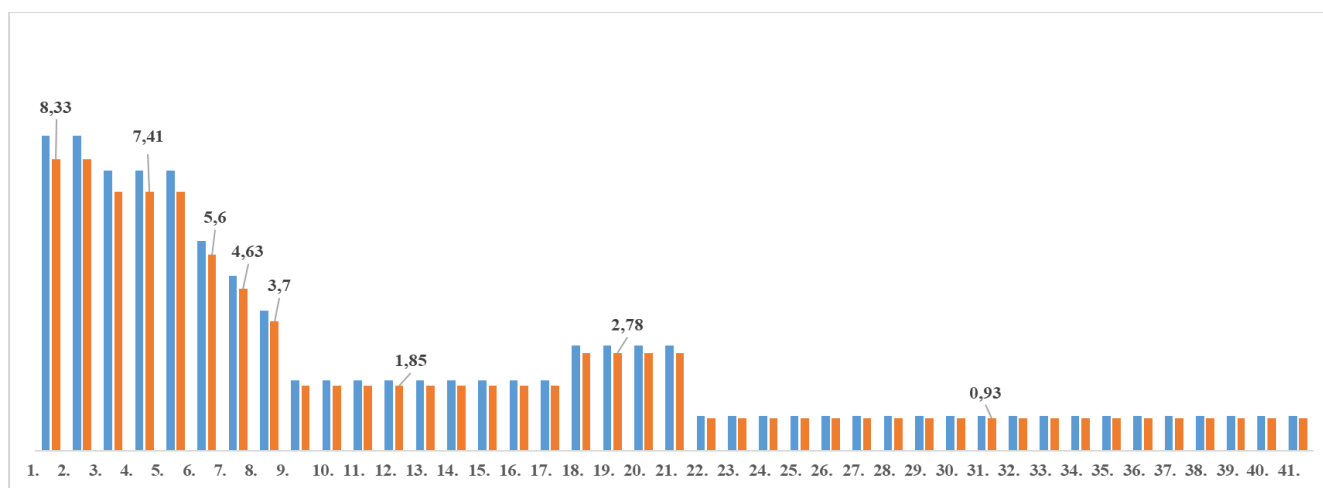


Figure 4. Geographical areal types of species belonging to the Poaceae family distributed in the lowland areas of Karabakh: numbers in apts are reflected in % and ordinate reflects geographical areal types. 1. Mediterranean-Iran-Turan, 2. Mediterranean with irradiation each, 3. Mediterranean, 4. Palearctic, 5. Iran-Turan, 6. Eastern- Mediterranean-Iran-Turan, 7. Mediterranean-Iran, 8. Western Palearctic, 9. European forest, 10. Turan, 11. Palearctic forest, 12. Sarmatian with irrigation 13. Boreal tropica, 14. East-Mediterranean, 15. East-Transcaucasia, 16. Cosmopolitan, 17. Cultural, 18. Holarctic, 19. Holarctic forest, 20. Mediterranean-Iran-Turanwith irrigation, 21. Europe, 22. West Asia, 23. West Asia Highland, 24. East-Mediterranean-Iranian, 25. Mediterranean-Turanian, 26. Mediterranean-Iranian-Sindian, 27. Mediterranean-Subtropical, 28. Mediterranean-European, 29. Mediterranean-Sarmatian, 30. Mediterranean-Sarmatian with irrigation, 31. European-Mediterranean with irrigation, 32. Boreal-Subtropical, 33. Armenian-Iranian Highland, 34. East-Mediterranean-Iranian with Irrigation, 35. Adventiv, 36. Pannonian-Sarmatian, 37. Central-Asiatic, 38. South-Palearctic-Subtropical, 39. Palearctic with Irrigation, 40. West-Palearctic (South), 41. Native American each as appropriate.

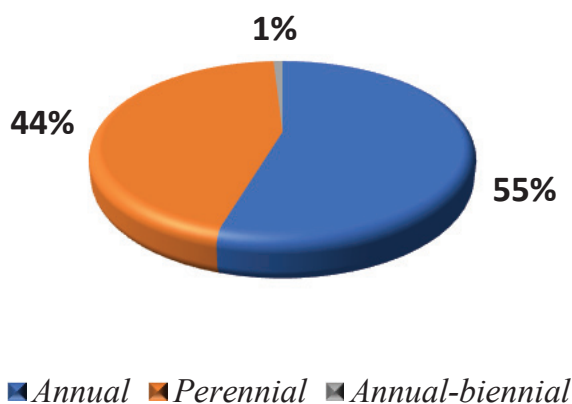


Figure 5. Life forms of the family species distributed in the area.

durum L. are used for chronic hepatitis, biliary dyskinesia, as a choleric, antispasmodic agent, and also for diseases of the gastrointestinal tract. The richness of grasses in minerals (Fe, Mg, P, Se), vitamins A, C, E, K, B group (thiamine, riboflavin, niacin), proteins, amino acids, starch, carbohydrates, macro- and microelements increases the spectrum of their use. As fibrous plants can be used in the treatment of diseases caused by cardiovascular and metabolic disorders. [Srivastava et

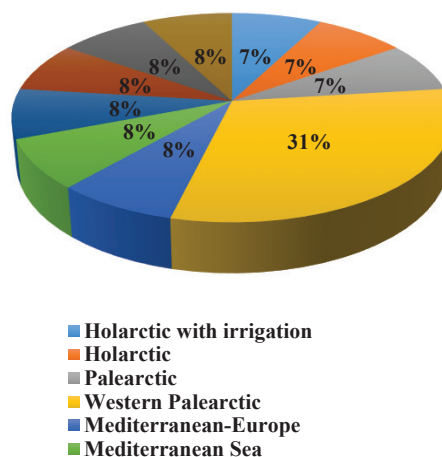


Figure 6. Geographical areal types of species included in the Juncaceae family.

al., 2021] *Eragrostis* Wolf is used for the greening of dry and sandy soils for decorative purposes [Peterson, 2008].

The perennial herbaceous plants of genus *Juncus* L., which reach a height of 120 centimeters, are found in swamps, along the edges of roads and reservoirs. The shoots of some species are used for weaving various baskets, as rope for tying greenery into bundles, and also as a “fence” against soil erosion and wind. More

species are used in Chinese medicine. According to the literature [Kirschner, 2002], preparations based on these plants are used for insomnia, pleurisy, respiratory diseases, and ulcers. The aboveground parts of some species contain steroids, coumarins, phenolcarboxylic acids, anthocyanins, flavonoids and carbohydrates. It is widely used in the treatment of gastrointestinal tract diseases, lung diseases, chronic bronchitis, and tuberculosis. But most often in folk medicine the plant is used for kidney stones, cystitis and inflammation of the bladder. A decoction (infusion) of the roots has an anti-inflammatory effect [Flora..., 1939].

Juncus bufonius L. is used as a fodder plant in livestock farming and *J. gerardii* Loisel. for basket weaving. Various ethnical groups around the world have made “red lights” by peeling the stems of these species and soaking them in oil. *Juncus articulatus* L. - is used for diseases of the gastrointestinal tract, liver, as a choleric, expectorant, for skin diseases, tumors, for healing purulent wounds [Flora..., 1939]. *J. filiformis* L. with antibacterial composition has anti-inflammatory, antioxidant and soothing properties. In nature, some species of animals and birds depend on *Juncus* species for food and survival: they use this plant for hiding and its seeds as food. The water bodies where the species is widespread are a shelter for various waterbirds and invaluable spawning grounds for some fish.

Juncus effusus L. is used in the treatment of tonsillitis, yellow jaundice, edema, and acute urinary tract infection [Flora..., 1939]. Its stems are used to make baskets, weave mats, and make ropes for tying. In old times, it is used as a candle by peeling its young branches (except for the upright stem) and soaking them in oil. The fibres from the stems are used in the production of paper and stencils. During interviews with local people in the study areas, it was found that in some regions, the young roots of these species, called “Gindirgha”, are used as food. According to the Lezgins living in Nabran, the roots of the plant are used for colds.

In general, the species of the genus have been studied very little from a medicinal perspective. Recently, chemical compounds formed with a phenanthrene chain from Juncaceae species have been extensively analyzed for their biological properties such as antitumor, antimicrobial, antispasmodic, and anti-inflammatory effects, and the anti-inflammatory activity of the obtained compounds has been tested [juncuenin B (2)], dehidrojuncuenin B (3) and juncusol (4)], two flavonoids [apigenin (5), luteolin (6)]. Thus, isolated components

have been confirmed to have many biological activities, including anti-cancer effects [Flora..., 1939; Bús et al., 2018; Kuo et al., 2016].

In conclusion, the results from the available literature data and research conducted in the plain areas of Karabakh have identified the distribution of 108 species from 55 genera of the Poaceae Barnhart family, as well as 13 species from two genera of the Juncaceae Juss. family. These species were examined based on their morphological characteristics, bioecological traits, and ethnobotanical information was also documented. Ethnobotanical surveys conducted among the local population of 18 different ages has revealed that many of the medicinally important species of grasses common in the area are not used at present.

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Qarabağın aran ərazilərində yayılmış Juncaceae və Poaceae fəsilələrinə aid növlər və onların etnobotaniki tədqiqi

Fatmaxanım X. Nəbiyeva

Fərəh F. Əmrahova

Botanika İnstitutu, Azərbaycan Respublikası Elm və Təhsil Nazirliyi, A. Abbaszadə küç., giriş 99, Bakı, AZ1004, Azərbaycan

Təqdim olunan məqalədə Qarabağın aran ərazilərində yayılmış Juncaceae və Poaceae fəsilələrinə aid olan növlərin təbii ekosistemlərdə rolu, faydalı resurslarının etnobotaniki xüsusiyyətləri, fitosenoloji təhlili, növlərin təbiətdə mövcud vəziyyəti və əhali arasında aparılmış etnobotaniki sorğular verilmişdir. Aparılmış geobotaniki tədqiqatlar əsasında təbii fitosenozların mövcud vəziyyəti və taksonomik tərkibi müəyyən edilmişdir. Növlərin yayılma arealı qeydə alınmış, herbari nümunələri toplanılmış, təhlil edilərək və müəyyən edilmişdir. Fitosenozların tərkibi və strukturu, cins və növlərin taksonomik vəziyyəti sistemləşdirilmişdir. Ədəbiyyat məlumatlarına və aparılan tədqiqatlara əsasən müəyyən edilmişdir ki, Qarabağın düzənlik ərazilərində Poaceae fəsiləsi 55 cinsə aid 108 növlə, Juncaceae fəsiləsi iki cinsə aid 12 növlə təmsil olunur. Etnobotaniki sorğular əsasında əhalinin istifadə etdiyi bir sıra faydalı bitkilər haqqında məlumat əldə edilmişdir. *Juncus* növlərindən əsasən yem bitkisi kimi və səbət toxumasında istifadə olunur. *J. articulatus* üst hissələri mədə-bağırsaq traktının xəstəlikləri, qaraciyər xəstəlikləri, ödqovucu və bəlgəmgətirici kimi, həmçinin dəri xəstəlikləri, şişlər və irinli yaraların sağlamlığında istifadə olunur. Tədqiqat ərazisində mövcud olan növlərdən qida kimi,

heyvandarlıqda, əkinçilikdə və tikinti materialları kimi də istifadə olunur. 18 müxtəlif yaş qrupu üzrə aparılan təhlillər nəticəsində məlum olmuşdur ki, ərazidə yayılmış bir çox dərman əhəmiyyətli ot növlərindən istifadə olunmur.

Açar sözlər: *areal tipləri, geobotanik tədqiqatlar, Juncaceae, yerli icmaların bitkiləri, fenoloji müşahidə, bitkilər, nadir*

Исследование видов семейств Juncaceae и Poaceae, распространенных в равнинных районах Карабаха, и их этноботаническая характеристика

Фатмаханым Х. Набиева

Фарах Ф. Амрахова

Институт ботаники, Министерство Науки и Образования Азербайджанской Республики, ул. А.Аббасзаде, подъезд 99, Баку, AZ1004, Азербайджан

В статье представлены данные о видовом разнообразии семейств Juncaceae и Poaceae, широко распространенных в естественных равнинных экосистемах Карабаха. Сделана попытка осветить их фитоценологические особенности и этноботанические характеристики, отражающиеся на их использовании среди населения. На основе проведенных геоботанических исследований установлено современное состояние и таксономический состав естественных фитоценозов. Зафиксировано распространение видов, собраны, проанализированы и идентифицированы гербарные образцы. Обобщен состав и структура фитоценозов, таксономическое положение родов и видов. С учетом данных, полученных из литературы и исследований, проведенных в равнинных районах Карабаха, установлено, что семейство Poaceae представлено 108 видами, относящимися к 55 родам, а семейство Juncaceae Juss. включает 12 видов, относящихся к двум родам. На основе этноботанических обследований получены сведения о ряде полезных растений, используемых населением. Виды *Juncus* в основном используются как кормовые растения и в плетении корзин. Целые надземные части *J. articulatus* применяются при заболеваниях желудочно-кишечного тракта, расстройствах печени, как желчегонное и отхаркивающее средство, а также при кожных заболеваниях, опухолях и для заживления гнойных ран. Виды, присутствующие в районе исследования, так-

же используются в пищу, в животноводстве, сельском хозяйстве и в качестве строительных материалов. Анализ по 18 различным возрастным группам показал, что многие лекарственно значимые виды трав, распространенные в этом районе, остаются неиспользованными.

Ключевые слова: *типы ареалов, этноботаника, геоботаническое исследование, Juncaceae, растения местного населения, фенологические наблюдения, растения, редкие*