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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

FLORA AND VEGETATION OF MIL PLAIN OF KUR-ARAZ LOWLAND

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INTRODUCTION

Relevance and degree of development of the topic. In modern times, geobotanical research is of great importance for the implementation of issues such as protection of environment and the conservation of wild flora in the ecological system, as well as the efficient use, improvement and management of winter pastures, which are a source of feed for livestock on scientific and practical basis [1, 2, 3]. The "National Strategy for the Protection and Sustainable Use of Biodiversity in the Republic of Azerbaijan"[4], approved by the Decree of the President No. 2353 dated October 3, 2016, includes the creation of sustainable development and sound economy through monitoring and protection of flora diversity.

Paragraphs 7.1.7 and 7.2.8 of the "Actions of Plan"[5] of the "State Program for 2016-2020 on the improvement of the system of real estate cadastre, land use and its protection in the Republic of Azerbaijan" points out the importance of conducting ecological and geobotanical studies for the efficient use of real estate lands, as well as pastures. Based on the above, the chosen topic is one of the pressing issues of our time.

Some authors' works contain information about the study of the flora and vegetation cover of the Mil Plain[6, 7, 8, 9] . However, these studies

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[1] Qurbanov, E.M. Geobotanika / E.M.Qurbanov, M.T.Cabbarov, – Bakı: «Bakı Dövlət Universiteti», – 2017. – 320 s.

[2] Ibadullayeva, S.J., Huseynova, İ.M., An Overview of the Plant Diversity of Azerbaijan //Biodiversity, Conservation and Sustainability in Asia, -2021. V.1, -p. 431–478.

[3] Костин, А.Е., Авдеев, Ю.М. Геоботанические исследования биоразнообразия в урбанизированной среде // Вестник Красноярского государственного аграрного университета, – 2015. № 3. – с. 19–23.

[4] Azərbaycan Respublikasında bioloji müxtəlifliyin qorunmasına və davamlı istifadəsinə dair 2017-2020-ci illər üçün Milli Strategiya [Elektron resurs] //Azərbaycan Respublikası Prezidentinin 2016-cı il 3 oktyabr tarixli 2358 nömrəli Sərəncamı ilə təsdiq edilmişdir, – Bakı: Qanun, – 2016.

[5] Azərbaycan Respublikasında daşınmaz əmlakın kadastr sisteminin inkisafı, torpaqdan istifadənin və onun mühafizəsinin səmərəliliyinin artırılmasına dair 2016-2020-ci illər üçün Dövlət Proqramı"nın həyata keçirilməsi üzrə "Tədbirlər planı"// "Azərbaycan" qəz-i. -Bakı: -2016.

[6] Гроссгейм, А.А. Очерк растительности Мильской степи / А.А. Гроссгейм. - Баку: Наркомзем, -1929. -120 с.

[7] Nəbiyeva, F.X. Kür-Araz ovalığı və Arazboyu düzənliklərdə səhralaşma prosesi və onun flora biomüxtəlifliyinə təsiri:/ Biologiya üzrə elmlər doktoru diss.. /-Bakı, 2017. – s. 220-228.

covered specific areas and did not fully reflect the plant diversity of the Mil Plain.

In order to create the "Electronic cadastral registration information system of land in the Republic of Azerbaijan" approved by the Decree of the President of the Republic dated March 7, 2016 and compile a digital cadastral map[10], we have prepared for the first time the "Ecological-geobotanical map scheme of the natural vegetation cover of the Mil Plain" (at a scale of 1:200,000), which is relevant in the selection of a scientific topic.

Object and subject of research. The object of the conducted geobotanical research was the flora and natural vegetation of the Mil Plain (total area of the Mil Plain - 276 452,0 hectares). The subject of the research was to conduct floristic and geobotanical studies on the winter pastures of the Mil Plain, assess the productivity of natural forage areas of semi-desert and desert vegetation, and determine the pasture load.

Goals and objectives of the study. The main goal of the study is to compile a taxonomic synopsis of the flora diversity of the Mil Plain of the Kur-Araz lowland, to analyze taxa (division, class, family, genus, species) according to the new nomenclature, to prepare their biomorphological, ecological, botanical-geographical classification, to investigate the reasons for the decline of species with protection status, including mapping the current state of natural vegetation by examining the ecological-geobotanical parameters. In addition, the goal also includes issues such as the productivity of natural winter pastures and implementing practical measures for their improvement.

The following tasks have been set to achieve the goals:

Ø Compilation of a synopsis of the wild flora of the Mil Plain of the

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[8] Ömərov, S.X., Ağaquliyev, İ.M., Qasımova, Y.Q. Mil-Qarabağ düzünün boz-çəmən torpaqlarında bitkiliyin tədqiqatı və onun səmərəli istifadəsi//-Bakı: AMEA "Torpaqşünaslıq və Aqrokimya", -2018. cild 23, №1-2, -s.120-124.

[9] Алиев, Р.А. Прикуринские тугайные леса Азербайджана (современное состояние и пути улучшение и восстановление) / Р.А. Алиев, М.Ю. Халилов, - Баку: «Элм», -1976. -135с.

[10] Azərbaycan Respublikasında torpaqların elektron kadastr uçotu informasiya sisteminin yaradılması Qaydaları/ Azərbaycan Respublikası Prezidentinin 2016-cı il 7 mart tarixli Fərmanı ilə təsdiq edilmişdir. – Bakı: Qanun, – 2016.

Kur-Araz lowland, its analysis according to taxa (division, class, family, genus, species) in accordance with the latest nomenclature, and preparation of a biomorphological, ecological, botanical-geographical classification;

Ø Analysis of endemic, subendemic, rare, endangered species and species with the protection status of the flora of plain based on theoretical and practical research;

Ø Identification of species belonging to new distribution areas found in wild flora;

Ø Investigation of the ecological-geobotanical characteristics of the natural vegetation cover of the study area, provision of geobotanical descriptions of the species composition and structure of associations and formations;

Ø Compilation of an ecological-geobotanical map scheme of the vegetation cover of the Mil Plain;

Ø Assessment of productivity, nutritional value, and grazing capacity of important forage formation groups in semi-desert and desert vegetation;

Ø Based on the results of the conducted scientific research, development of complex measures for the protection of flora, efficient use and improvement of vegetation cover.

Research methods. Field research was conducted on the Mil Plain of the Kur-Araz lowland using route and stationary methods. Floristic, bioecological, geographical arealological and geobotanical analysis of the flora and vegetation of the area, determination of fodder productivity, and evaluation of pastures were carried out using modern methods, and endemic and plants with protection status were also identified.

The main provisions put forward for defense. As a result of the research conducted, the following conceptual approaches were obtained and presented in the form of provisions:

1. Floristic and geobotanical studies in the Mil Plain area of the Kur-Araz lowland determine the decisive role of the influence of ecological and physical-geographical conditions in the formation of phytocenoses characterized by the dominance of edificators of vegetation in these areas.

2. The formation of plant groups in the Mil Plain area, especially on the banks of the rivers Araz and Kur, including around the lakes Aghgol and Sarisu and variability of their structural elements are closely

related to the influence of ecological factors (salinization due to changes in groundwater levels, climate changes, etc.).

3. The species composition, forage quality, and productivity of natural vegetation in the pastures of the Mil Plain depend on changing climatic conditions, overgrazing, and the duration of pasture use.

4. The application of measures for the efficient use and improvement of vegetation cover on ecological and phytocenological grounds will establish a foundation for the protection of wild flora and the efficient use of phytodiversity in the ecosystem of the Mil Plain, as well as the Kur-Araz lowland.

Scientific novelty of the research. As a result of ecological-geobotanical research and cameral-floristic studies conducted on the Mil Plain, a conspectus of the wild flora of the area has been determined. In the wild flora of the area, 656 species of higher plants belonging to 73 families and 328 genera have been identified; of these, 7 species belong to the higher spores, 3 species to the gymnosperms, 646 species to the angiosperms or flowering plants division, including 170 species to the monocotyledons and 476 species to the dicotyledons class.

New distribution areas of *Stipa arabica* Trin. & Rupr., *Juncus filiformis* L., *Medicago hemicycla* Grossh. and *Artemisia splendens* Willd. species recorded for the first time from the area have been identified. The plant groups distributed here are concentrated in 6 types, 22 formation classes, 52 formation groups, and 117 associations according to the vegetation classification. Based on this classification, an "Ecological-geobotanical map-scheme of the natural vegetation cover of the Mil Plain" (scale 1:200,000) was compiled and a certificate was obtained from the Copyright Agency of the Republic of Azerbaijan (Certificate of Registration of the Work No. 11525).

The productivity, forage quality, pasture load and capacity of formation groups typical of semi-desert and desert vegetation distributed in winter pastures located in the administrative territories of Aghjabedi, Beylagan and Imishli districts belonging to Karabakh and Mil-Mugan economic regions, as well as the Mil Plain (for 2016-2022), were determined based on geobotanical and biochemical indicators.

Rare, endemic and endangered species of the wild flora of plain were investigated, and it was determined that 9 species belonging to 7

families and 8 genera included in the “Red Book of the Republic of Azerbaijan” (III edition) are rare and endangered, and that the endemics with Caucasian range are represented by 28 species and with Azerbaijan range by 5 species.

Theoretical and practical significance of the study. Based on research and studies, the first flora conspectus of the area developed for the purpose of protecting the wild flora of the Mil Plain has laid the foundation for the compilation of the "Ecological-geobotanical map of the natural vegetation cover of the Mil Plain" (at a scale of 1:200,000) based on ecological-geobotanical classification for the efficient use and improvement of phytodiversity. The research work can be used in ecological-phytocenological research of other botanical-geographical regions of the republic, in the reprinting of books and maps such as “Flora of Azerbaijan”, “Determinants of plants”, “Map of vegetation cover of Azerbaijan” and etc., as well as in the development of the “General scheme of natural forage areas of Azerbaijan”. The Ministry of Ecology and Natural Resources of the Republic of Azerbaijan can benefit from information on the flora and vegetation of the Mil Plain, as well as recommendations on the creation of buffer zones and points in the Aghgol National Park. It is considered appropriate for the Ministry of Agriculture of the Republic of Azerbaijan to benefit from measures related to the improvement of productivity, forage quality, capacity, efficient use of semi-desert and desert phytocoenoses common in the Mil Plain. “Ecological-geobotanical map of the natural vegetation cover of the Mil Plain” and indicators related to the productivity and feed quality of natural forage areas can be used by the State Service for Property Issues under the Ministry of Economy of the Republic of Azerbaijan for the economic, ecological and normative assessment of the pasture lands of the plain under study.

Approbation and application. Presentations were made at the following conferences, congresses, symposiums and seminars on numerous articles and theses published on the basis of scientific research and studies conducted in accordance with the main provisions of the dissertation work defended: At the Republican scientific conference on the topic "Scientific achievements in Biology" held at the Faculty of Biology of Baku State University (Baku, 2006); Republican scientific conference on “Problems of Applied Ecology” at Baku State University (Baku,

2007); International Scientific Conference on “Ecology: Problems of Nature and Society” dedicated to the centenary of academician Hasan Aliyev (Baku, 2007); International Conference on Environment. Survival and Sustainabilities (Near-East University, Nicosia-Nothern Cyprus, 2007); International symposium 7th Plant life of South West Asia. Anadolu University (Eskisehir, Turkey, 2007); At the "Republican Scientific Conference Dedicated to the 85th Anniversary of the Birth of the Great Leader Heydar Aliyev" at Baku State University (Baku, 2008); International scientific conference on “Current problems of modern chemistry and biology” at Ganja State University (Ganja, 2016); “Modern Problems of Biology and Ecology” materials of reports of the II International Scientific and Practical Conference (Makhachkala, 2016); The 3rd International symposium on EuroAsian biodiversity (Belarusia, 2017); VII Republican Scientific Conference on “Problems of Ecology and Soil Science in the 21st Century” (Baku, 2018); “International scientific conference on "Actual problems of modern natural and economic sciences" (Ganja, 2018); Scientific conference dedicated to the 90th anniversary of academician Vahid Hajiyev on "New challenges in botanical research" (Baku, 2018); Second International Scientific Conference of young scientists and specialists. Multidisciplinary approaches in solving modern problems of fundamental and applied sciences (Baku, 2020) etc.

The dissertation work was presented at a scientific seminar held at the Faculty of Botany and Plant Physiology of Baku State University and the Institute of Botany of the Ministry of Science and Education of the Republic of Azerbaijan.

49 works and one map; 32 theses, 17 scientific articles have been published on the topic of the dissertation work, 2 of which are included in the International Abstracting and Indexing Systems (AGRIS).

Name of the organization where the dissertation work was performed. The research work was carried out at the Faculty of Botany and Plant Physiology of Baku State University, Ministry of Science and Education of the Republic of Azerbaijan.

Structure and scope of the dissertation. The dissertation consists of an introduction, seven chapters, results, recommendations, a list of used literature, and appendices, with 210 computer pages (239 892 characters): (introduction- 10856 characters, Chapter I – 24942

characters, Chapter II - 30459 characters, Chapter III – 10470 characters, Chapter IV – 25690 characters, Chapter V – 93200 characters, Chapter VI – 20000 characters, Chapter VII – 20675 characters, results – 2400 characters, recommendations – 1200 characters). The dissertation contains 28 tables, 37 figures, 1 map and 208 references.

MAIN CONTENT OF THE DISSERTATION

CHAPTER I. A LITERATURE REVIEW OF THE HISTORY OF THE STUDY OF FLORA AND VEGETATION OF THE PLAINS.

For the study of the flora and vegetation of the Mil Plain by us, references were made to literature, as well as scientific works and articles, in chronological order. Dissertation presents a detailed explanation of this. Based on literature and other sources, it is possible to divide the history of the study of the wild flora and natural vegetation of the Mil Plain into five periods.

From the analysis of the literature review on the history of studying the flora and vegetation of the Mil Plain, it can be concluded that the wild flora and natural vegetation cover of this area were studied by travelers, soil scientists, dendrologists, botanists and geobotanists who came to Azerbaijan (especially the Kur-Araz lowland) from different countries from the end of the 18th century to the beginning of the 21st century (from 1770 to 2022).

CHAPTER II. PHYSICAL-GEOGRAPHICAL FEATURES OF THE MIL PLAIN

The total area of the Mil Plain is 276,452 hectares, of which 164,865 hectares are winter pastures. The natural vegetation of the Mil Plain is distributed in the dry subtropical semi-desert zone and the Kur-Araz lowland botanical-geographic region. The area of plain is separated from the Shirvan Plain by the Kur River to the east and from the Mughan Plain to the southwest.

Within the borders of the districts of Agjabedi, Beylagan, Imishli and Sabirabad in the plain area, there are the Kur-Araz rivers, Aghgol National Park, Bash Mil-Garabagh collector, Bash Mil canal,

settlements, village-adjacent grazing areas and winter pastures. The soils formed in the area are classified according to 3 zonal, 1 intrazonal and 7 types.

The hydrography of the Mil Plain includes the Kur and Araz rivers, Lake Aggol, Lake Sarisu, and wetlands. The climate of the Mil Plain area is a temperate-hot semi-desert and dry steppe type with dry summers.

CHAPTER III. OBJECTS, MATERIAL AND METHODS OF RESEARCH

3.1. Objects of research. The flora and natural vegetation of the Mil Plain were taken as the object of the research conducted in 2016-2022. In the Mil Plain area, forest (tugay), shrubland, semi-desert, saltwort desert, sinkhole-meadow, and wetland vegetation were analyzed.

3.2. Materials and methods of the research. Geobotanical studies of the wild flora and natural vegetation formed in the region's various relief, soil and ecological conditions were conducted in preparatory, field and chamber stages, materials were collected, and routes were marked based on land development plans (Fig. 1).

Field research was carried out using semi-stationary and stationary methods. The species composition and structure of the formations according to the classification of forest, shrubland, semi-desert, desert, sinkhole-meadow and wetland type phytocoenoses distributed here (the largest classification unit is the type, and the smallest unit is the association) were recorded separately in geobotanical descriptions.

When identifying plant samples collected from the flora of the area, works such as "Flora of Azerbaijan"[11], "Flora of the Caucasus"[12] and others were used. Systematic taxa (family, genus and species) of flora was mainly clarified according to the “International Code of Botanical Nomenclature”[13], “International Code of Nomenclature for algae, fungi,

[11] Флора Азербайджана: [в 8-х т.] / Под Ред. Колл. - Баку: Изд. АН Азерб. ССР, 1950-1961.

[12] Гроссгейм, А.А. Флора Кавказа: [в 7 томах] / А.А. Гроссгейм, – Баку. Аз ФАН СССР. -1939-1967.

[13] Международный кодекс ботанической номенклатуры (Венский кодекс) принятый семнадцатым Международ. ботаническим конгрессом/ Товарищество научных изданий КМК, -Венгрия: -2005; - Санкт-Петербург: - 2009. - 282 с.

and plants"[14], "Conceptus of the Flora of the Caucasus",[15] "Plant kingdom of Azerbaijan"[16], etc.

For the study of vegetation cover in natural forage areas of administrative districts located in the region "Introduction to Geobotany"[17], "Methodology for certification of natural forage lands"[18], "Methodological instructions on geobotanical research of natural forage areas of Azerbaijan", "Instructions on large-scale geobotanical research of natural forage areas of the Republic[19] of [20] Azerbaijan", as well as "Map of vegetation cover of Azerbaijan"[21] by E.M.Gurbanov were used.

In the study of the botanical-geographical elements of the species, the range classes were given according to A.A. Grossheim[22], and the types according to A.I.Tolmachev[23] and R.V.Kamelin[24].

The life forms of plants are given according to C.C.Raunkier[25] and

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[14] International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen [electron resources] / N.J. Turland, J.H. Wiersema, F.R. Barrie [et al.], -China: -2017. DOI https://doi.org/10.12705/Code.2018

[15] Конспект Флоры Кавказа: [В 3 томах] / Под ред Ю.Л. Меницкий, Т.Н. Попова, -СПб.: Изд-во, С.-Петербург. Ун-та, -том I-III, – 2003, – 2006, – 2008, – 2012.

[16] Əsgərov, A.M. Azərbaycanın bitki aləmi / A.Əsgərov. - Bakı: TEASPRES, -2016. -444 s.

[17] Шенников, А.П. Введение в геоботанику / А.П.Шенников, – Л.: Изд-во. ЛГУ, – 1964. –447 с.

[18] Методика паспортизаций природных кормовых угодий/ Товарищество научных изданий, -Москва: -1967. -127с.

[19] Azərbaycan Respublikasının təbii yem sahələrinin geobotaniki tədqiqatina dair metodik göstəriş/ Red. hey. -Bakı:"Elm", -2001. -72s.

[20] Azərbaycan Respublikasının təbii yem sahələrinin irimiqyaslı geobotaniki tədqiqatına dair təlimat /Həmmüəlliflər qrupu, –Bakı: –2002. –142 s.

[21] Azərbaycanın bitki örtüyü xəritəsi / miqyas 1:600 000/ AMEA-nın müxbir üzvü, professor E.M. Qurbanovun müəllifliyi ilə. -Bakı: -2022. -1v.

[22] Гроссгейм, А.А. Флора Кавказа: [в 7 томах] / А.А. Гроссгейм, – Баку. Аз ФАН СССР. -1939-1967.

[23] Толмачев, А.И. Методы сравнительной флористики и проблемы флорогенеза /А.И. Толмачев, Сибирское отделение, – Новосибирск: Наука, – 1986. –195 с.

[24] Камелин, Р.В. Флорогенетический анализ естественной флоры горной Средней Азии / Р.В. Камелин, –Л.: Наука, –1973.

[25] Raunkaier, C. The life form of plants and statistical plant geography / C. Raunkaier, – Oxford: Clarendon Press, –1934. – p. 48-154.

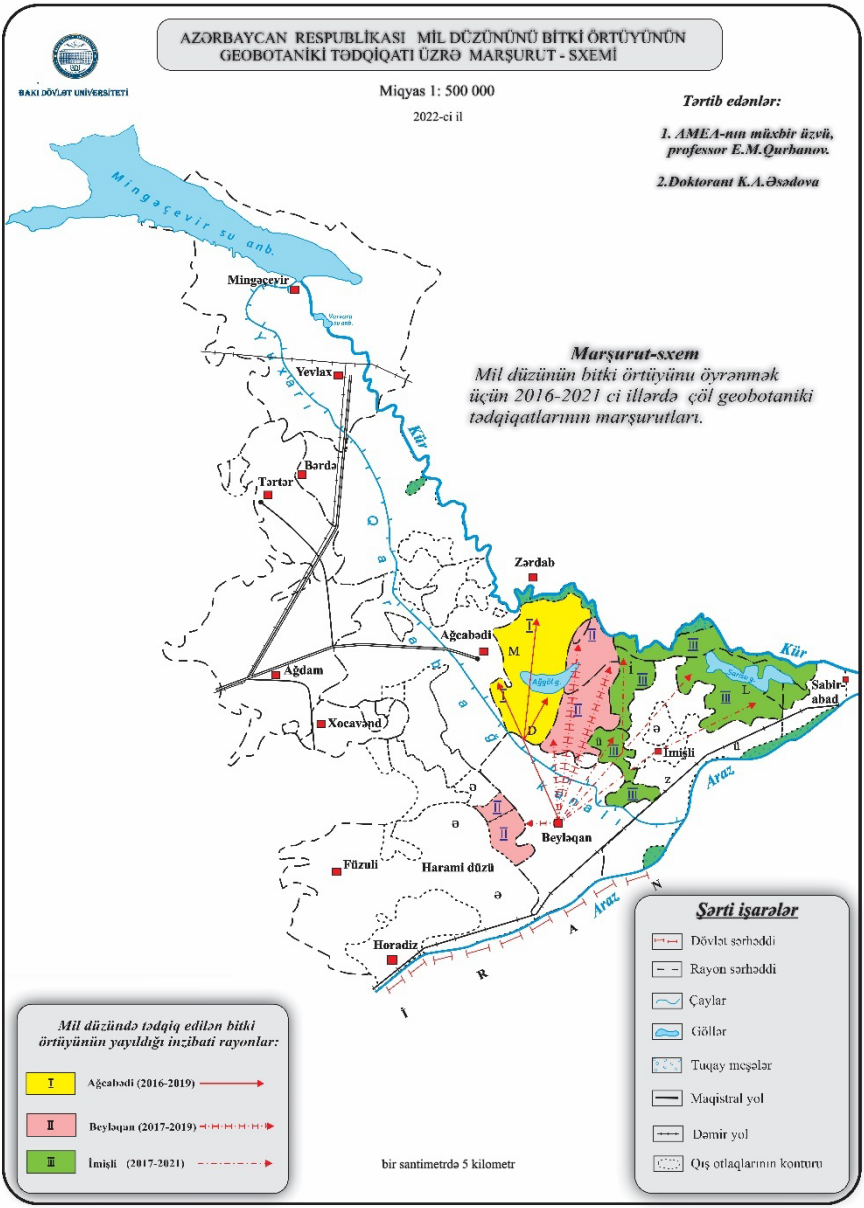

Figure 1. Route scheme for geobotanical study of vegetation cover of the Mil Plain

I.Serebyakov[26], and the ecological groups according to A.P. Shennikov[27] and V.J. Viktorov[28]. Productivity was determined based on I.M. Ponyatovskaya[29] methods and carried out in the most widespread semi-desert and desert vegetation in the Beylagan, Agjabedi and Imishli districts by the method of mowing and modeling In this regard, seasonal productivity in winter pastures was investigated over a period of four years. During the field phase of geobotanical studies, samples of the main forage plants were collected and analyzed in order to investigate the forage quality of the vegetation cover of the formations. Based on the analysis of the mentioned analyses, forage unit, digestible protein, and nitrogen-free extractives (NFE) were calculated.

The works of G.F. Akhundov[30], A.M. Askerov[31, 32], "Red list of the endemic plants of the Caucasus"[33] and others were used in the study of endemic and subendemic flora. Rare and endangered plants are identified according to the "Red Book of the Republic of Azerbaijan"[34].

According to M.F. Tomme[35], fixed coefficients were taken into account, and the forage unit and digestible protein of the formations were

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[26] Серебряков, И.Г. Жизненные формы высших растений и их изучение (Полевая геоботаника): [в 3-х т.] /И.Г.Серебряков, –М.-Л.: АН СССР, - т. 3, –1964. -181 с.

[27] Шенников, А.П. Введение в геоботанику /А.П.Шенников, –Л.:ЛГУ, –1964.–447с.

[28] Ботаническая география с основами экологии растений: Учебник для вузов/ Под ред. В.С. Викторов, - Москва: Агропролниздат. -1986, -255с.

[29] Понятовская, В.М. Учет обилия и особенности размещения видов и естественных растительных сообществах// Полевая геоботаника. -М.: Наука, -1964. т.3. –с.200-289.

[30] Ахундов, Г.Ф. Эндемы флоры Азербайджана: /автореф. дис. доктор. биол. наук. /–Баку, 1973, –44 с.

[31] Əsgərov, A.M. Azərbaycan florasının endemləri // - Bakı: AMEA-nın Xəbərləri, Biologiya və tibb elmləri bölməsi, - 2011. c. 66, №1, -s. 99-105.

[32] Əsgərov, A.M. Azərbaycan florasının subendemləri // -Bakı: AMEA-nın Xəbərləri, Biologiya və tibb elmləri bölməsi, -2014. №1, -s. 81-91.

[33] Schatz, G.E. Red list of the endemic plants of the Caucasus: Armenia, Azerbaijan, Georgia, Iran, Russia, and Turkey / G.E. Schatz, T. Shulkina, J.C. Solomon, -St. Louis, US: Missouri Botanical Garden Press, -2014. - 451pp.

[34] Azərbaycan Respublikasının Qırmızı Kitabı. Flora: [3 cilddə] / Red. Hey. – Bakı:"Imak", –c.3. –2023. –507s.

[35] Томме, М.Ф. Корма СССР. Состав и питательность (таблицы)/ М.Ф. Томме, – Москва: Наука. -1964. -448с.

determined according to the rules of the Electronic Land Accounting Information System (ELAIS).

For the first time, we have developed an "Ecological and Geobotanical Map of the Natural Vegetation Cover of the Mil Plain" (scale 1:200000) based on a geographic information system (GIS).

CHAPTER IV. ANALYSIS OF THE FLORA OF THE MIL PLAIN

4.1. Taxonomic analysis of flora. The distribution of 656 species of higher plants belonging to 3 divisions, 5 classes, 73 families, and 328 genera has been specified in the wild flora of the Mil Plain (Tab. 1).

Table 1. The spectrum of the systematic structure of the flora of the Mil Plain by taxa

Plant groups	Families		Genera		Species	
	Quantity	By total amount, in %	Quantity	By total amount, in %	Quantity	By total amount, in %
1. Higher spores	4	5,5	4	1,2	7	1,1
2. Gymnosperms	1	1,4	1	0,3	3	0,4
3. Angiosperms	68	93,1	323	98,5	646	98,5
a) monocotyledons	14	20,6	79	24,5	170	26,3
b) dicotyledons	54	79,4	244	75,5	476	73,7
Total:	73	100,0	328	100,0	656	100,0

A comparison of the taxa recorded in the flora of the plain with the "Flora of Azerbaijan" and "Plant world of Azerbaijan" shows that the families (73 families) found in the wild flora of the Mil Plain account for 58.4% and 45.9% of the families in the flora of the republic, 35.2% and 29.4% of the genera (328 genera), and 14.6% and 14.4% of the species (656 species) (Table 2).

In terms of the number of all species 6 families, *Poaceae* Barnhart is characterized by 92 species, *Asteraceae* Giseke by 82 species, *Fabaceae* Lindl. by 59 species, *Amaranthaceae* Juss. by 52 species, *Brassicaceae* Burnett by 43 species, *Caryophyllaceae* Juss. by 30 species and the corresponding families include 182 genera and 358 species (Fig. 2).

Table 2. Comparison of the flora of the Mil Plain with the flora of Azerbaijan in terms of systematic taxa and plant life forms

№	Taxa and life forms	”Flora of Azerbaijan"		Flora of the Mil plain		"Plant kingdom of Azerbaijan”		Flora of the Mil plain	
		Quan-tity	By total amount, in %	Quan-tity	By total amount, in %	Quan-tity	By total amount, in %	Quan-tity	By total amount, in %
1.	Families	125	100	73	58,4	159	100	73	45,9
2.	Genera	930	100	328	35,2	1117	100	328	29,4
3.	Species	4500	100	656	14,6	4557	100	656	14,4
4.	Trees	107	100	8	7,5	119	100	8	6,7
5.	Tree-shrubs, shrubs, subshurb semi-hrubs, semi-subshrubs	328	100	38	11,6	316	100	38	12,0
6.	Grasses	4065	100	610	15,0	4122	100	610	14,8

According to the number of species in the analysis of genera (328 genera), *Ranunculus* L. is represented by 15 species, *Medicago* L. and *Trifolium* Tourn. ex L. by 12 species each, *Cyperus* L. by 11 species, *Carex* L. by 10 species, *Orobanche* L. by 9 species, *Plantago* L., *Galium* L. and *Bromus* L. by 8 species each, *Juncus* L., *Atriplex* L., *Astragalus* L. and *Lepidium* L. by 7 species each, *Avena* L. and *Vicia* L. by 6 species each.[36] The number of species in the 195 genera of flora consists of 5-1 species.

4.2. Biomorphological analysis of flora. As a result of the analysis of biomorphological groups, it was determined that therophytes predominate in terms of quantity in the flora of the Mil Plain (Fig. 3). Thus, therophytes are represented in first place with 379 species (58%), cryptophytes in second place with 112 species (17%), hemicryptophytes in third place with 98 species (15%), chamaephytes in fourth place with 38 species (6%), and phanerophytes in fifth place with 29 species (4%) (Fig. 3).

[36] Qurbanov, E.M., Əsədova, K.A. Kür-Araz ovalığının Mil ərazisinin florasının təhlili // AMEA-nın Gəncə bölməsi “Xəbərlər” məcmuəsi, –Gəncə: “Elm”, –2018. №4, 74, – s.3-11.

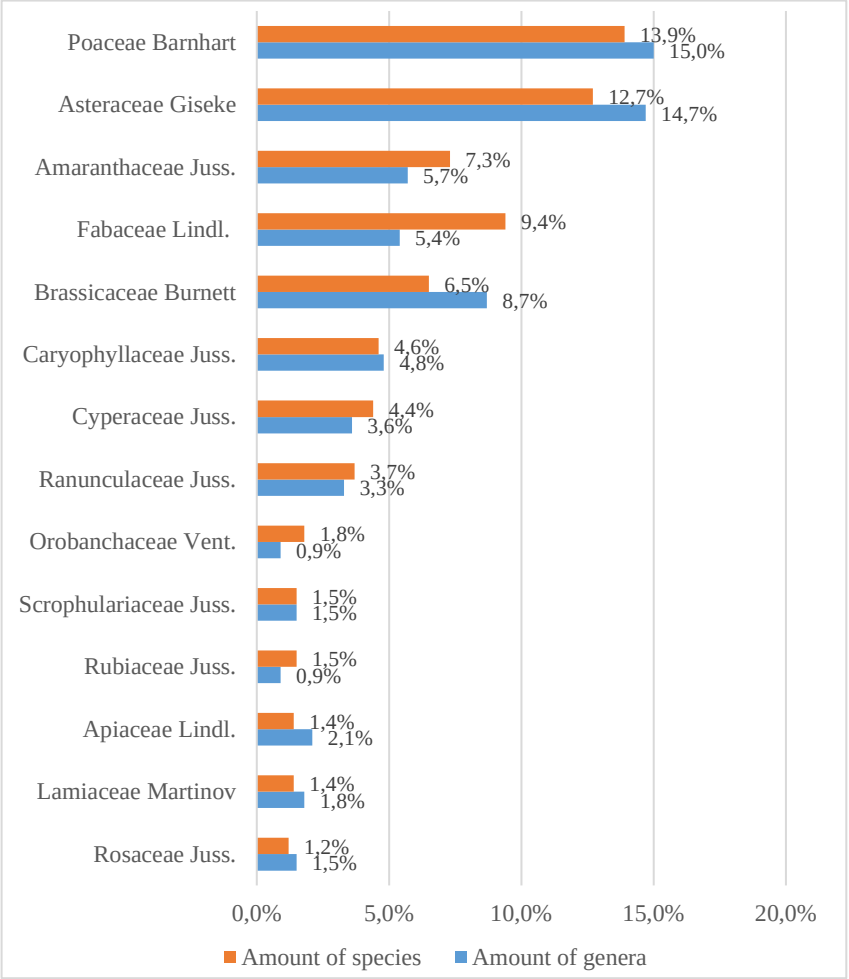


Figure 2. Distribution of species and genera found in the wild flora of the Mil Plain by family (by quantity, in %)

In the flora of the Mil Plain (656 species), annual herbs dominate in quantity with 331 species (50.5%) and perennial herbs with 231 species.

The biomorphological analysis of the flora of the area shows that, according to their life forms, biennial herbs (29 species), shrubs and annual/perennial herbs (19 species each), trees (8 species), subshrubs and semi-subshrubs (6 species each), as well as subshrubs and and

tree/shrubs consist of relatively few species (Tab. 3).

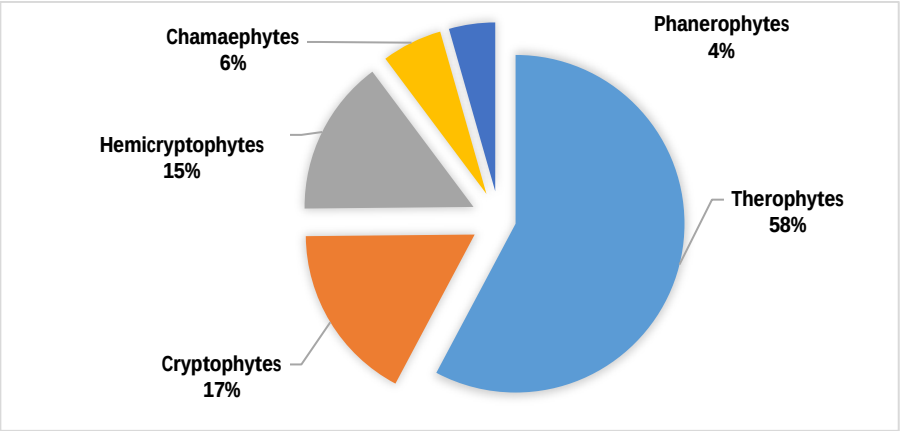


Figure 3. Spectrum of plant species recorded in the flora of the Mil Plain by life forms

Table 3. Classification and species composition of life forms of higher plants (according to Serebryakova) in the flora of the Mil Plain

№	Life forms	Number of species	
		by number	in %
1.	Trees	8	1.2
2.	Tree/shrubs	2	0.3
3.	Shrubs	19	2.9
4.	Subshrubs	5	0.8
5.	Semi-shrubs	6	0.9
6.	Semi-subshrubs	6	0.9
7.	Perennial herbs	231	35.2
8.	Biennial herbs	29	4.4
9.	Annual/biennial herbs	19	2.9
10.	Annual herbs	331	50.5
Total:		656	100.0

4.3. Ecological analysis of flora. In the **e**cological spectrum of the flora of the area, xerophytes are represented by 201 species (30.6%), mesoxerophytes by 109 species (16.6%), mesophytes by 108 species (16.5%), halophytes by 95 species (14.5%), psammophytes by 79 species (12.0%), and hydrophytes by 64 species (9.8%).

4.4. Analysis of botanical-geographical elements of flora. The

geographical range types and classes of species distributed in the area were determined according to A.A.Grossheim[37]. Of the 656 species recorded in the flora of the plain, species belonging to the Ancient Mediterranean (332 species) and boreal (173 species) range types have a quantitative advantage. In the flora of the area, 52 species (7.9%) belong to desert, 28 species (4.3%) to Caucasian, 18 species (2.7%) to adventive, 13 species (2.0%) to steppe, 7 species (1.1%) to cosmopolitan, and 4 species (0.6%) to Ancient or Tertiary periods.

4.5. Analysis of flora endemicity and subendemicity. Our research shows that 28 species of endemic plants from the Caucasus range, belonging to 13 families and 24 genera, are common in the wild flora of the Mil Plain.

As a result of the analysis of the endemism of the flora of the area, 5 species belonging to 5 families and 4 genera were identified as endemic plants with Azerbaijan range in the Mil Plain (Tab. 4).

Table 4. Systematic taxon indicators of endemic plants with Azerbaijan range in the flora of the Mil Plain

№	Families	№	Genera	№	Species
1	*Asparagaceae* Juss.	1	*Bellevalia* Lapeyr.	1	*B. zygomorpha* Woronow
		2	*Muscari* Mill	2	*M. neglectum* Guss. ex Ten. & Sangiov. (≈*M. leucostomum* Woronow)
2	*Papaveraceae* Juss.	3	*Papaver* L.	3	*P.schelkovnikovii* N.Busch
3	*Brassicaceae* Burnett.	4	*Neotorularia* Hedge. et Leonard	4	*N. contortuplicata* (Stephan ex Willd.) Hedge & J.Léonard
4	*Asteraceae* Giseke	5	*Tragopogon* L.	5	*T.macropogon* C.A.Mey.

As a result of our research, the distribution of 11 species of subendemic plants in the flora of the Mil Plain has been identified. Subendemic plants with Azerbaijan range belong to 8 families and 11 genera.

4.6. Analysis of rare and endangered species found in the flora of the Mil Plain and included in the "Red Book of the Republic of Azerbaijan". In the flora of the Mil Plain, 9 species of higher

[37] Гроссгейм, А.А. Флора Кавказа: [в 7 томах] / А.А. Гроссгейм, – Баку. Аз ФАН СССР. -1939-1967.

plants belonging to 8 genera from 7 families, which are rare and endangered and included in the "Red Book of the Republic of Azerbaijan", were discovered, and the assessment of these species on the IUCN Red List was examined according to categories and criteria[38].

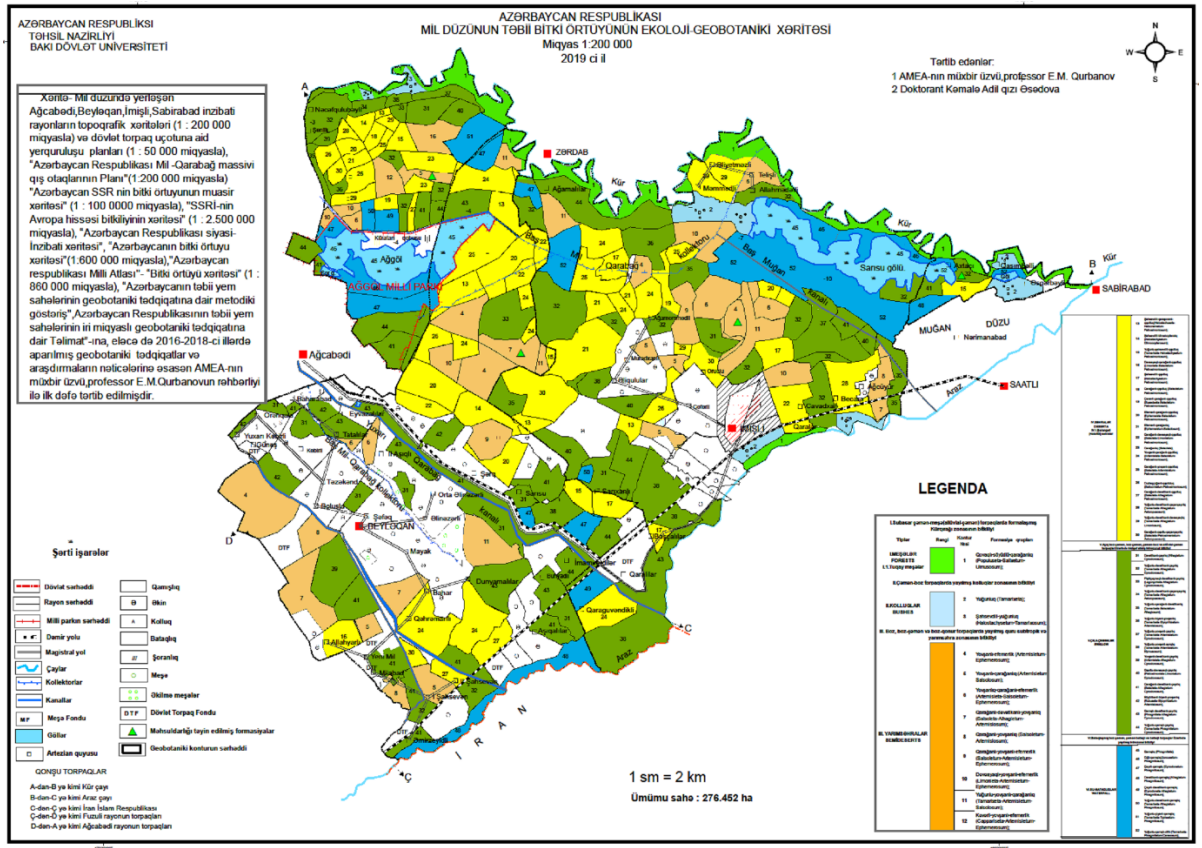
4.7. Analysis of species of the flora of which new distribution areas are identified. A new distribution area of the same number of species belonging to 4 families has been discovered for the area. New distribution areas of Arabian needlegrass (*Stipa arabica* Trin. & Rupr.) of the genus Stipa belonging to the family *Poaceae;* thread rush (*Juncus filiformis* L.) of the genus Juncus belonging to the family *Juncaceae;* semitwisted lucern (*Medicago hemicycle* Grossh.) from Medicago belonging to the family *Fabaceae;* shining wormwood *(Artemisia splendens* Willd.) of the genus Artemisia belonging to the family *Asteraceae* were identified in the Mil Plain.

CHAPTER V. ECOLOGICAL-GEOBOTANICAL FEATURES OF THE NATURAL VEGETATION OF MIL PLAIN

The classification was developed for the first time by us based on research on the ecological characteristics of the natural vegetation of the Karabakh and Mil-Mugan economic regions of the Republic of Azerbaijan, as well as the Mil Plain, located in the southwestern part of the Kur-Araz lowland. The vegetation studied in terms of phytocoenological characteristics of the Mil Plain is concentrated in 6 types (forest (tugai forests), shrubs, semi-deserts, saltwort deserts, sinkhole-meadows and wetlands), 22 formation classes, 52 formation groups and 117 associations. By systematizing the geobotanical descriptions of these formations and associations, a scheme and spectrum of vegetation classification were determined.

An ecological-geobotanical map of phytocoenoses (at a scale of 1:200,000) was compiled for the first time based on the formation groups reflected in the classification scheme of the natural vegetation cover of the Mil Plain (map).

[38] Musayev, M.G., Asadova, K.A., Mukhtarova, Sh.J., Aliyev, S.I. Conservation of the rare and endangered species of Mil steppe of Azerbaijan// Jokull Journal. –2018. Vol. 68, №8, –p.37-42.



Map. Ecological-geobotanical map of the natural vegetation of the Mil Plain.

According to geobotanical surveys and research conducted at an altitude of 20-160m above sea level in the Mil Plain area, the studied vegetation is distributed in the following zones:

I. Vegetation of the Kurgiragi (river edge) forest zone, formed on floodplain meadow-forest or alluvial-meadow soils:

Tugai forests of this vegetation type are rare forests dominated mainly by tall willow *(Salix excelsa* J.F.Gmel.*)* and white poplar (*Populus alba* L.) in the floodplain of the Kur River. As reflected in the classification scheme of forest-type vegetation, tugai is represented in the forest formation class, 1 formation group, and 2 associations (Fig. 4).

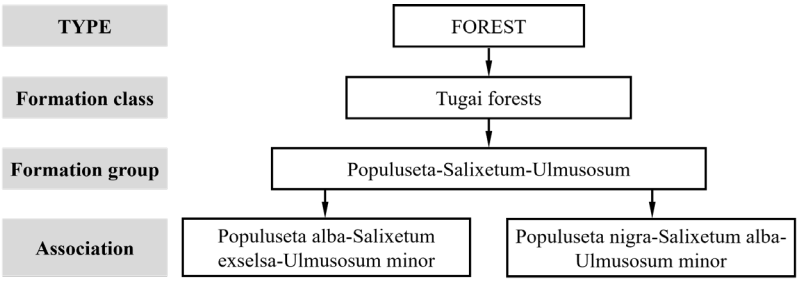


Figure 4. Classification scheme of forest vegetation of the Mil Plain

II. Vegetation of the shrubland zone distributed on meadow-gray soils:

Shrub vegetation - the vegetation type consists of 1 formation class, 2 formation groups, and 4 associations (Fig. 5).

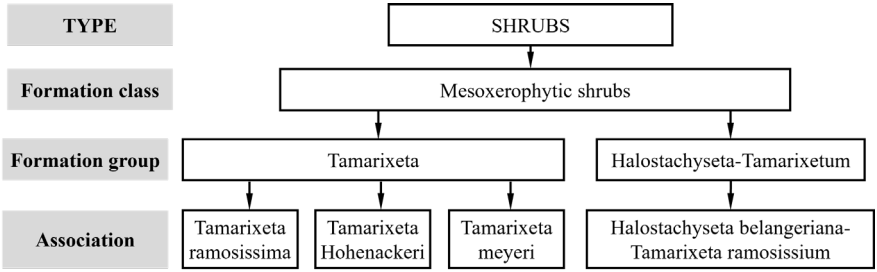


Figure 5. Classification scheme of shrub vegetation of the Mil Plain

III. Vegetation of the dry subtropical and semi-desert zone, which is distributed on gray-meadow, meadow-gray, saline and alkaline soils:

Semi-desert vegetation - 5 formation classes, 9 formation groups, and 18 associations have been identified in this vegetation type (Fig. 6).

Desert vegetation - forms on alkaline meadow-gray and saline soils. Based on the results of geobotanical studies conducted on the corresponding desert vegetation type spread across the Mil Plain, 9 formation classes, 18 formation groups, and 38 associations were identified in the phytocoenosis[39] (Fig. 7).

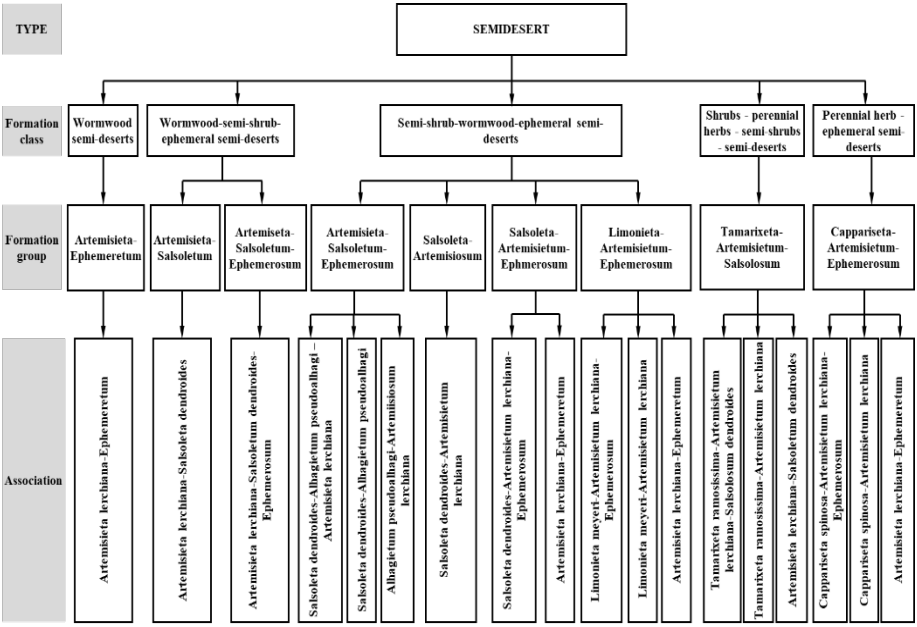
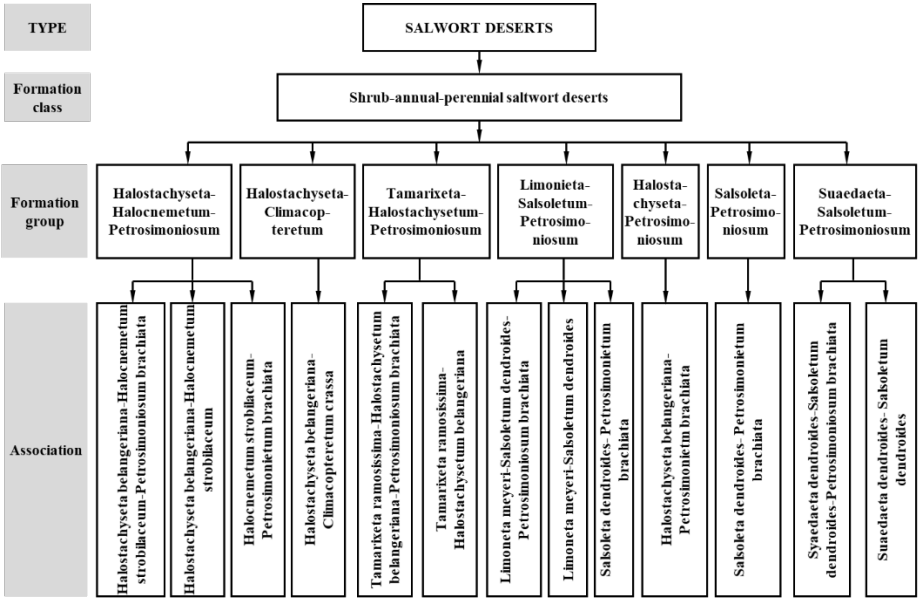
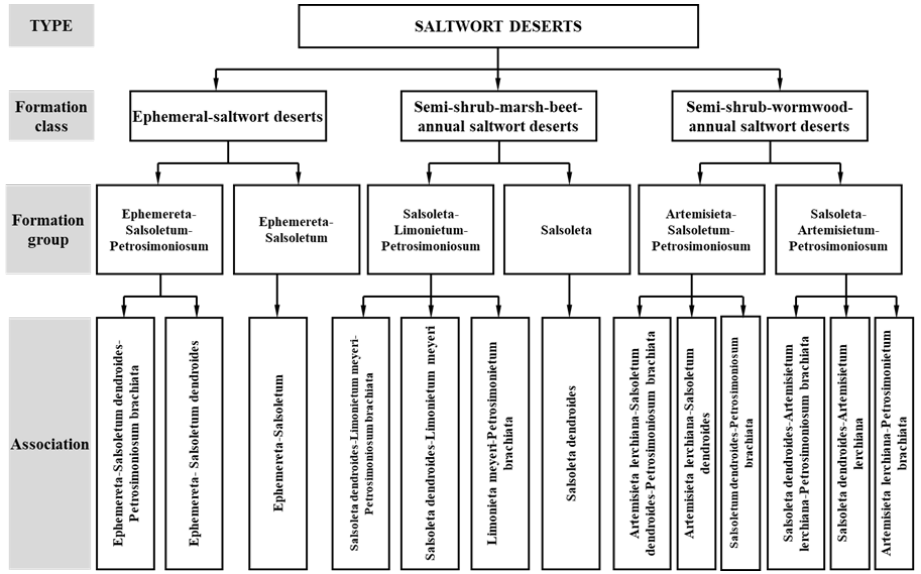


Figure 6. Classification scheme of the semi-desert vegetation of the Mil Plain

[39] Qurbanov, E.M., Əsədova (İbayeva), K.A. Kür-Araz ovalığının Mil düzünün səhra və yarımsəhra bitkiliyi və onun bioekoloji xüsusiyyətləri// AMEA Botanika İnstitutunun Elmi Əsərləri. –Bakı: "Elm", –2008. XXVIII cild. –s.53-58.


TYPE
SALWORT DESERTS
Formation class
Shrub-annual-perennial saltwort deserts
Formation group
Halostachyseta-Halocnemetum-Petrosimoniosum
Halostachyseta-Climacop-teretum
Tamarixeta-Halostachysetum-Petrosimoniosum
Limonieta-Salsoletum-Petrosimo-niosum
Halosta-chyseta-Petrosimo-niosum
Salsoleta-Petrosimo-niosum
Suaedaeta-Salsoletum-Petrosimoniosum
Association
Halostachyseta belangeriana-Halocnemetum strobilaceum-Petrosimoniosum brachiata
Halostachyseta belangeriana-Halocnemetum strobilaceum
Halocnemetum strobilaceum-Petrosimonietum brachiata
Halostachyseta belangeriana-Climacopteretum crassa
Tamarixeta ramosissima-Halostachysetum belangeriana-Petrosimoniosum brachiata
Tamarixeta ramosissima-Halostachysetum belangeriana
Limoneta meyeri-Salsoletum dendroides-Petrosimoniosum brachiata
Limoneta meyeri-Salsoletum dendroides
Salsoleta dendroides- Petrosimonietum brachiata
Halostachyseta belangeriana-Petrosimonietm brachiata
Salsoleta dendroides- Petrosimonietum brachiata
Syaedaeta dendroides-Salsoletum dendroides-Petrosimoniosum brachiata
Suaedaeta dendroides- Salsoletum dendroides


TYPE
SALTWORT DESERTS
Formation class
Ephemeral-saltwort deserts
Semi-shrub-marsh-beet-annual saltwort deserts
Semi-shrub-wormwood-annual saltwort deserts
Formation group
Ephemereta-Salsoletum-Petrosimoniosum
Ephemereta-Salsoletum
Salsoleta-Limonietum-Petrosimoniosum
Salsoleta
Artemisieta-Salsoletum-Petrosimoniosum
Salsoleta-Artemisietum-Petrosimoniosum
Association
Ephemereta-Salsoletum dendroides-Petrosimoniosum brachiata
Ephemereta- Salsoletum dendroides
Ephemereta-Salsoletum
Salsoleta dendroides-Limonietum meyeri-Petrosimoniosum brachiata
Salsoleta dendroides-Limonietum meyeri
Limonieta meyeri-Petrosimonietum brachiata
Salsoleta dendroides
Artemisieta lerchiana-Salsoletum dendroides-Petrosimoniosum brachiata
Artemisieta lerchiana-Salsoletum dendroides
Salsoletum dendroides-Petrosimoniosum brachiata
Salsoleta dendroides-Artemisietum lerchiana-Petrosimoniosum brachiata
Salsoleta dendroides-Artemisietum lerchiana
Artemisieta lerchiana-Petrosimonietum brachiata

continued

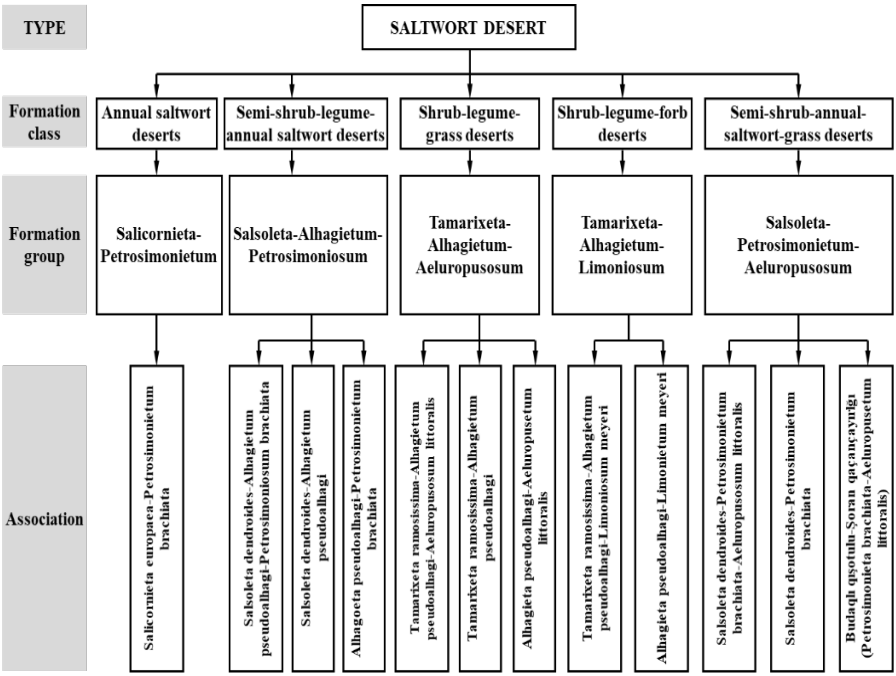


Figure 7. Classification scheme of saltwort desert vegetation of the Mil Plain

Sinkhole-meadow vegetation type was recorded in light gray meadow and alkaline meadow-gray soils. In the sinkhole-meadow vegetation type recorded in the natural vegetation cover of the plain, 39 associations were found in 3 formation classes and 14 formation groups (Fig. 8).

Wetland vegetation - intrazonal vegetation distributed on swampy gray-meadow, meadow-swamp and swampy soils – 3 formation classes, 8 formation groups and 16 associations were noted in the wetland vegetation (Fig. 9).

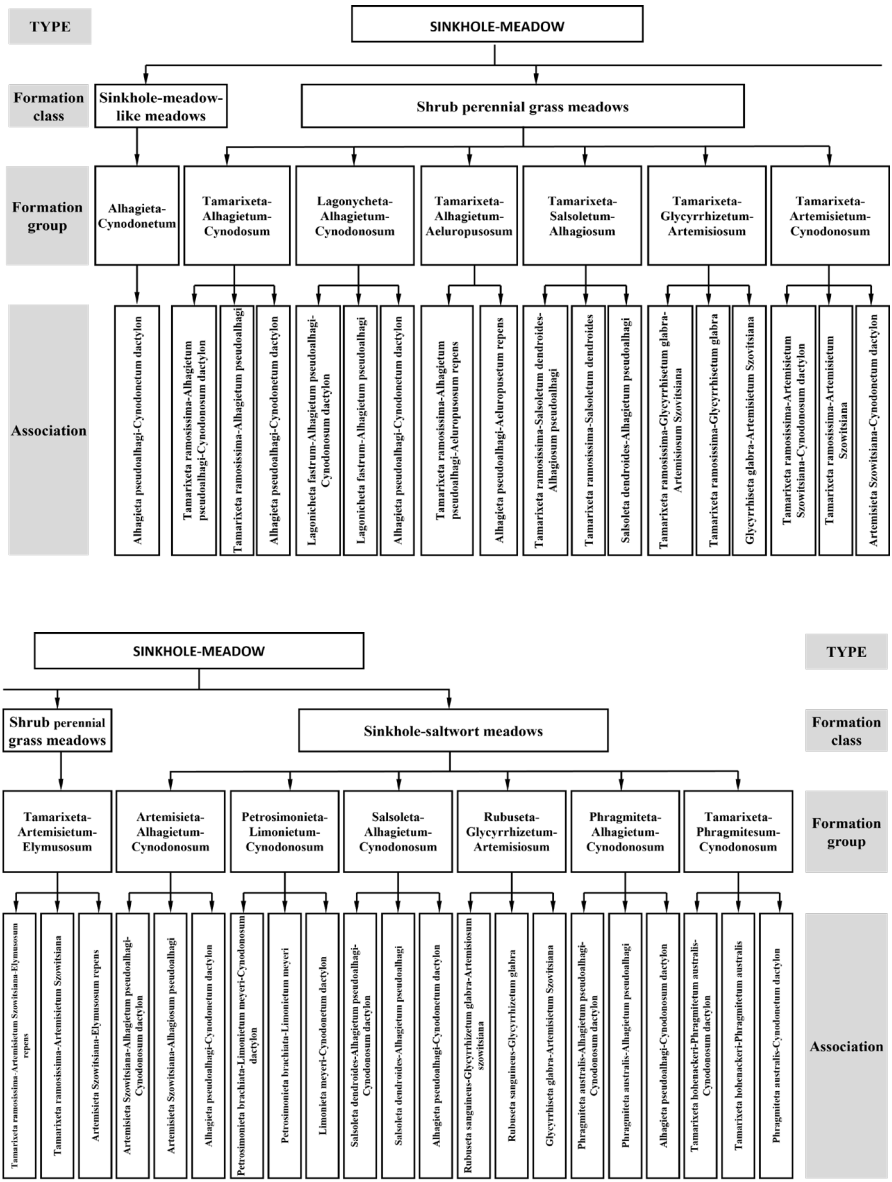


Figure 8. Classification scheme of sinkhole-meadow vegetation of the Mil Plain

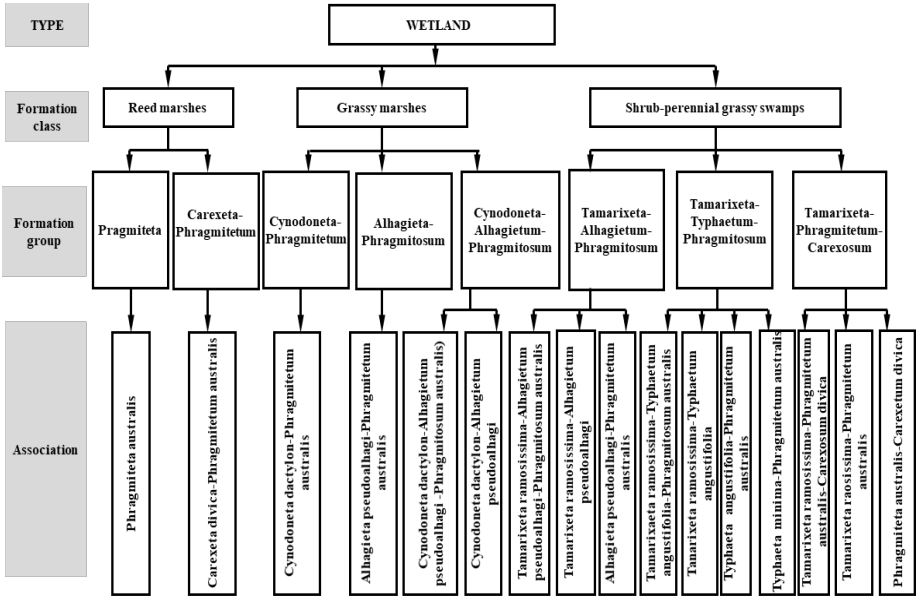


Figure 9. Classification scheme of wetland vegetation of the Mil Plain

CHAPTER VI. PRODUCTIVITY, FEED QUALITY AND CAPACITY OF NATURAL VEGETATION IN THE WINTER PASTURES OF MIL PLAIN

In accordance with the goals and objectives of the research, the productivity of Artemisieta-Salsoletum, Suaedaeta- Salsoletum-Petrosimoniosum, Salsoleta-Alhagietum-Artemisiosum and Artemisieta-Ephemeretum formations in the desert and semi-desert phytocoenoses of the Mil Plain was studied.

To investigate the productivity and forage quality of vegetation cover of formations recorded on alkaline gray-meadow, meadow-gray and saline soils in the winter pastures of the Aghjabedi, Beylagan and Imishli districts of Azerbaijan, located on the border of the Mil plain, samples of the main forage plants were taken by botanical groups in the flowering phase in the autumn, winter and spring of 2016-2020, including forbs in autumn and winter, and grasses and le-

gumes in spring[40, 41].

From the results of the productivity of Artemisieta-Salsoletum formation, it can be concluded that 6.3 c/ha was determined by dry mass in 2016-2017, 8,5 c/ha in 2017-2018, 10,6 c/ha in 2018-2019 and 7,4 c/ha in 2019-2020 (Tab. 5). Drying coefficient of the average annual productivity is 1.5. The digestibility coefficient in absolute dry matter of the formation is characterized by 50% protein, 46% fat, 58% cellulose and 59% NFE (nitrogen-free extractives). Based on the winter pasture area (1230 hectares), grazing period (210 days), productivity (8.2 c/ha in dry weight), as well as feed units per 100 kg of feed (50.2) and daily feed rate of cattle (1.3 feed units), the load (1.5 heads of small cattle per hectare) and capacity (1845 heads of cattle) of winter pasture area No. 31-32^{h} in the territory of Agjabedi district were calculated.

The annual productivity of the Suaedaeta-Salsoletum-Petrosimoniosum formation based on dry mass was determined to be 6.1 c/ha in 2016-2017; 9.2 c/ha in 2017-2018; 9.4 c/ha in 2018-2019; and 10.2 c/ha in 2019-2020. Based on feed quality or nutritional value, total moisture is 30.0%, hygroscopic moisture – 9.3, crude ash – 10.9%, crude protein – 2.9%, crude cellulose – 26.4%, and NFE– 49.7%. 100 kg of feed of the corresponding formation yields 40.3 feed units and 4.1 digestible protein. The load and capacity of winter pasture area No. 39^{h} (1175 ha) were calculated taking into account the nutritional value of the phytocoenosis (feed unit), the grazing period of the winter pasture area, its productivity, and the daily feed rate of the cattle. The load per hectare of this pasture area is 1.7 heads, and a total of 1,998 heads of small cattle can be grazed on the area.

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[40] Qurbanov, E.M., Əsədova, K.A. Mil düzünün qış otlaqlarının bitkiliklərinin tədqiqi və onların səmərəli istifadəsi // Naxçıvan Dövlət Universitetinin Elmi Əsərləri (Təbiət və tibb elmləri seriyası). –Naxçıvan: "Qeyrət", –2017. №7 (88), –s.60-63.

[41] Asadova, K.A. Bioecological features of some feed, poisonous and noxious plants of the winter pastures of the Mil steppe in Azerbaijan// Khazar Journal of science and technology. –Baku: Khazar University, –2019. Vol. 3, num. 2, –p.56-62.

Table 5. Dynamics of productivity (cents/ha) of natural phytocoenoses in winter pastures of the Mil Plain for 2016-2020

Years	Formations							
	Artemisieta Salsoletum		Suaedaeta-Salsoletum Petrosimoniosum		Salsoleta-Alhagietum-Artemisiosum		Artemisieta Ephemeretum	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
2016-2017	10,1	6,3	7,9	6,1	11,8	8,4	6,8	5,7
2017-2018	13,6	8,5	13,8	9,2	13,8	9,2	9,1	6,5
2018-2019	14,8	10,6	13,2	9,4	14,2	8,9	14,4	9,6
2019-2020	11,1	7,4	16,3	10,2	16,2	9,5	10,7	8,3
Total:	12,4	8,2	12,8	8,7	14,0	9,0	10,3	7,5

The productivity of the phytocoenosis (in terms of edible dry mass) of the Salsoleta-Alhagietum-Artemisiosum formation was 8.4 c/ha in 2016-2017, 9,2 c/ha in 2017-2018, 8,9 c/ha in 2018-2019 and 9,5 c/ha in 2019-2020. The absolute dry matter content was 51% protein, 44% fat, 53% cellulose, and 55% NFE. Based on the biochemical analysis of the feed quality of the phytocoenosis, the total moisture content in dry mass was 21.1%, hygroscopic moisture content – 9.0%, crude ash – 8.9%, crude protein – 10.3%, crude fat – 3.4%, crude cellulose – 27.1%, and NFE– 50.3%; 53.3 feed units and 5.3 digestible protein were calculated per 100 kg of feed. The pasture load or capacity per hectare (1.8 heads), as well as the pasture capacity (929 heads of small cattle), were determined taking into account the productivity of the formation (9.0 s/ha in dry matter), feed unit, grazing period during the grazing season (210 days), winter pasture area (216 ha), feed units per 100 kg of dry feed (53.3), daily feed rate of the cattle (1.3 feed units).

In the Artemisia-Ephemeretum phytocoenosis, the dry mass yield was determined as 5.7 c/ha in 2016-2017, 6.5 c/ha in 2017-2018, 9.6 c/ha in 2018-2019, and 8.3 c/ha in 2019-2020. The absolute dry matter content was determined to be 54% protein, 28% fat, 57% cellulose, and 59% NFE. The results of biochemical analyses of the dry mass of the Artemisieta-Ephemerosum formation showed that the composition contained 20.0% total moisture, 9.7% hygroscopic moisture, 10.3% crude ash, 10.4% crude protein, 3.2% crude fat, 28.0%

crude cellulose, and 48.1% NFE. Thus, based on the quality of the feed, 45.2 feed units and 4.6 digestible protein were calculated in 100 kg of feed (dry grass) of the mentioned formation. To determine pasture capacity, the pasture load (1.2 heads) and capacity (1178 heads of cattle) were determined, taking into account the dry mass productivity of the formation (7.5 centners/ha), feed unit (45.2), grazing period during the grazing season (210 days), winter pasture area (982 ha), as well as the daily feed rate of small cattle (1.3 feed units).

CHAPTER VII. MEASURES FOR THE PROTECTION OF THE FLORA OF THE MIL PLAIN, THE EFFICIENT USE AND IMPROVEMENT OF VEGETATION COVER

Based on the research and studies conducted, we consider it appropriate to divide the Aghgol National Park into the following points for the protection of its flora:

a) Natural point. Study of the bioecological characteristics of endemic, subendemic, rare, endangered species and species with protection status found in the species composition of wetland vegetation here;

b) Special protection point. Establishing a protective zone for the protection of Sharp-edged iris (*Iris acutiloba* C.A.Mey), Caucasian orchid (*Ophrys caucasica* Woronow (= *O. mammosa* subsp. *caucasica* (Woronow ex Grossh.) Soó)), Caspian lotus (*Nelumbo caspica* Fisch. (= *N. nucifera* Gaertn.)) plant species and etc. included in the "Red Book of the Republic of Azerbaijan", as well as taking biotechnical measures to prohibit the grazing of domestic or mammalian animals there;

c) Forest strip point. Planting of trees and shrubs such as tall willow (*Salix exselsa* S.G.Gmel.), white poplar (*Populus alba* L.), French tamarisk (*Tamarix ramosissima* Ledeb.) and etc. in order to create a protective forest strip between the border of the National Park and winter pasture areas;

d) Prohibition point. Protecting rare, endangered, endemic, subendemic species, found there by organizing a prohibition point on the shores of Lake Aghgol and Kichik Aghgol, provided that anthropogenic factors and improper economic activities are prevented from

affecting the flora and vegetation of the area;

e) Experiment point. To study information on the protection of wild flora, birds and mammals of the National Park for educational and training purposes, to ensure periodic field training of personnel in the field of ecology, biology and botany in higher educational institutions.

f) Ecological education and propaganda point. In order to protect important natural complexes of phytodiversity and endangered species in the ecosystem of park, marking the images of birds with the attributes of our country, establishing a recreational forest strip for the development of ecotourism, as well as the creation of recreational forests, construction of roads and paths in green areas, and environmental education of the population.

In addition to protecting the flora of Aghgol National Park, an action plan has been prepared and recommendations have been made for improving phytodiversity and the ecological environment at the mentioned points.

RESULTS

1. Based on the analysis of the wild flora of the Mil Plain, a conspectus of 656 plant species belonging to 73 families and 328 genera was developed. It was determined that the flora includes 7 species (1.1%) of higher spores, 3 species (0.4%) of gymnosperms, and 646 species (98.5%) of angiosperms, or 170 species (26.3%) of monocotyledons belonging to flowering plants division, and 476 species (73.7%) of dicotyledons. The 656 species common in the wild flora of area constitute 14.6% of Azerbaijan's flora (4,500 species).

2. According to the analysis of life forms in the flora of the area, the quantitative dominance of therophytes with 379 species (57.8%) is typical for the study area; cryptophytes consist of 112 (17.1%), hemicryptophytes - 98 (14.9%), chamaephytes - 38 (5.8%) and phanerophytes - 29 (4.4%) species. According to biomorphological classification, trees account for 8 (1.2%), tree-shrubs for 2 (0.3%), shrubs for 19 (2.9%), subshrubs for 5 (0.8%), semishrubs for 6 (0.9%), semi-subshrubs for 6 (0.9%), perennial herbs for 231 (35.2%), biennials for 29 (4.4%), annual- biennials for 19 (2.9%), and annuals 331 (50.5%)

species.

3. Studies have been conducted according to the geographical range types of the flora of the plain, and 332 species (50.6%) were determined to belong to the Ancient Mediterranean, 173 species (26.4%) to the boreal, 52 species (7.9%) to the desert, 28 species (4.3%) to the Caucasus, 18 species (2.7%) to the adventive, 13 species (2.0%) to the steppe, 7 species (1.1%) to the cosmopolitan, and 29 species (4.4%) to the undetermined.

4. In the flora of the plain, 28 species of Caucasian endemics belonging to 13 families and 24 genera; 5 species of Azerbaijani endemics belonging to 5 families and 4 genera; 11 species of subendemics belonging to 8 families and 11 genera; as well as 9 species belonging to 7 families and 8 genera, included in the "Red Book" (III edition), have been identified. New distribution areas of 4 species (*Stipa arabica, Juncus filiformis, Medicago hemicycla, Artemisia splendens*) have been identified for the Mil Plain area.

5. Based on ecological-geobotanical characteristics and the principle of dominance in the natural vegetation of the plain, 6 vegetation types such as forest (tugai), shrubland, semi-desert, halophyte desert, sinkhole-meadow, and wetland have been identified. These types are represented by 22 formation classes, 52 formation groups, and 117 associations. An "Ecological-geobotanical map of the natural vegetation cover of the Mil Plain (scale 1: 200,000)" has been compiled based on the vegetation of the Mil Plain.

6. Four-year productivity was investigated for Artemisieta-Salsoletum, Suaedaeta- Salsoletum-Petrosimoniosum, Salsoleta-Alhagietum-Artemisiosum and Artemisieta-Ephemeretum formations, and the spectrum of its dynamics was compiled based on the average productivity in these phytocoenoses (8.2 c/ha, 8.7 c/ha, 9.0 c/ha, 7.5 c/ha, respectively). Feed quality and nutritional value were determined, as well as feed units were calculated. It has been determined that it is possible to graze 1,7 heads of smallcattle in Artemisieta-Salsoletum (hectare), 1,7 heads in Suaedaeta- Salsoletum –Petrosimoniosum, 1,8 heads in Salsoleta-Alhagietum-Artemisiosum, 1,2 heads in Artemisieta-Ephemeretum.

RECOMMENDATIONS

1. To protect the flora and biodiversity of Aghgol National Park located in the Mil Plain, it is advisable for the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan to use the proposals developed for the division into buffer zones and points.

2. The compiled "Ecological-geobotanical map of the natural vegetation cover of the Mil Plain" is intended for the creation of an information system for electronic cadastral registration of lands and preparation of a digital cadastral map at the State Service on Property Issues under the Ministry of Economy of the Republic of Azerbaijan.

3. The implementation of recommendations on developed comprehensive measures by the Ministry of Agriculture of the Republic of Azerbaijan for the efficient use and improvement of winter pastures in the administrative territories of Agjabedi, Beylagan and Imishli districts, which are used as a source of feed for livestock, is of great importance in preventing food security and managing pastures.

4. In the application of the "National Strategy for the Conservation and Sustainable Use of Biological Diversity for 2017-2020", implementation of the protection of the flora and vegetation of the Mil Plain on ecological and geobotanical grounds; including the names of endemic, subendemic, rare and endangered species and those with protection status in the "Red Book of the Republic of Azerbaijan" has scientific importance in the protection and conservation of these plants.

The main content and scientific provisions of the dissertation are reflected in the following articles and theses:

1. Əsədova, K.A. Kür-Araz ovalığının Mil düzü ərazisinin bitki örtüyü və onların təsərrüfat əhəmiyyəti// AMEA Botanika İnstitutunun Elmi əsərləri. – Bakı: "Elm", – 2006. XXVI cild, – s. 206-207.
2. Əsədova, K.A. Kür-Araz ovalığının Mil düzü ərazisinin bitki örtüyü // "Biologiyada elmi nailiyyətlər" mövzusunda Respublika Elmi Konfransının materialları. – Bakı: BDU, 28-29 aprel, – 2006. – s. 31-32.
3. Асадова, К.А. Водно-болотная растительность Мильской степи Кура-Араксинской низменности //Естествознание и гуманизм.

Межвузовский сборник научных трудов. –Томск: –2007. Т.4, №3, –с.117-118.
4. Gurbanov, E.M., Asadova (Ibayeva), K.A. Desert vegetation of the Mil part of Kura-Araks lowland// International Conference on Environment, Survival and sustainability, Near University, –Nicosia-Northern Cyrpus: 19-24 February, –2007. – p.101-102.
5. Gurbanov, E.M., Asadova (Ibayeva), K.A. Semidesert vegetation of the Mil part of Kura-Araks lowland// International Symposium 7th Plant life of South west Asia (7th PLOSWA). – Eskişehir: –25-29 June, –2007. –p. 71.
6. Əsədova, K.A. Kür-Araz ovalığının Mil ərazisinin halofit səhra bitkiliyi // "Tətbiqi biologiyanın problemləri" mövzusunda Respublika Elmi konfransının materialları. – Bakı: "Bakı Universiteti", 27-28 aprel, –2007. –s.170-171.
7. Əsədova, K.A. Kür-Araz ovalığının Mil düzü sahəsinin tuqay meşələri //Akademik Həsən Əliyevin 100 illik yubileyinə həsr olunmuş "Ekologiya: təbiət və cəmiyyət problemləri" mövzusunda Beynəlxalq Elmi Konfransı. –Bakı: 8-9 noyabr, –2007. – s.383.
8. Əsədova, K.A. Kür-Araz ovalığının Mil düzü sahəsinin su-bataqlıq bitkiliyinin bioekoloji xüsusiyyətləri// "Biokimyəvi nəzəriyyələrin aktual problemləri" mövzusunda Elmi-praktik konfransın materialları. –Gəncə: Gəncə Dövlət Universiteti. –2007. –s. 68-73.
9. Gurbanov, E.M., Asadova, K.A. Genofund protection of the vegetative resources of Kura-Araks lowland// Proceedings of the ninth Baku İnternational Congress "Energy, ecology, economy". –Baku: 7-9 June, –2007. –p. 458-460.
10. Əsədova, K.A. Kür-Araz ovalığının Mil düzünün yovşanlı yarımsəhraları // Ulu öndər Heydər Əliyevin anadan olmasının 85-ci ildönümünə həsr olunmuş Respublika Elmi Konfransının materialları. –Bakı: "Bakı Universiteti", 25-26 aprel, – 2008. –s.227.
11. Qurbanov, E.M., Əsədova (İbayeva), K.A. Kür-Araz ovalığının Mil düzünün səhra və yarımsəhra bitkiliyi və onun bioekoloji xüsusiyyətləri// AMEA Botanika İnstitutunun Elmi Əsərləri. –Bakı: "Elm", –2008. XXVIII cild. –s.53-58.
12. Əsədova, K.A. Mil düzü ərazisinin yarımsəhra bitkiliyinin bəzi növlərinin təsərrüfat əhəmiyyəti //BDU-nun Biologiya fakültəsinin

80 illik yubileyinə həsr olunmuş “Eksperimental biologiyanın inkişaf perspektivləri” mövzusunda Respublika elmi konfransının materialları. –Bakı: 19-20 dekabr, –2014. –s.213.
13. Qurbanov, E.M., Məmmədova, Z.C., Əsədova, K.A. Kür-Araz ovalığının Tuqay meşələrinin müasir vəziyyəti// Aqrar elmin və təhlilin innovativ inkişafı. Dünya təcrübəsi və müasir prioritetlər. Beynəlxalq elmi-praktik konfransın materialları. 2015-ci ilin Azərbaycan Respublikasında “Kənd təsərrüfatı ili” elan edilməsinə həsr olunur. –Gəncə: 23-24 oktyabr, –2015. I cild, –s.222-224.
14. Гурбанов, Э.М., Асадова, К.А. Типы растительности Мильской степи Кура-Араксинской низменности // Современные проблемы биологии и экологии. Материалы докладов II Международной научно - практической конференции. –Махачкала: 4-5 марта, –2016. –с.177-179.
15. Qurbanov, E.M., Əsədova, K.A. Kür-Araz ovalığının Mil düzünün bəzi bitkilik tiplərinin qısa təsviri// “Müasir kimya və biologiyanın aktual problemləri”. Ümummilli lider Heydər Əliyevin anadan olmasının 93-cü ildönümünə həsr olunmuş Beynəlxalq Elmi Konfransın materialları.–Gəncə: Gəncə Dövlət Universiteti, 12-13 may, –2016. –s.21-23.
16. Gurbanov, E.M., Asadova, K.A. Bioecological features of the wetland vegetation of Kura-Araks lowland of Azerbaijan// Symposium on EuroAsian biodiversity (SEAB-2016). Antalya: 23-27 May, –2016. –p.25.
17. Mammadova, Z.J., Gurbanov, E.M., Asadova, K.A. Leguminous phytocenosis distributed in hole-meadow vegetation of Azerbaijan and their agricultural importance// European Academic Research. –2017. Vol. V., Issue 1, –p.580-594.
18. Gurbanov, E.M., Mammadova, Z.J., Asadova, K.A. Phytocenological structure of the perennial wheaty-leguminous grassy hole-meadow vegetation distributed at Mil steppe of Azerbaijan// The 3rd International Symposium on EuroAsian biodiversity. –Belarusian State University, –Minsk: 05-08 July, –2017. –p.661.
19. Məmmədova, Z.C., Qurbanov, E.M., Əsədova, K.A. Azərbaycanın Mil düzündə paxlalı bitkilərin üstünlüyü ilə rast gəlinən fitosenozlarına iqlim dəyişikliklərinin təsiri //“İqlim dəyişkənliyinin bitki

biomüxtəlifliyinə təsiri" Beynəlxalq elmi konfransı. Məruzələr toplusu. –Bakı: –2017. –s.463-464.
20. Qurbanov, E.M., Əsədova, K.A. Mil düzünün qış otlaqlarının bitkiliklərinin tədqiqi və onların səmərəli istifadəsi // Naxçıvan Dövlət Universitetinin Elmi Əsərləri (Təbiət və tibb elmləri seriyası). – Naxçıvan: "Qeyrət", –2017. №7 (88), –s.60-63.
21. Gurbanov, E.M., Asadova, K.A. Contemporary assesment of the species content of endemics and subendemics of Mil steppe flora of Azerbaijan//"German Science Herald", Germany: –2018. №4, –p.3-6.
22. Əsədova, K.A. Cənubi Mil düzünün çala-çəmən bitkiliyində Tamarixeta-Alhagietum-Cynodonosum formasiyasının fitosenoloji xüsusiyyətləri// Ümummilli lider Heydər Əliyevin anadan olmasının 95 illiyinə həsr olunmuş "XXI əsrdə ekologiya və torpaqşünaslıq elmlərinin problemləri" mövzusunda VII Respublika Elmi Konfransının materialları. –Bakı: 3-4 may, –2018. –s.173-174.
23. Əsədova, K.A. Mil düzünün qış otlaq sahələrində yayılmış yovşanlı-efemerlik formasiyasının tədqiqi// "Müasir təbiət və iqtisad elmlərinin aktual problemləri" mövzusunda Beynəlxalq Elmi Konfransın materialları. –Gəncə: 4-5 may, –2018. –s.65-67.
24. Əsədova, K.A. Mil düzü florasının endemizminin analizi// Azərbaycanda mikoloji tədqiqatların inkişafında akademik V.İ.Ulyanişevin rolu. Akad. V.İ. Ulyanişevin 120 illiyinə həsr olunmuş simpozium. –Bakı: 25 dekabr, – 2018. –s. 54.
25. Əsədova, K.A. Mil düzü florasının nadir növlərinin müasir qiymətləndirilməsi// Biologiyanın müasir problemləri Respublika elmi konfransının materialları. –Sumqayıt: 23-24 oktyabr, –2018. –S.239.
26. Qurbanov, E.M., Əsədova, K.A. Mil düzündə yayılmış yovşanlı-efemerlik formasiyasının fitosenoloji xüsusiyyətləri// "Botaniki tədqiqatlarda yeni cağırışlar" mövzusunda akad. V.C. Hacıyevin 90 illiyinə həsr edilmiş konfransın materialları. –Bakı: 20-21 iyun, – 2018. –s.143-145.
27. Qurbanov, E.M., Əsədova, K.A. Kür-Araz ovalığının Mil düzünün cənub hissəsinin səhra və çala-çəmən bitkiliyinin fitosenoloji quruluşu və məhsuldarlığı //AMEA-nın Xəbərləri. Biologiya və Tibb elmləri. –Bakı: – 2018. Cild 73. №3, – s.87-91.
28. Qurbanov, E.M., Əsədova, K.A. Mil düzü ərazisinin səhra və ya-

rımsəhra fitosenozları // Bakı Universiteti Xəbərləri, təbiət elmləri seriyası. –Bakı: – 2018. №2, –s. 37-44.
29. Musayev, M.G., Asadova, K.A., Mukhtarova, Sh.J., Aliyev, S.I. Conservation of the rare and endangered species of Mil steppe of Azerbaijan// Jokull Journal. –2018. Vol. 68, №8, –p.37-42.
30. Asadova, K.A. Characteristic peculiarities of Suaedaeta-Salsoletum-Petrosimoniosum formation (Mil steppe of Azerbaijan)// Conference of young scientists and students. Innovations in biology and agriculture to solve global challenges. –Baku: 31 October, – 2018. – p.109.
31. Qurbanov, E.M., Əsədova, K.A. Kür-Araz ovalığının Mil ərazisinin florasının təhlili// AMEA-nın Gəncə bölməsi "Xəbərlər" məcmuəsi, –Gəncə: "Elm", –2018. №4, 74, – s.3-11.
32. Qurbanov, E.M., Məmmədova, Z.C., Əsədova, K.A. Mil düzü florasının coğrafi təhlili// Azərbaycanda mikoloji tədqiqatların inkişafında akademik V.İ. Ulyanişevin rolu. Akad. V.İ. Ulyanişevin 120 illiyinə həsr olunmuş simpozium. –Bakı: 25 dekabr, –2018. –s. 36.
33. Əsədova, K.A. Mil düzü florasında rast gəlinən nadir növlərin biomüxtəlifliyinin qorunması// Akad. A.A.Qrossheymin 130-cu ildönümünə həsr olunmuş gənc alim və tədqiqatçıların "Müasir botanikada innovasiya və ənənələr" mövzusunda konfrans. –20 dekabr, – 2019. – s.31
34. Əsədova, K.A. Mil düzündə yayılmış Tamarixeta-Salsoletum-Alhagiosum formasiyasının məhsuldarlığı və təsərrüfat əhəmiyyəti// Doktorantların və gənc tədqiqatçıların XXIII Respublika Elmi Konfransının materialları. Azərbaycan Memarlıq və İnşaat Universiteti. –03-04 dekabr, –2019. I cild. –s. 69-71.
35. Qurbanov, E.M., Əsədova, K.A. Mil düzündə yayılmış yulğunluşahsevdili-qışotuluq formasiyasının məhsuldarlığı, qidalılığı və tutumunun tədqiqi// Heydər Əliyevin 96 illiyinə həsr olunmuş Gənc tədqiqatçıların III Beynəlxalq elmi konfransı. –Bakı: Mühəndislik Universiteti, 29-30 Aprel, – 2019. –s. 223-225.
36. Asadova, K.A. Bioecological features of some feed, poisonous and noxious plants of the winter pastures of the Mil steppe in Azerbaijan// Khazar Journal of science and technology. –Baku: Khazar University, –2019. Vol. 3, num. 2, –p.56-62.

37. Asadova, K.A. Chorological structure of the flora of Mil steppe// Journal of Baku engineering university. Chemistry and biology. – 2019. Vol. 3, №2, –p. 149-153.
38. Gurbanov, E.M., Naglaa Y. Abdallah, Mammadova Z.J., Asadova, K.A., Ahmed Elkordy. Floristic Diversity and Phytogeography of Mil steppe Azerbaijan //Journal of ecology of Health and Environment. Natural Sciences Publishing USA. –New York: –2019. Vol. 7, №1, –p.21-30.
39. Gurbanov, E.M., Mammadova, Z.J., Asadova, K.A. Phytocenosis created by leguminous plants of Mil steppe of Azerbaijan and their agricultural importance. Pelagia research library// Asian Journal of plant science and research. – 2019. Vol. 9, is. 2, –p.1-5.
40. Gurbanov, E.M., Asadova, K.A. Taxonomic synopsis of *Salsola* genus (Mil plain, Azerbaijan)// Bulletin of science and practice, – 2020. Vol. 6, is. 11, –p.78-84.
41. Əsədova, K.A., Qurbanov, E.M. "Azərbaycan Respublikası Mil düzünün təbii bitki örtüyünün ekoloji-geobotaniki xəritəsi". Əsərin qeydiyyatı haqqında şəhadətnamə №11525. Qeydiyyat tarixi-10.03.2020.
42. Əsədova, K.A. Mil düzü Sabirabad rayonun (Qasımbəyli kəndi) kəndətrafı örüşlərin bəzi fitosenozlarının xarakteristikası// Pedaqoji Universitetin Xəbərləri jurnalı, Riyaziyyat və təbiət elmləri seriyası. – Bakı: ADPU, –2020. C.68, №2. –s. 66-75.
43. Asadova, K.A. Study on endemic, rare and threatened species pf Mil steppe (Azerbaijan Republic)// Second international scientific conference of young scientists and specialist. Multidisciplinary approaches in solving modern problems of fundamental and applied sciences. –Baku: 3-6 March, –2020. – p.57.
44. Gurbanov, E.M., Asadova, K.A. Study of Ceratophylletum and Najasetum formations of the water-marshy vegetation of Mil area (Azerbaijan) //"Pontokaspi və Qafqaz Bölgəsi: ekosistemlərin birləşməsi və izolyasiyası şəraitində dəyişikliklər, canlıların filogenezi, geologiya, ekologiya və coğrafiyası" Multidisiplinar Beynəlxalq Konfrans (onlayn). –Bakı: 27-28 noyabr, –2020. –p.131-133
45. Gurbanov, E.M., Mukhtarova, Sh.J., Asadova, K.A. Wetland vegetation and algoflora of the lakes of Kur-Aras lowland //Azerbaijan

Journal of Botany. Published by Society of Azerbaijani Botanists. – 2020. Vol.1, №2, –s.13-18.

46. Asadova K.A. To the study of endemic and subendemic species of the Asteraceae family in the flora of the Mil steppe (in Azerbaijan Republic)// Proceedings of II. International agricultural, biological & life science conference E-AGBIOL, –Edirne: 1-3 September, – 2020. –p.347.
47. Asadova, K.A. Characteristics of the hole-meadow vegetation of Kur-Aras lowland (Azerbaijan)// Bulletin of science and practice. - 2021. Vol.7, №11, –p. 51-56.
48. Gurbanov, E.M., Asadova, K.A. Wormwood semi-deserts of the Mil Plain of Kur-Aras lowland //11th International Conference: Achievements & challenges in biology. Devoted to 120th anniversary of professor Mirali Akhundov. Baku State University. –Baku: 13-14 October, –2022. –p. 222-223.
49. Asadova, K.A. Geographical analysis of the flora of Mil steppe of Kur-Araz lowland (Azerbaijan)// Materials of the 1st International Conference: conservation of Eurasian biodiversity: Contemporary problems, solutions and perspectives. Andijan State University. – 2023. Part II. –p.16.
50. Gurbanov, E.M., Alosmanova, V.M., Asadova, K.A. Effect of salinity of the soil of Kur-Araz lowland on the productivity of seepweed (*Suaeda* Forsk.) species // ICEB- 2024, –Izmir: 2-4 September, –2024. –p. 360-362.

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