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WETLAND VEGETATION AND ALGOFLORA OF THE LAKES OF KUR-ARAZ LOWLAND

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The article provides the results of the researches at wetland vegetation of Mil plain and its geobotanical classification. Distribution, contemporary situation, species biodiversity, morphobiological, bioecological and phytocenological features of this vegetation was analyzed. Plant formations and associations were given together with edificators classification scheme were elaborated. It was determined that wetland vegetation type of researched area contains three formation classes, eight formations and 16 associations. Reed marshes formation class is represented with two formations: Phragmitetum and Carexeto-Phragmitesetum. Phragmiteta australis assosiation of Phragmitetum formation is one of the most distribited assosiations of the fresh water basins of Kur-Araz lowland. Grassy marshes formation class is represented with three formations: Cynodoneto-Phragmitesetum, Alhagieto-Phragmitesetum, Cynodoneto-Alhagietum. Shrabby-perennials marshes formation class includes three formations: Tamarixeto-Phragmitesetum, Typhaeto-Phragmitesetum and Tamarixeto-Carexetum. As well as the species content of plankton and bentos of Aggol and Sarisu lakes was also defined and results of ecological analysis of these lakes were given. During researches of algoflora of the lakes of researched area 50 algae species were found which belong to three divisions. Species of Pennatophyceae class of Bacillariophyta division have been dominated with 30 species. It was also determined that at the researched lakes the characteristic feature of phytoplankton is abundance of bentos species and scarcity of plankton ones.

Keywords: flora, algae, vegetation, species biodiversity

INTRODUCTION

Mil plain is situated between Kur and Araz rivers. It covers southern-western part of Kur-Aras lowland [Museyibov, 1998; Museyibov, 1975]. Temperate hot semidesert climate is characteric for region, average annual temperature is between 14°C-20°C, annual precipitation- 309 mm [Shixlinskiy, 1968]. Geobotanical researches were conducted on desert, semidesert, hole-meadow and wetland phytocenoses in the study region. These phytocenoses are distributed in gray-meadow, marsh-meadow and salted soils [Babayev, 1982; Volobuyev, 1963]. The species content of plankton and bentos of Aggol and Sarisu lakes was also analyzed [Mammadov, 2012], ecological analysis of these lakes was given.

Hydrographics of region consists of Kur and Araz rivers and some small lakes. From these lakes Aggol, Sarisu, Shorgol can be shown [Aliyev, 1966,1969; Babayev, 1974]. Total area of Aggol is 4000-5000 ha, average depth is 1,3-1,8 m. Total mineralized water is 5,319 mg/l. Water of lakes belong to natrium-sulphate group. Sarısu lake area is 3000 h, its depth- 1,3-1,8 m. Total mineralized water is 10,75-4,723 mg/l. Water of lakes is very mineralized. In our researches we have studied the wetland vegetation communities for the first time [Musayev, 2008; 2010], as well as algoflora of lakes in the study region.

MATERIAL AND METHOD

Research work was conducted on wetland vege-

tation of Mil plain during 2014-2016 years. For the classification of vegetation we have used generally accepted phytocenological and ecological approaches [Hajiyev and Latifova, 1988; Ramenskiy, 1971; Raskopov, 1985; Serebryakov, 1964].

Herbariums collected during field researches were determined on Askerov [Askerov, 2016] and Flora of Caucasus [Flora of Caucasus, 1940] based on systematic taxons; naming of species was given on World Flora Online [WFO, 2021].

For determination of the composition of algae species we have collected samples with the plankton net, identification was conducted at fixated samples [Barinova et al., 2006; Jafarov, 1972 a, b].

RESULTS AND DISCUSSION

Classification of vegetation – is a division of plants into groups on their similar features. These plants form plant communities [T. Harper, 2018]. Main taxonomic units accepted in geobotany are type and formation. Plant cover can consist of several formations. Taxonomic units are association, association group, association class, formation, formation group, formation class and vegetation type. For preparing a classificaion scheme we have used the dominant-determinant method [Alexandrowa, 1969]. Wetland vegetation of Mil plain belong to intrazonal vegetation distributed at grey-meadow, meadow-marshy and marshy soils. Wetland vegetation of researhced area is represented with three formation classes, eight formation groups and 16 assosiations (Tab.)

Reed marshes formation class is represented with two formations: Phragmitetum and Carexeto-Phragmitesetum. Phragmiteta australis assosiation of Phragmitetum formation is one of the most distribited assosiations of the fresh

Table. Classification scheme of wetland vegetation.

Types	Formation classes	Formation groups	Assosiations
1	2	3	4
Water-marshes (Wetland)	Reed marshes	Phragmiteta	Phragmiteta australis
		Carexetum-Phragmitosum	Carexetum divisa-Phragmitosum australis
	Grassy marshes	Cynodonetum-Phragmitosum	Cynodonetum dactylon-Phragmitosum australis
		Alhagietum-Phragmitosum	Alhagietum pseudoalhagi-Phragmitosum australis
		Cynodoneta-Alhagietum-Phragmitosum	Cynodoneta dactylon-Alhagietum pseudoalhagi- Phragmitosum australis
			Cynodonetum dactylon-Alhagiosum pseudoalhagi
	Shrubby-perennially marshes	Tamarixeta-Alhagietum-Phragmitosum	Tamarixeta ramosissima-Alhagietum pseudoalhagi-Phragmitosum australis
			Tamarixetum ramosissima-Alhagiosum pseudoalhagi
			Alhagietum pseudoalhagi-Phragmitosum australis
		Tamarixeta-Typhaetum-Phragmitosum	Tamarixeta ramosissima-Typhaetum angustifolia-Phragmitosum australis
			Tamarixetum ramosissima-Typhaosum angustifolia
			Typhaetum angustifolia-Phragmitosum australis
			Typhaetum laxmani-Phragmitosum australis
		Tamarixeta-Phragmitetum-Carexosum	Tamarixeta ramosissima-Phragmitetum australis-Carexosum divisa
			Tamarixetum ramosissima-Phragmitosum australis
			Phragmitetum australis-Carexosum divisa

water basins of Kur-Araz lowland.

This assosiation was observed in Sarisu and Hajigabul lakes. Clear reed communities are dominating among water-marsh vegetation of researched region. Project cover of these communities reach to 90-100%. Some reed individuals reach to 2 meters, diameter in 0,5-1 cm. *Phragmites australis* Trin. ex Steud. is a cosmopolitan plant which has a wide ecological amplitude and is distributed almost in all regions of our country. Phytocenological classification of reed communities was elaborated by some authors [Prilipko, 1970; Katanskaya, 1981; Kenkel, 1987; Ipatov, 2010; Ibrahimova et al., 2014; Askerov, 2016; Gurbanov, 2007, 2017].

Carexetum divisa-Phragmitosum australis assosiation of Carexeto-Phragmitesetum formation is well distributed in researched region. Species composition of assosiation contains species such as *Typha angustifolia* L., *T. minima* Funck., *Cyperus longus* L., *Phragmites australis* Trin. ex Steud., *Carex divisa* Huds. etc.

Grassy marshes formation class is represented with three formations: Cynodoneto-Phragmitesetum, Alhagieto-Phragmitesetum, Cynodoneto-Alhagietum.

Shrubby-perennials marshes formation class includes three formations: Tamarixeto-Phragmitesetum,Typhaeto-Phragmitesetum and Tamarixeto-Carexetum.

In the species content of Tamarixeta ramosissima-Alhagietum pseudoalhagi-Phragmitosum australis assosiation of Tamarixeto-Phragmitesetum formation the following species are represented: *Tamarix ramosissima* Ledeb., *Phragmites australis* Trin. ex Steud., *Butomus umbellatus* L., *Alopecurus arundinaceus* Pois., *Alhagi pseudoalhagi* (Bieb.) Fisch etc. Alhagietum pseudoalhagi-Phragmitosum australis assosiation of Tamarixeto-Phragmitesetum formation includes species such as *Veronica anagalis-aquatica* L., *Caltha polypetala* Hochst., *Alopecurus arundinaceus* Pois. etc.

At the species content of Tamarixeta ramosissima-Typhaetum angustifolia-Phragmitosum australis assosiation of Typhaeto-Phragmitesetum formation the following species are represented: *Zannichellia pedunculata* Reichenb., *Bolboschoenus maritimus* (L.) Palla, *Tamarix ramosissima* Ledeb., *Typha angustifolia* L., *Phragmites australis* Trin. ex Steud. etc.

Many species of *Typha* genus such as *Typha angustifolia* L., *T. latifolia* L., *T. laxmanii* Lepech., *T. minima* Funck., *T. domingensis* Pers. are found in Azerbaijan. But at the various *Typha* formations mainly *T. angustifolia* L. və *T. laxmanii* Lepech. are presented and they form clean and mixed assosiations. These formations are found in water as well as in marshy places [Kenkel, 1987].

Typhaetum angustifolia-Phragmitosum australis assosiation is distributed almost all water basins of Kur-Araz lowland. Edificators of assosiation are *Phragmites australis* Trin. ex Steud. and *Tamarix ramosissima* Ledeb., subedificator is *Typha angustifolia* L.. Besides. In this assosiation other species such as *Juncus acutus* L., *Aeluropus littoralis* (Gouan) Parl., *Ranunculus scleratus* L., *Senecio vernalis* Waldst. & Kit., *Scirpus litoralis* Schrad. are also found.

Typhaetum laxmani-Phragmitosum australis assosiation is found mainly at moisture and marshy places, also at the aryk sides. At the species content of assosiation *Batrachium trichophyllum* (Chaix) Bosch., *Potamogeton pectinatus* L., *Zannichellia palustris* L. etc. have also been presented.

Tamarixeto-Carexetum formation is represented with three assosiations: Tamarixeta ramosissima-Phragmitetum australis-Carexosum divisa, Tamarixetum ramosissima-Phragmitosum australis, Phragmitetum australis-Carexosum divisa. In the Tamarixeta ramosissima-Phragmitetum australis-Carexosum divisa assosiation species such as *Tamarix ramosissima* Ledeb.,, *T. meyeri* Boiss., *Phragmites australis* Trin. ex Steud., *Carex divisa* Huds., *C. acuta* L. have been presented.

During researches of algoflora of the lakes of the study area 50 algae species were found which belong to 3 divisions. Species of *Pennatophyceae* class of Bacillariophyta

division have been dominated with 30 species. From diatoms the following species were mainly found: *Navicula phyllepta* Kütz., *Cymbella inelegans* Cleve, *Navicula libonensis* Schoeman, *Frustulia spicula* Amosse and *Neidium bisulcatum* (Lagerst.) Cleve var. subampliatum Krammer.

Cyanoprokaryota division is represented mostly with species belonging to the Microcystis genus. *Synechocystis* Sauvageau, *Gloeocapsa* Kützing, *Aphanothece* Nägeli genera are represented with less number of species. In plankton dominant representatives such as *Synechocystis salina* Wisl., *Aphanothece clathrata* W. et G.S.West. are found.

Mostly found species were *Oscillatoria levis* (Gardner) Anagnostidis, *O. limosa* Agardh ex Gomont, *O. splendida* Grev, *O. tenuis* f. tenuis Agardh ex Gomont; *Lyngbya aestuarii* Liebman ex Gomont, *L. semiplena* J.Agardh ex Gomont. of *Oscillatoria* and *Lyngbya* genera of *Oscillatoriales* order. Species of *S. laxissima* C. S. West and *Ph. foreolarum* Mont. Gom. from *Spirulina* and *Phormidium* genera are also recorded.

Chlorophyta division is represented with *Oocystis* Nägeli ex A.Braun, *Ankistrodesmus* Corda and *Scenedesmu*s Meyen genera: *Oocystis lacustris* Chodat, *O. parva* West et G.S.West, *O. pusilla* Hansg.; *Ankistrodesmus densus* Korschikov, *A. lacustris* (Chodat) Ostenfeld; *Scenedesmus ellipticus* Corda, *S. obtusus* Meyen.

Thus, the results of floristic and geobotanical researches conducted in wetland vegetation of Mil plain have allowed us to elaborate their classification. It was determined that wetland vegetation type of researched area is collected in three formation classess, eight formations and 16 associations.

These plants have fodder and medicinal importance. It was also determined that at the researched lakes the characteristic feature of phytoplankton is abundance of bentos species and scarcity of plankton ones.

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Kür-Araz ovalığında yerləşən göllərin su-bataqlıq bitkiliyi və alqoflorası

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Məqalədə Mil düzünün su-bataqlıq bitkiliyinin tədqiqinin nəticələri və onun təsnifatı verilmişdir. Bu bitkiliyin yayılması, müasir vəziyyəti, növ biomüxtəlifliyi, morfobioloji, bioekoloji və fitosenoloji xüsusiyyətləri analiz edilmişdir. Bitki formasiya və assosiasiyaları edifikator növlərlə birlikdə verilmiş, bunun əsasında onun təsnifatı işlənib hazırlanmışdır. Müəyyən edilmişdir ki, tədqiq olunan ərazinin su-bataqlıq bitkilik tipi üç formasiya sinfi, səkkiz formasiya və 16 assosiasiyada cəmlənmişdir. Qamışlı bataqlıqlar formasiya sinfi iki formasiya ilə təmsil olunur: Qamışlıq (Phragmitetum) və Cilli qamışlıq (Carexeto-Phragmitesetum). Qamışlıq formasiyasının Təmiz Avrasiya qamışlığı (Phragmiteta australis) assosiasiyası Kür-Araz ovalığının şirin su hövzələrinin ən geniş yayılmış assosiasiyalarından biridir. Otlu bataqlıqlar formasiya sinfi üç formasiya ilə təmsil olunmuşdur: Çayırlı-qamışlıq (Cynodoneto-Phragmitesetum), Dəvətikanlı-qamışlıq (Alhagieto-Phragmitesetum), Çayırlı-dəvətikanlı (Cynodoneto-Alhagietum). Kolə lu-çoxillik otlu bataqlıqlar formasiya sinfi üç formasiyanı özündə birləşdirir: Yulğunlu-qamışlıq (Tamarixeto-Phragmitesetum), Çiyənli-qamışlıq (Typhaeto-Phragmitesetum), Yulğunlu-cillik (Tamarixeto-Carexetum). Eyni zamanda Ağgöl və Sarısu göllərinin plankton və bentosun növ tərkibi aşkar edilmiş və bu göllərin ekoloji analizi göstərilmişdir. Tədqiq olunan ərazinin göllərinin alqoflorası öyrənilərkən üç şöbəyə aid 50 yosun növü müəyyən edilmişdir. Baccillariophyta şöbəsinin Pennatophyceae sinfi 30 növlə dominantlıq edir. Bundan başqa, qeyd edilmişdir ki, tədqiq olunan göllərdə fitoplanktonun xarakterik xüsusiyyəti

bentosa aid nümayəndələrin dominantlığı və plankton növlərin azlıq təşkil etməsidir.

Açar sözlər: flora, yosun, bitkilik, növ müxtəlifliyi

Водно-болотная растительность и альгофлора озер Кура-Араксинской низменности

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В статье представлены результаты изучения водно-болотной растительности Кура-Араксинской низменности и ее классификация. Проанализированы распространение, современное состояние, биоразнообразие, морфобиологические, биоэкологические и фитоценологические особенности данной растительности. На основании объединения растительных формаций и ассоциаций с эдификаторными видами разработана их классификация. Установлено, что тип водно-болотной растительности исследуемой территории, представлен тремя классами формаций, восемью формациями и 16 ассоциациями. Класс формаций Тростниковых болот представлен с двумя формациями: Phragmitetum и Carexeto-Phragmitesetum. Ассоциация Phragmiteta australis формации Phragmitetum является одним из широко распространенных ассоциаций пресноводных озер Кура-Араксинской равнины. Класс формаций Травяных болот представлен с тремя формациями: Cynodoneto-Phragmitesetum, Alhagieto-Phragmitesetum и Cynodoneto-Alhagietum. Класс формаций Кустарниково-многолетних болот представлен с тремя формациями: Tamarixeto-Phragmitesetum, Typhaeto-Phragmitesetum и Tamarixeto-Carexetum. Наряду с этим дан экологический анализ, выявлен видовой состав планктона и бентоса озер Аггёл и Сарысу. Во время исследований были найдены 50 видов водорослей, относящиеся к трем отделам. Виды класса Pennatophyceae доминируют с 30 видами. Отмечено, что характерной особенностью фитопланктона исследованных озер является доминирующее количество бентоса и небольшое количество видов планктона.

Ключевые слова: флора, водоросль, растительность, видовое разнообразие