ISSN 2959-1864 (Online)
ISSN 2958-0536 (Print)
Volume 2, Number 1
December 2023

Acta Botanica Caucasica

CONTENT

VEGETATION CLASSIFICATION OF OIL-CONTAMINATED SOILS IN AZERBAIJAN

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DOI: 10.30546/abc.2023.2.1.3.

Article info: pp. 3-8
Received 20.01.2023; Received in revised form 13.10.2023; Accepted 28.11.2023

Abstract. *The climate of the area is dry subtropical, the natural vegetation is drought-resistant, heat-resistant and less demanding on soil.In accordance with these climatic conditions, plants have acquired a number of adaptations.Usually, xerophytic plants predominate, and in these soils, drought plant species with a strong root system, thorny, resistant to harsh winds, adapted to saline soils and sunny weather, are better developed. Mainly annual, perennial herba-ceous plants and shrubs are found. They have a number of adaptations against water loss (their leaves are hairy or limp, etc.) there is. Among annual grasses, ephemeroids predominate, and in perennials-ephemeroids. In modern times, in the territory of Azerbaijan, vegetation is subject to decline or degradation in man-made disturbed, including oil-polluted lands. So, here it is required to prevent anthropogenic and man-made effects, as well as based on the classification of phytoce-noses for the purpose of biological recultivation.*

We conducted phytoecological studies and identified 16 formation classes, 19 formation groups, and 26 associations in 5 vegetation types. Based on our analysis of the phytoecological descriptions recorded during field studies, we classified the selected oil-contaminated vegetation on the country's territory according to the "objects of the study." In 9 exemplary objects, we found the same number of formation groups related to the types of halophyte deserts, psammophyte deserts, semi-deserts, thickets, and wetlands in the vegetation classification. So, the appropriate classification was given by us for the first time.

Keywords: *vegetation type, formation class, formation group, association, reclamation*

INTRODUCTION

The following biological remedies have been planned for the restoration of vegetation in contaminated soils.

– creation of a plant classification of selected objects found in oil-contaminated areas with reference to the species composition and structure of the vegetation;

– composition of the phytoecological map according to formation groups in the relevant classifica-tion;

– In order to prevent the pollution of phytocenoses with oil and ground-water, the biological recultivation according to the conducted phyto-cenological studies, of the soil-vegetation cover with oil pollution levels [Flora of Azerbaijan 1950-1961] is taken into account.

MATERIALS AND METHODS

Phytoecological or ecological-geobotanical methods were referred to for the classification of oil and oil products con-taminated vegetation performed by us [Bykov, 1973; Gurbanov, 2022; Cerepanov, 1995]. Studies carried out between 2020-2023 years in accordance with the plan of

the scientific subject in the oil fields belonging to the Oil and Gas Production Department of the State Oil Company of the Republic of Azerbaijan, Socar Production Union are of great relevance. As it can be seen from the literature review, information on phytocenological clas-sification units is given in the works of V.A.Bykov [1973], V.S. Novruzov [2010], E.M.Gurbanov [2017; 2023], H.Z.Huseynova [2013] and other botanists.

RESULTS

Based on the results of phytoecological studies, a basis has been created for classify-ing vegetation into objects that are contami-nated with oil in the territory of Azerbaijan. The analysis of this classification is explained below (Table 1, fig.1,2,3,4).

Table 1.

CLASSIFICATION OF VEGETATION ON OİL-CONTAMINATED "RESEARCH OBJECTS" IN THE TERRITORY OF AZERBAIJAN

№	Results of the study	Vegetation types	Formation classes	Formation groups
1	The territory of Siyazan dis-trict, "Siyazanneft" OGPD, Oil field № 1	Halophytic desert	Various herba-ceous – annual halophytic desert	Wormwood Ar-temise-tum-Petrosimo-niosum
2	Pirallahi district area, Ab-sheronneft, 1.0 km from the coast of the Caspian Sea	Halophytic desert	Shrub-annual sedge desert	Halocnematum Petro-simoniosum
3	"Babazanan deposit" territo-ry of Salyan region	Halophytic desert	Shrub-halophyte desert	Halostachyse-tum–Halocnemum
4	Area of Khazar region, "Buzovna - Mashtaga field", coverage of 1381 № oil well	Psammophyte desert	Perennial herba-ceous -ephemeral psammophytic desert	Alhagietum-Chamoemelosum
5	The territory of Siyazan dis-trict, "Siyazanneft" OGPD,Oil field №2	Semi-desert	Perennial grass - half shrub, half desert	Wormwood-black-berry Artemisi-etum-Salsolosum
6	The territory of Garadagh region, A.J. Amirov name. OGPD, Oil field № 1	Semi-desert	Semi-desert with semi-shrubs and semi-shrubs	Blackberry Petro-simonieta- Alhagi-etum- Salsolosum
7	The territory of Siyazan dis-trict, "Siyazanneft" OGED,1 № oil field (by the Chil-gil river)	Grassland	Perennial grass - semi-shrub - semi-shrub-field.	Alhagieta - Salsoletum - Artemisiosum
8	The territory of Siyazan dis-trict, "Siyazanneft" OGPD,Oil field № 2	Water– swamp	Grassland - swamp	Junceta
9	The territory of Garadagh region, A.J. Amirov name. OGPD 2 №oil field (around 1354 № oil well)	Water– swamp	Shruby-peren-nial herbaceous - wet-land	Tamarixeta-Phrag-mitetum-Juncosum

Figure 1. *Tamarix ramosissima*

According to the table 1, in the vegeta-tion of the study area contaminated with oil and groundwater, the species composition and structure of 9 groups of formations are ch-arac-teristic of 5 types of veg etation [5,9].

It should also be added that in a vast area on the saline and saline gray-brown soils of Azer-baijan, such as on the Absheron Peninsu-la, the Samur-Shabran Plain and the Salyan region, in the oil fields and fields of the OGPD (Oil and Gas Production Department), there are halophyt-ic and psammophytic deserts, semi-deserts, thickets - meadows and wet-lands. In the terri-tory of the Siyazan region, in the "Siyazanneft" OGPD oil field, as well as on the banks of the Gil-gil river, the formation of the chala-chaman

Figure 2. *Oil polluted area*

vegetation has been rec-orded . Thus, it is clear from the table that the selected objects are: 1, 2, 21 N mines of “Siyazanneft” OGPD, 1 and 2 N mines of OGPD named after A.J. Amirov in the territory of Garadagh region, “Absheronneft” on Pirallahi island. “Buzovna-Mashtaga field in Khazar district and “Babazanan field” in Salyan dis-trict (Shirvan National Park) were consid-ered as OGPD.The vegetation classification in those research objects is given in types, forma-tion classes, formation groups and associations. Including, during the field researches of dom-inant and subdominant plants (biomorphic and ecomorphic species), herbariums were collect-ed, dried and systematized, determined and specified according to systematic taxa based on the descriptive literature [Gurbanov et all., 2022].

Therefore, in determining the formation classes included in vegetation types, edifi-ca-tors and phytocenological principles on bio-morphs are taken as the main criterion. For-mation groups form formations consisting of dominants and subdominants of the genus. As you know, the formations are formed from associations, as well as the naming is given ac-cording to the type [Yagubov, 2003].

Based on the conducted researches and studies, “Classification of oil-contaminated veg-etation in Azerbaijan” is listed below by geobo-tanical taxonomic units (types, for-mation class-es, groups and associations).

Figure 3. *Alhagi pseudalhagi*

Figure 3. *Artemisia lerchiana*

It should also be added that in a vast area on the saline and saline gray-brown soils of Azer-baijan, such as on the Absheron Peninsula, the Samur-Shabran Plain and the Salyan region, in the oil fields and fields of the OGPD (Oil and Gas Production Department), there are halophyt-ic and psammophytic deserts, semi-deserts, thickets - meadows and wetlands. In the terri-tory of the Siyazan region, in the “Siyazanneft” OGPD oil field, as well as on the banks of the Gil-gil river, the formation of the chala-chaman vegetation has been recorded . Thus, it is clear from the table that the selected objects are: 1, 2, 21 N mines of “Siyazanneft” OGPD, 1 and 2 N mines of OGPD named after A.J. Amirov in the territory of Garadagh region, “Absheronneft” on Pirallahi island. “Buzovna-Mashtaga field in Khazar district and “Babazanan field” in Salyan

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Based on the conducted researches and studies, "Classification of oil-contaminated vegetation in Azerbaijan" is listed below by geobotanical taxonomic units (types, formation classes, groups and associations).

CLASSIFICATION OF VEGETATION CONTAMINATED WITH OIL IN AZERBAIJAN

I. TYPE. HALOPHYTE DESERTS.
1. Formation class – Deserts with various herbaceous annuals
A. formation (form.) group (gr.) – (Artemisietum – petrosimoniosum)
A. -1-a). association (association) – Artemisietum lerchiana + Petrosimoniosum brachiata
2. Formation class – Shrub-annual sorghum deserts
B.-1. form.gr. – Halocnemetum-Petrosimoniosum.
B.-1-b) ass. – Halocnemetum strobilaclum + Petrosimoniosum brachiata
3. Shrub-halophytic desert formation class
C.form.gr. – Halostachysetum – Halocnemosum.
C. -1- c) ass. Halostachysetum belangeriana – Halocnemosum strobilaceum

II. TYPE. PSAMMOPHYTE DESERTS
4. Formation class – Perennial herbaceous-ephemeral-psammophytic deserts.
A. form. gr. – Alhagietum – Chamamaemelosum
A. -1.-a) ass. Alhagietum pseudo - Alhagi - Chamaemelum praecox

III. TYPE. SEMI-DESERTS.
5. Formation class – Perennial grassy semi-shrub semi-deserts.
A. form. gr. – Artemisietum – salsolosum
A. 1 – a) ass. – Artemisietum lerchiana – Salsolosum dendroides.
6. Formative class – Annual herbaceous – perennial herbaceous – semi-shrub semi-deserts.
B. form.gr. Petrosimoniet - Alhagietum – Salsolosum.
B. 1. – a) ass. Petrosimonieta - bractiata - Alhagietum pseudoalhagi - Solsolosum dendroides.
B. 1. – b) ass. - Petrosimonietum brachiata - Alhagiosum pseudoalhagi
B. 1. – c) ass. - Alhagietum pseudoalnagi - Salsolosum dendroides.

IV. TYPE. LAWLANDS
7. Formation class – Perennial herbaceous - semi-shrubby - semi-shrubby thickets - meadows.
A. form. gr. Alhagieta - Salsoletum - Artemisiosum.
A. 1. – a) ass. - Alhagieta pseudoalhagi - Salsoletum dendroides – Artemisiosum szowitsiana
A. 1. – b) ass. - Alhagietum pseudoalhagi - Salsolosum dendroides
A. 1. – c) ass. - Salsoletum dendroides - Artemisiosum szowitsiana

V. TYPE. WATER MARSHES SWAMPS AREAS

8. Formation class. - grassy - swamps

A. form . gr. – Junceta.

A. – a) ass. - Junceta acutus

9. Formation class – Shrubs – Berennial herbaceous wetlands

B. – form. gr. –(Tamarixeta – Phragmitetum – Juncosum)

B. – 1 – a) ass. Tamarixeta ramosissima - Phragmitesetum australis - Juncosum acutus.

B. – 1. – b) ass. (Tamarixatum ramosissima – Phragmitosum australis

B. 1. – c) ass. Phragmitetum australis – Juncosum acutus

CONCLUSION

As a result of the analysis of the mentioned formation groups and associations, it was determined that oil-contaminated vegetation on "research objects" in Azerbaijan was represented in 5 vegetation types, 9 formation classes, 9 formation groups and 15 associations. Among them, 1 formation group for semi-desert vegetation (Davetikanli - Mollabashilig) was discovered for the first time. In general, the results of the phytoecological studies we conducted in the vegetation of areas polluted with oil and groundwater in Azerbaijan show that the classification developed for the purpose of biological recultivation for the restoration of primary phytocenoses has important scientific and practical significance.

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