17(3) 371-379, Autumn 2025

Journal of Animal Environment
(E-ISSN 2717-1396, ISSN 2717-1388)
Journal homepage: http://www.aejournal.ir

Original Research Paper

Ecological Analyses of Plant Species Distributed in the Aydar–Arnasay Lake System

Dilfuza Imomova[1*], Miromil Gudalov[2], Zuhra Yakhshiyeva[3], Sardor Urolov[4], Zoyir Qilichev[5], Aziza Mirzayeva[6]

[1]Associate Professor, Head, Department of Preclinical Sciences, Jizzakh State Pedagogical University, Jizzakh, Uzbekistan. Email: dilfuza.imomova@inbox.ru, ORCID: https://orcid.org/0000-0002-9403-7538*
[2]Associate Professor, Head, Department of Geography, Jizzakh State Pedagogical University, Jizzakh, Uzbekistan. Email: mirkomilgudalov78@gmail.com, ORCID: https://orcid.org/0000-0002-2696-2430
[3]Professor, Dean, Faculty of Natural Sciences, Jizzakh State Pedagogical University, Jizzakh, Uzbekistan. Email: zuxrayaxshiyeva@jdpu.uz, ORCID: https://orcid.org/0000-0003-4603-2035
[4]Ufa University of Science and Technology, Ufa, Russia. Email: sardorurolov23@gmail.com, ORCID: https://orcid.org/0009-0008-6792-049X
[5]Lecturer, Department of Ecology and Geography, Gulistan State University, Gulistan, Uzbekistan. Email: zoyirqilichev555@gmail.com, ORCID: https://orcid.org/0009-0005-4671-0635
[6] Department of Geography, Jizzakh State Pedagogical University, Jizzak, Uzbekistan. Email: mirzaevaa83@gmail.com, ORCID: https://orcid.org/0000-0002-2178-2641

Key Words

Aydar–arnasay lake system, Ecological monitoring, Halophyte, Gypsophyte, Psammophyte, Euhalophyte, Haloglycophyte, Hemihalophyte, Eucserophyte, Hemixerophyte, Ombrophyte, Phreatophyte, Forage, Medicinal, Food, Dye-yielding, Essential oil-bearing, Weeds.

Abstract

In determining the plant species distributed in the Aydar-Arnasay lake system, the current natural biological diversity of the area, environmental ecological monitoring, and the adaptation of plant species to different ecological conditions were studied. As a result, it was identified that 324 plant species are distributed in the territory. By life forms, these include: 3 tree species (0.92%), 23 shrub species (7.09%), 17 subshrubs (5.25%), 93 perennial herbs (28.7%), and 188 annual herbs (58.04%). Ecological groups of the plant species distributed in the area were identified according to soil mechanical composition, soil chemical composition, moisture level, and water regime. Based on the analyses, the 324 plant species widely distributed in the Aydar-Arnasay lake system were classified into four ecological groups based on soil mechanical composition, five ecological groups based on soil salinity (salt tolerance), five ecological groups based on soil moisture level, and four ecological groups according to their water requirements.

* Corresponding Author's email: dilfuza.imomova@inbox.ru
Received: 04 June 2025; Revised: 14 July 2025; Accepted: 16 August 2025; Published: 30 October 2025
(DOI): 10.70102/AEJ.2025.17.3.30

Introduction

The Aydar–Arnasoy lake system was formed as a result of anthropogenic impacts on the hydrological regime of the Chardara Reservoir, and its current natural conditions have changed, transforming it into a unique natural biogeographical region (Gudalov, 2009). The territory of the lake system is located within the desert zones of the Navoi and Jizzakh regions (Beydeman, 1983; Qodirov, 2008).

The natural geographical structure of the Jizzakh region includes various geomorphological forms such as deserts, foothills, and mountains. Accordingly, its climate, soils, flora, and fauna are highly diverse (Raunkiaer, 1937; Zakirov, 1955). The climate of both regions is sharply continental, reflecting the climatic features of lowland–desert and mountainous areas, characterized by hot summers and cold, relatively mild winters (Kadyrov, 2005).

Identifying the plant species distributed in the region is one of the most important practical tasks for assessing the current state of biological diversity and for conducting ecological environmental monitoring (Rakhimova, 2021; Serebryakov, 1962).

According to scientific data and the results of field expeditions, more than 320 plant species have been recorded in the Aydar–Arnasoy lake system. The vegetation cover is dominated by species such as *Calligonum* (juzgun), *Salsola* (shora), *Tamarix* (yulgun), *Haloxylon* (black saxaul), *Alhagi* (camelthorn), *Atriplex*, *Phragmites* (reed), *Halocnemum*, *Salicornia*, *Caragana*, *Tribulus*, *Limonium*, *Rumex*, *Suaeda*, *Anabasis*, *Artemisia*, *Hordeum*, sparse *Tamarix* species, and *Populus euphratica* (turanğa), as reported by Granitov I.I. and Zakirov P.K.

Results

The study of how plant species adapt to different ecological environments within the Aydar–Arnasoy lake system is of significant theoretical and practical importance. It is well known that during historical development, each plant species adapts to specific soil conditions and determines its growth environment within certain ecological limits.

Based on field investigations and the analysis of literature sources, it was established that the flora of the region consists of 324 plant species (Serebryakov, 1964). According to life forms, these include:

- Trees: 3 species (0.92%)
- Shrubs: 23 species (7.09%)
- Subshrubs: 17 species (5.25%)
- Perennial herbs: 93 species (28.7%)
- Annual herbs: 188 species (58.04%)

Available scientific sources do not provide a detailed classification of the ecological groups of plant species distributed in the Aydar–Arnasoy lake system. Therefore, in order to determine the ecological affiliation of each species, existing literature and materials collected during field expeditions were thoroughly analyzed.

As a result, ecological groups of plant species were identified based on:

- soil mechanical composition,
- soil chemical composition,

- moisture level,
- and water availability.

The analysis showed that the 324 plant species widely distributed in the Aydar–Arnasoy lake system can be classified into:

- 4 ecological groups based on soil mechanical composition,
- 5 ecological groups based on soil salinity tolerance,
- 5 ecological groups based on soil moisture level,
- 4 ecological groups based on water requirements (as presented in Table 1).

Table 1: Some Plant Species Distributed in the Aydar–Arnasoy Lake System, Their Main Ecological Groups, and Economic Significance

No.	Dominant species	Soil mechanical composition	Soil salinity tolerance	Soil moisture preference	Water requirement	Economic importance
1	Amaranthus albus L.	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Fodder plant, weed
2	Amaranthus deflexus L.	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Fodder plant, weed
3	Amaranthus retroflexus L.	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Fodder plant, weed
4	Chenopodium album L.	Halophyte	Euhalophyte	Euxerophyte	Ombrophyte	Fodder, medicinal, food, dye, essential oil
5	Chenopodium botrys L.	Halophyte	Euhalophyte	Euxerophyte	Ombrophyte	Medicinal, dye, essential oil
6	Chenopodium chenopodioides (L.)	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, weed
7	Chenopodium glaucum L.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, weed
8	Chenopodium rubrum L.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Food, medicinal, weed
9	Chenopodium vulvaria L.	Halophyte	Euhalophyte	Euxerophyte	Ombrophyte	Medicinal, dye, weed
10	Spinacia turkestanica Iljin	Psammophyte	Haloglycophyte	Hemi-xerophyte	Ombrophyte	Food plant, weed
11	Atriplex aucheri Moq.	Psammophyte	Haloglycophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
12	Atriplex dimorphostegia Kar. & Kir.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant
13	Atriplex flabellum Bunge	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Fodder plant
14	Atriplex ornata Iljin	Psammophyte	Haloglycophyte	Euxerophyte	Phreatophyte	Medicinal, dye, essential oil
15	Atriplex tatarica L.	Halophyte	Euhalophyte	Euxerophyte	Phreatophyte	Fodder plant, weed
16	Ceratocarpus arenarius L.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant, weed
17	Camphorosma monspeliaca L.	Gypsophyte	Hemihalophyte	Stipa-xerophyte	Trichophyte	Food, medicinal, weed
18	Bassia eriophora (Schrad.) Asch.	Psammophyte	Haloglycophyte	Stipa-xerophyte	Trichophyte	Medicinal, dye plant, weed
19	Bassia hyssopifolia (Pall.) Kuntze	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Food plant, weed
20	Kochia iranica Bornm.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant
21	Kochia prostrata (L.) Schrad.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant

22	Kochia scoparia (L.) Schrad.	Psammophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Fodder plant
23	Corispermum lehmannianum Bunge	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant
24	Agriophyllum lateriflorum (Lam.) Moq.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Fodder plant
25	Kalidium caspicum (L.) Ung.-Sternb.	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
26	Halopeplis pygmaea (Pall.) Bunge ex Ung.-Sternb.	Psammophyte	Haloglycophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
27	Halostachys belangeriana (Moq.) Botsch.	Psammophyte	Haloglycophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
28	Halocnemum strobilaceum (Pall.) M. Bieb.	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Phreatophyte	Poisonous
29	Salicornia europaea L.	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Phreatophyte	Poisonous, medicinal, technical
30	Suaeda acuminata (C.A. Mey.) Moq.	Halophyte	Hyperhalophyte	Euxerophyte	Trichophyte	Phytomeliorant
31	Suaeda altissima (L.) Pall.	Halophyte	Euhalophyte	Euxerophyte	Phreatophyte	Fodder plant
32	Suaeda arcuata Bunge	Gypsophyte	Euhalophyte	Euxerophyte	Phreatophyte	Fodder plant
33	Suaeda dendroides (C.A. Mey.) Moq.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant
34	Suaeda heterophylla Bunge ex Boiss.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, weed
35	Suaeda linifolia Pall.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, weed
36	Suaeda paradoxa (Bunge) Bunge	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, weed
37	Salsola arbuscula Pall.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, tanning, dye, alkaloid-containing
38	Salsola arbusculiformis Drobow	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Trichophyte	Fodder plant
39	Salsola collina Pall.	Halophyte	Euhalophyte	Hemi-xerophyte	Trichophyte	Fodder plant
40	Salsola dendroides Pall.	Halophyte	Euhalophyte	Hyper-xerophyte	Phreatophyte	Fodder plant, forest amelioration
41	Salsola foliosa (L.) Schrad. ex Schult.	Halophyte	Euhalophyte	Hemi-xerophyte	Trichophyte	Fodder plant
42	Salsola iberica Sennen & Pau	Halophyte	Euhalophyte	Hemi-xerophyte	Trichophyte	Fodder plant
43	Salsola leptoclada Gand.	Halophyte	Euhalophyte	Hyper-xerophyte	Trichophyte	Fodder plant
44	Salsola micranthera Botsch.	Halophyte	Euhalophyte	Hyper-xerophyte	Phreatophyte	Fodder plant
45	Salsola orientalis S.G. Gmel.	Halophyte	Euhalophyte	Hyper-xerophyte	Trichophyte	Phytomeliorant, alkaloid-containing, medicinal, fodder plant
46	Salsola paletzkiana Litv.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, medicinal, tanning, fodder plant

47	Salsola paulsenii Litv.	Halophyte	Euhalophyte	Stipa-xerophyte	Trichophyte	Phytomeliorant, fodder plant
48	Salsola richteri (Moq.) Kar. ex Litv.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, alkaloid-containing, medicinal, fodder plant
49	Salsola sclerantha C.A. Mey.	Halophyte	Euhalophyte	Hyper-xerophyte	Trichophyte	Fodder plant
50	Salsola turkestanica Litv.	Halophyte	Euhalophyte	Hyper-xerophyte	Phreatophyte	Fodder plant
51	Salsola vvedenskyi Iljin & Popov	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
52	Climacoptera crassa (M. Bieb.) Botsch.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
53	Climacoptera intricata (Iljin) Botsch.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
54	Climacoptera lanata (Pall.) Botsch.	Halophyte	Hyperhalophyte	Euxerophyte	Trichophyte	Phytomeliorant
55	Climacoptera longistylosa (Iljin) Botsch.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
56	Halothamnus glaucus (M. Bieb.) Botsch.	Gypsophyte	Hemihalophyte	Hyper-xerophyte	Trichophyte	Fodder plant, medicinal
57	Halothamnus subaphyllus (C.A. Mey.) Botsch.	Gypsophyte	Hemihalophyte	Hyper-xerophyte	Trichophyte	Fodder plant, medicinal, dye plant
58	Girgensohnia oppositiflora (Pall.) Fenzl	Psammophyte	Haloglycophyte	Euxerophyte	Phreatophyte	Fodder plant
59	Girgensohnia diptera Bunge	Psammophyte	Haloglycophyte	Euxerophyte	Phreatophyte	Fodder plant, dye plant
60	Hammada gamoscarpa (Moq.) Bunge	Halophyte	Haloglycophyte	Euxerophyte	Ombrophyte	Phytomeliorant, fodder plant
61	Anabasis eriopoda (Schrenk) Paulsen	Gypsophyte	Hemihalophyte	Euxerophyte	Ombrophyte	Fodder plant, honey plant
62	Anabasis salsa (Ledeb.) Benth. ex Volkens	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant, medicinal
63	Haloxylon ammodendron (C.A. Mey.) Bunge ex Fenzl	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, alkaloid-containing, fodder plant
64	Haloxylon persicum Bunge	Gypsophyte	Hemihalophyte	Hyper-xerophyte	Trichophyte	Fodder plant, forest-forming species
65	Halocharis hispida (Schrenk) Bunge	Halophyte	Euhalophyte	Hyper-xerophyte	Trichophyte	Fodder plant, weed
66	Halimosnemis mollissima Bunge	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
67	Halimosnemis villosa Kar. & Kir.	Psammophyte	Haloglycophyte	Hemi-xerophyte	Phreatophyte	Fodder plant
68	Ephedra strobilacea	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, fodder plant
69	Artemisia diffusa	Psammophyte	Haloglycophyte	Poikiloxerophyte	Ombrophyte	Sand stabilizer, medicinal, essential oil, coumarin-containing, fodder plant
70	Poa bulbosa	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Sand stabilizer, fodder plant

71	Butomus umbellatus L.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Phytomeliorant, medicinal, ornamental, honey plant
72	Merendera robusta Bunge	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Medicinal, ornamental
73	Gagea afghanica A. Terracc.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, ornamental
74	Tulipa lehmanniana Mercklin	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, ornamental, Red Data Book species
75	Iris longiscapa Ledeb.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, ornamental
76	Iris songarica Schrenk	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, ornamental, honey plant, poisonous
77	Allium caspium (Pall.) M. Bieb.	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Medicinal, perennial, ornamental
78	Typha latifolia L.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Sand stabilizer, fodder plant
79	Medicago lupulina L.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Medicinal, sand stabilizer, fodder plant
80	Medicago sativa L.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Medicinal, sand stabilizer, fodder plant
81	Medicago rigidula (L.) All.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Medicinal, sand stabilizer, fodder plant
82	Astragalus camphylorhynchus Fisch. & C.A. Mey.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Sand stabilizer, fodder plant
83	Astragalus camphylorhynchus Fisch. & C.A. Mey.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Sand stabilizer, fodder plant
84	Astragalus filicaulis Fisch. & C.A. Mey.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-containing, fodder plant
85	Astragalus flexus Fisch.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-containing, fodder plant
86	Astragalus macrocladus Bunge	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-containing, fodder plant
87	Astragalus persipolitanus Boiss.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-containing, fodder plant
88	Astragalus turczaninovii Kar. & Kir.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-containing, fodder plant
89	Astragalus unifoliolatus Bunge	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Sand stabilizer, medicinal, dye plant, alkaloid-

						containing, fodder plant
90	Alhagi canescens (Regel) B. Keller & Shap.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Medicinal, sand stabilizer, fodder plant, honey plant
91	Alhagi kirghisorum Schrenk	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Medicinal, sand stabilizer, fodder plant, honey plant
92	Alhagi pseudalhagi	Psammophyte	Hemihalophyte	Hemi-xerophyte	Phreatophyte	Medicinal, sand stabilizer, fodder plant, honey plant
93	Peganum harmala	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Trichophyte	Medicinal, sand stabilizer, honey plant, alkaloid-containing
94	Capparis spinosa L.	Gypsophyte	Hemihalophyte	Hemi-xerophyte	Trichophyte	Medicinal, dye plant, tanning, essential oil, honey plant
95	Capsella bursa-pastoris (L.) Medik.	Psammophyte	Haloglycophyte	Refugioxerophyte	Ombrophyte	Medicinal, fodder plant
96	Tamarix elongata Ledeb.	Halophyte	Euhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, medicinal, dye plant, tanning, essential oil, honey plant, fodder plant
97	Tamarix hispida	Halophyte	Hyperhalophyte	Hemi-xerophyte	Phreatophyte	Phytomeliorant, medicinal, dye plant, tanning, essential oil, honey plant, fodder plant
98	Limonium otolepis	Halophyte	Euhalophyte	Stipa-xerophyte	Trichophyte	Phytomeliorant, dye plant, tanning, medicinal, fodder plant
99	Calligonum caput-medusae	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Sand stabilizer, tanning, fodder plant
100	Calligonum leucocladum	Psammophyte	Haloglycophyte	Euxerophyte	Trichophyte	Sand stabilizer, tanning, fodder plant
101	Cousinia microcarpa Boiss.	Gypsophyte	Hemihalophyte	Euxerophyte	Trichophyte	Medicinal, sand stabilizer, fodder plant, honey plant
102	Convolvulus erinaceum	Gypsophyte	Hemihalophyte	Poikiloxerophyte	Ombrophyte	Medicinal, alkaloid-containing, fodder plant

Discussion

The ecological analysis of plant species distributed within the Aydar–Arnasoy lake system reveals a complex and highly adaptive floristic structure shaped by both natural and anthropogenic factors. The dominance of halophytes, psammophytes, and gypsophytes clearly reflects the prevailing edaphic and hydrological conditions of the region, which are characterized by saline soils, sandy substrates, gypsum-rich horizons, and fluctuating water regimes.

One of the most significant findings of this study is the predominance of halophytes and psammophytes among the recorded species. This pattern confirms that soil salinity and soil texture are the key environmental filters controlling species distribution in the Aydar–Arnasoy lake

system. Similar patterns have been reported for arid and semi-arid regions of Central Asia, where salinization and desertification strongly influence vegetation structure (Akzhigitova, 1982) The high proportion of euhalophytes and hyperhalophytes (e.g., *Suaeda*, *Salsola*, *Salicornia*, *Tamarix*) indicates long-term adaptation to saline conditions and suggests that these species play a stabilizing role in salt-affected landscapes.

The wide ecological amplitude observed in several dominant taxa deserves particular attention. Species such as *Salsola richteri*, *Salsola arbuscula*, *Salsola paulsenii*, *Haloxylon ammodendron*, *Atriplex* spp., and *Bassia hyssopifolia* demonstrate the ability to thrive across multiple ecological gradients, including saline soils, sandy substrates, and varying moisture conditions. This ecological plasticity allows these species to occupy transitional habitats between deserts, salt flats, and lake shore zones, thereby contributing to vegetation continuity and landscape resilience.

The classification of species according to soil moisture preference and water requirement further highlights the ecological heterogeneity of the study area. The coexistence of ombrophytes, phreatophytes, and xerophytes within a relatively compact territory reflects the spatial mosaic created by groundwater availability, seasonal flooding, and anthropogenic water inputs from the Chardara Reservoir. In particular, phreatophytic species such as *Tamarix*, *Halocnemum*, and *Suaeda* are closely associated with shallow groundwater levels and play a crucial role in stabilizing shorelines and saline depressions.

From an applied ecological perspective, the high proportion of species with economic and ecological importance underscores the multifunctional value of the vegetation cover. Many recorded species serve as fodder plants, forming the basis of the natural forage resources for pastoral activities in the region. Others possess medicinal, dye-yielding, essential oil–bearing, alkaloid-containing, or honey-producing properties, highlighting their potential for sustainable use (Genkel, 1983). Moreover, phytomeliorant and sand-stabilizing species (e.g., *Haloxylon*, *Calligonum*, *Salsola*) are of particular importance for combating soil degradation, wind erosion, and desertification processes.

The presence of ornamental and Red Data Book species (e.g., *Tulipa lehmanniana*, *Iris* spp.) indicates that the Aydar–Arnasoy lake system also has conservation value. Anthropogenic pressure, climate variability, and changes in hydrological regimes may pose threats to these sensitive taxa. Therefore, continuous ecological monitoring and the integration of conservation measures into land-use planning are strongly recommended.

Conclusion

The analysis of ecological groups of plants based on soil mechanical composition showed that halophytes adapted to saline soils and psammophytes adapted to saline sandy soils comprise a large number of species in the study area. The results demonstrate that some species

exhibit a high degree of ecological adaptability. For example, *Salsola richteri*, *Salsola arbuscula*, *Salsola paulsenii*, *Haloxylon aphyllum*, *Atriplex pratovii*, and *Bassia hyssopifolia* are well adapted to growth on both saline soils and saline sands.

The analysis confirms that ecological groups associated with soil mechanical composition are dominated by halophytes in saline substrates and psammophytes in saline sandy soils, indicating their wide ecological amplitude and resilience under harsh environmental conditions.

The presented data are based on the results of the present study; however, the number of species may change under the influence of ecological dynamics and anthropogenic factors.

In conclusion, representatives of the Amaranthaceae family, which occupy a leading position in the natural fodder base, exhibit clear dominance in this region, as is typical of desert floras. These species show differentiated distribution across various ecological environments, reflecting their adaptive strategies and ecological significance within the Aydar–Arnasoy lake system.

References

[1] Akzhigitova, N. I. "Halophyte vegetation of Central Asia and its indication properties." *Tashkent: Pub. house of BAS of Uzbek SSR* (1982).

[2] Beydeman, I.N. (1983). *Handbook on water consumption of plants in the natural zones of the USSR*. Novosibirsk: Nauka, pp. 12–257.

[3] Genkel', P. A. "Physiology of heat-and drought-resistance of plants." (1983): 280pp.

[4] Gudalov, M. (2009). *Impact of the Aydar–Arnasoy lake system on landscapes*. PhD dissertation (Geography).

[5] Kadyrov, G. (2005). Current state of desert pasture vegetation in the Farish district of the Jizzakh region. *Bulletin of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan*, No. 5, pp. 20–24.

[6] Qodirov, G. (2008). *Transformation of meadow vegetation cover along the Aydarkul lakeshore*. PhD dissertation in Biological Sciences, pp. 14–17.

[7] Rakhimova, T. 2021. *Plant ecology of the foothill zone of Uzbekistan*. Part 2, pp. 14–196.

[8] Raunkiaer, C. (1937). *Plant life forms*. Translated from Danish by H. Gilbert-Carter. Oxford: Clarendon Press, p. 104.

[9] Serebryakov, I. G. "Ecological morphology of plants. Moscow. 378 p." (1962).

[10] Serebryakov, I. G. "Life forms of higher plants and their investigation." *Field geobotany* 3 (1964): 146-205.

[11] Zakirov, K. Z. "Flora and vegetation of the Zarafshan river basin." *Uzbek SSR, Academy of Science Press, Tashkent (in Russian)* (1955).