Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **44** Issue **S-2 Year 2023** Page **1955:1960***

Taxonomic Composition of the Dendroflora of the Kuhistan Botanical-Geographical District

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Article History

Received: 13 June 2023
Revised: 12 September 2023
Accepted: 21 September 2023

Abstract

This article presents the results of studying the species composition of the dendroflora of the Kukhistan district. The features of the taxonomic composition are considered. As a result of the conducted research, the species composition of the dendroflora of the botanical-geographical Kukhistan district was formed for the first time, according to which it was established that it consists of 4292 herbarium specimens of 116 species belonging to 26 families and 46 genera. The 5 polymorphic families with the largest number of genera and species account for 66.37% of the total dendroflora. The results show that this dendroflora is characteristic of the Mountain-Central Asian province.

Keywords: *vegetation cover, anthropogenic load, biodiversity, shrubs and trees, geographical distribution, conservation.*

1. Introduction

Kuhistan district, part of the mountainous Central Asian Province, is distinguished by its high floristic diversity [1, 2]. According to R.V.Kamelin (1979), the Kuhistan district includes the Turkestan and Zarafshan ranges and the eastern part of the Molguzar range. The authors of "Botanical geography of Central Asia and Kazakhstan" [3] mention Turkestan, the northern slopes of the Zarafshan and Hisar ranges, and the greater part of the Aloy range as the Kuhistan sub-province of the Mountainous Central Asian province. The botanical-geographical zoning map of Uzbekistan [1] mainly reflects the views of R.V.Kamelin and shows that the botanical-geographical district of Kuhistan includes North Turkestan, Urgut, Molguzar, and Ziadin-Zirabulok botanical-geographical regions.

The part of Uzbekistan in the Kuhistan district is mainly represented by the Turkestan and Molguzar ridges. Protected natural areas include Zomin State Reserve and Zomin National Nature Park [4]. Preliminary information on the flora of the district belongs to M.G.Popov and N.V.Androsov (1937). Later, an increase in knowledge in this regard was associated with the research of Ye.M.Demurina (1975). M.B.Tirkasheva (2011), A.S.Esankulov (2012), F.O.Khasanov et al. (2013), L.A.Botirova (2013), and others can be included among the studies conducted in recent years. They contain information on the composition of flora and plant cover in some parts of the Turkestan range. The latest information on the flora of the Molguzar range is reflected in the work of D.E.Azimova (2018). Information on the flora of

the part of Kuhistan district outside Uzbekistan is given in A.A.Konnov (1966), G.Gaffarov (1991), N.A.Sulaymanov (2008), and other works.

The long-term research carried out so far provides general information on the composition of the flora of the district. However, the creation of digital maps in the geoinformation system and the formation of a database that reflect the complete species composition of the flora or some of its elements, including species composition, distribution, and status of rare species, require new research.

2. Research objects and methods

Research was conducted on the basis of routed and semi-stationary methods of floristry [5, 6]. In order to determine the main characteristics of the dendroflora, the sequence of the leading families and genera in terms of the number of species was determined [5]. The main source for the composition of species is the field research conducted during 2019–2023. Also, specimens collected from the research area and stored in the herbarium of the National Herbarium of Uzbekistan (TASH), Moscow State University (MW), and the Botanical Institute named after V.L.Komarov (LE) were involved. In addition, data posted on the Plantarum (https://www.plantarium.ru/) online platform were also accepted for analysis.

In the synopsis of Dendroflora, plant families are listed according to APG IV (2016). Genera and species (as well as their authors) were adopted mainly on the basis of the identifiers of plants of Central Asia (1969–1993) and, in most cases, were coordinated according to POWO (POWO, 2023).

The systems proposed by S.Raunkiaer (1937) and I.G.Serebryakov (1964) were used to determine the life forms of plant species and were revised according to the identifiers of plants in Central Asia (1969–1993) and the flora of Uzbekistan (1941–1963).

3. Obtained results and their discussion

As a result of the study of the materials collected during the field research conducted in 2019–2023 and the samples collected from the research area and stored in large herbarium funds, it was found that 116 species of trees and shrubs belonging to 26 families and 46 genera are found in the part of the botanical-geographical district of Kuhistan belonging to the Republic of Uzbekistan (Table 1).

In terms of the composition of the dendroflora, it is possible to see the disproportion between large taxonomic units. Gymnosperms (Gymnospermae) consist of 8 species (6.9%), belonging to 2 families (Ephedraceae, Cupressaceae) and 2 genera (*Ephedra*, *Juniperus*). Angiosperms (Angiospermae) form the basis of the flora, and 24 families with 106 species belonging to 44 genera participate in this area (93.1%).

Table 1- Taxonomic composition of the dendroflora of the botanical-geographic district of Kuhistan

№	Taxons	Number of genera	Number of species	Species %
GYMNOSPERMAE				
Subclass PINIDAE				
Ordo Pinales Gorozh.				
1	Cupressaceae Gray.	1	3	2.59
Subclass GNETIDAE				
Ordo Ephedrales Dumort				
2	Ephedraceae Dumort.	1	5	4.31
	Total of Gymnosperm plants	**2**	**8**	**6.9%**

ANGIOSPERMAE				
Clade EYDICOTS				
Ordo Ranunculales Juz. ex Bercht.				
3	Berberidaceae Juss.	1	3	2.59
4	Ranunculaceae Juss.	1	1	0.86
Ordo Proteales Juss. ex Bercht. & J.Presl				
5	Platanaceae T. Lesrib.	1	1	0.86
Ordo Saxifragales Bercht. & J.Presl				
6	Grossulariaceae DC.	1	1	0.86
Ordo Fabales Bromhead				
7	Fabaceae Lindl.	5	12	10.34
Ordo Rosales Bercht. & J.Presl				
8	Rosaceae Juss.	13	41	35.34
9	Elaeagnaceae Juss.	2	2	1.72
10	Rhamnaceae Juss.	1	2	1.72
11	Ulmaceae Mirb.	2	4	3.44
12	Moraceae Gaudich.	1	2	1.72
Ordo Fagales Engl.				
13	Juglandaceae DC. ex Perleb	1	1	0.86
14	Betulaceae Gray	1	2	1.72
Ordo Malpighiales Juz. ex Bercht. & J.Presl				
15	Salicaceae Mirb.	2	10	8.62
Ordo Sapindales Juss. ex Bercht. & J.Presl				
16	Anacaridaceae R. Br.	1	1	0.86
17	Sapindaceae Juss.	1	3	2.59
18	Simaroubaceae DC.	1	1	0.86
Ordo Malvales Juss. ex Bercht. & J.Presl				
19	Thymelaeaceae Juss.	1	1	0.86
Ordo Santalales P.Br. ex Bepcht. & J.Presl				
20	Santalaceae R. Br.	1	1	0.86
Ordo Caryophyllales Juz. ex Bercht. & J.Presl				
21	Tamaricaceae Link.	2	2	1.72
22	Polygonaceae Juss.	1	3	2.59
23	Amaranthaceae Juss.	1	3	2.59
Ordo Solanales Juss. ex Bercht. & J.Presl				
24	Solanaceae Juss.	1	1	0.86
Ordo Lamiales Bromhead				
25	Oleaceae Hoffmanns. & Link	1	1	0.86
Ordo Dirsacales Ayss. ex Bercht. & J.Presl				
26	Caprifoliaceae Juss.	1	9	7.76
	Total of Angiosperm plants	44	108	93.1%
Total:		46	116	100%

One of the indicators showing the main aspects of the flora is the composition of polymorphic families, which take the lead in terms of the number of species [7]. Based on this, an analysis of polymorphic families and genera in dendroflora was carried out during the research conducted in Kuhistan district (Table 2).

Table 2- Spectrum of polymorphic families and genera of dendroflora of the botanical-geographic district of Kuhistan.

№	Families	NoG	NoS	%	Genera	NoS	%
1	Rosaceae	13	41	35.34	Prunus	10	8.60
					Rosa	9	7.76
					Cotoneaster	7	6.03
2	Fabaceae	5	12	10.34	Astragalus	7	6.03
3	Salicaceae	2	10	8.62	Salix	6	5.17
4	Caprifoliaceae	1	9	7.76	Lonicera	9	7.76
5	Ephedraceae	1	5	4.31	Ephedra	5	4.31
		22	77	66.37		53	45.66
	Other families (21)	24	39	33.63	Other genera (39)	63	54.34
	Total:	**46**	**116**	**100%**		**116**	**100%**

Explanation: NoG – number of genera; NoS – number of species.

The 5 families listed in the table participated with 77 species belonging to 22 genera and making up 66.37% of the total dendroflora. Usually, in the analysis of the composition of the leading families, special attention is paid to the first three families [8]. Asteraceae, Poaceae, and Fabaceae (As-Poa-Fa) lead the sequence of leading families in the flora throughout the Holarctic, including the mountainous regions of Central Asia [8].

The top three families of dendroflora in the study area include Rosaceae (41 species), Fabaceae (12), and Salicaceae (10). They include 20 genera (43.48%) and 63 species (54.30%), making up 66.37% of the total dendroflora. The leading position of the Rosaceae family is distinguished not only by the high number of species but also by the fact that it is almost three times more than the species of the family in the next place, as well as by the highest diversity in the number of genera (Table 2). The leadership of the Rosaceae family in the flora of Kuhistan district is due to *Prunus* (10 species), *Rosa* (9), *Cotoneaster* (7), *and Crataegus* (3).

The Fabaceae family (5 species, or 10.87%) occupies the second place in the dendroflora of the botanical-geographic district of Kuhistan. The leadership characteristics of the family are also characteristic of other dendrofloras of the ancient Mediterranean [9, 10]. The dominance of this family in the dendroflora was explained by the abundance of *Astragalus* species (7/6.03%) (Table 3).

Table 3- Species of the Fabaceae family of Kuhistan district and herbarium specimens belonging to them

Genera	TASH fund (1926–2019)		Field research (2019–2023)		Total number of species
	NoS	NoH	NoS	NoH	
Astragalus	6	86	7	130	7
Caragana	1	3	2	25	2
Colutea	1	20	1	63	1
Halimodendron	1	7	1	35	1
Onobrychis	1	20	1	55	1
Total:	**10**	**136**	**12**	**308**	**12**

Explanation: NoS – number of species; NoH – number of herbariums.

The remaining genera of the Fabaceae family, *Caragana* (2/1.72%), *Colutea* (1/0.86%), *Halimodendron* (1/0.86%), and *Onobrychis* (1/0.86%), are relatively rare in the area as a result of environmental factors.

Salicaceae completes the top three leading families. There are more than 200 species of this family on earth [11]. In the study area, the family participates with the genera *Salix* and *Populus*. The leadership position of the *Salix* genus is explained by the wide ecological range of some species and the abundance of favorable environments for their growth in the study area. A similar situation can be noted for the *Populus* genus. In the Uzbekistan part of the Kuhistan district, this family is represented by a total of 10 species, most of which are recorded in the flora of the Turkestan and Molguzar mountain ranges.

During the research, *Populus nigra* L. and *Salix excelsa* S.G. Gmel. are listed for the first time for the territory of Uzbekistan in Kuhistan district.

The family Caprifoliaceae, which occupies the next place in the spectrum of leading families, includes nine species belonging to the genus *Lonicera*. Among them, *Lonicera altmannii, L. microphylla, and L. nummulariifolia* are the dominant plant communities in the upper hills and mountains of the study area. *Lonicera bracteolaris Boiss.* & Buhse is introduced for the first time for the study area.

In the case of the Ephedraceae family, we can see a situation where one genus is the leader in terms of the number of species. Five species (*E. equisetina*, *E. fedtschenkoae*, *E. foliata*, *E. intermedia*, *E. regeliana*) belonging to the *Ephedra* genus were identified in the study area. Among them, *E. equisetina* is the dominant species in the plant communities of hill and mountain regions. In addition to the polymorphic families leading in terms of the number of species, it is necessary to pay special attention to the Cupressaceae family, which forms the basis of the vegetation cover of the middle and upper mountain regions. The genus *Juniperus* from this family includes three species, and all of them form formations [12].

As a result of the comparative analysis of the genera and species of large families in the dendroflora of other regions of the study area, it was found that 58 (49.99%) species in the Molguzar ridge, 56 (48.27%) species in the Zomin reserve, and 35 (30.17%) species in the TASH coll. make up the total dendroflora. The dendroflora among the trees and shrubs in the flora of the Molguzar ridge from these areas differs from the dendroflora of TASH coll. and Zomin State Reserve by the large number of species in the Rosaceae (31), Fabaceae (12), and Salicaceae (7) families (Table 4).

Table 4- Distribution of the composition of the leading polymorphic families in some parts of the research area

Families	**TASH coll. (1915-2019)**		**Zomin reserve (Esankulov, 2012)**		**Molguzar ridge (Azimova, 2017)**	
	Genus %	**Species %**	**Genus %**	**Species %**	**Genus %**	**Species %**
Rosaceae	6 (13.04%)	13 (11.20%)	13 (28.26%)	30 (25.86%)	10 (21.73%)	31 (28.26%)
Fabaceae	5 (10.86%)	10 (8.62%)	4 (8.69%)	12 (10.34%)	4 (8.69%)	12 (10.34%)
Salicaceae	2 (4.34%)	3 (2.59%)	2 (4.34%)	6 (5.17%)	2 (4.34%)	7 (6.03%)
Caprifoliaceae	1 (2.17%)	5 (4.31%)	1 (2.17%)	4 (3.45%)	1 (2.17%)	3 (2.59%)
Ephedraceae	1 (2.17%)	4 (3.45%)	1 (2.17%)	4 (3.45%)	1 (2.17%)	5 (4.31%)
Total:	**15 (32.58%)**	**35 (30.17%)**	**21 (45.63%)**	**56 (48.27%)**	**18 (39,10%)**	**58 (49.99%)**

In summary, 77 species (66.37%) of the total dendroflora are included in the leading polymorphic families in the dendroflora of Kuhistan district. The remaining 21 families have 39 species (33.63%). On average, one family has 15.6 species.

The results of the research conducted were transferred to a digital format and included in the database on the species diversity of the flora of Uzbekistan. Also, the results of taxonomic analysis of dendroflora, including specimens stored in herbarium funds, field records, are geolinked and placed on a grid system map. New research aimed at conducting an inventory of the composition of dendroflora shows that determining the taxonomic composition of natural flora, forming a modern taxonomic list, and creating living collections of plants are of significant scientific and practical value.

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