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# ANALYSIS OF AREAL TYPES OF SPECIES OF THE GENUS SCUTELLARIA, DISTRIBUTED IN THE FLORA OF THE FERGHANA VALLEY

Akbarova Mukhayyo Khusanovna
Ferghana State University, PhD in Biology, Docent
muhayyo-akbarova@mail.ru+998905625624
ORCID ID 0000-0002-2903-5675

Yusupova Zohida Abdumalikovna
Ferghana State University, Docent
zohidaxon.yusupova@mail.ru +998937371551
ORCID ID: 0000-0003-2638-8544

**Abstract**
This article presents an analysis of the results of scientific research conducted to determine the geography and types of habitat of species of the genus Scutellaria of the Lamiaceae family, widespread in the Fergana Valley. To analyze species by area types, classical and latest publications on the local flora of Central Asia were used.
Based on the results of the research, the natural boundaries of the distribution of species of the genus Scutellaria common in the flora of the valley were established, and they were divided into 11 areal types. These habitat types, in turn, were divided into four habitat classes: Western Tien Shan (7), Pamir-Alai (5), Mountain Central Asian (10), Palaearctic (1). Of the 23 species of the genus Scutellaria common in the Fergana Valley, 22 species (96%) are Central Asian endemics, that is, they are recognized as centers of local speciation.

**Keywords**: Lamiaceae, Scutellaria, habitat type, habitat class, biogeographic spectrum, Mountainous Central Asian, endemic, subendemic.

## Introduction

The reduction of biological diversity in the world has a great negative impact on the functional stability of natural ecosystems. Since species belonging to the endemic fraction of natural flora are geographically limited, they are at high risk of extinction and have the highest priority for their conservation. Based on the fundamental principles of priority preservation of biological diversity, it is considered appropriate to carry out scientific research works on the cross-border level in the growth environments and regional flora and to determine protection measures. Mountainous Central Asia is important as one of the world's hotbeds of biodiversity. It is one of the important centers of origin and species diversity for some sections of a number of family groups. Genus Scutellaria L. belonging to the Lamiaceae family can also be included among these taxa.
Currently, the Lamiaceae Martinov family is the largest family in the Lamiales order, with more than 230 genera and more than 7000 species. Scutellaria L., one of the largest polymorphic families, has 474 species in the flora of the Earth [4] and is found in mountainous areas of tropical and subtropical, temperate regions. The variety of species belonging to the category is greater in the hilly, foothill and high mountain regions of Eurasia compared to other regions, in particular, the regions of Iran-Turonia, Central Asia and Afghanistan are considered to be one of the centers

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of origin of the species of the category, while the eastern Mediterranean Sea part is recognized as the second center [5]. In the flora of the former USSR (now the CIS) of the species of the category, In the data provided by S.V. Yuzepchuk [18], 148 species belonging to 4 sections (Euscutellaria Briq., Cystaspis Juz., Anaspis (Roching) Juz., Apeltanthus (Nevsky) Juz.) are found, accordingly, 84 species of the genus are found in Central Asia distributed [8], 86% of which are confined to the mountainous region of Central Asia. Of these, 32 species are listed in the flora of Kazakhstan, 30 species in the flora of Kyrgyzstan [17], 35 species in the flora of Tajikistan, 7 species in the flora of Turkmenistan, 32 species in the flora of Uzbekistan [9], but the as a result of field research conducted in recent years and taxonomic changes, it became known that there are 40 species of the genus in the flora of Uzbekistan [4].

Until now, studies on biomorphology, biogeography and assessment of the modern state of senopopulations of representatives of the species have not been carried out sufficiently. Most of the conducted research have revealed some aspects of the senopopulations of the series, which do not allow us to assess their modern condition and to monitor them.

Scutellaria species are distributed in almost all regions of the earth, except for the desert regions of Antarctica, southern Africa and the Amazon. The highest diversity of species in the category corresponds to Iran-Turonia, mountainous parts of Central Asia, and several provinces of the People's Republic of China. There are still debates among scientists about the centers of origin of species of the category, their formation and their number today. Among their centers of origin, we can include the mountainous part of Central Asia and the regions adjacent to it [1,6,7].

Areal types are natural boundaries that graphically represent species' origin and distribution range. Geographical space covers certain areas on the surface of the earth. At the same time, it is divided into local (a narrow geographical area), regional (certain large areas on one continent) and multi-regional (located on no more than three continents) regions. Examples of multi-regional regions include Ancient Mediterranean and Euro-Siberian-Central Asia, and regional regions include Central Asia, Mountainous Central Asia and other regions [1].

Currently, several terms are used in biogeography to describe the borders of the natural distribution of species. Including chorological category, element, chorotype, component and areal terms, etc. [2]. In Western European countries, the term chorological category is used to express the natural borders of species belonging to the flora, and in Asian countries, in particular, Uzbekistan, the term areal type is used more often.

## LITERATURE REVIEW AND METHODOLOGY

Floristic studies conducted in Uzbekistan are based on the approach proposed by R.V.Kamelin. In his research, R.V. Kamelin (1973) presented the distribution of species in the flora of the Mountainous Central Asia province by areal types and information about the natural borders of the distribution range [1].

Hierarchical principles were used as a basis for placing areal types. Areal types close to each other were combined into areal classes. This principle serves to fully reveal the geographic relationships of the studied flora. It helps to reveal the mutual relationship of geographical elements belonging to different classes and to easily accept the information obtained from the given tables (Table 2).

K.Sh. Tojibayev's research on the flora of Western Tiyanshan is based on the fact that combining areal types that are close to each other into classes in the region of mountainous Central Asia is

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convenient for analysis—using the results of K.Sh. Tojiboyev's research, 2056 species of South-Western Tien Shan flora were divided into 55 areal types and combined into 7 areal classes [16]. Later, this practice took a firm place in floristic analysis, and used in the studies of A.R. Batoshov (2016), O.T. Turginov (2017), F.I.Karimov (2016), R.K.Gulomov (2022) and others.

To determine the areal types of Scutellaria species of the Fergana Valley, the flora of Uzbekistan [9], the flora of Kyrgyzstan [17], the flora of Tajikistan [14], the identifier of Central Asian plants [7] and several other scientific sources were used [ 10; 12; 11, 13].

## RESULTS AND DISCUSSIONS

According to the results of the research, the natural distribution borders of the Scutellaria species in the flora of the Fergana Valley were determined and they were divided into 11 areal types. These areal types, in turn, were divided into four areal classes (Table 1).

The main goal of the analysis of the geographical distribution of the species was to determine the relative proportions of autochthonous and allochthonous elements among the species of the genus, determining the role of species formation processes in the soil of the Western Tien Shan and Pamir-Alai mountain ranges in the formation of the composition of Scutellaria species distributed in the Fergana Valley and their mutual relations. According to the results of the analysis, the species Scutellaria distributed in the flora of the Fergana Valley consists of 11 types belonging to 4 areal classes (Table 2, Fig. 2).

**Table 1. Distribution of Fergana Valley Scutellaria species by areal classes**

| № | Areal classes | Number of areal types | Number of species | Total % |
|---|---|---|---|---|
| 1 | Western Tien Shan | 4 | 7 | 30% |
| 2 | Pamir-Alai | 2 | 5 | 22% |
| 3 | Mountainous Central Asian | 4 | 10 | 44% |
| 4 | Central Asian | - | - | - |
| 5 | Ancient Mediterranean | - | - | - |
| 6 | Poleoarctic | 1 | 1 | 4% |
| 7 | Golarctic | - | - | - |
| Total: | | 11 | 23 | |

Scutellaria species are distributed mainly in the foothills, lower, middle and sometimes upper mountain regions of the Fergana Valley. It was found that 10 species (44%) belonging to the Mountainous-Central Asian areal class are the leaders in these areas, which unite the West-Tien Shan and Pamir-Alai mountains.

As can be seen from the data presented in Table 2, the Mountainous Central Asian areal class combines 4 types and prevails over other classes. In the composition of the class, Northern Tien Shan – West Pamir-alai (5), Northern Tien Shan – North Pamir-alai (2), Eastern Fergana – North Pamir-alai (1), Western – Tien Shan – Pamir-alai (2 of each) areal types are clearly distinguished by the number of species (Fig. 1). Their sum is the basis of this areal class. These areas indicate that there are local foci of modern speciation processes for the genus Scutellaria in Mountanious Central Asia [15].


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**Table 2. Biogeographic spectrum and number of species of Scutellaria genus distributed in the flora of Fergana Valley**

| № | Main areal classes | Areal types | | | (%) | Total (%) |
|---|---|---|---|---|---|---|
| 1. | Western Tien Shan | Eastern chatkal | S. kamelinii | 1 | 4% | 7 (30) |
| 2. | | Western Tien Shan | S. pycnoclada | 1 | 4% | |
| 3. | | Eastern Ferghana | S. urticifolia, S. knorringiae, S. kugarti, S. andrachnoides | 4 | 18% | |
| 4. | | Southern-western Tien Shan | S. haematochlora | 1 | 4% | |
| 5. | Pamir-Alai | Northern Alai | S. nepetoides | 1 | 4% | 5 (22) |
| 6. | | Pamir-Alai | S. picta, S. ocellata, S. physocalyx, S. orbicularis | 4 | 18% | |
| 7. | Mountainous Central Asia | Northern Tien Shan-northern Pamir-Alai | S. intermedia, S. comosa, S. oxystegia, S. iskanderi, S. immaculata | 5 | 22% | 10 (44) |
| 8. | | Western Tien Shan-northern Pamir-Alai | S. cordifrons, S. ramosissima | 2 | 9% | |
| 9. | | Eastern Ferghana-Northern Pamir-Alai | S. xanthosiphon | 1 | 4% | |
| 10. | | Western Tien Shan – Pamir-Alai | S. filicaulis, S. adenostegia | 2 | 9% | |
| 11. | Paleoarctic | Euro-Syberian-Ancient Mediterranean | S. galericulata | 1 | 4% | 1 (4) |

The basis of the Western Tien Shan areal class, which has a narrow distribution area in mountainous Central Asia is the widespread species along some ridges of this mountain system (7 species, 30%). In this class, the percentage of species belonging to the Eastern Fargana (4.18%) areal type is high, endemic and sub-endemic species (S. kugarti, S. andrachnoides, S. urticifolia, S. knorringiae) are the basis of type, and the remaining Eastern chatkal, Western Tien Shan, and Southwestern-Tien Shan have one species each (Fig. 1).

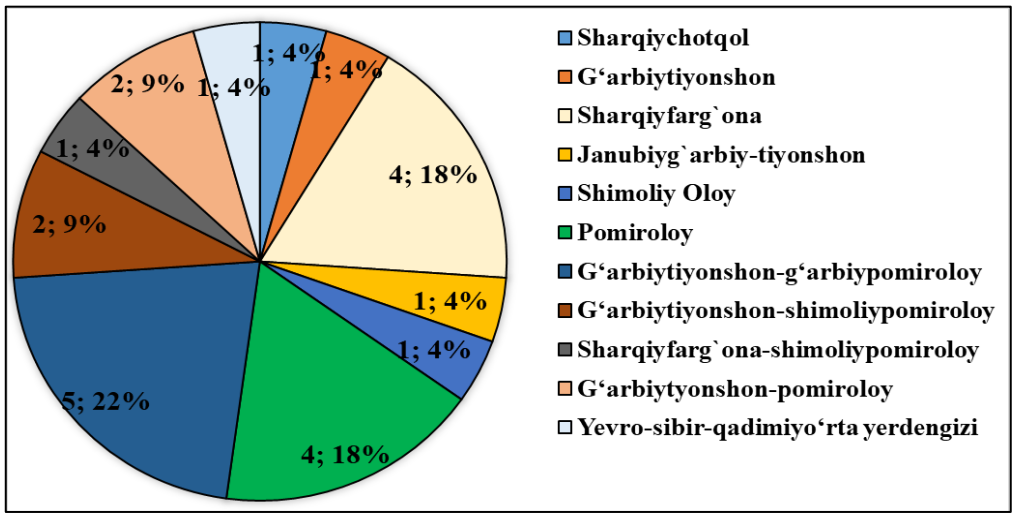


**Figure 1. Distribution of Scutellaria genus distributed in the flora of the Fergana Valley by areal types**

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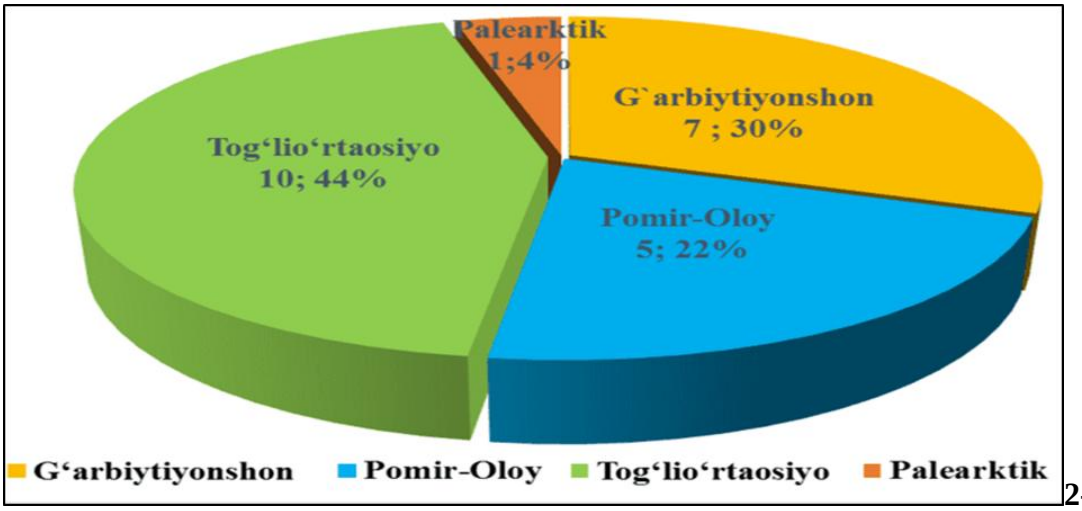
The basis of the class of Pamir-alai areals is S. picta, S. ocellata, S. physocalyx, S. orbicularissingari, distributed along the ridges of the Pamir-alai system, with a relatively narrow distribution range (4 species, 18%). S. nepetoides is the only endemic species for Northern-alai type (Fig. 2).




**2-Figure 2. Distribution of the Scutellaria genus distributed in the flora of the Fergana Valley by areal classes**

The expansion of areal types is accompanied by a decrease in the diversity of the number of species. The presence of S. galericulata species of the group as the only representative in the Paleoarctic areal class is explained by the fact that autochthonous Mountainous Central Asian species are of great importance in the flora of the studied area. The low percentage of species belonging to the Palearctic areal class, which is the largest in terms of area, proves that the natural and climatic conditions of the Fergana Valley are not suitable for the Scutellaria species typical for more northern regions.

## CONCLUSION

22 of the 23 species listed for the Ferghana valley flora of the Scutellaria genus are Central Asian endemics. Species of the group in Central Asia areal types were also determined by A.M.Makhmedov [15].

The species of Scutellaria genus distributed in the flora of the Fergana valley are divided into 4 areal classes: Western Tien Shan (7), Pamir-Alai (5), Mountainous Central Asia (10), Ancient Mediterranean (1). It was found that 22 (96%) of the 23 species in the valley flora of the Scutellaria genus are Central Asian endemics, i.e., local species are recognized as foci of formation.

The main core of Fergana Valley species of the Scutellaria genus is the Mountainous Central Asian species. Their share is 96% of the total studied species, especially the endemic species of Central Asia, i.e., the Western-Tien Shan-West-Pamir-alai area, which is recognized as the hotbed of local species formation. It became known that species belonging to types The Alai ridge occupies a special place in the Pamir-Alai part of the valley in terms of species diversity. This region is characterized by a large number of endemic species with a wide distribution range. It is in the example of this ridge we can see the strong connections of the Pomirolai species with Western-Tien Shan.

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