Volume 3, Issue 11, November - 2025
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

RESEARCH AIMED AT DETERMINING PLANT DIVERSITY IN THE FERGANA VALLEY

Djurayeva Mahbubaxon Doniyorjon qizi
Namangan State University PhD Student in Biology

Abstract
The Fergana Valley is one of the richest floristic regions in Central Asia; however, over the past 50 years, systematic inventory studies have been practically non-existent here. The lack of up-to-date data hampers the development of strategies for biodiversity conservation and sustainable use of plant resources. The aim of this article is to conduct a comprehensive inventory of vascular plants in the Fergana Valley, determine its current floristic richness, identify rare and endemic species, and assess the degree of anthropogenic impact on the flora. From 2018 to 2024, 428 route surveys were carried out, over 18,000 herbarium specimens were collected and processed, and collections from 12 herbaria were analyzed. A total of 3,784 species of vascular plants belonging to 794 genera and 128 families were identified. For the first time, 164 species were recorded for the valley, and the presence of 42 species previously considered extinct was confirmed. 218 endemic and sub-endemic taxa have been identified, with 312 species included in national Red Lists.

Keywords: Flora, vascular plants, endemism, Red Data Book, Fergana Valley, Central Asia..

Introduction

The Fergana Valley is the largest intermountain lowland basin of the Tian Shan and Hissar-Alai, with an area of about 22 thousand km2, located on the territory of three states: Uzbekistan, Kyrgyzstan, and Tajikistan. Due to the contrast of altitudinal belts (320 to 4500 m above sea level), the diversity of substrates, and the long history of agricultural culture, the valley is distinguished by its exceptionally rich flora (Peshkova, 1972; Tosheva, 2012).

Classical Summaries of the Second Half of the 20th Century (Zapryagayka, 1961; Pyak, 2001; Tosheva, 2007) indicate approximately 3200-3400 vascular plant species for the valley. However, since the 1970s, systematic floral research here has practically ceased, and intensive agricultural development, urbanization, and climate change have led to the transformation of natural habitats. According to the IUCN (2023), more than 18% of the region's plant species are endangered.

The lack of a relevant flora summary hinders the implementation of the Convention on Biological Diversity, the development of national strategies and action plans for plant conservation, and the assessment of ecosystem services. Therefore, conducting a comprehensive inventory of vascular plants in the Fergana Valley is a pressing scientific and environmental task.

The aim of the research is to establish the modern taxonomic and cenotic diversity of vascular plants of the Fergana Valley, to identify rare, endemic, and invasive species, to assess the degree of anthropogenic transformation of the flora, and to develop scientifically based recommendations for its conservation.

Volume 3, Issue 11, November - 2025
ISSN (E): 2938-3781

To achieve the goal, the following tasks were set:

1. Collect and process the original herbarium material throughout the valley.
2. Conduct an audit of the herbarium funds of the main collections of Central Asia.
3. Make an annotated summary of vascular plants.
4. Perform an analysis of endemism and rarity.
5. Evaluate the trends of anthropogenic transformation of flora.
6. Develop proposals for optimizing the OOPT network.

Materials and Methods

Research area

The Fergana Valley is bordered by the Chatkal, Fergana, Turkestan, and Alai ranges. The work uses the Pyak (2001) physical-geographical boundary with minor adjustments. Total area - 22,150 km2.

Field research

In 2018-2024, 428 route surveys (60-120 km each) were conducted, covering all altitudinal belts and main vegetation types: deserts, semi-deserts, foothills, steppes, meadows, tugai forests, juniper groves, subalpine and alpine communities. The training sessions were conducted according to the standard methodology (Shelyag-Sosonko et al., 1981). A total of 18,342 herbarium sheets have been collected. The coordinates of the points were recorded using GPS Garmin 64s (accuracy ±3 m).

Chamber processing

Identification of the material was carried out using multi-volume collections "Flora of Uzbekistan" (1953-1959), "Flora of Tajikistan" (1956-1991), "Flora of Kyrgyzstan" (1950-1965), and modern revisions of families. Critical groups (Allium L., Cousinia Cass., Astragalus L., Oxytropis DC.) were determined by systematic specialists. Duplets are deposited in the TASH, LE, FRU, and BIS herbariums.

Analysis of herbarium collections

More than 48,000 sheets of 12 herbariums (TASH, AA, LE, TAD, FRU, BIS, KW, MW, BISH, TEAK, NUR, KRA) were examined. 11,200 labels have been digitized.

Geographical and statistical analysis

ArcGIS 10.8 GIS was used to create maps. Statistical processing - Statistica 13.0 and R 4.3.2 (Vegan, iNEXT packages).

Assessment of protection status

The criteria and categories of the IUCN Red Book versions 3.1 and 2022, as well as the national Red Books of Uzbekistan (2021), Kyrgyzstan (2023), and Tajikistan (2017), were used.

Results

Taxonomic structure of flora

The modern flora of vascular plants of the Fergana Valley consists of 3784 species (3839 species

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 3, Issue 11, November - 2025
ISSN (E): 2938-3781

and subspecies taxa), belonging to 794 genera and 128 families.

Table 1. Leading families of the flora of the Fergana Valley

№	Family	Number of species	% of flora
1	Asteraceae	512	13,53
2	Fabaceae	378	9,99
3	Poaceae	314	8,30
4	Brassicaceae	236	6,24
5	Lamiaceae	188	4,97
6	Rosaceae	156	4,12
7	Apiaceae	142	3,75
8	Chenopodiaceae	118	3,12
9	Caryophyllaceae	112	2,96
10	Ranunculaceae	98	2,59

Compared to data from the 1960s, the flora increased by 472 species (14.3%), mainly due to the discovery of new species for the region (164) and adventites (208).

Endemism

218 endemic and subendemic taxa (5.76% of the flora) have been identified. The largest number of endemics are concentrated in the genera Cousinia (34 species), Allium (18), Astragalus (16), Ferula L. (11). The main endemic centers are the southwestern spurs of the Fergana Range (42 endemics), the Kurama Range (31), and the Alai Range within the valley (28).

Rare and endangered species

312 species (8.2%) are included in the Red Books of three countries. Of these, 42 species considered extinct in the 20th century were confirmed in 2018-2024 (for example, Tulipa ferganica Vved., Allium hissaricum Vved., Cousinia olgae Regel & Schmalh.). For the first time, 57 species have been proposed for protection.

Invasive species

208 adventive species (5.5% of the flora) were recorded, of which 37 are transformers (Xanthium strumarium L., Ambrosia artemisiifolia L., Ailanthus altissima (Mill.) Swingle et al.).

Phytocoenotic diversity

18 formations and 84 associations of natural vegetation have been identified. The most threatened are tugai forests (50 years of 78% reduction in area) and high-mountain cryophyte communities.

Debate

The resulting number of species (3784) makes the flora of the Fergana Valley one of the richest among the intermountain basins of Central and Middle Asia, surpassing only the Kashgar Basin (about 3900 species according to unpublished data). The high level of endemism (5.76%) is close to the indicators of the Pamir-Alay region as a whole (6-8%) and confirms the valley's status as an independent floral district (Taxtadjyan, 1978).

The increase in species richness compared to the mid-20th century is due to three factors: 1) more complete coverage of hard-to-reach territories, 2) discovery of new species for science (14 described in 2000-2024), 3) expansion of adventitious species ranges. At the same time, 47 indigenous species have not been confirmed since the 1950s and are likely extinct in the valley.

Comparison with neighboring regions shows that the Fergana Valley maintains a higher diversity

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

compared to the intensively developed Chuy and Talas valleys (a decrease of 28-34% during the same period).

Conclusion

The inventory conducted allowed us to establish that the modern flora of vascular plants in the Fergana Valley consists of 3,784 species, which is 14.3% higher than data from the second half of the 20th century. 218 endemic species were identified, and 312 species were recommended for protection. The main threats are the plowing of adyrs, the degradation of tugai forests, overgrazing, and the invasion of alien species.

A network of 28 new micro-reserves with a total area of 90.2 thousand hectares has been proposed to preserve critical habitats. The obtained results can be used in the preparation of the second edition of the Red Books of Uzbekistan, Kyrgyzstan, and Tajikistan, as well as in the development of a transboundary biodiversity conservation program for the Fergana Valley.

References

1. Sparser P. I. Flora of the Fergana Valley. - Tashkent: Fan, 1961. - Vol. 1. - 450 p.
2. Peshkova G. A. Vegetation of the Western Tien Shan. - Novosibirsk: Nauka, 1972. - 284 p.
3. Pyak A. I. Floristic Complexes of the Western Tien Shan // Botanical Research in Kyrgyzstan. - Frunze: Ilim, 2001. - Issue. 12. - P. 3-45.
4. Taxtadjyan A. L. Floristic Regions of the Earth. - L.: Science, 1978. - 247 p.
5. Tosheva O. P. Concept of the flora of the Fergana Valley: Diss.... Doctor of Biological Sciences. - Tashkent, 2007. - 412 p.
6. Tosheva O. P., Beshko N. Yu., Shomurodov H. F. Rare plant species of the Fergana Valley // Uzbek Biological Journal. - 2012. - No. - P. 3-9.
7. Flora of Uzbekistan. - Tashkent: Academy of Sciences of the Uzbek SSR Publishing House, 1953-1959. - Vol. 1-6.
8. Flora of the Tajik SSR. - L.; M.; Dushanbe: Nauka, 1956-1991. - Vol. 1-10.
9. Flora of the Kyrgyz SSR. Frunze: Publishing House of the Academy of Sciences of the Kyrgyz SSR, 1950-1965. - Vol. 1-11.
10. Shelyag-Sosonko Yu. R., Osichnyuk V. V., Andriyenko T. L. Methodology of Geobotanical Research. - Kiev: Naukova Dumka, 1981. – 216 p.

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8