ASSESSMENT OF ENDEMIC PLANT SPECIES IN THE FERGANA VALLEY BASED ON INTERNATIONAL IUCN CRITERIA

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Abstract: *The Fergana Valley is one of the most densely populated and anthropogenically impacted regions in Central Asia, where 82% of the natural landscape has been altered. This study evaluates the conservation status of endemic plant species distributed in the region using the international IUCN Red List criteria (Categories and Criteria Version 3.1). The geospatial assessment tool GeoCAT was employed to calculate the Extent of Occurrence (EOO) and Area of Occupancy (AOO). The research highlights that many endemics in the Fergana Valley lack sufficient protection, with state reserves covering only 0.1% of the valley's territory. The results underscore the urgent need for establishing new protected areas to conserve these vulnerable taxa.*

Аннотация: *Ферганская долина — один из самых густонаселенных и подверженных антропогенному воздействию регионов Центральной Азии, где изменено 82% природного ландшафта. В данном исследовании оценивается природоохранный статус эндемичных видов растений региона с использованием международных критериев Красного списка МСОП (Категории и критерии, версия 3.1). Для расчета площади распространения (EOO) и площади обитания (AOO) использовался инструмент геопространственной оценки GeoCAT. Исследование показывает, что многие эндемики Ферганской долины не имеют достаточной защиты, поскольку государственные заповедники занимают лишь 0,1% территории долины. Результаты подчеркивают острую необходимость создания новых охраняемых природных территорий для сохранения этих уязвимых таксонов.*

Annotatsiya: *Farg‘ona vodiysi Markaziy Osiyoning aholi eng zich joylashgan va antropogen ta’sirga uchragan mintaqalaridan biri bo‘lib, bu yerda tabiiy landshaftning 82 foizi o‘zgartirilgan. Ushbu tadqiqotda mintaqada tarqalgan endem o‘simlik turlarining muhofaza holati Xalqaro Qizil kitob (IUCN) mezonlari (3.1-versiya) asosida baholanadi. Tarqalish ko‘lami (EOO) va egallagan maydonini (AOO) hisoblash uchun GeoCAT geofazoviy baholash vositasidan foydalanildi. Tadqiqot shuni ko‘rsatadiki, Farg‘ona vodiysidagi ko‘plab endemlar yetarli darajada himoyalanmagan, davlat qo‘riqxonalari vodiy hududining atigi 0,1 foizini tashkil*

qiladi. Natijalar ushbu zaif taksonlarni saqlab qolish uchun yangi muhofaza etiladigan hududlarni tashkil etish zarurligini ta'kidlaydi.

Keywords: *Fergana Valley, endemic plants, IUCN Red List, GeoCAT, biodiversity conservation, anthropogenic impact.*

Introduction:

The Fergana Valley is a unique biogeographical region surrounded by the Tien Shan and Alay mountain ranges. Despite its rich biodiversity, the valley faces severe anthropogenic pressure due to population growth and agricultural expansion. Currently, there are no large state reserves within the Uzbekistan part of the valley, leaving many endemic species vulnerable to extinction.

Materials and Methods:

The study analyzed endemic species lists compiled from recent floristic research (Turginov, 2024). Assessments were conducted using IUCN criteria B (Geographic range) to determine threatened categories (CR, EN, VU). Distribution maps were generated using GeoCAT based on herbarium specimens and field data.

Discussion Phytogeographical and Evolutionary Significance The rediscovery and monitoring of *Allium tatyanae* in the Namangan region provide critical insights into the floristic richness of the Fergana Valley, which is historically recognized as a center of diversity for the genus *Allium*. The presence of this narrow endemic in the low-mountain "adyr" landscapes confirms that the foothills of the Northern Fergana Valley serve as a unique refugium for xerophytic geophytes. Unlike widespread species, *A. tatyanae* exhibits strict edaphic specialization, thriving exclusively on skeletal, stony substrates that are prone to erosion. This suggests that the species has evolved specific physiological mechanisms to tolerate extreme water deficits and soil instability, making it an invaluable component of the local ecosystem's stability. The restriction of this species to the 1000–1300 m elevation belt places it in a precarious ecological niche; it is trapped between the intensively cultivated agricultural lowlands and the higher montane zones, leaving it with very little room for vertical migration in the event of climate change.

Ecological Vulnerability and Anthropogenic Pressure The findings from the Yangiqo‘rg‘on and Chortoq districts highlight a disturbing trend of habitat degradation in the adyr zones of Uzbekistan. The "adyrs" are ecologically fragile transition zones, yet they are subjected to the highest pressure from unmanaged pastoralism. The field data indicates that the primary threat is not merely the consumption of the vegetative parts of the plant, but the trampling of the soil by livestock. This soil compaction reduces porosity and water infiltration, which is fatal for bulbous geophytes that rely

on capturing ephemeral spring moisture. Furthermore, grazing during the flowering period (anthesis) directly removes the reproductive organs of the plant, preventing seed set and dispersal. This leads to what conservation biologists term "senile populations"—groups of plants consisting only of old, vegetative bulbs with no recruitment of young seedlings to replace them. Over time, this results in a demographic collapse, even if the adult plants appear to survive for a few more years.

The Role of Micro-Habitats The survival of *A. tatyanae* in the Arbag‘ish and O‘ng‘or-tepa sites is likely due to the specific micro-topography of these areas, where steep, rocky outcrops provide a natural, albeit partial, barrier against heavy machinery and livestock. However, relying on natural barriers is no longer sufficient. The degradation of the surrounding vegetation community facilitates the invasion of aggressive weed species, which can outcompete the slow-growing *Allium* for nutrients and sunlight. The ecological data suggests that *A. tatyanae* acts as a bio-indicator: its decline signals a broader degradation of the foothill ecosystem, which could eventually lead to increased mudslides and soil loss in the Namangan region.

Conclusion

Summary of Scientific Findings This study has successfully clarified the current chorology and population status of *Allium tatyanae*, confirming it as a highly vulnerable element of the Fergana Valley flora. The research established that while the species retains viable populations in the Yangiqo‘rg‘on and Chortoq districts, its ecological plasticity is low, binding it tightly to specific erosion-prone, stony soil types. The assessment of the adyr belt revealed that the current land-use practices are unsustainable for the long-term survival of this species. The intersection of a narrow geographic range, specific habitat requirements, and intense anthropogenic pressure creates a "perfect storm" for local extinction if left unaddressed.

Conservation Imperatives Based on the field monitoring results; it is imperative that *Allium tatyanae* be recommended for inclusion in the next edition of the **Red Data Book of Uzbekistan**. The status should arguably be set to "Vulnerable" or "Endangered" depending on the calculated fragmentation of the remaining populations. Passive protection is insufficient; active management strategies must be implemented immediately.

Strategic Recommendations

1. **Establishment of Micro-Reserves:** The creation of botanical micro-reserves (zakazniks) in Arbag‘ish is the most viable solution. These areas do not require the total exclusion of human activity but must enforce a strict ban on grazing during the critical phenological windows of flowering and fruiting (April to June).

2. Ex-situ Conservation: Seeds should be collected immediately for long-term storage in the National Gene Bank. Additionally, introduction trials should be conducted in the Namangan Botanical Garden to assess the feasibility of cultivating this species away from its natural threats.

3. Community Engagement: Conservation efforts must involve local pastoral communities. Educational programs explaining that preserving the "stony adyrs" helps prevent landslides—which directly benefits the villages—can create community buy-in for protecting the plant.

Final Thought The loss of *Allium tatyanae* would not just be the loss of a single species; it would represent the erosion of the unique genetic heritage of the Pamiro-Alay Mountain system. Protecting this humble geophyte is a test of our ability to balance agricultural needs with the preservation of the irreplaceable biodiversity that defines the natural identity of Uzbekistan.

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