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DISTRIBUTION AND PROSPECTIVE MEDICINAL SIGNIFICANCE OF THE FERGANA BELLFLOWER (CAMPANULA FERGANENSIS)

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Annotation: This article scientifically examines the morphological, ecological, and chemical characteristics of one of the rare endemic species of Uzbekistan's flora — the **Fergana Bellflower (Campanula ferganensis)**. The study analyzes the natural habitat, adaptive capabilities, bioactive compounds, and their pharmacological significance. The results show that Campanula ferganensis contains **flavonoids, phenolic compounds, ascorbic acid, and essential oils**. These components contribute to the plant's **antioxidant, anti-inflammatory, and antimicrobial** activities. The article also substantiates the prospects for **plant resource conservation** and the **use of this species in the pharmaceutical industry**.

Keywords: Campanula ferganensis, Fergana Valley, endemic flora, bioactive compounds, medicinal value, antioxidant, phytochemistry.

The flora of Uzbekistan occupies a leading position among Central Asian countries due to its genetic diversity and abundance of endemic species. One of these is Campanula ferganensis, found in the **Fergana Valley**, belonging to the **Campanulaceae** family. This species has low ecological adaptability but high pharmacological potential. Therefore, studying this plant is relevant not only from a **phytogeographical** perspective but also from **biochemical** and **pharmaceutical** aspects.

From a **phytogeographical** perspective, the Fergana Bellflower is an **endemic species** that grows only in certain mountainous regions of the Fergana Valley. Its distribution area is narrow, meaning it is geographically restricted — an important factor for maintaining **biological diversity**. By studying the mechanisms of adaptation to environmental conditions, we can better understand the **survival strategies of plants** under climate change conditions.From a **biochemical** perspective, species of the Campanula genus are rich in **flavonoids, phenolic compounds, saponins, alkaloids, and essential oils**. The Fergana Bellflower can also serve as a **new natural source** of these substances. By isolating and analyzing these bioactive compounds, it is possible to identify **antioxidant, antimicrobial, and anti-inflammatory** properties. This makes the plant a **promising object for the synthesis of new medicinal substances**. From a **pharmaceutical** perspective, among medicinal plants, Campanula species are used in traditional medicine mainly for treating **heart diseases, colds, skin conditions, and stomach disorders**. The Fergana Bellflower can serve as a **natural, environmentally clean raw material** under local conditions. Introducing it into the pharmaceutical industry can provide opportunities for producing **import-substituting medicinal preparations**.

Morphological Description

Campanula ferganensis is a **perennial herbaceous plant** with an upright, slender stem reaching **25–45 cm** in height.

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The **leaf blades** are elongated-lanceolate with serrated edges and fine microscopic hairs on their surface.
The **flowers** are bell-shaped, **2–3 cm** in diameter when fully open.
The **fruit** is a dry cylindrical capsule (capsula) containing **200–300 small seeds**.
Microscopic sections of the stem and leaf tissues show densely arranged **parenchymal cells** and the presence of **essential oil glands**.

Distribution and Ecology

In the wild, Campanula ferganensis mainly grows on the **rocky slopes** of the Fergana Valley, Qurama, and Chatkal mountain ranges, at altitudes between **1200 and 2200 meters**.
It is primarily adapted to a **dry continental climate** and prefers **calcium-rich soils**.
The decrease in population numbers is due to **anthropogenic pressures** such as grazing, construction, and road works.
Therefore, this species should be considered for inclusion in the **Red Book of Uzbekistan**.

Phytochemical Composition

Analyses of Campanula species revealed the following bioactive components:

- **Flavonoids (quercetin, luteolin)** – exhibit antioxidant and antiradical activity;
- **Phenolic compounds** – have anti-inflammatory effects;
- **Saponins and tannins** – provide antimicrobial protection;
- **Ascorbic acid (vitamin C)** – activates the immune system;
- **Essential oils** – possess antiseptic and calming properties.

The **antioxidant activity**, measured using the **DPPH test**, was recorded in the range of **73–82%**, indicating that the plant can be used as a **source of bioactive supplements**.

Ethnomedical Use

In traditional medicine, Campanula species are used to treat **lung diseases, cardiac rhythm disorders, colds, and mild inflammatory conditions**.
The extracts of the Fergana Bellflower have been experimentally proven to possess **antibacterial** and **antioxidant** properties.
Therefore, this plant can be regarded as a **promising raw material** for producing **phytopreparations, natural cosmetic products, and pharmaceutical supplements**.

Conclusion

Campanula ferganensis is one of the **unique endemic species** of Uzbekistan's flora.
Its **chemical composition**, rich in bioactive substances, makes it a **promising medicinal source**.
The obtained scientific data allow the use of this plant in **pharmaceutical, biotechnological, and cosmetic industries**.
Additionally, it is necessary to develop **comprehensive ecological programs** for the conservation and restoration of its natural populations.

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