

Analysis of Herbarium Data of the Genus *Glycyrrhiza* L. Preserved in the the National Herbarium of Uzbekistan

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Abstract The study aimed to analyze the distribution of the genus *Glycyrrhiza* in Central Asian countries through herbarium specimens. A total of 974 samples from the National Herbarium of Uzbekistan were examined. *Glycyrrhiza glabra* was identified as the most widespread species across Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan, and Kyrgyzstan. The results reveal geographic variation in species distribution and research activity levels. In this study, an analysis was conducted on 974 herbarium specimens of the *Glycyrrhiza* genus collected from various regions of Central Asia between 1900 and 2020 and preserved in the Central Herbarium of Uzbekistan. The specimens stored in the Central Herbarium of Uzbekistan served as the primary material of this research. For the taxonomic identification of *Glycyrrhiza* specimens, the reference "Key to the Plants of Central Asia" was used, while the data analysis was performed using MS Excel 2019 software. The analysis of the herbarium specimens of this genus provides important information for determining the distribution ranges of *Glycyrrhiza* species across Central Asia, identifying changes in their geographical distribution, and locating potential plant reserves. According to the research results, most of the 974 *Glycyrrhiza* specimens stored in the Central Herbarium of Uzbekistan were collected from the territories of Uzbekistan and Kazakhstan. When analyzed by collection periods, the largest number of specimens were gathered between 1920 and 1940, and the main collectors were identified as Sovetkina, Gomolitskiy, and Ashurova.

Keywords National Herbarium of Uzbekistan, *Glycyrrhiza*, Herbarium

1. Introduction

Among the numerous medicinal plants found in the flora of our country, one of the most ancient and significant genera is *Glycyrrhiza*. This genus ranks first among flowering plants in terms of the number of medicines derived from it [4]. The root of *Glycyrrhiza* has become increasingly competitive among products on the global market. This plant is widely used in many fields of production, including heavy and light industries, cosmetics, medicine, and food manufacturing [1]. The leaves and stems of the plant are also used as fodder for livestock, while its flowers, rich in nectar, make it valuable for beekeeping. In Uzbekistan, the cultivation of this plant brings significant economic, social, and ecological benefits [5].

The root of *Glycyrrhiza* has been used since ancient times in both Eastern and Western medicine for the treatment of various diseases. The root is consumed mainly in dried and fresh forms. At present, *Glycyrrhiza* is widely utilized in the form of dried licorice sticks, licorice powder, licorice extract, licorice syrup, and licorice paste [3]. The extract of *Glycyrrhiza glabra* without fibers is used as a flavoring and aromatic

additive in cooked foods, alcoholic and non-alcoholic beverages, chewing gum, and spices [5]. The fiberless stems of *Glycyrrhiza glabra* have also proven to be a good supplementary feed for livestock. Its leaves contain about twice as much protein as alfalfa, making it a valuable component of dry fodder mixtures. In addition, the plant is effectively used in apiculture as a nectar source for bees [2]. Based on the obtained data, *Glycyrrhiza* species can be regarded as ecologically and economically important plants with diverse functional properties. Herbarium specimens serve as an important source for determining the distribution areas and ranges of plant species, searching for their reserves, and clarifying their morphological characteristics. To date, there are no scientific references concerning the analysis of *Glycyrrhiza* genus specimens preserved in the Central Herbarium of Uzbekistan, which ranks first among the Central Asian herbaria. In this study, an analysis of 974 specimens of *Glycyrrhiza* collected from various regions of Central Asia between 1920 and 2020 and preserved in the Central Herbarium of Uzbekistan is presented. The distribution of the collected specimens by country, collector, and species has been determined and analyzed.

2. Material and Methods

The primary source of information was specimens of the

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genus *Glycyrrhiza* L. preserved in the unique scientific collection of the National Herbarium of Uzbekistan—the Herbarium of the Institute of Botany. An electronic database of herbarium records for the genus was developed using MS Excel 2019 based on these materials. The database includes details on genus and species names, herbarium labels, specimen registration numbers, and collector information.

For species identification, the “Key to the Plants of Central Asia” and other relevant literature on the flora of Central Asia were used as primary references [3].

3. Results and Discussion

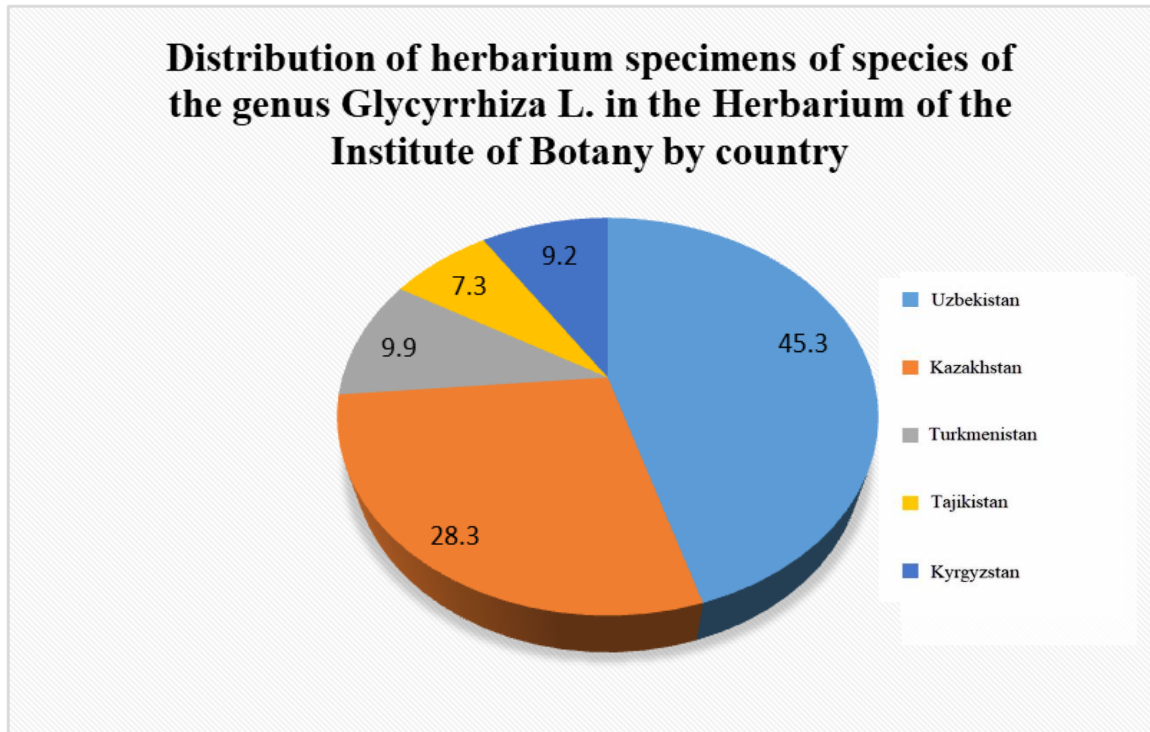


Figure 1

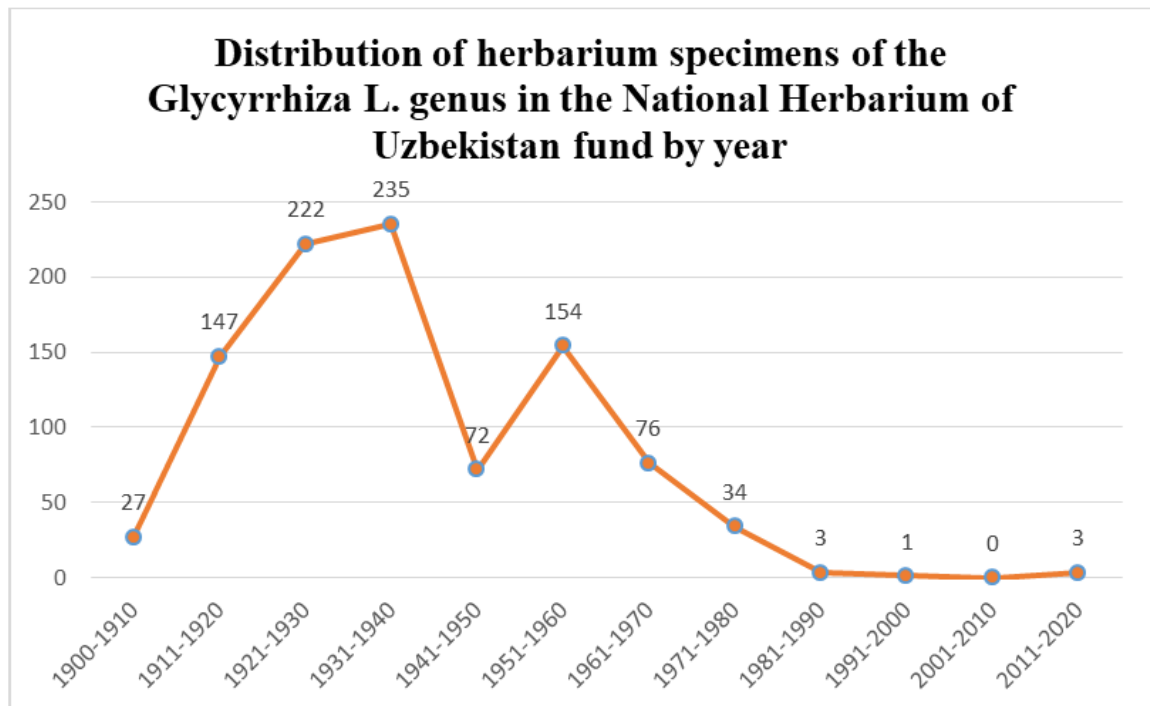


Figure 2

A total of 974 herbarium specimens representing five species of the genus *Glycyrrhiza* L., collected from the Central Asian region and preserved in the herbarium collection of the Institute of Botany, Academy of Sciences of Uzbekistan, were analyzed. The National Herbarium of Uzbekistan holds specimens not only from Uzbekistan but also from neighboring countries, including *Glycyrrhiza* species absent from the Uzbek flora. The country-of-origin analysis revealed that 45% (410 specimens) originated from Uzbekistan, 29% (255 specimens) from Kazakhstan, and the remaining 26% (236 specimens) from Turkmenistan, Tajikistan, and Kyrgyzstan (Figure 1). Herbarium specimens of the genus *Glycyrrhiza* preserved in the National Herbarium of Uzbekistan collection of the Institute of Botany, Academy of Sciences of Uzbekistan, were analyzed based on their collection years. Results indicated an uneven distribution of specimens across different periods. The earliest decade, 1900–1910, included only 27 specimens, while a sharp increase to 147 specimens occurred during 1911–1920. Collection activity steadily grew through subsequent decades, reaching 222 specimens in 1921–1930 and peaking at 235 specimens in 1931–1940 (Figure 2).

Collection efforts markedly declined during the Second World War (1941–1950), with only 72 specimens collected. A recovery followed in 1951–1960, with 154 specimens gathered. However, a consistent decrease resumed from 1961–1970, with 76 specimens, and further dropped to 34 specimens during 1971–1980. After 1981, herbarium collection almost ceased: just 3 specimens were added during 1991–2000, 1 specimen during 2001–2010, and 3 specimens between 2011–2020. This trend highlights the most active period of *Glycyrrhiza* specimen collection occurred between the 1920s and 1940s, followed by a gradual decline due to political, economic, and scientific factors leading to near cessation in recent years.

Among collectors, Sovetkina was the most prolific with 49 specimens, followed by Gomolitskiy with 47 and Ashurova with 40 specimens. Other significant contributors include Drobov and Pyataeva (each 34 specimens), Kudryashev (29), Korotkova (25), Abolin and Kultiasov (24 each), Vvedenskiy (21), Papov (20), Titov (19), Raykova (15), and Korovin and Soskov (14 each). Although contributions varied, the

collective efforts of these researchers substantially advanced the systematic, floristic, and ecological knowledge of *Glycyrrhiza*.

Table 1. Collectors of *Glycyrrhiza* L. Herbarium Specimens Preserved in the National Herbarium of Uzbekistan Collection

| № | Collectors | A number of Herbarium specimens |
|----|-------------|---------------------------------|
| 1 | Abolin | 24 |
| 2 | Ashurova | 40 |
| 3 | Vvedenskiy | 21 |
| 4 | Gomolitskiy | 47 |
| 5 | Granitov | 20 |
| 6 | Drobov | 34 |
| 7 | Korovin | 14 |
| 8 | Korotkova | 25 |
| 9 | Kudryashev | 29 |
| 10 | Kultiasov | 24 |
| 11 | Papov | 20 |
| 12 | Pyataeva | 34 |
| 13 | Raykova | 15 |
| 14 | Sovetkina | 49 |
| 15 | Soskov | 14 |
| 16 | Titov | 19 |

As a result of the analysis of *Glycyrrhiza* genus herbarium specimens collected from various regions of Central Asia, it was revealed that their geographical distribution and degree of study differ significantly across the area. Among the species, *G. glabra* is the most widespread, recorded in all republics, and predominates particularly within the territory of Uzbekistan. *G. aspera* and *G. uralensis* are dominant mainly in the floras of Kazakhstan and Uzbekistan, indicating their high adaptability to continental climatic conditions. *G. triphylla* has a relatively wide but uneven distribution, whereas *G. bucharica* and *G. korshinskiy* are narrowly distributed, being endemic to certain regions. Overall, the results demonstrate that the richest and most diverse populations of the *Glycyrrhiza* genus are concentrated within the territory of Uzbekistan.

Table 2. Distribution of *Glycyrrhiza* L. Herbarium Specimens by Species in the National Herbarium of Uzbekistan collection

| Species name | Uzbekistan | Kazakhstan | Turkmenistan | Tajikistan | Kyrgyzstan |
|-----------------------|------------|------------|--------------|------------|------------|
| <i>G. glabra</i> | 241 | 55 | 63 | 48 | 28 |
| <i>G. aspera</i> | 85 | 92 | 0 | 1 | 7 |
| <i>G. uralensis</i> | 12 | 50 | 0 | 9 | 41 |
| <i>G. triphylla</i> | 62 | 48 | 18 | 0 | 7 |
| <i>G. bucharica</i> | 9 | 0 | 8 | 8 | 0 |
| <i>G. korshinskiy</i> | 0 | 10 | 0 | 0 | 0 |

4. Conclusions

An analysis of herbarium specimens of the genus *Glycyrrhiza* L. housed in the National Herbarium of Uzbekistan, Institute of Botany, Academy of Sciences of Uzbekistan, revealed that the majority of specimens were collected in Uzbekistan and Kazakhstan, which represent the genus's primary distribution area. Herbarium collection activity was most intense between the 1920s and 1940s, but then significantly decreased and virtually ceased in recent decades.

At the species level, *G. glabra* was identified as the most widespread species, recorded throughout Central Asia, while other species were restricted to narrower regional ranges. Collecting activity was uneven, with some researchers playing a leading role in the collection's development. Overall, the National Herbarium of Uzbekistan serves as an important scientific resource for understanding the floristic diversity, distribution, and history of the study of the genus *Glycyrrhiza* in Central Asia.

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