RESULTS OF GRID-BASED MAPPING OF SPECIES OF THE FAMILY ROSACEAE IN THE DENDROFLORA OF THE KOHISTON DISTRICT

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Abstract: This study presents the results of grid-based mapping of dendroflora in the Kohiston district of Uzbekistan, focusing on species richness and collection density across 263 grid cells of 5×5 km. Fieldwork conducted between 2020 and 2024, combined with historical herbarium data from 1926–2019, provided a dataset of 4,653 specimens representing 116 species from 26 families. The analysis revealed that the mountainous regions of the Turkestan and Molguzar ranges exhibit the highest species diversity, particularly at elevations between 1,100 and 2,500 m in the Zomin and Baxmal districts. Among the polymorphic families, Rosaceae dominates, occurring in 93.54% of grid cells and comprising 41 species from 13 genera, with Prunus, Rosa, Cotoneaster, and Crataegus being the most species-rich. Maximum species richness reached 80 species per grid cell, and collection density peaked at 476 specimens. The study provides the first comprehensive grid-based distribution analysis of Rosaceae and other dendroflora families for the region, contributing valuable data for botanical geography and biodiversity conservation in Central Asia.

Key words: grid squares, grid cells, dendroflora, grid-based maps, herbarium specimens, species richness, collection density, mountain floras, family, of the Kohiston district.

INTRODUCTION. The study of the distribution of dendroflora species found in the local flora of the Kohiston district using grid-based maps has in recent years become an integral part of research conducted across the territory of Uzbekistan [1]. Today, studies reflecting the grid-based distribution of species within local floras represent a new research direction not only for Uzbekistan but for the entire Central Asian region [2]. According to the adopted methodology, the study area was divided into 263 indices (grid squares, grid cells) each measuring 5×5 km (Fig. 1). During the research conducted in 2020–2024, the presence of dendroflora representatives was recorded in 259 indices within the Northern Turkestan and Molguzar regions. The remaining 4 indices had a "0" value, being located along the border with the Republic of Tajikistan.

LITERATURE REVIEW AND METHODS. During the 2020–2024 studies, grid-based maps were created for 116 species belonging to 26 families and 46 genera of the dendroflora of the Kohiston botanical-geographical district, based on 4,653 herbarium specimens. Two key indicators were used in producing the mapping results: the number of species identified in each grid square (species richness) and the number of herbarium specimens collected thus far (collection density) (Fig. 1). More than 500 herbarium specimens of 56 species collected from the study area during 1926–2019 and stored in the TASH, MW, and LE collections, along with more than 4,153 specimens collected by the author in 2020–2024 and the geographical coordinates of species' growth points, were used as the basis of the study. The highest species richness was recorded as 80 species (indices BB220, BC206, BC209, BD220, and BF213), while the highest collection density was 476 specimens (BB220 index) (Fig. 2).

The maps presented reveal that the species composition of the leading families in the local flora reflects the principal characteristics of the dendroflora under study. Accordingly, the research conducted in the Kohiston botanical-geographical district illustrates the grid-based distribution of species belonging to this group.

RESULTS. Grid-based mapping employed the 4,153 herbarium specimens collected by the author in 2020–2024, as well as more than 500 herbarium specimens of 56 species collected during 1926–2019 and stored in the TASH, MW, and LE collections.
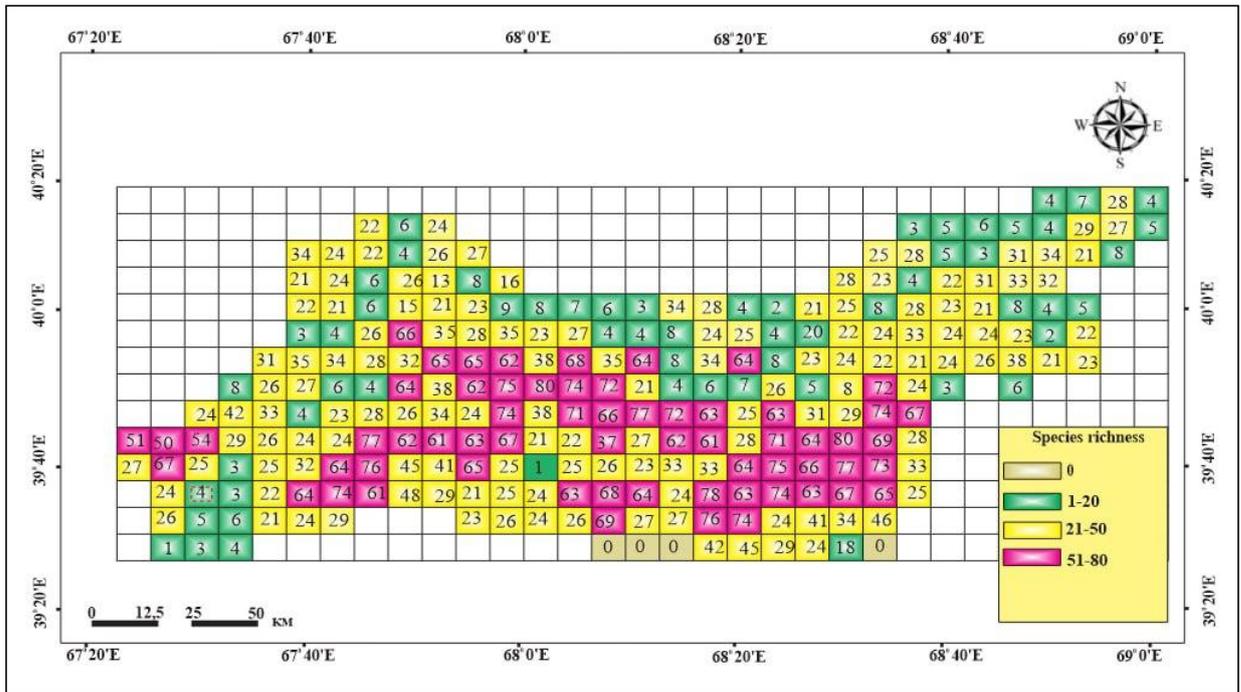
Fig. 1. Grid-based map of species richness (SR) of dendroflora in the Kohiston district (Uzbekistan).
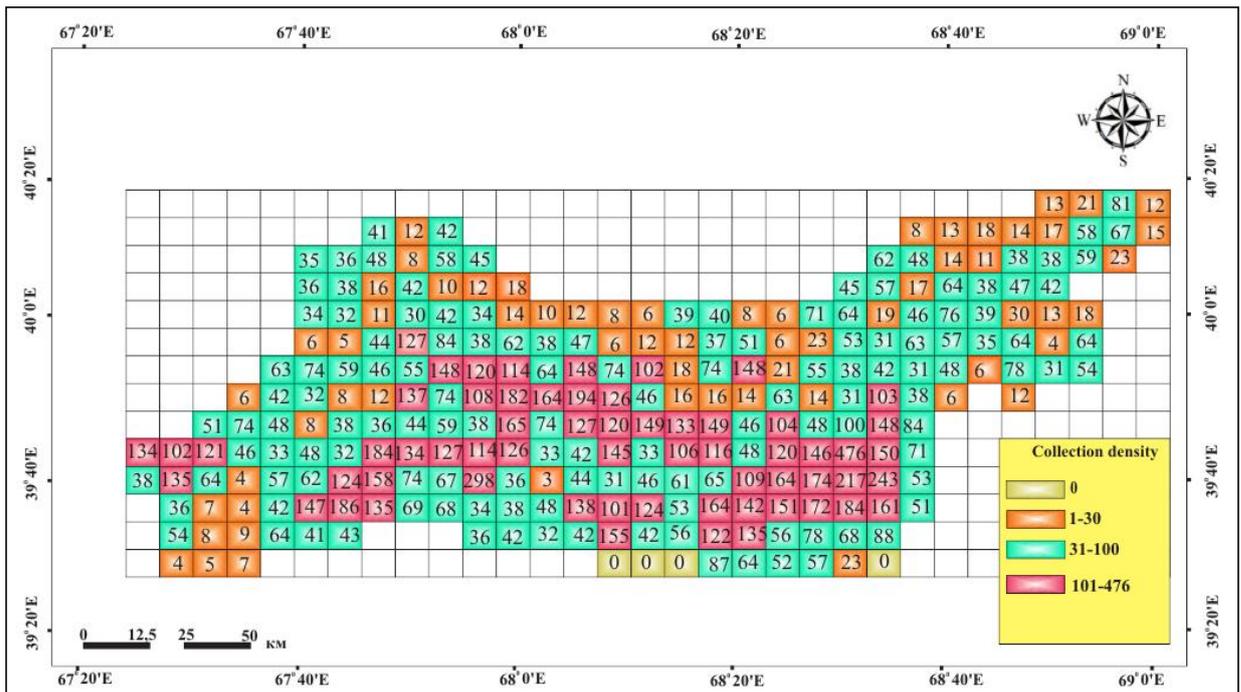

Fig. 2. Grid-based map of collection density (CD) of dendroflora in the Kohiston district (Uzbekistan).

The mapping results were analyzed using two primary indicators: species richness (SR) — the number of species identified per grid cell, and collection density (CD) — the number of herbarium specimens collected in each grid cell. As shown in Fig. 1, among the 263 indices where dendroflora species were recorded, the highest species richness reached 80 species (indices BB220 and BC209, Zomin district, Oʻriklisoy ravine), while the highest collection density reached 476 specimens (BB220 index, see Fig. 2).

Based on grid-mapping data, the spatial distribution of species belonging to the five polymorphic families that contained 41 or more species was analyzed.

In the study area of the Kohiston botanical-geographical district, Rosaceae ranks first among the leading families. Its dominance is due not only to its high species count—nearly three times more than the next largest family—but also to its high generic diversity. In the study area, 41 species belonging to 13 genera have been identified. Among them, the genera Prunus L. (10 species), Rosa L. (9), Cotoneaster Medik. (7), and Crataegus L. (3) are widely distributed and more species-rich compared with other genera (Fig. 3). These genera are considered polymorphic in all mountain floras of Central Asia [3].

DISCUSSION. In the study, Rosaceae species were found to dominate in 246 of the 263 grid cells (93.54%), which is the highest indicator among polymorphic families. More than 2,091 herbarium specimens of this family were collected from the TASH herbarium and field research. The earliest Rosaceae specimen from the study area was collected on 28 July 1926 by M.G. Popov and N.V. Androsov (from the Guralash ravine of the Zomin forestry of the Turkestan Range, TASH), and currently 14 species and more than 45 herbarium samples of this family are stored in the TASH collection.

The highest species richness of Rosaceae was recorded in indices BB220 (23 species, Turkestan Range, Zomin district), BC209 (20 species, Turkestan Range, Baxmal district), and BC205 and BC215 (16 species each). Rosaceae species were found in 246 of the 263 grid indices. Seventeen indices had a value of "0", 60 indices had "1–5", 125 indices had "6–10", and 61 indices had "11–23" species. The highest collection densities were observed in indices BC205 (260 specimens), BG212 (206), BB220 (172), and BD206 (130), all located at elevations ranging from 850 to 3,300 m in the Turkestan Range. For Rosaceae, the collection density across the grid was as follows: 17 indices with "0", 55 with "1–10", 130 with "11–50", and 61 with "254–260".
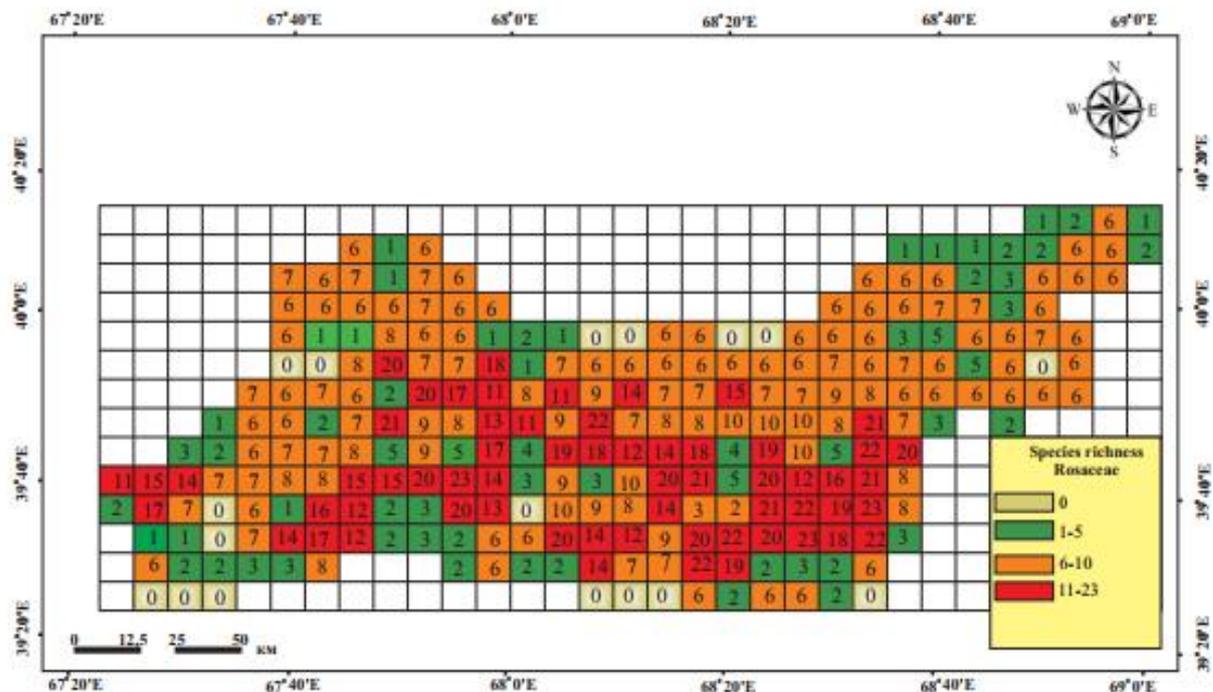

Fig. 3. Grid-based distribution of Rosaceae species (SR).

Rosaceae species in the study area occur at elevations ranging from 500 to 3,000 m. Grid-based mapping showed that indices within the 1,100–2,500 m elevation range exhibit the highest species richness and collection density. The highest percentage of species richness is concentrated in the northern part of the Turkestan Range in the Kohiston district (Zomin district: Tog'-terak, Usmonlisoy, Uriklisoy ravines; Baxmal district: Temirqadam, Boyqo'ng'ir, Muzbuloq, Usmat ravines) (Fig. 4).
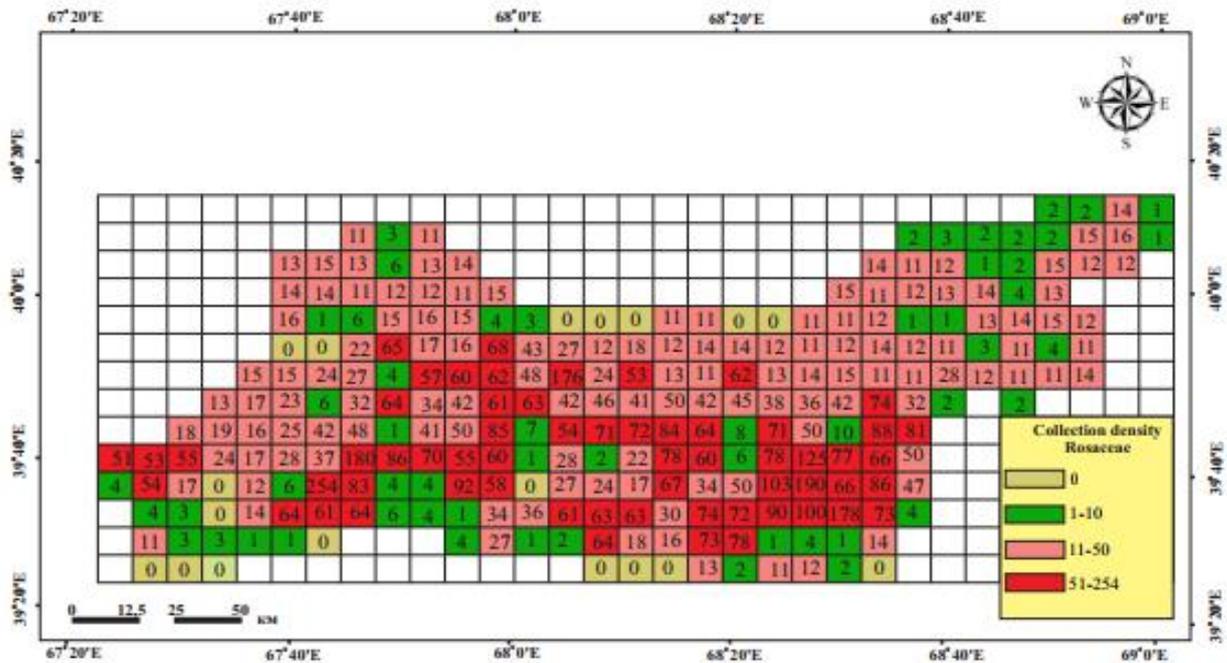
Fig. 4. Grid-based map (CD) of Rosaceae based on herbarium specimens.

To prepare the maps representing the species diversity of the Rosaceae family, its dominant genera and the number of relevant herbarium specimens stored in the TASH collection were analyzed (Table 1). The 13 genera listed in Table 1 played a major role in shaping the grid-based distribution map of Rosaceae species shown in Fig. 3.

Table 1.

Genera of the Rosaceae family with the largest numbers of herbarium specimens

Genera	Number of species	Genera	Number of specimens
Prunus	10	Rosa	751
Rosa	9	Prunus	668
Cotoneaster	**7**	Cotoneaster	221
Crataegus	3	Crataegus	200
Pyrus	2	Malus	71
Sorbus	2	Rubus	67
Spiraea	2	Pyrus	29
Cydonia	1	Spiraea	27
Hulthemia	1	Potentilla	20
Malus	1	Sorbus	11
Dasiphora	1	Cydonia	10
Rubus	1	Hulthemia	8
Potentilla	1	Dasiphora	8

In this area, the genera Prunus, Rosa, Cotoneaster, and Crataegus dominate both in terms of species numbers and herbarium specimens. When compared by species numbers and specimen counts, the remaining genera do not show consistent proportional order. In forming the grid-based map (Fig. 4) of Rosaceae based on herbarium specimens, in addition to the dominant genera of the dendroflora, the genera Pyrus, Sorbus, Spiraea, Cydonia, Hulthemia, Malus, Dasiphora, Rubus, and Potentilla also played an active role due to their species diversity.

For the family, the maximum number of species per grid cell was 23, while the maximum number of specimens per grid cell was 260.

CONCLUSION. As a result of grid-based mapping of the dendroflora of the Kohiston district, it was determined that species diversity is significantly high in the mountainous areas of the Turkestan and Molguzar ranges. The highest species richness and collection density were recorded at elevations between 1,100 and 2,500 meters, particularly in the Zomin and Baxmal districts. Among the polymorphic families, Rosaceae is the leading group, with the highest number of species concentrated in the BB220 and BC209 indices.

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