AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN
ISSN: 2996-511X (online) | ResearchBib (IF) = 9.512 IMPACT FACTOR
Volume-4| Issue-6| 2025 Published: |30-06-2026|

ONTOGENETIC FEATURES AND COENOPOPULATION ORGANIZATION OF THE RARE ENDEMIC SPECIES FUMARIOLA TURKESTANICA (PAPAVERACEAE) OF THE ALAY RANGE (UZBEKISTAN)

https://doi.org/10.5281/zenodo.20591795

Sayramov Fayzullo Baratjon o‘g‘li
Master's student in Biotechnology,
Fergana State University

Abstract

The ontogenetic development and ontogenetic structure of two coenopopulations of Fumariola turkestanica, a rare endemic species of the Alay Range, were investigated. Field studies were carried out under natural conditions in the Shahimardan River basin of the Fergana Valley, Uzbekistan, during 2020–2025. The results revealed that F. turkestanica is a summer–winter green biennial monocarpic plant. During the first year of development, individuals complete the pregenerative stage, forming a single rosette shoot. In the second year, the shoot continues monopodial growth and enters the generative phase, producing open racemes consisting of 5–8 flowers that are arranged into a highly branched cup-shaped panicle. Two ontobiomorphs were identified in the species: a compact form occurring under arid environmental conditions and a prostrate form developing in more humid habitats. Both studied coenopopulations were found to be complete in ontogenetic composition. Population density varied among habitats, ranging from 0.05 to 0.5 individuals per square meter.

Keywords

Fumariola turkestanica, Papaveraceae, coenopopulation, ontogeny, endemic species, population structure.

Fumariola turkestanica Korsh. is the sole representative of the genus Fumariola Korsh., belonging to the tribe Fumarieae of the subfamily Fumarioideae within the family Papaveraceae. The species is distributed in Central Asia, mainly within the Alay Range, particularly in the Shahimardan River basin of the Fergana Valley. Outside Uzbekistan, it has also been recorded near the village of Isfayram in Kyrgyzstan.

F. turkestanica is a small herbaceous plant reaching 9–13 cm in height. It is characterized by a solitary, slender, thread-like stem that branches from the base. The leaves are long-petiolate, glabrous, and twice ternately dissected, with two- to

three-lobed segments. The species inhabits rocky mountain slopes, limestone rock crevices, and the banks of mountain streams in the middle mountain belt at elevations ranging from 1,050 to 1,500 m above sea level. Due to its restricted distribution and rarity, the species is included in the Red Data Book of the Republic of Uzbekistan as a rare endemic of the Alay Range. It is also listed in the Red Data Book of the Kyrgyz Republic as an endangered species threatened by its narrow endemic range and increasing anthropogenic pressure. The geographical range of F. turkestanica covers the Alay Range, including the basins of the Isfayram and Shahimardan rivers and adjacent foothill territories. Within the botanical-geographical zoning of the Fergana Valley, the species belongs to the Fergana–Alay floristic district, which comprises both the Eastern and Western Alay regions and represents an important transboundary area shared by Uzbekistan and Kyrgyzstan. In the Fergana Region, the species occurs as isolated individuals or small coenopopulations. Earlier reports indicated several local populations on rocky habitats located between the settlements of Vuadil, Shahimardan, and Yardan. However, according to recent observations, the species has disappeared from the vicinity of Vuadil due to increasing human impact on its habitats.

Previous studies have provided contradictory information regarding the life form of F. turkestanica. While it has been described as a perennial species in the flora of Uzbekistan, it has often been treated as an annual plant in the flora of Kyrgyzstan. Furthermore, no detailed investigations of its current coenopopulation status or ontogenetic structure under natural conditions have been conducted. Therefore, the present study aims to describe the ontogenetic development of F. turkestanica and to assess the ontogenetic structure of its coenopopulations in the natural habitats of the Alay Range. Field investigations were conducted between 2020 and 2025. Vegetation communities were described using standard geobotanical methods. Two coenopopulations of Fumariola turkestanica were selected for detailed study. Study Sites. Coenopopulation 1 (CP1) was located within rocky plant communities northwest of Yardan village (39°57′42″ N, 71°44′27″ E) at an elevation of 1,550–1,600 m above sea level. The average annual precipitation in this area ranges from 200 to 345 mm. The species inhabits fissures of steep limestone cliffs on south-facing slopes within the middle mountain belt. These rock crevices provide favorable microhabitats for moisture accumulation and retention. Vegetation cover is poorly developed. Associated species include Scutellaria immaculata, Prunus spinosissima, and Salvia scrophulariifolia, while Ephedra equisetina occurs occasionally on rocky ledges. The total projective cover of the herbaceous layer does not exceed 1–3%, with F. turkestanica accounting for approximately 0.1–0.5%.

AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN
ISSN: 2996-511X (online) | ResearchBib (IF) = 9.512 IMPACT FACTOR
Volume-4| Issue-6| 2025 Published: |30-06-2026|

Coenopopulation 2 (CP2) was situated southwest of Yardan village on the right bank of the Dugoba River. The population occupied north-facing slopes with an inclination of 75–80° at elevations ranging from 1,900 to 2,100 m above sea level. The soils are sandy-brown forest soils typical of the Alay Range. Annual precipitation varies between 400 and 600 mm.

The tree layer is dominated by Juniperus seravschanica, J. semiglobosa, and J. pseudosabina, with a projective cover of 15–25%. Shrub vegetation includes Rosa kokanica, Lonicera nummulariifolia, Berberis oblonga, and Spiraea hypericifolia, reaching heights of 150–220 cm and covering 25–35% of the area. The herbaceous layer is species-rich and includes Artemisia tenuisecta, A. glanduligera, Ziziphora clinopodioides subsp. bungeana, Centaurea virgata subsp. squarrosa, Achillea millefolium, Codonopsis clematidea, Geranium collinum, Galium verum, Eremurus altaicus, Poa nemoralis, P. pratensis, P. bulbosa, Phleum phleoides, Hordeum brevisubulatum, Carex turkestanica, and Festuca rupicola. The herb layer covers approximately 45–60% of the ground surface, whereas F. turkestanica contributes only 1–2% of the total vegetation cover.

Ontogenetic and Population Analysis. The ontogenetic development of F. turkestanica was investigated following the concept of discrete ontogenetic stages. Ontogenetic type was determined according to established classifications, and developmental stages were distinguished based on both quantitative and qualitative morphological traits. For biometric characterization, five individuals from each ontogenetic stage were examined. Life-form identification was carried out using the ecological–morphological approach of the Warming–Serebryakov system. The ontogenetic structure of coenopopulations was assessed using standard population biology methods. To determine population composition, transects measuring 50 × 1 m were established in each study site. Individuals belonging to different ontogenetic stages were counted three times during the growing season (April, July, and September). Population density was calculated as the number of individuals per unit area of occupied habitat

AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN
ISSN: 2996-511X (online) | ResearchBib (IF) = 9.512 IMPACT FACTOR
Volume-4| Issue-6| 2025 Published: |30-06-2026|

Fumariola turkestanica

It was demonstrated for the first time that the rare endemic species of the Alay Range, Fumariola turkestanica, is a summer–winter green biennial monocarpic plant. Three developmental periods and eight ontogenetic stages were identified in the life cycle of the species. Individuals pass through the pregenerative period during the first year of life, forming a single rosette shoot. In the second year, monopodial growth of the main axis continues, culminating in the formation of an open raceme bearing 5–8 flowers. Two ontobiomorphs were identified in F. turkestanica: a compact form occurring under arid conditions and a prostrate form developing in more humid habitats. Both studied coenopopulations were found to be complete in their ontogenetic structure. Population density varied among habitats, ranging from 0.05 to 0.5 individuals per m^2.

REFERENCES:

1. Арифханова М.М. Растительность ферганской долины. Издательство «ФАН» Узбекской ССР. Ташкент, 1967. 293 с.
2. Белолипов И.В. 2009. Fumariola turkestanica Korsh. – В кн.: Красная книга Республики Узбекистан. Ташкент. С. 244-245.
3. Жукова Л.А. 1995. Популяционная жизнь луговых растений. Йошкар-Ола. 223 с.
4. Корчагин А.А. 1964. Видовой (флористический) состав растительных сообществ и методы его изучения. – В кн.: Полевая геоботаника. Т. 3. М.; Л. С. 39–62.
5. Лазьков Г.А. 2019. Fumariola turkestanica Korsh. – В кн.: Красная книга Республики Узбекистан. Растения. Т. 1. Ташкент. С. 232.

6. Лазьков Г.А., Умралина А.Р. Эндемики и редкие виды Кыргызстана (Атлас). Анкара. 2015. С. 86-87.

7. Милько Д.А. 2006. Fumariola turkestanica Korsh. – В кн.: Красная книга Кыргызской Республики. Бишкек. С. 118-119.