

Ephemeral Plants and Newly Recorded Species in the Southwestern Taklamakan Desert (Postprint)

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Abstract

This study employs field surveys, specimen curation, and literature review to investigate ephemeral plants in the desert environment of the southwestern Taklamakan Desert, analyzing their species composition, life-form characteristics (phenological traits), and floristic types. Results: The ephemeral plants in the study area comprise 27 species belonging to 21 genera across 8 families, including Brassicaceae, Poaceae, Asteraceae, Boraginaceae, Solanaceae, Plantaginaceae, Papaveraceae, and Geraniaceae, among which Brassicaceae accounts for 15 species. Ten newly recorded species, including *Malcolmia scorpioides*, *Sisymbrium altissimum*, *Koelpinia linearis*, *Bromus squarrosus*, *Eremopyrum triticeum*, *Hyoscyamus pusillus*, *Erodium stephanianum*, *Sisymbrium heteromallum*, and *Echinops gmelinii*, constitute 37% of the ephemeral plants in this region. The life history characteristics of ephemeral plants in this region include summer, winter, and spring types. The ephemeral plants in this region belong to the North Temperate distribution, Mediterranean-West Asia to Central Asia distribution, Old World Temperate distribution, Cosmopolitan distribution, and Central Asia distribution, with 15 species of North Temperate and Mediterranean-West Asia to Central Asia distributions, accounting for 51.86% of the total species recorded in the study area. These findings enrich the knowledge of ephemeral plant taxa in the unique habitats of southern Xinjiang and hold significant implications for the development and conservation of plant germplasm resources in the region, as well as for elucidating the responses of ephemeral plants to different ecological environments.

Full Text

Ephemeral Plants and Their Newly Recorded Species in the Southwest Taklimakan Desert

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Abstract

In this paper, the ephemeral plants growing in desert environments in the southwest Taklimakan Desert were studied by means of field investigation, specimen collection, and data analysis. Their species compositions, life history characters (phenological characters), and flora characteristics were analyzed. The results showed that: (1) The ephemeral plants in the study area were preliminarily identified as including 27 species in 21 genera and 8 families, which were Brassicaceae, Asteraceae, Solanaceae, Geraniaceae, Papaveraceae, Plantaginaceae, Boraginaceae, and Poaceae, among which there were 15 species in Brassicaceae. There were also 10 newly recorded species, i.e., *Malcolmia scorpioides*, *Sisymbrium altissimum*, *Koelpinia linearis*, *Bromus squarrosus*, *Eremopyrum triticeum*, *Hyoscyamus pusillus*, *Sisymbrium heteromallum*, *Echinops gmelinii*, *Erodium stephanianum*, and *Cardaria draba*, accounting for 37% of the ephemeral species in the study area. (2) The life cycle of the ephemeral plants in this area was characterized by spring ephemeral plant type, winter ephemeral plant type, and summer ephemeral plant type. The low-altitude environment was mainly expressed by the winter ephemeral plant type and spring ephemeral plant type, and the high-altitude environment was expressed by the winter ephemeral plant type and summer ephemeral plant type. (3) The ephemeral plants in the study area belonged to the distribution patterns of northern temperate zone, the zone from Mediterranean-West Asia to Central Asia, Old World temperate zone, world temperate and Central Asia. Among them, 15 species belonged to the distribution patterns of northern temperate zone and the zone from Mediterranean-West Asia to Central Asia, and they accounted for 51.86% of the total in the study area. Accordingly, especially the newly recorded species, enriched the database of plant genetic diversity in the special habitat of south Xinjiang, and also were of important scientific significance for researching the response of ephemeral plants to different ecological environments.

Keywords: habitat; ephemeral plant; species composition; flora; life history; South Xinjiang

1. Study Area and Methods

Field investigations were conducted during the 2016–2018 growing seasons in the southwest Taklimakan Desert. Three representative study sites were selected: (1) a low-altitude site at 1200 m (39°28 N, 75°59 E), (2) a second low-altitude site at 1200 m (39°44 N, 76°36 E), and (3) a high-altitude site at 2200 m (39°14 50 N, 75°04 30 E). The study area is characterized by typical desert vegetation with ephemeral plants as the dominant component [?].

Plant specimens were collected and identified using standard taxonomic methods. Species composition, life history traits (phenological characteristics), and floristic features were analyzed based on field observations and herbarium records [?]. The life cycle patterns of ephemeral plants were classified into three types: spring ephemerals, winter ephemerals, and summer ephemerals [?, ?].

2. Results

2.1 Species Composition A total of 27 ephemeral plant species belonging to 21 genera and 8 families were identified in the study area. The families recorded were Brassicaceae, Asteraceae, Solanaceae, Geraniaceae, Papaveraceae, Plantaginaceae, Boraginaceae, and Poaceae. Brassicaceae was the most diverse family, containing 15 species.

Ten species were newly recorded for this region, representing 37% of the total ephemeral flora: *Malcolmia scorpioides*, *Sisymbrium altissimum*, *Koelpinia linearis*, *Bromus squarrosus*, *Eremopyrum triticeum*, *Hyoscyamus pusillus*, *Sisymbrium heteromallum*, *Echinops gmelinii*, *Erodium stephanianum*, and *Cardaria draba*.

[Figure 1: see original paper] The ephemeral plant species and their growth natural environment in the southwest Taklimakan Desert

[Figure 2: see original paper] Proportions of the ephemeral plants in the total genus and total species in the southwest Taklimakan Desert

2.2 Life History Characteristics The life cycles of ephemeral plants in the study area exhibited three distinct patterns: spring ephemeral, winter ephemeral, and summer ephemeral types. Low-altitude environments (1200 m) were dominated by winter and spring ephemeral types, while high-altitude environments (2200 m) were characterized by winter and summer ephemeral types.

The phenological duration of most ephemeral plants ranged from 2–3 months, with germination occurring after snowmelt in March–April and completing their life cycle by May–June. At higher altitudes, the growing season was shorter, with some species exhibiting a compressed life cycle of only 6–8 weeks.

2.3 Floristic Characteristics The floristic analysis revealed that the ephemeral plants belong to several phytogeographic distribution patterns:

northern temperate zone (55.56% of species), Mediterranean-West Asia to Central Asia (52.38% of species), Old World temperate zone, and world temperate/Central Asian patterns. Fifteen species (51.86% of the total) were associated with the northern temperate and Mediterranean-West Asia to Central Asia distribution patterns.

Plant flora characters of the ephemeral plants in the southwest Taklimakan Desert

3. Discussion

The newly recorded species significantly enrich the database of plant genetic diversity in the unique desert habitats of southern Xinjiang. These findings are particularly important for understanding how ephemeral plants respond to different ecological environments, especially in the context of climate change and habitat alteration. The altitudinal differentiation in life cycle types suggests that temperature and moisture regimes are key factors determining the distribution and phenology of ephemeral plants in this region.

4. Conclusion

This study identified 27 ephemeral plant species in the southwest Taklimakan Desert, including 10 newly recorded species that account for 37% of the total ephemeral flora. The life cycle patterns and floristic characteristics demonstrate clear relationships with altitude and geographic distribution. These results provide important baseline data for future research on plant diversity and ecological responses in extreme desert environments.

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