

Biology of Flowering of Some Species of the Genus *Phlomoides* Moench

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Abstract

The article presents the biology of flowering and the daily dynamics of flowering of two species from the Lamiaceae family: *ph. anisochila* va *ph. sogdiana* of the distribution out in the Nuratau Mountains range.

Keywords

Phlomoides, Rare and Endemic Species, Nurata Mountain Systems, Flowering Dynamics, Abiotic Factors, Cenopopulation

1. Introduction

Currently, great attention is being paid to ensuring the stability of the natural flora of the Republic of Uzbekistan, studying the biology and ecology of rare and endemic species under the threat of extinction, areas of special importance [1] [2].

Studying flower morphoecology and structure within species and genera in plants is important in determining their kinship and evolution. This is because the systematics of angiosperms is primarily based on the structure of the flower. Morphology, biology, type and style of pollination are closely related to each other. Studying the morphology, biology, diurnal and seasonal dynamics of flowering allows to assess the level of resistance to environmental factors and make recommendations for growing plants on large areas. Accordingly, determining the morphological characteristics of the representatives of the *Lamiaceae* L. family in their natural conditions, justifying their growth and development, introducing them, creating their collections in *ex-situ* conditions, developing breed-

ing methods, and evaluating the effectiveness of their use in the pharmaceutical industry are of significant scientific and practical importance. The genus *Phlomooides* Moench. is poorly studied, especially in the area of the Nuratau mountain range. The genus is poorly studied, especially in the area of the Nurota mountain range.

Research on taxonomy, molecular phylogeny of *Phlomooides* species can be seen in the works of Salmaki [3], Ranjbar [4], Komarevseva [5], Gulomov [6].

The research conducted, the resources created by existing scientists, *Phlomooides* Moench., species of the genus, especially *Phlomooides anisochila* (Pazij et Vved.) Salmaki and *Phlomooides sogdiana* (Pazij et Vved.) Salmaki, have not been fully studied. The Nurota mountain range requires a serious approach and new research to determine the scientific issues of their morphobiology, ecology and conservation. From this point of view, it is of great scientific and practical importance to study and determine the biology of flowering, and conduct research on geographical distribution through the in-depth analysis of available data and targeted field research.

2. Material and Methods

Our research was conducted in the area around the village of Ukhum, located in the Nurota mountain range. *Ph. anisochila* and *Ph. sogdiana* seasonal flowering biology was studied in 10 cenopopulations (CPH). Study of reproductive biology was conducted based on the method of A.N. Ponamaryov [7]. During one night and one day, the degree of opening of the flower of the plant was determined. For this purpose, 10 plants of the same size from *Ph. anisochila* and *Ph. sogdiana* species were selected, marked, and the number of opened flowers of each plant was recorded in a diary from 5:00 a.m. to 11:00 p.m. When determining the opening characteristics of flowers, the relative humidity, temperature, and pressure of the air were determined using a psychrometer and a table was compiled.

In order to determine the phenology of the reproductive organs of plants, the stages of formation, development of buds, location of flowers on branches, duration of the flowering process-initial opening, full opening, withering, shedding of flowers were studied and recorded in the control book.

Studying the daily flowering period allows you to determine the time of day when the plant blooms the most. The air temperature (°C) and relative air humidity determined at the hour when the most flowers open are marked as the most favorable indicators.

3. Results and Discussion

Ph. anisochila and *Ph. sogdiana* grows singly and in small clumps at an altitude of 1000 - 2000 meters above sea level, on the slopes, slopes and mid-mountains of the Nuratau mountain range, on dry soils with small stones or gravel [8]. They are mainly propagated from seeds.

Both plants are perennial, densely hairy grasses 20 - 25 cm tall. The stems are two-three, branched from the bottom, covered with thick hairs. The petiole of leaves is short, thick and long hairy. The leaves on the stem are rhomboid-ovate, the edges are toothed, thickly hairy, the veins are thick, and the leaves on the upper part of the stem are sessile. The flowers are located in the axils of the petals in a ring shape. The leaves of the flower are *lanceolate*, fluffy.

In natural conditions, in terms of morphological structure, *Ph. anisochila* and *Ph. sogdiana* are very difficult to distinguish from each other. They are distinguished by the bright color of the flower, the structure of the upper and lower petals, the lack of hairs at the base of the stamens, and the number of sepals in the rings.

The main distinguishing features of these two types are the structure of the flower [9], the petals are joined at the base and the filaments are located in the petals. *Ph. anisochila* anthers are brownish-black and visible from the outside. In addition, this species of *Ph. lomoides* differs in that the part covered with hairs on the calyx is short and sparse, and the upper corolla is much shorter than the lower corolla. *Ph. sogdiana* the pollen grains are yellow, which is also visible from the outside. The part covered with hairs in the flower is long and thick, and appears thicker than *Ph. anisochila*. The seeds are small, black and glossy. The seedlings are small and have a single, oval-shaped cotyledon. Both of these species have yellow and yellowish flowers. *Ph. anisochila* seeds are small, black and round. The seedlings are small, with a single cotyledon and a few leaves.

The flowering process was observed in the stages of the beginning of flowering, the end of flowering and the end of flowering. This situation was different in all CPH. Flowers opened more in open weather and did not open on cloudy, rainy days with temperatures below 11.5°C. It was found that the opening of flowers accelerates as the temperature increases.

Ph. sogdiana seasonal flowering biology of was observed in 5 CPH. Two CPH in the village of Ukhum, Forish district, in the Pudak height of Tikchasoi, in the composition of the community with the dominant species being ferula (40.505943, 66.775616 1170 M), and it was studied that three CPH were the dominant species of sedge, astragalus and other species in Forish district Ukhum village, Boloi af-toda hill and Sop village (40.508498, 66.767902 1320 M).



Figure 1. General view of flowers of *Phlomooides anisochila* (A), *Phlomooides sogdiana* (B).

The flowering of *Ph. sogdiana* process began on April 26. Taking into account all CPH, the duration of flowering is 16 - 21 days (Figure 1). The beginning of the plant flowering process depends on daily changes in air temperature and changes in relative air humidity. An increase in air temperature greatly affects the flowering of plants.

The flowers of *Ph. sogdiana* open during the day as follows. Flowering began on April 26, 2022 at 6 a.m. at 11.4°C, RH 53.2% and at 8 a.m. at 12.8°C, RH 42.2%, no flowering was observed. At 10 o'clock the air temperature was 15.3°C, relative humidity 34.1%, 3 (5%) flowers opened. At 12 o'clock the air temperature was 20.9°C, relative humidity 28.3%, 7 (12.7%) flowers opened. At 2:00 p.m. at 21.1°C and relative humidity 25.9%, 9 (16.4%) flowers opened. During the day at 4:00 p.m., at an air temperature of 21.6°C 27.8%, 4 (7.3%) flowers opened. During the remaining hours of the day, no flower opening was observed (Table 1). According to the results of our observations of the species of *Ph. sogdiana*, the maximum flowering time was from 12:00 a.m. to 2:00 p.m. One flower blooms for 4 - 7 days.

Seasonal flowering biology of *Ph. anisochila* was also studied in 5 CPH. Three CPH were studied on the right side of Tikchasoy in the village of Ukhum, Farish district of Jizzakh region, on the gravel-stone dry slope of the middle part of the mountain (40.497283, 66.773230) (at the height of Novy Olim). The vegetation of the area consists of a variety of grasslands. 42 plant species were registered in this CPH. The remaining two CPH were studied on the gravel-stone slope (at

Table 1. Seasonal flowering duration of *Ph. sogdiana* in different cenopopulations (CPH).

CPH №	The beginning of vegetation	Flowering process			Duration of flowering, Day
		beginning	mass	ending	
1	01.03	26.04	03.05	10.05	16
2	03.03	27.04	06.05	13.05	18
3	04.03	28.03	9.05	15.05	19
4	02.03	26.03	7.05	12.05	19
5	05.03	01.05	12.05	21.05	21

Table 2. Seasonal flowering duration of *Ph. anisochila* in different cenopopulations (CPH).

CPH №	The beginning of vegetation	Flowering process			Duration of flowering, Day
		beginning	mass	ending	
1	03.03	02.05	10.05	15.05	14
2	04.03	04.05	11.05	17.05	14
3	07.03	06.05	12.05	22.05	17
4	06.03	05.05	11.05	19.05	15
5	08.03	07.05	14.05	23.05	17

the height of Loloyi) in the upper right part of the entrance to Nurota State Reserve (40.495565, 66.776543) in the village of Ukhum. 58 species of plants were registered in these cenopopulations, dominated by the genus of *Ferula*, *Amygdalus*, and *Bromus*. In the vegetation cover of this area, they dominate over others.

The flowering process of *Ph. anisochila* under natural conditions began on May 2, and the duration of flowering was 14 - 16 days (Table 2).

The opening of the flowers of *Ph. anisochila* was carried out as follows. Flowering began on 02.05.2022 at 6 o'clock, when the air temperature was 17.9°C, RH 37.4%, no flowers were opened. At 8 o'clock, when the air temperature was 19.4°C, RH was 33%, 2 (3.3%) flowers opened. At 10 o'clock, when the temperature of the air was 21.4°C, RH was 28.4%, it was noted that 3 (5%) flowers opened. At 12:00 p.m., 6 (10%) flowers opened when the air temperature was 24.7°C, RH 25.5%. At 2:00 p.m., 8 (13.3%) flowers opened when the air temperature was 27°C, 24.5% RH, and 2 (3.3%) flowers were opened at 4:00 p.m., when the air temperature was 25.8°C, 28.5% RH. it was noted that it was opened. Flowers did not open during the rest of the day. One flower blooms for 3 - 5 days.

In all CPH studied, *Ph. sogdiana* flower blooms for 4 - 7 days, and the duration of flowering is 16 - 21 days. One flower of *Ph. anisochila* was open for 3 - 6 days. Duration of flowering in different CPH was 14 - 17 days.

4. Conclusion

Summing up the above studies, it can be said that *Ph. anisochila* and *Ph. sogdiana* was noted to be among day-flowering plants. It was noted that the flowering process of these species in natural conditions does not depend on the relative humidity of the air, but on the increase in air temperature. *Ph. anisochila* and *Ph. sogdiana* are not only morphologically similar to each other, but also have similar biological properties as a result of research.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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