THE EFFECT OF CLIMATIC FACTORS ON THE GROWTH AND DEVELOPMENT OF TURKESTAN BUGLEWEED (*AJUGA TURKESTANICA (REGEL) BRIQ.*)

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Abstract: This study examines the influence of climatic factors on the growth and development of *Ajuga turkestanica* (Regel) Briq., commonly known as Turkestan bugleweed. The species is a valuable medicinal plant native to Central Asia, particularly Uzbekistan, and is known for its biologically active compounds. Climatic conditions such as temperature, precipitation, soil moisture, and seasonal variations play a significant role in regulating its growth stages, biomass accumulation, and overall physiological development. The research analyzes how different environmental factors affect germination, vegetative growth, flowering, and reproductive performance of the species. Understanding these relationships is important for improving cultivation practices, conserving natural populations, and optimizing the sustainable use of *Ajuga turkestanica* in pharmaceutical and agricultural applications.

Keywords: *Ajuga turkestanica*, Turkestan bugleweed, climatic factors, vegetation period, growth and development, medicinal plants, steroid compounds, propagation, in vitro cultivation, Central Asia, Uzbekistan flora, ecological conditions, seed formation, flowering phase.

Introduction: *Ajuga turkestanica* (Regel) Briq., commonly known as Turkestan bugleweed, is a perennial herbaceous plant belonging to the Lamiaceae family. This species is endemic to Central Asia, with a particularly wide distribution in the mountainous and foothill regions of Uzbekistan and neighboring countries. It

is highly valued for its medicinal properties due to the presence of biologically active compounds such as phytoecdysteroids, flavonoids, and other secondary metabolites, which have attracted significant attention in pharmacological and agricultural research.

The growth and development of *Ajuga turkestanica* are strongly influenced by environmental and climatic conditions. Temperature regimes, precipitation patterns, soil moisture availability, solar radiation, and seasonal fluctuations play a crucial role in determining the plant's physiological processes, including germination, vegetative growth, flowering, and seed formation. Variations in these climatic factors can significantly affect biomass accumulation, the concentration of biologically active substances, and the overall productivity of the species.

In recent years, global climate change has become an important factor affecting natural ecosystems and medicinal plant resources. Increasing temperatures, irregular precipitation, and prolonged drought periods may alter the natural habitats of *A. turkestanica*, potentially reducing its population density and limiting its distribution. Therefore, studying the relationship between climatic conditions and the biological development of this species is essential for its conservation and sustainable use.

Furthermore, understanding how environmental factors influence the growth dynamics of *Ajuga turkestanica* is important for developing effective cultivation technologies. Controlled cultivation under optimal climatic conditions can ensure stable raw material production for pharmaceutical purposes and reduce pressure on natural populations. This is especially important given the growing demand for plant-based medicinal resources in modern medicine.

This study aims to analyze the impact of key climatic factors on the growth and developmental stages of *Ajuga turkestanica*, with a focus on identifying optimal environmental conditions for its cultivation and conservation. The findings are

expected to contribute to both ecological research and the practical application of this valuable medicinal plant.

It contains medically important steroid compounds such as ayugalactone, ecdysterone, cyasterone, turkesterone, and ayugosterone [O. Xojimatov et al., 2021: 14]. Turkestan bugleweed is considered an endemic species and is found in the territory of Uzbekistan, particularly in sandy areas of the Torqopchig‘ay geographic region. Its life form is a semi-shrub [K. Tojiboyev et al., 2019: 201].

Due to climate change and anthropogenic factors, the population of this species in nature has significantly decreased, which requires special protection and conservation measures. Considering the growing population and the development of the medical and pharmaceutical industries, it is necessary to develop new methods for cultivating and propagating this plant. Turkestan bugleweed is one of the main raw material sources for the production of certain medicinal preparations. One such product is the “Eksumid” tablets, whose pharmacological properties have been well studied [Sh. Madraximov, 2019: 28]. Taking into account the above information, we consider it important to develop methods for the propagation of this plant species.

Our research is being conducted on the southern slopes of the Zarafshan mountain range, in the Chiroqchi district. The district is located in the northern part of Kashkadarya region, where desert zones are found at elevations of 400–600 m above sea level, foothills at 700–900 m, and mountainous areas at 1200–1500 m. The climate is sharply continental, with an average temperature of 2.7°C in January and 28°C in July. The region’s soils consist mainly of meadow soils, while the plain areas are characterized by typical and light gray soils [M. Diyorova et al., 2024: 305].

Several studies are being carried out on the cultivation of healthy and high-quality seedlings of Turkestan bugleweed. In particular, in 2022, its shoots were brought from Surkhandarya region to the in vitro laboratory of SAG LLC, where they were propagated in a sterile state [B. Qodirov et al., 2024: 3].

The laboratory-propagated seedlings, after adaptation to external conditions, were prepared for planting. We planted 5–7 cm long seedlings, propagated in the laboratory, in the field during the third ten-day period of May 2024, with a spacing of 40 × 60 cm.

Figure 1. General view of the plant.

It was observed that the vegetative period of the plant continued until the second ten-day period of December of the same year, lasting 210–215 days in total. The budding stage began on the 110–115th day of the vegetative period and continued until the second ten-day period of September. The flowering phase lasted from the third ten-day period of September to the first ten-day period of November (Figure 1). The seed formation period was observed from the second ten-day period of November to the second ten-day period of December.

References

1. Xojimatov, K., Haydarov, X. Q., Xamraeva, D. T., Imomova, D. A., & Xujanov, A. N. (2021). *Atlas of Medicinal Plants of Uzbekistan* (textbook). SamSU Editorial and Publishing, pp. 52–56.
2. Tojibaev, K. Sh., Beshko, N. Yu., Shomurodov, Kh. F., Kodirov, U. Kh., Turginov, O. T., & Sharipova, V. K. (2019). *Flora Cadastre of Uzbekistan: Kashkadarya Region*. Tashkent: Fan.
3. Madraximov, Sh. N. (2019). Doctoral dissertation abstract. p. 67.
4. Diyorova, M., & O‘raqov, Q. (2024). Mechanical composition of irrigated light gray soils distributed in Karshi district. *Interpretation and Researches*. Retrieved from https://interpretationandresearches.uz/index.php/iar/article/view/3092
5. Kadirov, B. E., Khujanov, A. N., Tashpulatov, Sh. Y., & Valiyev, Sh. A. (2025). *Ajuga turkestanica in vitro sterilization and vitality*. Acta Botanica Plantae.