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MORPHOMETRIC INDICATORS OF ACORUS CALAMUS L. IN THE CONDITIONS OF THE SAMARKAND REGION

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Abstract. *The article describes the morphometric parameters of Acorus calamus L., distributed in the Samarkand region, and its significance for assessing the ecological state of water bodies. As a result of the study, the bioindicative properties of this species were determined.*

Keywords: *Acorus calamus L., morphometric parameters, bioindicator, water bodies, environmental monitoring, Samarkand region.*

Introduction. When studying the influence of environmental factors on species in natural populations, the identification, analysis, and comparison of morphometric indicators of vegetative and generative organs are of great importance for determining the stability level of individual species. In assessing species stability within specific ecosystems, methods of in-depth analysis of the ecological and biomorphological aspects of species—whether widespread or rare in a particular region or local areas—are widely utilized (Kapitonova, 2025).

The purpose of the study was to evaluate the morphobiological indicators of sweet flag (*Acorus calamus* L.), an endangered species in the study area, and thus to monitor and predict the ecological state of water bodies. Sweet flag (*Acorus calamus*) is a coastal, aquatic, and wetland perennial plant of the Acoraceae family; it belongs to the group of perennial herbaceous plants. It grows along rivers, lakes, and ponds, as well as in stagnant waters, waterlogged meadows, and around marshes. Hydrophilic plants play a vital role in determining the level of organic matter input into open water bodies. One such indicator species is the sweet flag (*Acorus calamus* L.), also known as sweet calamus, belonging to the Acoraceae family (Fig.1). It is a perennial herbaceous plant with a horizontal rhizome, characterized as a cryptophyte according to its life cycle. This species serves as a reliable bioindicator of the organic matter richness in water bodies (Nurniyozov, 2020).



Figure 1. *Acorus calamus* L. and its raw materials

Due to the extensive use of *Acorus calamus* L. rhizomes in folk medicine, its natural range has significantly decreased in recent years. Subsequent studies have shown that this species is currently

distributed only in the Taylak district and the F. Kasimova area of the Samarkand region (Nurniyozov, 2020). During the study, three natural populations of *Acorus calamus* L. were identified in these areas, and a comparative analysis of their morphometric indicators was conducted. In the **first population**, located in the collector ponds of the Taylak district, an average of 8.3 ± 0.25 plants per 10 m² was recorded. The average plant height was 66.7 ± 2.0 cm, and the number of leaves was 5.2 ± 0.16. The **second population** was identified around fishing ponds, with a density of 5.1 ± 0.15 plants per 10 m² and a plant height of 70.1 ± 2.1 cm. In the **population identified in the F. Kasimova area**, the plant density was 6.6 ± 0.20 plants per 10 m², the height was 67.4 ± 2.0 cm, and the number of leaves was 5.3 ± 0.16. These analyses serve as an effective tool for monitoring and predicting the ecological state of water bodies.

Conclusion. Analysis of the obtained data shows that across the three identified populations, the average plant density was 6.66 plants per 10 m², while other indicators did not differ significantly from one another. From this, it can be concluded that the natural populations of *Acorus calamus* L. in the Samarkand region are in a state of moderate regression. In all identified populations, the plant does not flower and reproduces entirely vegetatively.

Table 1. Morphometric indicators of *Acorus calamus* L.

Populations	**Plant height, cm**	**Number of plants per 10 m², pcs**	**Number of leaves, pcs.**
Taylak			
1	66,7±2,0	8,3±0,25	5,2±0,16
2	70,1±2,1	5,1±0,15	5,3±0,16
F. Kasimova)			
3	67,4±2,0	6,6±0,20	5,3±0,16

Results and Discussion

The height of *Acorus calamus* L. plants in the Samarkand region ranges from 66.7 to 70.1 cm across various observation points. The maximum height was observed in Taylak 2, while the minimum was recorded in Taylak 1; however, this difference is insignificant within the margins of standard error. The density of plant individuals per 10 m² reached its peak in Taylak 1 (8.3 units) and its lowest in Taylak 2 (5.1 units), indicating regional variations in population density. The number of leaves remained nearly identical (5.2–5.3 units), reflecting morphological stability (Figure 2). The reasons for the sharp decline in the species' range can be attributed to unauthorized mass harvesting by humans, hydro-technical activities in growth areas (excavation, cleaning), and the decreasing water levels in water bodies.

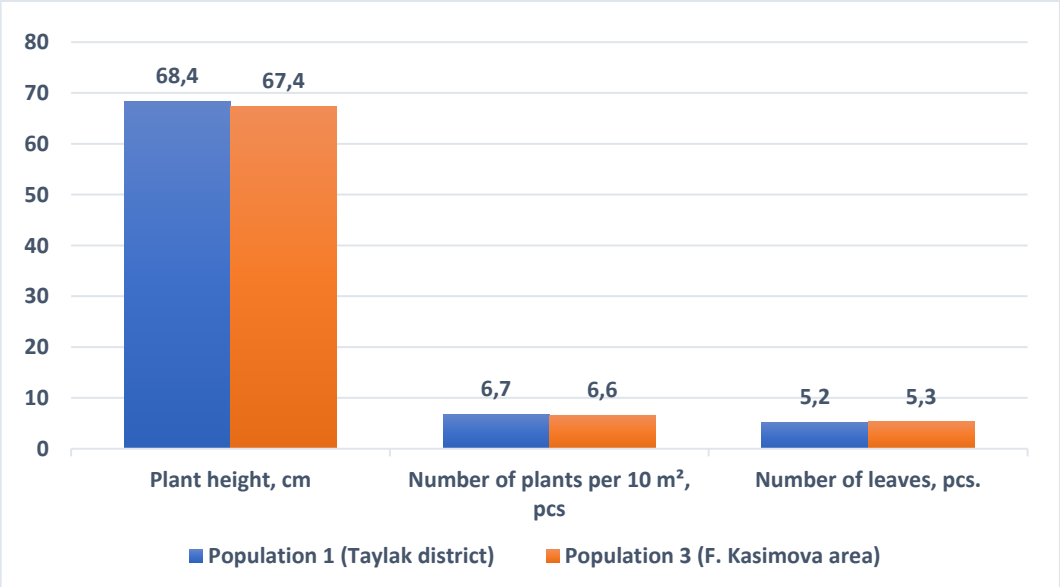


Fig. 2. Average morphometric indicators of *Acorus calamus* L.

In general, studying the morphobiological indicators of both dominant and rare species growing in water bodies allows for monitoring the ecological state of a specific body of water and forecasting its future condition. The results of the comparative analysis demonstrate that changes in morphometric indicators are directly linked to the hydrological conditions of the water bodies and the level of organic matter input. This confirms that *Acorus calamus* L. can be utilized as an effective indicator species for assessing the ecological status of aquatic ecosystems. On average, the morphometric indicators of *Acorus calamus* L. are consistent across different regions. Differences in plant density may be attributed to the ecotopic conditions of the region, while the uniformity in leaf count indicates its stability within natural populations. These findings can serve as baseline information for future hydrobiological and biomass studies of *Acorus calamus* L.

Conclusion. According to the results obtained, the sweet flag (*Acorus calamus* L.) serves as an important bioindicator for assessing the ecological state of water bodies in the Samarkand region. Its morphometric indicators allow for the determination of organic matter input levels into the aquatic environment. Furthermore, the study established the necessity of developing measures for the conservation and protection of this species' populations.

The research found that the distribution of *Acorus calamus* L. in the Samarkand region is limited, being identified only in the Taylak district and the F. Kasimova area. A comparative analysis of the morphometric parameters across three natural populations revealed that population density, plant height, and leaf count are directly correlated with the hydrological regime of the water bodies and the level of organic matter enrichment.

While *Acorus calamus* L. is a reliable bioindicator for determining the organic richness of water bodies, the extensive use of its rhizomes in folk medicine has led to a significant reduction in its natural range. These findings categorize *Acorus calamus* L. as a vital subject for the ecological monitoring of aquatic ecosystems and the development of biodiversity conservation strategies.

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