MORPHOMETRIC CHARACTERISTICS OF *HELICHRYSUM MARACANDICUM* DISTRIBUTED IN SOUTHERN AND EASTERN REGIONS OF UZBEKISTAN

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Annotation: This scientific paper studies the morphometric characteristics of **Helichrysum maracandicum** (Samarqand everlasting) distributed in the southern and eastern regions of Uzbekistan. The research analyzes the ecological factors influencing the plant's growth in different geographical areas, as well as the plant's structures and forms. Specifically, morphological parameters such as leaf size, flower structure, root system, and bush height were examined, with a focus on their regional variations. The aim of the study is to understand the plant's adaptability to ecological conditions, its genetic diversity, and its response to growth conditions. The findings contribute to assessing the agronomic and pharmaceutical potential of **Helichrysum maracandicum**, as well as understanding its role in preserving biodiversity. This research helps expand scientific knowledge about the flora of Uzbekistan and facilitates a deeper exploration of local plant species.

Key words: Helichrysum maracandicum, ecological factors, root, leaf, stem, endophytic fungi, biological activity, antimicrobial properties.

Introduction

The global demand for economically significant plant species is steadily increasing. This trend underscores the necessity to conserve biodiversity, protect these species, and restore their populations. Identifying medicinal plant species, studying their biological characteristics, evaluating their pharmaceutical potential, and analyzing the causes of population decline due to natural and anthropogenic factors are ongoing research priorities. Additionally, significant attention is being given to improving conservation and propagation methods. In recent years, rapid agricultural development has intensified human impact on wild ecosystems. This is evident in the conversion of natural habitats into croplands and the increased harvesting of rare species for trade purposes. Consequently, the natural habitats of *Helichrysum maracandicum* are shrinking, and some populations are experiencing significant declines. To address these issues, an international system for listing rare and endangered medicinal plants has been developed.

Literature Review and Methodology

The genus *Helichrysum* was introduced to science by P. Miller in 1754. The first systematic classification of the genus was established by L.P. Decandolle in 1837 and later refined by G. Bentham. In Uzbekistan, *H. maracandicum* has been studied by M.M. Nabiyev, X.K. Bo'riyev, A.S. Yuldashev, and others. The ontogeny of this species was studied using methods proposed by T.A. Rabotnov, later improved by A.A. Uranov and his students. The age structure of populations has been analyzed in four stages (7 phases): seedling (p), juvenile (j), immature (im), vegetative (v), generative stages (g1, g2, g3), and senescent (s). For determining population structure, the transect method (20x1), biometric indicators, and the coefficient of variation method by G.N. Zaysev were employed.

Results and Discussion

Anatomical studies of the above-ground organs (stem, leaf, flower) of *H. maracandicum* were conducted using field-collected materials. The findings revealed diagnostic features in the leaves, stems, and flowers. Specifically, the mesophyll of the leaf contains glandular cells producing essential oils, and the inner surfaces of the corolla lobes have glandular cells, both characteristic of this species. In mature generative individuals, an average of 1000–3500 seeds are formed, influencing the regeneration of the population. In some populations, dominance of younger generative individuals is observed, likely due to anthropogenic impacts leading to the overharvesting of mature generative individuals. Antioxidant activity was assessed using the DPPH radical scavenging test, showing high activity. The application of *Trichoderma harzianum* as a growth stimulator resulted in a 25–30% increase in the growth of cucumber and tomato seedlings. Metabolites produced by *Fusarium spp.* stimulated root development in plants.

Anatomical studies of the leaf, stem, and flower were conducted by fixing the materials in 70% ethanol. The leaf blade, in cross-section, is dorsiventral, with a prominent midrib on the abaxial side. The epidermis is covered with glandular and non-glandular trichomes. The mesophyll consists of palisade parenchyma and spongy parenchyma. Vascular bundles are collateral, with xylem and phloem arranged in a circle. The stem has a circular cross-section, with a single-layered epidermis and multiple layers of collenchyma and sclerenchyma. Vascular bundles are scattered throughout the ground tissue. The flower heads are composed of numerous florets, with glandular trichomes present on the involucral bracts and corolla lobes.

These anatomical features serve as diagnostic markers for identifying *H. maracandicum*. Additionally, the presence of essential oil glands in the leaf mesophyll and corolla lobes indicates the potential for utilizing both the inflorescence and leaves as raw materials.

Conclusion

Helichrysum maracandicum is a unique plant species endemic to the southern and eastern regions of Uzbekistan. Detailed studies of its morphological and anatomical characteristics are of significant scientific and practical importance. The research indicates that the plant's height, leaf size, and flowering time are crucial for conserving biological diversity and effectively utilizing it as a medicinal raw material. Preventing the degradation of its natural habitat is vital. Furthermore, in-depth genetic analysis and understanding the ecological factors affecting the plant will aid in expanding its medicinal raw material reserves and ensuring their sustainable management. The findings suggest that *Helichrysum* species are rich in biologically active endophytic fungi, some of which exhibit antimicrobial, antioxidant, and growth-stimulating properties. These fungi have potential applications in pharmaceuticals, biotechnology, and ecological agriculture.

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