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**MORPHO-BIOLOGICAL CHARACTERISTICS, CHEMICAL COMPOSITION,
BIOLOGICAL ACTIVITY AND CULTIVATION PROSPECTS OF PERILLA
FRUTESCENS (L.) BRITTON**

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Abstract. *Perilla frutescens* (L.) Britton is an annual aromatic and medicinal plant belonging to the Lamiaceae family. The species is recognized as an important source of omega-3 fatty acids, essential oils, phenolic compounds, and natural antioxidants. This article summarizes the morphological and biological characteristics, chemical composition, biological activity, cultivation technology, and economic significance of *Perilla frutescens*. Particular attention is given to its adaptability to irrigated conditions of Uzbekistan and its potential applications in the pharmaceutical, food, cosmetic, and functional food industries.

Keywords: *Perilla frutescens*, morphology, biological characteristics, omega-3 fatty acids, rosmarinic acid, essential oil, antioxidant activity, cultivation technology.

Аннотация. *Perilla frutescens* (L.) Britton — однолетнее ароматическое и лекарственное растение семейства Яснотковые (Lamiaceae). Растение является ценным источником омега-3 жирных кислот, эфирных масел, фенольных соединений и природных антиоксидантов. В статье рассмотрены морфолого-биологические особенности, химический состав, биологическая активность, технология возделывания и хозяйственное значение культуры. Особое внимание уделено перспективам интродукции растения в условиях орошаемого земледелия Узбекистана.

Ключевые слова: *Perilla frutescens*, морфология, биологические особенности, омега-3 жирные кислоты, розмариновая кислота, эфирное масло, антиоксидантная активность, агротехнология.

Introduction. Medicinal and aromatic plants have become increasingly important due to their applications in food, pharmaceutical, cosmetic, and nutraceutical industries. Among these plants, *Perilla frutescens* (L.) Britton has attracted considerable scientific attention because of its high nutritional value and medicinal properties. The species contains abundant omega-3 fatty acids, essential oils, phenolic compounds, vitamins, and minerals that contribute to its antioxidant, anti-inflammatory, and antiallergic effects. Despite its economic importance in East Asian countries, the cultivation of *Perilla frutescens* remains limited in Central Asia. Therefore, studying its biological characteristics and cultivation technology under the climatic conditions of Uzbekistan is of great practical significance.

Main part. Morphological and Biological Characteristics. *Perilla frutescens* is an annual herbaceous species, although it behaves as a perennial under subtropical climatic conditions. The plant develops an erect, four-angled stem reaching 40–150 cm in height and producing numerous branches in the upper portion.



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The leaves are simple, petiolate, broadly ovate to heart-shaped, with serrated margins and an acuminate apex. Two botanical forms are commonly distinguished:

f. *viridis* – green-leaved plants mainly cultivated for fresh consumption and essential oil production.

f. *purpurea* – purple or red-leaved plants containing high concentrations of anthocyanins and commonly used as natural food colorants and medicinal raw materials.

The flowers are small, white or pink, arranged in racemes or panicles. Flowering occurs from July to September, while pollination mainly takes place through self-pollination (autogamy). The fruit is a schizocarp that separates into four nutlets. Seeds are very small, with a thousand-seed weight of 2.5–4.0 g. Since the seeds require light for germination, they should be sown shallowly.

Chemical Composition. The biochemical composition of *Perilla frutescens* varies depending on genotype, environmental conditions, and growth stage. **Seed Composition.** *Perilla* seeds contain 35–45% oil characterized by an exceptionally high concentration of polyunsaturated fatty acids:

Alpha-linolenic acid (Omega-3): 50–60%

Linoleic acid (Omega-6): 15–20%

Oleic acid (Omega-9): 10–15%

Saturated fatty acids: 6–10%

The high content of alpha-linolenic acid makes *perilla* oil one of the richest plant sources of omega-3 fatty acids.

Leaf Composition. Leaves contain essential oil (0.2–0.5%), with perillaldehyde as the dominant component responsible for the characteristic aroma. Other volatile compounds include limonene, β -caryophyllene, and linalool.

Leaves are also rich in rosmarinic acid, caffeic acid, ferulic acid, luteolin, apigenin, anthocyanins, vitamins A and C, potassium, calcium, and iron.

Biological Activity and Pharmacological Properties. Numerous pharmacological studies have confirmed the medicinal value of *Perilla frutescens*. Its antioxidant activity is mainly attributed to rosmarinic acid and anthocyanins, which protect cells against oxidative damage. *Perilla* extracts also exhibit significant anti-inflammatory properties by reducing inflammatory cytokines.

Traditional medicine has long used the plant for treating allergies and bronchial asthma due to the presence of rosmarinic acid and luteolin. Recent studies suggest that *perilla* essential oil positively affects the central nervous system, contributing to antidepressant and calming effects.

Furthermore, extracts have demonstrated hepatoprotective activity by protecting liver tissues from toxic substances.

Growth and Development Indicators of *Perilla frutescens*

Growth parameter: Indicator

Plant height: 40–150 cm

Stem type: Erect, quadrangular

Leaf shape: Broad ovate to cordate



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Leaf color: Green or purple
Flower color: White or pink
Flowering period: July–September
Pollination: Self-pollination
Fruit type: Schizocarp
Thousand seed weight: 2.5–4.0 g
Oil content in seeds: 35–45%

Cultivation Technology. *Perilla frutescens* is a thermophilic crop requiring fertile, well-drained loamy soils. The plant is sensitive to frost and cannot tolerate temperatures below –1 to –2°C.

Seeds may be sown directly in the field or transplanted as seedlings. Since germination is light-dependent, seeds should only be lightly covered with soil.

Under Uzbek conditions, sowing is recommended from late April to early May after the danger of frost has passed. The recommended planting pattern is 45–60 cm between rows and 20–30 cm between plants.

Crop management includes irrigation during dry periods, weed control, and nitrogen fertilization to stimulate vegetative growth.

Economic Importance. The economic value of *Perilla frutescens* is associated with its multiple industrial applications. Fresh green leaves are widely consumed in salads and traditional Korean cuisine. Purple leaves serve as natural food colorants in pickled vegetables, beverages, and processed foods.

Perilla seed oil is highly valued as an edible oil and dietary supplement due to its high omega-3 content. The pharmaceutical industry utilizes *perilla* extracts as expectorants, anti-inflammatory agents, antioxidants, and dietary supplements. In cosmetics, both *perilla* oil and essential oil are incorporated into anti-aging creams, moisturizers, perfumes, and skin-care formulations.

Conclusion. *Perilla frutescens* (L.) Britton represents a highly valuable multifunctional crop possessing significant nutritional, medicinal, and industrial potential. Its exceptionally rich composition of omega-3 fatty acids, rosmarinic acid, anthocyanins, and essential oils provides substantial opportunities for pharmaceutical, food, and cosmetic applications.

Considering its ecological adaptability and relatively simple cultivation technology, the introduction of *Perilla frutescens* into Uzbekistan offers promising prospects for agricultural diversification and the production of high-value medicinal raw materials. Future research should focus on developing locally adapted varieties, optimizing cultivation techniques, and improving seed oil and essential oil production technologies.

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