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ORIGANUM VULGARE L.: BOTANICAL FEATURES, USE IN FOLK MEDICINE, AND SIGNIFICANCE IN THE CULTURES OF OTHER COUNTRIES

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Abstract: The article summarizes previous research findings on *Origanum vulgare* L. It mentions and describes its anti-inflammatory properties, as well as its ability to combat fungi, viruses, and bacteria. Additionally, the article reviews and consolidates information on the use of *Origanum vulgare* L. in pharmacy, medicine, and agriculture. Information regarding the botanical characteristics of this plant, as well as the family to which it belongs (*Lamiaceae*), is also described and compiled. The article discusses the application of *O. vulgare* L. by various cultures in their traditional medicine, as well as in phytotherapy. *O. vulgare* L. has a unique chemical composition that enhances its properties. Decoctions made from *O. vulgare* L. are used to treat respiratory diseases, improve expectoration, and relieve throat pain. According to preliminary studies, *O. vulgare* L. can treat nervous disorders, reduce stress, and improve sleep quality. It can relax skeletal muscles and alleviate body tension. Research on rats has also shown its influence on brain activity, indicating its potential antidepressant properties and its ability to bind to the hormone serotonin. *O. vulgare* L. strengthens the immune system and is used not only in pharmacy but also in culinary practices. Due to its essential oils, it has a fragrant aroma, which makes it suitable for use in cooking. *O. vulgare* L. can be used for wound healing. It may help prevent the effects of oxidative stress on the body and reduce inflammatory processes in cells. *O. vulgare* L. plays a significant role in biodiversity, serving as food for pollinating beetles and other animals. In agronomy, the plant is undemanding in terms of its environment and grows well. It can also be used as a bio-herbicide in the fight against pests. The issue of population decline of *O. vulgare* L. due to its uncontrolled use in pharmaceutical and agricultural activities is highlighted, emphasizing the need for large-scale cultivation of the plant under controlled production conditions.

Keywords: *Origanum vulgare* L., botanical characteristics, plant introduction, acclimatization, distribution, growth

1. INTRODUCTION

Origanum vulgare L. is a plant of great importance to both nature and humans. Its study is highly relevant across several key fields, including medicine, ecology, agriculture, as well as in the context of biodiversity conservation and cultural heritage preservation (Akrayi et al. 2015; Pezzani and Vitalini 2017; Lombrea et al. 2020).

O. vulgare L. is known for its unique chemical composition characteristic of the Lamiaceae family, particularly the presence of essential oils, flavonoids, phenolic compounds, and organic acids. Its primary fatty acids include linoleic, oleic, stearic, and palmitic acids. In cold-pressed *O. vulgare* L. extract, γ-tocopherol accounted for 32.1% of the total measured tocols, followed by α-tocotrienol (25.8%) and γ-tocotrienol (21.3%) (Assiri et al. 2016). The plant exhibits a wide range of therapeutic properties, making it an important subject of medical research (Assiri et al. 2016, Pezzani and Vitalini 2017).

Studies have demonstrated that the essential oils of *O. vulgare* L. effectively neutralize various bacteria and fungi, making it a promising candidate for the development of natural antiseptic agents (Rakover et al. 2008; Al-Kalaldeh and Abu-Dahab 2010). Additionally, researchers have confirmed

the antimicrobial properties of *O. vulgare* L. against foodborne bacteria, spoilage fungi, and dermatophytic fungi (Assiri et al. 2016).

O. vulgare L.is widely used in traditional medicine to reduce inflammation and alleviate pain, particularly in cases of arthritis, colds, and headaches (Chernetska and Beley 2018).

Consuming a decoction of *O. vulgare* L. supports overall immune system strengthening and aids in combating viral infections such as flu and colds (Chernetska and Beley 2018).

The phenolic compounds in *O. vulgare* L. help reduce free radical levels in the body, thereby slowing aging processes and protecting cells from oxidative damage (Al-Kalaldeh et al. 2024; Silva et al. 2012).

O. vulgare L. plays a crucial role in ecosystems as part of the flora that maintains the stability of natural biocenoses (Priti Kumari and Joshi 2011). Its active interactions with the environment make it valuable for research in ecology and environmental conservation (Pezzani and Vitalini 2017; Priti et al. 2011; Da Mata and De Alencar 2016).

O. vulgare L. is an excellent source of nectar for honeybees and other pollinating insects (Priti Kumari and Joshi 2011). This contributes significantly to plant pollination processes, supporting biodiversity conservation.

Furthermore, *O. vulgare* L. is a profitable crop for agricultural cultivation, making it valuable in the agrarian industry. Its root system enhances soil structure and protects against erosion. The plant can also be used for landscaping and the restoration of degraded lands.

O. vulgare L. is a plant that adapts well to various climatic conditions, including drought and high temperatures. This makes it potentially significant in addressing the effects of climate change (Papp et al. 2011; Pezzani and Vitalini 2017; Lombrea et al. 2020; Tawffiq and Almulathanon 2022).

The study of *O. vulgare* L. is highly relevant in agronomy as it can be used not only as a medicinal plant but also as a vital raw material for the food industry and the production of natural pesticides (Georgantopoulos and Vougioukas 2023).

Oregano is widely used as a spice in many cultures. Its essential oils are added to sauces, marinades, meat, and vegetable dishes, making it an essential component in the food industry (Chernetska and Beley 2018). *O. vulgare* L. has the potential to be used as a selective herbicide targeting monocotyledonous plant species. This is crucial for reducing chemical pollution, protecting the environment, and preserving biodiversity, as oregano-based herbicides are biological in origin (Gruľová and Caputo 2023).

Research on *O. vulgare* L. opens up new opportunities for scientific discoveries. Its rich chemical composition and diverse properties provide a basis for further studies in several directions:

Biochemical research: Deciphering the mechanisms of biosynthesis of active compounds in the plant could lead to the discovery of new molecules with new therapeutic properties.

Genetics and breeding: Studying the genetic characteristics of *O. vulgare* L. may help develop new varieties that are more resistant to diseases or climate change.

O. vulgare L. holds deep cultural significance for many peoples, having been used in traditional medicine, culinary practices, and rituals (Fournomiti and Kimbaris 2015; Mombeini and Mazloumi 2015). Exploring the historical context of its use helps preserve cultural heritage and sheds light on how knowledge about medicinal plants was passed down through generations.

Thus, the study of *O. vulgare* L. is an extremely relevant and multifaceted endeavor encompassing various fields of science. It enables the development of new medical technologies, supports ecological balance in ecosystems, enhances agriculture, and preserves cultural traditions. For this reason, research on this plant is a crucial step toward advancing bio-innovations and conserving natural resources.

2. RESEARCH OBJECTIVE, METHODOLOGY AND DATA

Drawing on previous research, a comprehensive information base was compiled to characterize the biological features of *Origanum vulgare* L. The study outlines its applications in medicine, agronomy, and phytotherapy, as well as its ecological significance in terms of biodiversity. Particular attention was given to the role of *O. vulgare* L. in phytotherapeutic practices across various cultural traditions. The methodological approach involved comparative analysis, interpretation, and synthesis of the available data.

3. Systematics and Family Context

The Lamiaceae (mint/deadnettle) family comprises ≈236 genera and 3,500 species and is characterized by essential-oil–secreting glandular trichomes on stems and leaves that help neutralize viruses and bacteria (Maithani and Maithani 2023). Members contain essential oils, phenolics, carotenoids, polysaccharides, organic acids, and tannins, enabling broad industrial utility (Kotyuk 2011; Ličina et al. 2017). In modern medicine, 13 species from 11 genera are used, predominantly the aerial parts; essential oils are prominent alongside flavonoids, iridoids, triterpenoids, and tannins (Shanaida 2018). Origanum vulgare L. exhibits these typical Lamiaceae traits and serves as an essential oil–producing, medicinal, spice-flavoring, honey- and pollen-producing, vitamin-rich, fodder, and ornamental plant (Kotyuk 2011).

4. Biogeography, Habitat and Cultivation Networks

In the wild, O. vulgare L. is widespread across Ukraine, Europe, Central Asia, and the Mediterranean, growing in mixed and broadleaf forests, shrublands, and clearings. Supply chains draw on both wild harvesting and cultivation; Turkey is the leading supplier of Mediterranean O. vulgare L. (Lombrea and Diana Antal 2020). The crop is cultivated as an essential oil–producing and medicinal plant in the USA, Germany, and France, and in Ukraine it is grown for medicinal uses and as a culinary spice (Kotyuk 2011). To stabilize populations and enable sustainable industrial use, expanded cultivation is recommended (Maithani and Maithani 2023; Kotyuk 2011).

5. Morphology and Diagnostic Characters

Root system. A robust, branched taproot provides strong anchorage in diverse soils and can extend substantially with adequate moisture and temperature.

Stem. Erect, 25–90 cm tall, apically branched; square in cross-section; covered with short hairs; green with possible reddish hue during flowering; aromatic due to essential oils (Antoniadou and Rozos 2024; Al-Kalaldeh and Abu-Dahab 2010; Priti Kumari and Joshi 2011). Leaves. Alternate, oval to elongated (1–4 cm), with distinct reticulate venation; margins entire or serrate; apices pointed or rounded; sessile (Rakover et al. 2008; Skoufogianni et al. 2019). Strong aroma and spicy flavor reflect essential oil content; antibacterial activity has been noted (Polat and Satıl 2012).

Flowers. Small, tubular, pink to violet; grouped into head-like inflorescences forming dense, spike-like clusters at shoot tips; flowering June–August (regional variation); insect-pollinated (Lombrea and Diana Antal 2020).

Fruit and reproduction. A four-segmented nutlet that separates at maturity; reproduction both sexual (seeds) and vegetative (root offshoots) (Skoufogianni et al. 2019).

6. Phytochemical Architecture

Lamiaceae plants feature essential oils, phenolics, carotenoids, polysaccharides, organic acids, and tannins; flavonoids are present, with iridoids and triterpenoids also important (Kotyuk 2011; Ličina et al. 2017; Shanaida 2018). In O. vulgare L., carvacrol and thymol dominate the essential oil

and underpin aroma and bioactivity (Kokkini and Karousou 1997). Rosmarinic acid is a leading antioxidant; a high level of 87.16 ± 4.03 mg/g dry matter has been reported (Betlej and Żurek 2024).

7. Mechanisms of Action and Pharmacology

Antimicrobial. Extracts and essential oil act against Gram-positive and Gram-negative bacteria; mechanisms include membrane disruption, increased permeability, and ionic imbalance (Chouhan et al. 2017; Fournomiti et al. 2015; Khan et al. 2019; Sikkema et al. 1995). Activity includes respiratory pathogens implicated in bronchitis and pneumonia (Antoniadou et al. 2012); carvacrol and thymol are key effectors (Kokkini and Karousou 1997).

Anti-inflammatory. Marked anti-inflammatory effects support utility in arthritis and gastrointestinal disorders (Silva et al. 2012; Skoufogianni and Solomou 2019; Lombrea and Diana 2020). Phenolics (notably carvacrol, thymol) suppress IL-6 and TNF-α and attenuate NF-κB activation (Veenstra and Johnson 2019; Sharifi-Rad et al. 2020; Georgantopoulos and Vougioukas 2023; Khan and Khan 2019).

Antioxidant. Constituents neutralize free radicals and mitigate oxidative stress linked to chronic disease; antioxidants also downregulate pro-inflammatory cytokines and NF-κB signaling (Betlej and Żurek 2024; Al-Kalaldeh and Abu-Dahab 2010; Amiresmaeili et al. 2018; Antoniadou and Rozos 2024).

Anticancer potential. Demonstrated antimigratory and cytotoxic effects (e.g., gastric cancer cells); explored in breast adenocarcinoma; 4-terpineol can inhibit tumor cell growth (Betlej and Żurek 2024; Assiri and Elbanna 2016; Aliabadi and Valizadegan 2020; Begnini and Nedel 2014). Neuropharmacology. Carvacrol and thymol may modulate GABA receptors, reducing anxiety and improving sleep; antioxidant actions provide neuroprotection relevant to neurodegenerative disease (Fonseca and Ferreira 2023; Carrasco et al. 2016; Lombrea et al. 2020). Extracts may elevate serotonin and mildly inhibit monoamine reuptake; antidepressant-like effects observed in a rat model, without effects on stress-induced TLR2/4 regulation (Mohajeri and Wynn Prudence 2013; Amiresmaeili and Roohollahi 2018).

Respiratory health. Antimicrobial, anti-inflammatory, and mucolytic actions support use in acute respiratory infections, asthma, bronchitis, and COPD (Rakover et al. 2008; Ben-Arye and Dudai 2011; Veenstra and Johnson 2019).

Dermatology and wound healing. Essential oil promotes cell proliferation and wound repair (Lombrea and Diana Antal 2020; Priti Kumari and Joshi 2011; Carrasco et al. 2016).

8. Translational Applications, Safety and Sustainability

Thirteen Lamiaceae species (11 genera) are used in contemporary medicine, usually the aerial parts (Shanaida 2018). O. vulgare L. aligns with this pattern and is utilized across medical, food, and cosmetic sectors (Kotyuk 2011). Plant-derived extracts often show fewer side effects than synthetic anti-inflammatory drugs and are investigated as anticancer, antitumor, hypoglycemic, and anti-inflammatory adjuncts (Akrayi et al. 2015; Georgantopoulos and Vougioukas 2023; Ben-Arye and Dudai 2011). Given anthropogenic pressure and population declines, scaling sustainable cultivation is a priority to secure stable supply (Maithani and Maithani 2023; Kotyuk 2011).

9. Ethnomedical Landscapes

Western Europe. Decoctions/teas of aerial parts used as expectorants and antiseptics for colds, coughs, and bronchitis; also as calming remedies for stress, insomnia, and nervous disorders. Different organs are used for pain, cough, genitourinary issues, and externally for fractures and toothache (Mohajeri and Wynn Prudence 2013; Papp et al. 2011; Veenstra and Johnson 2019; Bahmani et al. 2019).

Mediterranean region. Beyond culinary use, leaves/herb and essential oil treat respiratory and gastrointestinal ailments; decoctions support appetite and digestion after heavy meals; applications also include perfumery and beverage flavoring (Sharifi-Rad and Berkay Yılmaz 2020; Akrayi et al. 2015; Veenstra and Johnson 2019; Kaurinovic et al. 2011).

Turkey and Middle East. Traditional roles include cleansing shallow wounds, gargling for upper respiratory infections, and calming infusions for anxiety and sleep normalization (Papp et al. 2011; Gruľová et al. 2020; Lombrea et al. 2020; Amiresmaeili and Roohollahi 2018). India (Ayurveda). Incorporated into herbal mixtures for colds and coughs; powders and decoctions used to ease breathing and reduce symptoms of bronchitis and dry/wet cough (Verma and Padalia 2012; Tawffiq and Almulathanon 2022).

CONCLUSIONS

Based on the results of studies conducted by various scientists, it can be noted that *Origanum vulgare* L. possesses a range of pharmacological properties, which allows it to be widely used in folk medicine. In the future, this could lead to the development of medicines based on *Origanum vulgare* L. extracts. Due to its rich chemical composition, *Origanum vulgare* L. is capable of alleviating symptoms of acute respiratory diseases, soothing sore throats, promoting expectoration, and generally improving the patient's condition. *Origanum vulgare* L. also has a positive effect on the stomach, alleviating bloating symptoms and easing the discomfort after consuming fatty foods. *riganum vulgare* L. also significantly influences the nervous system. It relieves muscle tension and improves sleep. Studies on rats have proven that it may have antidepressant properties and also improves memory. The review of articles by authors from different countries demonstrates that the plant is used worldwide and is a cultural element in many countries. It is mainly used to treat similar symptoms and the same diseases. Many clinical and laboratory studies have shown that *Origanum vulgare* L. extracts possess significant anti-inflammatory properties. This makes the plant useful in treating diseases related to inflammation, such as arthritis or intestinal diseases. In addition to its pharmaceutical significance, *Origanum vulgare* L. supports biodiversity, can be used to produce pesticides to combat fungi and bacterial diseases, and serves as a bio-herbicide for pest control. Moreover, *Origanum vulgare* L. is not a finicky plant and easily adapts to various types of soil.

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Анотація. У статті узагальнено попередні результати досліджень, що проводились над Материнкою звичайною. Згадуються та описуються її протизапальні властивості. Здатність Материнки звичайної боротись з грибками, вірусами та бактеріями. Також, опрацьовано і узагальнено інформацію про використання Материнки звичайної у фармації, медицині та аграрному господарстві. У статті описано і зібрано інформацію стосовно ботанічних особливостей цієї рослини, а ще родини до якої вона належить (Губоцвіті). У статті описується застосування Материнки звичайної різними народами у своїй народній медицині та у фітотерапії. Материнка звичайна має особливий хімічний склад, що розширює її властивості. Відварами з Материнки звичайної лікують респіраторні захворювання, вона покращує відкашлювання мокроти та знімає біль у горлі. За попередніми дослідженнями, материнкою можна лікувати нервові розлади, стерси та покращувати якість сну. Материнка звичайна здатна розслабляти скелетні м'язи та знімати напругу в тілі. Дослідження на щурах також показали її вплив на нервову діяльність мозку, вона може мати антидепресантні властивості і зв'язувати гормон - серотонін. Материнка звичайна укріплює імунітет, використовується не тільки в фармації, але й у кулінарії. Завдяки ефірним оліям у складі вона має духмяний запах, що дозволяє використовувати рослину у кулінарії. Материнка звичайна може використовуватись для загоєння ран. Вона може перешкоджати дії оксидативного стресу на організм, зменшувати запальні процеси у клітинах. Крім того материнка звичайна відіграє неабияку роль у біорізноманітті, вона є кормом для жуків-запилювачів та інших тварин. Щодо використання у агрономії - рослина невибаглива до середовища і добре росте, також її можна використовувати, як біо-гербіцит у боротьбі з шкідниками.

Ключові слова: *Origanum vulgare* L., ботанічні особливості, інтродукція, акліматизація, поширення, зростання.