

# *Melissa officinalis*: Recent advancement in medicinal use, post-harvest processes and value addition

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## Abstract

In the heart of serene herb gardens, *Melissa officinalis*, commonly known as lemon balm, has captivated herbal enthusiasts and scientific attention alike for centuries. With its aromatic leaves and potential health benefits, this herb has found its place not only in traditional remedies but also in modern wellness practices. In recent times, a renewed focus on optimizing post-harvest processes and exploring innovative value-addition techniques has emerged as a potential approach to preserve active constituents and market value.

## Introduction

In the ever-expanding utilization of medicinal and aromatic plants in traditional as well as modern medicine, *Melissa officinalis* commonly known as lemon balm emerges as an industrially important aromatic herb with tremendous utilization in perfumery, cosmeceuticals as well as pharmaceuticals. It belongs to mint family (Lamiaceae) and genus *Melissa* includes five species native to Iran, Europe, and Central Asia. The origin of lemon balm (*Melissa officinalis*) was primarily in southern Europe but it is naturalized throughout Asia. Cultivation of lemon balm for culinary purpose as a garden herb is quite common in European and Asian country households. Ideologically *Melissa* is derived from Greek word *Melisso-phyllon* which implies bee-leaf due to its ability to attract bees and presence of nectar. Indigenous use of *Melissa officinalis* dates to ancient times (2000 years) as listed in *Historia Plantarum*. Traditionally lemon balm was utilized as a local sedative due to its anxiolytic properties. Pharmacological properties of *Melissa officinalis* are attributed to the presence of a wide range of biologically active chemical constituents i.e polyphenols, terpenoids and flavonoids etc. In India, *Melissa officinalis* currently cultivated in Uttarakhand, Kashmir, and south India. It is a perennial herbaceous plant reaching height up to 1 m. It possesses hairy root system which adapts different climatic variabilities feasible for plant. Leaves are pubescent, heart shaped dark green in color, and 2-8 cm long. Along with medicinal uses this herb is very popular for its culinary utilization. To preserve

flavors, aroma, and important phytochemicals it is essential to practice sustainable effective post-harvest processes and value addition.

## Unlocking Wellness: Lemon Balm's Nutritional and Medicinal Blueprint for Vibrant Living

In light of the growing preference for a disease-free lifestyle and the desire to minimize potential side effects on human health, there has been a recent trend toward incorporating medicinal herbs into diets. This shift underscores the importance of integrating pharmacologically significant medicinal and aromatic herbs into food or nutraceuticals to promote overall wellness. Lemon balm, traditionally employed in culinary practices such as tea, infused honey, food flavoring, decoctions, etc., has garnered scientific interest, particularly in the realm of post-harvest processes and the development of value-added products. Consumption of lemon balm contributes a substantial supply of vitamin C and traces of Ca and Mg for bone health as well as other physiological processes. Lemon balm is a significant reservoir of polyphenols, encompassing flavonoids and phenolic acids, known for their antioxidant prowess. These elements play a pivotal role in counteracting free radicals and alleviating oxidative stress in the body, potentially reducing the likelihood of chronic diseases. Moreover, lemon balm comprises essential oils, predominantly constituted by monoterpenes like citronellal and geranial, contributing to its unique aroma and taste profile. These essential oils could potentially provide antimicrobial and anti-inflammatory benefits, thereby aiding the immune system and promoting overall health.

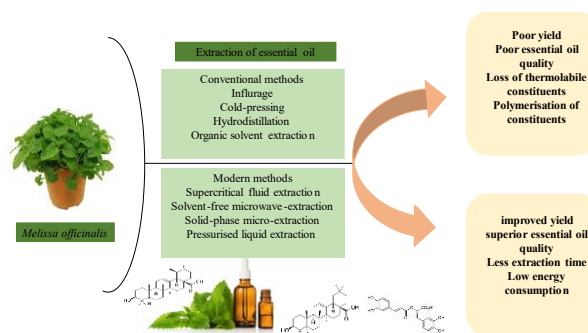


Fig.1. Conventional and modern methods for post-harvest processing of essential oil

## Post-harvest Processing and Value Addition in *Melissa officinalis*

Recent advancements in the post-harvest processing and value addition of *Melissa officinalis*, colloquially known as lemon balm, underscore a progressive trajectory in refining methodologies for the preservation, quality enhancement, and product diversification of this medicinally significant herb. In the domain of post-harvest processing, contemporary approaches gravitate toward precision-controlled storage atmospheres, including controlled atmosphere storage and modified atmosphere packaging. These methods intricately manipulate environmental factors such as temperature and humidity, aiming to curtail enzymatic degradation and oxidative processes during storage, thereby augmenting the longevity of lemon balm and safeguarding its phytochemical profile. Moreover, cutting-edge drying technologies, such as freeze-drying and vacuum drying, are instrumental in preserving the volatile essential oils, polyphenols, and other bioactive constituents inherent in lemon balm. These methodologies seek to circumvent heat-induced degradation, ensuring the retention of the herb's therapeutic potency throughout the drying process. Different extraction methods i.e. traditional (infusion and maceration) and advanced modern methods (ultrasound-assisted extraction) are being employed to ensure chemo-profile and biological activities in aerial parts of lemon balm (de Oliveira et al., 2023). Essential oil of lemon balm faces consequential loss depending on drying conditions (Temperature) and moisture content, making post-harvest handling a major concern for the maintenance of finished product. Accumulation of valuable anthocyanin is also reported in lemon balm after 45 days of post-harvest treatment followed by incubation of detached leaves (Dey et al., 2023).

Value-addition strategies have transcended conventional paradigms, focusing on the creation of sophisticated products tailored to diverse consumer preferences. Extraction methodologies, notably supercritical fluid extraction and microwave-assisted extraction, stand out for their efficiency in isolating and preserving lemon balm's bioactive compounds, yielding potent extracts with heightened therapeutic efficacy. In the landscape of product diversification, the integration of lemon balm into functional foods, nutraceuticals, and herbal teas undergoes continual refinement. Advancements in formulation, featuring encapsulation technologies and nanostructured delivery systems, strive to optimize the bioavailability

of active constituents, ensuring their efficacy upon consumption. In addition to use of lemon balm in pharmacological formulations there's incorporation of this plant into edible things targeting flavoring along with infusion of medicinal properties in diet. The addition of lemon balm could enhance functional properties in bakery products such as cupcakes (Caleja et al., 2018).

Waste generated through the extraction of essential oil from *Melissa officinalis* by hydrodistillation can enhance total dietary fiber and shelf life in bread (Vasileva et al., 2018). Lemon balm is very efficient in food preservation. The development of low-energy, low-fat Bologna items, fortified with omega-3 polyunsaturated fatty acids, involved substituting pork back-fat with an oil-in-water blend comprising linseed-algae oil. This blend was stabilized using freeze-dried *Melissa officinalis* extract (Berasategi et al., 2014). Introducing the vegetable filler *Melissa officinalis* L. will enhance the sensory qualities of the final product, imparting a pleasing hue and a delightful herbal fragrance to the curd mass (Lyashchuk et al., 2022).

Collectively, these advancements signify a transformative paradigm in the post-harvest processing and value addition of *Melissa officinalis*, ushering in a new era of technologically refined products that harness the medicinal properties of lemon balm while aligning with evolving market demands. The imperative for ongoing scientific inquiry in this domain persists, necessitating continual refinement and expansion of these methodologies for the maximal realization of the therapeutic potential inherent in lemon balm.

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