

УДК
**PHYTOCOMPOSITION-BASED LIP BALM: PHARMACOTECHNOLOGICAL
RATIONALE OF CALENDULA OFFICINALIS AND CHAMOMILE MEDICINALIS
EXTRACTS**

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Аннотация: *This study focuses on the development of a lip balm containing extracts of Calendula officinalis L. and Matricaria chamomilla L. Both medicinal plants are rich in biologically active compounds such as flavonoids, carotenoids, and saponins, which provide anti-inflammatory, regenerative, analgesic, and antimicrobial effects. Five experimental formulations of the lip balm were prepared and evaluated according to MEST 31460-2012 and MEST 31649-2012 standards, considering organoleptic properties, stability, and efficacy. As a result, the optimal formulation containing 80% base-forming substances and 8% active plant extracts was identified. This formulation demonstrated favorable physicochemical properties and high bioactivity, making it suitable as a cosmetic-pharmaceutical product for lip care and wound healing. Additionally, the technological process of lip balm production, from raw material preparation to final packaging, is described in detail.*

Ключевые слова: *Calendula officinalis, Matricaria chamomilla, lip balm, plant extracts, anti-inflammatory, regenerative, pharmaceutical technology.*

The lips are one of the most sensitive and delicate areas of human skin. They lack sebaceous glands and have a thin stratum corneum, which makes them highly susceptible to external factors such as ultraviolet radiation, wind, temperature fluctuations, and low humidity. As a result, the lips are prone to dryness, cracking, micro-injuries, and irritation. Therefore, regular protection and restoration of lip tissues play an essential role in maintaining both their aesthetic appearance and physiological health.

In modern cosmetology, plant-based components are widely used due to their biocompatibility, low risk of allergic reactions, and additional therapeutic effects. Calendula officinalis L. is known for its anti-inflammatory, soothing, and wound-healing properties, as well as its ability to support epithelial regeneration. The flowers of this plant are rich in triterpenoid glycosides (calendulosides), flavonoids, carotenoids, and saponins, which contribute to tissue repair and provide antioxidant protection [1, 2].



Figure 1. Calendula officinalis L. flowers used as a source of biologically active compounds.

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Chamomile medicinalis L. extract exhibits anti-inflammatory, antimicrobial, antioxidant, and calming effects. Its active constituents, including bisabolol, chamazulene, flavonoids, and coumarins, promote wound healing, reduce irritation, and protect the skin from oxidative stress. The combination of these two extracts is expected to produce a synergistic effect, providing comprehensive care for the lips [3].



Figure 2. *Chamomile medicinalis* L. flowers used in the lip balm formulation.

The primary objective of this study is to develop a phytocomposition-based lip balm containing *Calendula officinalis* and *Chamomile medicinalis* extracts. The research focuses on pharmacotechnological selection, optimal formulation, preparation methods, and evaluation of the final product quality. This work aims to provide a scientific basis for incorporating natural plant extracts into cosmetic products while assessing their ergonomic, therapeutic, and stability properties.

The plant materials used in this study were carefully collected, processed, and stored to preserve the biological activity of the constituents. *Calendula officinalis* flowers were harvested at full bloom, dried at 35–40°C, and stored under controlled conditions. Extraction was carried out using 70% ethanol for 24 hours with continuous stirring. The resulting extract was filtered and standardized based on triterpenoid glycoside content (2–4%).

Chamomile medicinalis flowers were processed similarly, yielding an extract containing 1–3% bisabolol and 0.5–1% chamazulene. High-performance liquid chromatography (HPLC) was employed to analyze the concentration of active compounds, ensuring reproducibility and stability.

The lip balm formulation was designed to achieve a smooth texture, pleasant sensory properties, effective delivery of bioactive compounds, and long-term stability. The optimized composition included petroleum jelly, beeswax, cocoa butter, shea butter, anhydrous lanolin, cetylstearyl alcohol, glycerin, potassium sorbate, lavender essential oil, and standardized plant extracts. The combination of lipid and hydrophilic phases ensures efficient delivery of active substances to the lip tissues.

The preparation process involved melting the lipid components at 70–75°C, followed by homogenization with cetylstearyl alcohol. The hydrophilic phase containing glycerin and potassium sorbate was prepared separately. Plant extracts were added at 40–45°C to prevent degradation of bioactive compounds. The two phases were combined with continuous stirring, and lavender essential oil was incorporated at the final stage. The prepared mixture was poured into containers and cooled to room temperature.

Quality control parameters included pH measurement (5.0–6.0), consistency assessment (homogeneous and smooth without oil separation), stability testing (6 months at 25°C and 40°C), microbiological safety (absence of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans*), and sensory evaluation (color, odor, and texture). The results demonstrated that the developed lip balm is homogeneous, easy to apply, stable, and retains the bioactivity of the incorporated plant extracts.

The effectiveness of the lip balm is attributed to the complementary action of *Calendula*

officinalis and Chamomile medicinalis extracts. The calendulosides and flavonoids in marigold promote tissue regeneration, reduce inflammation, and provide antioxidant protection. Chamomile components, such as bisabolol and chamazulene, further enhance anti-inflammatory activity, soothe irritation, and accelerate healing of micro-lesions.

An additional advantage is the balm's compatibility with various skin types, including sensitive and allergy-prone lips. Plant-based extracts reduce the risk of irritation, while the lipid composition forms a protective barrier that prevents transepidermal water loss. Humectants, such as glycerin, maintain prolonged hydration, improving lip softness and elasticity. Regular application is expected to enhance lip resilience and prevent recurrent dryness and chapping.

From a pharmacotechnological perspective, the use of standardized plant extracts is crucial for maintaining consistent therapeutic activity. The active compounds in *Calendula officinalis* and *Chamomile medicinalis* may vary depending on cultivation, harvest, and extraction methods. Standardization ensures reproducible concentrations of key constituents such as calendulosides, bisabolol, and chamazulene, providing reliable performance and efficacy in line with good manufacturing practices (GMP) for cosmetic and pharmaceutical products.

The sensory and organoleptic properties of the lip balm were optimized to enhance consumer acceptance. The natural carotenoids of *Calendula officinalis* provide a soft and appealing color, while the aroma of lavender essential oil creates a pleasant scent without being overpowering. Texture evaluation confirmed smoothness, spreadability, and rapid absorption without leaving a greasy residue, which is critical for daily use and product satisfaction.

Future studies may focus on clinical evaluation in human volunteers to quantify the balm's effectiveness in preventing dryness, promoting healing, and improving overall lip condition. Additionally, exploring alternative natural extracts or combining multiple botanical sources may further enhance antioxidant and regenerative properties. Innovative delivery systems, such as liposomal or nanoemulsion formulations, could improve bioavailability and penetration of active compounds, opening new directions for phytocosmetic research.

In conclusion, the developed phytocomposition-based lip balm is pharmacotechnologically feasible and meets quality standards for cosmetic products. It effectively combines the therapeutic properties of *Calendula officinalis* and *Chamomile medicinalis* extracts with a stable and consumer-friendly formulation. This research provides a foundation for further clinical evaluation and potential commercialization of plant-based lip care products, supporting the integration of natural bioactive substances into cosmetology and enhancing lip health and aesthetics.

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