INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Research Article

Formulation and Characterization of Herbal Balm

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ARTICLE INFO

Published: 25 Oct 2025
Keywords:
Herbal balm, mint, camphor, carom, eucalyptus
DOI:
10.5281/zenodo.17440472

ABSTRACT

In comparison to synthetic treatments, herbal formulations have drawn a lot of interest since they are safe, effective, and have few adverse effects. The creation and assessment of a herbal balm comprising mint flower, camphor, carom, and eucalyptus for the topical treatment of pain, inflammation, and nasal congestion is the main goal of this study. Using beeswax and coconut oil as the foundation, the balm was made with predetermined concentrations of the active ingredients: eucalyptus oil (1%), carom oil (0.5%), camphor (1.5%), and mint oil (2%). For three months, the produced product was tested for homogeneity, viscosity, spreadability, stability, and organoleptic qualities under accelerated circumstances (40 ± 2°C/75% RH). The balm had a consistent, smooth texture, a nice scent, was easy to spread, and showed no signs of phase separation or fragrance loss. Patch testing on human volunteers revealed no irritation, and the pH and viscosity stayed within acceptable bounds. The overall findings indicate that the developed herbal balm is safe, stable, and effective for topical use as a natural analgesic and decongestant. Further standardization and clinical evaluation are recommended to confirm its therapeutic efficacy.

INTRODUCTION

The pain balm functions on the counter irritancy principle, which suppresses the pain sensation rather than reducing it by producing the irritation to the extent of the application of the formulation. According to common sense, a balm is a semi-solid composition that is intended for external application and typically contains medication. An example of a composition designed to alleviate mild to moderate pain is pain balm [1].

Balms are made topically and applied to the skin to ease soreness and stiffness. Analgesic herbal balm, an Ayurvedic concoction of strong essential oils, offers instant relief from headaches, backaches, and colds. Human skin can be treated

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

using herbal balms that contain organic essential oils, organic beeswax, and other appropriate herbal substances. One Pain is a crucial connection between primary disorders and downstream effects [2].

The International Association for the Study of Pain states that modulation, affective responses, nociception, afferents to the central nervous system, endogenous analgesia, behavioral alterations, and changes in social roles are all components of pain, which is a complicated phenomenon [3]. According to their chemical classification of active compounds, studies on plant contents were analyzed, indicating that medicinal plants may restore biological balance and prevent the accumulation of therapeutic ingredients [4,5].

Pain arises when tissue is injured. Pain is a vital natural defense mechanism that can significantly affect an individual's quality of life [6]. A comprehensive understanding of how pain impacts the body is essential for developing creative pain management strategies [7]. Nociceptor neurons play a key role in inflammation and pain. The individual attempts to get rid of the unpleasant stimulus [6]. Disease, inflammation, and damage to the central and peripheral nerve systems result in significant changes in pain pathways, an increase in excitability, and changes to gene expressions, enzymes, and receptors [7].

Because of their diverse chemical makeup, plants are one of the main sources for the extraction and purification of secondary metabolites. But for a very long time, people have been worried about pain and have turned to natural remedies, mostly plants, for relief. Therefore, medications that reduce pain can be classified as analgesics (painkillers) [8]. Foods often contain components of essential oils that give them a unique flavor and aroma. Essential oils are a class of natural substances with possible biological qualities that have been used historically in aromatherapy for a variety of purposes [9]. These include opioid analgesics, aloe vera, glycyrrhiza glabra, zingiber officinale, eugenia caryophyllata, cinnamonomum camphora, matricaria pubescens, and many more natural and synthetic analgesics [10].

Natural ingredients used in preparation of herbal balm includes camphor, mint flower, carom, tulsi, eucaluptus. A synergistic therapeutic impact for common ailments like headaches, colds, coughs, and muscle discomfort is the goal of combining these natural substances into a single balm composition. Additionally, the creation and assessment of these herbal balms aids in the creation of eco-friendly, natural healthcare substitutes that are in line with both contemporary pharmaceutical standards and traditional medical principles.

MATERIALS

Camphor, beeswax, eucalyptus oil and coconut oil were purchased from the local market, and a variety of plant materials, including mint flower, carrom, tulsi were gathered from the herbal garden to make the herbal balm [Table 1]. Plant profile of above herbs are given below

Camphor:

Biological source: Camphor is a waxy, white crystalline solid substance, obtained from the tree Cinnamomum camphora belonging to Lauraceae family, with a strong scent. Its terpenoid is originally obtained by distillation of bark from camphor tree.

Chemical constituents: Camphor is the primary component of leaves and wood, accounting for 51.3% and 40.5% of each, respectively. Other

constituents include cineol, linalool, eugenol, limonene, safrole, a-pinene, and camphene.

Mint flower :

Biological source : Fresh flowering tops of Mentha arvensis (corn mint or Japanese mint) and Mentha piperita (peppermint) are the main biological sources of Mentha. Commercial usage is also made of other species, such as spearmint (Mentha spicata). The Lamiaceae family includes these perennial herbaceous plants, which are distilled to provide essential oils for a variety of uses.

Chemical constituents : Numerous volatile and non-volatile substances, including as menthol, menthone, methyl acetate, limonene, 1,8-cineole (eucalyptol), carvone, flavonoids (such as luteolin and hesperidin), tannins, and rosmarinic acid, are found in mint flowers.

Carrom:

Biological source : The dried, ripe seeds of the Apiaceae plant Trachyspermum ammi are the biological source of carrom. Other synonyms for it include Carum copticum and Trachyspermum copticum.

Chemical constituents : Thymol, which serves as the main active ingredient in charge of many of its therapeutic effects, is present in high concentrations (35–60%) in its essential oil. Along with α- and β-pinene, other important chemicals in the oil include p-cymene and γ-terpinene..

Tulsi

Biological source The biological source for tulsi is the fresh and dried leaves of Ocimum sanctum L., also known as Ocimum tenuiflorum, which belongs to the family Lamiaceae. Other Ocimum species, like Ocimum basilicum, are also considered sources.

Chemical constituents: Tulsi's main chemical constituents include eugenol, oleanolic acid, ursolic acid, carvacrol, and rosmarinic acid. Other important compounds are linalool, β-caryophyllene, estragole, and various flavonoids, terpenoids, and fatty acids. These compounds are responsible for its medicinal properties, which include antioxidant, anti-inflammatory, and antimicrobial effects.

Eucalyptus

Biological source : Eucalyptus oil is the essential oil obtained by the distillation of fresh leaves of Eucalyptus globulus and other species like E. polybractea, E. viminalis, and E. smithii, belonging to family Myrtaceae.

Chemical constituents : It includes eucalyptol (α-cineole), which is the most abundant component, along with α-pinene, limonene, citronellal, and other terpenes. Other compounds present include phenolic compounds like flavonoids, acids, and certain glycosides.

Formulation

Table 1: Formulation of herbal balm.

S.no	Ingredients	Quantity (%)	Used as
1	Mint flower	2	Cooling, soothing and anti-inflammatory
2	camphor	1.5	Counter-irritant, analgesic and decongestant
3	Carom	0.5	Antimicrobial, pain-relieving and warming agent
4	Eucalyptus oil	1	Decongestant, antiseptic and aromatic agent
5	Coconut oil	25	Emollient, improves spreadability and skin absorption
6	Beeswax	20	Base, provides consistency and firmness

Method

Collection of herbs

A botanist verified the authenticity of fresh mint flowers (Mentha spp.), carom seeds (Trachyspermum ammi), camphor (Cinnamomum camphora), tulsi (Ocimum sanctum) and eucalyptus leaves (Eucalyptus globulus) that were purchased at a nearby herbal market. Every item was cleaned and allowed to dry in the shade.

Extraction

Mint flower : Extracted by hydrodistilled for three hours with a Clevenger device.

Carom : Crushed seeds were extracted using steam distillation and kept in amber glass vials.

Tulsi : Essential oils can be extracted via steam distillation or hydro-distillation, or by solvent extraction.

Preparation of base

Beeswax were heated in a double boiler at 60 to 70^{o} C until completely liquefied.

After adding coconut oil, it was thoroughly blended.

Incorporation of active ingredients

After partial cooling, add the essential oils and camphor in the following amounts, stirring slowly to ensure even distribution: mint flower – 2%, carom – 1.5 %, camphor – 2 %, tulsi- 1%

Cooling and packing:

The sterilized jar was filled with the heated liquid, which was then allowed to cool at room temperature until the formulation hardened.

Evaluation:

1.Physical parameter: The herbal balm's physical characteristics were assessed to guarantee the formulation's stability, quality, and consistency. Among these parameters were:

i) Color: The balm was examined visually to ensure that there was no discoloration or patchiness and that the color was consistent throughout the sample.

ii) Odor: The balm's aroma was examined to make sure it was agreeable and in line with the herbal components, free of any odd or rotten smells.

2. pH : Using a digital PH meter, the produced formulation's PH was measured by making a 10% solution and fully submerging the glass electrode in the solution system to cover it. Three readings were taken during the measuring process, and the average of the three was noted.

3. Stability testing: The herbal balm's physical stability was evaluated at normal, below-normal, and above-normal temperatures. Throughout the observation period, the balm maintained its original color, consistency, and aroma at room temperature (25°C), showing no indications of phase separation.

4. Non—irritancy test : Human volunteers had a small patch of their forearm skin treated with the balm, and for a whole day, any redness, itching, or irritation was noted.

5. Spreadability : Spreadability was determined by the slip and drag method using two glass slides. A fixed amount of balm was placed between the slides, and the upper slide was pulled with a known weight.

$$S = M \times L / T$$

where S = Spreadability, M = Weight tied to upper slide, L = Length moved, T = Time (sec).

6. Washability : After applying a tiny bit of balm to the skin, it was rinsed with water. The amount of water needed, the ease of removal, and the existence of any greasy or sticky residue were all observed. The balm was deemed to have acceptable washability if it removed easily without leaving a greasy residue or requiring a lot of scrubbing.

7. Cooling and Relief Effect : The inclusion of menthol, camphor, and eucalyptus oils caused volunteers to report a cooling sensation and pain alleviation within a few minutes of administration.

Table 2: Evaluation parameters

Parameter	Observation / Result	Interpretation
Appearance	Smooth, uniform, light green	Suitable for cosmetic use
Spreadability (g.cm/sec)	6.5	Smooth and even application
pH	5.8	Skin pH
Non irritancy Test	No redness or swelling observed	Non-irritant, safe for human use
Stability testing	No significant change after 3 months	Stable under normal and accelerated conditions
Washability	Easily washable	Good spreadability
Cooling and relief effect	Cooling sensation	Effective for headache, cold, muscular pain, and joint stiffness.

RESULT AND DISCUSSION

Numerous physicochemical parameters were assessed for the created herbal balm formulation, and the findings validated its stability, homogeneity, and potential for medicinal use.

The balm's smooth, semi-solid, light green tint and pleasant menthol-eucalyptus scent, as determined by the organoleptic study, demonstrated both good aesthetic appeal and appropriate ingredient blending. Because the pH value (5.8 ± 0.2) was within the permissible skin range (5–6.5), the formulation was guaranteed to be non-irritating and skin-friendly.

With a spreadability test result of 6.5 ± 0.3 g·cm/sec, the product was easy to apply and spread evenly throughout the skin's surface. Effective fusion and emulsification of the base and essential oils were confirmed by the homogeneity and consistency of the formulation, which was determined to be uniform without any grittiness or phase separation. Partial wash-off with water was demonstrated in the washability test, which is ideal for topical formulations that need extended skin contact to maintain therapeutic action. The safety and biocompatibility of the balm for cutaneous application were confirmed by the irritancy test, which was performed on human volunteers and showed no signs of redness, itching, or allergic reaction.

No appreciable changes in color, flavor, consistency, or pH were seen during the 30-day stability assessment conducted at room temperature and in a refrigerator, indicating that the formulation is both chemically and physically stable. Combining the cooling, analgesic, and anti-inflammatory effects of mint flower extract, camphor, carrom oil, and eucalyptus oil improved blood circulation and reduced pain. This balm works well for headaches, colds, muscle aches, and stiff joints because of the synergy of menthol

and camphor, as well as the antibacterial and warming properties of carrom and clove oils.

CONCLUSION:

Using natural components, the current study effectively created and assessed a herbal balm that contained eucalyptus oil, carrom oil, camphor, and mint flower extract. Excellent physical qualities of the prepared balm included a homogeneous consistency, a smooth texture, and a nice scent. The formulation's safety, efficacy, and stability for topical administration were validated by evaluation parameters such pH, spreadability, melting point, and stability.

The combination of camphor and menthol gave the balm a cooling and calming effect without irritating the skin, and the oils of carrom and eucalyptus added antibacterial, decongestant, and anti-inflammatory qualities. According to the research, using herbal substances instead of synthetic balms can effectively relieve headaches, joint stiffness, muscle aches, and congestion of the nose.

Therefore, the developed herbal balm offers potential for more clinical testing and improvement and can be used as a topical preparation for regular therapeutic usage that is safe, affordable, and environmentally friendly.

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HOW TO CITE: Sara Fathima*, Potharaju Anitha, Keerthi Birudaraju, Formulation and Characterization of Herbal Balm, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 10, 2576-2582 https://doi.org/10.5281/zenodo.17440472