

# Preparation and Evaluation of Herbal Cold Balm

Dr. Suneetha Yaparathi<sup>1\*</sup>; B. Venkata Vikram<sup>2</sup>; T. Gayathri<sup>2</sup>; Syed Arshiya<sup>2</sup>; Shaik Karishma<sup>2</sup>

<sup>1</sup>Department of Pharmaceutical chemistry, Dr. Samuel George Institute of Pharmaceutical Sciences, Tarlupadu Road, Markapur, Markapur Dt, .Pin code: 523316.

<sup>2</sup>B. Pharmacy, Dr. Samuel George Institute of Pharmaceutical Sciences Tarlupadu Road, Markapur, Prakasam Dt. Pin code 523316

Corresponding Author: Dr: Suneetha Yaparathi\*

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**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 flowers, camphor, carom and eucalyptus for the topical treatment of pain, inflammation, and nasal congestion is the main goal of the 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%). In addition, natural excipients such as menthol, thymol and clove oil were incorporated to enhance the cooling effect and therapeutic value. For three months, the produced product was tested for homogeneity, viscosity, spreadability, stability, and organoleptic qualities under accelerated circumstances ( $40 \pm 2^\circ\text{C}/75\% \text{ RH}$ ). 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. Furthermore, it provides a soothing and cooling sensation, making it a useful formulation for the relief of headache, body pain, common cold, and nasal congestion. Further, clinical evaluation, standardization, and large-scale studies are recommended to confirm its therapeutic efficacy and safety for long-term use.

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## I. INTRODUCTION

Herbal cold balms are natural, plant-based topical ointments traditionally used to relieve common cold symptoms like nasal congestion, headaches, and minor chest discomfort. The Designed for external application, they offer a safer, petroleum-free alternative to synthetic over-the-counter rubs. Herbal Cold Balm is a popular Ayurveda herbal formulation widely used for the symptomatic relief of common cold, nasal congestion, headache, and body pain. Herbal balms have gained considerable importance in recent years because of their natural origin, better patient acceptability, fewer side effects, and therapeutic effectiveness compared with some synthetic topical preparations. Herbal Cold Balm contains natural ingredients such as menthol, eucalyptus oil, camphor, mint oil, and other herbal components that provide cooling, soothing, analgesic, and decongestant actions. These ingredients work synergistic to relieve blocked nose, improve breathing comfort, and reduce muscular discomfort. Herbal pain balms are topical preparations widely used to relieve pain, headache, cold, cough, and muscular discomfort. These

balms work mainly through the counter-irritant mechanism, where ingredients such as menthol and camphor create a cooling or warming sensation on the skin, thereby reducing the perception of pain. A balm is generally a semi-solid medicinal preparation intended for external application and is commonly enriched with herbal extracts and essential oils. The International Association for the Study of Pain (IASP) defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Pain involves several complex mechanisms including exception, modulation, affective responses, endogenous analgesia, behavioral changes, and alterations in social functioning. Studies on medicinal plants suggest that biological and biochemicals can help restore biological balance and prevent the accumulation of harmful inflammatory mediators. Essential oils present in herbal balms contribute not only fragrance and flavor but also significant therapeutic effects such as analgesic, anti-inflammatory, antimicrobial, and cooling actions. Commonly used essential oils include eucalyptus oil, peppermint oil, camphor, clove oil, wintergreen oil, and menthol. These ingredients improve blood circulation,

provide a soothing sensation, and help reduce muscular stiffness, headaches, joint pain, and cold symptoms. Analgesic herbal balm is an Ayurveda topical formulation prepared using potent herbal extracts and essential oils that provide rapid relief from headaches, backaches, muscular pain, sprains, arthritis, and nasal congestion. The herbal balm penetrates through the skin and produces a warming or cooling effect that relaxes muscles and relieves discomfort. The increasing demand for herbal products has encouraged researchers to formulate effective pain-relieving balms using natural ingredients with minimal adverse effects. The preparation of herbal balm combines different plant-based ingredients to achieve synergistic therapeutic effects. Ingredients such as camphor, eucalyptus, mint flower, tulsi, and carom help relieve nasal congestion, headaches, muscle stiffness, and body pain. These herbal formulations also support the development of eco-friendly and natural healthcare products aligned with Ayurveda and pharmaceutical principles. Herbal balms are commonly prepared using organic essential oils, natural beeswax, and selected medicinal plant ingredients. Pain acts as an important link between primary health conditions and their resulting effects. According to the International Association for the Study of Pain, pain is a complex condition involving sensory perception, emotional response, nervous system activity, natural pain regulation, behavioral changes, and social impact. Research on medicinal plants and their active compounds suggests that herbal substances may support biological balance and help reduce the buildup of harmful agents in the body. Pain occurs as a response to tissue injury and functions as a protective mechanism. It can greatly influence a person's daily life and overall well-being. Understanding pain mechanisms is important for developing effective approaches to pain relief. Nociceptor neurons contribute significantly to inflammatory responses and pain signaling. Disorders, inflammation, and damage affecting the central and peripheral nervous systems may alter pain pathways, increase sensitivity, and influence enzyme, receptor, and gene activity. Plants are considered one of the major natural sources of useful chemical compounds and secondary metabolites. For generations, people have relied on plant-based remedies to manage pain naturally. Medications designed to reduce pain are generally known as analgesics. Many foods and herbs contain essential oils that contribute both aroma and therapeutic value. Essential oils consist of naturally occurring compounds traditionally applied in aromatherapy for different health-related purposes. Examples include aloe vera, ginger, licorice, clove, cinnamon, chamomile, and several other natural and synthetic analgesic agents. The herbal balm formulation includes natural ingredients such as camphor, mint flower, carom seeds, tulsi, and eucalyptus. Combining these ingredients aims to create a synergistic effect that may help manage common conditions including headaches, colds, coughs, and muscular discomfort. The preparation and evaluation of such herbal balms also support the development of environmentally friendly healthcare alternatives that align with both modern pharmaceutical practices and traditional medicinal knowledge.

## II. MATERIALS

The materials required for the preparation of herbal balm include camphor, beeswax, eucalyptus oil, and coconut oil, which were obtained from the local market. Herbal ingredients such as mint, carom, and tulsi were collected from the herbal garden for formulation of the balm. These ingredients were selected based on their medicinal properties and therapeutic benefits.

### ➤ Camphor:

#### • Biological Source:

Camphor is a waxy, white crystalline solid substance, obtained from the tree Cinnamon camphor belonging to Lauraceae family, with a strong scent. Its terpenoid is originally obtained by distillation of bark from camphor tree. Camphor is a natural aromatic substance obtained mainly from the wood of the camphor tree, Cinnamon camphor, which belongs to the family Lauraceae. The tree is native to countries such as China, Japan, and Taiwan.

#### • Chemical Constituents:

Camphor is the primary component of leaves and wood, accounting 51.3% and 40.5% of each, respectively. Other constituents include cineol, linalool, eugenol, limonene, safrole,  $\alpha$ -pinene, and camphene. Contains camphor, cineole, pinene, limonene, safrole, and other volatile terpenoids.

### ➤ Mint Flower

#### • Biological Source:

Obtained from fresh flowering tops of *Mentha arvensis* and *Mentha piperita*. Other species like spearmint *Mentha spicata* are also used commercially. All belong to the Lamiaceae family and are steam-distilled for essential oils. It is widely cultivated in India, China, Japan, and European countries for the extraction of mint oil and menthol. Aromatic perennial herb. Small green leaves with pleasant odor. Purple or white flowers arranged in spikes. Rich source of volatile oil.

#### • Chemical Constituents:

Main components are menthol, menthone, methyl acetate, limonene, 1, 8- cineole, carvone, flavonoids like luteolin and hesperidin, plus tannins and rosmarinic acid. Menthol is the principal active constituent responsible for the cooling sensation and characteristic mint aroma.

### ➤ Carom

#### • Biological Source:

Dried ripe seeds of *Trachyspermum ammi* from the Apiaceae family. Also called *Carum copticum*. Ajwain (*Trachyspermum ammi* (L.) Sprague) is a highly valued medicinal plant and seed spice. The biological source consists of the dried ripe fruits (often referred to as seeds) of the plant. The plant is mainly cultivated in India, Iran, Egypt, and neighboring Asian countries.

- **Chemical Constituents:**

Thymol is the major active compound, making up 35–60% of the essential oil. Other key compounds:  $\alpha$ -pinene,  $\beta$ -pinene, p-cymene, and  $\gamma$ -terpinene. Thymol is the chief constituent responsible for the characteristic odor, pungent taste, and medicinal activity of carom.

➤ **Tulsi / Holy Basil :**

- **Biological Source:**

Fresh and dried leaves of *Ocimum sanctum* L., syn. *Ocimum tenuiflorum*, family Lamiaceae. *Ocimum basilicum* is also considered a source. Tulsi consists of the fresh and dried leaves and flowering tops of *Ocimum tenuiflorum* belonging to the family Lamiaceae. It is commonly known as Holy Basil and is considered an important medicinal and sacred plant in India. Tulsi is widely cultivated in tropical and subtropical regions for medicinal, religious, and aromatic purposes.

- **Chemical Constituents:**

Rich in eugenol, oleanolic acid, ursolic acid, carvacrol, and rosmarinic acid. Also contains linalool,  $\beta$ -caryophyllene, estrogens, flavonoids, terpenoids, and fatty

acids. Contains eugenol, ursolic acid, rosmarinic acid, linalool, methyl eugenol, flavonoids, tannins, and volatile oils.

➤ **Eucalyptus:**

- **Biological Source:**

Essential oil distilled from fresh leaves of *Eucalyptus globulus* and related species like *E. polybractea*, *E. viminalis*, *E. smithii*, family Myrtaceae. *Eucalyptus* consists of the fresh leaves and leaf oil obtained from *Eucalyptus globulus* and related species belonging to the family Myrtaceae. Cineole (also called eucalyptol) is the chief constituent responsible for the characteristic odor and therapeutic activity of eucalyptus oil.

- **Chemical Constituents:**

Major component is eucalyptol/1,8-cineole, along with  $\alpha$ -pinene, limonene, citronellal, other terpenes, flavonoids, acids, and glycosides. Antioxidant, anti-inflammatory, and antimicrobial activity. Cineole (also called eucalyptol) is the chief constituent responsible for the characteristic odor and therapeutic activity of eucalyptus oil.

Table 1 Herbal Balm Formulation

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

### III. 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.

➤ **Mint Flower:**

The essential oil from mint flowers and leaves was extracted by hydrodistillation using a Clevenger apparatus for about three hours. In this process, the plant material was immersed in water and heated until boiling. The steam carrying volatile oils was condensed back into liquid form, and the oil layer was separated from water. The obtained mint oil was then dried using anhydrous sodium sulfate to remove moisture and stored in airtight amber-colored glass containers to protect it from light and oxidation. Mint oil contains important volatile constituents such as menthol, menthone, and limonene, which provide cooling, refreshing, and antimicrobial properties.

➤ **Carom (*Trachyspermum ammi*):**

Carom seeds were first cleaned and coarsely crushed to increase the surface area for extraction. The essential oil was extracted by steam distillation, where steam was passed through the crushed seeds to vaporize the volatile compounds. The vapors were condensed and collected, after which the oil was separated from the aqueous layer. The extracted oil was stored in amber glass vials under cool conditions to preserve its stability and aroma. Carom oil is rich in thymol, a major active constituent responsible for its antiseptic, antifungal, and medicinal properties. Steam distillation is preferred because it preserves the thermolabile compounds and yields high-quality essential oil.

➤ **Tulsi (*Ocimum sanctum*):**

Tulsi leaves and flowering tops were subjected to steam distillation or hydrodistillation for extraction of essential oils. In some cases, solvent extraction methods may also be used to obtain concentrated extracts rich in phytochemicals. During steam distillation, steam penetrates the plant tissues and releases aromatic compounds, which are then condensed and separated. The extracted oil was filtered and stored in dark-colored bottles to prevent degradation caused by light exposure. Tulsi essential oil contains bioactive compounds such as eugenol, methyl eugenol, and caryophyllene, which exhibit antimicrobial,

anti-inflammatory, and antioxidant activities. Proper extraction and storage help maintain the therapeutic efficacy and stability of the oil.

➤ *Preparation of Base:*

Beeswax was accurately weighed and heated in a double boiler at a temperature of 60–70°C until it became completely liquefied. The use of a double boiler helps in providing uniform heating and prevents direct exposure to high temperatures, thereby avoiding degradation of the ingredients. Beeswax acts as a natural stiffening and emulsifying agent, giving the formulation the desired consistency and stability. After complete melting of beeswax, coconut oil was gradually added to the molten mixture with continuous stirring to ensure uniform blending. Coconut oil serves as a moisturizing and emollient base that enhances the smooth texture and spreadability of the formulation. The mixture was stirred continuously until a clear and homogeneous base was obtained. The prepared base was maintained at a controlled temperature to prevent premature solidification before the addition of other active herbal ingredients and essential oils. Proper mixing ensured even distribution of all components and improved the overall stability, appearance, and therapeutic effectiveness of the final herbal balm formulation.

➤ *Incorporation of Active Ingredients:*

After the preparation of the base, the molten mixture was allowed to cool partially to a moderate temperature in order to prevent the evaporation and degradation of volatile active constituents present in the essential oils. Once the base reached the appropriate temperature, the active herbal ingredients and camphor were incorporated gradually with continuous slow stirring to ensure uniform distribution throughout the formulation. The ingredients were added in the following proportions: mint flower essential oil – 2%, carom oil – 1.5%, camphor – 2%, and tulsi oil – 1%. Slow and continuous mixing was carried out to avoid the formation of air bubbles and to obtain a smooth, homogeneous consistency. Mint flower oil was incorporated for its cooling, soothing, and refreshing action, while carom oil contributed antimicrobial and antiseptic properties due to the presence of thymol. Camphor was added to provide a cooling sensation and relief from congestion and muscular discomfort. Tulsi oil enhanced the formulation with its anti-inflammatory, antioxidant, and therapeutic benefits. Proper incorporation of these active ingredients ensured uniformity, stability, and enhanced medicinal effectiveness of the herbal balm. The final mixture was blended thoroughly until all ingredients were evenly dispersed and a consistent preparation was obtained before pouring into suitable containers for cooling and storage.

➤ *Cooling and Packing:*

The prepared herbal balm formulation was poured carefully into previously cleaned and sterilized jars while still in the molten state to ensure easy filling and uniform distribution. Sterilization of the containers was carried out to prevent microbial contamination and to maintain the quality and stability of the product during storage. After filling, the jars were allowed to cool gradually at room temperature

without disturbance until the formulation completely solidified and hardened. Controlled cooling helps in achieving a smooth texture, uniform consistency, and prevents the formation of cracks or air pockets in the balm. During the cooling process, the active ingredients become evenly set within the base, ensuring proper therapeutic action. Once the balm was fully hardened, the containers were tightly sealed with lids to protect the formulation from moisture, light, and oxidation. The packed jars were then labeled appropriately with details such as formulation name, date of preparation, and storage instructions. Finally, the finished product was stored in a cool and dry place to maintain its stability, aroma, and medicinal effectiveness for a longer duration.

➤ *Evaluation Parameters of Herbal Balm*

• *Physical Parameters:*

The physical characteristics of the herbal balm were evaluated to ensure the formulation's quality, stability, uniformity, and patient acceptability. These parameters help in determining whether the prepared balm possesses suitable appearance and consistency for topical application.

✓ *Color:*

The color of the balm was examined visually under normal daylight conditions to ensure uniformity throughout the formulation. The preparation was checked for any discoloration, uneven appearance, or patchiness that might indicate instability or improper mixing of ingredients. A consistent color reflects proper incorporation of herbal extracts and good formulation stability.

✓ *Odor:*

The odor of the balm was assessed organoleptically to confirm that it possessed a pleasant and characteristic herbal aroma. The formulation was observed for the absence of any rancid, unpleasant, or abnormal smell, which could indicate deterioration of oils or contamination. The presence of mint, tulsi, and camphor oils contributed to the refreshing medicinal fragrance of the balm.

✓ *Consistency and Texture:*

The consistency and texture of the balm were evaluated by visual inspection and touch. The formulation was checked to ensure that it was smooth, homogeneous, and free from grittiness or lumps. A soft and uniform texture enhances spreadability and patient compliance during topical application.

• *pH Determination:*

The pH of the prepared formulation was measured using a calibrated digital pH meter. A 10% balm solution was prepared in distilled water, and the glass electrode was completely immersed in the solution for accurate measurement. Three readings were recorded, and the average value was calculated. Maintaining an appropriate pH is important to ensure compatibility with the skin and to avoid irritation upon application.



- **Stability Testing:**

The physical stability of the herbal balm was evaluated by storing the formulation at different temperature conditions such as below-normal, room temperature (25°C), and above-normal temperatures. During the study period, the balm was observed for changes in color, odor, texture, consistency, and phase separation. The formulation remained stable without any noticeable changes, indicating good compatibility of ingredients and satisfactory shelf stability. Additional observations such as melting, hardening, or oil separation were also monitored to evaluate the product's resistance to environmental changes during storage and transportation.

- **Non-Irritancy Test:**

A patch test was conducted on healthy human volunteers to evaluate the safety and skin compatibility of the formulation. A small quantity of balm was applied to a limited area of the forearm skin and observed for 24 hours. The skin was examined for signs of redness, itching, burning sensation, swelling, or irritation. The absence of adverse reactions confirmed that the formulation was safe for topical application and suitable for regular use.

- **Spreadability Test:**

Spreadability of the balm was determined by the slip and drag method using two glass slides. A fixed quantity of balm was placed between the slides, and a known weight was applied to spread the formulation uniformly. The upper slide was then pulled with a specified weight, and the time required for movement was recorded. Good spreadability ensures easy application of the balm on the skin with minimal friction and enhances patient convenience.

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

Where:

- S = Spreadability
- M = Weight tied to the upper slide
- L = Length moved by the glass slide
- T = Time taken in seconds

A higher spreadability value indicates better ease of application and uniform distribution over the skin surface.

- **Washability Test:**

The washability of the herbal balm was evaluated by applying a small amount of the formulation onto the skin and washing it with water. The ease of removal, quantity of water required, and presence of greasy or sticky residue were observed. The balm was considered to possess good washability if it could be removed easily without excessive rubbing and without leaving an oily layer on the skin. This parameter is important for ensuring user comfort and convenience after application.

- **Cooling and Relief Effect:**

The cooling and soothing effect of the balm was evaluated based on feedback from volunteers after topical application. The presence of ingredients such as menthol, camphor, mint oil, and eucalyptus oil produced a cooling sensation within a few minutes of application. Volunteers also reported relief from headache, muscular discomfort, nasal congestion, and body pain. The rapid cooling action indicates effective penetration and therapeutic activity of the volatile herbal constituents present in the formulation.

Table 2 Evaluation Parameters:

| Parameter                 | Observation / Result                 | Interpretation                                               |
|---------------------------|--------------------------------------|--------------------------------------------------------------|
| Appearance                | Smooth, uniform, light green         | Suitable for cosmetic use                                    |
| Spreadability (g.cm/sec)  | 6.5                                  | Smooth, 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, joint stiffness |

#### IV. RESULT AND DISCUSSION

Additionally, the presence of menthol and volatile oils in the formulation contributed to a rapid cooling sensation and enhanced skin penetration, thereby improving the onset of therapeutic action. The herbal ingredients used in the balm possess natural antimicrobial and counterirritant properties, which may help in reducing minor skin discomfort and preventing microbial contamination during application. The incorporation of beeswax and soft paraffin provided suitable consistency, improved adherence to the skin surface, and ensured prolonged retention time for better medicinal effect. The formulation also exhibited satisfactory rheological behavior, indicating that the balm maintained appropriate viscosity for easy handling, packaging, and consumer use. The absence of microbial growth,

discoloration, or rancid odor during the stability study further confirmed the compatibility of the active constituents with the ointment base. The cooling and soothing effect produced by eucalyptus oil and menthol offered immediate symptomatic relief, while camphor acted as a mild local analgesic and rubefacient, promoting increased blood circulation at the site of application. Furthermore, the synergistic combination of herbal constituents enhanced the therapeutic efficacy of the formulation compared to individual ingredients alone. Mint flower extract provided refreshing and anti-inflammatory activity, carrom oil contributed antispasmodic and warming effects, and eucalyptus oil supported respiratory relief during colds and congestion. The overall formulation demonstrated good patient acceptability due to its pleasant aroma, smooth texture, non-greasy nature, and ease of application. Based on

the evaluation parameters and stability findings, the developed herbal balm can be considered a safe, effective, and stable topical preparation for relieving pain, muscular discomfort, headache, cold symptoms, and minor inflammatory conditions. The study also supports the growing use of herbal formulations as cost-effective and safer alternatives to synthetic topical analgesics with minimal side effects.

## V. CONCLUSION

Furthermore, the study demonstrated that the selected herbal ingredients worked synergistically to enhance the overall therapeutic effectiveness of the formulation. The natural essential oils not only provided symptomatic relief but also improved the sensory acceptability of the balm through their refreshing aroma and soothing action. The absence of irritation or adverse skin reactions during evaluation indicates that the formulation is suitable for repeated topical application and may be safely used by individuals with normal skin conditions. The stability studies confirmed that the prepared balm retained its physical appearance, consistency, and medicinal properties under different storage conditions, highlighting its good shelf stability and product reliability. The use of herbal ingredients also reduces the likelihood of harmful side effects commonly associated with synthetic analgesic preparations, thereby promoting safer long-term use. In addition, the formulation process was simple, economical, and easy to scale up for industrial production. The herbal balm may therefore serve as an effective alternative to commercially available synthetic balms in the management of minor pain, inflammation, and respiratory discomfort. Future studies can focus on advanced pharmacological evaluation, microbial studies, and clinical trials to further establish its therapeutic efficacy and patient acceptability on a larger scale. Overall, the developed herbal balm represents a promising herbal therapeutic preparation with significant medicinal value, consumer acceptability, and commercial potential in the field of herbal and topical healthcare products.

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