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A Review on Herbal Pain-Relieving Balm

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Abstract: ***Herbal pain-relieving balms are semisolid topical preparations designed to provide localized relief from mild pain and discomfort. Their action is generally associated with ingredients that produce cooling or warming sensations after application to the skin, thereby influencing the perception of pain. Menthol and camphor are commonly used as counter-irritant agents, while rosemary oil may contribute herbal properties to the formulation. Beeswax provides consistency and structural support, whereas castor oil acts as an oily vehicle and emollient. This review discusses the formulation principles of herbal pain-relieving balms, the functions of selected ingredients, general methods of preparation, and commonly used evaluation parameters. It also highlights the importance of selecting suitable ingredients and assessing the physical properties, stability, and skin compatibility of the prepared balm. The information presented may provide a basic framework for the formulation and evaluation of herbal pain-relieving balms.***

Keywords: Herbal balm, topical formulation, pain relief, menthol, camphor, rosemary oil, beeswax, counter-irritant.

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I. INTRODUCTION

Pain can be described as a sensory and emotional response that may occur following actual or possible tissue injury. Topical preparations are applied directly to the skin when a localized effect is required. A balm is a semisolid preparation intended for external use and may contain medicinal or aromatic substances.

Herbal pain-relieving balms may contain ingredients such as menthol and camphor that produce noticeable cooling or warming sensations after application to the skin. These sensory effects may influence the perception of discomfort at the application site. Menthol is mainly associated with a cooling effect, whereas camphor may produce cooling or warming sensations depending on its concentration and formulation. Herbal formulations have gained attention because they can combine plant-derived ingredients with suitable topical excipients. Each ingredient should be selected according to its intended function in the formulation. The use of menthol, camphor, rosemary oil, beeswax and castor oil should be supported by relevant literature and their specific roles in the formulation. Tension-type headache is one example of a condition for which topical preparations containing cooling or counter-irritant ingredients are traditionally used. The present review focuses on the formulation concept rather than claiming treatment of a specific disease

II. OBJECTIVES

1) To study the ingredients used in herbal pain-relieving balm.
2) To understand the role of different ingredients in pain relief.
3) To study the formulation and evaluation of herbal pain-relieving balm.
4) To understand the benefits and applications of herbal pain-relieving balm.

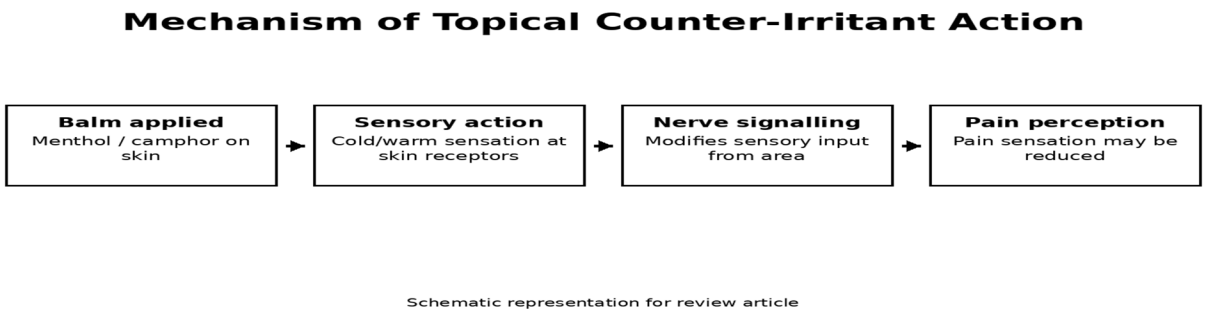


Figure 1. concept of topical counter-irritant action

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III. HERBAL PAIN-RELIEVING BALM

A herbal pain-relieving balm is a topical semisolid preparation containing one or more herbal or naturally derived active ingredients incorporated into a suitable base. The base provides the required consistency, spreadability and ease of application, while selected active ingredients provide the intended topical sensory or therapeutic effect.

The formulation should be homogeneous, smooth, stable and acceptable for topical use. The final product should also be evaluated for physical properties and, where appropriate, skin compatibility.

IV. COUNTER-IRRITANTS AND TOPICAL PAIN RELIEF

Counter-irritants act mainly at the skin and sensory nerve level. Menthol and camphor are frequently used in topical preparations because they produce distinctive cooling or warming sensations. The resulting sensory input can alter the perception of discomfort from the underlying area. This mechanism should be described as modulation of pain sensation rather than as simple removal of the underlying cause of pain.

The concentration of counter-irritant ingredients is important because excessive amounts may increase local irritation. Therefore, formulation development should include appropriate concentration selection and evaluation of skin tolerability.

V. DRUG PROFILE

A. Menthol

Synonyms: Peppermint camphor; L-menthol

Biological Source: Menthol is mainly obtained from the essential oil of Mentha arvensis and other Mentha species

Family: Lamiaceae

Chemical constituents: Menthol (40.7%), menthone (23.4%), menthyl acetate, 1,8-cineole, limonene, beta-pinene and beta-caryophyllene. [Verify percentages and composition against the cited source.]

Uses:

1. Topical pain relief
2.In migraine headache.
3.Cooling effects.
4.To reduce inflammation.

Menthol is a cyclic monoterpene alcohol mainly obtained from mint-derived oils. It is characterized by a pleasant mint-like odour and produces a cooling sensation following topical application. Because of its sensory and counter-irritant properties, menthol is incorporated into different topical preparations. It has limited solubility in water but dissolves readily in several organic solvents.



Figure 1. Menthol

Role in balm: active counter-irritant and cooling agent.

B. Camphor

Synonyms: Camphor; Alcanfor; 2-Camphanone.

Biological Source: Camphor is primarily obtained from the wood of Cinnamomum camphora, commonly known as the camphor tree.

Family: Lauraceae.

Chemical constituents: camphor (51.3%), 1,8-cineole (4.3%), and alpha-terpineol.

Uses:

1. Used to relieve minor muscle and joint pain.
2. Gives a cooling sensation on the skin.
3. Acts as a topical counter-irritant.
4. Used in balms and liniments.

Camphor is a naturally occurring terpenoid obtained from Cinnamomum camphora and related sources. It has a strong characteristic odour and is used in topical preparations as a counter-irritant and sensory agent. Camphor is volatile and can contribute to the characteristic sensation and aroma of a balm.



Figure 2. Camphor

Role in balm: topical counter-irritant and aromatic active.

C. Rosemary Oil

Synonyms: Rosemary oil; Oleum rosmarini.

Biological Source: Rosemary oil is the volatile oil obtained by distillation of the aerial parts of Rosmarinus officinalis L., now classified as Salvia rosmarinus Spenn.

Family: Lamiaceae.

Chemical constituents: 1,8-cineol (38.5%), Camphor (17.1%), limonene (6.23%), camphene (6.00%) and linalool (5.70%)

Uses:

1. Used in balm and cosmetic formulations.
2. Investigated for topical antioxidant and anti-inflammatory activity.
3. Used as a complementary botanical component in balm and cosmetic formulations.
4. Contributes characteristic aroma to topical formulations.

Rosemary oil is an essential oil obtained from rosemary. Its composition may include compounds such as 1,8-cineole, camphor, limonene, camphene and linalool, depending on source and processing. Rosemary oil is investigated for topical applications and may contribute an herbal aroma and complementary botanical activity.

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Figure 3. Rosemary oil

Role in balm: herbal essential-oil component and aromatic agent.

D. Castor Oil

Synonyms: Castor oil; Ricinus oil.
Biological Source: Castor oil is obtained from the seeds of Ricinus communis by suitable extraction methods.
Family: Euphorbiaceae.
Chemical constituents: Castor oil mainly contains triglycerides of ricinoleic acid (about 80–90%).

Uses:
1. Used as an oily vehicle in topical formulations.
2. Helps improve spreadability and skin feel of semisolid preparations.
3. Used in pharmaceutical and cosmetic preparations.
4. Provides an oily base component in balm formulations.

Castor oil is a vegetable fixed oil obtained from Ricinus communis seeds. It is rich in ricinoleic acid and can act as an emollient and oily vehicle in topical balm formulations.



Figure 4. Castor oil

Role in balm: oily vehicle/emollient.

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E. BEESWAX

Synonyms: Beeswax; White beeswax; Cera alba.

Biological Source: Beeswax is secreted by worker honey bees, principally Apis mellifera, and is purified for pharmaceutical use.

Family: Apidae (verify taxonomy/reference)

Chemical constituents: Myricylpalmitate (80%), free cerotic acid (15%), melissic acid cerolein.

Uses:

1. Used as a thickening agent in balm formulations.
2. Helps provide structure to ointments, balms and creams.
3. Used as a protective and emollient ingredient in topical preparations.
4. Helps maintain the semisolid consistency of balm formulations.

Beeswax is a natural wax used in pharmaceutical and cosmetic semisolids. It increases consistency and can act as a structuring or stiffening agent. In a balm, beeswax helps produce a semisolid consistency that remains sufficiently firm in the container while allowing application to the skin.



Figure 5. Beeswax

Role in balm: stiffening/structuring agent and consistency enhancer.

VI. GENERAL FORMULATION APPROACH

A typical balm may be prepared by melting the wax and oily vehicle, incorporating suitable ingredients at appropriate temperatures, mixing until uniform, and filling the product into suitable containers. Volatile ingredients such as essential oils, menthol and camphor require appropriate handling to minimize unnecessary loss during processing.

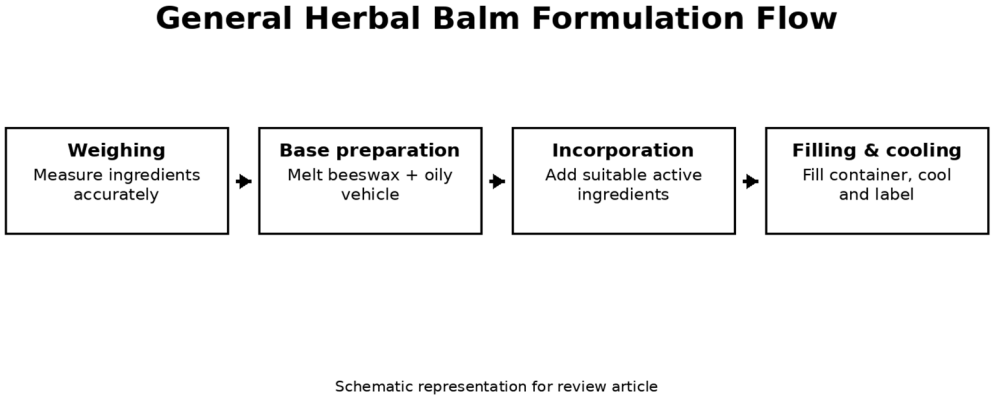


Figure 6. General herbal balm formulation flow

VII. LITERATURE SURVEY

1) Ghori et al. (2016): The study evaluated a formulation containing camphor, menthol, and thymol for its pain-relieving and anti-inflammatory effects. The formulation showed potential for use in topical preparations for pain relief and inflammation.
2) Ghode et al. (2020): The study focused on preparing a paracetamol-containing pain balm and checking its basic properties, compatibility, and stability.
3) Markad et al. (2024:The researchers prepared a herbal balm for pain relief using ingredients such as castor oil, menthol, eugenol, camphor, rose oil, and beeswax.
4) Gaikwad et al. (2024): A herbal pain-relieving balm was prepared and evaluated in the study. Menthol was included for its cooling and pain-relieving effects.
5) Bindod et al. (2025): The study involved the preparation of a herbal balm containing beeswax, camphor, methyl salicylate, and essential oils. Its basic properties, stability, spreadability, washability, pH, and skin compatibility were evaluated.
6) Gondane et al. (2025): A herbal balm containing Mimosa pudica leaf extract was developed for headache and migraine. The prepared balm showed good spreading properties and was found to be non-irritating.
7) Hoang et al. (2023): The authors reviewed studies on topical products containing camphor and menthol. These ingredients were found to have possible benefits in pain management, although more research is needed.
8) Subhash et al. (2017): The study developed and validated a method for measuring menthol and methyl salicylate in topical creams and gels.
9) Bogdanov (2009): The article described the composition, properties, uses, and different applications of beeswax.
10) USP (2016): The United States Pharmacopeia provides standard information about menthol, including requirements related to its identity and quality.

VIII. FORMULATION DEVELOPMENT CONSIDERATIONS

The formulation should be designed by defining the role of each ingredient before selecting concentrations. Trial batches may be prepared by varying the proportions of the base and active ingredients within scientifically justified limits. Exact concentrations should be selected from validated literature, institutional guidance or a guide-approved formulation and should not be invented solely for the review article.

Important development considerations include homogeneity, ease of spreading, appropriate consistency, pleasant odour, absence of grittiness, physical stability and skin compatibility.

IX. EVALUATION PARAMETERS

Parameter	Purpose
Appearance	Checks overall physical appearance of the balm.
Colour	Checks uniformity and acceptable appearance.
Odour	Checks characteristic odour and any unpleasant change.
Homogeneity	Checks whether all the ingredients are mixed properly and spread evenly throughout the balm.
Grittiness	Checks presence of coarse particles.
Spreadability	Assesses the ease of applying the balm to the skin.
Washability	Assesses ease of removal after application.
pH	Assesses whether the balm is suitable for application on the skin.
Skin irritation/compatibility	Assesses local tolerability using an appropriate ethical and approved procedure.
Stability	Monitors physical changes during storage under selected conditions.

X. ADVANTAGES

1) Convenient and easy external application.
2) Provides a cooling or soothing sensation on the applied area of the skin.
3) Can incorporate selected plant-derived ingredients.
4) Semisolid consistency can provide good residence at the application site.

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XI. DISADVANTAGES

1) Some ingredients may cause skin irritation or contact dermatitis.
2) Some drugs may not pass easily through the skin.
3) Some ingredients may cause allergic reactions in certain people.
4) The effect of the formulation may vary depending on the ingredients and their concentration.

XII. LIMITATIONS

1) Topical balms may mainly provide symptomatic sensory relief and should not be considered a substitute for diagnosis of persistent or severe pain.
2) Essential oils and counter-irritants can cause irritation in sensitive individuals.
3) Volatile ingredients may be lost during processing or storage if packaging is inadequate.
4) Quality and composition of natural materials can vary with source and processing.
5) Claims about therapeutic efficacy require appropriate experimental or clinical evidence.

XIII. FUTURE SCOPE

Future work may focus on improving the composition of the herbal pain-relief preparation, comparing different active ingredient combinations, enhancing product stability and packaging, using suitable testing methods, and checking product safety. A formulation project can then prepare small trial batches and compare their physical properties and overall performance.

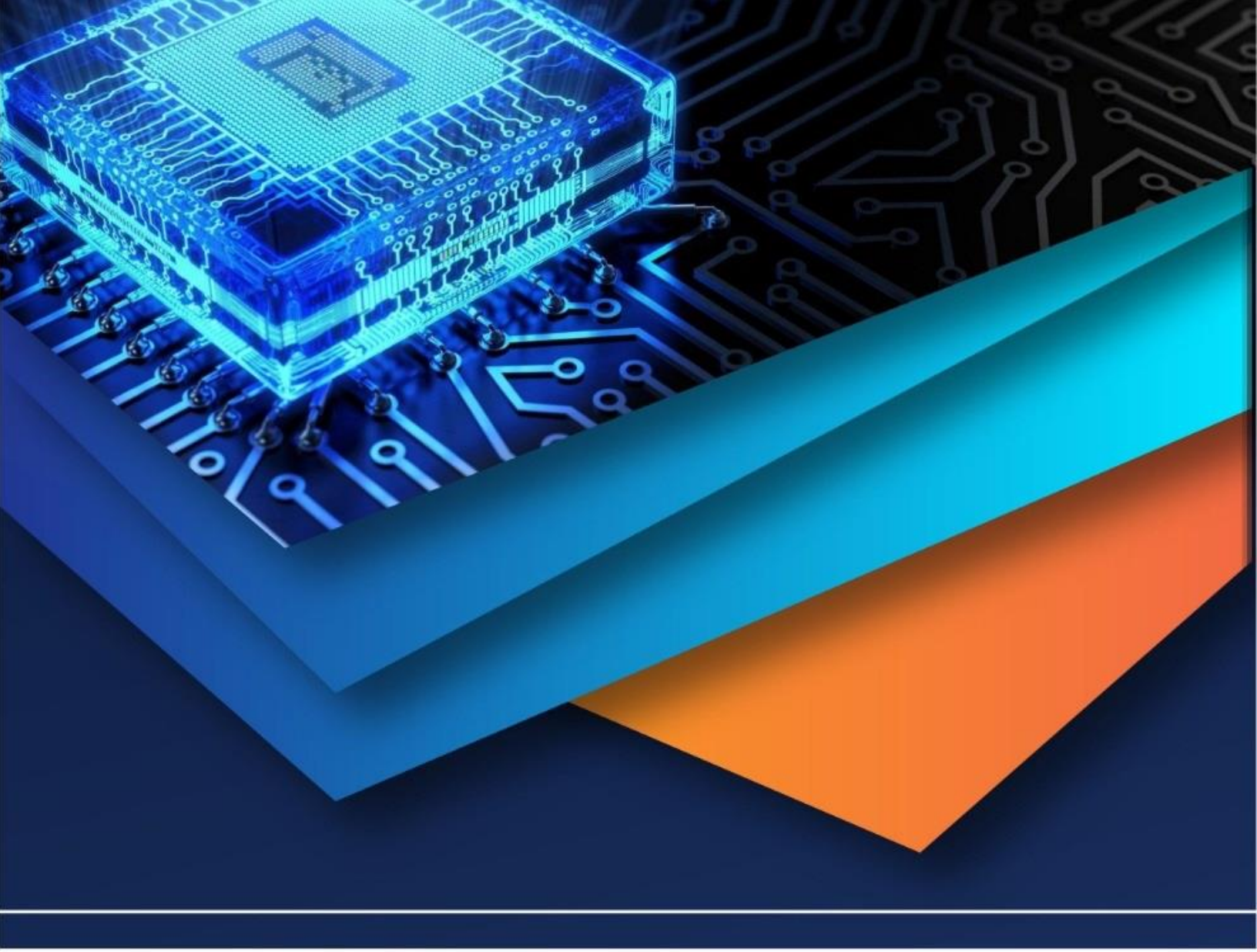
XIV. CONCLUSION

Herbal pain-relieving balms are useful topical semisolid systems in which naturally derived ingredients can be combined with suitable pharmaceutical excipients. Menthol and camphor provide the main counter-irritant/sensory components considered in the present review, while rosemary oil can contribute a botanical component and beeswax and castor oil can provide formulation support. A scientifically justified formulation should clearly define the purpose of every ingredient and should be evaluated for physical quality, stability and topical compatibility. The present corrected review provides a suitable literature base for subsequent formulation and evaluation work.

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