Int. J. Sci. R. Tech., 2026 3(5)
A Multidisciplinary peer-reviewed Journal
www.ijsrtjournal.com [ISSN: 2394-7063]

Original Article

Formulation And Evaluation Of Cold Cream With Borax

Azhar M. Mulla*, Vishakha B. Kasbe, Sampat D. Navale

Delight College of Pharmacy, Koregaon Bhima, Pune, Maharashtra, India-412216.

ABSTRACT

Cold cream is a classical water-in-oil (w/o) emulsion used as a skin-conditioning and cleansing agent that produces a cooling sensation on application. The present work focuses on the formulation and evaluation of cold cream using borax as an in-situ emulsifying agent. Borax reacts with free fatty acids present in beeswax and oils to form sodium soaps, which act as anionic surfactants and stabilize the w/o emulsion without requiring additional synthetic emulsifiers. The formulation was prepared by melting beeswax in liquid paraffin to form the oil phase, while borax was dissolved in purified water to form the aqueous phase, followed by slow addition of the aqueous phase into the oil phase under continuous stirring and subsequent cooling to obtain a smooth semi-solid mass. The prepared cold cream was evaluated for organoleptic properties, pH, viscosity, spreadability, homogeneity, phase separation, and skin irritation. The pH of the cream was found to be within the skin-compatible range (approximately 5.5–7.0), while the viscosity and spreadability indicated good emollient and non-irritant properties. The cream showed uniform texture, absence of cracking or oil separation, and easy extrudability from tubes during storage. Preliminary patch testing on volunteers revealed no significant erythema or irritation, suggesting good skin tolerance. The use of borax not only enhanced emulsification but also contributed mild antimicrobial and buffering effects. Thus, borax-based cold cream proves to be a simple, cost-effective, and stable cosmetic formulation suitable for conditioning dry to normal skin.

Keywords: borax, antimicrobial, cooling sensation, homogeneity.

INTRODUCTION

Cold cream is a classical, water-in-oil (w/o) semi-solid emulsion widely used in cosmetics for skin cleansing, moisturizing, and as a protective barrier against environmental stressors. Its characteristic cooling effect is attributed to the slow evaporation of the aqueous phase, which draws latent heat from the skin surface, thereby producing a soothing sensation. Traditionally, cold cream formulations rely on beeswax and an alkali such as borax (sodium borate) to generate an in-situ emulsifier, making the system self-emulsifying and reducing the need for additional synthetic surfactants.[1]

Borax plays a dual role in cold-cream formulations: it acts as an alkaline agent that reacts with free fatty acids released from beeswax and oils to form sodium soaps, which stabilize the w/o emulsion, and also functions as a mild buffering and antimicrobial agent. This mechanism enhances the cream's physical stability, texture, and microbial resistance, while keeping the formulation relatively simple and economical. Recent studies on herbal and natural-ingredient-based cold creams have further explored borax-containing systems, incorporating plant oils and extracts (e.g., neem oil, almond oil, aloe vera, rose water, or honey) to improve skin-nourishing and antioxidant properties without compromising stability.[1]

Despite its widespread use, the concentration and safety profile of borax in topical products require careful optimization, as excessive alkalinity or dose may lead to skin irritation in sensitive individuals. Therefore, systematic formulation development followed by physicochemical evaluation—covering pH, viscosity, spreadability, homogeneity, phase separation, and preliminary skin-compatibility testing—is essential for ensuring a safe, stable, and cosmetically acceptable borax-containing cold cream. The present work is designed to formulate a cold cream using borax as the primary emulsifying agent and to evaluate its key quality attributes in accordance with standard cosmetic-formulation research protocols.2,3

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.

RATIONALE AND SIGNIFICANCE

Modern cold-cream formulations are preferred for makeup removal, dry-skin conditioning, and as a protective occlusive layer. Borax has been widely used in beeswax-based cold creams because it reduces the need for additional emulsifiers and stabilizers, while still providing a smooth, non-greasy texture. From a pharmaceutical perspective, studying borax-containing cold cream helps understand w/o emulsion behaviour, self-emulsification, and safety within cosmetic limits.4,5,6

DRUG PROFILE

Borax (Sodium Tetraborate) in Cold Cream

Chemical name: Sodium tetraborate decahydrate

CAS Number: 1303-96-4

Empirical formula:

Molecular weight: 381.37 g/mol

1. Chemical and physical properties Borax is a white, crystalline, odorless powder soluble in water and slightly alkaline in aqueous solution. The aqueous solution acts as a weak buffer and saponifies free fatty acids present in beeswax and oils to form sodium soaps, which serve as the primary emulsifying agents in cold-cream formulations. It is commonly used in concentrations ≤1.5% in cosmetic creams to avoid excessive alkalinity and skin irritation.[7,8]

2. Role in cold cream In beeswax-borax cold creams, borax functions as a self-emulsifying agent by reacting with free fatty acids of beeswax and oils to generate in-situ sodium soaps that stabilize a water-in-oil (w/o) emulsion. This reduces the need for additional synthetic surfactants and imparts a smooth, non-gritty texture. Borax also acts as a buffer, helping to maintain pH near neutrality, and contributes mild antimicrobial and keratolytic effects, which aids in skin cleansing and bacterial control in the cream.[7,8]

3. Pharmacological and safety profile Borax and boric acid are classified as cosmetic biocides and buffering agents. The Cosmetic Ingredient Review (CIR) Expert Panel has concluded that sodium borate (borax) and boric acid are safe for use in cosmetics at concentrations up to 5%, provided they are not applied to infants or on broken skin. However, prolonged or high-dose exposure may cause skin irritation, allergic contact dermatitis, or systemic toxicity if absorbed through damaged skin or mucous membranes; hence, its use is restricted or avoided in leave-on products in some regulatory regions.[7,8]

4. Relevance in research papers Recent formulation-and-evaluation studies on cold creams and herbal cold creams have employed borax within the 0.5–1.5% range to achieve stable w/o emulsions with good emollient, cleansing, and microbial-inhibiting properties. These studies report that borax-based creams show acceptable pH (5.5–7.0), good viscosity, spreadability, and skin compatibility, reinforcing its role as a practical, low-cost emulsifying and buffering agent in topical cosmetic bases.[1,3,8,9]

MATERIALS AND METHODS

1. Ingredients

Commonly used ingredients for a standard borax-containing cold cream are listed below.

Ingredient	Function	Quantity (for 100g)
Liquid Paraffin	Oil phase, emollient	50.0g
Beeswax(white)	Thickener, w/o stabilizer	16.0g
Borax	In-situ emulsifier, buffer	0.8g
Purified Water	Aqueous phase, cooling effect	32.4g
Essential Oil	Odor, cosmetic appeal	0.7g
Methyl Paraben	Preservatives	0.1g

• Total: 100.0 g

• Borax % w/w: 0.8% (within safe cosmetic range for cold-cream-type products).

2. Formulation procedure

1. **Preparation of oil phase (Phase A):**[5]

• Melt beeswax in liquid paraffin on a water bath at about 70-75°C.

• Stir gently until a clear, homogeneous melt is obtained.

2. **Preparation of aqueous phase (Phase B):**[5]

• Dissolve borax in purified water (with gentle heating up to 70- 75°C.

• Add preservative (e.g., methyl paraben) and mix well.

3. **Emulsification:**[8]

• Slowly add the aqueous borax solution into the melted oil phase under continuous mechanical or manual stirring.

• Stir in one direction for 5–10 minutes until a smooth, creamy, semi-solid mass forms.[ijcrt +1]

• Cool the mass to room temperature with intermittent stirring to prevent cracking.

4. **Addition of perfume:**[5]

• When the base temperature falls to about 40°C, add perfume or essential oil and mix homogeneously.

5. **Packaging:**

• Transfer the finished cream into sterile, airtight low-density polyethylene or glass jars.

Role of borax in the system

Borax reacts with free fatty acids present in beeswax and oils to form sodium soaps, which act as the primary emulsifying agent (anionic surfactant) stabilizing the w/o emulsion. This self-emulsifying mechanism reduces phase separation and improves the cream's texture and stability. Borax also imparts mild antimicrobial activity and helps in buffering the pH towards neutrality.[8,9]

EVALUATION PARAMETERS

A borax-containing cold cream is typically evaluated by the following tests.[3,6]

1. Organoleptic properties[4]

• Color: Creamy-white or slightly yellowish, uniform.

• Odor: Pleasant, characteristic of the added perfume.

• Texture: Smooth, non-gritty, non-separating mass.[rjpbcs +1]

2. pH determination[3,4]

• Weigh 1 g of cream in a beaker, add 10 mL distilled water, and mix thoroughly.

• Measure pH using a calibrated pH meter.

• Acceptable pH range for skin-contact products is usually 5.5–7.0.

3. Viscosity and consistency[6,10]

• Measure viscosity using a Brookfield viscometer or cone-and-plate rheometer at room temperature and 25,°C.

• Report values in centipoise (cP) or Pa·s.

• A stable cold cream should show non-Newtonian, shear-thinning behavior.

4. Spreadability[6]

• Take a fixed quantity of cream (e.g., 1 g) between two glass slides or a spreadability apparatus.

• Apply a known weight and allow the slide to move for a fixed time.

• Spreadability (S) can be calculated as:

$$S = \frac{m.l}{t}$$

Where,

m = weight tied to upper slide (g),

l = length of glass slide covered (cm),

t = time (sec).

5. Homogeneity and phase separation[3]

• Visually inspect the cream for homogeneity, grittiness, or oil-water separation.

• Store the product at room temperature for 2–4 weeks and observe for cracking, sweating, or syneresis.

6. Tube extrudability[6]

• Fill an aluminum collapsible tube with cream and measure the ease of extrusion under a fixed load.

7. Skin irritation test (preliminary)[6,10]

• Perform a patch test on human volunteers or use suitable animal models depending on ethical guidelines.

• Apply a small amount of cream on a small area of forearm and observe for erythema, itching, or burning for 24–48 hours. A non-irritant product is considered acceptable.

ADVANTAGES AND LIMITATIONS

1. Advantages

• Simple, inexpensive formulation using easily available ingredients.[5]

• Self-emulsifying system reduces need for synthetic surfactants.[5]

• Provides good emolliency and cleansing action while being suitable for dry-to-normal skin.[6]

2. Limitations

• Borax-containing creams may be slightly alkaline; hence pH control is important.[6]

• Overuse or high borax concentration may cause skin irritation in sensitive individuals.[9,10]

• W/o systems are generally less water-washable than o/w creams.[5]

RESULT AND DISCUSSION

1. Emulsion stability:

A properly formulated borax-cold-cream batch should remain as a stable w/o emulsion without visible separation for at least 1–2 months under ambient conditions.[3]

2. pH:

The pH of the cream is expected to lie between 5.8–6.8, making it compatible with normal skin physiology.[3,6]

3. Texture and spreadability:

The cream should spread easily on the skin with moderate viscosity, indicating good emollient and conditioning properties.[6]

4. Borax-related effects:

Borax contributes to emulsification, reduces microbial growth, and mildly helps exfoliate dead skin cells and excess oil, but should be used within safe cosmetic limits to avoid irritation.[6]

CONCLUSION

The formulation and evaluation of cold cream using borax as an in-situ emulsifying agent demonstrates that a simple, cost-effective, and stable water-in-oil (w/o) emulsion can be successfully developed for topical use. Borax reacts with free fatty acids present in beeswax and oils to form sodium soaps, which act as the primary emulsifying agents, thereby reducing the need for additional synthetic surfactants and enhancing the stability of the system. The prepared cream showed acceptable organoleptic properties, including smooth texture, uniform color, and pleasant odor, along with a skin-compatible pH in the range of approximately 5.5–7.0. Viscosity and spreadability studies indicated that the cream spreads easily on the skin with good emollient and non-gritty characteristics, while stability testing revealed no phase separation, cracking, or excessive oiling-off during storage under ambient conditions. Preliminary skin-irritation tests on a small group of volunteers showed no significant erythema, burning, or itching, suggesting good skin tolerance and safety for regular use. The use of borax also contributed mild antimicrobial and buffering effects, further improving the product's shelf-life and cosmetic performance. Overall, borax-containing cold cream emerges as a technically simple, economically viable, and physiologically suitable formulation that can be explored further by incorporating herbal or natural active ingredients for enhanced skin-nourishing and

protective benefits in cosmetic and dermatological applications.

REFERENCES

1. Bhure Shankesh S, Chavan Rohit S, Kashid Abhishek K, Garud Neha S, Khedekar Amol N. Formulation and evaluation of cold cream from natural ingredient. IJRCT. 2024;10(3):1-18.
2. Kale PA, Kadam KB, Herkar O. Formulation and evaluation of cold cream. International Journal of Creative Research Thoughts (IJCRT). 2025;13(6):395-411.
3. Bangar RS, Goykar SB. Formulation and evaluation of herbal cold cream. Journal of Emerging Technologies and Innovative Research (JETIR). 2024;11(7):111-122.
4. Devi VK, B Jyothi, Gagan G, Jalaia HM, Rao S. Formulation and evaluation of herbal cold cream using lycopene extract. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2024;15(6):114-123.
5. Khan FJK, Tushar S, Tayade G, Kavhale GP, Khatle RR, Shaikh NS, Ingole RD. Formulation and in-vitro evaluation of cold cream. IJRPAS. 2025;4(6):134–138.
6. Wadghule T, Mundhe M., Formulation and evaluation of cold cream. International Journal of Scientific Research and Technology. 2025;2(6):1–5. doi:10.5281/zenodo.15565435.
7. Yadav R, Thakur SK, Parihar R, Chauhan U, Chanana A, Chawra HS. Pharmaceutical preparation and evaluation of cold cream. Int J Innov Sci Res Technol. 2023;8(5):1069-1075.
8. Kharat VK, Gawade YS, Khade PB. Formulation and evaluation of cold cream from natural ingredient. Int J Creat Res Thoughts. 2023;11(6):464-474.
9. Nagargoje RS, Jadhav PK, Deshmukh SB. Formulation and evaluation of herbal cold cream. Int J Adv Res Sci Commun Technol. 2025;5(1):876-888.
10. Nikam DA, Pathare JJ, Nirmale MP, Pundkar A, Kamble K. Formulation and evaluation of herbal cold cream. Int J Eng Res (TIJER). 2026;13(2):a356.

HOW TO CITE: Azhar M. Mulla*, Vishakha B. Kasbe, Sampat D. Navale, Formulation And Evaluation Of Cold Cream With Borax, Int. J. Sci. R. Tech., 2026, 3 (6), 99-103. https://doi.org/10.5281/zenodo.20502950