



HERBAL COOLING ROLL-ON (ALOE VERA–LAVENDER) FOR THE MANAGEMENT OF VASOMOTOR SYMPTOMS IN MENOPAUSAL WOMEN

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ABSTRACT

Hot flashes are the most common vasomotor symptom experienced by women during the climacteric phase, often accompanied by sleep disturbances and anxiety. Hormone therapy is effective, but not all women can use it due to contraindications and the risk of long-term side effects. Therefore, non-hormonal interventions based on topical products are a potential alternative. Researcher are developing a cooling roll-on based on aloe vera, lavender hydrosol, and menthol in concentrations safe for skin application. The purpose of this study was to develop and evaluate the effectiveness of a cooling roll-on based on aloe vera, lavender hydrosol, and menthol as a non-hormonal intervention in reducing the intensity and frequency of hot flashes in menopausal women. This study used an experimental laboratory design followed by a pilot clinical trial. The initial phase involved the formulation of two cooling roll-on preparations based on aloe vera and lavender hydrosol, one with and one without added menthol. Evaluation of the preparation quality was carried out through pH testing using a calibrated pH meter and microbial contamination testing using the Total Plate Count (TPC) method. Furthermore, initial safety testing was conducted through patch tests on 10 respondents to assess potential skin irritation. Data were analyzed descriptively to assess the safety, stability, and feasibility of the product before proceeding to the clinical trial phase. The findings in this study are based on laboratory tests on coolant roll-on preparations, both with and without menthol, obtained data based on pH parameters. Preparations with menthol have an average pH of 5.91 and preparations without menthol have an average pH of 5.98. while microbial contamination (Total Plate Count/TPC) in both preparations has a TPC value $<1.0 \times 10^1$ CFU/ml. Implications for Product Feasibility Based on these two parameters, it can be concluded that Initial safety is met (both formulations have met the basic criteria for topical safety, both in terms of pH and microbial contamination) and the formulation is stable (there are no significant changes due to the addition of menthol to).

Keywords: aloe vera; climacteric; cooling roll-on; hot flashes; lavender

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INTRODUCTION

The climacteric phase is a physiological transition period experienced by women before and after menopause. One of the most frequently reported complaints is hot flashes, or vasomotor symptoms, which affect more than 70% of menopausal women (Morga et al., 2024). Hot flashes not only cause sudden feelings of heat but are also associated with sleep disturbances, anxiety, reduced quality of life, and the risk of depression (Hamzehgardeshi et al., 2020)(Tangkeeratichai et al., 2025). Hormone therapy (HRT) is an effective option, but its use is limited due to the risks of breast cancer, cardiovascular disease, and thromboembolism (Tsoumani et al., 2022)(Pertynska-Marczewska et al., 2024). This situation emphasizes the importance of evidence-based non-hormonal therapies. Non-pharmacological approaches, such as aromatherapy and topical products, are increasingly being investigated as safe alternatives (Kargozar et al., 2021). Menthol, the main compound in peppermint, is known to stimulate the TRPM8 receptor, triggering a cooling sensation without changes in actual body temperature. Physiological studies have shown that topical

application of menthol can reduce heat perception and increase thermal comfort (Gillis et al., 2020)(Rosales et al., 2024). These findings support the use of menthol as a cooling agent in roll-on formulations. Aloe vera is a plant widely used as a topical ingredient due to its soothing, moisturizing, and anti-inflammatory effects. Recent clinical trials have shown Aloe vera to be effective and safe for use in postmenopausal women with vaginal atrophy, demonstrating its potential for non-hormonal dermatological applications (Catalano., 2024)

Besides physical cooling, psychological aspects are also important. Lavender has been shown to have anxiolytic and sedative effects. A recent meta-analysis confirmed that lavender aromatherapy can improve sleep quality and reduce anxiety in postmenopausal women (Chen et al., 2023). Furthermore, recent research has also strengthened the benefits of lavender in postmenopausal women. A pilot clinical trial showed that inhalation of *Lavandula angustifolia* combined with a sleep hygiene protocol improved sleep quality in postmenopausal women with insomnia, although the direct effect on hot flashes was inconsistent (Chen et al., 2021). The meta-analysis also confirmed that aromatherapy can improve sleep efficiency and decrease sleep latency in postmenopausal women (Tangkeeratichai et al., 2025). Furthermore, another study reported that twice-daily lavender inhalation for several weeks reduced vasomotor symptoms, including hot flashes, and improved sexual function in postmenopausal women (Heydarpour et al., 2023). These findings support the use of lavender as an additional component to complement the physical cooling effects of menthol and aloe vera in roll-on formulations. This study aims to address the scientific challenges related to the limitations of effective, safe, and practical non-hormonal therapies for managing vasomotor symptoms (hot flashes) in climacteric women through an innovative topical product-based approach.

METHOD

Tools used in making roll-ons for This research includes: magnetic hot plate , balance analytic or digital scales , glasses measuring 50 ml, beaker glass 150 ml, glass measuring 25 ml, glass thermometer , stem mixer glass , plastic funnel , face shield, pipette drops glass , spatula or spoon , plastic beaker, gloves and alcohol tissue, deodorant bottle . The materials used in this study include: Aloe vera extract, Lavender hydrosol, Phenoxyethanol, menthol crystals, glycerin

Roll Formulation and Manufacturing on cooler

The cooling roll-on preparation was formulated in two variations: one with menthol (Formula 1) and one without menthol (Formula 2), to compare product characteristics and stability.

Formula 1

Consisted of 60 mL of aloe vera extract, 30 mL of lavender hydrosol, 1.5 g of menthol crystals, 5 mL of glycerin, 0.8 mL of phenoxyethanol, and distilled water to a final volume of 100 mL. The manufacturing process began with sterilization of all equipment using alcohol and the use of gloves as part of aseptic procedures. 1.5 g of menthol crystals was weighed and dissolved in 5 mL of glycerin with gentle stirring until homogeneous. The aloe vera extract was then transferred to a beaker, followed by the addition of lavender hydrosol gradually, stirring gently until evenly mixed. The menthol-glycerin mixture was then gradually added to the gel base, stirring until homogeneous. Afterward, phenoxyethanol was added as a preservative, followed by distilled water to reach a volume of 100 mL. The homogenized preparation was then transferred into a roll-on container that had been cleaned with an alcohol wipe.

Formula 2

Formulated without menthol, consisted of 60 mL of aloe vera extract, 30 mL of lavender hydrosol, 5 mL of glycerin, 0.8 mL of phenoxyethanol, and distilled water to 100 mL. The manufacturing process began with sterilization of equipment and the use of gloves. The first step was mixing the air phase, consisting of aloe vera extract and lavender hydrosol, in a beaker until homogeneous.

Next, the glycerin was mixed with the phenoxyethanol until evenly distributed, then gradually added to the aqueous phase mixture while stirring gently until homogeneous. The distilled water was added until the final volume was reached, and the preparation was then transferred into a sterilized roll-on container. Test laboratory work carried out on second sample This is pH and TPC tests (tests pollution microbes). pH and TPC test is an important parameter in evaluating the quality of cosmetic preparations, including roll-on deodorants . pH measurement is necessary to ensure compliance with the physiological pH of the skin to prevent irritation and maintain the stability of the preparation (Azahary et al., 2017). Meanwhile, the TPC test is used to detect microbial contamination that can increase during product use and potentially cause skin infections (Sari et al. , 2024). Therefore, these two tests are an important part of quality control and compliance with cosmetic safety standards before distribution. in accordance with SNI .

RESULT

Inspection This using 2 samples roll-on with And without mixture menthol . This done because roll-on with mixture menthol felt more sensation sharp cooling And menthol and menthol crystals difficult late in glycerin . So that researchers make roll-on without mixture menthol. Invention temporary on study This based on test laboratory to cooling roll-on preparation, good with menthol or without menthol, the pH parameter data was obtained and pollution microbes (Total Plate Count/TPC) as following :

1. pH Characteristics of Preparation

Test results show that :

- a. Preparation with menthol having an average pH of 5.91
- b. Preparation without menthol has an average pH of 5.98

Second pH value formulation is at in range physiological pH skin ($\pm 4.5-6.5$) . This show that :

- a. Preparation relatively safe For use topical
- b. Risk irritation skin minimum
- c. No bother natural skin barrier

The difference in pH between second formulation relatively small , which indicates that addition of menthol in concentration used No give change significant to pH stability of the preparation .

- a. pH is an important parameter for skin safety and product stability.
- b. Deodorants also have the potential to cause skin irritation if not suitable (Azahary et al. et al. , 2017)

2. Test Pollution Microbes (TPC)

Test results show : Second stock own TPC value $< 1.0 \times 10^1$ CFU/ml

Interpretation :

- a. This value show amount microbes very low (almost No detected)
- b. Preparation fulfil standard general security microbiology For product topical
- c. System preservative (potassium sorbate) and the formulation process assessed effective in hinder growth microorganisms
- d. No there is difference significant between stock with And without menthol in aspect pollution microbes , so that can concluded that :
- e. The addition of menthol does not increase risk contamination microbes
- f. Stability microbiological second formulation equivalent

3. Implications to Eligibility Product

Based on both parameters , can concluded temporary that :

- a. Security beginning fulfilled : second formulation has fulfil criteria base topical safety , good from pH aspects as well pollution microbes
- b. Formulation stable : No there is change significant consequence addition of menthol to :

- 1) pH of the preparation
- 2) Contamination microbes

Table 1.
Roll on test results with menthol content

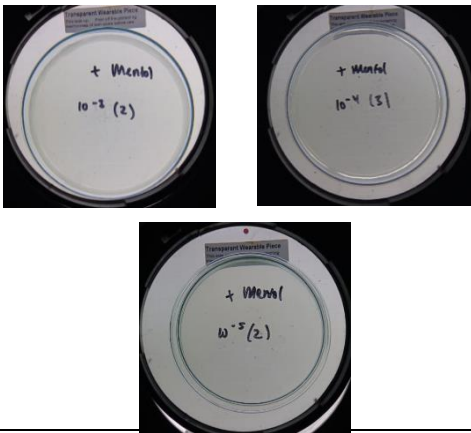
No.	Testing	Results
1	pH	5.91
		
2	Test Pollution Microbes (TPC)	$< 1.0 \times 10^1$
		

Table 2.
Results of the roll on test without menthol content

No.	Testing	Results
1	pH	5.98
		
2	Test Pollution Microbes (TPC)	$< 1.0 \times 10^1$
		

4. Test irritation (patch test)

The results obtained namely 10 respondents No experience marked irritation with No arise color red And No felt hot. This data support that product :

- Safe to use on skin human (after done patch test)
- Fulfil condition beginning for enter to stage test effectiveness clinical (pilot trial)

Table 3.
Irritation test

Respondents	Test irritation	
	Test on respondents	Test results
1		No irritation
2		No irritation
3		No irritation
4		No irritation
5		No irritation
6		No irritation
7		No irritation

Respondents	Test irritation	
	Test on respondents	Test results
8		No irritation
9		No irritation
10		No irritation

DISCUSSION

Laboratory tests conducted on both samples included pH and Total Plate Count (TPC) as key parameters in evaluating the quality of topical cosmetic preparations. These two parameters are crucial indicators in ensuring product safety, stability, and quality before use by consumers. Recent studies have shown that pH and microbial contamination evaluation are essential components of cosmetic quality control to prevent skin irritation and microbial contamination during storage and use (International Organization for Standardization, 2022; World Health Organization, 2023).

pH Characteristics of Preparation

pH values of the menthol- containing (5.91) and non- menthol-containing (5.98) formulations were within the physiological skin range (4.5–6.5). This indicates that the formulations have good skin compatibility and have the potential to minimize irritation. Recent research shows that skin pH plays a crucial role in maintaining skin barrier function, balancing the skin microbiota, and preventing irritation and infection. A pH imbalance can disrupt barrier function and increase skin sensitivity, especially in vulnerable groups such as climacteric women (Proksch et al., 2020; Ali & Yosipovitch, 2022). Therefore, the use of topical preparations with a pH close to the skin's physiological pH is highly recommended to maintain skin integrity and improve product tolerability. The difference in pH values between the two formulations was relatively small, indicating that the addition of menthol at the concentration used did not significantly affect the pH stability of the preparations. This indicates that both formulations have good stability and are safe for short-term topical use.

Microbiological Quality of Preparations

The test results showed a microbial contamination value (TPC) $< 1.0 \times 10^1$ CFU/ml in both formulations, which indicates excellent microbiological quality. According to the latest cosmetic microbiology standards, topical products must contain minimal microbial contamination to ensure safe use. A low TPC value indicates that the formulation process, sanitation, and preservative system used are effective in inhibiting the growth of microorganisms (International Organization for Standardization, 2022). Furthermore, recent research indicates that the use of preservatives such as potassium sorbate and phenoxyethanol is effective in maintaining the microbiological stability of water-based formulations by inhibiting the growth of bacteria and fungi (Halla et al., 2021; Herman,

2022). The lack of significant differences between the two formulations indicates that the addition of menthol does not increase the risk of microbial contamination, thus ensuring equivalent microbiological stability for both formulations.

Implications for Product Suitability

Based on the pH and TPC test results, both cooling roll-on formulations meet the basic safety criteria for topical preparations. A pH value consistent with skin physiology indicates minimal potential for irritation, while a very low TPC value indicates good microbiological safety. Therefore, it can be concluded that both formulations have good stability and are suitable for clinical trials. This evaluation aligns with modern cosmetic quality standards, which emphasize the importance of physicochemical and microbiological testing as the basis for assessing product safety before distribution to the public. This formulation combines three active ingredients with different mechanisms:

- a. Aloe vera (moisturizing and anti-inflammatory)
- b. Lavender (relaxation and anxiolytic)
- c. Menthol (quick cooling)

CONCLUSION

Aloe vera and lavender -based cooling roll-on formulation demonstrated skin-friendly pH stability and good microbiological properties. The addition of menthol did not affect the formulation's stability, making it safe for use as a cooling agent in topical preparations . The combination of active ingredients shows potential as a non-hormonal multimodal therapy for vasomotor symptoms (hot flu) during menopause . This product is worthy of clinical trials , although further research is needed to evaluate its long-term effectiveness and safety.

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