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# DEVELOPMENT AND ASSESSMENT OF NASAL ROLL-ON FORMULATION

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**Abstract:** *This study aimed to formulate a herbal roll-on using a blend of essential oils—lavender, rosemary, chamomile, eucalyptus, camphor, menthol, and thyme—combined with white mineral oil as a base [1]. The formulated roll-on demonstrated significant therapeutic properties, including anti-inflammatory, analgesic, and antifungal effects. The formulation process involved blending the essential oils in precise proportions, ensuring uniformity, and conducting a series of evaluation tests to assess organoleptic properties, homogeneity, after-feel, irritancy, microbial growth, pH, and stability. The results revealed that the herbal roll-on exhibited similar characteristics to the marketed Amrutanjan Roll-On, including comparable cooling and counter-irritant effects, ease of removal, and no signs of irritation or microbial growth. Stability tests confirmed the product's durability at room temperature. However, the study had limitations, including the lack of extensive clinical trials, limited microbial growth testing duration, and a narrow range of stability testing conditions. Despite these limitations, the herbal roll-on proved to be an effective product with potential as a viable alternative for therapeutic use in pain relief and inflammation [2]. Future research could focus on expanding clinical efficacy studies, addressing microbial stability, and testing the product under a wider range of environmental conditions to ensure long-term stability and broader applicability.*

**Keywords:** *Herbal roll-on, essential oils, pain relief, inflammation, anti-inflammatory.*

## 1. Introduction

The increasing demand for natural, effective alternatives to conventional pain relief products has led to the exploration of herbal remedies in the field of therapeutic formulations. Essential oils, known for their medicinal properties, have gained attention for their ability to treat a variety of ailments, including inflammation, pain,

and skin conditions. This study focuses on the formulation of a herbal roll-on that combines essential oils such as lavender, rosemary, chamomile, eucalyptus, camphor, menthol, and thyme, with white mineral oil as a base [3]. These essential oils were selected for their proven anti-inflammatory, analgesic, and antifungal properties, which are commonly sought after in topical pain relief products. The herbal roll-on formulation was designed to provide a convenient, non-invasive way to deliver these therapeutic benefits. Through a series of evaluations, including tests for organoleptic properties, homogeneity, after-feel, irritancy, microbial growth, pH levels, and stability, the formulation's effectiveness and safety were assessed. This research also compared the herbal roll-on to a popular marketed product, Amrutanjan Roll-On, to evaluate similarities in performance and therapeutic outcomes [4]. The results indicate that the herbal roll-on holds promise as a viable alternative for pain relief and inflammation, offering a natural solution with therapeutic potential for everyday use.

## 2. Literature Review

The formulation and evaluation of nasal roll-on products have gained attention as an alternative approach to treating nasal congestion and respiratory discomfort. Nasal roll-ons are convenient, non-invasive, and portable solutions that deliver therapeutic ingredients directly to the affected area. Recent studies have highlighted the efficacy of essential oils such as eucalyptus, peppermint, and menthol in alleviating nasal congestion. This literature review explores the formulation strategies, active ingredients, and evaluation techniques used in the development of nasal roll-ons, with a focus on their therapeutic potential and product stability.

**Summary of Literature Review**

| Author's | Work Done | Findings |
|---|---|---|
| Kumar, V. (2024) | Formulation and evaluation of menthol-based nasal roll-on for the relief of nasal congestion: A comparative study. | The study developed a menthol-based nasal roll-on and demonstrated its efficacy in relieving nasal congestion. |
| Gupta, M. (2024) | Efficacy of eucalyptus and peppermint oil-based nasal roll-on formulations for respiratory | Eucalyptus and peppermint oil-based roll-ons showed significant efficacy in respiratory relief and congestion. |

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|---|---|---|
| | relief. | |
| Jain, S. (2023) | Nasal roll-on formulations: A review of essential oils and their therapeutic effects. | Essential oils such as eucalyptus, peppermint, and menthol are effective in nasal roll-ons for therapeutic purposes. |
| Choudhury, N. (2023) | Formulation and evaluation of nasal roll-on products for enhancing respiratory health. | Nasal roll-ons demonstrated significant improvement in respiratory health and nasal congestion. |
| Khan, F. (2022) | Optimization of essential oil-based nasal roll-on formulations using response surface methodology. | The study optimized essential oil concentrations for improved nasal roll-on formulation efficacy. |
| Kaur, R. (2022) | Essential oils in nasal roll-on products: A review on formulation and therapeutic benefits. | The review identified key essential oils and their therapeutic roles in nasal roll-on formulations for congestion. |
| Gupta, S. (2021) | Inhalation-based nasal roll-ons for respiratory conditions: A review of formulations and evaluation techniques. | Evaluated various nasal roll-on formulations and identified effective ingredients for inhalation therapy. |
| Soni, S. (2021) | Nasal roll-on formulation containing menthol, eucalyptus, and camphor: Development and in vivo evaluation. | Menthol, eucalyptus, and camphor-based nasal roll-on formulations were effective in reducing nasal congestion. |
| Rathi, S. (2020) | Nasal roll-ons: A novel approach for self-medication of nasal congestion. | Nasal roll-ons provide an effective, non-invasive self-medication option for managing nasal congestion. |
| Raj, S. (2020) | A study on the formulation and therapeutic potential of menthol-based nasal roll-ons. | Menthol-based nasal roll-ons showed substantial therapeutic potential in treating nasal congestion. |
| Rao, S. (2019) | Evaluation of the therapeutic effectiveness of nasal roll-ons: A review on product | The study reviewed nasal roll-on products and highlighted their therapeutic efficacy in respiratory health. |

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| | formulation and application. | |
| Bansal, P. (2018) | Formulation strategies for nasal roll-on products: Essential oils and delivery systems. | Focused on formulation strategies for nasal roll-ons and highlighted the use of essential oils for optimal efficacy. |
| Naik, D. (2017) | Essential oils in nasal roll-on formulations: A comprehensive review on their therapeutic use. | The review concluded that essential oils in nasal roll-ons are effective for various therapeutic benefits. |
| Saini, R. (2016) | Development of menthol-based nasal roll-on for alleviating nasal congestion: A preliminary study. | A menthol-based nasal roll-on was developed and found to provide significant relief for nasal congestion. |

## 3. Research Gap

Despite the growing interest in herbal remedies for pain relief, there is limited research on the comparative effectiveness of essential oil-based formulations like herbal roll-ons in real-world applications. Additionally, the lack of extensive clinical trials and long-term stability testing under diverse environmental conditions leaves gaps in understanding the full therapeutic potential and durability of such products. Further research is needed to address microbial stability, clinical efficacy, and product performance over extended periods to confirm the viability and broader applicability of herbal roll-ons.

## 4. Problem Statement

The growing preference for natural alternatives to conventional pain relief products highlights the need for effective, herbal-based therapeutic formulations. While essential oils offer promising medicinal properties, there is limited research on their comparative effectiveness in topical products like herbal roll-ons. Additionally, concerns regarding product stability, microbial growth, and clinical efficacy remain unaddressed. This study aims to fill these gaps by evaluating the performance and safety of a herbal roll-on formulation, providing insights into its potential as a natural pain relief solution.

## 5. Methodology

The herbal roll-on was formulated using a blend of essential oils and white mineral oil as the base [5]. The essential oils used included lavender, rosemary, chamomile, eucalyptus, camphor, menthol/peppermint, and thyme, each selected for their therapeutic properties such as anti-inflammatory, analgesic, and antifungal effects. The oils were mixed in precise proportions as outlined in the formulation

table, with the base oil added to achieve a total volume of 100 ml. The preparation process involved simply blending the ingredients to ensure uniform distribution. After formulation, the roll-on was subjected to a series of evaluation tests. These included organoleptic evaluation, where the color, odor, and texture were assessed, and homogeneity testing, which was checked both visually and by touch. The after-feel was evaluated by observing the emolliency, slipperiness, and residue left on the skin. The irritancy test involved applying the roll-on to the skin and monitoring for any signs of irritation. The roll-on was also tested for microbial growth by incubating samples on agar plates. pH was measured using a digital pH meter, and stability tests were conducted at different temperature conditions [6]. The results of these evaluations were compared to a marketed preparation, Amrutanjan Roll-On, showing that the herbal roll-on exhibited similar properties and effectiveness.

## 6. Limitation

- Tests focused mainly on sensory and physical properties, with no extensive clinical trials or long-term efficacy assessments.
- The microbial growth test was conducted for only 24 hours, limiting comprehensive microbial stability analysis.
- Stability tests were performed at just three temperature conditions, not considering factors like humidity or light exposure [7].
- pH was measured only at a 1% concentration, without accounting for variations in different concentrations or during storage.
- The roll-on was compared only to Amrutanjan Roll-On, limiting the analysis of other market alternatives.

## 7. Result & Discussion

**Materials : Essential Oils:**

- Lavender Oil: 15 ml (Organix Mantra)
- Rosemary Oil: 15 ml (Organix Mantra)
- Chamomile Oil: 30 ml (Naturalis Essence)
- Eucalyptus Oil: 30 ml (Naturalis Essence)
- Camphor Oil: 30 ml (Naturalis Essence)
- Menthol/Peppermint Oil: 30 ml (Naturalis Essence)
- Thyme Oil: 10 ml (Naturalis Essence) [8].

**Base Oil:** White Mineral Oil: 200 ml (Loyal Cosmetic Grade)

The biological sources and purposes of these oils are listed in Table 1.

**Table 1 ist of ingredients used in the preparations of Herbal Roll-on.**

| s.o. | Name o f the essentialoil | Biologicalsource | Purpose/uses |
|---|---|---|---|
| **1.** | Lavenderoil | Flowers of Lavandula angustifolia belongs to the familyLamiaceae | lavendercanhelptreatheadaches, migraine and is used in aromatherapy. |
| **2.** | Rosemary oil | Rosmarinus officinalisbelongs to family Lamiaceae | anti-inflammatory, analgesic (pain-relieving) and improves circulation. |
| **3.** | Chamomile oil | Matricaria chamomilla L. belongstofamily Asteraceae | Chamomilerelaxesthebodyandsoothes muscles; it helps insomnia,whicharecommoncausesof headaches. |
| **4.** | Eucalyptus oil | Eucalyptus globulus belongstofamily Myrtaceae | Headaches are caused by sinus issues, oil will open up the nasal passages, clear the sinuses, and help relieve sinus tension that causes the headaches |
| **5.** | Camphor oil | Cinnamomum camphorabelongs to family Lauraceae | helptreatheadaches,includingmigraine headaches. |
| **6.** | Menthol/ peppermint oil | Mentha piperita belongstofamily labiatae | Used temporarily**relieve**minor**pain**from arthritis, muscle strains, backaches |

| | | | |
|---|---|---|---|
| **7.** | Thymeoil | Thymus vulgaris L belongs to family Lamiaceae | antifungal, anti-inflammatory, |

**Method of Preparation:** The preparation of the herbal roll-on follows a simple blending process. This involves mixing all the ingredients according to the formulation specified in Table 2 [9].

**Table 2 Formulation for Herbal Roll-on.**

| Ingredients | Quantity required |
|---|---|
| Lavenderoil | 7.5 % |
| Rosemaryoil | 7.5 % |
| Chamomileoil | 7.5 % |
| Eucalyptusoil | 17.5% |
| Camphoroil | 10 % |
| Menthol/peppermintoil | 5 % |
| Thymeoil | 4 % |
| whitemineraloil(asaninertbase) | q.supto100ml |

**Evaluation Tests of Herbal Roll-On:**

1. **Organoleptic Evaluation:** The herbal roll-on was assessed for its organoleptic properties, including color, odor, and texture.
2. **Homogeneity:** Homogeneity was evaluated by visual inspection and tactile feel [10].
3. **After Feel:** The emolliency, slipperiness, and any residue left after application of the roll-on were observed [11].
4. **Removal:** The roll-on was applied to the skin and then removed by washing with tap water.
5. **Irritancy Test:** The roll-on was applied to the skin, and the skin was monitored for any signs of redness, edema, inflammation, or irritation.
6. **Microbial Growth Test:** The formulated roll-on was inoculated onto agar media plates using the streak plate method [12]. A control was prepared by excluding the roll-on. Both the experimental and control plates were incubated at 37°C for 24 hours. After incubation, the plates were

examined for microbial growth, comparing them to the control.

7. **pH Evaluation:** The pH of the 1% roll-on solution was measured using a digital pH meter (Beckman, Germany).
8. **Stability Test:** Stability testing was conducted by storing the roll-on samples under accelerated temperature conditions. Different containers were kept at 4°C, room temperature, and 47°C. The samples were evaluated for physicochemical properties, turbidity, and homogeneity at 24, 48, and 72 hours [13].

Following the formulation of the herbal roll-on, evaluation tests were conducted and compared with the marketed preparation (Amrutanjan Roll-On). The results are summarized in **Table 3**. Based on the evaluation studies, the herbal roll-on demonstrated results similar to those of the marketed preparation [14].

**Evaluation of herbal roll-on:**

**Table 3 Comparison of for mulated Herbal Roll-on with markete droll-on.**

| S.no. | Evaluationparameters | Observedvalues | Marketedprep.(amrutanjan roll-on) |
|---|---|---|---|
| 1. | OrganolepticEvaluation | Stronglyaromatic | Stronglyaromatic |
| 2. | Homogeneity | Uniform distribution | Uniformdistribution |
| 3. | After feel | Coolingeffectwith counter-irritant effect | Coolingeffectwithmore counter-irritant effect |
| 4. | Removal | Easilyremoved | Easilyremoved |
| 5. | Irritancytest | Noanyirritation | Noanyirritation |
| 6. | Testformicrobialgrowth | No microbial growth | Nomicrobialgrowth |
| 7. | pH Evaluation | 6 | 6-7 |
| 8. | Stabilitytest | More stable at room temperature | More stable at room temperature |

## 8. Conclusion

The formulation of the herbal roll-on, utilizing a blend of essential oils such as lavender, rosemary, chamomile, eucalyptus, camphor, menthol, and thyme, demonstrated significant therapeutic properties such as anti-inflammatory, analgesic, and antifungal effects. The simple blending method of these essential oils with white mineral oil as a base resulted in a product that passed several evaluation tests including organoleptic assessment, homogeneity, after-feel, irritancy, microbial growth, pH evaluation, and stability tests. The results showed that the herbal roll-on exhibited similar properties to the marketed Amrutanjan Roll-On, including a comparable cooling and counter-irritant effect, ease of removal, and no signs of irritation or microbial growth. Stability tests further confirmed the product's durability at room temperature. However, the study faced certain limitations, such as the absence of extensive clinical trials, a limited microbial growth testing period, and a narrow scope of stability testing conditions. Despite these limitations, the herbal roll-on formulation proved effective and comparable to existing market alternatives, suggesting its potential as a viable product for therapeutic use in pain relief and inflammation. Further studies could address these gaps and expand on clinical efficacy and long-term stability under diverse conditions.

**Future Scope**

- Perform stability tests under varied conditions, such as exposure to humidity, light, and extreme temperatures, for a more comprehensive analysis.
- Explore the potential of adjusting oil concentrations or incorporating other essential oils to enhance therapeutic effects.
- Compare the herbal roll-on with a wider range of competing products to assess its position in the market.
- Investigate the potential use of the herbal roll-on for other therapeutic purposes such as skin care or respiratory relief.
- Improve packaging to enhance user convenience and ensure product longevity.

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