

FORMULATION AND EVALUATION OF MENSTRUAL PAIN RELIEF ROLL-ON

Subodhini S. Gharde*, Shweta S. Nannaware, Dr. Nitin Indurwade

Dr.R.G.Bhoyar Institute of Pharmaceutical Education and Research, Wardha.

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*Corresponding Author

Subodhini S. Gharde

Dr.R.G.Bhoyar Institute of
Pharmaceutical Education and
Research, Wardha.



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ABSTRACT

Aim: The present study aimed to formulate and evaluate a herbal menstrual pain relief roll-on using natural ingredients as a safe, effective, and convenient topical alternative for the management of dysmenorrhea. **Materials and Methods:** The formulation was prepared using red raspberry leaf extract, fennel seed extract, peppermint oil, lavender oil, rosemary oil, sandalwood oil, camphor oil, vitamin E oil, and coconut oil as the carrier base. The prepared formulation was evaluated for phytochemical screening, organoleptic properties, homogeneity, pH, spread ability, skin irritation, antimicrobial activity, stability, acid value, and UV-visible spectroscopic analysis. **Preparation:** All ingredients were accurately measured and uniformly blended with the carrier oil to obtain a smooth and homogeneous roll-on formulation. The prepared

formulation was filled into sterilized roll-on bottles and stored under suitable conditions for further evaluation. **Discussion:** The combination of herbal extracts and essential oils demonstrated analgesic, anti-inflammatory, antispasmodic, and soothing properties. The topical roll-on provided localized action with good skin compatibility, indicating its potential to reduce menstrual cramps effectively while minimizing systemic side effects. **Conclusion:** The developed herbal menstrual pain relief roll-on was found to be safe, stable, and effective for topical application. The formulation may serve as a promising natural alternative for the management of menstrual pain and improve patient comfort and compliance. **Results:** The formulation exhibited satisfactory organoleptic characteristics with a pleasant aroma, smooth consistency, pH of 5.88, spreadability of 6.94 gcm/s, and good stability. Phyto-chemical analysis confirmed the presence of major bioactive constituents, and no skin irritation was

observed.

❖ **KEYWORDS:** Menstrual Pain, Dysmenorrhea, Herbal Roll-On, Topical Drug Delivery, Red Raspberry Leaf, Fennel Seed.

❖ INTRODUCTION

Menstruation characterized by Dysmenorrhea refers to painful cramping in the lower abdomen, often radiating to the back and thighs, and may be accompanied by symptoms like nausea, headache, and fatigue. It is typically classified as primary dysmenorrhea, which occurs without underlying pelvic pathology, or secondary dysmenorrhea, which results from identifiable conditions like endometriosis or fibroids.^[11]

Conventional treatment approaches mainly include oral analgesics such as NSAIDs and hormonal therapy. However, these treatments are often associated with adverse effects like gastrointestinal irritation, hormonal imbalance, and long-term dependency.^[4]

This has created a demand for safer, natural, and non-invasive alternatives for managing menstrual discomfort. Herbal medicine has gained significant attention due to its therapeutic benefits and minimal side effects. Among various herbal remedies Red Raspberry Leaf extract are selected for its antioxidant and anti-inflammatory effects, supporting local circulation and reducing oxidative stress. Fennel extract provides antispasmodic and mild estrogenic effects, helping relieve uterine contraction.^[9]

Essential oils like peppermint, lavender, rosemary and sandalwood offer cooling, soothing, calming, and analgesic actions, while camphor acts as a counter-irritant to distract pain receptors. Virgin coconut oil serves as a skin-nourishing carrier with antimicrobial benefits, and vitamin-E oil enhances skin repair and stability of the formulation.^[5]

A topical roll-on formulation serves as an effective delivery system, allowing direct application of active ingredients to the lower abdomen. This localized delivery enhances drug absorption, provides rapid relief, and minimizes systemic side effects compared to oral medications.^[3]

Moreover, roll-ons are portable, easy to use, and improve patient compliance. The formulation of a menstrual pain relief roll-on using red raspberry leaf extract, fennel seed oil, and selected essential oils requires careful consideration of excipients, penetration enhancers,

and stability factors.^[6]

Evaluation of the formulation includes parameters such as pH, viscosity, spread ability, homogeneity, stability, and skin irritation to ensure safety, effectiveness, and consumer acceptability. Thus, the development of a herbal menstrual pain relief roll-on combining traditional plant-based ingredients with modern formulation techniques offers a promising and patient-friendly approach for the management of menstrual pain.^[1]

❖ ADVANTAGES

1. Applied directly on lower abdomen for localized relief.
2. Quick absorption through skin.
3. Clean and comfortable compared to creams.
4. Portable and hygienic.
5. Gives cooling and soothing effects.
6. Easy and convenient to use.

❖ DISADVANTAGES

1. Relief duration is short, usually around 1-3 hr.
2. Not suitable on damaged or very sensitive skin.
3. Gives only temporary relief, not permanent treatment.
4. Usually works only on surface discomfort, not deep abdominal cramps.

❖ APPLICATION

1. Help reduce muscle cramps and spasms.
2. Gives quick localized action at the site of pain.

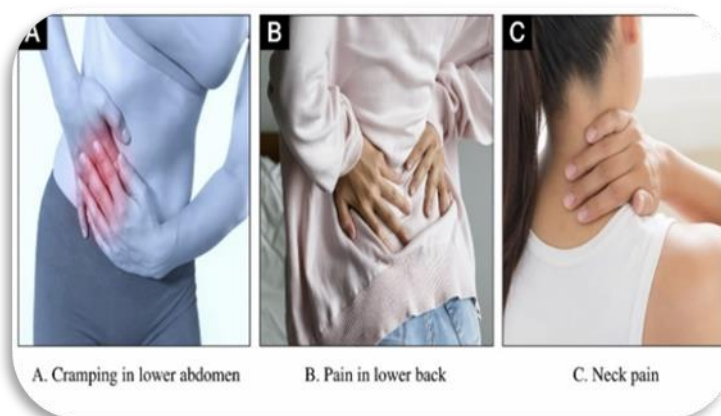


Fig. No. 1: Menstrual pain.

❖ REVIEW OF LITERATURE

1. Jemimah Sudhakaran¹, Deepika Singaravelan, et. al.: (2025) In this study entitled “Topical formulation and evaluation of a menstrual cramp relief roll on containing butterfly pea and fennel extract.” They emphasized that develop and evaluate a safe, effective, natural topical herbal roll-on for menstrual cramp relief. This study conduct in-vitro and in-vivo studies to assess analgesic, antispasmodic, and anti-inflammatory properties. It is concluded that efficacy and safety of the herbal roll-on, highlighting its potential as a natural alternative for dysmenorrhea management.^[1]
2. Yegane Lagzian, Fariba askari, et. al.: (2025) In This study entitled “The effect of peppermint on menstrual disorders: A systemic review of randomized controlled trials.” This study aims that evaluate the effects of peppermint on menstrual disorders. That study was conducted systematic review of randomized controlled trials (RCTs) analyzing the effects of peppermint on menstrual conditions. Its concludes that Peppermint may help improve menstrual disorders, but more high-quality studies are needed to confirm its effectiveness.^[2]
3. Rutuja Shriode, Kanchan Gursal, et. al. : (2024) In This study entitled “Formulation and evaluation of polyherbal roll on to reduce dysmenorrhea.” This article aims that develop and evaluate a herbal roll-on for relieving menstrual pain (dysmenorrhea). This study was conducted formulation of a herbal roll-on using volatile oils and its evaluation for effectiveness and usability. Its concludes that herbal roll-on is a convenient and effective formulation that helps relieve menstrual pain and associated symptoms.^[3]
4. Janhavi Patil, Dipali Singh, Anish Rathod, et. al. : (2024) In This study entitled “A study on the formulation and evaluation herbal menstrual pain relief balm.” This study aims to assess develop and evaluate a herbal menstrual pain relief balm using essential oils for reducing dysmenorrhea symptoms. Its highlighted that study involving formulation of the balm followed by sensory evaluation, patch testing, and user feedback. Its concludes that herbal balm is a safe and effective natural remedy that helps relieve menstrual pain and improves overall well-being.^[4]
5. Lone Holsk, Svein Haavik, et. al. : (2009) In this study entitled “Complementary therapies in clinical practices” They emphasize that there is insufficient and inconclusive scientific evidence to support the safety and effectiveness of raspberry leaf (*Rubus idaeus*) during menstrual cramps. This study covers that analysis of clinical studies, animal experiments, and in vitro research, as well as evaluation of its traditional use and

recommendations in maternal healthcare. It concluded that raspberry leaf may help reduce menstrual pain, but strong scientific evidence supporting its effectiveness is limited.^[5]

❖ PLANT PROFILE



1. Red Raspberry Leaves: Red raspberry leaves (*Rubus idaeus* L.) belong to the family Rosaceae. They contain flavonoids, tannins, phenolic acids, vitamins C & E, and minerals. These phytochemicals provide anti-inflammatory, antioxidant, and analgesic effects. The leaves help relax uterine muscles and support menstrual health. They are effective in reducing menstrual cramps and lower abdominal pain.^[9]



2. Fennel Seeds: Fennel seeds (*Foeniculum vulgare*) belong to the Apiaceae family. They contain volatile oils (anethole and fenchone), flavonoids, phenolic compounds, tannins, and alkaloids. These phytochemicals provide antispasmodic, anti-inflammatory, analgesic, antimicrobial, and antioxidant properties. Fennel seeds help relieve menstrual cramps by reducing muscle spasms and pain.^[8]



3. Sandalwood oil: It belongs to the Santalaceae family. Its main chemical constituents are α -santalol, β -santalol, and santalene. It has soothing and calming properties. It also shows anti-inflammatory activity. It is commonly used in aromatherapy and skincare products.^[10]



4. Peppermint oil: It belongs to the Lamiaceae family. It contains menthol, menthone, and methyl acetate. It provides a cooling sensation on the skin. It acts as a mild analgesic and helps relieve pain. It is widely used in pain relief and therapeutic products.^[3]



5. Rosemary oil: It belongs to the Lamiaceae family. Its main constituents are cineole and α -pinene. It improves blood circulation. It has stimulating and analgesic properties. It is commonly used for muscle pain and massage oils.^[4]



6. Lavender oil: It belongs to the Lamiaceae family. It contains linalool and linalyl acetate. It has soothing and stress-relieving properties. It provides a pleasant aromatic effect. It is widely used in aromatherapy and relaxation products.^[2]



7. Camphor oil: It belongs to the Lauraceae family. It contains camphor, safrole, and cineole as major constituents. It acts as a counter-irritant and provides a cooling sensation. It improves local blood circulation. It is commonly used for muscle pain, joint pain, and massage oils.^[1]



8. Coconut oil: It belongs to the Arecaceae family. Its main constituents are lauric acid and caprylic acid. It acts as a carrier oil in herbal formulations. It moisturizes and softens the skin. It helps in better absorption of essential oils and nourishes the skin.^[4]

❖ AIM AND OBJECTIVES

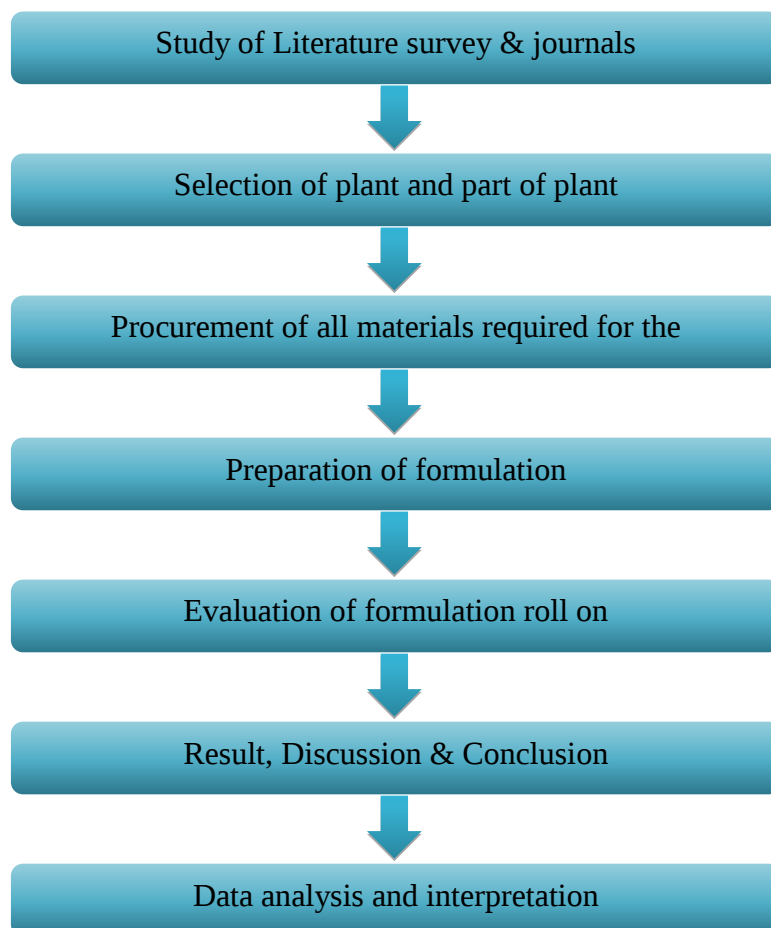
❖ **AIM:** “Formulation and evaluation of menstrual pain relief roll on”

❖ OBJECTIVE

1. To formulate a topical roll-on preparation for easy and convenient application.
2. To provide effective relief from menstrual pain using analgesic and antispasmodic ingredients.
3. To ensure quick absorption through the skin for faster action.
4. To develop a non-greasy and smooth formulation for better user comfort.
5. To ensure safety and skin compatibility without causing irritation.

6. To evaluate physical and chemical properties like pH, viscosity, and stability.
7. To assess the overall effectiveness and stability of the formulation.

❖ PLAN OF WORK



❖ MATERIALS AND METHODS

❖ Materials

❖ **Apparatus:** Beaker, Measuring cylinder, Stirrer, Round bottom flask, Heating mantle, Condenser, Mortar pestle, Petri plate, Separating funnel, Conical flask, etc.

❖ **Instruments:** Weighing balance, Digital PH meter, etc.

❖ **Chemicals:** Red raspberry leaves oil, Fennel seeds oil, Lavender oil, Sandalwood oil, Rosemary oil, Peppermint oil, Camphor oil, Tea tree oil, Coconut oil.

❖ **Plant material:** Red raspberry leaves and fennel seeds.

❖ Methods

❖ Collection of plant material

Leaves of the raspberry tree were collected from areas around the Wardha region. Fennel seeds were purchased from the market in Wardha.

❖ Preparation of red raspberry leaves extract

Weigh accurately 100–120 g of dried red raspberry leaves and crush them coarsely. Transfer the crushed leaves into a round bottom flask and add 400–500 mL distilled water.^[3] Set up the steam distillation apparatus by connecting the flask to condenser and receiver. Heat the flask using heating mantle for 5 hrs to generate steam. Steam passes through plant material and carries volatile oil components.^[11] Vapors (steam + oil) pass into condenser and get cooled. Condensed liquid (distillate) is collected in receiver as oil and water mixture. Transfer distillate into separating funnel and allow layers to separate.^[7] Collect the oil layer (if present in small quantity) carefully. Dry the oil using anhydrous sodium sulfate to remove moisture. Measure and store the oil in airtight container.^[1]



Fig. no. 10: Preparation of red raspberry leaves extract.

❖ Preparation of fennel seeds extract

Weigh accurately 80–100 g of fennel seeds (from *Foeniculum vulgare*) and crush them coarsely. Transfer the crushed seeds into a round bottom flask and add 300–400 mL distilled water. Set up the steam distillation apparatus by connecting flask to condenser and receiver. Heat the flask using heating mantle to generate steam carrying volatile oil. Vapors of steam + essential oil pass through the condenser where they are cooled. Condensed liquid (distillate) is collected in receiver as oil + water mixture. Transfer the distillate into a separating funnel and allow layers to separate. Collect the fennel oil layer carefully. Dry the collected oil using anhydrous sodium sulfate to remove moisture. Measure the obtained oil (~3 mL) and store in airtight container.



Fig. No. 11: Preparation of fennel seeds extract.

❖ EXPERIMENTAL WORK

Sr No.	Ingredients	Quantity	Purpose
1.	Red raspberry leaves extract	1ml	Anti-inflammatory, Antioxidant
2.	Fennel seeds extract	1ml	Antispasmodic, Uterine relaxant
3.	Peppermint oil	0.75 ml	Cooling effect, mild analgesic
4.	Sandalwood oil	0.75 ml	Soothing, calming, anti-inflammatory
5.	Lavender oil	0.75 ml	Soothing, stress-relieving, aromatic
6.	Camphor oil	0.75 ml	Counter-irritant, enhances local blood circulation
7.	Coconut oil	19.00 ml	Carrier oil, emollient, enhances skin absorption, As base
8.	Vit E oil	0.55 ml	Antioxidant, improves skin barrier, stabilizes formula
9.	Rosemary oil	0.55 ml	Analgesic activity
10.	Tea tree oil	0.35 ml	Preservative

❖ Preparation of menstrual pain relief roll on

Choose suitable essential oils (peppermint, lavender, fennel, rosemary, sandalwood, camphor) and a carrier oil (coconut/almond) based on analgesic and

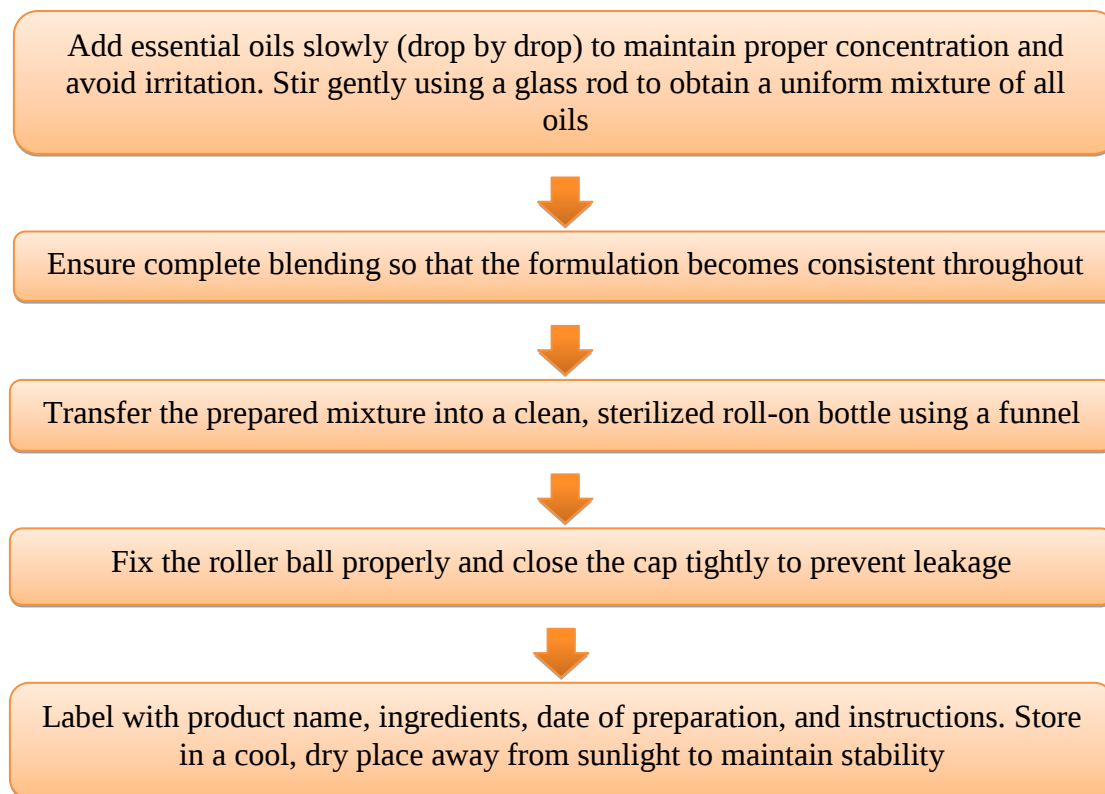


Accurately measure all oils in required proportion (usually essential oils 5–10% and carrier oil 90–95%) to ensure safety and effectiveness



Take a clean, dry container and add the carrier oil first, which acts as a base and dilutes essential oils.





❖ EVALUATION PARAMETER FOR MENSTRUAL PAIN RELIEF ROLL ON:

1. Organoleptic Properties

Sr. No.	Parameters	Observations
1.	Colour	Light yellow
2.	Odour	Aromatic, Characteristics
3.	Texture	Smooth, uniform, Non greasy, Free flowing liquid
4.	Consistency	Smooth liquid, Slightly viscous
5.	Physical State	Liquid

2. pH Test

Equal quantities of roll-on sample and distilled water were mixed in a beaker, allowed to stand for 2–5 minutes, and the pH was measured using a calibrated pH meter.



Fig. No. 12: pH Test.

- ❖ **Spread ability:**—Accurately weigh 0.5 ml of sample of roll on and it was pressed between two slides and left for about 5 minutes where no more spreading was expected. Diameter of spreaded circle was measured in cm and was taken as comparative for Spreadability.

$$S = ML/T$$

Where,

M = weight of upper slide

$$S = M L / T$$

L = length of circle

$$S = 100 \times 5.9 / 85$$

T = time in minute

$$S = 6.94 \text{ g.cm / s}$$

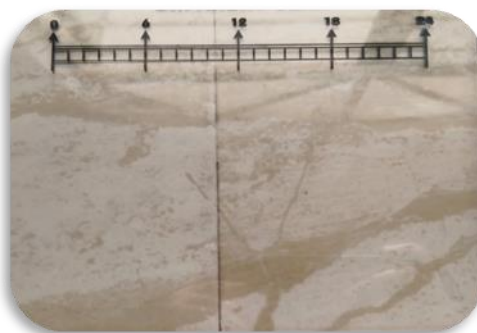


Fig. No. 13: Spread ability.

- ❖ **Stability studies:** The stability studies for formulation carried according to ICH guideline. The created roll-on was put through stability testing in order to maintain the samples accelerated temperature conditions. Various roll-on containers were maintained at room temperature, 47°C, and an accelerated 4°C, respectively. The samples were evaluated for the physicochemical parameters, turbidity and homogeneity at 24 hr., 48 hr., and 72 hrs. respectively.



Fig. No. 14: Stability Test.

❖ **Acid value**

Weigh accurately about 1–2 ml of oil sample. Add 25 ml neutralized ethanol. Warm gently to dissolve the oil. Add 2–3 drops of phenolphthalein indicator. Titrate with 0.1 N KOH until a light pink color persists for 30 seconds.



Fig. no. 15: Acid Value.

$$\text{Acid value} = V \times N \times 56.1 / W$$

❖ **UV-Visible Spectroscopy**

Take 1 mL of roll-on sample and dilute it with 10 mL ethanol. Mix well and fill the solution in a cuvette. Measure the absorbance using a UV-Visible spectrophotometer by using ethanol as blank.

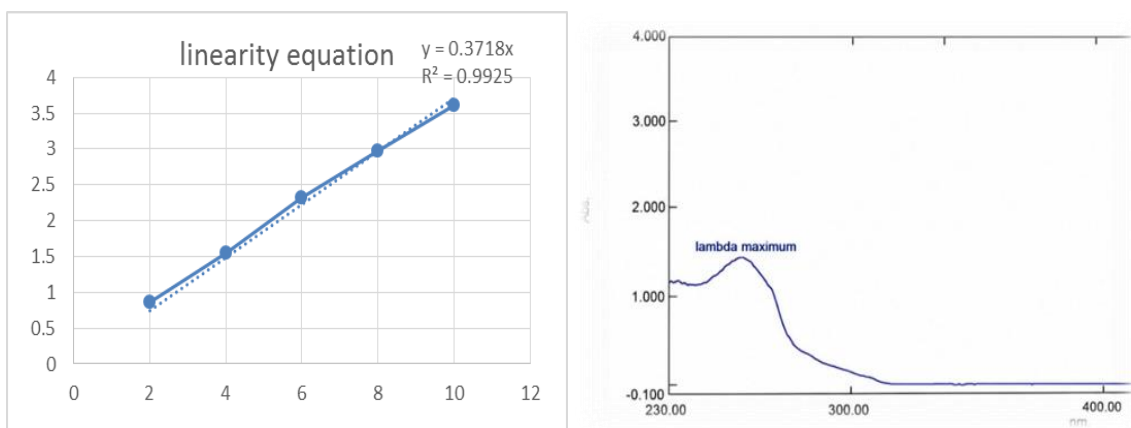


Fig. no. 16: Graphical representation of UV-Visible Spectroscopy.

Sr.No	Concentration ug/ml	Absorbance
1	2	0.856
2	4	1.546
3	6	2.325
4	8	2.978
5	10	3.612
Y=0.318		R²=0.998

❖ DISCUSSION

In the present study, a herbal menstrual pain relief roll-on was prepared using selected essential oils and natural ingredients known for their analgesic and antispasmodic properties. The formulation included oils derived from *Foeniculum vulgare*, *Mentha piperita*, *Lavandula angustifolia*, *Rosmarinus officinalis*, and *Santalum album*, along with camphor and *Cocos nucifera* as a carrier oil. The study was initiated after reviewing various literature sources regarding herbal remedies for dysmenorrhea.

The roll-on formulation was prepared by properly mixing and diluting essential oils in coconut oil to ensure safe topical application. The prepared formulation was evaluated for different parameters such as appearance, consistency, odor, spread ability, and skin irritation. The results indicated that the formulation possessed good consistency, pleasant aroma, and smooth application without causing any irritation.

The active constituents present in fennel oil exhibit antispasmodic activity which helps in reducing uterine contractions. Peppermint oil provides a cooling effect and acts as an analgesic, while lavender oil contributes to relaxation and stress relief. Rosemary oil improves blood circulation and reduces muscle stiffness, whereas sandalwood oil shows soothing and anti-inflammatory properties.

Camphor acts as a counter-irritant and enhances the penetration of active components through the skin. The combined effect of these herbal ingredients showed significant relief in menstrual pain by reducing cramps, improving blood flow, and providing a soothing sensation. The roll-on application allows localized delivery of the formulation, making it convenient and effective for use during menstruation.

❖ CONCLUSION

The present study mainly focuses on the formulation of a herbal menstrual pain relief roll-on containing essential oils with significant therapeutic properties. The formulation was prepared using oils obtained from *Foeniculum vulgare*, *Mentha piperita*, *Lavandula angustifolia*, *Rosmarinus officinalis*, *Santalum album* along with camphor and *Cocos nucifera* as a carrier oil.

The formulation showed good analgesic, antispasmodic, and anti-inflammatory properties which are beneficial in relieving menstrual pain. An attempt has been made in the present

study to develop a safe and effective herbal roll-on formulation for the management of dysmenorrhea.

The prepared formulation was evaluated for various parameters such as appearance, odor, consistency, spread ability, and skin compatibility. The results obtained were found to be satisfactory, indicating that the formulation is suitable for topical application. The herbal ingredients present in the formulation contributed significantly to the reduction of uterine cramps, improvement in blood circulation, and provision of a soothing cooling effect.

The roll-on dosage form proved to be convenient, easy to use, and effective for localized application on the lower abdominal region. The herbal menstrual pain relief roll-on demonstrated promising results in reducing menstrual discomfort without causing any adverse effects. The formulation can be considered as a natural and safe alternative to conventional synthetic medications for the management of menstrual pain.

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