

Formulation And Evaluation of Trachyspermum Ammi Oil Roll-On for Migraine Relife

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Abstract- Migraine headaches can be debilitating, significantly impacting quality of life. This study investigates the development and evaluation of a topical herbal roll-on formulation designed for the rapid relief of migraine symptoms. Herbal roll-ons are natural liquid preparations containing essential volatile oils and herbal extracts used to relieve pain and stress in migraines. Literature review and studies reveal that essential oils such as camphor, eucalyptus, lavender, and peppermint, along with herbal extracts like Ajwain, is commonly used in migraine treatment. This roll-on format offers a convenient and non-invasive alternative to traditional oral medications, providing targeted delivery of these active herbal ingredients Ajwain as key ingredients. Ajwain is known for its potential to reduce migraine frequency and intensity through anti-inflammatory and analgesic actions. Eucalyptus oil provides calming effects, helping to mitigate stress and anxiety, common migraine triggers. Together, they aim to alleviate pain and discomfort associated with migraines. The roll-on was evaluated for its physicochemical properties, including viscosity, Spreadability, and stability. In vitro drug release studies were conducted to assess the rate and extent of active ingredient permeation. The results demonstrate that the developed roll-on formulation exhibits desirable physicochemical characteristics and provides sustained release of active ingredients. This topical herbal roll-on presents a promising option for the on-demand relief of migraine symptoms, offering a practical and patient-friendly approach.

KeyWords: Aromatherapy, Natural relief, Essential oils, Headache Management.

I. INTRODUCTION

Migraines are extremely frequent affecting more than 1 in 10 individuals. Migraine headache begins in major part in meninges, blood vessel, particularly dural arteries. While it was once thought that

dilatation of these arteries was the trigger for migraine headache, neurogenic inflammation involving trigeminal nerve and inhibition of 5-HT_{1B/1D} receptors are the primary causes of the condition.[1]

Many vasoactive neuropeptides such as serotonin, calcitonin gene related peptide (CGRP), pituitary adenylate cyclase activating peptide, histamine are key regulators of the neurogenic inflammation in migraine. The brainstem, hypothalamus and cerebral cortex all have a role in migraine pain and aura modulation. Cortical spreading depression is a phenomenon that occur when a wave of neuronal alteration washes throughout the cerebral cortex causing a hypersensitive state throughout neural networks due to which migraine occur.[1]



Fig 1: MOA of Ajwain

• Herbal Roll On

A Roll-on is a type of liquid preparation packed in a container with an applicator consisting of a revolving ball at the top of the dispenser. Herbal roll-on contains the essential oil or volatile oils used to treat different pains such as headaches, joint pains, neck aches.[4]

Introducing our revolutionary herbal roll-on, a scientifically informed formulation designed to provide natural relief from migraine and sinus symptoms. Herbal roll-ons, which contain volatile oils extracted from plants, offer a non-invasive, topical approach to pain and respiratory discomfort, making them a valuable addition to both traditional and modern wellness practices

- Herbal roll-ons use plant-based ingredients such as peppermint, eucalyptus, cinnamon, menthol, camphor, thyme, and wintergreen oils, known for their analgesic, anti-inflammatory, and soothing properties.
- They are portable and convenient, making them ideal for quick relief at home, work, or while traveling.
- Migraine-Related Problems Addressed by Ajwain Roll-On



- Severe unilateral or bilateral headache
- Throbbing or pulsating head pain
- Tension-type headache
- Stress-induced migraine
- Sinus headache
- Sensitivity to light (photophobia)
- Sensitivity to sound (phonophobia)
- Nausea and dizziness associated with migraine
- Muscle tightness around temples, forehead.
- Why Ajwain Roll-On is Effective for Migraine?

- Ajwain contains thymol, which produces a warming effect and helps relax tense muscles.
- Acts as a natural analgesic, reducing headache intensity.
- Anti-inflammatory action helps decrease nerve irritation.
- Aromatic vapors provide calming and soothing effects, reducing stress-related triggers.
- Roll-on application ensures easy, mess-free, and targeted delivery to temples and forehead.

II. LITERATURE REVIEW

1. Furqan, M., Ghatode, V., & Heerakaremore. (2025) "Formulation and Evaluation of a Herbal Roll-on for Pain Relief" The work highlights that herbal roll-ons using natural ingredients such as menthol, peppermint oil, clove oil, and garlic oil in a coconut-oil base offer a safer, low-adverse-effect alternative to synthetic analgesics for musculoskeletal pain, headaches, and minor discomfort.

2. Pawar, et al. (2025)

Preparation and Evaluation of Herbal-Roll on for the management of Migraine presents a formulation using herbal ingredients, including Ajwain, designed for migraine relief, with initial evaluation indicating promising results for pain management.

3. Heydariradet al. (2024)

Exploring the Effectiveness of Ajwain Cream in Treating Taxane-induced Peripheral Neuropathy in Cancer Patients: A Pilot, Randomised and Double-blind Clinical Trial shows that Ajwain cream may help reduce symptoms of peripheral neuropathy in cancer patients, suggesting its potential as a supportive therapy.

4. Pireimathy Murthy,et al (2023)

Essential Oils as an Alternative Treatment for Migraine Headache: A Systematic Review and Meta-Analysis. The study analyzed randomized controlled trials comparing essential oils to placebo in adults with migraine, focusing on outcomes like attack frequency, severity, duration, associated symptoms, and use of analgesics.

5. Dahiya, et al. (2023)

Trachyspermum ammi (Ajwain): A Sacred plant with High Medicinal and Therapeutic potential is a concise review emphasizing Ajwain's traditional importance, rich phytochemistry, and diverse therapeutic benefits, including antioxidant, anti-inflammatory, and digestive effects, highlighting its value in medicine

6. Himadri Sharma, et al. (2023)

Trachyspermum ammi Bioactives Promote Neuroprotection by Inhibiting Acetylcholinesterase, A β Oligomerization/Fibrilization, and Mitigating Oxidative Stress In Vitro demonstrates that Ajwain bioactives have neuroprotective effects by inhibiting key Alzheimer's-related processes and reducing oxidative stress in laboratory studies.

7. Fatemeh Zal et al. (2023)

A Comparison of the Effect of Ajwain (Trachyspermum ammi(L.) Sprague) and Mefenamic Acid for Alleviating the Symptoms of Primary Dysmenorrhea: An Open-Label Randomized Controlled Trial

8. Shilpa Debnath, et al. (2022)

An insight of Trachyspermum ammi L.: A comprehensive review on its aromatic and medicinal potential is a concise review published in Annals of Phytomedicine (2022). It summarizes the traditional uses, phytochemistry, and pharmacological activities of Ajwain, highlighting its antioxidant, antimicrobial, anti-inflammatory, and digestive benefits, and discusses its potential as a safe herbal remedy in both traditional and modern medicine.

9. Ruyifang yan, et al. (2020)

Review of aromatherapy essential oils and their mechanism of action against migraines. The review supports the use of plant-based essential oils as alternative treatments for migraine, focusing on their pharmacological actions and clinical evidence.

10. P.A Lingaya, et al. (2020)

"Formulation and evaluation Herbal Roll-on used in Headache" explored the development of a topical herbal roll-on specifically designed to relieve headache. The study emphasized that such roll-ons,

based on essential oils such as peppermint oil, eucalyptus oil, camphor, and related herbal volatiles, provide rapid, non-invasive pain relief with minimal systemic adverse effects.

11. Himani Singh, et al. (2019)

Ajwain: A Potential Source of Phytochemical for Better Health. The study emphasized ajwain's antioxidant, anti-inflammatory, carminative, and antimicrobial properties, making it effective for various health issues like migraine, abdominal discomfort, and respiratory problems.

III. AIM & OBJECTIVE

- Aim: "Formulation and Evaluation of an Trachyspermum ammi oil Roll-on for migraine Relief"
- Objectives:
 1. To develop a natural, effective herbal roll-on for migraine relief.
 2. To offer a safer, plant-based alternative to synthetic pain relievers.
 3. To utilize the therapeutic properties of ajwain and other herbs for pain relief.
 4. To provide convenient, easy-to-use, and skin-friendly migraine management.
 5. To promote non-invasive, plant-based migraine treatments.
 6. To optimize the formulations based on the results of efficacy and safety evaluation.

IV. PLANT PROFILE

Ajwain



Fig 3: Ajwain Plant

SYNONYM: Ajwan, Ajowan, Carum copticum

BIOLOGICAL SOURCE: Ajowan is the dried ripe seeds of *Trachyspermum ammi* (L.) Sprague. Belonging to family Apiaceae.

GEOGRAPHICAL SOURCE: It is a native of Egypt and grown throughout India, Asian countries such as Iraq, Iran, Afghanistan, and Pakistan.

CHEMICAL CONSTITUENTS: Ajowan contains an essential oil (2–3.5%), protein (17.1%), and fat (21.8%). The principal constituents of the oil are phenol, mainly thymol (35–60%), carvacrol, p-cymene, γ -terpinene, α -, and β -pinenes and dipenten. USES: Ajowan is widely used as a spice in curries; in pickles, certain types of biscuits, confectionery, and in beverages. It is valued for its antispasmodic, stimulant, tonic, and carminative properties.

MECHANISM OF ACTION:

Thymol: Acts as a natural analgesic by modulating pain receptors and inhibiting histamine (H1) receptors, reducing pain and inflammation. Enhances gamma-aminobutyric acid (GABA) activity, providing mild anxiolytic and muscle-relaxing effects, which may help reduce migraine triggers. Blocks sodium channels in nerve endings, decreasing pain signal transmission.

Eucalyptus plant



Fig 4: Eucalyptus Plant

SYNONYM: Eucalyptus oil (Aka Blue Gum or Tasmanian Blue Gum).

BIOLOGICAL SOURCE: Leaves and stems of *Eucalyptus globulus*. Belonging to family Myrtaceae.

GEOGRAPHICAL SOURCE: Native to Australia, now cultivated in countries like India, China, South Africa, Portugal, Spain, and Brazil.

CHEMICAL CONSTITUENTS: Mainly 1,8-cineole

(eucalyptol), also contains phellandrene, piperitone, limonene, and geranyl acetate.

USES: Used for respiratory relief (nasal congestion, sinusitis), as an antiseptic, for pain relief (arthritis), and in aromatherapy for mental clarity and skin conditions.

V. PLAN OF WORK

PHASE 1

- Literature Survey.

PHASE 2

- Selection and Collection of plant material.

PHASE 3

- Authentication and identification of plant material.

PHASE 4

- Phytochemical screening of Ajwain oil.

PHASE 5

- Formulation of Ajwain infused oil for herbal roll on.

PHASE 6

- Evaluation of herbal based roll-on.

PHASE 7

- Result and discussion.

VI. MATERIALS

Sr.no	Materials	Quantity	Source
1	Ajwain seeds	2 gm	Local area of Gondia
2	Almond oil	25 ml	Market
3	Lavender oil	1%	Market
4	Eucalyptus oil	1-2%	MIBP, Gondia
5	Peppermint oil	1%	MIBP, Gondia
6	Vitamin E	0.5%	Market

Table No 1: List of drug and excipients

Table No.4: Instruments

Sr.no	Instrument	Manufacturer
1	Muffle Furnace	Scientific Co. NGP (BTI – 18)
2	pH Meter	Apurwa Sci. Gondia
3	Brookfield Viscometer	Brookfield Engineering Laboratories.
4	Digital Balance	Kerro P3
5	Hot Air Oven	Alka Scientific Co.
6	Mixer Grinder	Sujata
7	Heating Mantle	Apurwa Sci. Gondia.
8	Digital Water Bath	Apurwa Sci. Gondia.
9	B.O.D Incubator	HMG Gondia.
10	Rotary Flask Shekar	M/S Swastik Acids.
11	Electric Water Bath	INSIF, India.

Table No.3: List of Chemicals / reagent

Sr.no	Chemicals
1	Dragendroff's reagent
2	Mayer's reagent
3	Ninhydrin solution
4	Lead Acetate
5	Ferric Chloride
6	Glacial Asetic Ascid
7	Sulphuric Acid
8	Millions reagent
9	Hydrochloric acid
10	Acetone
11	Magnesium Turnings
12	Sodium bi carbonate
13	Chloroform
14	Sudan III
15	Distilled water
16	Ethanol
17	Phenopthaline
18	KOH

VII. METHODOLOGY

- **Drying:**
High-quality Ajwain seeds (*Trachyspermum ammi*) were procured from a local certified vendor. To

ensure the stability of the volatile oils (specifically thymol), the seeds were cleaned to remove foreign organic matter and then shade-dried at room temperature. This prevents the degradation of heat-sensitive active compounds that occurs during direct sun drying.

- **Grinding:**

Once the Ajwain seeds were thoroughly dried, they were subjected to mechanical grinding. The seeds were coarsely powdered using a laboratory-grade grinder. A coarse powder is preferred over a very fine powder for oil infusion to prevent clogging during the filtration stage and to ensure a better surface area for the menstruum (oil) to penetrate.

- **Infusion (Maceration/Percolation):**

The infusion process is the primary procedure for the preparation of medicated oils. For this project, a cold/hot infusion method was utilized:

Preparation: The weighed amount of crushed Ajwain powder was placed in a glass vessel and moistened with a small amount of the carrier oil (e.g., Coconut, Sesame, or Olive oil).

- **Maceration:**

The mixture was then combined with the remaining volume of carrier oil in a ratio of 1:5 (w/v). The container was sealed and kept at room temperature, away from direct sunlight, for a period of 7 to 10 days.

- **Filtration:**

After the completion of the maceration period, the oil was filtered through a double-layered muslin cloth followed by Whatman filter paper to remove all particulate matter.

- **Storage:**

The resulting Ajwain-infused oil was stored in an amber-colored glass bottle to protect it from photo-oxidation and labeled for further qualitative and quantitative analysis.

PREFORMULATION EVALUATION

- **Organoleptic Properties:**

Organoleptic properties refer to the characteristics of a substance that are perceived by the senses, such as color, odor, and taste.

- Solubility Studies:

A solubility study is an experiment or analysis to determine the solubility of a substance in a given solvent, typically at specific conditions (e.g., temperature, pH).

- Preliminary Phytochemical Screening

- Test for Alkaloids:

Dragendorff's Test: A few drops of Dragendorff's reagent were added to the Ajwain extract. The appearance of an orange or reddish-brown precipitate indicates the presence of alkaloids.

Mayer's Test: A small portion of the extract was treated with Mayer's reagent. The formation of a cream-colored precipitate confirms a positive result for alkaloids. [11]

- Test for Flavonoids:

Shinoda Test: To the extract, a small magnesium ribbon and a few drops of concentrated HCl were added. The development of a pink or red color indicates the presence of flavonoids. [11]

- Test for Tannins:

Ferric Chloride Test: 1–2 drops of FeCl_3 solution were added to the extract. The formation of a blue-black or greenish coloration indicates the presence of tannins.

- Test for Saponins:

Foam Test: A small amount of the extract was diluted with distilled water (2ml) and shaken vigorously in a test tube for 15 minutes. The persistence of stable foam for 10–15 minutes confirms the presence of saponins. [11]

- Test for Phenolic Compounds:

Lead Acetate Test: A few drops of lead acetate solution were added to the extract. The formation of a white precipitate indicates the presence of phenolic compounds. [11]

- Test for Glycosides:

Keller–Killiani Test: The extract was treated with glacial acetic acid, one drop of FeCl_3 solution, and concentrated H_2SO_4 . The appearance of a brown ring at the interface indicates the presence of cardiac glycosides.[11]

- Test for Volatile Oils (Thymol):

Sudan III Test: The extract was treated with Sudan III stain. The development of a red coloration confirms the presence of volatile oils, specifically Thymol, which is the major active constituent of Ajwain responsible for its antimicrobial properties. [11]

- Test for Proteins:

Biuret Test: The extract was treated with 10% sodium hydroxide solution and two drops of 0.1% copper sulfate solution. A violet or pink color indicates the presence of proteins. [11]

- Amino Acids:

Ninhydrin Test: To the extract, 2 drops of Ninhydrin solution (10 mg of ninhydrin in 10 ml of acetone) were added. The appearance of a purple or blue color indicates the presence of amino acids. [11]

- Extractive Values

- Alcohol Extractive Value

Weigh 5g coarsely powdered ajwain seeds (constant weight, shade-dried); macerate with 100ml ethanol (95%) in stoppered flask for 24h, shaking occasionally. Filter through Whatman #1; evaporate 25ml filtrate to dryness on water bath (60°C); dry residue at 105°C to constant weight. [8]

- Water Extractive Value

Procedure: Weigh 5g ajwain powder; macerate with 100ml chloroform water (or distilled water) for 24h, shaking frequently. Filter; evaporate 25ml filtrate as above. [8]

- Loss on Drying

Weigh about 5 g of coarsely powdered ajwain seeds (constant weight, shade-dried in air-dried condition) into a previously tared, flat-bottom shallow dish or LOD bottle. Dry the dish with sample in a hot-air oven at 105 °C for a specified time (usually until constant weight is obtained, with intermittent cooling in a desiccator and re-weighing). [8]

- Ash Value

- Total Ash value

Weigh 2-3 g of powdered material in a tared silica/porcelain crucible. Incinerate in a muffle furnace by gradually increasing heat to until free from carbon (white/grey ash).

- Acid Insoluble Ash Value

Take the total ash obtained above. Add 25 mL of 2M HCl or dilute HCl to the crucible. Boil for 5 minutes. Filter the solution through an ashless filter paper (e.g., Whatman No. 42). Wash the filter paper with hot water, then ignite the residue in a muffle furnace until constant weight. [8]

- Sulphated Ash Value

Gently ignite 1-2 g of the sample in a tared crucible. Cool, moisten the residue with 1 mL of concentrated sulphuric acid and heat gently until white fumes cease. Continue to ignite in a furnace until all black particles are gone. [8]

Time required: Cooling & Maceration : 30–40 minutes & 6–8 hours (can extend up to 12 hours in lab

Procedure:

Once completely cooled, cover the beaker Use aluminium foil, watch glass, or lid. Keep the beaker undisturbed at room temperature.

Place it in a dark area (drawer or cupboard). [1]

- Step 6: Filtration

Time required: 10–15 minutes

Filter oil using muslin cloth or Whatman No.1 filter paper. Collect clear filtrate in a clean, dry beaker.[1]

- Step 7: Storage

Time required: 5 minutes

Transfer filtered oil into an roll on bottle.

FORMULATION OF HERBAL OIL ROLL ON:

- Step 1: Crushing Ajwain Seeds Time required: 3–5 minutes

Weigh 5 g Ajwain seeds accurately.

Transfer to a clean, dry mortar. Lightly crush using pestle until seeds crack open. [1]

- Step 2: Heating the Almond Oil Time required: 3–4 minutes

Measure 50 ml almond oil and transfer to a clean beaker.

Place the beaker on a water bath. Heat gently and maintain temperature at 60°C.[1]

- Step 3: Adding Ajwain to Oil Time required: 1–2 minutes

Slowly add the crushed Ajwain seeds to the warm almond oil. Stir continuously using a glass rod.

- Step 4: Infusion (Controlled Heating). Time required: 15 minutes

Maintain temperature between 60–70°C. Stir occasionally to prevent settling or burning.

- Step 5: Cooling & Maceration

BATCHES PREPARED

Table No.5: Batches prepared

Sr.no	Ingredients	Uses	F1 (20ml)	F2 (25ml)	F3 (25ml)
1	Ajwain seeds	Analgesic, anti-inflammatory	2gm	2gm	2.3gm
2	Lavender oil	Relaxant, anxiolytics	1 %	1-2%	1-2%
3	Eucalyptus oil	i-inflammatory, Decongestant	1%	1%	2%
4	Peppermint oil	Cooling, muscle relaxant	1%	1%	1%
5	Vitamin E	Antioxidant, moisturizer	0.5%	0.5%	1%
6	Almond oil	Carrier base, Emollient	94.5%	94.5%	94.5%

EVALUATION OF HERBAL OIL ROLL ON

- pH

Measure of how acidic or basic a preparation is; numerically it is the negative logarithm of hydrogen ion concentration. [3]

- Clarity

Degree to which a formulation is transparent, translucent, or free from visible particles or cloudiness. [3]

- Viscosity

Thickness or internal resistance to flow of a liquid or semisolid; high viscosity = thicker product.

- Spreadability

Ease with which a formulation can be uniformly spread on a surface (e.g., skin) with light force. [3]

- Skin irritation

Undesirable reaction on the skin (redness, burning, itching, swelling) produced after application of a product. [3]

- Washability

Ease with which a product can be removed from skin or hair using water (sometimes with soap).

- Homogeneity

Uniform distribution of all ingredients throughout the formulation, with no lumps, phase separation, or visible non-uniformity. [3]

- After feel

Sensation left on the skin after application and partial/complete absorption of the product (e.g., greasy, sticky, smooth, dry).

- specific gravity

The specific gravity test for oil is a simple physical test that measures how dense an oil is compared with water. It gives a dimensionless number (no units) that helps assess purity, identity, and, in some cases, grade or adulteration of the oil. [3]

- Stability study

Ability of a formulation to maintain its physical, chemical, microbiological, and therapeutic properties over time under specified storage conditions.

PHYSIOCHEMICAL EVALUTION OF HERBAL OIL ROLL ON

- Acid Value

This measure the milligrams of potassium hydroxide (KOH) needed to neutralize free fatty acids in 1 gram of sample. It indicates hydrolytic rancidity and oil quality—lower values suggest fresher oils. [11]

- Saponification Value

Defined as the milligrams of KOH required to saponify (hydrolyze esters into glycerol and fatty acid salts) 1 gram of fat or oil. Higher values reflect shorter-chain fatty acids, aiding molecular weight estimation in formulations. [11]

VIII. RESULT

PREFORMULATION EVALUATION

Table No.6: Organoleptic properties

Sr.no	Test	Observation
1	Appearance	Small oval shape.
2	Colour	Light brown
3	Odor	Aromatic
4	Taste	Pleasant, pungent.
5	Texture	Hard rigid Texture

Table No.7: Solubility studies

Sr.no	Compound	Solubility
1	Water	Insoluble
2	Alcohol	Soluble
3	Glycerine	Insoluble
4	Chloroform	Soluble
5	Acetone	Soluble

Table No.7: Phytochemical Screening of ajwain extract

Sr.no	Constituents	Test / Reagent	Trachyspermum ammi
1	Alkaloids	Dragendorff's Test	—
2	Flavanoids	Shinoda Test	+
3	Glycosides	Keller Kelani Test	—
4	Quinones	NaOH Test	—
5	Protiens	Million's Test	+
6	Phenols	Lead Acetate Test	+
7	Saponins	Foam Test	+
8	Amino acids	Ninhydrin Test	+
9	Volatile oil	Sudan III Test	+
10	Tannins	FeCl ₃ Test	+

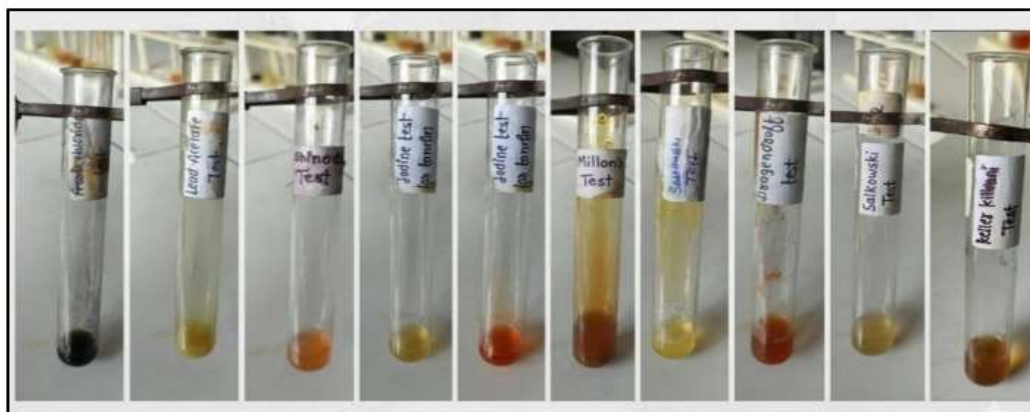


Fig no 6: Phytochemical Screen Test

Extractive Value

Table No.8: Alcohol Extractive Value of Ajwain

Sr.no	Petri dish prep weight (A)	Sample	Petri dish final weight (B)	Difference (A-B)
1	61.044gm	5 gm	61.421gm	0.377gm

Alcohol extractive value (%) = $\frac{\text{Wt. of dried residue}}{2} \times 100 = \frac{0.377}{2} \times 100 = 18.85\%$.

Table No.9: Water Extractive Value of Ajwain

Sr.no	Petri dish prep weight (A)	Sample	Petri dish final weight (B)	Difference (A-B)
1	62.375gm	5 gm	62.778gm	0.403gm

Water extractive value (%) = $\frac{\text{Wt. of dried residue}}{2} \times 100 = \frac{0.403}{2} \times 100 = 20.15\%$.

Loss on Drying

Table No 10: Loss on Drying

Sr.no	Petri dish prep weight+ sample (W1)	Sample	Petri dish final weight after drying (W2)	Difference (W1-W2)
1	37.825gm	2 gm	37.730gm	0.16gm



Loss on Drying % = $\frac{(W1-W2)}{\text{Wt. of sample}} \times 100 = \frac{37.825-37.730}{2} \times 100 = \frac{0.095}{2} \times 100 = 0.0475 \times 100 = 4.75\%$.

Ash Value:

Table No.11: Total ash value

Sr.no	Wt. of empty crucible dish (A)	Sample	Wt. of crucible dish after ignition (W2)	Difference (W2-W1)
1	32.55gm	2 gm	32.81gm	0.27gm



Total Ash Value = $\frac{(W2 - W1)}{\text{Wt of sample}} \times 100 = \frac{32.55 - 32.82}{2} \times 100 = -0.135 \times 100 = -13.5\%$

Table No.12: Acid Insoluble Ash Value

Sr.no	Wt. of empty crucible dish (W1)	Wt. of sample (y)	Wt. of crucible dish after ignition (W2)	Difference (W2-W1) = (a)
1	29.998gm	2 gm	29.884gm	0.114gm



Acid Insoluble Value % = $a / y \times 100 = 0.114 / 2 \times 100 = 0.057 \times 100 = 5.7\%$.

Table No.13: Sulphated Ash Value

Sr.no	Wt. of empty crucible dish (W1)	Wt. of crucible dish+sample (W2)	Wt. of crucible dish after ignition (W3)
1	29.874gm	31.610gm	29.998 gm



Sulphated Ash Value % = $(W3-W1)/(W2-W1) \times 100 = 0.124/1.610 \times 100 = 0.0769425 \times 100 = 7\%$.

EVALUATION OF HERBAL OIL



Fig no.7: Herbal oil

Table No.14: Physical Appearance

Sr.no	Test	Formulation		
		F1	F2	F3
1	Appearance	yellow	yellow	yellow
2	Odour	pleasant	pleasant	pleasant
3	Consistency	Smooth, non-greasy	Smooth, non-greasy	Smooth, non-greasy
4	Homogeneity	good	good	good
5	Clarity	Transparent	Transparent	Transparent

Table No 15: pH of Herbal oil

Test	Formulation		
	F1	F2	F3
pH	4.67	5.28	5.44



Table No 16: Viscosity of herbal oil

Test	Formulation		
	F1	F2	F3
Viscosity (50rpm) (cp)	12.2	24.0	30.0



Table No 17: Spreadability

Test	Formulation		
	F1	F2	F3
Spreadability	12.2	24.0	30.0
Time	14:87 s	14:87 s	20:30 s
Length	4.2 cm	3.1 cm	4.1cm
Assessment	Good	Very good	Excellent

Table No 18: Skin irritation

Skin irritation Test	Formulation		
	F1	F2	F3

30 min	No reaction	No reaction	No reaction
1 hour	No reaction	No reaction	No reaction
2 hour	No reaction	No reaction	No reaction

Table No 19: Washability

Test	Formulation		
	F1	F2	F3
Washability	Slightly washable	washable	washable

Table No 20: After feel

Test	Formulation		
	F1	F2	F3
After feel	Little greasy and relief the pain	Little Greasy and relief the pain	Not greasy and relief the pain

Table No 21: Specific Gravity

Test	Formulation		
	F1	F2	F3
Specific Gravity	0.30	0.50	0.92
Assesment	Very Light	Light	High

PHYSIOCHEMICAL EVALUTION OF HERBAL OIL ROLL ON

Table No 22: Acid Value

Test	Observation	Inference	Result
2 ml of sample + 50 ml ethanol + 2 drops of phenophthalien + titrate with 0.1 N KOH solution	Appear light pink colour	Colourless to light pink	

Acid Value = $5.61 \times V \times N / W = 5.61 \times 6 \times 0.1 / 10$
= 0.33 mg KOH/g

Table No 23: Saponification Value

Test	Observation	Inference	Result
2 ml of sample + 25 ml of alcoholic KOH in reflux condenser + 2 drop of phenophthalien and titrate with 0.5 HCL	Pink colour appear	Pink to colourless	

Saponification Value = $(B-S) \times N / 56.1/W = (25-10) \times 0.5 \times 56.1 / 2 = 420.75 / 2 = 210.37 \text{ mg KOH/g}$

STABILITY STUDIES:

Table No 24: For F1

Evaluation	F1		
	Room Temp.	Refrigration	Oven
Temp	25 °C	2 - 8 °C	40 °C ± 2 °C
Colour	Yellow	Yellow	Yellowish brown
Odour	Aromatic	Aromatic	Aromatic
Spredability	Good	Good	Inadequate
p.H	4.67		

Table No 25: For F2

Evaluation	F2		
	Room Temp.	Refrigration	Oven
Temp	25 °C	2 - 8 °C	40 °C ± 2 °C
Colour	Yellow	Yellow	Yellow
Odour	Aromatic	Aromatic	Aromatic
Spredability	Good	Good	Inadequate
p.H	5.28		

Table No 26: For F3

Evaluation	F3		
	Room Temp.	Refrigration	Oven
Temp	25 °C	2 - 8 °C	40 °C ± 2 °C
Colour	Yellow	Yellow	Yellow

Odour	Aromatic	Aromatic	Aromatic
Spredability	Good	Good	Inadequate
p.H	5.44		

COMPARISON BETWEEN HERBAL FORMULATION AND MARKETED FORMULATION

Table No 27: Comparison between herbal formulation and marketed formulation.

Sr. no	Physiochemical Parameter	Formulation 1	Formulation 2	Formulation 3	Marketed Formulation
1	Colour	Yellow	Yellow	Yellow	Off -White
2	Ordour	Charecterstic	Charecterstic	Charecterstic	Charecterstic
4	Viscosity	12.2	24	30	28
5	p.H	4.67	5.28	5.44	5.4
6	Homogenetiey	good	good	good	good
7	Washability	Slightly Washable	Washable	Washable	Washable
8	Thermal Stability	Stable	Stable	Stable	Stable
9	Irritation Test	Non - Irritation	Non - Irritation	Non - Irritation	Non - Irritation
10	Spreadability	Good	Good	Excellent	Excellent

IX. DISCUSSION

The optimized Ajwain essential oil roll-on formulations exhibited a clear to pale yellow color with excellent homogeneity and no phase separation observed across all batches. The pH values ranged from 5.5-6.5, aligning well with skin pH for optimal dermal compatibility and reduced irritation potential. Viscosity measurements using Brookfield viscometer (20 rpm) showed consistent values of 5000-6000 cP, ensuring smooth application and prolonged contact time on the skin. Spreadability was excellent at 8-12 g/cm², facilitating easy roll-on delivery for migraine-affected temple areas. The irritancy of formulated herbal oil is negligible and washability is also excellent. After Feel parameter shows non greasyness.

These attributes confirm the formulation's enhanced bioavailability, patient compliance, and commercial

viability as a stable herbal alternative for migraine relief.

X. CONCLUSION

The present study successfully focused on the formulation and evaluation of a Trachyspermum ammi (ajwain) oil-based roll-on for migraine relief. The roll-on was formulated using suitable excipients to ensure ease of application, stability, and patient compliance. Trachyspermum ammi oil, known for its analgesic, anti-inflammatory, and antispasmodic properties, proved to be a promising natural ingredient for migraine management.

The outcome of the study "Formulation and Evaluation of a Trachyspermum ammi oil Roll-on for Migraine Relief" demonstrated that a stable, effective, and user-friendly herbal roll-on can be

successfully developed using *Trachyspermum ammi* oil as the active ingredient.

The presence of bioactive constituents such as thymol in *Trachyspermum ammi* oil contributed to its analgesic, anti-inflammatory, and soothing effects, which are beneficial in reducing migraine symptoms such as headache and discomfort.

REFERENCES

- [1] Pawar et al. "Preparation and Evaluation of Herbal-Roll on For the Management of Migraine", *International Journal of Creative Research Thoughts (IJCRT)*, November 2025, page no. g47.
- [2] Heydarirad et al "Exploring the Effectiveness of Ajwain Cream in Treating Taxane-induced Peripheral Neuropathy in Cancer Patients: A Pilot, Randomised and Double-blind Clinical Trial", *Indian Journal of Palliative Care*, 2024, page no. 71-76.
- [3] P.A Lingaya, et al. "Formulation and evaluation Herbal roll on used in headache", *International Journal of Scientific Research and Development (IJSRD)*, 2024, page no. 144.
- [4] Padmaja Kota et al. "Formulation and Evaluation of Pain relief Herbal roll on,"
- [5] *World Journal of Pharmaceutical Sciences (WJPS)*, 2022, page no. 52-55.
- [6] Ruyifang yan, et al. "Review of aromatherapy essential oils and their mechanism of action against migraines," *Journal of Ethanopharmacology*, 2020, page no. 1-17.
- [7] Himadhari Sharma et al. "Pharmaceutical and Cosmetic Approach to Skin Barrier Repair," *International Journal of Creative Research Thoughts (IJCRT)*, 2025, published paper ID: IJCRT2504182.
- [8] Furqan, M., Ghatode, V., & Heerakaremore. "Formulation and Evaluation of a Herbal Roll-on for Pain Relief". *International Journal of Innovative Science and Research Technology*, (2025) 10(3), 2472–2474. ISSN 2456-2165.
- [9] Ankit Kushwaha and Dr. Vandna Pathak, "Phytochemical and Physicochemical Study of Ajwain Seeds (*Trachyspermum ammi*.)," *International Journal of Novel Research and Development (IJNRD)*, July 2024, Volume 9, Issue 7, ISSN: 2456-4184, page no. f109–f130.
- [10] Shilpa Debnath et al., "An Insight of *Trachyspermum ammi* L.: A Comprehensive Review on Its Aromatic and Medicinal Potential," *Annals of Phytomedicine*, 2022, Volume 11, Issue 2, pp. [210-2218].
- [11] Himani Singh et al., "Ajwain: A Potential Source of Phytochemical for Better Health," *The Pharma Innovation Journal*, 2019, Volume 8, Issue 6, Part K, pp. 122–127.
- [12] K.R. Khandelwal. "Practical Pharmacognosy: Techniques and Experiments", Nirali Prakashan, 2008 (19th edition), page no. 47.