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FORMULATION AND EVALUATION OF TOPICAL HERBAL GEL FOR ANTI-INFLAMMATION

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ABSTRACT

Gels are semi-solid, three-dimensional, polymeric formulations consisting of a small amount of dispersed solid within a larger amount of liquid. These topical formulations have been extensively researched. Herbal gels have gained significant attention in recent years due to their natural origins, safety profiles, and therapeutic potential. This abstract outlines the formulation of a novel herbal gel designed to offer topical relief for various dermatological conditions. The formulation integrates a synergistic blend of herbal extracts renowned for their anti-inflammatory properties. Thymus Vulgaris and Salvia Hispanica L contain active ingredients with known anti-inflammatory activities. The topical anti-inflammatory activity of the gel was also assessed. The gel was prepared using Carbopol 940 (1% w/v), Thymus vulgaris extract, Salvia Hispanica L extract, and the required amount of distilled water. The prepared gels underwent evaluation for physical appearance, pH, spreadability, toxicity, or homogeneity, as well as anti-inflammatory activity. The results indicated that the gel formulations exhibited good appearance and homogeneity. Spreadability values suggested that these herbal gels were easily spreadable with minimal shear force. The pH of all formulations was approximately 6, falling within the normal pH range of the skin. The preparation demonstrated stability under cold storage conditions.

KEY WORDS: Anti-inflammatory, Gel, Thymus Vulgaris, Salvia Hispanica L, Homogeneity

INTRODUCTION

SKIN

The skin, being the body's largest organ, is both highly exposed and sensitive, serving as a crucial interface with the external environment. Its intricate structure plays a significant role in various functions, including barrier maintenance, substance penetration, absorption, and immune response. Thus, a through grasp of the skin's anatomy is essential for comprehending its protective mechanisms and how it reacts to chemical, particles, or other forms of damage.

Many receptors within the skin have the ability to detect sensations such as touch, pain, and heat. The skin has three layers as following Epidermis, Dermis and fat of subcutis (hypodermis).

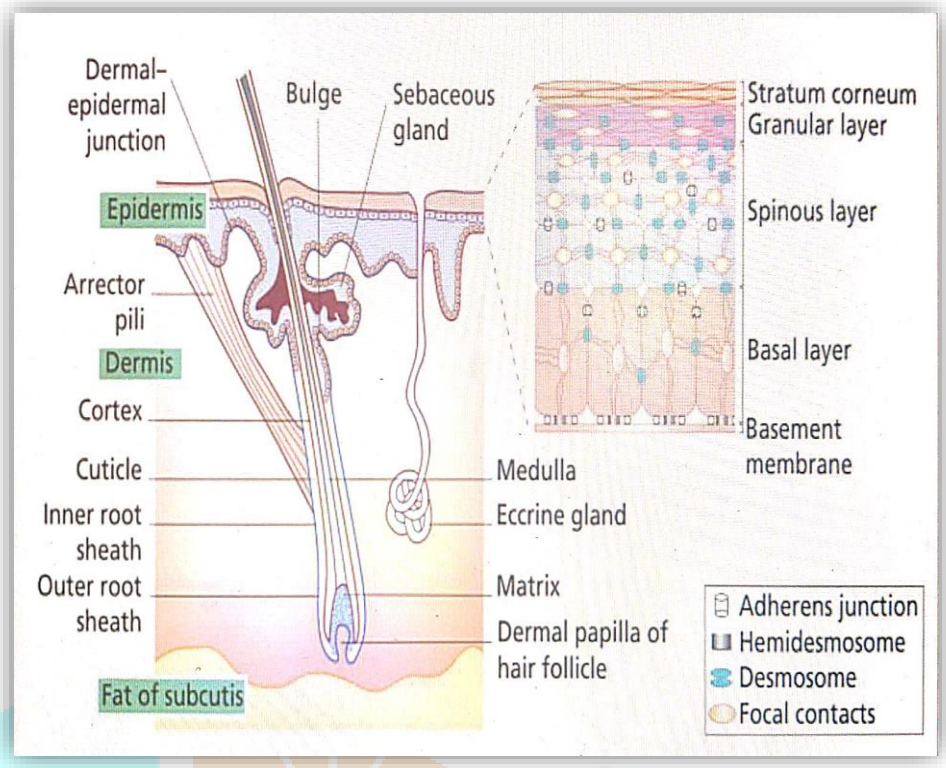


Figure 1: skin anatomy

FUNCTIONS OF SKIN:

I. Skin acts as a barrier and protects against external environmental treats.
II. It detects the surrounding sensations.
III. Regulates the body temperature through sweating.
IV. It is a defense against pathogens and contributes to body's immune system.
V. Excretes the waste products such as sweat, metabolic byproducts through sweat glands.
VI. It converts sunlight into Vitamin D.
VII. Regulates the blood flow and pressure by providing reservoir.

SKIN CONDITIONS

Skin conditions encompass a wide range of disorders and abnormalities affecting the skin. Some common skin conditions include:

I. Dermatitis: Inflammation of skin caused by allergens, irritants.
II. Acne: Condition by clogged pores, inflammation, or some bacterial infections.
III. Rosacea: Can be characterized by visible blood vessels, bumps, facial redness or pimples.
IV. Eczema: Conditions causing itchy, dry and red skin patches with some family history of allergies.
V. Skin cancer: Caused to most frequent on parts of the body that are commonly exposed to sun.
VI. Psoriasis: A condition resulting in buidup of skin cells, red patches covered with silvery scales.
VII. Urticaria: Red, itchy welts on skin that are triggerd by allergies, medications or other infections.
VIII. Vitiligo: Condition that causes loss of skin color in patches.
IX. Herpes Zoster: Painful rash and blisters occurring in band or clusters along one side of body.
X. Reynaud's Phenomenon: It affects the blood vessels and causes body to not send enough blood to hands and foots for a period of time.

As mentioned there are several skin conditions and inflammation is the main cause or a symptom of many diseases.

HERBAL GELS

Herbal gels are topical preparations intended to deliver plant-derived therapeutic agents directly to the skin. They offer numerous advantages, such as easy application, targeted treatment, and typically fewer side effects compared to systemic medications.

BENEFITS

- Localized treatment
- Easy for application
- Minimum side effects
- Enhanced penetration

APPLICATIONS

- Anti microbial
- Anti-inflammatory
- Wound healing
- Moisturizing
- Hydrating

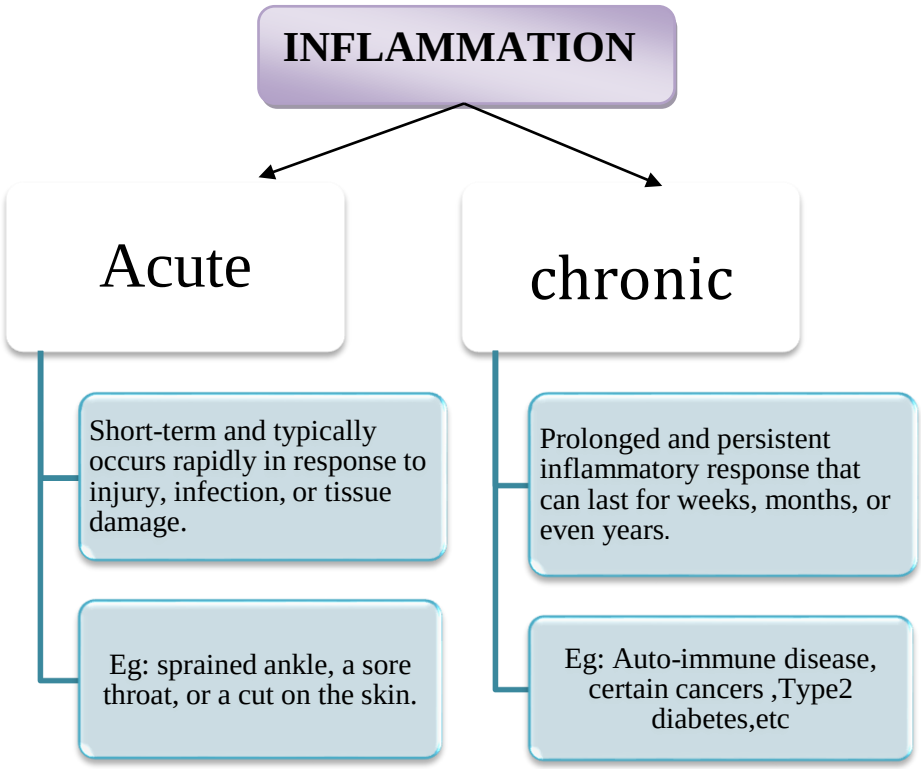
CHALLENGES

- **STANDARDIZATION:** Ensuring consistent quality and concentration of active ingredients in herbal gels can be challenging.
- **REGULATORY APPROVAL:** Herbal products must meet regulatory standards for safety and efficacy, which can vary by region.
- **CONSUMER ACCEPTANCE:** Educating consumers about the benefits and proper use of herbal gels is essential for market acceptance.

INFLAMMATION

What is inflammation?

Inflammation serves as the body's innate defense against injury, infection, or irritation, functioning as a protective measure to combat detrimental triggers and kick start the healing journey.



SYMPTOMS OF INFLAMMATION

The symptoms of inflammation can vary in severity depending on the cause and duration of inflammation. Chronic inflammation may also lead to long-term complications if left untreated. If you're experiencing persistent or severe inflammation, it's important to consult a healthcare professional for proper diagnosis and treatment.

Some additional sign and symptoms of inflammation include:

- Redness (Rubor)
- Swelling (Tumor)
- Heat (Calor)
- Pain (Dolor)
- Loss of function
- Fatigue

CAUSES

Inflammation is triggered by various factors, including:

I. Infection: Pathogens entering the body prompt an immune response, initiating inflammation. For instance, the flu and fungal infections such as athlete's foot can provoke this reaction.

II. Injury: Injuries like cuts, burns, bruises, sprains, or fractures can harm tissues, prompting an inflammatory response.

III. Chronic stress: Extended stress can disrupt the immune system and add to persistent inflammation. Hormones like cortisol, released during stress, can activate inflammatory reactions within the body.

IV. Allergies: Allergies to substances like pollen, dust mites, animal dander, or specific foods can induce inflammation in susceptible individuals.

V. Environmental toxins: Allergies to substances like pollen, dust mites, animal dander, or specific foods can induce inflammation in susceptible individuals.

VI. Age: As people age, they often experience heightened inflammation in the body, a phenomenon referred to as inflamm-aging. This contributes to the development of age-related illness and a decline in overall health.

VII. Autoimmune disorders: In certain conditions, the immune system erroneously targets the body's own tissues, sparking chronic inflammation. Examples of such disorders include rheumatoid arthritis, lupus, Crohn's diseases, and ulceratice colitis.

VIII. Unhealthy lifestyle factors: Unhealthy dietary habits, sedentary lifestyle, obesity, smoking, excessive alcohol intake, and insufficient sleep can all play a role in fostering chronic, mild inflammation within the body.

MECHANISM OF INFLAMMATION

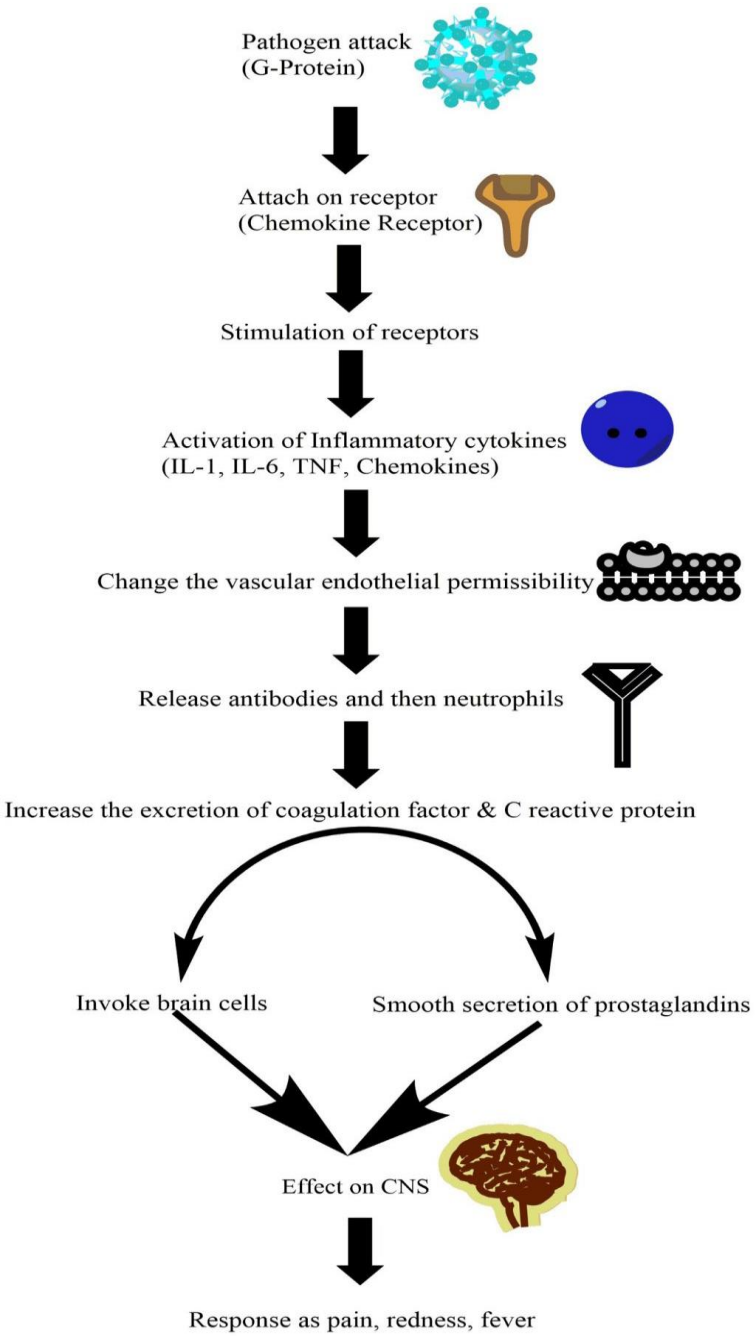


Figure2: Mechanism of action of inflammation

CURRENT TREATMENT

The treatment of inflammation depends on its cause, severity, and location. Here are some common approaches:

I. **CORTICOSTEROIDS:** Medication such as prednisone and cortisone, are potent and can be used to manage inflammation associated with autoimmune disorders, allergies, and certain other conditions.

II. **NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDs):** Medications like ibuprofen and naproxen are commonly prescribed to alleviate pain and diminish inflammation, particularly in cases of acute inflammation resulting from injuries or conditions such as arthritis.

III. **DISEASE-MODIFYING ANTI-RHEUMATIC DRUGS (DMARDs):** Medications such as methotrexate and sulfasalazine are frequently recommended for autoimmune disorders like rheumatoid arthritis. Their purpose is to mitigate inflammation and decelerate the advancement of the disease.

IV. **PHYSICAL THERAPY:** Physical therapy exercises and strategies recommended by professionals can aid in decreasing inflammation, enhancing mobility, and fortifying muscles, particularly in conditions like arthritis or sports-related injuries.

V. **SURGERY:** Occasionally, surgical procedures may be required to tackle the root cause of inflammation, such as excising infected tissue or restoring impaired joints.

VI. **TOPICAL TREATMENTS:** To address inflammation limited to a specific area, topical remedies like corticosteroid creams, ointments, or gels are employed to alleviate swelling and discomfort.

VII. **ALTERNATIVE THERAPIES:** Certain individuals discover relief from inflammation by exploring complementary and alternative therapies, such as acupuncture, chiropractic treatments, herbal supplements, and mind-body techniques like yoga and medications.

THYMUS VULGARIS

PLANT PROFILE:

Figure 3:Thymus vulgaris plant

Thymus vulgaris is a species of flowering plant in the mint family Lamiaceae.

Kingdom: Plantae

Order: Lamiales

Family: Lamiaceae

Genus: Thymus

Species: T. Vulgaris

CHEMICAL CONSTITUENTS:
Thymol, carvacrol, para- cymene, linalool, α-pinene, caryophyllene, borneol, cymol, tannin, apigenin, luteolin, saponins, and triterpenic acid.

USES:

- Improves respiratory health
- Promotes anti-inflammatory properties
- Aids digestive health
- Possess antiseptic and wound healing properties
- Has potential anti-cancer properties

CHEMICAL STRUCTURE:

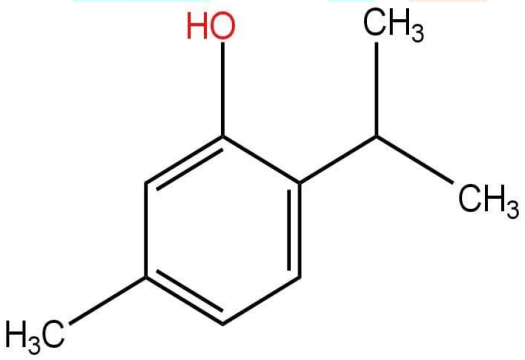


Figure 4: Thymol

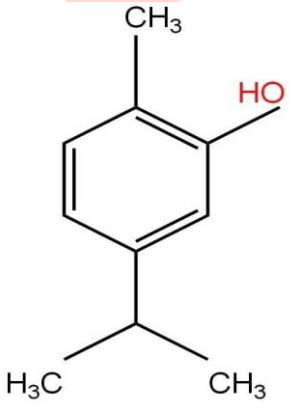


Figure 5: Carvacrol

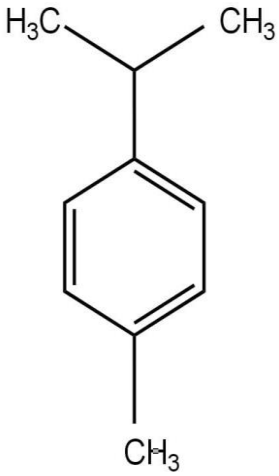


Figure 6: p- cymene

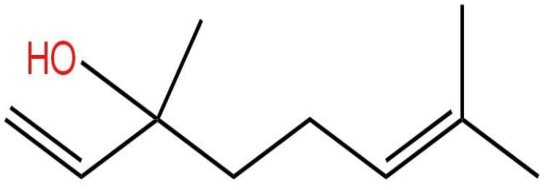


Figure 7: Linalool

SALVIA HISPANICA L

PLANT PROFILE:

Figure 8: Salvia Hispanica L

Salvia hispanica is a species of flowering plant in the mint family Labiates.

Kingdom: Plantae

Order: Lamiales

Family: Lamiaceae

Genus: Salvia

Species: S.Hispanica L

CHEMICAL CONSTITUENTS:
gallic acid, chlorogenic acid, caffeic acid, ferulic acid, and cinnamic acid, along with quercetin, epicatechin, apigenin, rutin, p-coumaric acid and kaempferol.

USES:

- Developed as natural supplement
- Improves cardiovascular health
- Regulates blood sugar
- Improves gastro-intestinal health
- Promotes anti-inflammatory properties

CHEMICAL STRUCTURE:

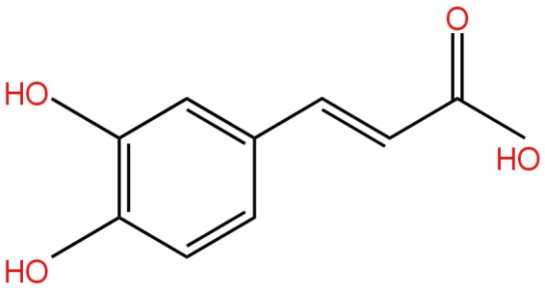


Figure 9: Caffeic acid

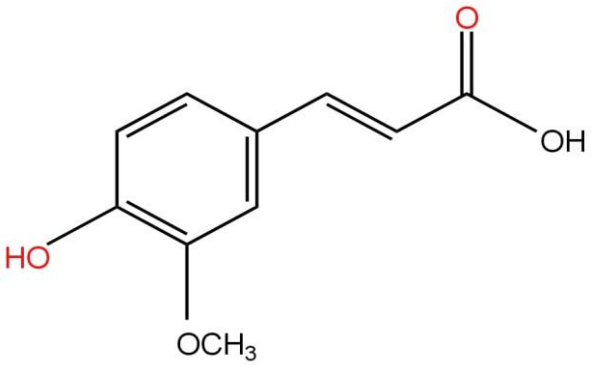


Figure 10: Ferulic acid

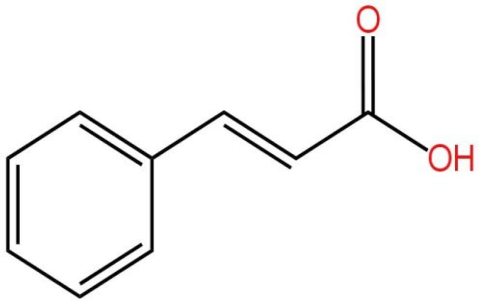


Figure 11: Cinnamic acid

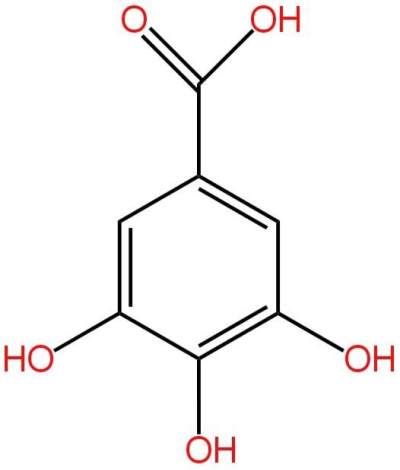


Figure 12: Gallic acid

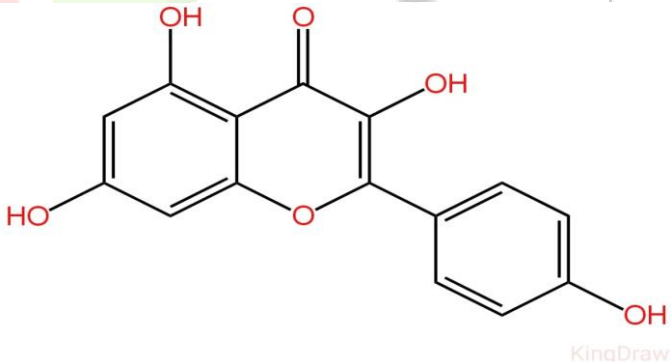


Figure 13 : Kaempferol

REVIEW OF LITERATURE

The effects of Thymus vulgaris ans salvia hispanica L on inflammation were examined by Edina Pandur, Giuseppe Micalizzi, Luigi Mondello, Adrienn Horvath, Katalin Sipos and Gyorgyi Horvath. According to the study, the preparation of the anti-inflammatory herbal gel follows a meticulous methodology aimed at harnessing the therapeutic potential of herbal ingredients. The careful selection of herbs known for their anti-inflammatory properties, precise weighing, and methodical mixing contribute to the formulation's effectiveness.

Through a controlled process of hydration, heating (if required), and pH adjustment, the herbal gel is optimized to provide a soothing and anti-inflammatory effect upon application. Quality control measures, including viscosity and consistency tests, ensure the final product meets established standards.

The Incorporation of natural preservatives enhances the shelf life of the anti-inflammatory herbal gel while maintaining its herbal efficacy. Thoughtful packaging considerations prioritize user convenience and preserve the integrity of the formulation. Stability testing validates the herbal gel's resilience under various conditions, affirming its reliability and therapeutic benefits. The detailed documentation of the preparation process, from ingredient quantities to testing results, underscores a commitment to transparency and quality assurance. In summary, the concluded methodology reflects a dedication to producing a well-formulated anti-inflammatory herbal gel, providing users with a reliable and natural solution for addressing inflammation and promoting skin health.

AIM AND OBJECTIVE

AIM

Formulation and evaluation of topical herbal gel for anti-inflammation

The goal of our study is to contribute to an acute condition by formulating a topical herbal gel for anti-inflammation.

OBJECTIVE

1. **Targeted Relief**: Providing targeted relief to areas of inflammation, reducing discomfort and promoting mobility.

2. **Natural Soothing**: Utilizing herbal ingredients to soothe irritated skin and alleviate pain without harsh chemicals.
3. **Inflammation Reduction**: Specifically formulated to reduce inflammation, addressing the root cause of discomfort.

4. **Gentle Formulation**: Formulating the gel with gentle ingredients to minimize the risk of irritation, suitable for sensitive skin types.

EXPERIMENTIAL WORK

1. PREFORMULATION

During the pre formulation stage, pharmacists delve into the physical and chemical properties of medicinal compounds and their interactions with other formulation ingredients. This critical step ensures the creation of a stable, efficient, and safe dosage form.

1. Physical description of drug
2. Solubility of drug
3. Determination of extract of thymus vulgaris and salvia hispanica L
4. Compatibility study of drug
5. % drug purity
6. Formulation of gel base

2. PHYSICAL DESCRIPTION

Color, nature and odor of thymus vulgaris were characterized and recorded.

3. SOLUBILITY OF DRUG

The solubility of extract was determined by dissolving it in different solvents like water, ethanol, etc.

4. DETERMINATION OF EXTRACT OF THYMUS VULGARIS AND SALVIA HISPANICA L

1. Thymus Vulgaris, 2 grams of it, was placed into a beaker followed by the addition of 40ml of distilled water. The mixture was then brought to a boil at 95±2 degrees Celsius. After boiling, the mixture was filtered using a funnel and filter paper to obtain the extract.

2. In a beaker, 2 grams of salvia hispanica L seeds were combined with 40ml of distilled water. The mixture was then placed on a magnetic stirrer for 2 hours, maintaining a temperature of 80°C until the seeds were thoroughly soaked and hydrated. Subsequently, it was left at room temperature for 24 hours to ensure complete seed hydration.

3. The process involved pouring the seed mixture, once mucilage had fully developed, onto a muslin cloth. By squeezing the cloth, the extract was obtained.

5. COMPATIBILITY STUDY OF DRUG

- An FTIR analysis was conducted to assess the compatibility of the excipients utilized in the formulation.
- Fourier Transform Infrared Spectroscopy is an analytical method used to identify functional groups within molecules by detecting the absorption of infrared radiation. This technique offers insights into the chemical bonds present in the sample being analyzed.
- Appropriate concentrations were combined with each excipient used in the formulations.
- The combinations of extracts and excipients were thoroughly combined ans passed through FTIR.
- The variations in the physical changes were analyzed.

6. FORMULATION OF GEL BASE

During formulation different gelling agents were used at different concentrations resulting in several batches were prepared. Carbopol was used. Gel composition was finalized after doing many trials and errors.

4.2. MATERIALS AND METHODS

Salvia Hispanica L and Thymus Vulgaris were acquired from reputable brands, Farmley and Foodfrillz, both of which entered the Indian market in 2017 and 2018 respectively, emphasizing the use of top-quality ingredients. The additional chemicals necessary for identification tests and other experimental procedures were procured from college laboratories.

Figure 14: Farmley chia seeds

Figure 15: Foodfrillz Thyme

4.2.1. IDENTIFICATION OF CONSTITUENTS

IDENTIFICATION TEST FOR PHENOLIC ACID (Thymol, Chlorogenic acid, Caffeic acid)

1. **Bromine water test:**

Phenol reacts with bromine water (aqueous bromine solution) to form a white precipitate or a color change from brown to colorless. This reaction is due to the substitution of one of the hydrogen atoms in the phenol ring with a bromine atom.

2. **Ferric chloride test**:

Phenol reacts with ferric chloride solution to form a colored complex. The intensity of the color change can vary depending on the concentration of phenol. A positive test indicates typically, purple, blue, or green depending on the phenol concentration.

IDENTIFICATION TESTS FOR FLAVONOIDS (Apigenin.Quercetin, Epicatechin)

1. **Shinoda test:**

This test involves the formation of colored complexes when flavonoids react with concentrated hydrochloric acid and magnesium powder. Flavonoids containing the 3-hydroxy group produce a pink or red color, while those lacking this group do not produce the color change.

2. **Alkaline Reagent Test:**

Flavonoids react with alkaline reagents such as sodium hydroxide (NaOH) to produce characteristic color changes. It can yellow color.

3. **Lead Acetate Test:**

Flavonoids can precipitate lead ions (Pb^2+) from lead acetate solution, forming a yellow precipitate. The intensity of the precipitate may vary depending on the flavonoid's structure and concentration.

4. **Sulphuric Acid Test:**

In this test, the flavonoid containing material is mixed with a few drops of strong sulphuric acid. Flavonoids are present when the yellow color comes first and then it is followed by green color.

IDENTIFICATION TESTS FOR TERPENE ALCOHOL (Linalool, Borneol)

1. **Bromine Test:**

Terpene alcohols can react with bromine water to form bromo derivatives. This reaction is often used as a confirmatory test for the presence of unsaturation in terpene alcohols. The disappearance of the red-brown color of bromine water indicates a positive test.

4.2.3. FORMULATION OF THYMUS VULGARIS AND SALVIA HISPANICA L TOPICAL GERBAL GEL

Ingredients	Formulation codes						
	F1	F2	F3	F4	F5	F6	F7
Thymus Vulgaris extract	45%	25%	50%	10%	20%	30%	40%
Salvia Hispanica L extract	15%	35%	10%	50%	40%	30%	20%
Carbopol	10%	10%	10%	10%	10%	10%	10%
Triethanolamine	5%	5%	5%	5%	5%	5%	5%
Distilled water	25%	25%	25%	25%	25%	25%	25%

Table 1: Formulation of herbal gel batches

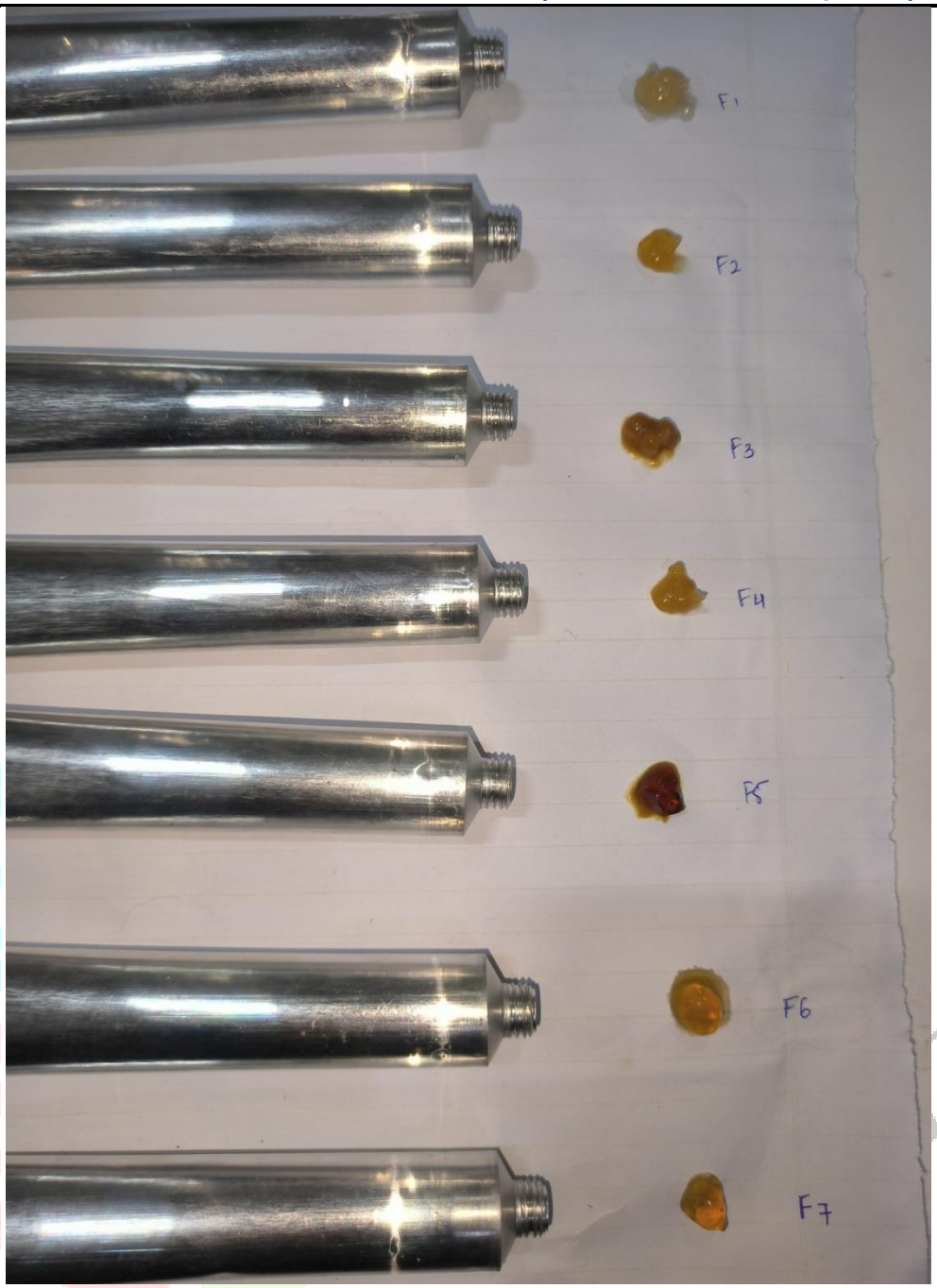


Figure 16: Formulation batches

4.3. EVALUATION OF HERBAL GEL

- **Physical characteristics**

  Color, homogeneity, and consistency of produced herbal gel compositions were all visually assessed.

- **Determination of pH**

  The pH values of the herbal gel composition were determined by pH paper.

- **Washability**

  On the skin, formulation was applied and the amount of water it takes for washing was manually assessed.

- **Extrudability**

  The herbal gel mixture was placed inside of flexible metal tubes or collapsible aluminium tubes. The substance was forced through the tubes, and the formulation's extrudability was assessed.

- **Spreadabilty**

  The standard dimensions (100x15mm) of two petri dishes were chosen. One petri dish was inverted and had the herbal gel formulation placed on it. Then, the second dish was also inverted and positioned on top of the first one, sandwiching the formulation between them at a specific distance. Applying a weight of 100 grams on the upper dish, the herbal gel formulation between the two dishes was evenly spread to create a thin layer. The extent to which the gel spreads out between the dishes indicates its spreadability characteristics. It is typically measured as the diameter of the spread area over time or under specific weight.

$$\text{Spreadability} = \frac{L}{W}$$

Where,

L= linear distance the substance spreads (in mm)

W= weight (force) applied on the upper dish (in newtons)

4.4. INVITRO DRUG RELEASE STUDIES

The generated herbal gel was evaluated for in vitro drug release using animal (goat) abdominal skin, and in vitro diffusion research was conducted in a Franz diffusion cell. The skin of the abdominal cavity was linked to a Franz diffusion cell. The formulation was applied in a donor compartment of the dialysis membrane. The reservoir chamber was filled with 25-phosphate buffer that had a pH of 7.4 and was kept at 37°C. A synchronous motor driving a magnetic bar at 100 revolutions per minute was installed in the receptor chamber. Samples were taken out of the reservoir compartment and the same volume of new medium was added at interval of 1, 2, 3, 4, 8 and 24 hours. Samples were examined for drug content, and spoof spectrophotometric measurements of absorbance at 262 nm were made.

Figure 17: Goat abdominal skin

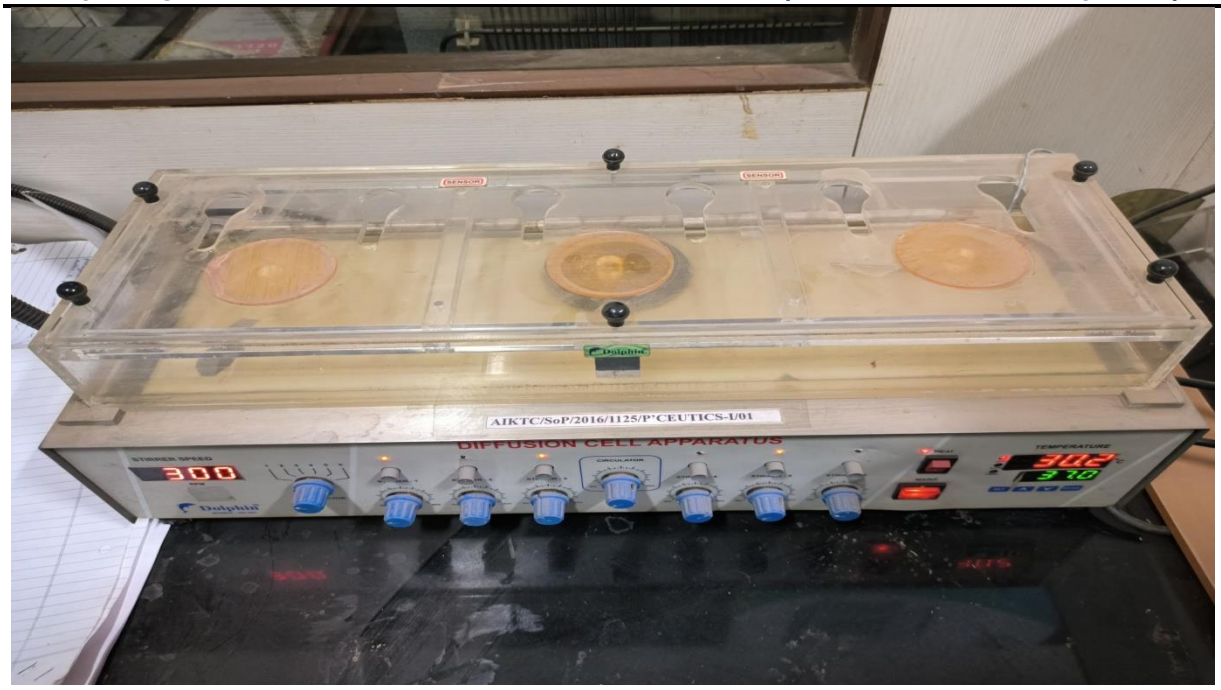


Figure 18: Franz diffusion cell

4.5. STABILITY STUDIES

Stability studies were carried out on optimized formulation. The formulation packed in aluminum tube was subjected to accelerated stability testing for 1 month at a cooling temperature (4 ± 2°C). Over the course of a month, samples were collected on a regular basis every 10 days and they were then examined according to the previously described method for changes.

RESULTS

5.1. EXPERIMENTAL

5.1.1. PREFORMULATION STUDIES:

1. **Physical description**

Sr.no.	Parameters	Standard	Observation
1	Color	Brown	Brown
2	Odor	Characteristic	Characteristic

Table 2: Physical description of Thymus Vulgaris extract

Sr.no.	Parameters	Standard	Observation
1	Color	Off white	Off white
2	Odor	Mild aroma	Mild aroma

Table 3: Physical description of Salvia Hispanica L Extract

2. Solubility

Medium	Extract
Distilled water	Soluble
Ethanol	Soluble
Chloroform	Non-Soluble
Propylene glygol	Non-Soluble

Table 4: Solubility of Thymus Vulgaris extract

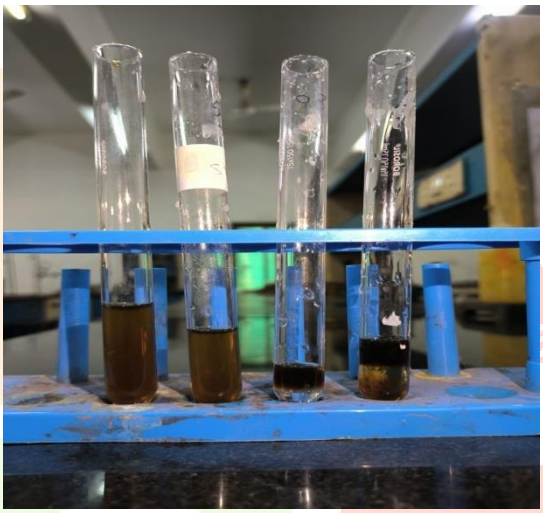


Figure 19: Solubility of Thymus Vulgaris extract

Medium	Extract
Distilled water	Soluble
Ethanol	Soluble
Chloroform	Non-Soluble
Propylene glygol	Non-Soluble

Table 5: Solubility of Salvia Hispanica L Extract

Figure 20: Solubility of Salvia Hispanica L extract

3. Drug excipient compatibility study of drug

Samples were checked for FTIR study for testing the stability of drugs used. The active ingredient was found to be stable with the other excipients used in the formulation.

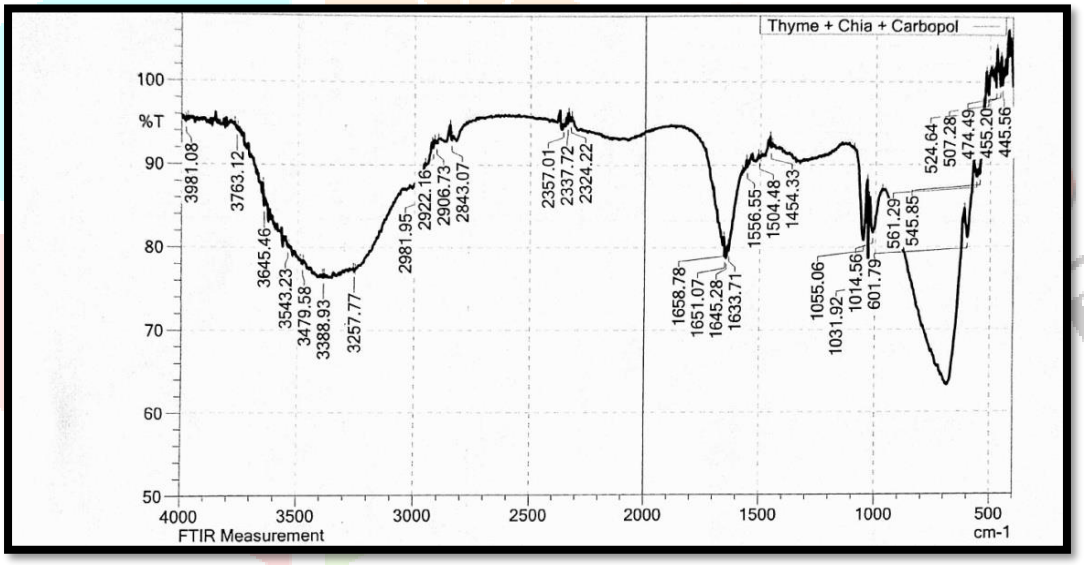


Figure 21: compatibility study of drugs using FTIR

4. Formulation of gel base

During formulation different gelling agents used at different concentrations resulting in 5 different batches of gel were prepared. Carbopol was used. Gel composition was finalized after doing many trials and errors.

Sr. no.	Ingredients	F1	F2	F3	F4	F5
1	Carbopol	1mg	1mg	1mg	1.5mg	1.5mg
2	Distilled water	2.5ml	1.5ml	2.8ml	1.5ml	2.5ml

Table 6: Formulation of gel base batches

4.1.2. IDENTIFICATION TEST

Test for phenols

Test	Observation	Inference
Bromine water test	Brown to colourless	Phenol is present
Ferric chloride test	Blue color	Phenol is present

Table 7: Identification test for phenols

Figure 22: Identification of phenols

Test for flavonoids

Test	Observation	Inference
Shinoda test	No color change	Flavonoids present
Alkaline reagent test	Yellow color	Flavonoids present
Lead acetate test	White ppt	Flavonoids present
Sulphuric acid test	Green color	Flavonoids present

Table 8: Identification tests for flavonoids

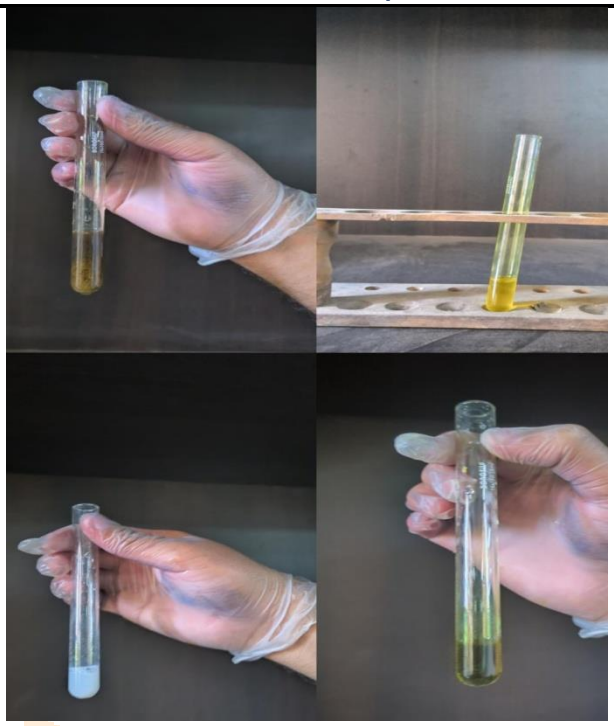


Figure 23: Identification test for flavonoids

Test for terpene alcohols

Test	Observation	Inference
Bromine test	Brown to colorless	Terpene alcohol present

Table 9: Identification test for terpene alcohols

Figure 24: Identification test for terpene alcohols

4.1.3. Pharmaceutical Evaluation Result

- **Physical parameters of formulation batches**

The formulas for herbal gel were creamy, slightly brown, light brown, dark brown and yellow, with a uniformly smooth texture and glossy appearance. The table below shows the outcomes of the herbal gel formulation.

Formulation	Color	Homogeneity	Consistency	Phase separation
F1	Creamy	Not so good	Not so good	None
F2	Slightly brown	Good	Good	None
F3	Light brown	Not so good	Not so good	None
F4	Slightly brown	Good	good	None
F5	Dark brown	Good	Good	None
F6	Yellow	Excellent	Excellent	None
F7	Yellow	Excellent	Excellent	None

Table 10: Physical parameters of formulation batches

- **Washability, Extrudability and spreadability study**

The results of washability, extrudability ans spreadability are given in the table below. From the result it was found that formulation F2, F6 and F7 have excellent washability. Formulation F6 and F7 have excellent extrudability and spreadability of all the formulations was found to be

Formlation	Washability	Extrudability	Spreadability (mm/N)
F1	Good	Average	12
F2	Excellent	Good	12.3
F3	Average	Good	12.6
F4	Good	Average	12.7
F5	Average	Average	11
F6	Excellent	Excellent	14
F7	Excellent	Excellent	14.3

Table 11: Evaluation of formulation batches

- **pH**

  The prepared herbal gel's was determined using pH paper. The herbal gel formulation's pH was in the 6 to 7 range, which is deemed adequate to prevent the possibility of skin irritation when applied to skin, and the drug content of F7was found to be

Formulation	pH
F1	6
F2	6
F3	7
F4	7
F5	6
F6	7
F7	6

Table 12: pH of formulation batches

4.1.4. INVITRO DRUG RELEASE STUDY RESULT

The in vitro drug release study utilized the F7 formulation, as it was identified as the most suitable. The drug release from the Thymus vulgaris and Salvia hispanica L herbal gel was significantly slower, confirming a slightly prolonged release rate. It was concluded that the prepared formulations effectively deliver the medication for treating inflammation.

Time(hours)	Cumulative % of drug release
1	0.76
2	2.59
3	9.92
4	25.32
8	28.50
24	32.41

Table 13: Invitro drug relase of formulation

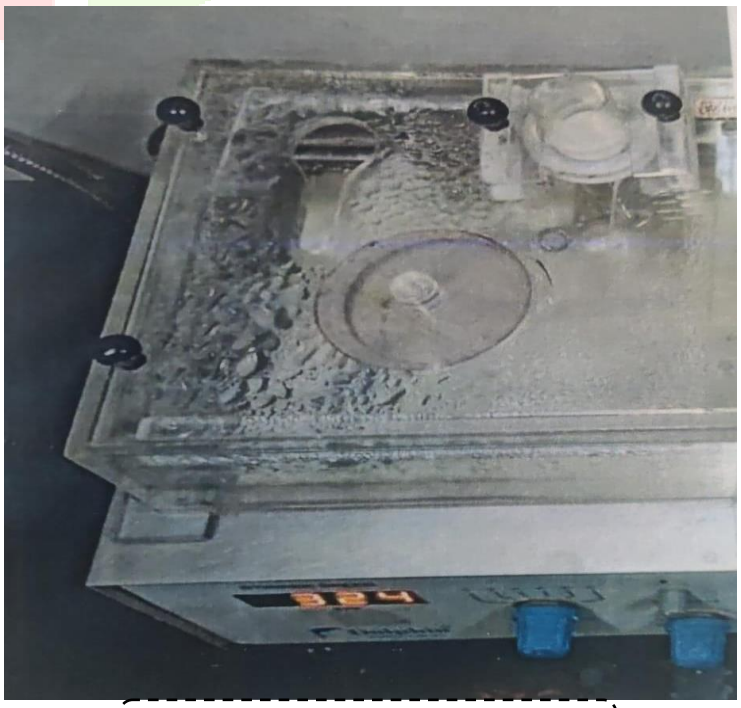
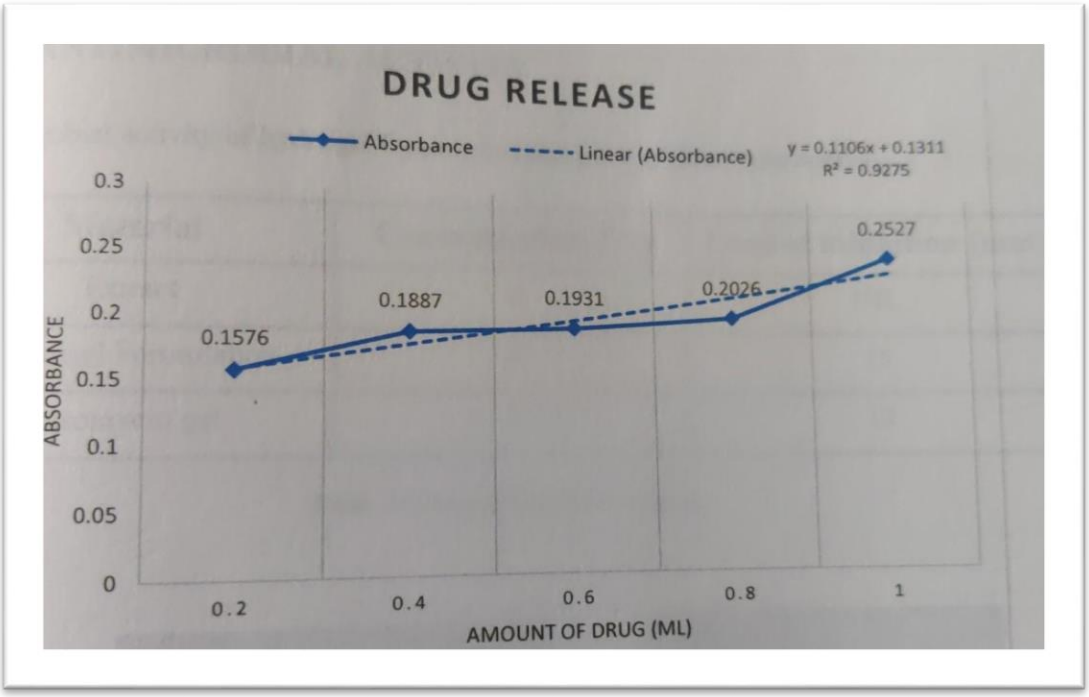
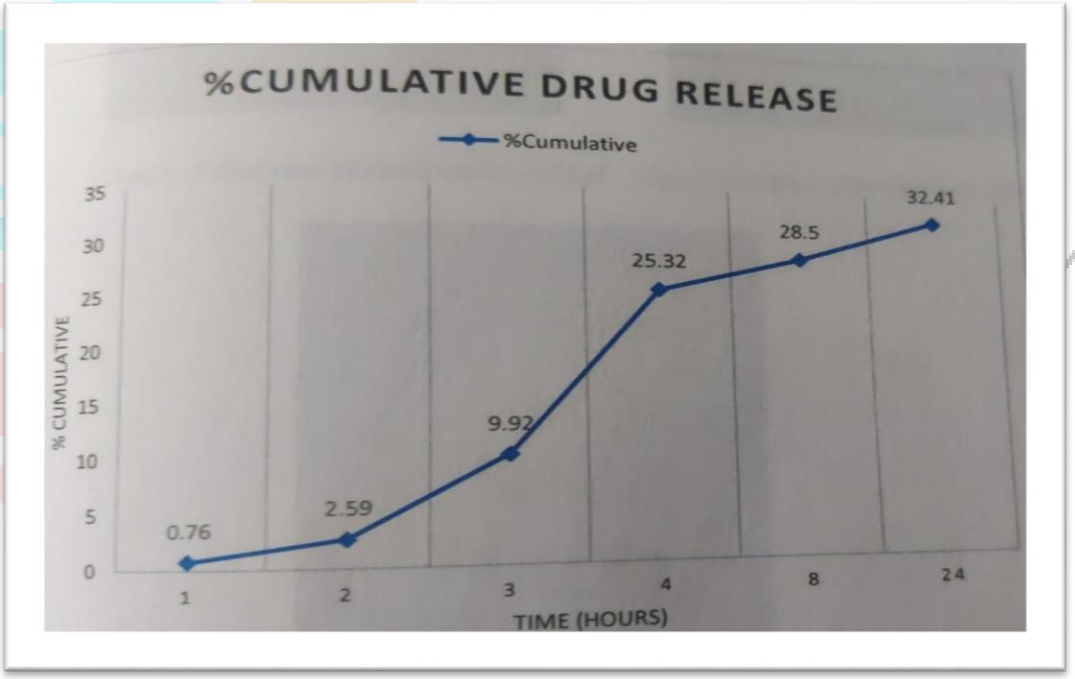


Figure 25: Franz diffusion cell





DISCUSSION

A compelling project concept involves utilizing gel-based drug delivery techniques to enhance the effectiveness of topical medications, particularly in addressing chronic inflammatory skin conditions. This proposed study focuses on the development of an herbal gel containing Thymus Vulgaris and Salvia Hispanica L extracts, aiming to provide relief for millions of individuals worldwide who endure such conditions. The treatment regimen often encompasses various therapies, including immunosuppressive medications, to manage inflammation effectively.

For centuries, Asian countries have incorporated Thyme Vulgaris and Salvia Hispanica L seeds into their cuisine and traditional remedies, acknowledging their positive impact on overall health and skin wellness, which unfolds gradually and consistently with prolonged use. Herbal gels emerge as a promising avenue in pharmaceutical innovation, offering a viable method for delivering treatments targeting inflammation and alleviating various skin issues.

As part of the proposed study, the project will involve the creation and analysis of a herbal gel incorporating extracts from Thymus Vulgaris and Salvia Hispanica L, aimed at treating inflammation. Subsequent phases may encompass additional elements to advance the research:

- Assessing the efficacy of the herbal gel in alleviating inflammation through both laboratory experiments (in vitro) and studies conducted on living organisms (in vivo).
- In vitro studies involving animal models or cell cultures can be employed to examine the anti-inflammatory properties of the herbal gel.
- In vivo studies, such as clinical trials, could be utilized to evaluate the efficacy and safety of the herbal gel in treating inflammation in human subjects.

This research has the potential to offer a promising drug delivery technique using natural plant extracts and seed mucilage extracts, demonstrating effectiveness in treating Inflammation.

CONCLUSION

The Thyme vulgaris and salvia hispanica extracts exhibit potential for alleviating inflammation. Their properties include anti-inflammatory, moisturizing, soothing, and cooling effects, all crucial for addressing inflammation. Moreover, these extracts have shown effectiveness in alleviating symptoms like itching or redness.

The analysis suggests that developing a herbal gel formulation entails meticulous selection of both drugs and polymers. Compatibility tests revealed that carbopol, a chosen polymer, was compatible with Thymus vulgaris and Salvia hispanica extracts. The pH, extrudability, and spreadability of the gel were influenced by the polymer at different concentrations. Utilizing carbopol, a gel formulation was formulated with uniformity, stability, anti-inflammatory properties, and controlled drug release.

The most effective formulation, demonstrating significant efficacy, was formulation number seven.

FUTURE SCOPE

The application of herbal gels containing Thymus vulgaris and Salvia hispanica L for anti-inflammatory purposes is a dynamic area of ongoing research. There are numerous potential future directions to explore in order to advance this project.

Exploring alternative formulations: Exploring alternative formulations could provide additional benefits beyond herbal gels, which are commonly used for topical drug delivery. Other forms, such as creams, ointments, and sprays, could be investigated. These alternatives might offer advantages like improved skin penetration or prolonged effects.

Conducting clinical trials: While pre-clinical studies have yielded promising results, clinical trials are essential to assess the safety and efficacy of herbal gels in humans. Conducting well-designed clinical trials with large sample sizes is crucial to determine the optimal dosing and treatment regimens for patients with inflammation.

Investigate other potential therapeutic applications Beyond inflammation, Thymus vulgaris and Salvia hispanica L have demonstrated potential therapeutic applications for other skin conditions. Further research could investigate the potential of the herbal gel in treating various skin ailments.

Develop commercial products: If clinical trials confirm the safety and efficacy of the herbal gel containing Thymus vulgaris and Salvia hispanica L, it could be developed into a commercial product for treating inflammation. For market success, it will be essential to create a product that is user-friendly and has a long shelf life.

REFERENCE

1. https://formulabotanica.com/natural-shower-gel/
2. https://www.researchgate.net/publication/288361178_Formulation_and_evaluation_of_herbal_gel
3. https://doi.org/10.1016/j.jfoodeng.2011.06.037
4. https://doi.org/10.1065/espr2006.02.295
5. https://www.researchgate.net/publication/369385095_FORMULATION_AND_EVALUATION_OF_HERBAL_ORAL_GEL
6. https://www.mdpi.com/2076-3921/11/7/1330
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5958536/
8. https://www.profsharemarketresearch.com/shower-gel-market/
9. https://www.bccresearch.com/partners/verified-market-research/global-body-wash-and-shower-gel-market.html
10. https://link.springer.com/article/10.1065/espr2006.02.295
11. https://pubmed.ncbi.nlm.nih.gov/32378329/
12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9147557/
13. https://scholar.google.com/scholar?hl=en&as_sdt=0,5&qsp=4&q=herbal+gel+formulation+%22anti+inflammatory+activity%22&qst=ib#d=gs_qabs&t=1701347095148&u=%23p%3Dz4zOsikASwUJ
14. https://scholar.google.com/scholar?hl=en&as_sdt=0,5&qsp=4&q=herbal+gel+formulation+%22anti+inflammatory+activity%22&qst=ib#d=gs_qabs&t=1701347162656&u=%23p%3DkhoxRZXF2y0J
15. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=thyme+used+as+anti+inflammatory+tropical+&btnG=#d=gs_qabs&t=1709489290298&u=%23p%3DNfnXldqy74gJ
16. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=thyme+used+as+anti+inflammatory+tropical+&btnG=#d=gs_qabs&t=1709489196960&u=%23p%3D7P46mN0m2RYJ
17. https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9502351/&ved=2ahUKEwjljeWv29iEAxUSVPUHHft6CG0QFnoECCQQAQ&usg=AOvVaw0iNIFPOvpzLvXf17H5oA6H
18. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7509312/
19. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4876256/
20. https://www.mdpi.com/2218-0532/88/2/26