

Formulation and Evaluation of Herbal Anti-Inflammatory Cream Containing Bryophyllum Pinnatum extract, Eucalyptus extract, Curcumin, Neem Oil and Sandalwood Oil.

Saurabh Rajnarayan Yadav^{1*}, Meet Pravin Soni², Akash Rajesh Padvi³,
Vaishali R. Mahajan⁴, Vaishali D. Shewale⁵

Student^{1,2,3}, Associate Professor⁴, Principal⁵, Nandurbar Taluka Vidhayak Samiti's Institute of Pharmacy, Khodai Mata Road, Near GTP College Campus Road, Tal & Dist.-Nandurbar, Maharashtra, India [425412].

Corresponding Author: Saurabh Rajnarayan Yadav^{1}*

Student, Nandurbar Taluka Vidhayak Samiti's Institute of Pharmacy, Khodai Mata Road, Near GTP College Campus Road, Tal & Dist.-Nandurbar, Maharashtra, India [425412].

Date of Submission: 11-05-2026

Date of Acceptance: 25-05-2026

Abstract

Due to the drawbacks and adverse effects of synthetic medications, there is a greater need for safe and efficient topical treatments derived from natural sources. Bryophyllum pinnatum, curcumin, eucalyptus extract, and neem oil—all of which have strong anti-inflammatory, antibacterial, and antioxidant properties—were used in the current study to create and assess a herbal anti-inflammatory cream. Stearic acid served as the main emulsifying agent in the oil-in-water emulsion process used to create the cream, which was then neutralized with a 10% sodium hydroxide solution to create a stable emulsion or triethanolamine gives emulsifying and pH adjusting agent. Coconut oil and glycerin provide emollient and hydrating qualities, while cetostearyl alcohol and beeswax were added to improve consistency and stability. To enhance scent and give more calming effects, sandalwood oil was used.

Key physicochemical characteristics of the produced formulation, such as appearance, pH, viscosity, spreadability, homogeneity, and stability, were assessed. Under test conditions, the cream showed no signs of phase separation or irritation, good spreadability, a smooth and consistent texture, and a pH that was adequate for skin application.

Through their synergistic effects, the presence of several herbal actives increased the therapeutic potential. In summary, the produced polyherbal cream showed remarkable anti-inflammatory activity and outstanding formulation qualities, indicating its promise as a topical medicinal agent that is safe, natural, and efficacious.

Keywords: Herbal Anti-Inflammatory Cream, Bryophyllum Pinnatum extract, Eucalyptus extract, Curcumin extract, Neem oil, Sandalwood oil.

I. Introduction

The body frequently experiences inflammation as a reaction to damage, illness, or irritation. Redness, swelling, discomfort, and heat are typically its defining characteristics. Even though synthetic anti-inflammatory medications are frequently used to treat these ailments, prolonged usage of them may result in adverse consequences like skin irritation and other problems. As a result, the usage of herbal and natural remedies—which are thought to be safer and more compatible with the human body—is becoming more popular.

Since ancient times, medicinal herbs have been utilized to cure a variety of skin conditions. Because of their well-known anti-inflammatory, antibacterial, and restorative qualities, natural substances like Bryophyllum pinnatum, curcumin, eucalyptus extract, and neem oil were chosen for this investigation.

Bryophyllum pinnatum has long been used to treat wounds and lower inflammation. Turmeric contains curcumin, a potent antioxidant and anti-inflammatory compound. While neem oil is well-known for its potent antibacterial and skin-protective qualities, eucalyptus extract has a cooling impact and aids in pain relief. The purpose of this research is to use these natural elements to create a stable and potent herbal anti-inflammatory cream. An oil-in-water emulsion with acceptable consistency, spreadability, and moisturizing effect was made using appropriate excipients such as stearic acid, cetostearyl alcohol, coconut oil, beeswax, and glycerin. To boost the cream's calming properties and smell, sandalwood oil was added.

To ensure the cream's quality and efficacy, it was assessed for a number of factors, including stability,

spreadability, pH, and physical appearance. The potential of herbal formulations as a secure and efficient substitute for traditional topical therapies for inflammation is highlighted by this study.

For a cream to be stable, homogenous, and effective, the oil and water phases must be carefully chosen and mixed. A number of criteria, including physical appearance, pH, viscosity, spreadability, homogeneity, and stability, are used to assess the manufactured herbal cream. To ensure that the formulation is stable, safe, and appropriate for topical administration, these assessments are crucial. The primary goal of this research is to create a herbal anti-inflammatory cream using natural ingredients that can effectively reduce inflammation while causing few negative effects. In order to produce topical medicines that are both safe and effective, our work highlights the significance of fusing traditional herbal knowledge with contemporary formulation techniques.

The proposed formulation can contribute to the expanding market of natural and herbal healthcare goods and be utilized as a substitute for synthetic creams. Redness, swelling, heat, and pain are typical symptoms. Minor inflammatory diseases such wounds, burns, rashes, bug bites, and allergic reactions are commonplace in daily life. Topical formulations, such as creams and ointments, are commonly used to treat these disorders since they operate directly on the afflicted areas.

Inflammation: A biological reaction known as inflammation is brought on by pathogens, damaged cells, or irritants. Molecular mediators, blood arteries, and immune cells are all involved. There are two primary forms of inflammation.

Acute Inflammation: Acute inflammation is a quick reaction to an injury or infection that manifests pain, swelling, and redness.

Chronic Inflammation:Chronic inflammation is a long-term reaction that damages tissue and is frequently linked to conditions like rheumatoid arthritis. Compared to oral drugs, topical anti-inflammatory creams help control pain and swelling

with fewer systemic side effects. Herbal substitutes are being investigated more and more since synthetic anti-inflammatory medications, such NSAIDs, can have negative side effects.

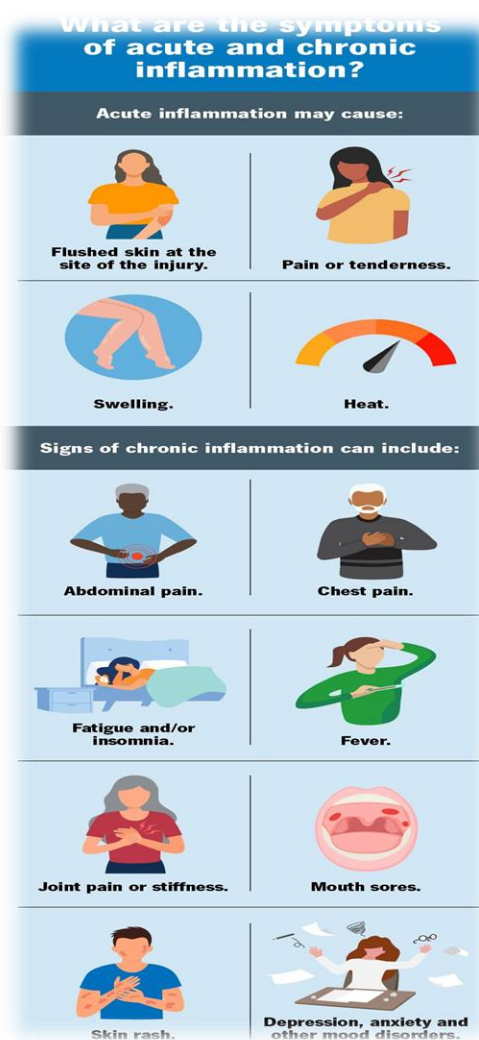


Fig.No.01:Symptoms of Acute and Chronic Inflammation



Fig.No.02:Image of *Bryophyllum Pinnatum*

✚ **Introduction:** *Bryophyllum pinnatum* is a famous medicinal plant of the family Crassulaceae. Popularly known as “Life Plant” or “Patharchatta”, it is widely used in traditional medicine for the treatment of wounds, inflammation, burns and skin infections. The leaves are thick and fleshy and have small plantlets along the edges of the leaves.

Bryophyllum pinnatum leaves contain several important phytoconstituents, viz. flavonoids, alkaloids, tannins, glycosides, and triterpenoids. The bioactive compounds have been attributed to this plant for anti-inflammatory, antimicrobial, antioxidant, analgesic and wound healing activities. Research studies have shown that the extract from the plant can inhibit inflammatory mediators thus reducing swelling, redness and irritation.

Bryophyllum pinnatum is known to have good healing and soothing properties and hence is one of the key herbal ingredients in topical formulations. In the current formulation, it act as the anti-inflammatory and wound healing agent.

✚ **Scientific name:** *Bryophyllum Pinnatum*.

✚ **Scientific Synonyms:** *Bryophyllum pinnatum* (Lam.), *Kalanchoe pinnata*, (Patharchatta) in Hindi.

✚ **Taxonomical Classification:**

Table No.1: Taxonomical classification of *Bryophyllum pinnatum*

Rank	Classification
Kingdom	Plantae
Class	Magnoliophyta (Flowering plant)
Order	Saxifragales
Family	Crasulaceae
Genus	<i>Kalanchoe pinnata</i>
Species	<i>Kalanchoe pinnata</i>

✚ **Chemical Constituents:** Research studies and published review articles reported that *Bryophyllum pinnatum* contains several important phytochemical constituents responsible for its anti-inflammatory, antimicrobial, antioxidant, and wound healing activities.

• **Major Chemical Constituents:** Class of Compound of Important Constituents:

1. Flavonoids-Quercetin, Kaempferol, Rutin, Apigenin, Luteolin
2. Alkaloids-Variou alkaloidal compounds
3. Tannins-Polyphenolic tannins
4. Glycosides-Cardiac glycosides
5. Triterpenoids-Bryophyllol, Bryophollone, Bryophollenone

✚ **Uses:**

1. Anti-Inflammatory Activity

2. Antioxidant Properties
3. Antimicrobial Activity
4. Antiurothropic Activity
5. Antiulcer Activity

✚ **Morphological Characteristic:** Commonly found in tropical areas, *Bryophyllum pinnatum* is a succulent perennial medicinal herb. Thick, meaty leaves and tiny plantlets along the leaf margins are the plant's distinguishing features. Small plantlets found on the leaf margins allow *Bryophyllum pinnatum* to reproduce vegetatively. The *Bryophyllum pinnatum* leaf extract typically looks like this after extraction:

- The colour ranges from greenish to dark green.
- viscous or semi-solid in consistency
- Typical scent of herbs

Table No.2: Morphological Characteristic of *Bryophyllum pinnatum*.

Part	Characteristics
Root	Fibrous
Stem	Hollow, Succulent
Leaves	Thick, fleshy, plantlets on margins
Flowers	Bell-shaped
Fruit	Follicle



Fig.No.03: Image of *Eucalyptus*

✚ **Introduction:** The leaves of *Eucalyptus globulus*, a fragrant evergreen tree of the Myrtaceae family, are used to make eucalyptus extract. The therapeutic and fragrant qualities of the leaves are attributed to their abundance of essential oils, particularly eucalyptol (1,8-cineole). The anti-inflammatory, antibacterial, analgesic, and cooling properties of eucalyptus extract are well established. By lowering inflammatory reactions in the afflicted area, it aids in the relief of pain, discomfort, and edema. It also aids in shielding the skin from microbial diseases because of its antibacterial

properties. The extract improves the therapeutic effectiveness of topical formulations and leaves the skin feeling calmer and refreshed. Eucalyptus extract has cooling, antibacterial, and anti-inflammatory properties in the current herbal cream.

- ✚ **Scientific name:** *Eucalyptus globulus*
- ✚ **Scientific Synonyms:** *Eucalyptus globulus*, *Eucalyptus camaldulensis*, *Blue gum tree*, *Nilgiri* etc.
- ✚ **Taxonomical Classification:**

Table No.3: Taxonomical classification of *Eucalyptus globulus*

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Myrtales
Family	Myrtaceae
Genus	<i>Eucalyptus</i>
Species	<i>Eucalyptus globulus</i>

✚ **Chemical Constituents:** - Published journals and phytochemical studies show that *Eucalyptus globulus* contains volatile oils, terpenoids, flavonoids, and tannins with strong medicinal properties.

• **Major Chemical Constituents:** Class of Compound of Important Constituents:

1. Essential oils-Eucalyptol (1,8-cineole).
2. Terpenoids- α -pinene, limonene, p-cymene.

3. Flavonoids-Quercetin, rutin.
4. Tannins-Polyphenolic tannins.
5. Triterpenes-Ursolic acid, betulinic acid.

✚ **Uses:**

1. Anti-inflammatory.
2. Antioxidant.
3. antimicrobial.
4. wound healing effects.

✚ **Morphological Characteristics:** - *Eucalyptus globulus* is a tall evergreen tree known for its strong aromatic smell and medicinal importance. It belongs to the family Myrtaceae and is commonly called the Blue Gum Tree. The tree has smooth bark that peels naturally, long narrow leaves with a characteristic fragrance, white flowers, and hard woody fruits called capsules. The leaves are rich in essential oils and are mainly used for medicinal purposes because of their anti-inflammatory, antimicrobial, and soothing properties.

Table No.4: Morphological Characteristic of *Eucalyptus globulus*.

Part	Characteristics
Habit	Tall evergreen aromatic tree.
Height	Usually 30–55 m tall.
Stem/Trunk	Straight trunk with smooth barks.
Leaves	Aromatic, lance-shaped, green, leathery.
Juvenile Leaves	Broad, bluish-green, opposite arrangement
Adult Leaves	Long, narrow, alternate arrangement
Flowers	White or cream-colored with numerous stamens.
Fruit	Woody capsule known as “gumnut”.
Odour	Strong aromatic odour due to essential oil.

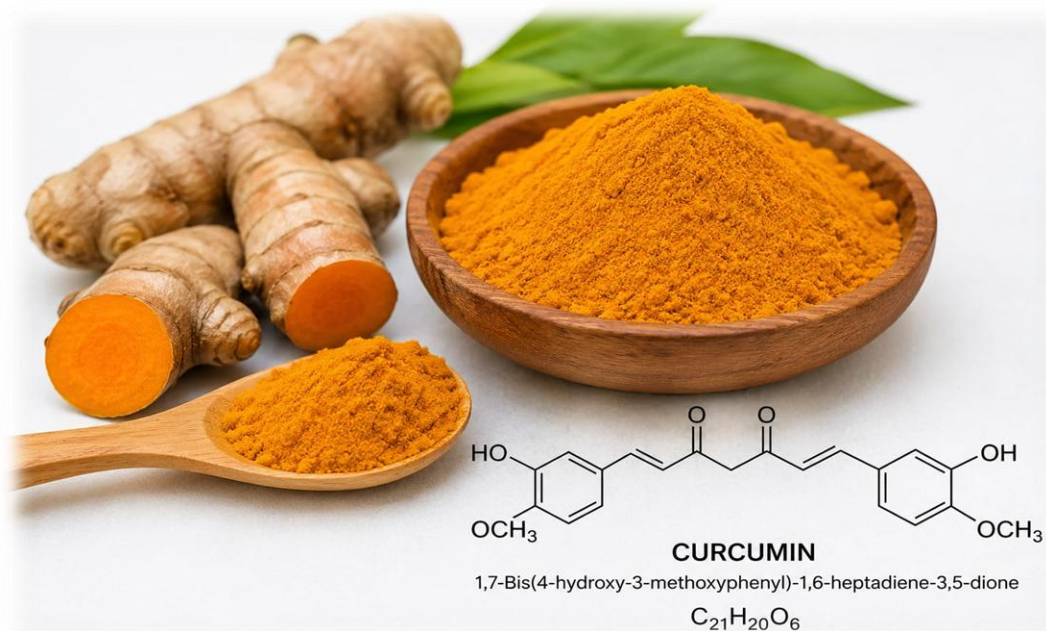


Fig.No.04: Image of Curcumin

✚ **Introduction:** The main active ingredient found in the rhizome of *Curcuma longa*, or turmeric, which is a member of the Zingiberaceae family, is curcumin. Curcumin, sometimes referred to as diferuloylmethane in chemistry, is what gives turmeric its distinctive yellow hue. Curcumin has exceptional antibacterial, anti-inflammatory, antioxidant, and wound-healing qualities. It works by inhibiting inflammatory pathways and lowering the synthesis of inflammatory mediators like cytokines and prostaglandins. Curcumin is useful in lowering inflammation-related discomfort, edema, and oxidative stress, according to a number of published research. In addition to its therapeutic properties, curcumin enhances tissue healing and has skin-protective properties.

Curcumin is frequently utilized in herbal lotions, gels, and cosmetic preparations due to these qualities. Curcumin mostly contributes to the antioxidant and anti-inflammatory properties of this composition.

✚ **Scientific name:** Curcumin, *Curcuma longa* L., IUPAC Name 1,7-Bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione.

✚ **Scientific Synonyms:** *Curcuma domestica*, Indian saffron, Turmeric etc.

✚ **Taxonomical Classification:**

Table No.05: Taxonomical classification of Curcumin.

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Zingiberales
Family	Zingiberaceae
Genus	<i>Curcuma</i>
Species	<i>Curcuma longa</i>

✚ **Chemical Constituents:** Phytochemical research and published journals indicate that turmeric contains a number of significant bioactive components. Curcumin, desmethoxycurcumin, and bisdemethoxycurcumin are found in turmeric rhizomes and collectively are called curcuminoids (3-6%). Several mono- and sesquiterpenes make up the pale yellow to orange-yellow volatile oil (4-6%) that turmeric generates.

• **Major Chemical Constituents:** Class of Compound of Important Constituents:-

1. Curcuminoids- Curcumin, Demethoxycurcumin, Bisdemethoxycurcumin.
2. Essential oils- Turmerone, Atlantone, Zingiberene.
3. Proteins- Plant proteins.
4. Carbohydrates-Starch and sugars.
5. Phenolic compounds- Polyphenols.
6. Minerals- Iron, potassium.

1. Anti-inflammatory activity.
2. Antioxidant effect.
3. Antimicrobial property.
4. Wound healing action.

✚ **Morphological Characteristics:** A perennial herbaceous medicinal plant, *Curcuma longa* is commonly grown in tropical climates. Curcumin, which gives the plant its distinctive yellow colour, is found in the rhizome, which is the most significant medicinal portion of the plant.

✚ **Uses:**

Table No.06: Morphological Characteristic of Curcumin

Part	Characteristics
Rhizome	Thick, branched, yellow-orange in color.
Stem	Short pseudo-stem formed by leaf sheath
Leaves	Large, broad, green, lance-shaped.
Flowers	Yellowish-white arranged in spikes
Odour	Aromatic
Taste	Slightly bitter and pungent



Fig.No.05:Image of Neem (*Azadirachta indica* A. Juss.)

✚ **Introduction:** The seeds of *Azadirachta indica* A. Juss, or neem, which is a member of the Meliaceae family, are used to make neem oil. Neem has been widely utilized in Ayurveda and traditional medicine to heal infections and skin conditions. Numerous physiologically active substances, including azadirachtin, nimbin, nimbidin, flavonoids, and fatty acids, are found in neem oil. Strong antibacterial, anti-

inflammatory, antioxidant, and wound-healing qualities are displayed by these components. Neem oil has been shown in trials to lessen microbial contamination, redness, and skin irritation. Because of its antibacterial properties, neem oil also serves as a natural preservative, extending the stability and shelf life of herbal compositions. Neem oil functions as an anti-

inflammatory, antibacterial, and skin-protective ingredient in the current cream composition.

Scientific name: *Azadirachta indica A. Juss.*

Scientific Synonyms: *Melia azadirachta, Indian Lilac, Margosa Tree.*

Taxonomical Classification:

Table No.07: Taxonomical classification of *Neem* (*Azadirachta indica A. Juss.*)

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Sapindales
Family	Meliaceae
Genus	Azadirachta
Species	Azadirachta indica

Chemical Constituents: According to published journals and phytochemical studies, neem oil contains several important bioactive compounds responsible for its medicinal activity.

- Major Chemical Constituents:** Class of Compound of Important Constituents.

1. Limonoids- Azadirachtin, Nimbin, Nimbidin
2. Flavonoids- Quercetin
3. Fatty acids- Oleic acid, stearic acid, palmitic acid
4. Triterpenoids- Gedunin
5. Sulfur compounds- Volatile sulfur compounds
6. Phenolic compounds-Polyphenols

Uses: Because of its antibacterial and antioxidant qualities, neem oil functions as a natural preservative that enhances the stability and safety of herbal compositions.

1. Anti-inflammatory activity
2. Natural preservative
3. Antimicrobial effect
4. Skin protective property
5. Wound healing
6. Antioxidant activity

Morphological Characteristics: The evergreen medicinal tree *Azadirachta indica* grows quickly and is found in many tropical and subtropical areas. Its potent antibacterial qualities and therapeutic benefits are widely recognized.

Part	Characteristics
Habit	Evergreen medium to large tree
Height	Approximately 15–20 m.
Stem/Trunk	Straight and rough bark
Bark	Brown to grey, fissured
Leaves	Compound, pinnate, green, serrated margins
Flowers	Small, white, aromatic
Fruits	Smooth olive-like drupe
Seeds	Oval-shaped containing neem oil

Table No.08: Morphological Characteristic of *Neem*.



Fig.No.06: Image of Sandalwood Oil (*Santalum album L.*)

✚ **Introduction:** One of the most valuable trees in the world is *Santalum album L.*, a member of the Santalaceae family. Known by several names, including Srigandha (Sanskrit), Safed Chandan (Hindi), and White Sandalwood (English), it is regarded as a priceless gift from the plant life that is deeply ingrained in Indian culture. Sandalwood, which has almost 2000 years of continuous history and is regarded as one of the earliest known fragrance materials, has maintained its reputation as a highly prized perfumery ingredient from antiquity to the present. A historical analysis shows that sandalwood has been mentioned in ancient texts, Indian mythology, and folklore. Its aromatic and therapeutic properties are highly valued in some cultures. Sandalwood is used to make a wide range of items, including boxes, cabinet panels, jewel cases, combs, picture frames, hand fans, pen holders, card cases, letter openers, and bookmarks. The heartwood, which makes up the middle portion of the tree, is prized for its aroma. However, the tree's bark, exterior wood (sapwood), and other sections are odourless. Sandalwood oil, which is produced by steam distilling the plant's heartwood, has been the primary product of its exploitation. Essential oil is also found in roots. The location, tree age, and distillation technique all affect oil yield and quality. Commercially, sandalwood is

referred to as East Indian sandalwood, and its oil is called East Indian sandalwood oil.

- ✚ **Scientific name:** *Santalum album L.*
- ✚ **Scientific Synonyms:** *Santalum ovatum R.Br.*, *Santalum myrtifolium A.DC.*, *Santalumaustroindicum*.

✚ **Taxonomical Classification:**

Table No.09: Taxonomical classification of Sandalwood.

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta (Angiosperms).
Class	Magnoliopsida
Order	Santalales
Family	Santalaceae
Genus	<i>Santalum</i>
Species	<i>Santalum album L.</i>

✚ **Chemical Constituents:** Sesquiterpene alcohols, which give sandalwood oil its scent and biological activity, make up the majority of its constituents.

- **Major Chemical Constituents:** Approximate percentage of constituents.
 1. α -Santalol- 41–55%

2. β -Santalol- 16–24%
 3. α -Santalenes- Minor
 4. β -Santalenes- Minor
 5. epi- β -Santalol- Trace–minor
 6. α -Bergamotol- Minor.
 7. Lanceol- Minor.
 8. Bisabolol- Minor.
4. Skin-soothing activity: Herbal dermatological products provide cooling and mild anti-inflammatory properties.
 5. Preservative-like actions against certain pathogens are attributed to antimicrobial activity.
 6. Aromatherapeutic effect: soothing, tranquil scent in topical and cosmetic wellness treatments.

Uses:

1. Sandalwood oil is utilized in topical preparations in herbal pharmaceuticals and research for:
2. fragrance/perfuming agent :A long-lasting warm, woody, sweet scent is produced by this natural fragrance/perfuming agent.
3. Fixative agent: enhances the retention of scent in ointments, gels, creams, herbal lotions, and perfumes.

Morphological Characteristics:The heartwood has the largest concentration of essential oil used in fragrance formulations, making it the most significant component both commercially and medicinally.

Character	Description
Plant type	Small evergreen hemi-parasitic tree.
Height	Approximately 8–18 m.
Bark	Dark brown to reddish-brown, rough and cracked with age.
Leaves	Opposite, smooth, ovate to elliptic, glabrous.
Flowers	Small, purplish-brown to reddish.
Fruit	Small globose drupe, purple-black when mature.
Wood	Yellowish-brown aromatic heartwood.
Oil source	Mature heartwood and roots.

Table No.10: Morphological Characteristic of Sandalwood Oil

II. LITERATURE WORK

- Inflammation is a normal reaction of the body to injury, infection or irritation. But if the inflammation is prolonged, it can lead to pain, redness, swelling and tissue damage. The conventional anti-inflammatory drugs are effective but their long term administration may cause side effects such as skin irritation, allergy and gastric problems. Thus the researchers are concentrating on herbal formulations as they are believed to be safe, economical and have lesser adverse effects. Herbal creams are widely used in the delivery of topical drugs due to ease of application, patient compliance and local therapeutic effect.
- *Bryophyllum pinnatum* is an important medicinal herb of family Crassulaceae. The published studies reported various activities of the plant like anti-inflammatory, antimicrobial, antioxidant, analgesic and wound healing activities. The leaves have Flavonoids,

Alkaloids, Glycosides, Tannins and Triterpenoids which are responsible for its therapeutic effects. The plant is traditionally used to treat wounds, burns, ulcers, pain and skin infections. Experimental studies have demonstrated the extract of *Bryophyllum pinnatum* to decrease edema and inflammatory responses.

- *Eucalyptus globulus* is an aromatic medicinal plant with essential oils, mainly eucalyptol (1,8-cineole). Research studies have reported that eucalyptus extract has anti-inflammatory, antimicrobial, analgesic and cooling properties. This extract is a source of relief from irritation, redness and microbial contamination and also gives a soothing sensation to the skin. Due to these therapeutic properties, eucalyptus extract is used extensively in herbal creams and ointments for skin care and to help with inflammation.

- Curcumin isolated from *Curcuma longa* is one of the most studied herbal compounds for inflammation management. Curcumin has strong anti-inflammatory and antioxidant effects, by blocking inflammatory mediators like prostaglandins and cytokines. Curcumin has been found to be effective in reducing swelling, pain, oxidative stress, and tissue damage in published literature. Curcumin is frequently employed in topical herbal preparations due to its medicinal value and skin protective effect.
- *Azadirachta indica* plants (Neem) is widely used in Ayurveda due to its antimicrobial, anti-inflammatory, antioxidant and wound healing activities. Neem oil contains bioactive compounds like azadirachtin, nimbin, and nimbidin which help to reduce microbial growth and skin irritation. In several published studies, it has been shown that neem oil can be used as a natural preservative in herbal formulations due to its antimicrobial properties.
- Traditionally, *Santalum album* (Sandalwood) oil is used for its soothing, cooling, antimicrobial and anti-inflammatory properties. α -santalol and β -santalol contained in sandalwood oil for calming and skin protective effects. It also improves fragrance and acceptability of herbal creams. Research reports suggest that sandalwood oil may help to reduce irritation, redness and skin inflammation.
- Recent studies on herbal topical formulations indicate that the incorporation of multiple herbal extracts might exhibit synergistic therapeutic effects. The herbal cream prepared using medicinal plant extracts showed good spreadability, stability, pH, homogeneity, and significant anti-inflammatory activity. Therefore, the combination of (*Bryophyllum pinnatum*, curcumin, eucalyptus extract, neem oil and sandalwood oil) may offer enhanced anti-inflammatory, antimicrobial, antioxidant and wound healing effects with minimal side effects. Herbal creams prepared from extracts of medicinal plants have shown good spreadability, stability, pH, homogeneity and significant anti-inflammatory activity. This combination of *Bryophyllum pinnatum*, curcumin, eucalyptus extract, neem oil and sandalwood oil may therefore have better anti-inflammatory, antimicrobial, antioxidant and

wound healing effects with little to no side effects.

- Hence, the present study is aimed at formulation and evaluation of herbal anti-inflammatory cream with natural active ingredients for development of a safe, effective and stable topical preparation for the management of inflammation.

III. AIM, NEED AND OBJECTIVE

3.1 Aim:

- To formulate and evaluate a herbal anti-inflammatory cream containing *Bryophyllum pinnatum*, Curcumin, Eucalyptus Extract, Neem Oil, and Sandalwood Oil for topical application.

3.2 Need of the study:

- Inflammation is a common condition that is associated with pain, redness, swelling and irritation. Long-term use of synthetic anti-inflammatory creams can lead to side effects like skin irritation and allergic reactions. Therefore, there is a need to develop a safe, effective and natural herbal formulation by using medicinal plant extracts with anti-inflammatory, antimicrobial, antioxidant and wound healing properties. In this study, a herbal cream was formulated using natural ingredients to provide better therapeutic effect with minimal side effects.

3.3 Objective of the study:

- Primary Objective:
 - To formulate a stable and effective herbal anti-inflammatory cream containing *Bryophyllum pinnatum*, curcumin, eucalyptus extract, neem oil, and sandalwood oil.
- Secondary Objectives:
 1. To prepare herbal extracts-
 - To prepare and incorporate herbal active ingredients suitable for topical application.
 2. To develop a stable cream base-
 - To prepare an oil-in-water emulsion using suitable excipients such as stearic acid, cetostearyl

- alcohol, beeswax, glycerin, and other formulation ingredients.
3. To evaluate physicochemical properties
 - To evaluate the prepared cream for-
 - ✓ Color
 - ✓ Odour
 - ✓ Texture
 - ✓ pH
 - ✓ Homogeneity
 - ✓ Spreadability
 - ✓ Viscosity
 - ✓ Washability
 - ✓ Stability
 4. To study anti-inflammatory potential-
 - To evaluate the effectiveness of herbal ingredients in reducing inflammation and soothing the skin.
 5. To evaluate skin compatibility-
 - To determine whether the formulation is safe and non-irritating for topical application.
 6. To improve patient acceptability-
 - To prepare a cream with good consistency, smooth texture, pleasant fragrance, and easy application.
 7. To explore herbal alternatives-

- To develop a natural and economical alternative to synthetic anti-inflammatory topical preparations.

3.4 How Anti-Inflammatory Creams Works:

- Herbal anti-inflammatory creams reduce the release of inflammatory mediators such as prostaglandins, histamine and cytokines that cause redness, swelling, pain and irritation. Herbal active ingredients penetrate into the skin and exert anti-inflammatory, antioxidant, antimicrobial and soothing effects in the area of affected skin.
- In my formulation:
1. Bryophyllum pinnatum decreases swelling and helps in wound healing.
 2. Curcumin is a powerful antioxidant and inhibits inflammatory pathways.
 3. Eucalyptus extract has a cooling, pain-relieving and antimicrobial effect.
 4. It has antimicrobial properties and reduces skin irritation.
 5. Sandalwood Oil has a soothing and calming effect on the skin.
 6. These ingredients, together, help to reduce inflammation, protect the skin and aid healing with less side effects than synthetic creams.



Fig.No.07: Image of Herbal Anti-Inflammatory Creams.

IV. Materials and Methods

“Formulation and Evaluation of Herbal Anti-inflammatory Cream”.

1. Collection of Materials:

- The fresh leaves of Bryophyllum pinnatum and eucalyptus were collected and authenticated. Curcumin, neem oil, sandalwood oil and other excipients were purchased from reliable sources.



Fig. No.8 Image of Collection & Preparation of herbal extract

2. Preparation of herbal extract:

- The collected plant materials were washed, shade dried, powdered and extracted by suitable solvent extraction method to get concentrated herbal extracts.

3. Cream Base Preparation:

- The oil phase consisted of stearic acid, cetostearyl alcohol, beeswax, coconut oil and neem oil which were heated separately.
- The aqueous phase containing purified water, glycerin and triethanolamine was separately heated at the same temperature.

4. Preparation of Herbal Cream:

- The aqueous phase was slowly added dropwise to the oil phase under stirring to form a stable oil in water emulsion. After cooling, Bryophyllum pinnatum extract, curcumin, eucalyptus extract and sandalwood oil were uniformly incorporated to obtain a smooth herbal cream.

5. Evaluation of Formulation:

The prepared cream was evaluated for:

- Color
- Odour
- Washability
- Viscosity
- Stability
- Skin irritation test.

- Spreadability
- Appearance
- Texture
- pH
- Homogeneity

6. Stability Testing:

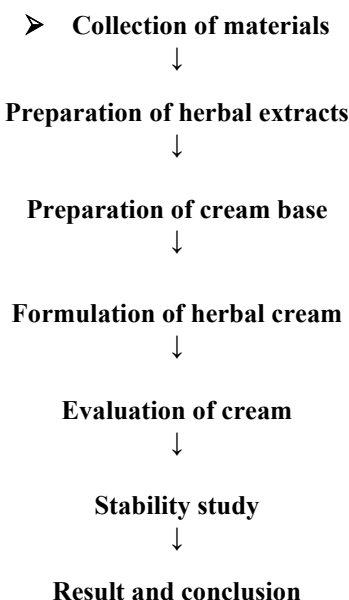
- The formulation was kept at different temperature conditions for the observation of physical stability, consistency and phase separation.

7. **Result and Conclusion:**

- The results obtained were analyzed for the effectiveness, stability and suitability of herbal anti-inflammatory cream for topical application.

➤ **Flowchart of Plan of work:**

Table No.11: Flowchart of Plan of work



V. MATERIALS AND METHODOLOGY

➤ **Formulation table:**

Three formulations of herbal anti-inflammatory cream were prepared as shown in given below table.

Table No.11: Formulation Table.

Sr. No.	Ingredients	Quantity (per 20gm)			Role in formulation
		F1	F2	F3	
1.	Bryophyllum pinnatum extract.	1gm	1gm	1gm	Anti-Inflammatory, Wound healing agents.
2.	Eucalyptus extract	0.5gm	0.5gm	0.5gm	Cooling and Antimicrobial agents.
3.	Curcumin extract	0.5gm	0.5gm	0.5gm	Anti-Inflammatory, Antioxidant.
4.	Neem Oil (<i>Azadirachta indica</i>)	1gm	1gm	1gm	Antimicrobial, Skin protective agent, Natural preservative
5.	Sandalwood Oil (<i>Santalum album L.</i>)	0.2gm	0.3gm	0.4gm	Fragrance, Soothing Agent.
6.	Stearic Acid	2gm	2gm	2gm	Emulsifying agent.
7.	Cetostearyl alcohol	3gm	3gm	3gm	Thickening and stabilizing agent.
8.	Beeswax	5gm	5gm	5gm	Consistency enhancer.

9.	Coconut oil	2gm	2gm	2gm	Emollient and moisturizing agent.
10.	Glycerin	2gm	2gm	2gm	Humectant and moisturizer.
11.	Triethanolamine (TEA)/ sodium hydroxide(dilute)	0.3gm	0.5gm	0.8gm	Emulsifying and pH adjusting agent.
12.	Purified water	q.s.	q.s.	q.s.	Vehicle

- Table No.11 Composition of different formulations (F1, F2 and F3) prepared for the development of herbal anti-inflammatory cream of Bryophyllum pinnatum extract, curcumin, eucalyptus extract, neem oil and sandalwood oil. The optimized formulation was evaluated at different concentrations of active ingredients.

8. Formulation Procedure

The oil-in-water (O/W) emulsion process was used to create the herbal anti-inflammatory cream formulations (F1, F2, and F3). Every component was precisely weighed in accordance with the formulation table.

1) Step 1: Oil Phase Preparation:

The components that are soluble in oil include:

- Acid stearic
- Cetostearyl alcohol
- Beeswax
- Neem oil
- coconut oil

were put into a clean beaker and heated to between 70 and 75 degrees Celsius while being constantly stirred until the oil was totally melted and a homogenous oily phase was produced.

2) Step 2: Aqueous Phase Preparation:

The aqueous phase in a different beaker that contains:

- Purified water
- Glycerin
- Triethanolamine



Fig.No.09: Aqueous Phase Preparation

A transparent solution was prepared by heating glycerin triethanolamine separately to the same temperature (70–75°C) while gently stirring.

3) Step 3: Cream Base Formation:

- With constant stirring, the heated aqueous phase was gradually added to the oil phase. A smooth and stable oil-in-water emulsion was created by continuing to mix.
- Stearic acid and triethanolamine combined to provide a stable emulsifying foundation that enhanced the cream's homogeneity and consistency.

4) Step 4: Including Active Ingredients:

The precisely weighed active ingredients were added to the cream base after it had cooled slightly:

- Bryophyllum pinnatum extract.
- Eucalyptus extract.
- Curcumin.

To guarantee that the herbal extracts were evenly distributed throughout the formulation, the mixture was constantly swirled.

5) Step 5: Sandalwood Oil Addition:

In order to maintain its aromatic, medicinal qualities and therapeutic properties, sandalwood oil was added at the very end of the manufacturing process after cooling.

6) Step 6: Packing and homogenization

A smooth, uniform consistency was achieved by completely mixing the produced cream. For additional evaluation research, the finished product was moved into dry, clean, air-tight containers and kept at room temperature.

"To create a stable and uniform topical preparation, the oil-in-water emulsion method was used to prepare the herbal cream formulations using appropriate excipients and herbal active ingredients."

9. Evaluation Parameter

The formulated herbal cream formulations were assessed for quality, stability, homogeneity, and topical application appropriateness using a range of physicochemical and stability characteristics.

1. Physical Appearance

- Goal: The goal is to see how the cream looks.
- Assessment: The prepared cream was visually inspected for:
 - Colour

- Odour
- Texture
- Consistency
- Smoothness

- Anticipated outcome: a smooth, uniform cream without any grittiness and a pleasant herbal scent.

2. Homogeneity

- Goal: To ensure that ingredients are distributed consistently.
- Procedure: The cream's homogeneity and lack of lumps were checked both visually and tactilely.
- Anticipated Outcome: Phase separation-free preparation that is homogeneous and uniform.

3. pH Determination

- Goal: To ascertain the formulation's skin compatibility.
- Method: A calibrated digital pH meter was used to measure the pH of around 1 g of cream that had been dissolved in distilled water.
- Anticipated Outcome: The ideal pH range for skin application is 5.5–6.5 which is suitable for skin application.

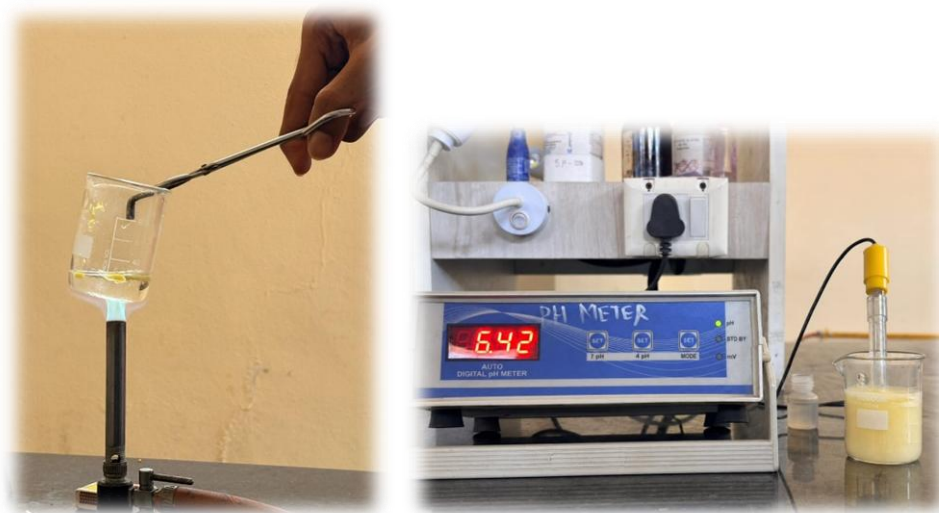


Fig.No.10: pH Determination.

4. Spreadability
 - Goal: To assess how easy it is to apply to the skin.
 - Method: A tiny bit of cream was sandwiched between two glass slides, and the spreadability was assessed by lightly pressing the slides together.
 - Expected Outcome: Smooth application and good spreadability.
5. Washability
 - Goal: To determine how simple it is to remove from the skin.
 - Method: After applying the lotion, it was cleaned with water and examined.
 - Anticipated Outcome: Cream ought to be simple to wash.
6. Viscosity
 - Goal: To determine the cream's consistency and thickness.
7. Stability Study
 - Method: A Brookfield viscometer or straightforward consistency observation were used to measure viscosity.
 - Anticipated Outcome: Good stability and semi-solid consistency.
- Goal: To assess the formulation's physical stability.
- Method: The cream was kept at
 - Room temperature
 - Refrigerator condition
 for a predetermined amount of time and watched for:
 - Separation of phases
 - Colour change
 - Odour change
 - Consistency
- Anticipated Outcome: No notable alteration in the characteristics of the formulation.

Table No.12: Evaluation parameter and Observations of herbal anti-inflammatory cream

Evaluation parameter	Observations
Physical appearance	Smooth, semi-solid cream with pleasant herbal odour.
Colour	Light yellowish-green Colour.
pH	5.8 to 6.4 (Skin Compatible).
Homogeneity	Good homogeneity with no lumps.
Spreadability	Good and easily spreadable
Washability	Easily washable with water.
Viscosity	Suitable semi-solid consistency.
Stability study	No Phase separation or colour change.
Skin irritation test	No irritation or redness observed.
Phase separation	Absent

VI. Results

- The oil-in-water emulsion method was successfully employed to formulate the herbal anti-inflammatory cream containing Bryophyllum pinnatum, curcumin, eucalyptus extract, neem oil and sandalwood oil. The cream prepared had smooth texture, good consistency, pleasant herbal smell and satisfactory appearance.
- The evaluation studies showed that the formulation has good homogeneity, excellent spreadability, easy washability and skin compatible pH. There was no phase separation, grittiness or irritation during the study. The

cream was physically stable during the entire stability period.

- The formulation exhibited anti-inflammatory, antimicrobial, soothing and wound healing properties due to presence of herbal actives. In general, the physicochemical properties of the prepared herbal cream were satisfactory and suitable for topical anti-inflammatory use.

VII. Discussion

- The present study was undertaken to formulate and evaluate a herbal anti-inflammatory cream containing Bryophyllum pinnatum, curcumin, eucalyptus extract, neem oil and sandalwood oil with suitable pharmaceutical excipients. Herbal

formulations are becoming increasingly important as they are safer, economical and have fewer side effects compared to synthetic topical preparations.

- The formulated cream was successfully prepared by oil-in-water emulsion method using stearic acid and triethanolamine as emulsifying agents. Cetostearyl alcohol and beeswax improved the formulation consistency and stability, while coconut oil and glycerin enhanced cream moisturization and spreadability.
- The study has been selected for the herbal active ingredients with significant medicinal properties. Bryophyllum pinnatum is renowned for its anti-inflammatory, wound healing and soothing properties.
- Curcumin has a strong anti-inflammatory and antioxidant effect by decreasing inflammatory mediators and oxidative stress. Eucalyptus extract provides cooling, antimicrobial, and analgesic effects, while neem oil contributes antimicrobial and skin protective properties. Sandalwood oil improved the soothing effect and fragrance of the formulation.
- The evaluation results showed that the prepared cream had good appearance, smooth texture, satisfactory homogeneity, good spreadability and suitable viscosity. The pH of the formulation was found to be within the acceptable pH of the skin indicating the cream is suitable for topical application and less likely to cause irritation. The stability study showed no phase separation and grittiness indicating that the emulsion system was stable during the period of storage.
- The skin irritation test showed no redness, itching, or irritation, suggesting that the formulation is safe for external use. The mixture of herbal ingredients may result in synergistic therapeutic effects as a result of their combined anti-inflammatory, antimicrobial, antioxidant and wound healing activities.
- In conclusion, the developed herbal anti-inflammatory cream possessed satisfactory physicochemical properties and can be used as a natural and effective topical preparation for the management of inflammation and related skin conditions. Additional pharmacological

and clinical studies may help to confirm its therapeutic effectiveness on a larger scale.

VIII. Conclusion

- The present study successfully formulated and evaluated herbal anti-inflammatory cream containing Bryophyllum pinnatum, curcumin, eucalyptus extract, neem oil and sandalwood oil using suitable pharmaceutical excipients. The prepared cream had good appearance, smooth texture, proper consistency, good spreadability, skin-friendly pH, and excellent homogeneity.
- The herbal ingredients in the formulation have anti-inflammatory, antimicrobial, antioxidant, soothing, and wound healing effects, which may help reduce redness, swelling, pain, and skin irritation. The formulation also did not show signs of phase separation and skin irritation during evaluation.
- In overall, the developed herbal cream was safe, stable, and suitable for topical application. The study suggests that this herbal formulation may serve as a natural and effective alternative to synthetic anti-inflammatory cream with fewer side effects.

Acknowledgments

- I am very thankful to my project guide, teachers and department for their valuable guidance, encouragement and support throughout the completion of this research work titled "Formulation and Evaluation of Herbal Anti-inflammatory Cream."
- I am thankful to the management of the college and the laboratory staff for providing the necessary facilities, chemicals, instruments and support required for the successful completion of this study.
- I would like to thank my friends and classmates as well for their help motivation and cooperation during the project work.
- Finally, I would like to express my sincere gratitude to my family members for their constant support, encouragement and inspiration during the study.

References

- [1]. Dr. Satheesh kumar. P, Lilly judi. J, Dr. Thilagam. E, Dr. Senthil kumar. N. (2024). Formulation and evaluation of *Bryophyllum pinnatum* (Lam.) Kurz. gel for wound healing topical application, International Journal of Pharmaceutical Research and Applications, Vol.9,issue (4), 1215-1221.
- [2]. Sunil Kumar, Surya Prakash Gupta.(2024) Research article on Formulation and Evaluation of Polyherbal gel containing *Thunbergia erecta* and *Bryophyllum pinnatum* extracts for Wound healing activity, Research Journal of Pharmacy and Technology , Vol.17, issue(12), 5816-5824.
- [3]. Priti Dnyandeep Gadge, Shubham Chandrakant Gadge. (2025). Formulation and evaluation of antimicrobial gel of *Bryophyllum pinnatum*, International Journal of Pharmacy and Pharmaceutical Science, Vol.7 issue (2),23-27.
- [4]. Kushal Thakare, Ramsajan Vishwaakarma and Kishor Yeole (2025). Formulation and Characterization of an Herbal Anti-Inflammatory Topical Cream, International Journal of Pharmacy and Pharmaceutical Science, Vol.7 issue (1),177-185.
- [5]. Hitesh Hire, Gosavi Pooja, Dinesh Jagtap, Namita Jadhav, Jitendra More, (2025).Formulation and evaluation of anti-Inflammatory Cream using herbal extracts, International Journal of Pharmacognosy and Life Science Vol.6 Issue (1), 62-65.
- [6]. Isibor, J. (2026). Phytochemistry and bioactivity studies of *Bryophyllum pinnatum*: A review. Discover Chemistry, 3, Article 33. DOI: <https://doi.org/10.1007/s44371-025-00360-3>
- [7]. Alyas, S., Yasin, I., Shafique, T., Zahid, B., Hayat, S., Shahbaz, M. S., Aman, F., Ilyas, A., Ahmad, S., & Khan, R. H. (2023). Anti-inflammatory, antipyretic and analgesic activities of *Eucalyptus globulus* essential oil in albino rats. Biological and Clinical Sciences Research Journal, 2023, Article 207. <https://doi.org/10.54112/bcsrj.v2023i1.207>
- [8]. Mondal, M., Quispe, C., Sarkar, C., Bepari, T. C., Alam, M. J., Saha, S., Pranta, R., Rahim, M. A., Islam, M. T., Setzer, W. N., Salehi, B., Ahmadi, M., Abdalla, M., Sharifi-Rad, J., & Kundu, S. K. (2021). Analgesic and anti-inflammatory potential of essential oil of *Eucalyptus camaldulensis* leaf: In vivo and in silico studies. Natural Product Communications, Vol.16(4), 1–16. <https://doi.org/10.1177/1934578X211007634>
- [9]. Krishna, K. R., Sinchana, S. P., Chaithra, R., Amrutha, N., & Vishwas, U. M. (2025). A review on formulation and therapeutic applications of herbal analgesic creams. Journal of Pharma Insights and Research, [Advance online publication]. <https://doi.org/10.69613/qj2sqm07>
- [10]. Yutaka Takagi. (2024). Efficacy of topical application of a skin moisturizer containing pseudo-ceramide and a *Eucalyptus* leaf extract on atopic dermatitis: A review. Journal of Clinical Medicine, Vol.13, Article 1749. <https://doi.org/10.3390/jcm13061749>
- [11]. Husni, P., Amalia, A. D., Mita, S. R., Putriana, N. A., & Januarti, M. (2019). Formulation and physical evaluation of cream containing neem oil 5%. Indonesian Journal of Pharmaceutics, Vol.1, issue(3), 79–83. <https://doi.org/10.24198/idjp.v1i3.23715>
- [12]. Paola Del Serrone, Chiara Toniolo and Marcello Nicoletti.(2015), Research article on Neem (*Azadirachta indica* A.Juss) Oil: A Natural Preservative to Control Meat spoilage. Foods Vol.4, 3-14.<https://doi.org/10.3390/foods4010003>
- [13]. Sunday O. Okoh, Omobia O. Okoh and Anthony I. Okoh (2019). Research article on Inhibitory effects of *Azadirachta indica* secondary metabolites formulated cosmetics on some infectious pathogens and oxidative stress radicals. BMC Complementary and Alternative Medicine, Vol.(19) issue (123). <https://doi.org/10.1186/s12906-019-2538-0>
- [14]. Kumar, R., Anjum, N., & Tripathi, Y. C. (2015). Phytochemistry and pharmacology of *Santalum album* L.: A review. World Journal of Pharmaceutical Research, 4(10), 1842-



1876.https://www.researchgate.net/publication/282638998_Phytochemistry_and_Pharmacology_of_Santalum_album_L_A_Review.

- [15]. Pushpendra Kumar Saini, Narendra Sharma, Chanchal Sharma, Chandra Prakash Mishra. (2025) Research Article on Formulation and Evaluation of an Oil-in-Water Herbal Cream Containing Aloe Vera, Neem and Turmeric Extracts, Publish on Journal of Drug Discovery and Therapeutics, (Source:- American Chemical Society) Vol.13, Issue(6), 34-42. <https://www.jddt.in/index.php/jddt/article/view/714>