



# Anti-Inflammatory Activity of Indian Herbs

Ms. Gayatri M. Mandilkar<sup>\*1</sup>, Dr. Amol N. Khedkar<sup>2</sup>, Ms. Rutuja D. Lagad<sup>3</sup>

Department of Pharmaceutical Sciences, Student<sup>1</sup>, Principal<sup>2</sup>, Assistance Professor<sup>3</sup>

Organization-Saikrupa Institute of Pharmacy, Ghargaon, Shrigonda, Ahmednagar, Maharashtra, India 413728

**Abstract:** Medicinal plants and their secondary metabolites are increasingly being utilized as supplemental medicine to treat various ailments. A broad spectrum of illnesses, including rheumatic and immune-mediated disorders, diabetes, cardiovascular accidents, and more, are classified as pathologic conditions that cause inflammation. We provide a few plants whose anti-inflammatory properties have been proven in investigations, both clinical and experimental. The introduced medicinal plants in this review are *Azadirachta indica*, *Aloe vera*, *Curcuma longa*, *Cassia fistula*, *Boswellia serrata*, *Citrus auranticum*, *Bacopa monneiri*, *Emblica officinalis*, *Garsinia mangostana*, *Moringa olifera*, *Vinca rosea*, *Vitex neugundo*, *Menthol*, *Eucalyptus oil*, *Piper longum*, *Achillea millefolium*. Since there is no one-size-fits-all solution for treating inflammation, this review uses herbal medicine and lifestyle modifications to try to attain a multimodal therapeutic approach to inflammation. **Keywords:** Anti-inflammation, Medicinal Plants, Response

## Introduction: [1-3]

Inflammation is the painful redness and swelling of a portion of the body caused by an infection, injury, or illness. Inflammation is a normal, defensive response to tissue injury produced by physical trauma, toxic chemicals, or microbiological organisms. It is a component of the complicated biological reaction of a body tissue to damaging stimuli such as infections, damaged cells, or allergens, and is a defensive response involving immune cells, blood vessels, and nerves. Molecular mediators. Inflammation can be acute or persistent.

## Acute inflammation:

Acute inflammation is the body's initial response to damaging stimuli, and it is characterized by accelerated flow of plasma and leukocytes from the blood into the wounded cells. Acute inflammation is a short-term process that usually manifests itself within a few minutes or hours.

## Chronic Inflammation:

It is related with the infiltration of mononuclear immune cells, macrophages, monocytes, neutrophils, fibroblast activation, proliferation (angiogenesis), and fibrosis. Chronic inflammation is a gradual, long-term inflammation that lasts for months or years. Chronic inflammation is a sign of other health disorders, such as rheumatoid arthritis (RA), which affects roughly 1% of the population in affluent countries.

## Pain: [2]

In the early stages, the most prevalent disease is pain. Pain is a vital nervous system function that alerts the body to possible or existing injury. Pain is an unpleasant sensation induced by severe or destructive stimuli such as stubbing a toe, burning a finger, putting alcohol on a cut, or bumping the "funny bone." "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, described in terms of such damage". Pain pushes people to avoid dangerous circumstances, safeguard a wounded bodily part while it heals, and avoid similar experiences in the future.

**Types of pain:** Pain is normally transient, lasting only until the noxious stimulus is eliminated or the underlying injury or disease heals, but some painful disorders, such as rheumatoid arthritis, peripheral neuropathy, and idiopathic pain, can linger for years. Psychogenic pain is pain that is induced, exacerbated, or extended by mental, emotional, or behavioral causes. Psychogenic pain is diagnosed only when all other sources of pain have been ruled out. These are the four primary forms of pain

1) Acute Pain

2) Chronic Pain

### 3Neuropathic Pain

#### 4Nociceptive Pain 1. **Acute Pain:**

Acute pain is caused by an injury, surgery, disease, trauma, or severe medical procedures. It serves as a warning of disease or a hazard to the body. It normally only lasts a short time and goes away once the underlying reason has been treated or cured.

#### 2. **Chronic Pain:**

Chronic pain is defined as pain that lasts or recurs for more than three months. Pain might be the only or main complaint in chronic pain syndromes, necessitating specialized treatment and care.

#### 3. **Neuropathic Pain:**

Neuropathic pain is pain produced by damage or disease to the somatosensory system. Neuropathic pain may be coupled with aberrant sensations known as dysesthesia or discomfort from typically non-painful stimuli (allodynia).

#### 4. **Nociceptive Pain:**

Nociceptive pain is pain induced by tissue injury. Nociceptive pain is acute, painful, or throbbing. It is frequently caused by an external injury, such as stubbing your toe, suffering a sports injury, or undergoing a dental surgery.

### **Importance herbal remedies useful in antiinflammation<sup>[4-6]</sup>**

In contrast to current allopathic pharmaceuticals, which have a single active ingredient and focus on a particular pathway, herbal treatments depend on an or chestral style. Numerous diverse chemicals found in plants interact with specific components of the intricate biological pathway in synergistic ways. For many years, medicinal plants have been a source of a wide range of biologically active substances that have been widely used as raw materials or as pure compounds to treat a variety of illness situations. Because of the toxicity and side effects of allopathic medications, the usage of herbal medicines is growing in popularity. Strong therapeutic substances are developed with the help of medicinal plants. More than 1.5 million exist. Traditional medicine practitioners use medicinal plants for therapeutic, promotional, and preventive purposes. India, which has the largest collection of medicinal plants in the world, may continue to play significant role in the manufacture of raw materials for therapeutics, either directly or indirectly through the use of bioactive components in the creation of pharmaceuticals

### **Advantages of herbal medicines:**

#### **Enhanced immunological response:**

Herbal medicine can aid in boosting immune system performance, which is crucial for preserving general health. This is due to the fact that many herbs include substances that can balance our immune response, assisting in illness prevention and enhancing the bodys capacity to heal from disease or injury.

#### **Improved intestinal function:**

Enhancing gut health can also be achieved with the aid of herbal medicine.

#### **Less anxiety and stress:**

Many plants are called adaptogens, which means they can help lower stress by lowering cortisol levels in the body.

#### **Natural pain relief:**

Herbs with anti-inflammatory and antioxidant qualities can be a natural substitute for over-the-counter painkillers because inflammation is the primary cause of pain. These substances have the capacity to lessen pain and inflammation.

### **Disadvantages of herbal medicines:**

Herbs have many benefits, but we must also consider some of their disadvantages before discussing them.

#### **Inconsistency:**

Many herbs have not yet undergone substantial research, therefore their efficacy may be unknown, even though some are successful in treating specific ailments.

#### **Contamination:**

The health of people may be negatively affected by contamination of mass-produced medicinal herbs. pesticides, heavy metals, microorganisms, and environmental contamination is just a few of the sources that might taint herbal medications.

#### **Potential risk:**

Unfortunately, the potential for health risk is one of the disadvantages of herbal medicines. That's because some herbal medicines can cause allergic reaction so interact with certain prescription drug.

Herbal medicines are often self administered. As such no dosage or warnings are given. When medicinal herbs are consumed together with drugs, the two can interact with each other and leads to health impairments.

#### **Causes of inflammation:<sup>[3]</sup>**

##### **Many different things can cause inflammation.**

These are the most common

Pathogens (germs) like bacteria, viruses, or fungi.

External injuries like scrapes or damage through foreign object.

Effects of chemical or radiation.

Rheumatoid arthritis, where many joints throughout the body are permanently inflamed.

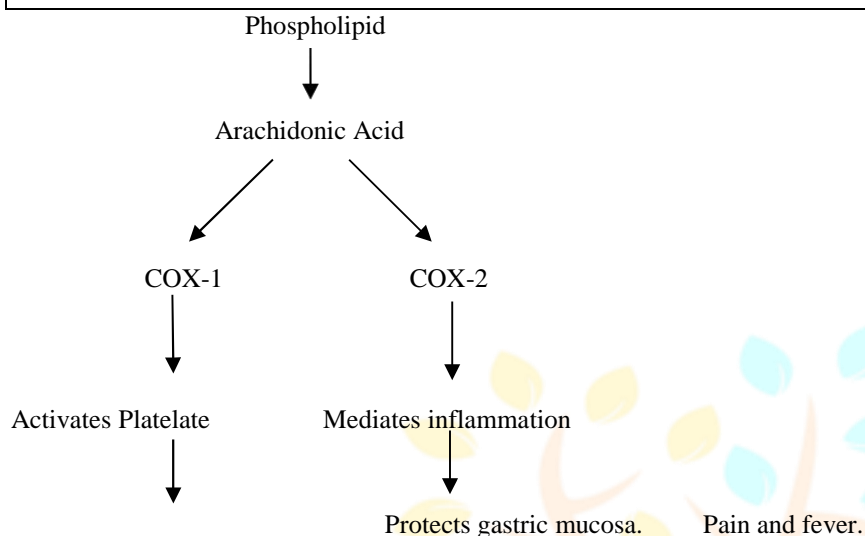
**Mechanism of inflammation:** <sup>[3-6]</sup>

The mechanism of inflammation are as follows:

Blunt trauma, vibration from foreign things, and chronic low intensity pressure are the main causes of inflammation.

**NSAID**

(Non Steroidal Anti-inflammatory Drug)

**ASPIRIN****Principle of Herbal balm:** <sup>[1-2]</sup>

Herbal balm is an ayurvedic preparation of potent essential oils for reducing pain and providing fast relief from headache, backache, cold and other symptoms. Herbal balm composition offers medicinal topical preparations for application to skin to relieve pain and stiffness. It consists of organic essential oils, organic bases, wax, and other desired herb components. Pain balms generally contain 3 components namely (1) Methyl salicylate (2) Menthol (3) Camphor. All these are easily absorbed through the skin. Chemicals that reduce irritation are present in the balm, including methyl salicylate. Methyl salicylate acts as an analgesic when absorbed via the skin. Camphor is extremely flammable and quickly absorbed to the skin. Both a rubeface and a mild local anaesthetic, it provides a cooling sensation. Menthol: The main component of peppermint oil and a white crystalline material, menthol widens blood vessels. One experiences a cooling sensation where the balm has been administered due to increased blood flow. Petroleum jelly is the common base for any kind of balms. Petrolatum, often known as petroleum jelly, is a semi-solid hydrocarbon combination that is used in household preparations for medical purposes. A combination of these active ingredients is useful in headache and rheumatic pains. The other ingredients in the pain relief balm are Eucalyptus oil, Thymol, Turpentine, and clove oil. Although the various pain relief balms have unique pharmacological effects in relieving pain, the primary function is to act as a local anaesthetic and, in the end, to create a comfortable stage. These products don't create inflammation at the application site or have any side effects or allergic reactions like skin irritation or skin discoloration. Consequently, the customer grows to like the selected product.

**Uses of Herbal Balm:** <sup>[8-10]</sup>

- Reduce stress and anxiety.
- Encourage sleep.
- Enhance appetite. □ Reduce pain.

**Herbs for anti-inflammatory agents:** <sup>[1,2,6,7,8]</sup>

Sr.no	Plant name	Family	Plant parts	Type of extract
1	<i>Azadirachta Indica</i>	<i>Meliaceae</i>	Leaves	Hydro alcohol
2	<i>Aloe vera</i>	<i>Liliaceae</i>	Leaves	Pet ether
3	<i>Curcuma longa</i>	<i>Zingiberaceae</i>	Rhizomes	Ethanol
4	<i>Cassia fistula</i>	<i>Caesalpiaceae</i>	Leaves	Methanol
5	<i>Boswellia serrata</i>	<i>Burseraceae</i>	Leaves, Bark	Hexane , ethanol
6	<i>Citrus auranticum</i>	<i>Rutaceae</i>	Fruit	Not indicated

7	<i>Bacopa monneiri</i>	<i>Scrophlulariaceae</i>	Whole plant	Ethanol
8	<i>Embllica officinalis</i>	<i>Euphorbiaceae</i>	Fruit	Ethanol and aqueous
9	<i>Garcinia mangostona</i>	<i>Guttiferae</i>	Fruit	Methanol
10	<i>Moringa olifera</i>	<i>Moringaceae</i>	Root , Flowers	Methanol and aqueous
11	<i>Vinca rosea</i>	<i>Apocynaceae</i>	Leaves	Not indicated
12	<i>Vitex negundo</i>	<i>Lamiaceae</i>	Leaves	Alcoholic
13	<i>Menthol</i>	<i>Labiataeae</i>	Leaves	Alcohol
14	<i>Eucalypytus oil</i>	<i>Myrataceae</i>	Leaves	Alcohol
15	<i>Piper longum</i>	<i>Piperaceae</i>	Roots	Aqueous
16	<i>Achillea millefolium</i>	<i>Asteraceae</i>	Whole plant	Aqueous Alcohol

Description of medicinal herbs used in treatment of anti-inflammatory agents:



#### 1)Neem<sup>[11,12,13,14]</sup>

Figure:-1- *Azadirachta indica*

**Botanical name:** *Azadirachta indica*

**Biological source:** It consist of the fresh or dried leaves and seed oil of *Azadirachta indica* J. **Family:** *Meliaceae* **Microscopic characters:**

- **Colour:** Leaves- Smooth and dark green
- **Odour:** Characteristics
- **Taste:** Bitter
- **Size:** 20-40cm in length
- **Shape:** Elongated to oblong **Chemical constituents:**

Nimbin, Salannin, Azadirachtin, Gedunin, Azadiradone **Uses:**

- 1) Used in immune system
- 2) Arthritis
- 3) Eczema
- 4) Diabetes
- 5) Rheumatism

6) Skin disorders

2) **Aloe vera:**<sup>[14,16]</sup>**Figure-2- Aloe barbadensis miller Botanical name:** *Aloe barbadensis miller***Biological source:** The aloe is dried latex of leaves of it known as Curacao aloe**Family:** *Liliaceae***Microscopic characters: Colour:** Reddish brown**Odour:** Pungent**Taste:** Extremely bitter**Size:** 60-100cm (24-39 inches)**Shape:** Leaves- rosette**Chemical constituents:**Aloe-emodin, Glycoside, Anthrones, Anthranols, Isobarbaloin, Amino acids, enzymes, vitamins **Uses:**

- 1) To treat painful inflammatory manifestation
- 2) Purgative
- 3) Also reduce eczema
- 4) Improve flexibility
- 5) To treat arthritis

3) **Turmeric:**<sup>[15,17,42]</sup>**Figure:-3 Curcuma longa****Botanical name:** *Curcuma longa***Biological source:** It is obtained from the dried as well as fresh rhizomes of the plant *Curcuma longa* **Family:** *Zingiberaceae***Microscopic characters:****Colour:** Orange yellow to yellow**Odour:** Aromatic**Taste:** Warmly aromatic and bitter**Size:** Length- 41.2 mm, Diameter- 9.3 mm **Shape:** Cylindrical**Chemical constituents:**Curcumin (50-60%), Essential oil (2-7%), Desmethoxy curcumin, Bisdsmethoxy curcumin, Zingiberine **Uses:**

- 1) Fight inflammation
- 2) Treat arthritis
- 3) Support cardiovascular function

- 4) Regulates cholesterol
- 5) Improve skin health



- 4) **Golden shower** <sup>[18,19,20]</sup>

**Figure:-4: Cassia fistula**

**Botanical name:** *Cassia fistula*

**Biological source:** It is obtained from the dried roots and leaves of *Cassia fistula* **Family:** *Caesalpiniaceae* **Microscopic characters:**

- **Colour:** Yellow/ Golden
- **Odour:** Pungent
- **Taste:** Sweet yet bitter
- **Size:** 30-80 cm long
- **Shape:** Flowers- pentamerous, slightly zygomorphic **Chemical constituents:**

Sennosides A and B, Volatile oil, Pulp consists of sugar, gum, resin, Barbaloin, Formic acid **Uses:**

- 1) Anti-inflammatory properties
- 2) Hepatoprotective
- 3) Anti-tussive
- 4) Antibacterial
- 5) Used for healing of wounds
- 6) Antifungal

- 5) **Indian frankincense:** <sup>[21,23]</sup>



**Figure:-5- Boswellia serrata Roxb Botanical name:** *Boswellia serrata Roxb.*

**Biological source:** It is dried exudates oleo gum resin obtained from the branches of plant *Boswellia serrata* **Family:** *Burseraceae*

**Microscopic characters:**

- **Colour:** Resin- Brown, Golden colour
- **Odour:** Strongly diffusive
- **Taste:** Bitter, Pungent
- **Size:** Upto 18 m in height and 2.4 m in girth
- **Shape:** Variable **Chemical constituents:**

Monoterpenes, Diterpenes, Triterpenes, Tetracyclic triterpenic acid, Beta- boswellic acid, Acetyl- beta – boswellic acid, 11-keto- beta- boswellic acid **Uses:**

- 1) Asthma
- 2) Osteoarthritis
- 3) Enhanced fertility

- 4) Cancer
- 5) Treat arthritis
- 6) Lowers inflammation

6) **Bitter orange, Marmalade orange:**<sup>[22,23]</sup>



Figure:- 6-*Citrus auranticum*

**Botanical name:** *Citrus auranticum*

**Biological source:** Orange peel is dried or fresh outer part of the pericarp of the ripe or nearly ripe fruits of *Citrus auranticum* Linn.

**Family:** *Rubiaceae* **Microscopic characters:**

- **Colour:** Dark orange red
- **Odour:** Aromatic ▪ **Taste:** Bitter, Aromatic ▪ **Size:**
- **Shape:** Variable **Chemical constituents:**

Volatile oil (2.5%), Hesperidin, Isohesperidin, Neohesperidin, Vitamin C, Pectin, Limonene, Citral.

**Uses:**

- 1) Antibacterial
- 2) Anticancer
- 3) Anti-inflammation
- 4) Antiarthritis

7) **Waterhyssop, Brahmi:**<sup>[21]</sup>

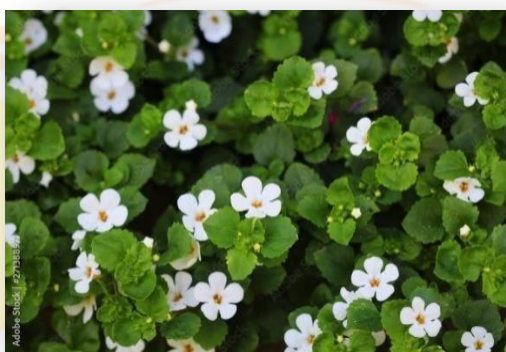


Figure:-7- *Bacopa monnieri*

**Botanical name:** *Bacopa monnieri*

**Biological source:** It consists of fresh leaves and stem of the plant known as *Bacopa monnieri* Linn. **Family:** *Scrophulariaceae*

**Microscopic characters:**

- **Colour:** Leaves- green
- Flowers- white
- **Odour:** No distinct odour
- **Taste:** Bitter
- **Size:** Leaves are about 2 cm
- **Shape:** Leaves- fleshy, obovate

Flowers- solitary, ovoid **Chemical constituents:**

Brahmin (alkaloid), Herpestin, Mixture of 3 alkaloids (Saponin, Bacoside A and B), Beutalic acid, Monneirin **Uses:**

- 1) Used to treat inflammation
  - 2) Asthma
  - 3) Epilepsy
  - 4) Diuretic
  - 5) Anticancer activity
- 8) Indian goose berry, Amla:<sup>[44-46]</sup>



Figure:-8- *Emblica officinalis*

**Botanical name:** *Emblica officinalis*, *Phyllanthus emblica*

**Biological source:** It is obtained from the dried as well as fresh fruits of the plant of *Emblica officinalis* Linn **Family:** *Euphorbiaceae*

**Microscopic characters:**

- **Colour:** Green colour changes to light yellow
- **Odour:** Odourless
- **Taste:** Sore and Astringent
- **Size:** Average size is between 1.5-2.5 in diameter
- **Shape:** Depressed globular **Chemical constituents:**

Emblicanin A and B, Chebulagic acid, Phyllanthine, Phyllanthidine, Gallic acid, Ellagic acid, Pectin, Ascorbic acid **Uses:**

- 1) Reduce inflammation
- 2) Helps to control joint pain and swelling
- 3) Reduce arthritis related to pain
- 4) Treat diabetes mellitus
- 5) Reduce weight

9) Mangosteen, Purple mangosteen:<sup>[27,28]</sup>



Figure:-9- *Garcinia mangostana*

**Botanical name:** *Garcinia mangostana*

**Biological source:** It is obtained from the plant of *Garcinia mangostana* Linn. **Family:** *Guttiferae* **Microscopic characters:**

- **Colour:** Green to purple black
- **Odour:** Mild fragrance that's sparkly sweet and topical
- **Taste:** Sweet and sour
- **Size:** Height 9.5 m (31 feet)
- **Shape:** Fruit- round or flattened on the ends

**Chemical constituents:**

Mangostin, Gartonin, Isomangostin, Flavonoids, Benzophenones, Benzofuran, Triterpenoids, **Uses:**



- 1) Treatment of abdominal pain
  - 2) Dysentery
  - 3) Infected wounds
  - 4) Anti-inflammatory
  - 5) Antiallergic
  - 6) Antibacterial
- 10) **Drumstick leaves:**<sup>[29,30]</sup>



**Figure:-10- *Moringa olifera***

**Botanical name:** *Moringa olifera*

**Biological source:** It consist of dried long slender triangular sees pods of *Moringa oeifera* Lam **Family:** *Moringaceae* **Microscopic characters:**

- **Colour:** Leaves- green
- Flowers- Violet, Pinkish white
- **Odour:** Characteristics
- **Taste:** Characteristics
- **Size:** Height- 10 to 12cm, Diameter- 45cm
- **Shape:** Long, slender **Chemical constituents:**

Isothiocynates, Nitrates, Pterygosperma, Crypto- chlorogenic acid, Quercetin **Uses:**

- 1) It is used for anemia
- 2) Arthritis
- 3) Joint pain (Rheumatism)
- 4) Headache
- 5) Bacterial, Fungal, Viral infection
- 6) Kidney stone

11) **Periwinkle:**<sup>[31,32,33]</sup>



**Figure:-11- *Vinca rosea* Botanical name:** *Vinca rosea*

**Biological source:** *Vinca* is the dried entire plant of *Catharanthus roseus* Linn. **Family:** *Apocynaceae* **Microscopic characters:**

- **Colour:** Leaves – green
- **Odour:** Characteristics
- **Taste:** Bitter
- **Size:** 7-24 in high and wide

- **Shape:** Ovate or oblong

**Chemical constituents:**

Leaves and roots contain more alkaloid, Ajmalicine, Serpentine, Dimer indole indoline alkaloids Vinblastine, Vincristine, Indole monomeric alkaloid-Vindoline, Catharanthine, Sesquiterpene

- Uses:**
- 1) To treat diabetes
  - 2) High blood pressure
  - 3) Disinfectant
  - 4) Antitumor
  - 5) Used as a gargle
  - 6) Laxative
  - 7) Purgative

**12) Negundo :**<sup>[34-38]</sup>



**Figure:-12-Vitex Negundo**

**Botanical name-** *Vitex Negundo*

**Biological source-** It is obtained from the leaves of the plant *Vitex Negundo*

**Family-** *Lamiaceae*

**Microscopic character -**

- **Colour-** Leaves- green
- **Odour-** No distinct odour
- **Taste -** Pungent
- **Size-** around 4 to 10 cm
- **Shape -** narrowly oblong or epileptic to lanceolate

**Chemical constituents –**

Casticin ,Isoorientin ,Chrysopenol D ,Luteolin ,P-hydroxybenzoic acid ,D- fructose

**Uses-**

- 1) In the treatment of rheumatoid arthritis.
- 2) Nirgundi decoction used for steam bath for joint pains.
- 3) Dried leaves when smoked also said to relieve catarrh and headache.
- 4) Used in sinuses and scrofulous sores.
- 5) Oil is used for sloughing wounds and ulcers.



**13) Menthol:**<sup>[39,40,41,43]</sup>**Figure:- 13-*mentha piperita*****Botanical name-** *mentha piperita***Biological source-** it is obtained by the distillation of the peppermint. **Family-***Labiatae***Microscopic characters** ▪ **Colour-**leaves-green

- **Odour-** minty smell
- **Taste-**minty taste and aroma
- **Size-** leaves- 4.5 to 2.3 cm
- **Shape-**Oblong to lanceolate

**Chemical constituents** –Essential oil,Menthol,Menthone,Methyl acetate,Eucalyptol,Isomenthone,Neomenthol,Limonene **Uses-**

- 1)Relief of pain
- 2)Anti-inflammatory
- 3)Relieve headache
- 4)Relieve nausea and dizziness

**14) Eucalyptus oil:**<sup>[24,25,26]</sup>**Figure:-14 -*Eucalyptus globulus* Botanical name - *Eucalyptus globulus*****Biological source-** it is made from the fresh leaves and branch tops of the eucalyptus plant**Family-** *Myrataceae***Microscopic characters -**

- **Colour** -colourless to pale yellow
- **Odour-** aromatic
- **Taste-** pungent
- **Size-** leaves-150-300 mm (5.9-11.8 in) long
- **Shape-** Oval shape

**Chemical constituents -**Eucalyptol ,Alpha-pinene ,Pinocarveol ,Pinocarvone,Globulol , Citronellal **Uses-**

- 1) Reducing symptoms of cough
- 2) Used to treat arthritis
- 3) sores and wounds
- 4) Releiving muscle and joint pain
- 5) also tick repellent

**Evaluation study-**<sup>[1-2]</sup>**1) Physical evaluation:** To confirm physical qualities such color, odour, and consistency, a visual assessment was done.**Colour:** Visual inspection was used to determine the formulation's colour.**Consistency:** By applying the formulation to the skin, the consistency was confirmed.**Odour:** After mixing the gel with water and smelling the mixture, the formulation's odour was evaluated **2)Ph-**The produced formulation's PH was assessed using a digital PH meter by completely submerging the glass electrode in the gel system to cover the electrode. The measurement was done three times, with the average of the values being recorded. **3) Viscosity-**

At 25°C and a spindle speed of 12rpm, a brook-filled viscometer (S-62, model LVDV-E) was used to measure the viscosity of the balm

**4)Phase seperation-**Phase separation involved transferring the produced balm into an appropriate wide mouth container. After 24 hours of storage, the oil phase and aqueous phase separation could be seen. **5)Spreadability-**

Two sets of identical glass slides were taken. One of the slides was placed on top of the herbal balm mixture. The other slide was placed on top of the gel, leaving a gap of 7.5 cm along the slides where the gel was sandwiched between the two slides. On the upper slides,

100 g of gel was positioned and pushed uniformly to form a thin layer between the two slides. The excess gel that was sticking to the slides was scraped off after the weight was taken off. The two slides were securely fastened to a stand so that only the upper slides could be released by the weight of something being linked to it. Carefully connected to the upper slide was a 20 g weight. The time it took for the upper slide to move 7.5 cm and separate from the lower slide under the weight's action was recorded. Three times the experiment was conducted.

#### 6) Patch test -

Apply the solution to a small area of skin that is unlikely to be unintentionally washed or rubbed away. The inside of the arm or the bend of the elbow are both suitable locations. To a patch of skin the size of a quarter, apply the product. The product should be applied with the same amount of thickness that it would require for normal use. As long as the product would ordinarily stay on the skin, leave it on the affected area of skin. When trying a substance that they would often wash off, such a cleanser, people should adhere to the directions and leave the patch on for at least 5 minutes. For a period of seven to ten days, repeat the patch test twice daily. Apply the solution to a small area of skin that is unlikely to be unintentionally washed or rubbed away. The inside of the arm or the bend of the el are potential good sites. It's critical to keep using the product for this amount of time even if a reaction doesn't appear right away. A person should wash the product off right away and cease using it if their skin reacts to it. If necessary, one can apply petroleum jelly or a cool compress to soothe the skin.

#### 7) Accelerated stability studies-

The developed herbal balm formulation underwent accelerated stability testing for one week at room temperature and three months at 50°C plus or minus 1°C. The herbal balm formulation was stored at both room temperature and an increased temperature, and the following parameters were measured on days 0, 15, 20, 30, 40, 50, 60, 70, 80, and 90.

#### Conclusion

Inflammation-related diseases are affecting a large portion of the global human population. Because they have side effects such as GIT irritation, liver dysfunction, and other issues, existing analgesics like opiates and NSAIDs are thought to not always be helpful (49). Based on their ability to inhibit COX-1, a number of immunosuppressing drugs have been created, but when used for an extended period of time, they have serious side effects. Therefore, COX-2 selective inhibitors were created to prevent the negative effects of COX-1 inhibitors. There have been no scientific studies on herbal anti-inflammatory and anti-rheumatic medications. Therefore, it is imperative that all of these herbal medicines be evaluated for their pharmacological activities, the identification of the specific compound responsible for their anti-inflammatory effects, and the creation of effective formulations that are effective against inflammatory disorders.

Using the hot processing technique, herbal balm was created, and it was discovered that the transparent ingredients used in the formulation had good compatibility and underwent little alterations. Eucalyptus leaf extracts contain pain-relieving properties, and vitex negundo leaf extracts are used to treat high fevers, ease menstrual cramps, and relieve arthritis pain. • The developed formulation was further assessed using several evaluation criteria, including PH, Extrudability, Spreadability, Viscosity, and Patch Test, and it produced positive results. Plants have had a big impact on human history.

#### References:-

- 1) P. Geetha Devi, S. Yamuna, Sk. Nourin, K. Naveen, Sk. Salma, D. Swathi, K. Gayathri, P. Subrahmanyam. 2022. Formulation of natural miracle balm formulation by using herabal plants and evaluation on topical region 21(7): 604-629.
- 2) Phoke S. V, Hatkar A. D., Dhut S. R, Jaybhaye S. S, Muley Y.P. 2023. Formulation and Characterization of anti-inflammatory characteristics of balm by using different herbs IJCRT. 2320-2882.
- 3) Sr V. Stankov 2012. Definition of Inflammation Causes of Inflammation and Possible Anti-inflammatory Strategies The Open Inflammation Journal, 5.
- 4) Dr. Susan Sam. Importance and effectiveness of herbal medicines Journal of Pharmacognosy and PhytochemistryC, 8(2): 354-357.
- 5) Fabio Carmona, Ana Maria Soares Pereiragnosy. 2023. Herbal medicines: old and new concepts, truths and misunderstandings Brazilian Journal of Pharmacognosy 23(2): 379-385.
- 6) S kumar, BS. Bajwal singh Kuldeep, AN. Kalia. 2013. Anti-Inflammatory Activity of Herbal Plants: A Review IJAPBC. 2(2): 2277 – 4688.
- 7) Debra Rose Wilson, Ph.D., MSN, R.N. 2013. — By Lana Burgess on 12 natural ways to relieve pain February 28: 1-9.
- 8) Joseph C. Maroon, Jeffrey W. Bost, and Adara Maroon. 2010. Natural anti-inflammatory agents for pain relief Surg Neurol Int. 1-6.
- 9) Linlin Chen, Huidan Deng, Hengmin Cui, Jing Fang, Zhicai Zuo, Junliang Deng, Yinglun Li, Xun Wang, Ling Zhao 2018. Inflammatory responses and inflammation-associated diseases in organs Oncotarget. Jan 9(6): 7204–7218.
- 10) Charles A. Dinarello. Anti-inflammatory Agents: Present and Future, 1-5.
- 11) Kausik Biswas, Ishita Chattopadhyay, Ranajit K. Banerjee, Uday Bandyopadhyay 2002. Biological activities and medicinal properties of neem (*Azadirachta indica*) 82(11): 1336-1345.
- 12) Salimuzzaman Siddiqui, Shaheen Faizi, and Bina Shaheen Siddiqui H. E. J. Research Institute of Chemistry, University of Karachi, Karachi, 32.
- 13) Pakistan Z. Naturforsch Studies on the Chemical Constituents of *Azadirachta indica* A. Juss (Meliaceae), 922 -924 .
- 13) Manpreet Kaur Neem: Sources, Macroscopical Characters and Uses

- 14) Amar Surjushe, Resham Vasani, and D G Saple, 2008. Aloe Vera -Its pharmacognosy, phytoconstituents, and pharmacological effects. *Indian J Dermatol.* 53(4): 163–166.
- 15) Sahdeo Prasad and Bharat B. Aggarwal. Turmeric, the Golden Spice From Traditional Medicine to Modern Medicine, Herbal Medicine: Biomolecular and Clinical Aspects. 2nd edition.
- 16) Ms. Varsha A Dighe, Astikta Ashok Bhondave, Aditi Rajendra Waghmare ALOE VERA: It's pharmacognosy, phytoconstituents and pharmacological effects. *IJARIE* . 2395-4396
- 17) Noura S. Dosoky and William N. Setzer . 2018. Chemical Composition and Biological Activities of Essential Oils of Curcuma Species Nutrients.
- 18) Maya Kushawaha and R. C. Agrawal, Biological activity of medicinal plant Cassia fistula – A review *Journal of Scientific Research in Pharmacy* 2277-9469.
- 19) Ayesha Maqsood, Ayesha Munir, Dr. Sammia Shahid A Phytopharmacological Evaluation of Cassia fistula. A Comprehensive Review *International Journal of Pharmaceutical Sciences Review and Research* 2(2): 45-53. 20) Dr. Manisha Sharma, Dr. Jagdish Mohan, Onkar and Dr. Omprakash Sharma 2019. An overview of botanical and therapeutic aspect of aragvadh-cassia fistula linn *World journal of pharmaceutical and medical research.* 2455-3301.
- 21) Arun Kumar Yadav, Pyiush Yadav, Vishal Prajapati, Ajay Upadhyay, Vikas Kumar Gupta A Phytomedicine Bacopamonnieri (BRAHMI) *International Journal of Creative Research Thoughts IJCRT* : 2320-2882.
- 22) Sawssan Maksoud, Roula M. Abdel-Massih, Hiba N. Rajha, Nicolas Louka, Farid Chemat, Francisco J. Barba, and Espérance Debs *Citrus aurantium L.* 2021. Active Constituents, Biological Effects and Extraction Methods. An Updated Review *Molecules*, 583.
- 23) Mona Ghasemian, Sina Owlia, and Mohammad Bagher Owlia 2016. Review of Anti-Inflammatory Herbal Medicines *Advances in Pharmacological Sciences* 11.
- 24) Umer Hayat, Muhammad Idrees Jilani, Rafia Rehman, and Farwa Nadeem A Review on Eucalyptus globulus: A New Perspective in Therapeutics *International Journal of Chemical and Biochemical Sciences.* 2226-9614. 25) N. Hall, R.D. Johnston, G.M. Chippendale. 1970. Forest trees of Australia. *Forest trees of Australia*. 3rd. 26) D.R. Batish, H.P. Singh, R.K. Kohli, S. Kaur. 2008. Eucalyptus essential oil as a natural pesticide. *Forest Ecology and Management.* 256(12): 2166-2174.
- 27) Defri Rizaldy, Rika Hartati, Trishna Nadhifa, Irda Fidrianny Chemical Compounds and Pharmacological Activities of Mangosteen (*Garcinia mangostana L.*) - Updated Review 2503 – 2516.
- 28) Ovalle-Magallanes, B.; Eugenio-Pérez, D.; Pedraza-Chaverri, J. 2017. Medicinal properties of mangosteen (*Garcinia mangostana L.*): A comprehensive update. *Food Chem Toxicol.* 102–122.
- 29) Mohammad Abu Taher, Mohammad Abu Bin Nyeem, Md. Monir Ahammed, Md. Mobarak Hossain and Mohammad Nazrul Islam. *Moringa oleifera* Shajna 2017. the wonderful indigenous medicinal plant *Asian Journal of Medical and Biological Research*, 3 (1): 20-30.
- 30) Aja PM, N Nwachukwu, UA Ibiam, IO Igwenyi, CE Offor and UO Orji, 2014. Chemical Constituents of *Moringa oleifera* Leaves and Seeds from Abakaliki, Nigeria. *American Journal of Phytomedicine and Clinical Therapeutics.* 310-321.
- 31) Rajeshwari Prabha Lahare, Hari Shankar Yadav, Anil Kumar Dashahre, Yogesh Kumar Bisen. An Updated Review on Phytochemical and Pharmacological Properties of *Catharanthus rosea* *Saudi Journal of Medical and Pharmaceutical Sciences* 2413-4910.
- 32) Gajalakshmi, S., Vijayalakshmi, S., & Devi, R. V. 2013. Pharmacological activities of *Catharanthus roseus*: A perspective review. *Int J Pharma Sci*, 4(2): 431-439.
- 33) De Mello, J. F. 1980. Plants in traditional medicine in Brazil. *J Ethnopharmacol*, 2(1): 49-55.
- 34) Ajila raj s s. Santhan neharu Narkilli, Prashob G r, Saurabhi g s. Jiji Mohan M U. 2022. An Overview of *Vitex negundo*, AJILA.
- 35) Alam, M.I. and Gomes, A. 2003. Snake venom neutralization by Indian medicinal plants (*Vitex negundo* and *Emblica officinalis*) root extracts. *Journal of Ethnopharmacology.* 86: 75-80.
- 36) Au, D.T., Wu, J., Jiang, Z., Chen, H., Lu, G. and Zhao, Z. (2008): Ethnobotanical study of medicinal plants used by Hakka in Guangdong, China. *Journal of Ethnopharmacology.* 117: 41-50.
- 37) Chawla, A.S., Sharma, A.K. and Handa, S.S. 1992. Chemical investigation and inflammatory activity of *Vitex negundo* seeds. *Jour. Nat. Prod.* 55 (2): 163-167.
- 38) Kirtikar KR, Basu BD. Indian medicinal plants. Text Vol.3, International Book Distributors, Dehradun 2008; 1937- 1940.
- 39) Fatih Brahma, Madani Khodir, Chibane Mohamed and Duez Pierre. Chemical Composition and Biological Activities of *Mentha* Species
- 40) Nilufar Z. Mamadalieva, Hidayat Hussain, Jianbo Xiao. Recent advances in genus *Mentha*: Phytochemistry, antimicrobial effects, and food applications *Food Frontiers*, 1(4): 435-458.
- 41) R. Ramasubramania Raja. Medicinally Potential Plants of Labiateae (Lamiaceae) Family: An Overview 6 (3): 203-213.
- 42) Shiyu Li, Wei Yuan, Guangrui Deng, Ping Wang, Peiyang Yang and Bharat B. Aggarwal 2011. Chemical Composition and Product Quality Control of Turmeric (*Curcuma longa L.*) *Pharmaceutical Crops* 29.

43) R. Ramasubramania Raja. Medicinally Potential Plants of Labiatae (Lamiaceae) Family: An Overview 44) Kaushik Vilas Kulkarni, Shrishail M Ghurghure. 2018. Indian gooseberry (*Emblica officinalis*): Complete pharmacognosy review International Journal of Chemistry Studies 2 (2): 05-11.

45) Khan, H. 2009. Role of *Emblica officinalis* in medicine 2(4): 218-228.

46) Udupa KN, 1985. Ayurveda for Promotion of Health, Journal of Ayurveda, 3.

