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Research Article

Formulation and Optimization of Natural Anti-Inflammatory Cream Using Herbal Extract

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ABSTRACT

This research explores the therapeutic potential and cosmetic applications of four key medicinal plants: turmeric (Curcuma longa L.), ginger (Zingiber officinale), lavender (Lavandula angustifolia), and aloe Vera (Aloe barbadensis Miller). Each plant is renowned for its distinct bioactive compounds and traditional uses in medicine across cultures, particularly in the Indian subcontinent. Turmeric, with its curcuminoids, is valued for its anti-inflammatory properties and skin-brightening effects. Ginger offers gingerols and shogaols, contributing to its anti-inflammatory and digestive benefits. Lavender's essential oils, rich in monoterpenes, are cherished for their calming and anti-inflammatory properties. Aloe Vera, known for its polysaccharide-rich gel, is prized in skincare for its moisturizing and wound-healing capabilities. The study examines these plants' chemical composition, historical uses, and modern applications in herbal cosmetics, highlighting their roles in promoting skin health and well-being.

INTRODUCTION

According to certain traditional texts, turmeric, or the rhizome of Curcuma longa L. (Zingiberaceae), is also referred to as haldi in Hindi. The Indian subcontinent is commonly used as a spice and food colouring. It has historically been used to treat a wide range of conditions about the gastrointestinal tract, skin, and lungs as well as liver, wounds, and sprains. A major study over the last 50 years indicates that curcumin is responsible for most of the activities associated with turmeric. The rhizome of Curcuma longa has been shown to contain curcuminoids, which include curcumin, desmethoxycurcumin, bis-desmethoxycurcumin, volatile oils (turmerone and zingiberene), sugars, proteins, and resins. The proposed goal of this effort was to standardize the manufactured and marketed product and create a w/o type cream with turmeric as the primary ingredient. In the nations where it originated, turmeric is widely used for several purposes, such as food colouring, spice, and Indian traditional medicine to cure a variety of ailments. In one way or another, it is utilized in Hindu religious rites as well as the textile and

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pharmaceutical sectors. It is used in modern traditional Indian medicine to treat rheumatism, sinusitis, cough, diabetic wounds, hepatic problems, and biliary disorders. It is described as a carminative and aromatic stimulant in ancient Hindu literature. Applying a localized mixture of slaked lime powder and turmeric powder to the affected area helps relieve sprains and swelling brought on by injuries. The plant family Zingiberaceae includes ginger (Zingiber officinal Rosc.). It was first utilized as a spice and condiment to enhance the flavor of food in numerous places, but it originated in Southeast Asia. In addition, traditional herbal therapy has made use of the rhizome of ginger. Ginger's rich phytochemistry is thought to be responsible for its health-promoting properties dividing fresh ginger into two broad categories: volatiles and non-volatiles. Ginger's unique flavor and scent are attributed to volatiles such as monoterpenoid hydrocarbons and sesquiterpene. Conversely, gingerols, shogaols, parasols, and zingerones are examples of non-volatile pungent chemicals. Ginger (Zingiber officinale) rhizomes have been used for ages as a spice in cookery and as a conventional medicine. Scientific studies have demonstrated the anti-inflammatory, hypolipidemic, antidiabetic, immune-modulatory, anticancer, antiapoptotic, and anticoagulant properties of ginger. Moreover, the antifungal properties of pharmaceuticals such as fluconazole are reinforced by ginger extracts, which inhibit the growth of biofilms by a variety of pathogenic bacteria and are very successful in treating diseases caused by drug-resistant pathogens. Originating in the Mediterranean mountain regions, lavender is one of the most widely used plants worldwide. Within the Lamiaceae family, the genus Lavandula has more than thirty species. The most widely grown species is Lavandula angustifolia Mill. (narrow-leaved lavender), Lavandula stoechas (French lavender), and Lavandula latifolia (broad-leaved lavender). The Latin verb lavare, which means "to wash," is the source of its common name. Garden lavender, often known as narrow-leaved lavender (Lavandula angustifolia, originally L. officinalis Chaix or L. vera), is the most valued genus among all the Lavender plants in terms of its distinct biological activity. Flowers and the upper growth of narrow-leaved lavender are used to make lavender oil. Flowers provide the majority of the therapeutic raw material, with about 3% coming from the essential oil. Comparable components, albeit in varying amounts, are present in the essential oils of the genus Lavender. Factors such as variety, growth circumstances, and place of origin affect the essential oil’s composition and quality. They are primarily classified as phenolic chemicals (flavonoids, phenolic acids, coumarin, tannins) and terpenoid compounds (monoterpenes, triterpenes, sesquiterpenes). Aloe vera, also known as Aloe barbadensis Miller, is a perennial succulent plant that is a member of the Liliaceae family. Gel and latex are two compounds that come from the plant. Squeezing the leaves releases the mucilaginous gel that is contained in the parenchymatous cells of the leaf pulp. Aloe latex, a yellow-bitter juice, is produced by the plant's peripheral bundle sheath cells and mostly contains anthraquinones and their derivatives, such as aloesin, oleoresin A, aloemodin, and barbalus (aloin A). Aloe latex on a dry-weight basis also includes a large quantity of ash, essential oil, and resin that is insoluble in acid. Polysaccharides, particularly ace Mannan, are the major components of the A. Vera gel. The ingestion of A. Vera leaf formulations have been demonstrated to have anti-arthritic and antirheumatoid, anticancer, and antidiabetic activities, despite the scientific literature providing minimal evidence to support claims on the systemic effects of A. Vera. Topically, A. Vera gel is used for a variety of therapeutic applications, such as treating heat

injury and chronic wounds, reducing inflammation, treating mouth ulcers, preventing UV-induced immunosuppression, and treating psoriasis and skin infections. Well-designed scientific research is necessary to address this problem, particularly concerning sunburn treatment, since published results on the effects of Aloe vera gel on skin disorders are inconsistent.

The availability of herbal cosmetics has led to a primary increase in demand for cosmetics. Furthermore, it supplies the skin with essential nutrients and moisture. The herbal cream is just an emulsion of water and oil. Turmeric, ginger, lavender, and aloe Vera are among the natural ingredients used to prepare the herbal lotion. The specific qualities of each ingredient determine which one is used. Aloe vera works as an anti-acne and moisturizer. An Asian beauty product called turmeric is useful for giving the skin a golden glow. As a natural defensive reaction to tissue damage brought on by harmful chemicals, microbes, or physical trauma, inflammation occurs. Throughout human history, medicinal plants have been identified and utilized. In addition to carrying out essential biological tasks and protecting humans from predators like insects, fungi, and other microorganisms, plants can synthesize a vast array of chemical substances.

Aim and Objective

Aim

- Formulation And Optimization Of Natural Anti-Inflammatory Cream Using Herbal Extract

Objective

1) To Reduce Acne And Skin Irritation
2) To heal Dry Skin
3) Wrinkle
4) Rashes
5) To Moisturize the skin

Review of Literature

Morphology

Turmeric

Fig. no. 01 Turmeric

- Synonym -Curcuma, Rhizome Curcumae, Saffron Indian
- Botanical Name – Curcuma longa
- Kingdom – Plantae
- Order – Zingiber Dae
- Genus – Curcuma
- Species - Longa
- Biological Source – Turmeric consists of dried as well as fresh rhizomes of plant known as Curcuma longa
- Family- Zingiberaceae
- Chemical Constituent – Turmeric rhizomes include curcumin, desmethoxycurcumin, and bisdemethoxycurcumin, which together are referred to as curcuminoids (3-6%). Turmeric produces a pale yellow to orange-yellow volatile oil (4-6%) that is made up of several mono- and sesquiterpenes.
- Uses –
  1) Turmeric reduces inflammation
  2) Anticancer Effect
  3) Skin cancer

Ginger-

Fig no-02 Ginger

- **Synonym – Zingiber, Rhizoma Zingiberis**
- Botanical Name – Zingiber Officinale
- Kingdom – Plantae
- Order – Zingiberales
- Genus – Zingiber
- Species – Z.Officinale
- Biological Source – It consists of dried and scraped rhizomes of Zingiber which is devoid of darker outer skin
- **Family- Zingiberaceae**
- Chemical Constituent- Volatile oil, sesquiterpenes, Zingiberene, sesquiterpenes alcohol, zingiberol.
- Use –

1) Anti-inflammatory effect
2) Cardiovascular effect
3) Reduce pain and inflammation

Aloe-Vera

Fig no-03 Aloe Vera

- **Synonym – Aloe**
- Botanical Name - Aloe barbadensis miller
- Kingdom - Plantae
- Order - Asparagus
- Genus – aloe
- Species – A. vera
- Biological Source – Aloes are obtained from the dried juice of the leaves of Aloe barbadense Miller.
- **Family- Liliaceae**
- Chemical Constituent-
- Anthracene glycoside (11 to40%), aloe-emodin and aloes one, resins, isobarbaioin
- Uses –

1) It inhibits inflammatory reactions
2) It has antioxidant and antibacterial properties

Lavender

Fig no-04 Lavender oil

- **Synonym – Lavanda, foreign oil**
- Botanical Name – Lavandula angustifolia
- Kingdom – Plantae
- Order – Lamiales Brom head
- Genus – Lavandula L.
- Species – Lavandula angustifolia Mill.
- Biological Source-
- Levendar oil is extracted from the flowers of Lavandula officinalis.
- **Family- Labiatae**
- Chemical Constituent-
- Drainage lavender oil contains pinene, limonene, cineole, camphor, and linalool
- Uses-

1) Reduce Anxiety
2) Wound healing
3) Heals acne

Cultivation

Turmeric: -

Soil properties: This crop can be cultivated on sandy soil having a good facility or loamy soil having enough humus content. To obtain a high yield of turmeric, the rhizome formation must be of high quality and can be achieved easily in soil having pulverized tilth

(Table 1)

Land preparation: The minimum tillage operation results are good for this crop. In the case of an irrigated crop system, the ridges and furrows are prepared for turmeric cultivation and the crop is sown on the ridges with shallow pits and the proper spacing is provided. Soil solarization is also used.

Table no 1. Required fertility status of organic research farm

Property	Result
pH	7.45
Electrical conductivity.	0.246 ds/m
Organic carbon content (%)	1.35%
Organic matter content (%).	2.32%
Bulk density	1.13 gm/cm3
Particle density	2.28 gm/cm3
Porosity.	48.8%
Available nitrogen (kg/ha)	190.6 kg/ha
Available phosphorus (kg/ha)	9.72 kg/ha

Ginger

It is usually cultivated vegetation, meaning the pieces of rhizome are planted in the soil and each sprouts to form a new plant. Modern micropropagation is also being used where new plants are cloned from cells taken from a single plant. The propagation through rhizome cuttings includes small bits of rhizome; each containing a bud is planted in holes or trenches 10–15cm deep and about 30cm apart during the months from March to May. The plants produce aerial shoots which are dried after flowering and fruiting in about 8–10 months. Though ginger requires ample rainfall, there should not be any waterlogging at any time; otherwise, it may result in rotting.

Ginger, like turmeric, can grow under both irrigated and rain-fed conditions. The best time for planting is just after the pre-monsoon showers. In case there are no pre-monsoon showers, then irrigation is necessary. Else the seed rhizomes would dry up.

Aloe vera: -

Aloe is found as a wild herb along the coast of South India. It is under cultivation in fairly large areas in many parts of India, viz. Chhatisgarh, Maharashtra, Madhya Pradesh, Gujarat, etc. And also grown as an ornamental plant. It is a sure cash spinner and progressive farmers can go for plantation of it. Cultivation of this herb on a large scale can make India move towards the leadership in global herbal market and this will fetch India good foreign reserves as well as domestic economic prosperity. Commercial cultivation of Aloe has been started in many parts of India. They can be grown in deserts and other dry situations. They flourish in a variety of climates and even on the poorest of soils but need protection from frost. Soil: Naturally occurs in the driest and poorest soils and can be grown in a variety of soils. But the most ideal soil for it is sandy loam which is slightly alkaline with a pH up to 8.5. The root system of this plant is shallow and does not penetrate deep into the soil. However, water-logged soil is unsuitable.

Lavender oil: -

In India, the lavender crop is cultivated in low-rainfall regions and on the slopes of the hills of Himachal Pradesh (HP) and Uttar Pradesh (UP). The lavender crop is also successfully grown in the Kashmir Valley region.

Traditional uses: -

Turmeric: - It is commonly used for

1) Strengthening The Overall Energy of The Body,
2) Relieving Gas,
3) Dispelling Worms,
4) Improving Digestion,
5) Regulating Menstruation,
6) Dissolving Gallstones, And
7) Relieving Arthritis.

Curcumin: -It is commonly used for its

1) Antioxidant,
2) Antimicrobial,
3) Anti-inflammatory,
4) Antitumor,
5) Anti-Diabetic,

6) Hypolipidemic,
7) Hepatoprotective, And
8) Neuroprotective Effects.

Aloe – vera: - It is used for

1) Constipation,
2) Colic,
3) Skin Diseases,
4) Worm Infestation,
5) Infections.

Lavender oil: - It is used for

1) treating anxiety,
2) insomnia,
3) depression, and
4) restlessness.

Reported Activities from Modern Literature

1) **B. CHENGAIAH et, al, -**In addition to their ability to dye, natural dyes provide a variety of therapeutic benefits. Thankfully, people's understanding of natural dyes and plants that provide dye is growing these days. Owing to their non-toxic characteristics, many food goods and the pharmaceutical sector employ natural hues, which have more therapeutic properties and fewer adverse effects. Despite having abundant plant resources, very little of them have been used up to this point in time. More thorough research and scientific studies are required to determine the true potential and supply of naturally occurring dye-producing resources, which are in high demand for the therapeutic formulations of naturally occurring medications used in the pharmaceutical industry. In conclusion, the pharmaceutical industry must continue to grow to create safe, therapeutically effective pharmaceutical formulations and dosage forms using natural plant pigments. This requires appropriate procedures, documentation, and characterization of dye-producing plants.
2) **Roshan Prasad Yadav et, al -**Naturally occurring dyes possess a multitude of medical effects in addition to their ability to dye. Thankfully, more and more people are becoming aware of natural dyes and plants that may produce dyes nowadays. Considering that they are non-toxic, less natural colors with higher therapeutic properties and fewer adverse effects are employed in everyday food goods and the pharmaceutical business. Even though there are many plant resources in the world, very little of them have been used up to this point. To evaluate the true potential and availability of naturally occurring dye-producing resources that are in high demand in the therapeutic formulations of natural pharmaceuticals sold commercially, more thorough studies and scientific investigations are required. To incorporate natural plant pigments into pharmaceutical formulations or dosage forms that are safe for use, the pharmaceutical industry must continue to refine its processes, documentation, and characterization of dye-yielding plants.
3) **Nafiseh Shokri Mashhadi et, al -**Ginger is widely recognized for its health-promoting properties. Through immunonutrition and anti-inflammatory reactions, it can treat a variety of illnesses. Ginger has an anti-inflammatory impact, which helps lessen muscle soreness after strenuous exercise. Similar to other plants, ginger has a well-established ability to fight cancer. Its active components, such as parasols, shogaol, and gingerols, are useful compounds that can stop the spread of cancer, angiogenesis, and metastasis, as well as induce apoptosis and arrest the cell cycle. In addition to these, it enhances the health of the gastrointestinal system, diabetes, and cardiovascular conditions.
4) **Shivraj Hariram Nile et, al -**Our findings imply that the active ingredients 6-gingerol

(6G), 6-shogaol (6S), and 6-paradol (6P), as well as the ginger ethyl acetate and water extracts, have potent anti-inflammatory, antioxidant, and xanthine oxidase inhibitory properties. For them to be classified as an agent for treatment against different diseases and disorders linked to oxidative stress, xanthine oxidase, and free radicals, more in vivo and clinical research is necessary. This investigation offers a scientific.

5) **Małgorzata Miastkowska et, al** -According to earlier accounts, lavender angustifolia essential oil can heal wounds. This is where we propose that the origin and growth circumstances of the plant, as well as the composition of the oil, determine the mode of action and efficacy of lavender oil. Human monocyte-derived macrophages and epithelial cells (HaCaT human keratinocyte line) were the subjects of the in vitro investigations that were reported. As a result of co-stimulating cells with bacterial lipopolysaccharide (LPS), keratinocyte synthesis of IL-6 and IL-8 was shown to be concentration-dependently elevated. The adjustment of the inflammatory response occurred when lavender oil was present in the LPS-stimulated macrophages, limiting the generation of TNF-α in MDM. It was also shown that the VEGF cytokine enhanced the pro-regenerative response of HaCaT cells.

6) **Tomasz Kantyka et, al** -Lavender oil has been found to have a strong potential to limit the inflammatory stimulation of immune system cells and to enhance the local, tissue-derived proinflammatory and pro-regenerative response. The in vitro cell models showed significantly better performance for the in-house preparation of lavender oil. Due to a drop in linalool acetate and a rise in Lavandula acetate in the in-house formulation, this effect might be explained. It will take more research to confirm the significance of each component of lavender oil and to define the role of inflammatory regulation and VEGF stimulation in the oil's support of wound healing.

7) **J. Reuter et, al** -Compared to the placebo gel containing 1% hydrocortisone, the A. Vera gel (97.5%) in this trial showed some stronger anti-inflammatory benefits after 48 hours. An inflammatory skin condition like UV-induced erythema may benefit from topical treatment with the A. Vera gel is examined here.

8) **A Jocher et, al** -A common ingredient in calming skin care products like after-sun lotions is aloe vera, a natural substance. In this investigation, our goal was to determine whether a highly concentrated A. Vera gel could reduce inflammation in vivo using the UV erythema test.

9) **Somnath S Davkhar et, al** -The produced herbal cream shields the skin from a variety of skin problems and has the best qualities and nutritional value while using minimal chemicals. This cream is very inexpensive because it was made with basic materials and a basic preparation technique. The herbal cosmetic mixture can be applied as a barrier to protect skin and is safe to use. According to the findings of various cream experiments, the formulation could be applied topically to shield skin from harm. Since they are thought to be safer and have fewer negative effects than synthetic ones, natural therapies are more widely accepted. There will be more investigation to verify the formulation's synergistic effect scientifically.

10) **Sailor Niyanta et, al** -The physicochemical parameters of the turmeric cream formulation provide good results, matching those of the marketed formulation. Based on the carrageenan-induced rat paw edema method, the release of active components is effective

in formulations intended to reduce inflammation. Future clinical research may be necessary to ensure its appropriate use.

11) **Patel Ritesh et, al -**Turmeric, or Curcuma longa, is a Zingiberaceae plant whose rhizomes are used to manufacture the spice. Curcumin is widely recognized for its ability to reduce inflammation and safeguard the skin. In natural herbal remedies, curcumin has long been used to treat inflammation and skin infections. This study aims to create an anti-inflammatory cream with a turmeric foundation. The main emulsion process was used to manufacture the herbal cream. The turmeric cream was subjected to a variety of physiochemical tests, including ones measuring pH, drug content, spreadability, viscosity, appearance, homogeneity, grittiness, and anti-inflammatory activity. The results of the study on several physicochemical characteristics were found to be acceptable and in line with turmeric cream that is sold commercially.

Inflammation

Inflammation may be indicated by a wound that hurts, swells, and turns red. The body's immune system's reaction to an irritant is, in general, what causes inflammation. If you have a splinter in your finger, for example, the irritant may not be a bacterium but something foreign.[9]

Anti-inflammatory

Muscle or joint discomfort can be brought on by inflammation. Pain and swelling brought on by a variety of illnesses and injuries can be lessened using topical anti-inflammatory treatments. As common topical anti-inflammatory drugs, Voltaren (diclofenac) gel, capsaicin cream, and menthol cream are used. Creams for inflammation can provide advantages comparable to those of oral medications when taken as prescribed. Their side effects also seem to be less common.[8]

Types Of Anti-inflammatories

A. Nonselective COX inhibitors (traditional NSAIDs)

1) Salicylates – Aspirin
2) Propionic acid derivative – Ibuprofen, ketoprofen
3) Anthranilic acid derivative – Mefenamic acid
4) Aryl-acetic acid derivative- Diclofenac, Aceclofenac
5) Oxicam derivative – Piroxicam
6) Pyrrolo-pyrrolo derivative – Ketorolac
7) Indole derivative – Indomethacin
8) Pyrazolone derivative – Phenylbutazone, Oxyphenbutazone

B. Preferential COX-2 inhibitor

Nimesulide, Meloxicam, Nabumeton

C. Selective COX-2 inhibitor

Celecoxib, Etoricoxib

D. Analgesic antipyretics with poor anti-inflammatory action

1) Para aminophenol derivative – Paracetamol
2) Pyrazalone derivative – Metamizole, Propyphenazone
3) Benzoxazocine derivative – Nefopam

Types Of Inflammation

1) Acute inflammation

Your body's reaction to an unexpected injury or sickness is this. When an injury occurs, such as a cut on your finger, or an infection occurs, inflammatory cells move to the area and initiate healing. There can be unexpected, and typically transient, inflammation brought on by infections in many bodily areas. Inflammation of the throat can be brought on, for instance, by viral or bacterial illnesses such as strep throat. Inflammation of the small intestine (enteritis) can be brought on by separate bacterial and viral infections. Depending on your health, the duration of acute inflammation might range from a few hours to many days.

2) Chronic inflammation

This occurs when there is no threat, but your body still produces inflammatory cells. Inflammatory cells and chemicals, for instance, assault joint

tissues in rheumatoid arthritis. Your joints may sustain significant damage as a result of this intermittent inflammation. Procedures that should safeguard your body can wind up harming it when there is persistent inflammation. Months or years may pass during a period of chronic inflammation. It might get better for periods and then worse for others.

Symptoms of Acute and Chronic Inflammation

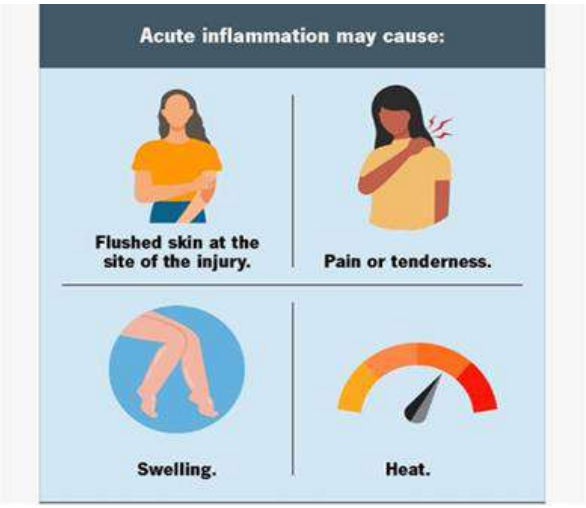


Fig no-05 Symptoms of Acute and Chronic Inflammation

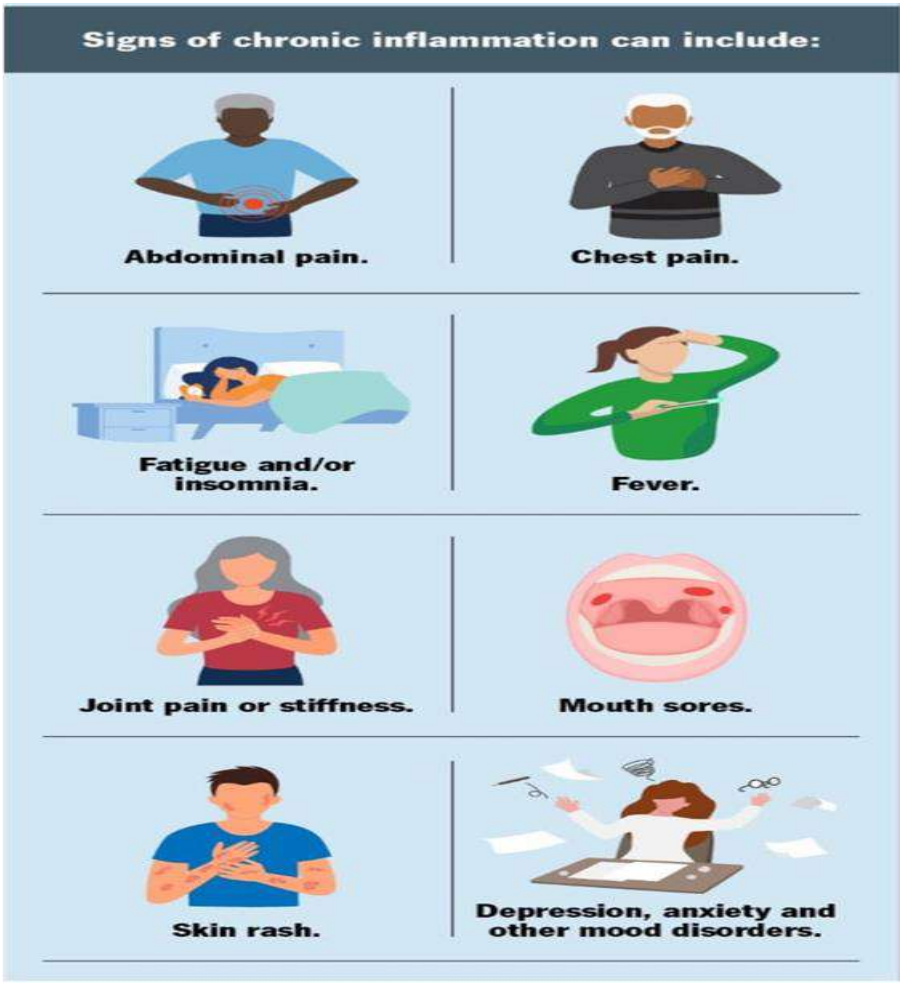


Fig no-06 Symptoms of Acute and Chronic Inflammation

Risk Factors of anti-inflammatory

- Raised liver enzymes (detected by a blood test, this is more commonly associated with diclofenac than other NSAIDs)

- diarrhoea.
- headache.
- dizziness.
- salt and fluid retention.
- high blood pressure.

How do anti-inflammatory creams work?

Depending on the drug. All anti-inflammatory lotions, however, must first be absorbed through the skin. At this point, the drug begins to ease pain in the surrounding muscles or joints. This may occur when the drug is distributed very little or not throughout the body.

How to apply anti-inflammatory creams

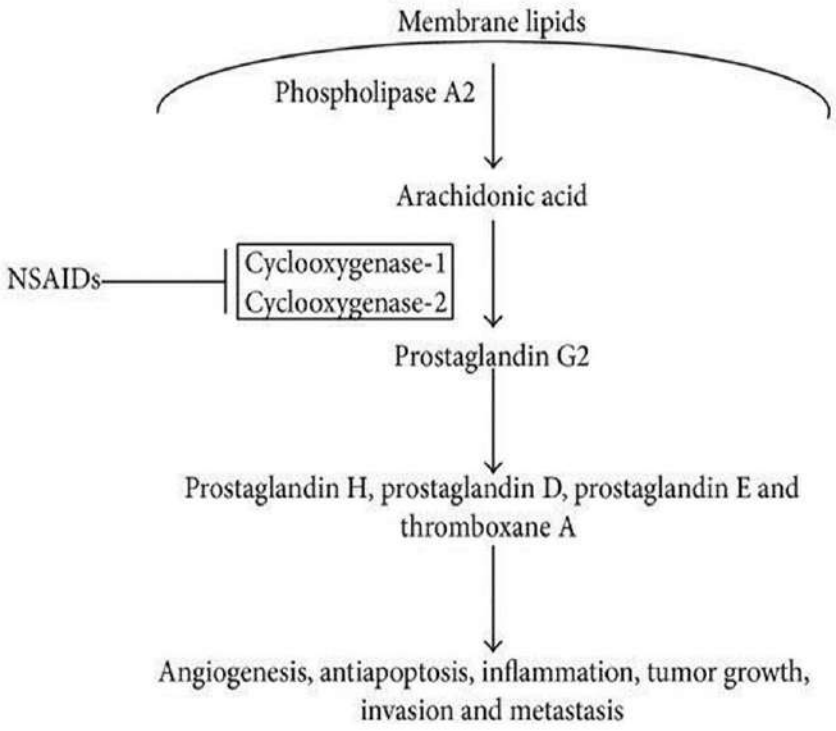
Applying anti-inflammatory treatments to the damaged area of your body's healthy skin is a good idea. The steps for using these topical medications are described below:

1) Before applying the drug, wash your hands with soap and water.
2) Cream should be applied sparingly to the sore spot. Measure out the right dosage of medication using the dosing card, if one is provided.
3) When you can no longer see the drug, carefully rub it into your skin.
4) The majority of products should only be used up to four times each day, though you can repeat doses as necessary. Be sure to adhere to the precise usage guidelines provided by your product.
5) To ensure that the drug is properly absorbed by your skin, wait at least one hour before taking a shower or cleaning the region.
6) Repeatedly wash your hands following each application. This is particularly crucial after using a cream containing capsaicin, which may burn.

It's crucial to remember that open wounds or skin that are inflamed or broken shouldn't be treated with these lotions. And if there is any pharmaceutical residue on your hands, refrain from touching your mouth, nose, or eyes.

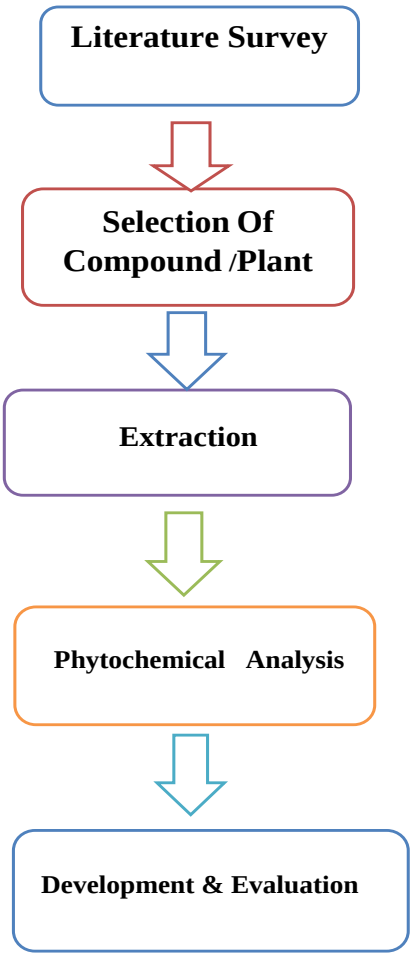
Treatment Of Anti-inflammatory

Aspirin



The enzyme phospholipase 2 is present in every cell in our body and is triggered by infections or damage to the cell. Membrane lipids are converted to arachidonic acid by it, and prostaglandins are subsequently produced by the enzyme cox1/2. These prostaglandins are responsible for both pain and inflammation. They do this by stimulating the nerve endings of the pain nerves and widening blood vessels, which draws white blood cells to the site of injury.

Plan of work



Methods And Material

Plant Material

Turmeric Extract, Ginger Extract, Aloe Vera Extract, Lavender Oil

List of Chemical

Table no – 02 List of chemicals

List of chemicals	Manufacturer
Methyl paraben	Shivaji scientific, Pune
Borax	Shivaji scientific, Pune
Bees wax	Shivaji scientific, Pune
Liquid paraben	Shivaji scientific, Pune
Perfume (Lavender Oil)	Sunder Pragati Product, Kanauji

List of Equipment

Table no – 03 List of Equipment

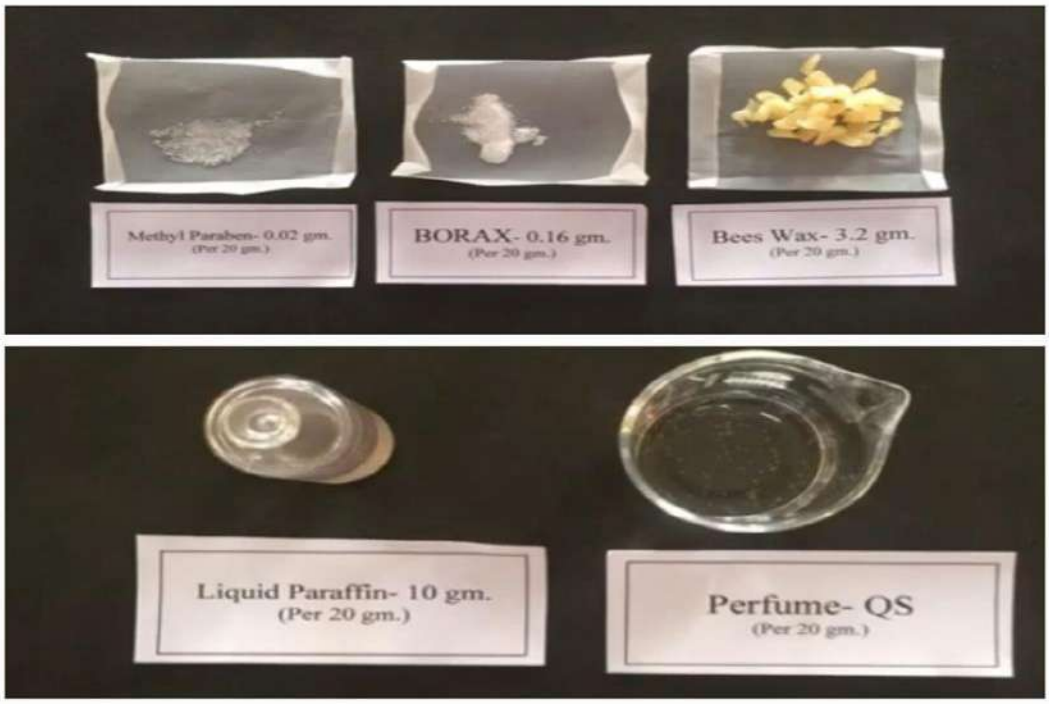
List of equipment	Manufacturer
Beaker	Borosil
Stirrer	Borosil
Water Bath	-
Porcelain Dish	-
Mortar & Pestle	-
Knife	-

Preparation of Cream

Table no - 04 Preparation of Cream

Ingredients	Quantity
Methyl Paraben	0.02 gm
Borax	0.16 gm
Bees Wax	3.2 gm
Liquid Paraffin	10gm
Lavender Oil	2-3 Drops
Turmeric Extract	3-4 Drops
Aloe vera Extract	2-3 Drops
Ginger Extract	2-3 Drops
Distilled water	2-3 Drops

Beeswax, Liquid Paraffin were mixed at 75 0 C ± 2 with constant stirring using a hot plate. Borax were mixed in purified water and add methyl paraben with continuous stirring using a hot plate at 75 0 C ± 2. The aqueous phase was added gradually in the oily phase with continuous triturating in a mortar with a pestle till smooth thick cream was obtained. The extract of turmeric, ginger, Aloe vera And Lavender oil was added with triturating to get the desired product. The cream was preserved.



Ginger, Turmeric, Aloe Vera Extract

Table no -05 Composition of cream Formulation

Ingredients	Uses
Methyl Paraben	Preservative
Borax	Emulsifying agent
Bees Wax	Anti-inflammatory, antibacterial
Liquid Paraffin	Moisture
Lavender Oil	Perfume
Turmeric Extract	Active Ingredient
Aloe vera Extract	Active Ingredient
Ginger Extract	Active Ingredient
Distilled water	Vehicle

Methodology

Test for Glycosides:

1. **Keller killani test:**(Cardiac glycosides) the test solution with few drops of glacial acetic acid in 2 ml of ferric chloride solution and concentrated sulphuric acid is added from the sides of the test tube which shows the separation between two layers, lower layer shows reddish brown and upper layer turns bluish green in colour.
2. **Raymond's test:** Test solution treated with dinitrobenzene in hot methanolic alkali gives violet colour
3. **Legal's test**: The test solution treated with 1ml pyridine and 1ml sodium nitroprusside gives pink to red colour appears.

Test for Alkaloids

1. **Mayer's test:** Test solution treated with Mayer's reagent (Potassium mercuric iodide) gives cream coloured precipitate.
2. **Wagner's test:** The acidic test solution treated with Wagner's reagent (Iodine in potassium iodide) gives brown precipitate.
3. **Hager's reagent:** The acetic test solution treated with Hager's reagent (Saturated picric acid solution) gives yellow precipitate.

Test for Flavonoids

1. **Ferric chloride test:** The test solution with few drops of ferric chloride solution shows intense green colour.
2. **Shinoda test:** Test solution with few fragments of magnesium ribbon and concentrated hydrochloric acid shows pink to magenta red colour.
3. **Zinc - Hydrochloric acid-reduction test:** Test solution with zinc dust and few drops of hydrochloric acid shows magenta red colour.
4. **Alkaline reagent test:** Test solution when treated with sodium hydroxide solution shows increase in the intensity of yellow colour which becomes colourless on addition of few drops of dilute acid.
5. **Lead acetate solution test:** Test solution with few drops of lead acetate solution (10% w/v) gives yellow precipitate.

Test for Steroids

1. **Chloroform Test**: The crude plant extracts (1 mg) was taken in a test tube and dissolved with chloroform (1 mL), then added equal volume of concentrated sulphuric acid to the test tube by sides. The upper layer in the test tube was turns into red and sulphuric acid layer showed yellow with green fluorescence. It showed the presence of steroids.
2. **Salkowski's test:** The second portion of solution above was mixed with concentrated sulphuric acid carefully so that the acid formed a lower layer and the interface was observed for a reddish-brown colour indicative of steroid ring.

Test for Phenols

Ferric Chloride Test: A small amount of the ethanolic extract was taken with 1 mL of water in a test tube and 1 to 2 drops of Iron III chloride

(FeCl3) was added. A blue, green, red or purple color is a positive test.

Test for Terpenoids

1. **Salkowski test:** When few drops of concentrated sulphuric acid is added to the test solution, shaken and allowed to stand, lower layer turns red indicating the presence of sterols.
2. **Liebermann Burchard test:** The test solution treated with few drops of acetic anhydride and mixed well. When concentrated sulphuric acid is added from the sides of the test tube, it shows a brown ring at the junction of the two layers and the upper layer turns green.

Test for Saponins

1. **Foam test:** Saponins when mixed with water and shaken shows the formation of foam which is stable at least for 15 min.
2. **Haemolysis test:** 2 ml of 18%w/v sodium chloride in two test tubes were taken. To one test tube distilled water and to the other test tube 2 ml of filtrate were added, and then few drops of blood was added to both the tubes. Mixed and observed the haemolysis under microscope.
3. **Raymond's test:** Test solution treated with dinitrobenzene in hot methanolic alkali gives violet colour.

Test for Carbohydrates

1)Molisch's test: Test solution with few drops of Molisch's reagent and two ml of concentrated sulphuric acid added slowly from the sides of the test tube shows a purple ring at the junction of two liquids.

2) Barfoed's test: Test solution treated with Barfoed's reagent and boiling on a water bath shows brick red precipitate.

3)Benedict's test: Test solution treated with Benedict's reagent and boiling on a water bath shows reddish brown precipitate.

Test for Proteins

1. **Millon's test:** Test solution treated with Millon's reagent and heated on a water bath, protein is stained yellow on warming.
2. **Xanthoproteic test:** Test solution treated with concentrated nitric acid and on boiling gives yellow precipitate.
3. **Biuret test:** Test solutions treated with 40% sodium hydroxide and dilute copper sulphate solution gives blue colour.
4. **Ninhydrin test:** Test solution treated with ninhydrin reagent gives blue colour.

Test for Starch

Starch Reagent: Test: 1ml of extract was added into 10ml of Nacl solution. After heating, starch reagent was added a blue purplish colour is a positive test for the presence of starch.

Test for Tannins

1) **Gelatin Test:** Plant Extract is dissolved in 5ml of distilled water and 1% gelatin solution and 10% Nacl. Reaction gives a white precipitate.
2) **NaoH Test:** 4 ml of 10% NaoH added into the 0.4ml of extract and shaken well formation of emulsion.

Test for Flavanol

1. **Ferric chloride test:** The test solution with few drops of ferric chloride solution shows intense green colour.
2. **Shinoda test:** Test solution with few fragments of magnesium ribbon and concentrated hydrochloric acid shows pink to magenta red colour.
3. **Zinc - Hydrochloric acid-reduction test:** Test solution with zinc dust and few drops of hydrochloric acid shows magenta red colour.
4. **Alkaline reagent test:** Test solution when treated with sodium hydroxide solution shows increase in the intensity of yellow colour which becomes colourless on addition of few drops of dilute acid.
5. **Lead acetate solution test:** Test solution with few drops of lead acetate solution (10% w/v) gives yellow precipitate.

Test for Anthocyanin

Hcl Test: 2ml of plant extract and 2 ml of 2N Hcl were mixed with few ml of ammonia gives the pink red solution turns into blue violet after addition of ammonia.

Evaluation of Cream

1) **Physical evaluation:**
   Color, smell, texture, and condition were noted during the physical assessment.
2) **Irritancy:**
   Mark an area of 1 cm2 on the left dorsal surface. Following the designated area's application of the cream, the time was noted. It is then assessed for erythema, oedema, and irritation, if present, for a maximum of 24 hours before being reported.
3) **Washability:**
   The hand was given a small amount of cream, and to see if it could be cleaned, tap water was used.
4) **Spreadability**:
   It was decided to put cream in between a pair of glass slides. They were compressed to a set force, and the length of time it took for a slide to separate from the other was recorded. The surplus product that remained on the slides was scraped off once the weight was removed. It fell off with ease thanks to the weight force associated to the upper slide.
   Spread ability= m × l/t
   Where,
   m= Standard weight, which is tied to or placed over the upper slide (30 gm),
   l= length of a glass slide (5 cm),
   t= time taken in seconds.
5) **Phase separation:**
   The developed and commercialized creams were kept between 25 and 100 0 C in a sealed jar away from light. Following that, phase separation was examined for a period of 24 to 30 days.
6) **pH:**
   After making a 10% aqueous solution of each formulation, the pH of the final product was determined.
7) **Viscosity:**
   A Brooke field viscometer was used to determine the viscosity of a cream that was formulated and commercialized.

Extraction Process

Turmeric

Ginger


Ginger
Washing
Peeling
Grinding
Addition Of Water
(1 Part Grated Material
Part 2 Water)
Mixing
Mixing In Mixer Cum Grinder
Straining Through Muslin Cloth
Keeping 1 Hr For Settling
Siphoning Of Clear Juice
Straining Through Muslin Cloth
Ginger juice

Aloe vera

Phytochemical Analysis

Plant Name	Chemical Present/Absent	Chemical Name
Turmeric	+++	Volatile oil
	+++	Curcuminoids
	+++	Bisdemethoxycurcumin
	+++	Resins
	--	Alkaloids
Ginger	+++	Volatile Oil
	+++	Flavonoids
	+++	Catechins
	+++	Zingiberal

	+++	**Leignans**
	--	**Anthraquinones**
Alovera	+++	**Chromones**
	+++	**Anthraquinones**
	+++	**Tannins**
	+++	**Flavonoids**
	--	**Catechins**

Results Of Evaluation Cream

Table no- 07 Evaluation of anti-inflammatory Cream

Physio-Chemical Parameter	**Observation**
Colour	Yellow-orange colour
Texture	Smooth
State	Semisolid
Irritancy	No irritancy
Washability	Good
pH	7.0-8.0
Viscosity	Appreciable range
Phase Separation	No phase separation was observed
Spreadability	Good and easily spreadable

DISCUSSION:

1) **Physical Evaluation -** When the color, smell, texture, and condition of the manufactured and Anti-inflammatory cream was assessed, they were found to be semi-solid, smooth, and yellow to orange in color.
2) **Irritancy** - After applying the developed anti-inflammatory cream for a whole day, no signs of irritation was seen.
3) **Washability**: It was seen that formulated Anti-inflammatory cream was easily washable under water.
4) **Spreadability**: The spreadability of formulated Anti-inflammatory creams was tested, and it was found that formulated cream was equally spreadable as marketed cream.
5) **pH**: 10% aqueous solution of formulated Anti-inflammatory cream has a pH of 7.0-8.0.
6) **Viscosity**: In result it was found that formulated anti-inflammatory cream had an adequate viscosity.
7) **Grittiness**: No, gritty substance were found in anti-inflammatory cream while observing under compound microscope.

CONCLUSION

The main purpose of this study was to develop the effective herbal anti-inflammatory cream using turmeric. The prepared herbal turmeric cream demonstrates good physicochemical properties as compared to available marketed formulations . The release the active constituents is effective as anti-inflammatory formulations based on the carrageenan-induced rat paw oedema Method. Curcumin is the natural pigment obtained from the Curcuma longa with considered medicinal uses. The herbal cream is one of the good alternatives for the synthetic Cream. The Future clinical studies can be proven vital for its effective usage. Now, the pharmacokinetics and anti-inflammatory effects of curcumin have been improved to some extent by the structural modification and modification of curcumin, preparation research and drug combination therapy. Among them, curcumin dietary supplement or adjuvant drug has significant therapeutic effect, which is the most feasible way for curcumin application at present.

FUTURE SCOPE

1. The ancient science of life known as Ayurveda has a long history, and its fundamental ideas might still hold true today.
2. There has long been a recognition of the need for Ayurvedic medicine to be evaluated scientifically.
3. But the fundamental element of all sciences is the ongoing pursuit of new information

through investigation, advancement, and innovative applications.

4. Research on the efficacy, safety, and quality of Ayurvedic medicines and treatments should be done continuously.
5. It's crucial to have methodical credentials and analyse clinical practice critically.
6. Although Herbal Anti-inflammatory Cream is a common Ayurvedic treatment so study was to investigate the potential of cream as base for topical medication.
7. In future, it might be utilised as a substitute for topical ointments.
8. Additionally, if we combine phytoconstituents or herbal medications with Anti-inflammatory cream we might be able to create an efficient herbal formulation.
9. While scientific research is necessary to confirm biological activity, ensure safety, and set guidelines.

REFERENCE

1. Sailor Niyanta, Patel Ritesh, Gajjar Umang, Prajapati Bhupendra. "DEVELOPMENT AND EVALUATION OF HERBAL ANTI-INFLAMMATORY CREAM CONTAINING TURMERIC," www.ijrap.net, vol. 4, 22, pp. 78 - 82, www.researchgate.net/publication/362580407. Accessed 27 Apr. 2022.
2. Roshan Prasad Yadav and Gaur Tarun. "Versatility of turmeric: A review the golden spice of life," Journal of Pharmacognosy and Phytochemistry, vol. 6(1), pp. 41 - 46, Accessed 10 Dec. 2016.
3. Mashhadi NS, Ghiasvand R, Askari G, Hariri M, Darvishi L, Mofid MR. Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. Int J Prev Med. 2013 Apr;4(Suppl 1):S36-42.
4. Shivraj Hariram Nile. "Chromatographic analysis, antioxidant, anti-inflammatory, and xanthine oxidase inhibitory activities of ginger extracts and its reference compounds," vol. 70, 2015, pp. 230 - 244, doi.org/10.1016/j.indcrop.
5. Tomasz Kartika ,Ewa Bielecka ,Urszula Kałucka ,Marta Kamińska ,Małgorzata Kucharska ,Anna Kilanowicz ,Dariusz Cudzik , Małgorzata Miastkowska. "Enhanced Biological Activity of a Novel Preparation of Lavandula angustifolia Essential Oil," vol. Volume 26, no. Issue 9, doi.org/10.3390/molecules26092458. Accessed 23 Apr. 2021.
6. J. Reuter a. Jocher a J. Stump a B. Grossjohann b G. Franke b C.M. Schempp . "Investigation of the Anti-Inflammatory Potential of Aloe vera Gel (97.5%) in the Ultraviolet Erythema Test," no. 10.1159/000114871 , 2005, pp. 106 - 110, www.karger.com/spp . Accessed 5 Feb. 2005.
7. Somnath S Davkhar , Aarti S Bhandari, Sanjivani A Akolkar. "Formulation and Evaluation of Multipurpose Herbal Cream," A multifaceted review journal in the field, of pharmacy , vol. 14(1), 2022, pp. 23 - 28, DOI: 10.31858/0975-8453.14.1.23-28. Accessed 1 Mar. 2023.
8. https://www.goodrx.com/classes/nsaids/topical-nsaids-pain-inflammation-need-to-know
9. Ina formedHealth.org [Internet]. Cologne, Germany: Institute for Quality and Efficiency in Health Care (IQWiG); 2006-. In brief: What is an inflammation? [Updated, 2021 May 18]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279298/
10. https://my.clevelandcthe linic.org/health/symptoms/21660-inflammation
11. https://www.goodrx.com/classes/nsaids/topical-nsaids-pain-inflammation-need-to-know

12. https://www.goodrx.com/classes/nsaids/topical-nsaids-pain-inflammation-need-to-know
13. Sailor Niyanta, Patel Ritesh, Gajjar Umang, Prajapati Bhupendra. "DEVELOPMENT AND EVALUATION OF HERBAL ANTI-INFLAMMATORY CREAM CONTAINING TURMERIC," www.ijrap.net, vol. 4, 22, pp. 78 - 82, www.researchgate.net/publication/362580407. Accessed 27 Apr. 2022.
14. Sailor Niyanta, Patel Ritesh, Gajjar Umang, Prajapati Bhupendra. "DEVELOPMENT AND EVALUATION OF HERBAL ANTI-INFLAMMATORY CREAM CONTAINING TURMERIC," www.ijrap.net, vol. 4, 22, pp. 78 - 82, www.researchgate.net/publication/362580407. Accessed 27 Apr. 2022.
15. Al-Busaid, M. M., Akhtar, M. S., Alam, T., & Shehata, W. A. (2020). Development and evaluation of herbal cream containing Curcumin from Curcuma longa. *Pharmacy & Pharmacology International Journal*, *8*(5), 285–289. https://doi.org/10.15406/ppij.2020.08.00307
16. Soliman, W. E., Shehata, T. M., Mohamed, M. E., Younis, N. S., & Elsewedy, H. S. (2021). Enhancement of Curcumin Anti-Inflammatory Effect via Formulation into Myrrh Oil-Based Nanoemulgel. *Polymers*, *13*(4), 577. https://doi.org/10.3390/polym13040577
17. Khan AW, Kotta S, Ansari SH, Sharma RK, Kumar A, Ali J. Formulation development, optimization and evaluation of aloe vera gel for wound healing. Pharmacogn Mag. 2013 Oct;9(Suppl 1):S6-S10. doi: 10.4103/0973-1296.117849. PMID: 24143047; PMCID: PMC3798142.
18. DE MESA, N. I. N. O., and Neti Waranuch. *Development of a Facial Cream for Anti-Inflammatory Containing Herbal Extracts*. Diss. Naresuan University, 2023.
19. Khan AW, Kotta S, Ansari SH, Sharma RK, Kumar A, Ali J. Formulation development, optimization and evaluation of aloe vera gel for wound healing. Phara macogn Mag. 2013 Oct;9(Suppl 1):S6-S10. doi: 10.4103/0973-1296.117849. PMID: 24143047; PMCID: PMC3798142.
20. Cherney, K. (2022, November 15). *9 Herbs to Fight Arthritis Pain*. Healthline. https://www.healthline.com/health/osteoarthritis/herbs-arthritis-pain#aloe-vera

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