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Formulation and Evaluation of the Anti Inflammatory Herbal Tablet by using Psidium Guajava Leaves

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Abstract: *Herbal medicine, the oldest form of healthcare known to humanity, has been utilized across cultures for centuries. Plants have long served as sources of food, clothing, shelter, and notably, medicine. Many modern pharmaceuticals trace their origins to traditional herbal remedies, with approximately 25% of prescription drugs in the United States containing plant-derived ingredients. Despite advances in synthetic medicine, the World Health Organization (WHO) reports that around 80% of the global population continues to rely on plant-based treatments due to their accessibility, efficacy, and minimal side effects.*

Inflammation, a biological response to harmful stimuli, is at the root of many chronic conditions such as heart disease, cancer, diabetes, and autoimmune disorders. While steroidal and non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used for treatment, they are often associated with adverse effects like gastric irritation and cardiovascular risks. Therefore, there is growing interest in exploring safer, plant-based alternatives with potent anti-inflammatory and analgesic properties.

This study focuses on Psidium guajava (guava) leaves, traditionally known for their anti- inflammatory and analgesic properties. The research includes the pharmacognostical analysis of guava leaves, formulation of an herbal tablet, in vitro evaluation, and pharmacological assessment of its anti-inflammatory effects. The objective is to validate the traditional use of Psidium guajava as a natural, effective, and safe alternative for managing inflammation and its associated complications..

Keywords: Herbal medicine, Psidium guajava, Anti-inflammatory, Analgesic, Traditional medicine, NSAIDs, Pharmacognosy, Plant-based drugs, Inflammation, Natural therapeutics.

I. INTRODUCTION

[1] Herbal Medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. It was an integral part of the development of modern civilization. Primitive man observed and appreciated the great diversity of plants available to him. The plants provided food, clothing, shelter and medicine. Much of the medicinal use of plants seems to have been developed through observations of wild animals and by trial and error. As time went on, each tribe added the medicinal power of herbs in their area to its knowledge base. They methodically collected information on herbs and developed well-defined herbal pharmacopoeias. Indeed, well into the 20th century much of the pharmacopoeia of scientific medicine was derived from the herbal lore of native people. Many drugs commonly used today are of herbal origin. Indeed, about 25 percent of the prescription drugs dispensed in the United States contain at least one active ingredient derived from plant material. Some are made from plant extracts; others are synthesized to mimic a natural plant compound. Herbal medicinal products are defined as any medicinal product, exclusively containing one or more active substances. WHO report 80% of the world population relies on the drug from natural origin. A large number of medicinal plants are used in the treatment of inflammation. Keeping in view of the importance of the disease and also considering the fact that green medicine are safe. So, I believed to select an herbal origin ug for this project.

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A number of traditional herbal medical practices have been adopted for the diagnosis, prevention and treatmentof various diseases. Many such practices were experimentally proved depicting the scientific insight behind their traditional adoption. This attempts to prove scientific insight behind the traditional adaption. Less toxicity, Better therapeutic effect, Good patient compliance and Cost effectiveness are the Reasons for choosing drug from natural origin. Psidium guajava leaves in the ethics a good analgesic anti- inflammatory, agent. So it was very interesting to select this plant which can help in the treatment of inflammation along with its major complication of the disease. The main objective of this present study was to investigate the leaves of psidium guajava as a potent anti inflammatory drug. During the course of present investigation its pharmacognostical studies, and then formulation of the extract as a tablet dosage form, in vitro evaluation of the tablets and finally its pharmacological evaluation for the anti- inflammatory activity with special reference to its curative .

[2] One of the traditional medicinal systems of India is the Ayurveda. The main principle of the Ayurveda is to live long healthy life by preventing the unnecessary suffering. Ancient Chinese, Greek, Egyptian and Indians were used the herbal medicines for various therapeutic purpose. Existence of herbal medicines was recorded worldwide and also have a long-recorded history. According to WHO, 80%of world still depends on traditional medicine for their health care . Because of the absence of the side effects the usage of herbal Ayurveda for mutations are popular worldwide .The herbal products have dual role .First role is helps in body care due to presence of photochemical and another role is to improvise the biological functions of human

Inflammation is defined as a reaction that produces redness, warmth, oedema, and soreness as a result of infectious, chemical and physical agents such as. microorganisms, toxins, radiations, bruises and caustic chemicals .

Inflammatory process starts by various chemical mediators which are released from macrophages and neutrophils which are responsible for the initiation, progression, regulation, and eventual resolution of the acute stage of inflammation. Monocytes play a main role in the clearing of cell debris. If the resolution is not occur in the acute stage, a chronic stage will develop]. Chronic inflammatory illnesses have been recently considered as the most cause of death worldwide, with more than half of all deaths being attributed to diseases related to inflammation such as ischemic heart disease, chronic kidney disease, cancer, diabetes and neurodegenerative and autoimmune conditions]. The main types of anti-inflammatory medications are the steroidal and non-steroidal drugs. Corticosteroids (steroidal drugs) are used to treat asthma and autoimmune inflammatory response. In addition, nonsteroidal drugs are used for mild to moderate pain and as antipyretic through the inhibition of cyclooxygenase enzyme. Nevertheless, non- steroidal anti-inflammatory drugs (NSAIDs) have many side effects, such as cardiovascular risk and gastric irritations . Therefore, extensive research was conducted on different plant species and their active compounds, which could constitute a source of new compounds which have anti-inflammatory property with fewer side effects and lower cost . In addition, researches were not exclusively conducted to evaluate the anti-inflammatory effect.

Therefore, studies varied to determine all the potential therapeutics. One of the thoroughly evaluated activities in plant species is the analgesic activity. Pain is defined as a feeling that ranges from mild discomfort to extreme suffering. Pain may be situated in a discrete area, as in an injury, or it may be more diffuse. Analgesic medications are usually administered to treat mild to moderate pain. On the other hand, opiates and other narcotics may be used for severe pain. When pain is associated with inflammatory conditions, non-steroidal anti-inflammatory or steroidal drugs are administered According to the World Health Organization, approximately 80% of the world population still use plant-based drugs

Nature-based medicines having increased attention in order to have novel drugs that could have more therapeutic potential. The 2015 Nobel Prize in Physiology or Medicine was awarded to the developers of Avermectin and Artemisinin, which are nature-based drugs. This highlights the possible effects of naturally derived medicines in tropical illnesses treatment. This development follows the World Health Organization's

2008 ratification of The Beijing Declaration, which promotes the efficacy and safety of folk medicines and claims greater assimilation of these into national health care systems . Therefore, this study aims to evaluate the anti-inflammatory and analgesic properties of both plants, especially there are no studies conducted in the me Inflammation is a severe response by living tissue to any kind of injury.

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[3] There can be four primary indicators of inflammation: pain, redness, heat or warmness and swelling. When there is injury to any part of the human body, the arterioles in the encircling tissue dilate. This gives a raised blood circulation towards
the area (redness). Inflammation is either acute or chronic inflammation. Acute inflammation may be an initial response of the body to harmful stimuli. In chronic inflammation, the inflammatory response is out of proportion resulting in damage to the body. Cyclooxygenase (COX) is the key enzymes in the synthesis of prostaglandins, prostacyclins and thromboxanes which are involved in inflammation, pain and platelet aggregation. Steroidal and non-steroidal anti-inflammatory drugs (SAIDs and NASIDs, respectively) are currently the most widely used drugs in the treatment of acute inflammatory disorders, despite their renal and gastric negative secondary effects . These drugs block COX-1 and COX-2 enzyme activity. COX enzymes assist with prostaglandin production. NSAIDs, steroidal anti-inflammatory drugs are being used till now, As a result long term uses of these drugs cause adverse side effects and damage human biological system such as liver, gastrointestinal tract, etc. As a result of adverse side effects, like gastric lesions, cardiovascular, renal failure and gastrointestinal damage. Now there is a need for the new safe, potent, nontoxicor less toxic anti- inflammatory drug. Plant medicines are great importance in the primary healthcare in many developing countries. According to World Health Organization (WHO) still about 80% of the world population rely mainly on plant- based drugs. In Ayurveda, Siddha, and Unani, utilizing a large number of medicinal plants were used for the treatment of human diseases. Plants have the ability to synthesize a wide verity of phytochemical compounds as secondary metabolites. Many of the phytochemicals have been used to effectively treat the various ailmentsfor mankinds. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species. Most of the medicinal plant parts are used as raw drugs and they possess varied medicinal properties . Plants have a great potential for producing new drugsand used in traditional medicine to treat chronic and even infectious diseases. In the present review an attempt has been made to investigate the anti-inflammatory activity of some medicinal plants.

[4] Plants have been the major source of drugs in Indian system of medicine and other ancient systems in the world. Rig-Veda (2500–1800 BC) offers the earliest depiction of healing properties of medicinal plants, while Charka Samhita and Sushruta Samhita unfold elaborately on several medicinal herbs.At present, the application of plant- derived natural products in the synthesis of drugs becomes a drift. Hence, there is a requirement to update data on the properties, uses, effectiveness, and safety of medicinal plant products.

Most of the drugs used at present for anti-inflammatory and analgesic effects are synthetic in nature and prolonged use of which causes severe side effects and exhibit toxic effects. In this regard, a novel possibility of evaluating herbs in pain therapy arises. Plants still remain a vase unexploited resource of structurally novel molecules that can aid in the development of novel drugs. Psidium guajava leaves commonly known as guava leaves is a native plant of India, and other countries.The plant is greatly appreciated as its leaves are a vital component in an Indian cuisine to promote anti inflammation. The leaves are used in treatment of inflammation. The leaves are analgesic and can be used effectively against inflammation and itching. The various pharmacological activities such as vasodilation, antimicrobial, antidiabetic, antiulcer, analgesic, phagocytic, and antioxidant activities of this plant have also been reported.

[5] inflammation is a reaction of living tissues towards injury, and it comprises systemic and local responses[1]. In spite of our dependence on modern medicine and the tremendous advances in synthetic drugs, a large number of the world populations (80% of people) cannot afford the products of the western pharmaceutical industry and have to rely upon the use of traditional medicines, which are mainly derived from plant material. The fact is well recognized by the WHO which has recently compiled an inventory of medicinal plants listing over 20 000 species. The family Apocynaceae consists of several important medicinal plants with wide range of pharmacological, biological activities and interesting phyto chemical constituents. The main action of anti- inflammatory agents is the inhibition of Cyclooxegenase enzymes which are responsible for the conversion of Arachidonic acid to prostaglandins. Since human red blood cell (HRBC) membranes are similar to these lysosomal membrane components, the prevention of hypotonicity induced HRBC membrane lysis was taken as a measure in estimating the anti- inflammatory property of various extracts of psidium guajava

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leaves. Thus, Human red blood cell membrane stabilization (HRBC method)[2] has been used as a method in estimating the anti- inflammatory property. In certain parts of Malabar the leaf of this plants was traditionally used in the treatment of inflammation. The present study aimed to authenticate that traditional information by both in vitro and in vivo anti- inflammatory screening

[7] A physiological and psychological sensation known as pain is linked to actual or possible tissue injury This frequently serves as one of the disease's early symptoms and indications and the primary reason patients visit their doctor . Additionally, the body's most typical adaptive response is inflammation . Both discomfort and inflammation include many kinds of complex biological reactions, such as the activation of enzymes, the release of inflammatory mediators and extravasating fluid, cell migration, and the breakdown and regeneration of tissue

hence, using accessible antiinflammatory medications could potentially be beneficial in the prevention and management of inflammation (Tabas and Glass, 2013). Antiinflammatory medications, whether steroidal or non- steroidal, are frequently used to treat various inflammatory illnesses (Zheng and Du, 2014). Non-steroidal antiinflammatory drugs (NSAIDs) can cause stomach sores, while opiates can cause tolerance and dependency. Although these medications offer significant assistance in managing pain and inflammation, certain individuals may experience terrible side effects from them (Rochette et al., 2020).

[8] Inflammation is a defense response of our body to hazardous stimuli such as allergens and/or injury to the tissues; on the other hand, uncontrolled inflammatory response is the main cause of a vast continuum of disorders including allergies, cardiovascular dysfunctions, metabolic syndrome, cancer, and autoimmune diseases imposing a huge economic burden on individuals and consequently on the society [1]. There are various medicines for controlling and suppressing inflammatory crisis; steroids, nonsteroid anti-inflammatory drugs, and immunosuppressant are the practical examples of these medications which are associated with adverse effects while in practice our goal is to apply minimum effective dose by the highest efficacy with the least adverse effects. Thus, we need to apply natural anti- inflammatory factors within medication therapy to achieve increased pharmacological response and the lowest degree of unwanted side effects [1, 2]. Herbal medicines are promoting subjects in

medicine and, of course, we have to increase our knowledge about them. Complementary, alternative, and traditional medicines are the pivotal source of herbal medication guidance, but surely modern medicine must prove these guidelines through scientific methods before using them in practice. In this review, we have endeavored to assess the plants and the most clinical evidence of their anti- inflammatory effects. [9]Inflammation is a biological protective response of vasculartissues against external agents such as irritants, pathogens or damaged cells. It is characterised as increased movement of plasmaand innate immune system cells such as neutrophils andmacrophages from the blood into the injured tissues. Inflammatory symptoms such as increased bloodflow, vasodilatation, and enhanced cellular metabolism, extravasation of fluids and release ofsoluble mediators are noticed [1-2]. In the presence of inflammatory substances, phospholipase A2 get activated and release of inflammatory mediators such asprostaglandin, histamine, cytokines, leukotrienes, and serotonin occurs. As a result vascular permeability increases and excess accumulation of leukocytes takes place at the site of inflammation [3-5]. In light of these findings, studies on plants with proven folkloric anti-inflammatory properties are seen as a fruitful and reasonable research strategy in the search for new anti-inflammatory medications

Fig.1:Psidium Guajava Leaves Powder

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Botanical Classification	
Kingdom	Plantae–Plants
Subkingdom	Tracheobionta Vascular Plants
Superdivision	Spermatophyta Seed Plants
Division	Magnoliophyta Flower Plants
Class	Magnoliopsida Dicotyledonous
Subclass	Rosidae
Order	Myrtales
Family	Myrtaceae
Subfamily	Myrtoideae
Tribe	Myrteae
Gender	Psidium
Species	Psidium guajava

Table1.Classification of Psidium Guajava

Phytoconstituents of Psidium guajava leaves

P.guajava leaves consist of Flavonoids,Polyphenols,Tannins.This phytoconstituents shows activity against inflammation

PHYTOCONSTITUE NTS	MECHANISM OF ACTION
Flavonoids	Act by damaging cytoplasmic membrane & inhibiting synthesis of nucleic acid against different microorganism and by inhibiting energy metabolism, thus exhibiting both bacteriostatic and bactericidal properties.
Polyphenols	Compounds like rutin,caffeicacidact against the hatching of eggs of cattle nematodes.
Tannins	They act by damaging digestive tissue and cuticle of larvae.

TABLE 2.Mechanism of action of Phytoconstituents

REVIEW OF LITERATURE:

1. Chandira, M. and Jayakar, B., 2010:

Ipomoea digitata Linn., a perennial climber native to India, possesses medicinal properties attributed to its secondary metabolites.

Traditionally, it's used for conditions like analgesic

,inflammation.Recent studies formulated tablets from its aqueous root extract using excipients such as carbopol and ethylcellulose. These tablets demonstrated significant anti inflammatory activity .Tablet evaluations confirmed

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acceptable weight variation, hardness, friability, and disintegration time, indicating their potential as effective herbal anti- diabetic agent.

2. Sen, S., Khare, N.P. and Shrivastava, S., 2024:
Herbal pain relief oil, formulated with volatile essential oils like eucalyptus and camphor, and herbs such as turmeric and nirgundi, penetrates the skin easily to relieve pain, inflammation, and improve circulation. Prepared via decoction, it is safe for long-term topical use without side effects. Preformulation studies evaluated organoleptic properties, flow, phytochemicals, swelling and foaming index, ash value, and viscosity. This oil offers a natural, effective alternative for managing various types of pain.

3. Karrat, L., Abajy, M.Y. and Nayal, R., 2022.
This investigation aimed to assess the anti-inflammatory and analgesic effects of Cedruslibani and Pinusbrutia leaves. The anti- inflammatory property was
evaluated by Human Red Blood Cells (HRBC) membrane stabilization assay and Albumin denaturation assay using Sodium diclofenac as a positive control. To evaluate the analgesic property, formalin and tail flick tests were carried out using ethanolic extracts at a dose of 30 mg/kg and gel containing 2% (w/v) of ethanolic extract of each plant.
Diclofenac sodium, diclofenac gel 1% and lidocaine gel 2 % were used as positive controls.

4. Maione, F., Russo, R., Khan, H. and Mascolo, N., 2016. Medicinal plants have long been used to treat various ailments, with many modern drugs derived from traditional remedies. This paper reviews key plants and their constituents with anti-inflammatory properties effective against joint, skin, cardiovascular, and other inflammatory conditions. It offers a concise overview of their roles in managing inflammation. The aim is to highlight the potential of natural compounds and inspire further research into novel therapeutic .

5. Singh, A., Singh, A., Chouhan, O., Tandi, G.P., Dua, M. and Gehlot, A., 2016: Murraya koenigii (curry leaf) exhibits analgesic, anti-inflammatory, and various pharmacological activities. This study evaluated the anti-inflammatory and analgesic effects of its aqueous leaf extract in male Wistar rats using plethysmometer and hot plate methods. Doses of 100, 300, and 500 mg/kg were orally administered. Results showed a dose-dependent reduction in paw edema and writhing, and increased pain threshold. Statistical analysis confirmed significance via one-way ANOVA and Tukey's test.c approaches.
6. Saleem, T.M., Azeem, A.K., Dilip, C., Sankar, C., Prasanth, N.V. and Duraisami, R., 2011
G. vulgaris Nees (Apocynaceae), a medium-sized tree found in Kerala, is traditionally used to treat ulcers, sores, inflammation, and wounds. This study evaluated the anti-inflammatory effects of its leaf extracts. Aqueous and alcoholic extracts were tested

7. Tadege, G., Sirak, B., Abebe, D. and Nureye, D., 2023:Leaves of
C. latifolia were extracted with 80% methanol, then fractionated using chloroform, pure methanol, and water. Anti-inflammatory activity was evaluated using the carrageenan-induced paw edema model. Antinociceptive effects were assessed through the hot plate and acetic acid-induced writhing tests in rodents. Results demonstrated the extract's potential to reduce both inflammation and pain.

8. Ghasemian, M., Owlia, S. and Owlia, M.B., 2016: Medicinal plants and their secondary metabolites are increasingly used as complementary treatments for inflammation-related diseases like rheumatism, diabetes, and cardiovascular conditions. This review highlights herbs with clinically and experimentally proven anti-inflammatory effects, including Curcuma longa, Zingiber officinale, Rosmarinus officinalis, Borago officinalis, evening primrose, and Devil's claw. It promotes a multidimensional approach to inflammation treatment through herbal medicine and lifestyle changes.

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9. Behera, A., Samal, H.B., Sharma, D.K., Kanhar, S., Kadam, A., Khamkar, P. and Behera, S., 2021: This study developed and evaluated a tablet dosage form of hydroalcoholic extract of P. emblica leaves (HPE) for anti-inflammatory activity. Tablets were tested for mechanical properties and efficacy using carrageenan-induced paw edema in Wistar rats. HPE (150 mg/kg) and tablets (650 mg) significantly reduced inflammation by 66.41% and 69.43%, respectively, close to the standard drug's 70.18% inhibition. Results confirm the formulation's effectiveness.

AIM AND OBJECTIVE:

Aim:

Formulation and Evaluation of Anti inflammatory HerbalTablet by using Psidium Guajava Leaves.

Objective:

1. To study the phytochemical analysis of the extract of psidium guajava leaves
2. To study the anti inflammatory activity of extract of psidium guajava leaves
3. To formulate the herbal tablet of extract of psidium guajava leaves
4. To evaluate the herbal tablet by using extract of psidium guajava leaves

PLAN OF WORK:

Plan	Duration of Week
Literature Survey	15January2025
Selection of Plant	17January2025
Extraction of plant	22January2025–27January2025
Phytochemical Tests	28January2025
Formulation and evaluation of granules	10February2025
Formulation of tablet	12March2025
Evaluation of tablet	21March2025-25March2025
Report	30March2025–1May2025

Table 3:plan of work

MATERIAL AND METHOD:

Sr.No.	Materials	Mfd.By
1.	Guava Leaves Powder	By grinding dried leaves
2.	Distilled water	Research Lab,chem.
3.	Dragendroff Reagent	Loba Chemie Pvt.Ltd.,Mumbai
4.	Mayer'sReagent	Research Lab,chem. industries,Mumbai.
5.	BiuretReagent	Research Lab,chem. industries,Mumbai.

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6.	Millon'sReagent	Research Lab,chem. industries,Mumbai.
7.	Barfoed'sReagent	Research Lab,chem. industries,Mumbai.
8.	KBr	Burgoyne Burbidge's & co.,Mumbai,India.
9.	Wagner reagent	Research lab.chem .industris,Mumbai

Table 4.list of materials

Sr.No.	Instruments	Model
1.	Oven	Oven at a temperature 110c
2.	UV visible spectrophotometer	Shimadzu Uv-2450
3.	Tablet compression machine	Tablet press machine

Table 5.list of instrument

Plant collection:

Fresh leaves of plant psidium guajava were collected from local regional area .The taxonomic identification of the plant was confirmed and processed for further investigations. Collected leaves were washed thoroughly under running water for 2–3 times. Washed leaves were dried under the shade for 6-7 days. The dried leaves were powdered and stored in a sterile bottle at room temperature.

Preparation of Plant Extract:

Method :

1. Collect the dried powered of psidium guajava leaves
2. Use the decoction extraction method .
3. 60 gmof powder is boiled with 300ml of distilled water.
4.1hr boiling is require to yield the extract.
1. filter the above mixture.and then evaporate it under reduce pressure in rotavapour.
2. We have collected dried extract of psidium guajava leaves by decoction extraction method.

This method is not time-consuming, The yield of the aqueous extract was 8.79gm. The extract was stored in safe places until further studies

Fig. 2 Extraction process of guava leaves by decoction method.

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Qualitative Analysis:

Phytochemical test:

Phytochemical analysis was carried out for identification ofcarbohydrates,proteins,tannins,steroids,flavonoid,alkaloid,phenol,and saponins according to standard methods

⇨ Test for Alkaloid: a.Dragendroff's test:

Test solution+ Dragendroff's (Potassium bismuth iodide solution) gives Reddish brown precipitate.

a. Mayer's test:

Test Solution + Mayer's reagent (Potassium mercuric iodide solution)gives Cream colour ppt.