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Formulation and Evaluation of Anti-Inflammatory Tablet using Mango Gum

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ABSTRACT:

The objective of this study was to formulate and evaluate an anti-inflammatory tablet using mango gum as a primary excipient. Mango gum, a natural polysaccharide derived from *Mangifera indica*, has demonstrated potential medicinal properties, including anti-inflammatory effects. In this research, mango gum was utilized as a binder and disintegrant in the tablet formulation, with other standard excipients like lactose, magnesium stearate, and microcrystalline cellulose. The tablets were prepared using direct compression, and their physicochemical properties were evaluated, including weight variation, hardness, friability, disintegration time, and dissolution rate. In vitro anti-inflammatory activity was assessed using the carrageenan-induced paw edema model, Comparing the mango gum-based tablets with a standard anti-inflammatory drug (e.g., ibuprofen).The results showed that the mango gum tablets exhibited significant anti-inflammatory effects, along with favorable tablet characteristics such as uniformity in size and weight, good hardness, and rapid disintegration. These findings suggest that mango gum could be a promising natural alternative in the formulation of anti- inflammatory tablets, offering a sustainable and effective approach for managing inflammation. Further clinical studies are recommended to confirm the therapeutic potential of mango gum in human health.

Keywords: *Mangifera indica*, Anti- inflammatory, Mango gum

Introduction:

The primary pathogenetic component of many diseases is the inflammatory process, and the disease's specificity is frequently determined by its genesis and specific location.

Thus, one of the most pressing issues in modern medicine and pharmacology is the control of the inflammatory process and the creation of novel, potent anti-inflammatory medications to prevent inflammation of various origins(1).

These days, a wide range of pharmaceutical medications from the class of nonsteroidal anti- inflammatory medicines (NSAIDs) are available for complicated management of the inflammatory process(2).

However, despite the tremendous advancements and successes, the pertinent mission of pharmacology is still to find new, extremely powerful, and less toxic anti-inflammatory medications. When a compound is proposed as therapeutic medicine, it must have a wide range of therapeutic effects and low adverse effects that are safe for long-term usage. The most promising approach in this regard is to look for such anti-inflammatory medications among plant-based raw ingredients(3).

The tropical and subtropical regions are home to *Mangifera indica*, whose parts are frequently employed in traditional medicine for a wide range of treatments. *Mangifera indica* has been used in traditional medicine for a number of medicinal purposes. For example, a fluid extract or bark infusion is used to treat leucorrhea, bleeding piles, monorrhagia, and lung hemorrhage. Eyelid warts can be removed using the calcined leaves' idibs. For diabetics, dried powdered leaves are utilized. In cases of chronic dysentery, gleet, and diarrhea, dried flowers in powder or decoction can be helpful. Compared to the common medication Diclofenac sodium, extracts of *Mangifera indica* gum have been shown to exhibit significant anti-inflammatory action(4).

Plant profiles:

Fig.1 *Mangifera indica*

1.1. Taxonomy of Plant profiles(5)

Kingdom	Plantae
Class	Magnoliopsida
Division	Magnoliophyta
Super division	Spermatophyta
Subkingdom	Tracheobionta
Genus	Mangifera
Family	Anacardiaceae
Species	M.indica
Subclass	Rosidae
Order	Sapindales

1.2 Mango Gum

Mango gum, a dried sticky exudate polysaccharide, is extracted from M. indica bark (Anacardiaceae family). Being a glucosyl xanthone and polyphenolic antioxidant, mangiferin exhibits potent anti-lipid peroxidation, hypotensive, antioxidant, immunomodulatory, cardiotonic, wound-healing, antidegenerative, and antidiabetic properties(6). A ripe mango is thought to be invigorating and revitalizing. The juice is used as a tonic for recovery and to treat heat stroke. The seeds have astringent properties and are used to treat asthma. By inhaling the fumes from the burning leaves, hiccups and throat infections can be avoided. The bark is used as an astringent, to treat rheumatism and diphtheria, and is thought to have a tonic effect on mucous membranes. Gum is applied as a scabies treatment and as a foot dressing. The majority of the mango tree's parts are utilized medicinally, while tannins found in the bark are used to color(7).

Mango gum has an anti-inflammatory property so it is used as an API in the formulation of tablets. It also has a binding property.

- **Purification of Mango gum**

The mango gum was hydrated and dried in distilled water for a day while being constantly stirred; any unnecessary materials were filtered out using muslin cloth. 95% ethanol was added to the filtered slurry to precipitate the gum, which was subsequently filtered and dried at 50°C in a water bath. After being ground in a lab blender, the dried gum was kept in a tightly sealed container(8)(9).

- **Preparation of Anti-inflammatory Tablet**

Mango gum served as the active ingredient in the tablet's preparation. The tablet weighed 500 milligrams total. Initially, the formulation contained 60–70% pure mango gum extract. After precisely weighing the ingredients, they were combined. After transferring the excipients and mango gum extract to a glass mortar, the mixture is typically blended for five to seven minutes. Granules were made using mesh number 14 after mango gum slurry (binder) was created and added to the mixture.

Prepared granules were kept in oven for 10 minutes at 50 °C. The dried granules were lubricated with magnesium stearate and their per formulation studies were carried out such as bulk density, tapped density, compressibility index (C.I.) & Angle of repose (θ).

Then the granules were punched using tablet compression machine and pressure was adjusted as per requirement. Lastly the three batches of tablet were prepared varying the quantities of excipients. Batch size prepared for each formulation was of 10 tablets.

Last step of evaluation of tablet was done by various methods such as weight variation, Hardness, Friability, Disintegration test, Dissolution test, Content uniformity(10).

Sr.No	Ingredients	Uses
1.	Mango Gum	API / Extract
2.	Microcrystalline cellulose (MCC)	Diluent
3.	Starch	Disintegrant
4.	Magnesium stearate	Lubricant
5.	Talc	Glidant
6.	Mango gum	Binder

Evaluation of Anti- inflammatory tablet of Mango gum

1. **Weight variation:**

The purpose of the weight variation test is to ensure that the weight of the tablets in a batch is consistent. First, the weight of all 20 tablets in each formulation is calculated. An average is calculated. To find out the weight variance, the specific weight of every tablet is also measured(11).

2. **Hardness:**

It is the amount of force needed to compress a tablet in a radial direction and break it. It is a crucial factor in the creation of Fast Dissolve tablets since too much crushing strength shortens the disintegration time. The crushing strength in this study Monsanto hardness testers were used to measure the percentage of the tablet. It reports an average of three observations. Hardness of about 3-5kg/cm2 is considered to as a satisfactory(12).

3. **Thickness:**

Tablet thickness is also the important step in tablet formulation, it is done by simple procedure.

Varnier calipers were used to measure the thickness of five tablets(13).

4. **Disintegration test:**

The disintegration test calculates how long it will take for a batch of pills to break up into particles that can fit through a 10-mesh screen under specific circumstances. A medication must initially be in solution in order to be absorbed from a solid dosage form following oral administration. Disintegration, or the breaking up of the tablet, is typically the first crucial step toward this state. The IP has defined the range within which certain tablet kinds can disintegrate.

For the uncoated tablet water maintained at 37 ± 0.5°C and disintegration time should to be 15 minutes(14).

5. **Dissolution test:**

The rate at which an active ingredient releases from a solid dosage form under controlled circumstances is determined by dissolution testing. This method is used to evaluate how well tablets, capsules, films, and other solids work. Comparing final products with various commercial preparations and

directing the formulation development process are two benefits of dissolution testing. Determining if the formulation's active pharmaceutical component release falls within acceptable bounds is another way that dissolving testing is used to evaluate a sample's quality(15).

6. Friability test:

Friability is the weight loss of a tablet in its container as a result of surface fine particle removal.

The purpose of the friability test is to determine whether the tablet can tolerate abrasion during handling, packing, and transportation. To determine the tablets' friability, the Roche friabilator is used(16).

Weigh the 20 tablets in each batch, then put them in a Roche friabilator set to rotate for four minutes at 25 rpm. After dusting every tablet, weigh it once more(17). The following formula can be used to determine the percentage of friability

% Friability = [(W1-W2)100]/W1

where, W1= Initial weight of tablet

W2= Final weight of tablet

Conclusion:

The development and testing of an anti-inflammatory tablet that uses mango gum as a binder and an active pharmaceutical ingredient (API) shows promise as a sustainable, affordable, and natural substitute for synthetic excipients. The study emphasizes how mango gum can be used with other formulation ingredients to provide the right amount of tablet hardness, friability, and disintegration time while preserving efficient drug release. Its medicinal potential is further supported by its anti-inflammatory qualities, which make it a strong contender for use in medications. Future research should concentrate on formulation optimization, long-term stability assessment, and in vivo tests to determine its safety and therapeutic efficacy.

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