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Modified Locust Bean Gum as A Novel Film-Forming Polymer in Ketorolac Tromethamine Oral Fast Dissolving Patches: A Comprehensive Review

Priyanshu Rajput[1*],Vijeta Bhattacharya[1]
School of Pharmacy ITM University, GwaliorMadhya Pradesh, India
**Corresponding author*

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ABSTRACT
Fast oral dissolving films (FODFs) have emerged as an advanced and patient-friendly drug delivery system designed to improve therapeutic efficacy, patient compliance, and onset of action. These thin polymeric films rapidly disintegrate in the oral cavity without the need for water, making them particularly suitable for pediatric, geriatric, and dysphagic patients. Ketorolac Tromethamine, a potent non-steroidal anti-inflammatory drug (NSAID), is widely used for the management of moderate to severe pain but is associated with gastrointestinal irritation and delayed onset when administered through conventional oral dosage forms. Formulating Ketorolac Tromethamine as a fast dissolving oral film can provide rapid drug release, enhanced bioavailability, improved patient convenience, and faster analgesic action. Natural polymers have gained considerable attention in pharmaceutical formulations because of their biodegradability, biocompatibility, and safety profile. Among these, Locust Bean Gum, a natural galactomannan polysaccharide, exhibits excellent film-forming, thickening, and swelling properties, making it suitable for oral film formulations. The present review discusses the formulation approaches, role of polymers, preparation methods, evaluation parameters, drug release kinetics, and recent advancements in fast dissolving oral films of Ketorolac Tromethamine using Locust Bean Gum.

Keywords: Fast dissolving oral film, Ketorolac Tromethamine, Locust Bean Gum, solvent casting, natural polymer, oral drug delivery system.

I. INTRODUCTION

Oral drug delivery remains the most preferred route of drug administration due to its convenience, cost-effectiveness, ease of administration, and high patient acceptance. Conventional oral dosage forms such as tablets and capsules are widely used; however, they possess several disadvantages including difficulty in swallowing, delayed onset of action, and poor patient compliance among pediatric and geriatric populations. Patients suffering from dysphagia, neurological disorders, nausea, and motion sickness often face difficulties in swallowing conventional solid dosage forms, which may affect therapeutic outcomes**(Baryakova*et al.*, 2023).**

To overcome these limitations, novel drug delivery systems have been developed to improve drug release characteristics, therapeutic efficacy, and patient acceptability. Among these systems, fast oral dissolving films have emerged as an innovative and effective dosage form capable of rapid disintegration and drug release within the oral cavity**(Irfan *et al.*, 2016).**

Fast dissolving oral films are thin, flexible polymeric strips that rapidly hydrate, disintegrate, or dissolve upon contact with saliva, releasing the active pharmaceutical ingredient for rapid absorption. These formulations combine the advantages of both solid and liquid dosage forms while providing accurate dosing, portability, rapid onset of action, and improved patient convenience**(Mostafa, 2018).**

II. Fast Oral Dissolving Films

Fast oral dissolving films, also known as oral thin films or mouth dissolving films, are thin polymeric films designed to dissolve rapidly in the oral cavity without requiring water. These films are generally placed on the tongue, buccal cavity, or sublingual region where they disintegrate within seconds to release the drug**(Joshua *et al.*, 2016).**

The oral mucosa possesses rich blood supply and high permeability, allowing rapid absorption of drugs. Some drugs may partially bypass hepatic first-pass metabolism through buccal absorption, thereby improving bioavailability and therapeutic effectiveness **(Alqahtani*et al.*, 2021).**

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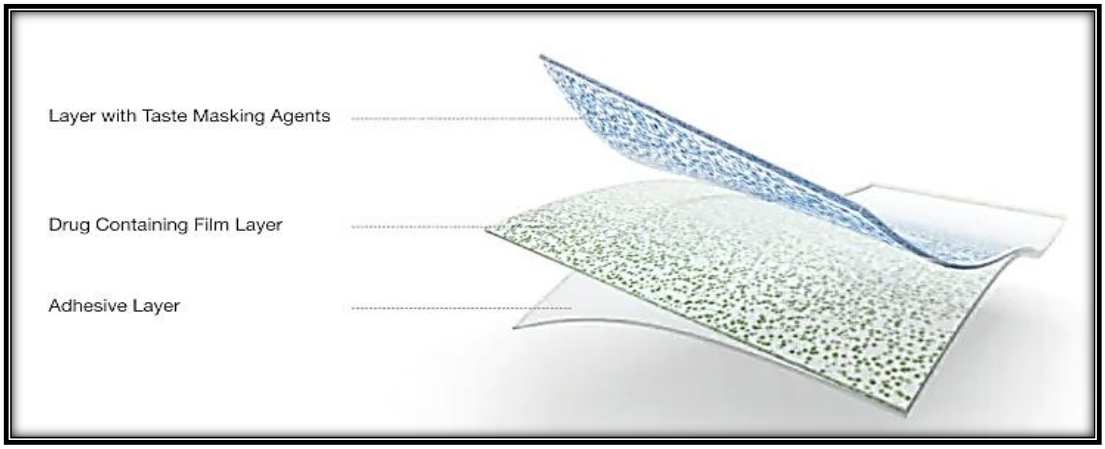

Figure 1: Fast Oral Dissolving Films

2.1 Advantages of Fast Oral Dissolving Films

- Rapid onset of action
- Improved patient compliance
- Ease of administration
- No requirement of water
- Accurate dosing
- Better portability
- Reduced choking risk
- Enhanced bioavailability
- Suitable for pediatric and geriatric patients
- Improved stability compared to liquid formulations **(Reddy *et al.*, 2018).**

2.2 Limitations of Fast Oral Dissolving Films

- Limited drug loading capacity
- Moisture sensitivity
- Requirement of specialized packaging
- Difficulty in formulating high-dose drugs
- Taste masking challenges**(Kawale*et al.*, 2023).**

III. IDEAL PROPERTIES OF THE FILM FORMING POLYMERS

The polymer employed should be non-toxic, nonirritant and devoid of any leachable impurities.

- It should be tasteless.
- It should have good wetting and spread ability property.
- The polymer should exhibit sufficient peel, shear and tensile strengths.
- The polymer should be cheap and readily available.
- It should have long shelf life.
- It should not cause any secondary infections in the oral mucosa/ dental region.
- It should have a good mouth feel property.
- It would be ideal to have a polymer that would have local enzyme inhibition action along**(Sinha and Dutt 2020).**

IV. COMPOSITION OF THE SYSTEM

Fast dissolving film is a thin film with an area of 2-8 cm2 containing an active ingredient. The immediate dissolution, in water or saliva is reached through a special matrix from watersoluble polymers. Drugs can be incorporated up to a single dose of 30mg. Formulation considerations have been reported as important factors affecting mechanical properties of the films. The excipients used in formulation of fast dissolving films are also discussed in detail. From the regulatory perspectives, all excipients used in the formulation should be generally regarded as safe(i.e.GRASlisted)and should be approved for use in oral pharmaceutical dosage forms **(Alshali*et al.*, 2015).**

4.1 Water soluble polymers

Water-soluble polymers are used as film formers. The use of film forming polymers in dissolvable films has attracted considerable attention in medical and nutraceutical application. The water-soluble polymers achieve rapid disintegration, good mouth feel and mechanical properties to the films. The disintegration rate of the polymers is decreased by increasing the molecular weight of polymer film bases. Some of the water soluble polymers used as film former are HPMC E-3 and K-3, Methyl cellulose A-3, A-6 and A-15, Pullulan, carboxmethylcellulosecekol 30, Polyvinylpyrollidone PVP K-90, Pectin, Gelatin, Sodium Alginate, Hdroxypropylcellulose, Polyvinyl alcohol, Maltodextrins and EUDRAGITRD10.Polymerized rosin is a novel film forming polymer**(Raihan *et al.*, 2024).**

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4.2 Plasticizers

Formulation considerations (plasticizer, etc.) have been reported as important factors affecting mechanical properties of films. The mechanical properties such as tensile strength and elongation tothe films have also been improved by the addition of plasticizers. Variation in their concentration may affect these properties. The commonly used plasticizers areglycerol, di-butylpthallate, and polyethylene glycolsetc**(Eslami*et al.*, 2023).**

4.3 Saliva stimulating agent

The purpose of using saliva stimulating agents is to increase the rate of production of saliva that would aid in the faster disintegration of the rapid dissolving film formulations. Generally acids which are used in the preparation of food can be utilized as salivary stimulants. E.g.Citric acid, malic acid, lactic acid, ascorbic acid and tartaric acid. These agents are used alone or in combination between 2 to 6% w/w of weight of the film **(Kulkarni *et al.*, 2021).**

4.4 Surfactants

Surfactants are used as solublising or wetting or dispersing agent so that the film is getting dissolved within seconds and release active agent immediately. Some of the commonly used are sodium lauryl sulfate, benzalkonium chloride, bezthonium chloride, tweens etc. One of the most important surfactant is polaxamer 407 that is used as solubilizing, wetting and dispersing agent**(Chaudhari and Dugar 2017).**

4.5 Sweetening agents

Sweeteners have become the important part of pharmaceutical products intended to be disintegrated or dissolved in the oral cavity. The classical source of sweetener is sucrose, dextrose, fructose, glucose, liquid glucose and isomaltose. The sweetness of fructose is perceived rapidly in the mouth as compared to sucrose and dextrose. Fructose is sweeter than sorbitol and mannitol and thus used widely as a sweetener. Polyhydric alcohols such as sorbitol, mannitol, and isomalt can be used in combination as they additionally provide good mouth-feel and cooling sensation. Polyhydric alcohols are less carcinogenic and do not have bitter after taste which is a vital aspect in formulating oral preparations. The artificial sweeteners have gained more popularity in pharmaceutical preparations. Saccharin, cyclamate and aspartame are the first generation of the artificial sweeteners followed by acesulfame-K, sucralose, alitame and neotame which fall under the second generation artificial sweeteners. Acesulfame-K and sucralose have more than 200 and 600 time sweetness. Neotame and alitame have more than 2000 and 8000 time sweetening power as compared to sucrose. Rebiana which is a herbal sweetener, derived from plant Stevia rebaudiana (South American plant) has more than 200 -300 time sweetness**(Al Humaid, 2018).**

4.6 Flavoring agents

Flavoring agents can be selected from the synthetic flavor oils, oleo resins, extract derived from various parts of the plants like leaves, fruits and flowers. Flavors can be used alone or in the combination. Any flavor can be added such as essential oils or water soluble extracts of menthol, intense mints such as peppermint, sweetmint, spearmint, wintergreen, cinnamon, clove, sour fruit flavor such as lemon , orange or sweet confectionary flavors such as vanillin, chocolate ,or fruit essence like apple , raspberry, cherry, pineapple. The amount of flavor needed to mask the taste depends on the flavor type and its strength**(Modupalli*et al.*, 2022).**

4.7 Colour

A full range of colors is available, including FD&C colors, EU Colours, Natural Colours and custom Pantone matched colours.Some saliva stimulating agents may also be added toenhance the disintegration and to get rapid release.Some of these agents are citric acid, tartaric acid, malicacid, ascorbic acid and succinic acid.

V. CLASSIFICATION OF FAST DISSOLVING TECHNOLOGY

For ease of description, fast-dissolve technologies can be divided into three broad groups:

5.1 Lyophilized systems:

The technology around these systems involves taking a suspension or solution of drug with other structural excipients, through the use of a mould or blister pack, forming tabletshaped units. The units or tablets are then frozen and lyophilized in the pack or mould. The resulting units have a very high porosity, which allows rapid water or saliva penetration and very rapid disintegration**(Usmanb*et al.*, 2019).**

5.2 Compressed tablet-based systems:

This system is produced using standard tablet technology by direct compression of excipients. Depending on the method of manufacture, the tablet technologies have different levels of hardness and friability. The speed of disintegration for fastdissolve tablets compared with a standard tablet

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is achieved by formulating using either water soluble excipients, superdisintegrant or effervescent components, to allow rapid penetration of water into the core of the tablet**(Ramireddy*et al.*, 2026).**

5.3 Thin film strips:

Oral films, also called oral wafers, evolved over the past few years from the confection and oral care markets in the form of breath strips and became a novel and widely accepted form by consumers for delivering vitamins and personal care products. Today, FDFs are a proven and accepted technology for the systemic delivery of APIs for over-thecounter (OTC) medications and are in the early-to mid-development stages for prescription drugs. This has been attributed to the success of the breath freshener products by consumers such as Listerine Pocket Paks in the US consumer market. Such systems use a variety of hydrophilic polymers to produce a 50- 200 mm film. The film is manufactured as a large sheet and then cut into individual dosage units for packaging in a range of pharmaceutically acceptable formats**(Vishwakarma, 2017).**

VI. METHODS OF MANUFACTURE OF FAST DISSOLVING FILMS

One (or a combination) of the following processes may be used to manufacture the oral films:

6.1 Solvent Casting

Fast dissolving films are preferably formulated using the solvent casting method, whereby the water soluble ingredients are dissolved to form a clear viscous solution and the drug along with other excipients is dissolved in suitable solvent then both the solutions are mixed and finally casted in to the Petri plate and dried, which is then cut into pieces of the desired size. The properties of the API play a critical role in the selection of a suitable solvent. Water-soluble hydrocolloids used to prepare RDFs include: hydroxyl propyl methyl cellulose (HPMC), hydroxyl propyl cellulose (HPC), pullulan, sodium alginate, pectin, carboxy methyl cellulose (CMC), polyvinyl alcohol (PVA). Solvents used for thepreparation of solution or suspension should ideally be selected from ICH Class 3 solvent list. Specific types of equipment such as rollers are required for pouring the solution on an inert base. The clearance between the roller and the substrate determines the required thickness of the film. The final step, drying the film, removes the solvent and helps to obtain the finished product. Usually, glass, plastic, or teflon plates are used as an inert base for film casting. When the manufacturing technology is transferred from laboratory scale to production scale, several problems can be encountered. These problems can include the casting of the film, obtaining uniform thickness of the film, and proper drying of the sample. The selection of the proper type of dryer is needed in the final step of drying**(Kawale*et al.*, 2023).**

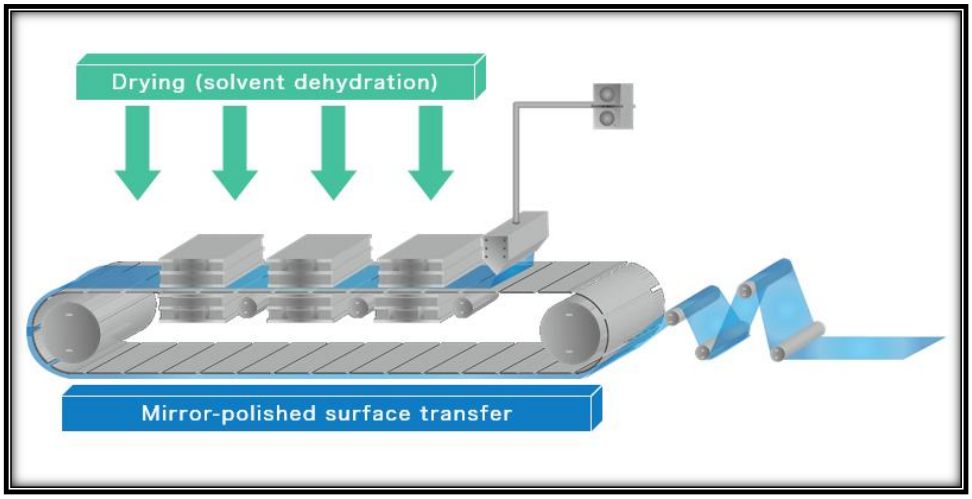

Figure 2: Solvent Casting

6.2 Hotmelt extrusion

Hot melt extrusion is commonly used to prepare granules, sustained-release tablets, and transdermal and transmucosal drug-delivery systems. In hot melt extrusion method firstly the drug is mixed with carriers in solid form. Then the extruder having heaters melts the mixture. Finally the melt is shaped in to films by the dies. Usually, when designing RDFs, polymers with low molecular weight or viscosity, such as HPMC E5 or pullulan PI.20, are

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preferred. A combination of various grades of polymers may also be used to achieve desired physical properties. Mixing polymers of high and low viscosity produces a film with good mechanical strength and high drug solubility in the film. The manufacturing process for the wafers in the pharmaceutical industry is divided into different steps. Generally, the mass is prepared first under the control of temperature and steering speed. Afterwards, the wafers are coated and dried in a drying tunnel, once again the temperature, air circulation and line speed are controlled. Then follows a slitting and in the last step the wafers are punched, pouched and sealed. Other ways of manufacturing oral wafers are spraying process or extrusion, in particular hot-melt extrusion **(Patil *et al.*, 2016).**

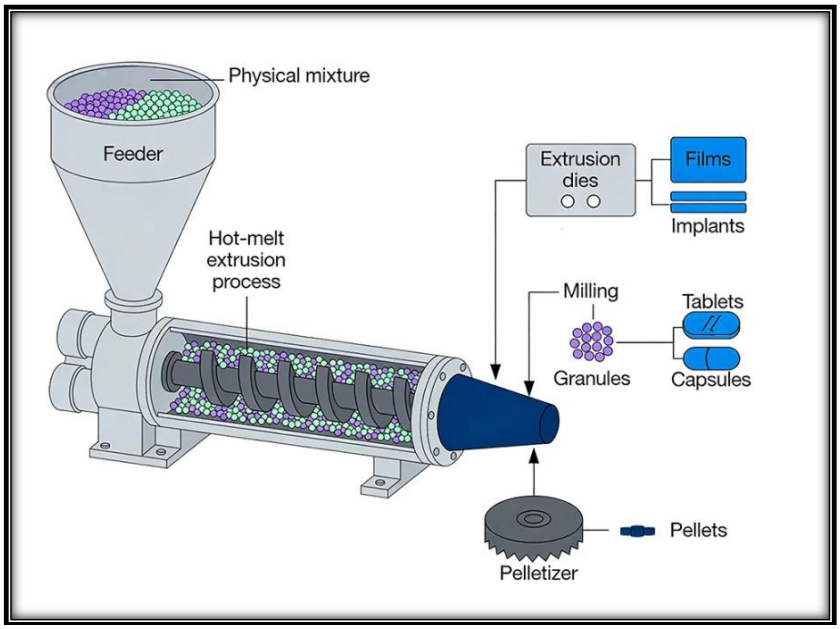

Figure 3: Hotmelt extrusion

6.3 Semisolid casting

In semisolid casting method, firstly a solution of water soluble film forming polymer is prepared. The resulting solution is added to a solution of acid insoluble polymer (e.g. cellulose acetate phthalate, cellulose acetate butyrate), which can be prepared in ammonium or sodium hydroxide. Then appropriate amount of plasticizer is added so that a gel mass is obtained. Finally the gel mass is casted in to the films or ribbons using heat controlled drums. The thickness of the film is about 0.015-0.05 inches. The ratio of the acid insoluble polymer to film forming polymer should be 1:4**(Lopes *et al.*, 2017).**

6.4 Solid dispersion extrusion

The term solid dispersions refer to the dispersion of one or more active ingredients in an inert carrier in a solid state in the presence of amorphous hydrophilic polymers. Drug is dissolved in a suitable liquid solvent. Then solution is incorporated into the melt of polyethylene glycol, obtainable below 70 ◦ C Finally the solid dispersions are shaped into the films by means of dies**(Nair *et al.*, 2020).**

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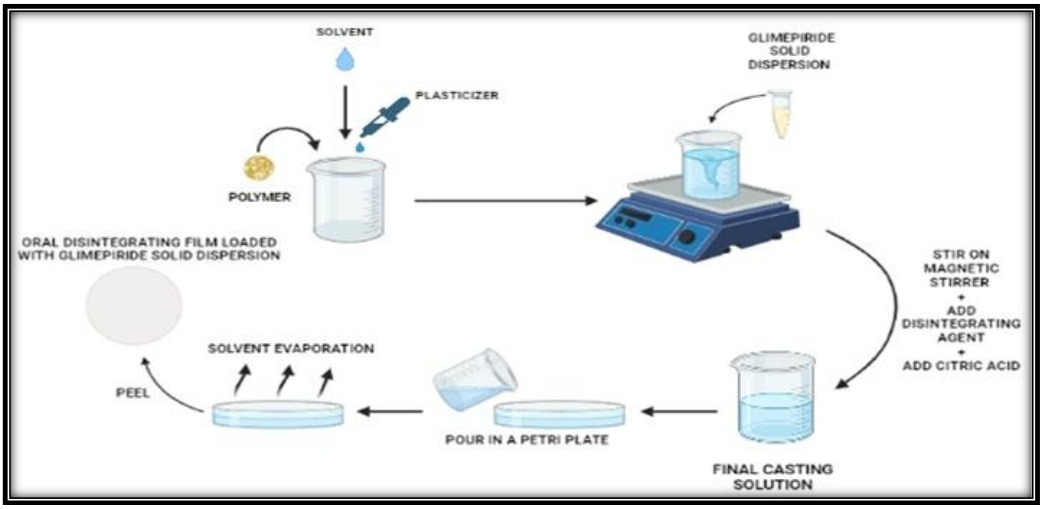

Figure 4: Solid dispersion extrusion

6.5 Rolling method

In this method the film is prepared by preparation of a pre-mix, addition of an active and subsequent formation of a film. Prepare pre-mix with film forming polymer, polar solvent and other additives except a drug Add pre mix to master batch feed tank. Fed it via a 1st metering pump and control valve to either or both of the 1st and 2nd mixer. Add required amount of drug to the desired mixer.Blend the drug with master batch pre mix to give a uniform matrix. Then a specific amount of uniform matrix is then fed to the pan through 2nd metering pumps. The film is finally formed on the substrate and carried away via the support roller. The wet film is then dried using controlled bottom drying**(Rekha *et al.*, 2023).**

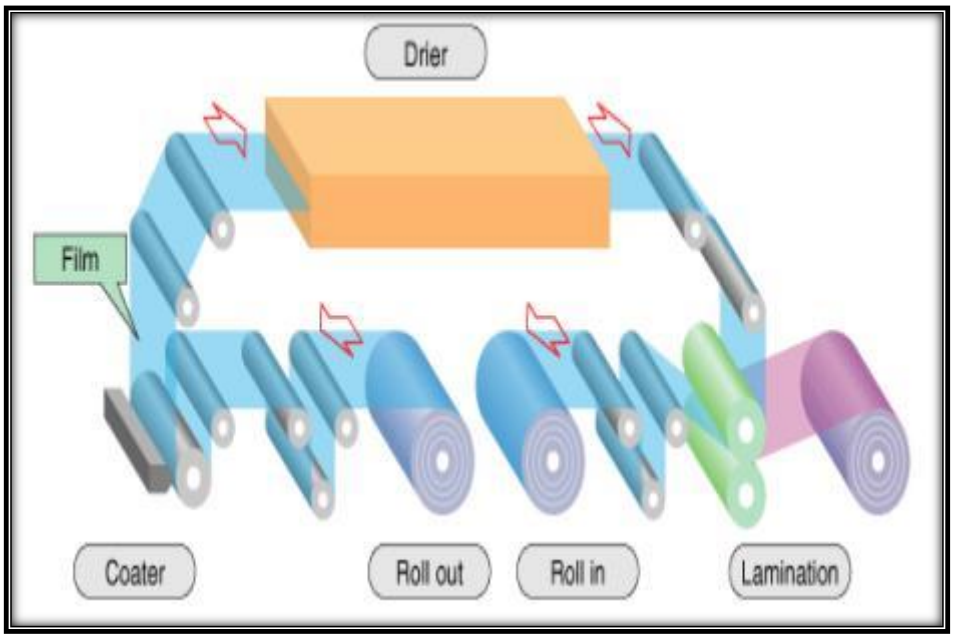

Figure 5: Rolling method

VII. EVALUATION OF FAST DISSOLVING FILMS

7.1 Organoleptic evaluation:

For evaluation of the product, special controlled human taste panels are used. Invitro methods of utilizing taste sensors, are being used for this purpose. These invitro taste assessment apparatus and methodologies are well suited for high-throughout taste screening of oral

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films**(Guedes *et al.*, 2021).**

7.2 Mechanical properties:

- **Thickness**

The thickness of strip can be measured by micrometer screw gauge at different strategic locations. This is essential to ascertain uniformity in the thickness of the film as this is directly related to the accuracy of dose in the strip **(Reddy *et al.*, 2018).**

- **Dryness test/tack test**

Tack is the tenacity with which the strip adheres to an accessory (a piece of paper) that has been pressed into contact with the strip.

- **Tensile Strength**

Tensile strength is the maximum stress applied to a point at which the strip specimen breaks. It is calculated by the applied load at rupture divided by the cross-sectional area of the strip as given in the equation below: **(Huang *et al.*, 2021).**

Tensile strength = Load at failure × 100 /Strip thickness × Strip width

- **Percent Elongation**

When stress is applied, a strip sample stretches and this is referred to as strain. Strain is basically the deformation of strip divided by original dimension of the sample. Generally elongation of strip increases as the plasticizer content increases**(Mahboob*et al.*, 2016).**

- **Tear Resistance**

Tear resistance of plastic film or sheeting is a complex function of its ultimate resistance to rupture. Basically very low rate of loading 51 mm (2 in)/min is employed to measure the force to initiate tearing. The maximum stress or force (that is generally found near the onset of tearing) required to tear the specimen is recorded as the tear resistance value in Newtons (or pounds-force)**(Mallegni*et al.*, 2018).**

7.3 Swelling property:

Film swelling study is conducted using simulated saliva solution. Each film sample is weighed and placed in a preweighed stainless steel wire mesh. The mesh containing film sample is submerged into 15ml medium in a plastic container. Increase in the weight of the film is determined at preset time interval until a constant weight is observed**(Rojewska*et al.*, 2017).**

7.4 Transparency:

The transparency of the films can be determined using a simple UV spectrophotometer. Cut the film samples into rectangles and placed on the internal side of the spectrophotometer cell. Determine the transmittance of films at 600 nm**(Zhao *et al.*, 2022).** The transparency of the films can be calculated as follows:

Transparency = (logT600)/b = - €c

Where T600 is the transmittance at 600 nm, b is the film thickness (mm) and c is concentration

7.5 Contact Angle:

Contact angle measurements are performed at the room temperature with a goniometry. A drop of double distilled water was placed on the surface of the dry film. Images of the water droplet were recorded by means of digital camera, digital images are analyzed by the image 1.28v software for angle determination**(Vuckovac*et al.*, 2019).**

7.6 Assay/ Content uniformity:

This is determined by any standard assay method described for the particular API in any of the standard pharmacopoeia. Content uniformity is determined by estimating the API content in individual strip. Limit of content uniformity is 85–115 percent**(Jakubowska and Ciepluch, 2021).**

7.7 Disintegration Time:

The disintegration time limit of 30 s or less for orally disintegrating tablets described in CDER guidance can be applied to fast dissolving oral strips. Although, no official guidance is available for oral fast disintegrating films/strips, this may be used as a qualitative guideline for quality control test or at development stage. Pharmacopoeial disintegrating test apparatus may be used for this study. Typical disintegration time for strips is 5–30 s. **(Saharan *et al.*, 2017).**

7.8*In-vitro* Dissolution Test:

Dissolution testing can be performed using the standard basket or paddle apparatus described in any of the pharmacopoeia. The dissolution medium will essentially be selected as per the sink conditions and highest dose of the API. Many times dissolution test can be difficult due to tendency of the strips to float on the dissolution medium where paddle system is used**(Gray, 2022).**

VIII. APPLICATION OF FAST DISSOLVING FILM

Oral mucosal delivery via Buccal, sublingual, and mucosal route by use of FDFs could become a preferential delivery method for therapies in which rapid absorption is desired, including those used to manage pain, allergies, sleep difficulties, and central nervous system disorders. Dissolvable FDFs evolved over the past few years from the confection and oral care markets in the form of breath strips and became a novel and widely accepted form by

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consumers for delivering vitamins and personal care products**(Bahraminejad and Almoazen 2025).**

8.1 Topical applications:

The use of dissolvable films may be feasible in the delivery of active agents such as analgesics or antimicrobial ingredients for wound care and other applications.

8.2 Gastro retentive dosage systems:

Dissolvable films are being considered in dosage forms for which water-soluble and poorly soluble molecules of various molecular weights are contained in a film format. Dissolution of the films could be triggered by the pH or enzyme secretions of the gastrointestinal tract, and could potentially be used to treat gastrointestinal disorders**(Panraksa*et al.*, 2020).**

8.3 Diagnostic devices:

Dissolvable films may be loaded with sensitive reagents to allow controlled release when exposed to a biological fluid or to create isolation barriers for separating multiple reagents to enable a timed reaction within a diagnostic device**(Dincer*et al.*, 2019).**

IX. KETOROLAC TROMETHAMINE

Ketorolac Tromethamine is a potent non-steroidal anti-inflammatory drug (NSAID) widely used for the short-term management of moderate to severe pain. It is chemically known as a pyrrolizine carboxylic acid derivative and possesses strong analgesic, anti-inflammatory, and antipyretic activities. The drug acts primarily by inhibiting cyclooxygenase (COX-1 and COX-2) enzymes, thereby suppressing the synthesis of prostaglandins responsible for pain, inflammation, and fever. Due to its rapid and effective analgesic action, Ketorolac Tromethamine is commonly prescribed for postoperative pain, dental pain, musculoskeletal disorders, orthopedic pain, and other acute inflammatory conditions **(Ghirardo*et al.*, 2023).**

Ketorolac Tromethamine is a water-soluble NSAID that exhibits good dissolution characteristics, making it a suitable candidate for fast dissolving oral drug delivery systems. The drug is generally administered for short-term therapy because prolonged use may increase the risk of gastrointestinal complications such as gastric irritation, ulceration, and bleeding. Conventional oral dosage forms such as tablets and capsules may also show delayed onset of action due to the time required for disintegration and dissolution in the gastrointestinal tract. Furthermore, swallowing difficulties among pediatric, geriatric, and dysphagic patients can reduce patient compliance and therapeutic effectiveness**(Mostafa *et al.*, 2020).**

The development of fast oral dissolving films of Ketorolac Tromethamine offers a promising alternative to conventional dosage forms. Oral films rapidly hydrate and dissolve in the oral cavity without the need for water, leading to faster drug release and quicker onset of analgesic action. In addition, fast dissolving films improve patient convenience, ease of administration, and compliance, especially among patients who have difficulty swallowing solid dosage forms. Therefore, Ketorolac Tromethamine is considered an ideal candidate for fast oral dissolving film formulations intended for rapid pain management and improved therapeutic performance**(Siddiqui *et al.*, 2022).**

X. LOCUST BEAN GUM

Locust Bean Gum (LBG), also known as carob gum, is a natural polysaccharide obtained from the seeds of *Ceratoniasiliqua*, commonly known as the carob tree. It is mainly composed of galactomannan units containing mannose and galactose residues. Due to its natural origin and excellent physicochemical properties, Locust Bean Gum has gained considerable importance in pharmaceutical formulations, particularly in oral drug delivery systems**(Hasnain *et al.*, 2019).**

10.1 Properties of Locust Bean Gum

Locust Bean Gum possesses several desirable pharmaceutical properties that make it suitable for formulation development.

- **Natural Polymer:** LBG is a naturally occurring polymer obtained from plant sources, making it eco-friendly and safe for pharmaceutical use.
- **Non-Toxic and Biodegradable:** The polymer is non-toxic, biodegradable, and biocompatible, which ensures safety and minimizes adverse effects during administration (**Idrees *et al.*, 2020).**
- **Excellent Swelling Property:** LBG exhibits high swelling capacity in the presence of water, which helps in rapid hydration and drug release from oral films.
- **Good Film-Forming Ability:** The polymer forms smooth, flexible, and uniform films, making it suitable for oral thin film formulations (**Chandramouli*et al.*, 2022).**
- **Biocompatibility:** Locust Bean Gum is compatible with biological tissues and does not produce irritation or toxicity, enhancing patient acceptability.

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- **Mucoadhesive Property:** LBG exhibits mucoadhesive characteristics that improve retention and contact of the formulation with the oral mucosa.
- **Thickening and Stabilizing Agent:** The polymer acts as an effective thickening and stabilizing agent by increasing viscosity and maintaining formulation uniformity (**Garcia*et al.*, 2019).**

10.2 Pharmaceutical Applications of Locust Bean Gum

Due to its multifunctional properties, Locust Bean Gum is widely used in pharmaceutical formulations.

- **Binder in Tablets:** LBG is used as a binding agent to improve tablet hardness and integrity.
- **Controlled Release Agent:** The polymer is employed in sustained and controlled-release formulations because of its swelling and gel-forming properties (**Abdeltawab*et al.*, 2020).**
- **Stabilizer:** It helps stabilize pharmaceutical suspensions, emulsions, and polymeric systems.
- **Suspending Agent:** LBG improves viscosity and prevents sedimentation in liquid formulations.
- **Film-Forming Polymer:** Its excellent film-forming ability makes it suitable for oral films, transdermal patches, and coating applications.
- **Mucoadhesive Formulations:** The polymer is used in buccal, nasal, and oral mucoadhesive drug delivery systems to enhance drug retention and absorption (**Subramanian *et al.*, 2022).**

XI. CONCLUSION

Fast oral dissolving films represent an advanced and effective oral drug delivery system capable of providing rapid drug release, improved bioavailability, and enhanced patient compliance. Ketorolac Tromethamine is a suitable candidate for oral film formulation because of its analgesic potency, water solubility, and requirement for rapid onset of action. Locust Bean Gum, being a natural, biodegradable, and biocompatible polymer, offers excellent film-forming and mechanical properties suitable for oral thin films. The use of Locust Bean Gum in fast dissolving films may improve flexibility, mechanical strength, drug release characteristics, and overall pharmaceutical performance. Therefore, the preparation and evaluation of fast oral dissolving films of Ketorolac Tromethamine using Locust Bean Gum represents a promising approach for rapid and patient-friendly pain management therapy.

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