A Compressive Review On: Natural Superdisintegrant in Fast Dissolving Tablet.

Miss. Sadiya. S. Inamdar*1, Miss. Shreya. S. Jadhav*2, Miss. Rachana. S. Das*3

*1,2 Students, Department of Pharmaceutics, JBVPS Vidya Niketan College of Pharmacy Lakhewadi , India

*3 Assistant Professor, Department of Pharmaceutics, JBVPS Vidya Niketan College of Pharmacy Lakhewadi , India.

ABSTRACT

Fast-dissolving tablets, a new trend in creative medication delivery systems, have become more and more necessary during the last few decades. Superdisintegrants are used in oral disintegrating tablets to improve the breakdown and efficacy of solid dose forms. Natural polymers are safer and more efficient due to their biocompatibility and biodegradability. Natural polymers are less costly, non-irritating, and non-toxic. Natural polymers such locust bean gum, banana powder, mango peel pectin, psyllium, and Hibiscus rosa sinenses mucilage improve the tablet's properties. These excipients have been employed as binder, diluent, and superdisintegrant. These compounds reduce the time needed for disintegration, enhance the solubility of drugs that aren't highly soluble in water, These natural alternatives function well as superdisintegrants in the production of fast-dissolving tablets and offer the advantages of being less expensive and biocompatible than synthetic excipients.

KEYWORDS: fast-dissolving tablet, natural polymer, superdisintegrant, non-irritating, and biocompatible.

INTRODUCTION:

Researchers recently created fast-disintegrating pills that improve patient compliance and convenience. Solid dose forms known as "fast-dissolving tablets" dissolve rapidly in saliva without the need for additional water or chewing. Fast-disintegrating tablets lessen the disadvantages of conventional dosage forms, especially in patients with dysphagia (difficulty swallowing) who are older or younger. Because they are readily available, nontoxic, chemically inert, and biodegradable, natural materials are superior than synthetic ones.[1] By choosing suitable dose forms, support materials, and production technology, fast-disintegrating tablet properties can be achieved. The absorption and start of the therapeutic effect happen more quickly when the medicine dissolves more quickly. Certain medications are absorbed from the mouth as saliva travels to the stomach. In these situations, the drug's bioavailability is noticeably higher than that of traditional tablet dose forms. The benefits of mouth-dissolving dosage forms are becoming more widely acknowledged in both academia and industry. Superdisintegrants, such as cross-linked carboxymethylcellulose (croscarmellose), sodium starch glycolate (primogel, explotab), polyvinylpyrrolidone (polyplasdone), etc., provide instantaneous tablet disintegration after being placed on the tongue, releasing the medication into saliva. This is the fundamental method used in the development of FDT.[2] The use of natural gums and mucilages as pharmacological excipients has been extensively studied. The pharmaceutical industry frequently uses them as thickeners, emulsifiers, stabilizers, gelling agents, granulating agents, suspending agents, binder, film formers, disintegrants, and sustained release matrices. There is a growing need for these natural resources, and new ones are being created. In the realm of drug delivery, natural gums and mucilages are favored over semi-synthetic and synthetic excipients due to their affordability, accessibility, calming properties, and lack of irritation. Additionally, because of their natural nature, they are compatible, eco-friendly, and capable of a wide range of chemical alterations. They may also decompose. Pediatric, elderly, bedridden, or intellectually challenged patients with dysphagia have typically been the target groups for these oral disintegrating dose forms. FDTs are also a useful option for patients who experience chronic nausea, abrupt episodes of coughing or allergic reactions, are traveling, or have limited or no access to water. These tablets are widely used as the preferred dosage form in the present market due to their advantages in terms of patient compliance, quick onset of action, enhanced bioavailability, and high stability. [3]

SUPERDISINTEGRANT:

Disintegrating agents are materials that are frequently added to tablet formulations seto help break apart the compacted mass into the primary particles so that the active chemicals can dissolve or be released when the tablet is placed in a fluid environment. They support the tablet matrix's dispersion and penetration of moisture. The disintegrant's primary purpose is to counteract The tablet binder's effectiveness and the physical forces that form the tablet during compression.[4]

TYPE OF SUPERDISINTEGRANT

1. Natural
2. Synthetic
3. Semi-synthetic

NATURAL SUPERDISINTEGRANT:

In order to facilitate the release of the medicine into the systemic circulation, natural superdisintegrants are added in dose form. They encourage the breakdown of the plug particle by increasing the water wicking into the sludge. Adding a tablet, capsule, or other natural disintegrant. Drug release is facilitated by the formulation, which makes it more resilient to the unavoidable variations in excipient qualities. Water Superdisintegrants come in a variety of forms depending on where they came from. Compared to synthetic agents, natural agents have higher benefits. It is nontoxic, non-irritating, safe, affordable, biodegradable, and a nutritional supplement.[5]

SELECTION CRITERIA OF NATURAL SUPERDISINTEGRANT:

- It ought to dissolve in a few seconds.
- It should have a pleasant mouthfeel.
- It should be able to form gel poorly and have a greater capacity for hydration.
- It shouldn't result in any drug complexes.
- It ought to work well with every other excipient.
- It should offer favorable flow characteristics .[6]

table.1. comparative overview of natural superdisintegrant with their marketed drug

Sr no.	Name of the polymer	Concentration	Marketed Drug
1.	Mango peel powder	0.1- 4 % W/W	Aceclofenac, diclofenac, sodium furosemide, Ibuprofen.
2.	Soy polysaccharide	8 % W/W	Atovastatin, sildenafil, Ibuprofen.
3.	Banana powder	6 % W/W	Ondansetron HCL, propranolol, Ibuprofen.
4.	Guar gum	1 % W/W	Glipizide
5.	Agar	1 – 2% W/W	Theophylline
6.	Fenugreek seed mucilage	4 % W/W	Metformine HCL
7.	Lepidium sativum mucilage	5 – 15 % W/W	Nimesulide
8.	Hibiscus rosa sinensis	6 % W/W	Aceclofenac
9.	Plantago ovata seed mucilage	5 % W /W	Granisetron HCL
10.	Chitosan	3 % W/W	Cinnarizine

IDEAL CHARACTERISTICS:

(i) They should dissolve in a few seconds when placed in the mouth.
(ii) They shouldn't require water to disintegrate.
(iii) They must provide precise dosage because they are unit dose formulations.
(iv) Quick oral absorption and disintegration.
(v) physically and chemically stable.
(vi) Standard equipment is used to create tablets at a minimal cost.
(vii) Less vulnerable to outside influences like humidity and temperature.
(viii) They should be less brittle and maintain their hardness.[7]

ADVANTAGES:

- Promote rapid tablet disintegration.
- Improve drug dissolution and bioavailability.
- Effective at low concentration (1–10%).
- Suitable for direct compression.
- Enhance patient compliance, especially in ODTs.
- Do not form gels, ensuring faster breakup.
- Maintain tablet hardness while reducing disintegration time.
- Work well in both wet granulation and direct compression methods.[8]

DISADVANTAGES:

- Moisture sensitivity: A lot of superdisintegrants take in moisture, which might make tablets less stable or hard.
- Costlier: Compared to traditional disintegrants, they are more costly.
- Possible over-swelling: Tablet breaking, capping, or friability problems could result from excessive swelling.
- Incompatibility with specific medications or excipients: Some may interact with very hygroscopic or ionic substances.
- Efficiency loss at extremely high compression forces: Excessive compression can impede disintegration and decrease porosity.
- It might need to be handled carefully: Some require glidants because they are fine powders with poor flow.[9]

MECHANISM OF NATURAL SUPERDISINTEGRANTS:

1. SWELLIMG:

Swelling is possibly the most extensively recognized general mechanism of action for tablet disintegration. Due to insufficient swelling force, tablets with high porosity exhibit poor disintegration. In contrast, the tablet with poor porosity experiences enough swelling force. It is important to remember that a very high packing fraction prevents moisture from penetrating the pill and slows down disintegration once again. Internal pressure increases within the compact tablet structure as the particles inflate. The created pressure is directed outward due to the surrounding matrix's restriction of expansion, which causes inter-particle connections to collapse and the tablet to disintegrate into

granules and ultimately fine particles. This larger surface area facilitates quicker drug release from the dosage form by allowing the dissolving media to penetrate more quickly.[10]

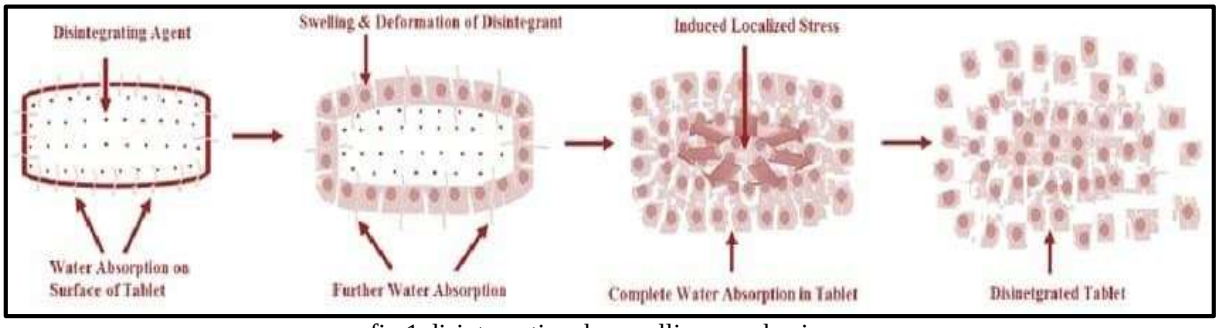

fig.1 disintegration by swelling mechanism

2. WICKING:

Certain disintegrants work by means of capillary action and porosity. The adsorbed air on the particles will be replaced by the aqueous medium when the tablet is exposed to it. The tablet's intermolecular bonds will weaken as a result, and the dosage form will fragment. Through capillary action, liquid is pulled up or "wicked" into these routes, rupturing interparticulate connections and causing the tablet to disintegrate. For instance, Cross carmillose and Crospovidone.[11]

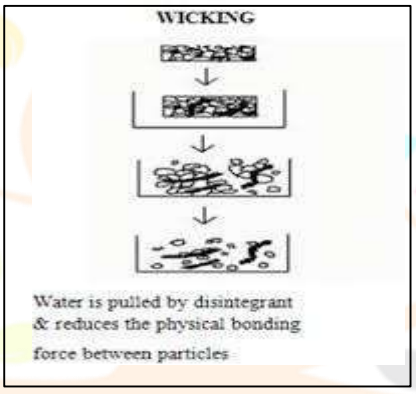

fig 2. disintegration by wicking mechanism.

3. DEFORMATION:

The deformation mechanism of tablet disintegration is based on the ability of certain excipients to undergo plastic deformation during compression and later recover their original structure upon hydration. When the tablet is compressed, particles such as starch or crospovidone become flattened or distorted, storing elastic energy within the matrix. As water penetrates the tablet, these deformed particles attempt to regain their initial shape, generating internal stress that weakens the bonding forces between particles. This stress leads to the formation of cracks and ultimately causes the breakup of the tablet into smaller fragments. This mechanism is particularly important for excipients that exhibit significant elastic recovery and often works synergistically with other mechanisms such as swelling and wicking, contributing to rapid disintegration.[12]

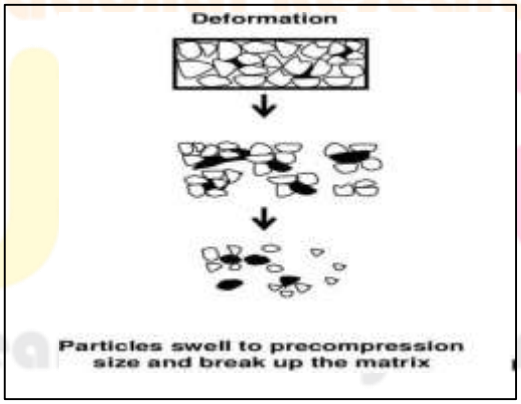

fig 3. disintegration by deformation mechanism

4. PARTICLE REPULSION FORCES:

The repulsion mechanism of tablet disintegration is associated with the generation of electrostatic or hydration forces within the tablet matrix when it comes into contact with water. Certain disintegrants contain functional groups capable of forming electrical charges or repulsive hydration layers upon wetting. As water penetrates the tablet, these groups ionize or hydrate, producing repulsive forces between adjacent particles. This particle–particle repulsion reduces cohesive interactions and disrupts the structural integrity of the compact. The resulting internal stress causes separation of particles, formation of micro-fractures, and ultimately rapid disintegration.[13]

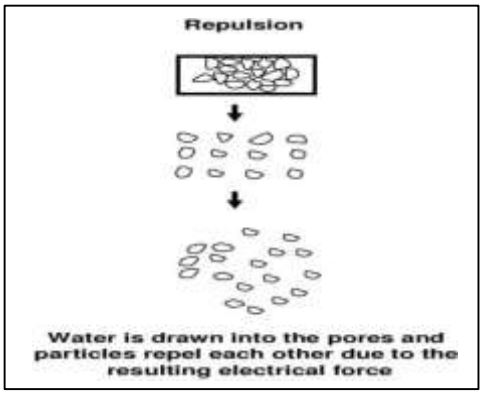

fig 4. disintegration by repulsion mechanism

5. ENZYMETIC REACTION:

Certain excipients—particularly natural polymers such as starch, gums, and cellulose derivatives—are susceptible to enzymatic degradation by enzymes like amylase, protease, or cellulase. When the tablet enters the GI environment, these enzymes act on the polymeric backbone, gradually reducing the structural integrity of the compact. The enzymatic cleavage weakens interparticulate bonds and decreases the viscosity or cohesiveness of the matrix, ultimately facilitating its breakup into smaller fragments. Although this mechanism usually plays a supportive role alongside swelling or wicking, it becomes significant when the formulation contains biodegradable natural disintegrants that are highly responsive to enzymatic action.[14]

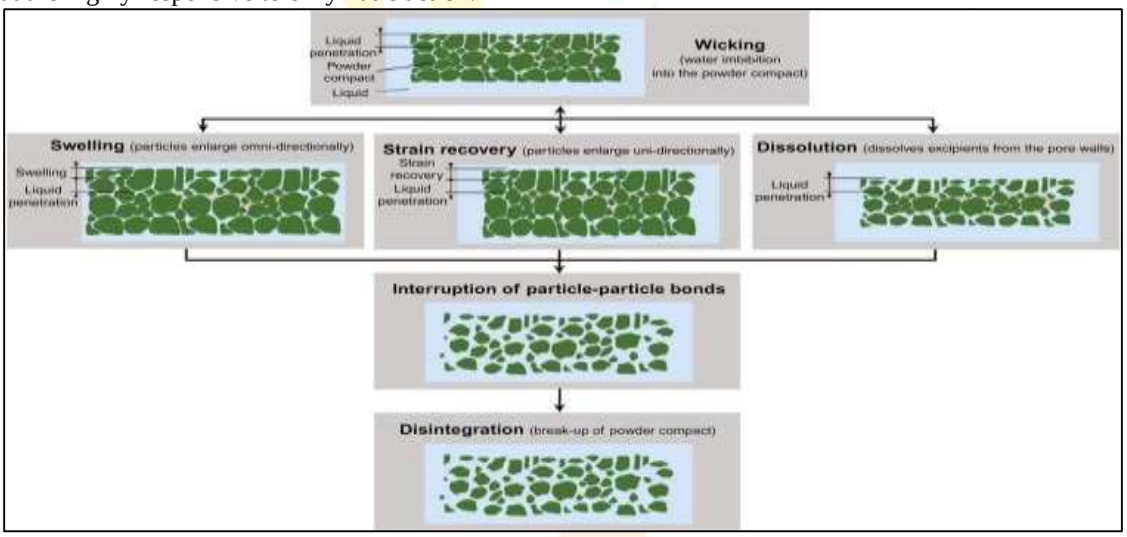

fig5. mechanism of superdisintegrant

NATURAL SUPERDISINTEGRANTS ARE USED IN FAST-DISSOLVING TABLETS

1. MANGO PEEL PECTIN:

Mango peel pectin Mango peel, which accounts for 20–25% of the waste produced during the processing of mangos, has been found to be a valuable source for the extraction of high-quality pectin that can be used to make film and appetizing jelly. Pectin is an involute heteropolysaccharide that is a hydrophilic colloid. Malviya et al. (2011) found that pectin from mango peels is a suitable candidate for a superdisintegrant. Although it lacks the strength of synthetic superdisintegrants, its high swelling index and outstanding solubility make it a promising candidate for use in the manufacturing of fast-dispersible tablets. Mucilage and pectin are the most commonly used adjuvants in the manufacturing of several pharmaceutical dosage forms. They possess a broad range of pharmacological qualities, including the ability to bind, disintegrate, suspend, emulsify, and maintain in different quantities, in a variety of medicinal dose forms. The manufacturing of the synthetic polymers employed as excipients, however, has resulted in environmental contamination, toxicity, nonbiodegradability, and high cost. Natural pulps, pectin, and mucilage are preferred over semi-synthetic and synthetic materials because they are non-toxic, affordable, easily accessible, emollient, and non-irritating. Because of its high solubility in biological fluid and better swelling index, pectin from mango peels can be employed to create rapidly dispersible tablets even if it is not a promising superdisintegrant . To increase patient adherence and lessen side effects, Shirsand et al. created and evaluated furosemide fast-dissolving pills. Fast-dissolving furosemide tablets were made for this study using the direct compression method, with pectin from mango peels (Mangifera indica) serving as a natural disintegrant and crospovidone serving as a synthetic superdisintegrant for comparison.[15]

2. BANANA DEHYDRATED POWDER:

Powdered dehydrated bananas Bananas are also known as plantains. DBP comes from the Nethran (Nenthra vazha) and Ethan banana types and belongs to the Musaceae family. Because it contains vitamin A, it is used to treat stomach ulcers and diarrhea. It also contains vitamin B6, which reduces solicitousness and tension. It is a great source of energy due to its high carbohydrate content, and it also contains potassium, which is responsible for more dominant brain activity. Bananas are a particularly nutrient-dense fruit with several medicinal applications. Banana powder's main ingredients include polysaccharides, citric acid, and ascorbic acid amines**.** Dehydrated banana powder (DBP) is made specifically from the banana variety known as Ethan or Nenthran, which belongs to the musaceae family. It is a well-liked and natural dietary supplement since it contains a number of essential ingredients, including vitamins and minerals. Fully ripened banana pulp contains 33.6% reducing sugar, 53.2% sugar, 5.52% proteins, 0.68% lipids, 0.3% fiber, 2.6% starch, and 4.09% ash. Bharathi et al. introduced and evaluated a natural excipient using Telmisartan as a model medication. with a variety of ODT characteristics. They produced ODTs of Telmisartan in different concentrations—2%, 4%, and 6%—using the wet granulation procedure in conjunction with a synthetic superdisintegrant, sodium starch glycolate, and a natural disintegrating agent, like banana powder.

The tablets were evaluated for

precompression parameters such as bulk density, compressibility, angle of repose, and so forth, and postcompression parameters such as hardness, weight variation, friability, disintegration time, and in-vitro dissolution profiles.[16]

3. SOY POLYSACCHARIDE:

The high fibrous soy polysaccharide material is composed of high relative molecular mass carbohydrate polymers, primarily found in soybeans, such as arabinose, galactose, xylose, and mannose. The fibrous carbohydrate material made from the structural components of soybean cell membranes, such as soy flakes, flour, or meal, is usually referred to by this broad term. Since it contains neither sugar nor starch, it can be utilized in nutritional products. Halakatti et al. 2010 evaluated soy polysaccharide, a type of high molecular weight polymer produced from soy beans, as a disintegrant in tablets made by direct compression with lactose and dicalcium phosphate dihydrate as fillers. As control disintegrants, corn starch and sodium carboxymethyl cellulose that had been cross-linked were employed. Soy polysaccharide functions well as a disintegrating agent in direct compression formulations, yielding results that are similar to those of cross-linked CMC. 95.6% of the drug was found to have been discharged. The generated SC sublingual pill not only started working quickly, but it also had a 1.68-fold better bioavailability than the tablets that were sold commercially. We may infer that the SC sublingual tablet is a promising formulation that results in greater solubility. As control disintegrants, cross-linked sodium carboxymethyl cellulose and corn starch were used. Soy polysaccharide works well as a disintegrating agent in compositions that include direct compression.[17]

WHY NATURAL SUPERDISINTEGRANTS ARE UNIQUE?

1. Structural Complexity & Biopolymeric Architecture: Natural superdisintegrants, such as gums, mucilages, and polysaccharides, include complex molecular structures, such as hemicelluloses, arabinoxylans, and branching polysaccharide chains, which are frequently absent from synthetic ones. For example, the arabinoxylans (xylan backbone with arabinose, rhamnose, and galacturonic acid) found in Plantago ovata mucilage give it a high capacity for swelling and water absorption. Multimodal hydration is made possible by this architecture, which speeds up breakdown by allowing both swelling and capillary water absorption.[18]

2. Hybrid Disintegration Mechanisms: While classical superdisintegrants employ mechanisms such as swelling or capillary wicking, natural polymers frequently combine these mechanisms in a synergistic way: their micro-porous structure and branched chains enable quick water penetration (wicking), and once water enters, they swell significantly, producing pressure from within. Elastic recovery or deformation-based disintegration, in which compressed particles regain shape after compression and aid in tablet breakage, is another method used by certain natural disintegrants (such as chitosan). Enzymatic contributions: Insomedesigns, natural disintegrants may be broken or have their structure altered by salivary or gastrointestinal tract enzymes.[19]

3. Outstanding Swelling Capacity: Research indicates that Plantago ovata mucilage has a higher swelling index than a number of artificial superdisintegrants, such as croscarmellose sodium or sodium starch glycolate. Natural polymers' hydrophilic groups, branching, and porosity give them a strong swelling power that enables them to swiftly absorb huge amounts of water.[20]

4. Biocompatibility and Safety: Natural superdisintegrants are typically non-toxic, biodegradable, and more suitable for regulatory approval in "green" or patient-friendly formulations because they come from plant or microbial sources. They frequently serve as multifunctional excipients rather than merely disintegrants. For example, some mucilages can serve as both a disintegrant and a binder, which lowers the amount of excipients required.[21]

5. Better Mouthfeel & Sensory Experience: These polymers' natural origin and hydration behavior can result in a softer, more enjoyable mouthfeel. Generally speaking, they don't produce sharp or gritty particles like some artificial disintegrants might. Reviews of orodispersible pills containing natural disintegrants frequently address this.Certain mucilages have a gel-forming tendency that can cushion the medication particles, lowering the possibility of a chalky or abrasive feeling.

6. Sustainability & Cost Advantage: Because natural superdisintegrants may frequently be obtained at a low cost (for example, from agricultural byproducts), formulations become more economical and sustainable. Because of their renewable nature, they support "green pharmaceutical" projects and meet the growing need for environmentally friendly excipients.

7. Tailored Functionality by Modification: Formulators have a great deal of flexibility because natural polymers can be chemically or physically altered (e.g., partial crosslinking, co-processing) to adjust their swelling rate, porosity, or mechanical performance.Natural superdisintegrants can be designed to fit extremely particular disintegration profiles (rapid, but not too fast; or controlled disintegration under certain pH or moisture conditions) thanks to their tunability.

8. Demonstrated Efficacy in Real Formulations : Rizatriptan orodispersible tablets were made using Plantago ovata mucilage in an actual formulation; the optimum formulation disintegrated in 35 seconds and demonstrated ~99% drug release in 5 minutes.Another study found that ondansetron mouth-dissolving tablets made with Plantago ovata mucilage might dissolve in as little as 7 seconds .These empirical findings demonstrate that natural superdisintegrants are both theoretically and practically promising.[22]

9. Batch-to-Batch Variability as an Opportunity: Although natural polymer variability (caused by season, extraction, or source) is sometimes viewed as a drawback, it can also be used as a design variable. For instance, various mucilage batches may have slightly varying swelling kinetics; formulators might select or combine these to maximize disintegration performance. This is a fresh way of thinking: if adequately described, unpredictability is not only a risk but also a controllable parameter.

10. Regulatory and Patient Trust: In markets or among populations who favor natural or plant-based products, the use of "natural" excipients can enhance patient acceptability and perception. Many natural gums and mucilages are already well-established (or "GRAS" in many jurisdictions) from a regulatory perspective, which lessens the regulatory burden compared to entirely new synthetic polymers.

EXTRACTION AND PURIFICATION OF NATURAL SUPERDISINTEGRANTS

1. PRE-TREATMENT METHOD:

Because pre-treatment directly affects the yield, purity, functional performance, and reproducibility of the separated biopolymers, it is an essential first step in the extraction and purification of natural superdisintegrants. Both structural and non-structural contaminants, including as fibers, lignin, proteins, lipids, colorants, and environmental pollutants like dust, soil, and bacteria, are naturally present in raw botanical materials like seeds, leaves, bark, tubers, and fruit peels. These extraneous components reduce extraction efficiency by blocking solvent penetration, decreasing polymer solubility, and influencing the physicochemical properties of the final product, such as swelling index, hydration capacity, and disintegration potential. As a result, thorough and scientifically planned pre-processing is required prior to extraction.

a) Cleaning and Sorting: The goal of cleaning and sorting is to get rid of any external objects that could lower the extracted

polymer's quality. In order to prevent the introduction of inorganic pollutants or microbiological load into the extract, it is necessary to remove dirt, stones, plant debris, dust particles, and infected or damaged plant parts. Cleaning is usually done by hand sorting to get rid of apparent contaminants, then washing with cold water to get rid of surface debris. However, for very water-soluble mucilage sources, this step is skipped to avoid losing active ingredients too soon. Additionally, air aspiration effectively eliminates light impurities like chaff and dried plant fragments, guaranteeing overall material uniformity, while sieving is specifically employed for seeds to separate broken or undersized particles.[23]

b) size reduction (grinding or milling): Increasing the surface area of the plant material through size reduction (grinding or milling) improves solvent accessibility and encourages plant cell wall breakage during extraction. Depending on the botanical nature of the material, mechanical grinding with tools like hammer mills, knife mills, or lab blenders turns it into a coarse or fine powder. In order to achieve consistent extraction kinetics, a homogeneous particle size distribution is obtained by passing this powdered material through suitable sieves, usually 40–80 mesh. In addition to improving the diffusion of water or solvents into the plant matrix, proper size reduction guarantees the effective release of intracellular polysaccharides and mucilage bodies that are responsible for superdisintegrant activity.

c) Defatting: Because the presence of oils can impede extraction efficiency, lower the purity of the isolated polymer, and produce viscous or sticky filtrates that affect downstream purification, the defatting phase is carried out. While ethanol is frequently chosen as a safer and more environmentally friendly substitute, defatting entails processing the powdered plant material with non-polar organic solvents, most frequently petroleum ether or hexane. To solubilize and eliminate lipids, the powdered material is steeped, agitated, or refluxed with the chosen solvent for two to six hours. Following extraction, the solvent is filtered or decanted, and any remaining solvent is eliminated by drying the defatted residue at a regulated temperature. [24]

2. EXTRACTION:

A) Hot water extraction

Extraction of Hot Water (HWE) most used method for gums and mucilages. Concept: When plant tissues are boiled or cooked to a high temperature (60–95°C), polysaccharides disintegrate. Heat softens cell walls and releases soluble polysaccharides. Method: Hot or boiling water is combined with pre-treated plant powder. Reflux or stirring is used for one to three hours. The extract is filtered using a vacuum filter or muslin cloth. Use alcohol (ethanol/isopropanol) to concentrate and precipitate. Uses: Okra mucilage Mucilage from hibiscus Plantago ovata's isapghula husk gel Aloe vera mucilage Benefits Low price Easy to use and expandable Restrictions Extended duration of extraction Thermolabile polysaccharides may be broken down by heat. Filtration is challenging due to high viscosity.

B) cold water extraction

Extraction of Cold Water used for heat-sensitive materials (such as isapghula and chia seeds). Concept: Without heat, polysaccharides naturally hydrate and spread into cold water. Benefits Absence of thermal deterioration Restrictions Extremely slow procedure Reduced yield.[25]

a. Acid/Alkaline extraction

Extraction of Cold Water used for heat-sensitive materials (such as isapghula and chia seeds). Concept: Without heat, polysaccharides naturally hydrate and spread into cold water. Benefits Absence of thermal deterioration Restrictions Extremely slow procedure Reduced yield.

b. enzyme-assisted extraction (EAE) is that certain connections in cell walls are broken by enzymes such cellulase, pectinase, and protease, which makes it easy to liberate polysaccharides. Method: At a particular pH and temperature, raw material is combined with an enzyme solution. 30–50°C for incubation. Precipitate the polysaccharide after filtering it. Benefits Superior purity Selective extraction Reduced use of energy Betterswelling/disintegration behavior is maintained by functional groups. Limitations: The cost of enzymes Optimization is required for every plant material. Uses: Aloe vera mucilage from cacti Polysaccharide from tamarind seeds.

C) Microwave-Assisted Extraction (MAE) Principle: Intracellular water is quickly heated by microwave energy,which causes cell rupture and the quick release of polysaccharides. Benefits High productivity Minimal extraction time (minutes as opposed to hours) Reduced solvent usage Strong polymer chain preservation Restrictions Overheating risk needs regulated circumstances Ideal for: Mucilage from fenugreek seeds Mucilage from hibiscus Flaxseed.[26]

D) Extraction Assisted by Ultrasound (UAE) Principle: Plant cell walls are disrupted by ultrasonic waves (20–40 kHz), which cause cavitation and enhance polysaccharide release. Benefits Increased efficiency of extraction Improved viscosity preservation reduced temperature in contrast to HWE Restrictions Depolymerization could result from high-power ultrasound. Applications: starch from okra, cacti, and jackfruit seeds.

E) Extraction of Supercritical Fluid (SFE) Principle: Lipophilic contaminants are eliminated and bioactive polymers are extracted using supercritical CO2 with ethanol as a co-solvent. Benefits Extremely pure extract Solvent-free and environmentally friendly can be combined with additional aqueous extraction Restrictions Expensive equipment High-molecular-weight gums are less effective Use: As a seed pre- extraction stage (defatting before mucilage extraction.

F) Accelerated Solvent Extraction (ASE) and Pressurized Liquid Extraction (PLE) Principle: Increases penetration and diffusion by using high pressure (100–150 bar) and moderate temperature (50–120°C). Benefits Quick High productivity Good preservation of the structure Use: Pectin Seed Polysaccharide Extraction

3. PURIFICATION:

Centrifugation and Filtration separate dissolved polysaccharides from insoluble fibers, sand, and plant debris. After extraction, the slurry is centrifuged for 10–20 minutes at 3000–5000 rpm or filtered through muslin or nylon cloth. This is used for tamarind seed gum, Plantago ovata husk extract, and mucilage. In alcohol precipitation, adding 2–3 volumes of ethanol, methanol, or isopropanol causes polysaccharides to precipitate while smaller molecules remain in solution. The extract is mixed with chilled ethanol and kept at 4°C for 1–24 hours, then the precipitate is collected and washed with 70% ethanol. Decolorization is achieved by adding activated charcoal to adsorb pigments and polyphenols, followed by filtration. Dialysis or ultrafiltration eliminates salts and low-molecular-weight solutes using deionized water or membranes with suitable MW cut-off. Drying methods include oven drying (40–60°C), spray drying for fine and flowable powder, and freeze drying, which preserves porosity, swelling, and quick hydration (useful for ODT-grade polymers). Finally, dried polymers are milled using a hammer mill and evaluated for swelling index, viscosity, pH, drying loss, microbial load, and particle size distribution.

EVALUTION PARAMETER:

PRECOMPRESSION PARAMETER:

1. BULK DENSITY:

density of bulk By putting a mixture of pre-sieved medication excipients into a graduated cylinder and measuring the volume (Vb) and weight (M), bulk density (ρb) was calculated. ρb = M/Vb

2. TAPPED DENSITY:

Density of tapping For a predetermined number of taps, the measuring cylinder holding a given amount of mix was tapped. The weight (M) of the drug excipient combination and the minimum volume (Vt) occupied in the cylinder were measured. The following formula was used to determine the tappeddensity (ρt).

Pt = M/Vt

3. CARR INDEX:

Carr index Carr's compressibility index was used to determine the powder blend's compressibility index. Assessing a powder's Db and Dt as well as how quickly it packed down is a straightforward test. The Carr index formula is as follows: 100 t b t D D Carr index D− = × where Db is the powder's bulk density and Dt is its tapped density. Hausner ratio The Hausner ratio, which may be defined as follows, was computed using the bulk and tapped density of the ondansetron mix powder formulation. Hausner ratio D.[28]

4. HAUSNER'S RATIO:

This measure indicates how easily powder flows. The following formula is used to compute it: Tapped density divided by bulk density is Hausner's Ratio. Better flow characteristics are indicated by a lower Hausner's ratio (1.25) than by a higher one (> 1.25).

5. ANGLE OF REPOSE:

The funnel method was used to calculate the angle of repose. A funnel that can be lifted vertically was used to pour the mixture until the maximum cone height (h) was reached. The formula was used to determine the angle of repose once the heap's radius was measured. where r is the radius of the pile's base, h is its height, and is the angle of repose.

$\tan \theta = H / R$

POST COMPRESSION PARAMETER:

1. HARDNESS: The force needed to shatter a tablet in a diametric compression is known as hardness or tablet crushing strength. The Pfizer hardness tester was used to measure the tablet's hardness. A tablet was positioned between the hardness tester's two anvils, force was applied to the anvils, and the crushing strength that broke the tablet was noted. By subtracting the original pressure from the end pressure, the hardness was calculated. The mean and standard deviation values were computed after three tablets were chosen at random from each formulation.

2. THIKNESS: Vernier Calipers were used to measure the thickness of three randomly chosen tablets from each batch. The thickness of the tablet was measured by sandwiching it between two Vernier Calipers arms.

3. DISINTEGRATION TIME: The breakdown of a tablet into smaller, finer particles is known as the disintegration time. Each of the six tubes in the basket held one tablet. Each tube was filled with a disc, and the device was operated using an immersion liquid of 6.8 pH phosphate buffer kept at 37°C. In the 6.8 pH phosphate buffer, the assembly was raised and lowered 30 times per minute. The amount of time it took for the tablet to completely disintegrate and leave no mass in the device was monitored and noted in seconds. The tablet has to dissolve in three minutes.

4. FRIABILIT: This test assesses a tablet's resistance to edge damage and abrasion during handling, packing, and shipping. In general, inadequate cohesiveness of tablet components is indicated by friability. The Roche friabilator was used to measure friability. Ten tablets were weighed and put in a plastic chamber that rotates for four minutes at 25 rpm. After the fines were removed, the tablets were reweighed. The formula used to determine the friability was F = w (initial) − w (final) / w (initial).

5. DRUG CONTENT UNIFORMITY: Ten tablets from each batch were weighed for the content uniformity test. and ground into a powder. This powder's aliquot containing rizatriptan benzoate 10 milligrams of rizatriptan was precisely weighed, suspended in shaken for 15 minutes with around 100 milliliters of 0.1 N HCl. Next, the Whatmann filter paper was used to filter the mixture, and five milliliters of the filtrate was properly diluted to 50 ml with the same buffer and examined using spectrophotometry at 280 nm. The quantity of benzoate rizatriptan was calculated using the drug's standard calibration curve. The For every batch of the formulation, atriplicate research was conducted.[29]

CONCLUSION:

Compared to synthetic polymers, natural polymers perform better in fast-dissolving tablets. Natural polymers are utilized as binder superdisintegrants and diluents, which not only increase the rate of drug release from the tablet but also decrease the dissolving and disintegration time. Natural polymers are preferred over produced ones because they are safe, readily available, affordable, utilized in small amounts, and naturally extracted to provide nutritional supplements. The use of these natural superdisintegrants not only enhanced pharmaceutical performance but also aligned with the principles of green pharmacy and sustainability. The results imply that these natural alternatives may be employed as effective superdisintegrants to produce rapidly dissolving formulations.

REFERANCE:

[1] Pandey P, Dahiya M. 2016 Oral Disintegrating Tablets: A Review. Int J Pharma Res Rev;5(1):50-62.

[2] Pebley W.S, Jager N.E, Thompson S.J, 1994, Rapidly disintegrating tablets, US Patent, Patent No. 5,298,261.

[3] Gohel, M., Patel, M., Amin, A., Agarwal, R., Dave, R., Bariya, N.,2004, Formulation design and optimization of mouth dissolve tablets of nimesulide using vacuum drying technique, AAPS Pharm Sci.Tech, 5, E36.

[4] Konapure AS, Chaudhari PS, Oswal RJ, Kshirsagar SS, Antre RV and Chorage TV, 2011, Mouth dissolving tablets-an innovative technology: International Journal of Applied Biology and Pharmaceutical Technology; 2(1): 496-503.

[5] Gandhi L, Akhtar S. 2019 March, Comparative study on effect of natural and synthetic superdisintegrants in the formulation of orodispersible tablets. Journal of Drug Delivery and Therapeutics. 15;9(2):507–13.

[6] Shirwaikar A., Shirwaikar A., Prabu S., Kumar G. 2008, Herbal excipients in novel drug delivery systems, Indian Journal of Pharmaceutical Sciences, 70(4): 415–422.

[7] Aulton, M.E., & Taylor, K. Aulton's Pharmaceutics: The Design and Manufacture of Medicines, 5th Edition. Elsevier.Discusses tablet disintegration mechanisms, ideal excipient characteristics, and formulation requirements.

[8] Desai, P.M., Liew, C.V., & Heng, P.W.S. 2016, Review of disintegrants and the disintegration phenomena. Journal of

Pharmaceutical Sciences, 105(9), 2545–2555.
[9] Kumar, R., Patil, M.B., et al. 2009, Effect of superdisintegrants on tablet formulation. International Journal of PharmTech Research, 1(4), 828–833.
[10] Nokhodchi A., Rubinstein M.H. 2000, Mechanisms of Disintegration. Journal of Pharmacy and Pharmacology; 52(2): 161– 171.Explains scientific basis of swelling, capillary action, and deformation.
[11] Joseph, F., & Premaletha, K. 2021, Natural superdisintegrants for the formulation of oral disintegrating tablets.International Journal of Research and Review, 8(5), 134–140. www.ijrrjournal.com.
[12] Remington: The Science and Practice of Pharmacy. Pharmaceutical Press.Provides detailed explanation of particle deformation and tablet breakup.
[13] Augsburger, L. L., & Hoag, S. W.Pharmaceutical Dosage Forms: Tablets (Vol. 2 & 3). CRC Press.
[14] Parikh, D. M.Handbook of Pharmaceutical Granulation Technology.CRC Press.
[15] Panda, S., Sethi, G., & Madhusrota, P. 2020.Superdisintegrants from natural origin: An updated review.International Journal of Pharmacognosy and Phytochemical Research, 12(1), 1–15.DOI:10.25258/phyto.12.1.1.
[16] Babalola, O. C., & Odeku, O. A. 2014. Disintegrant properties of banana starch obtained from the unripe fruits of Musa sapientum L.Journal of Applied Pharmaceutical Science, 4(9), 83–88.DOI:10.7324/JAPS.2014.40915.
[17] Hosny, K. M., Mosli, H. A., & Hassan, A. H. 2015. Soy polysaccharide as a novel superdisintegrant in sildenafil citrate sublingual tablets: preparation, characterization, and in vivo evaluation. Drug Design, Development and Therapy, 9, 465-472.
[18] Pahwa, R., & Sharma, M. 2016.Superdisintegrants: An overview. International Journal of Applied Pharmaceutical Sciences, Retrieved from iajps.com. 3(8), 777–787.
[19] Singh S., et al. 2019. Natural superdisintegrants in pharmaceutical formulations.International Journal of Pharmaceutical Science and Research, 4(3), 638–642.
[20] Mali A., Bathe R. 2010. Comparative study on effect of natural and synthetic superdisintegrants in the formulation of fast dissolving tablets.International Journal of Green Pharmacy, 4(1), Article 389.
[21] PharmaTutor Editorial Team. (n.d.). Superdisintegrants – A review. PharmaTutor. Retrieved from
[22] Garg, N., & Gupta, B. 2015. Formulation and evaluation of orally disintegrating tablet of rizatriptan using natural superdisintegrant. Journal of HerbMed Pharmacology.
[23] Choudhary P. D., Pawar H. 2014. Recently investigated natural gums and mucilages as pharmaceutical excipients: An overview.Journal of Pharmaceutics, Article ID 204849.
[24] Puligundla, P., & Lim, S. 2022. A Review of Extraction Techniques and Food Applications of Flaxseed Mucilage. Foods, 11(12), 1677.
MDPICovers how flaxseed mucilage is treated, including pre-extraction steps, though focused more on extraction techniques
[25] Malviya, R., Srivastava, P., & Kulkarni, G. T. 2011. Extraction and characterization of selected mucilages as pharmaceutical excipients. Polimery w Medycynie, 41(3), 39–44.
[26] Chan, C.-H., Yusoff, R., Ngoh, G.-C., & Kung, F. W.-L. 2011. Microwave-assisted extractions of active ingredients from plants. Journal of Chromatography A, 1218(37), 6213–6225.
[27] Mustafa, A., & Turner, C. 2011. Pressurized liquid extraction as a green approach in food and herbal plants extraction: A review. Analytica Chimica Acta, 703(1), 8–18.
[28] Sheetal, B., Raval, K., & Sandip, B. 2015. Formulation and evaluation of fast dissolving tablets of amlodipine and rosuvastatin. International Journal of Pharmacy and Biological Sciences, 2(S1), 1–12.
[29] Laxmi, C. S. R., Nitesh, J. P., Hitesh, P., & Sagar, P. 2011. Formulation and evaluation of oral dispersible tablets of cinnarizine using sublimation technique. International Journal of Pharmaceutical Sciences Review and Research, 6(S2), 178–182.