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Factors Influential on Effects of Fast Disintegrating Tableting with Natural Superdisintegrants –Review

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ABSTRACT

The oral route is widely preferred for drug administration due to its safety, convenience, and cost-effectiveness. Fast dissolving tablets have gained significant popularity as they rapidly dissolve or disintegrate in the mouth within seconds, eliminating the need for water. These tablets have addressed the challenges associated with conventional dosage forms, particularly swallowing difficulties in pediatric and geriatric patients. Natural materials offer advantages over synthetic counterparts, as they are chemically inert, non-toxic, affordable, biodegradable, and readily available. Natural polymers such as locust bean gum, banana powder, mango peel pectin, Mangifera indica gum, and Hibiscus rosa-sinensis mucilage enhance tablet properties and serve as binders, diluents, and superdisintegrants. They improve the solubility of hydrophobic drugs, reduce disintegration time, and provide nutritional supplementation. Natural polymers derived from renewable sources are cost-effective, non-toxic, biodegradable, eco-friendly, free from side effects, and offer nutritional benefits.

Keywords: Fast Disintegrating Tablet, Natural Superdisintegrants, Oral Drug Delivery.

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INTRODUCTION

The formulation of drugs into a presentable dosage form is an essential requirement for drug delivery to the living body. There are several types of dosage forms available such as tablets, syrups, suspensions, suppositories, injections, transdermal patches, etc., each with their own unique drug delivery mechanisms and advantages and disadvantages. However, the development of an ideal drug delivery system is a major challenge for pharmacists in the current scenario. To achieve the desired therapeutic effect with minimal adverse effects, it is important to deliver the drug to its site of action at the appropriate rate and concentration. Therefore, pharmacists need to have a comprehensive understanding of the physicochemical principles governing a particular drug formulation, as well as the patient's characteristics. This knowledge is essential for developing a suitable dosage form that can optimize drug therapy[1].

The traditional forms of drug delivery have been the initial and predominant approach for administering drugs. Of these, the oral route of drug delivery is the most commonly used and widely accepted method. Oral dosage forms are popular because they offer the convenience of self-administration and are relatively less expensive than other forms of drug delivery[2].

The latest developments in novel drug delivery systems (NDDS) focus on improving the safety and toxicity of drug molecules by creating a convenient dosage form for administration and promoting better patient compliance. A notable example of such an approach is the development of fast-dissolving tablets, which aim to provide an effective drug delivery system[3].

Disintegrants are added to tablets and some encapsulated formulations to aid in breaking up the tablet or capsule into smaller particles in a watery environment. This increases the surface area of the drug substance and promotes faster drug release. Disintegrants promote the infiltration of moisture and the dispersion of the tablet matrix. Achieving fast drug release is reliant on rapid tablet disintegration, which is influenced by various factors. Disintegrants play a vital role in neutralizing the impact of tablet binders and the physical forces involved in the compression process, ultimately influencing the effectiveness of the tablet.. The quick disintegration of a tablet is a vital factor in ensuring unhindered drug dissolution[4].

In 1970, FDDDS (Fast Disintegrating Drug Delivery Systems) were introduced as an option for pediatric and geriatric patients. They were developed as a substitute for tablets, syrups, and capsules, which can take time to dissolve and require water for consumption. FDDDS, on the

other hand, rapidly disintegrate and dissolve in saliva, making them easy to swallow without the need for water. This advantage over conventional dosage forms has made FDDDS a popular alternative[5].

For some patients, traditional tablets and capsules that require an 8-ounce glass of water to swallow can be inconvenient or impractical. This is particularly true for those who have difficulty swallowing solid oral dosage forms. Fast dissolving/disintegrating tablets (FDDTs) are designed to rapidly dissolve or disintegrate in the saliva within 60 seconds or less, making them an ideal option for these patients. FDDTs are also referred to as fast melting, fast dispersing, rapid dissolve, rapid melt, or quick disintegrating tablets[3]

A Fast Dissolving Tablet (FDT) is a type of solid unit dosage form that contains a medicinal substance. These tablets are designed to disintegrate quickly and dissolve in the mouth upon contact with saliva. Unlike other tablets, FDTs do not require water or chewing for administration[6].

United States Food and Drug Administration (FDA) define orally disintegrating tablets as "A solid dosage form which contain a medicament or active ingredient which disintegrates rapidly within few seconds when placed on a tongue. European Pharmacopoeia described orally disintegrating tablets as 'uncoated tablets intended to be placed in the mouth where they disperse rapidly before being swallowed' and as tablets which should disintegrate within 3 minutes[7].

Fast dissolving tablets are a novel method of drug delivery that dissolve, disintegrate, or disperse the active pharmaceutical ingredient (API) in saliva within seconds, with or without the need for water. The more quickly the drug dissolves into the solution, the faster the absorption and onset of clinical effect.

For some drugs, bioavailability may be enhanced by absorption in the oral cavity or through pregastric absorption from saliva that passes into the stomach. Superdisintegrants, both natural and synthetic, such as mucilage, cross-linked carboxymethyl cellulose (croscarmellose), sodium starch glycolate (primogel), and polyvinylpyrrolidone, promote immediate tablet disintegration and enable the development of delivery systems with desirable characteristics. Such formulations are widely recommended for emergency drugs such as cardiac agents, asthma medications, drugs for brain stroke, and anti-hyperlipidemic agents, among others[8].

ADVANTAGE OF FAST DISSOLVING TABLETS[9]

- Water is not necessary for the consumption of the tablet.
- This medication can be easily given to patients who are pediatric, elderly, or mentally disabled.
- Dosage can be more accurately measured compared to liquids.
- The drug has a rapid onset of action because it dissolves and gets absorbed quickly.
- First pass metabolism is reduced, which results in increase in the bioavailability and decrease in the side effects.
- Protected from the possibility of asphyxia brought on by physical obstruction, hence enhancing protection.
- It is suitable for the controlled and prolonged release of an active substance.
- Permit heavy drug loading.
- Economical or providing good value for the cost.
- Possess a favorable taste and a pleasant sensation in the mouth.
- There is no requirement to chew.
- Enhanced stability.
- Ingestion through the mouth, throat, and oesophagus increases drug bioavailability.
- Quick drug therapy intervention can be achieved.
- No special packaging is required; it can be squeezed via blisters.

Fast Disintegrating Tableting with Natural Superdisintegrants

STANDARDS FOR RAPIDLY DISSOLVING DRUG DELIVERY SYSTEM[10]

Table 1 highlights the criteria for Fast Dissolving Tablets (FDT).

Parameters	Acceptance/Rejection
Water Required for swallowing	No
Compatible with Taste Masking	Yes
Portable	Yes
Fragility Concern	No
Good Mouth Feel	Yes
Patient Compliance	Yes
Leave Residue in oral cavity/Grittiness	No
Sensitive to Environmental factors (humidity, temperature)	No
Suitable for traditional tablet processing and packaging	Yes
Economic	Yes

LIMITATIONS TO FDT[11]

- Creating rapidly dissolving tablets for drugs with high doses is a challenging task and hard.
- Fast dissolving tablets are not suitable for patients who are concurrently taking anti-cholinergic medications.
- Tablets often have insufficient mechanical strength, which necessitates careful handling and packaging.
- Improperly formulated tablets can leave an unpleasant taste and gritty sensation in the mouth.
- Fast-dissolving tablets are not suitable for drugs with short half-lives that require frequent injection and controlled or extended release.
- FDTs are made using porous and smoothly molded metrics or compressed into small tablets, which can make them fragile and brittle, and difficult to handle.
- Formulating drugs with unpleasant tastes as fast-dissolving tablets can be challenging, and extra precautions need to be taken before such drugs are formulated.

SUPERDISINTEGRANTS

Super-disintegrants are substances that can achieve faster disintegration than those typically used in tablets and capsules. When added to the content of a tablet or capsule, they cause the particles to break up or disintegrate into smaller pieces that dissolve more quickly. Super-disintegrants are usually in the form of granules and are added at low levels, typically comprising 1 to 10% of the total weight of a unit dosage form[7]

In modern times, researchers are actively seeking disintegrating agents that possess a combination of safety and efficacy, enabling rapid tablet disintegration even under high crushing strength exceeding 3.5 kg. By examining disintegration time within the oral cavity and wetting time based on surface free energy, scientists have identified that molecules with a high polar component of surface free energy tend to exhibit faster wetting. These specialized agents that fulfill these specific criteria are commonly known as super-disintegrants[12].

1.Natural superdisintegrants [13]

These are commonly used in tablet formulation which facilitates disintegration of tablet. Examples of natural superdisintegrants are given in table.

Advantages

- Local accessible
- Eco-friendly and Bio-acceptable

Low cost as compared to synthetic and renewable source.

2. Synthetic superdisintegrant[13]

These are commonly used in tablet formulation which facilitates disintegration of tablet.

Examples of synthetic superdisintegrants are Sodium starch

Glycolate/sodium carboxymethyl starch, Crospovidone, Croscarmellose Sodium etc

Merits of synthetic superdisintegrants

- Effective in low concentration as compared to starch.
- Have low effect on compressibility and flow ability.
- More effective intragranually.

Limitations

- Adsorptive in nature and may cause problems with water sensitive drugs.

3. Co-processed superdisintegrants[13]

Co-processing excipients provides superior property compared to physical mixture of individual excipient mixture.

Eg : Ludipress, Starlac, Starcap 1500, Ran-Explo-C.

To achieve immediate disintegration of tablets and create delivery systems with desirable properties, natural and synthetic superdisintegrants such as mucilage, cross-linked carboxymethyl cellulose (croscarmellose), sodium starch glycolate, and polyvinylpyrrolidone are commonly utilized. Such formulations are highly recommended for emergency drugs[14].

Pharmaceutical excipients, including natural gums and mucilages, have been extensively studied. These natural substances are favored over semi-synthetic and synthetic excipients in drug delivery because they are affordable, readily available, non-irritating, and have a soothing effect. Additionally, natural gums and mucilages are environmentally friendly and can be chemically modified, as well as potentially biodegradable and compatible with drugs due to their natural origin[12].

Plant-based materials are a diverse range of materials derived from various plants. They offer an alternative to synthetic products due to several factors such as their local availability, eco-friendliness, bio-compatibility, renewability, and affordability compared to synthetic products[15].

Natural polymers obtained from various sources are increasingly favored over synthetic alternatives due to their efficacy and safety. These polymers are easily accessible in regions around the world, making them a more economical choice. Additionally, natural polymers are nontoxic and do not have any negative effects on the body, making them a more attractive option. They are also environmentally friendly since they are biodegradable and do not cause pollution. Natural polymers have fewer side effects as they are derived from natural sources, which makes them preferable to patients. Furthermore, natural polymers provide nutritional supplements and are renewable, making them a sustainable option for various reactions[16].

Examples of natural disintegrants are Lapidium Sativum,Plantago ovata mucilage, Hibiscus rosa-sinesis Linn, muscilage powder ,Fenugreek seed mucilage, Guar gum, Gum karaya[17].

Selection of SuperDisintegrants[18]

There are many factors which are considered in selection of Superdisintegrants.

- Quantity of disintegrates present in preparation.
- Tablet hardness.
- Kind of addition and mixing.
- Drug nature.
- Good flow ability.
- Occurrence of surface active agents.
- Compactable to formulate less friable tablets.

Good mouth feel produce to the patient.

CLASSIFICATION OF SUPERDISINTEGRANTS[12]

1. Synthetic Superdisintegrants

a. Modified starches eg. Sodium Starch Glycolate

b. Modified cellulose eg. Croscarmellose

c. Cross-linked poly-vinyl pyrrolidone eg.Crospovidone, polyvinyl-pyrrolidone

d. Modified Resin eg.Indion 414, Kyron 314

e. Microcrystalline Celluloseeg. Avicel 102

f. Cross-linked alginic acid eg. Alginic acid NF

g. L-substituted Hydroxypropyl derivatives

2. Natural Superdisintegrants

a. Gums eg. Guar Gum, Xanthan Gum, Locust Bean, Cassia Fistula Gum, Karaya Gum,

b. Gellan Gum.

c. Agar eg. Gelidiumamansii

d. Chitosan eg:β (1, 4)2-amino-2-d-glucose

e. Soy polysaccharide Emcosoy

3. Co-processed superdisintegrants

a. EgStarlac (lactose and maize starch).

b. Starcap 1500 (corn starch and pregelatinized starch).

c. Ran Explo-C (microcrystalline cellulose, silica and crospovidone).

d. Ludipress (lactose monohydrate, polyvinylpyrrolidone and crospovidone).

e. PanExcea MH300G (microcrystalline cellulose, hydroxyl-propyl- methyl cellulose and crosspovidone).

f. Ran Explo-S (microcrystalline cellulose, silica and sodium starch glycolate).

Sl.No	Super disintegrant name	Source	Mechanism
1	Mucilage of Lepidus sativum (asaliyo)	Mucilage was obtained from the seeds of Lepidus sativum	Swelling
2	Locust bean gum(carob bean gum)	Extracted from the seeds of carob tree.	Swelling and capillary action
3	Isapghula husk(Plantago ovata)	From the seeds of Plantago ovata	Swelling
4	Hibiscus rosa sinesis linn	Mucilage of hisbiscus rosa sinesis	Swelling
5	Fenugreek seed mucilage	Mucilage of Fenugreek seed	
6	Xanthum gum	Derived from Xanthomonas compestris	Swelling property
7	Gellan gum	Obtained from Pseudomonas elodea.	Swelling
8	Soy polysaccharide	High molecular weight polysaccharides obtained from soy beans.	Swelling
9	Mango peel pectin	Extracted from mango peel which constitutes 20-25% of the mango processing waste.	Swelling, have good solubility and high swelling index

10	Agar and treated agar	Dried gelatinous substance obtained from Gelidium amansii (Gelidanceae) and several other species of red algae	High strength gelling property
11	Guar gum	Isolated from the endosperm seed of the guar gum, Cyamopsis tetragonaloba.	Swelling
12	Chitin and chitosan	Chitin obtained from natural polysaccharide obtained from crab and shrimp shells. Chitosan structural element in the exoskeleton of crustaceans (such as crabs and shrimp) and cell walls of fungi.	Swelling

NATURAL SUPERDISINTEGRANTS USED IN FAST DISSOLVING TABLETS[4]

S.No	Natural Superdsisntegrant	Marketed drug	Disintegration Time	Concentration Used
1	Chitin and chitosan	Cinnarizine	60sec	3% w/w
2	Guar gum	Glipizide	30sec	1% w/w
3	Gum karaya	Amlodipine,granisetron hydrochloride	17.10sec	4% w/w
4	Agar and treated agar	Theophylline	20sec	1-2%w/w
5	Fenugreek seed mucilage	Metformin hydrochloride	15.6sec	4%w/w
6	Soy polysaccharide	Metronidazole,	12sec	8%w/w
7	Gellan gum	Lornoxicam	155sec	4%w/w
8	Mango peel pectin	Aceclofenac	11.59sec	0.1-4%w/w
9	Lepidium sativum mucilage	Nimesulide	17sec	5-15%w/w
10	Plantago ovate seed mucilage	Granisetron Hydrochloride	17.10sec	5%w/w
11	Aegle marmelos gum	Aceclofenac	8-18min	6%w/w
12	Locust bean gum	Nimesulide	13sec	10%w/w
13	Lepidium sativum	Nimesulide	17sec	10%w/w
14	Mangifera indica gum	Metformin HCl,paracetamol	3-8min	6%w/w
15	Hibiscus rosa–sinesis muscilage	Aceclofenac	20sec	6%w/w
16	Dehydrated banana powder	Ondanstron HCl/propronolol,gabapectin	15-36sec	6%w/w

1. Chitin & Chitosan

Chitin is a natural polysaccharide sourced from the shells of crabs and shrimp, as well as the cell walls of certain mushrooms. By undergoing N-deacetylation, chitin is transformed into chitosan, a linear binary heteropolysaccharide composed of β-1,4-linked glucosamine. The solubility, viscosity, coagulation, and ability to chelate heavy metal ions are influenced by the molecular

weight and degree of deacetylation of chitosan. As a cationic polysaccharide, chitosan possesses distinctive properties such as antioxidant, antimicrobial, lipid-lowering, film-forming, and gelling activities. In pharmaceutical formulations, chitosan can serve various purposes, including acting as a binder in wet granulation, a diluent in direct compression, a tablet disintegrant, and a permeation enhancer. Through the deacetylation process, chitin's slow biodegradability and poor solubility are overcome, resulting in a more soluble polymer suitable for the production of fast-disintegrating tablets[19]

2. Guar gum

This polysaccharide is derived from the seeds of Cyamopsis tetragonoloba and possesses a high molecular weight. It is renowned for its thickening and stabilizing properties, making it valuable in various food and industrial applications. Additionally, its particle size plays a role in its disintegration ability, as finer particles tend to exhibit stronger disintegrating capabilities. In the pharmaceutical field, this polysaccharide is commonly employed as a binder and disintegrant. Moreover, it has garnered attention as a potential alternative to cellulose derivatives like methylcellulose in the development of sustained-release matrix tablets[20,21].

3. Gum karaya

Gum Karaya is a natural gum that is produced as a tree exudate. It consists of an acid polysaccharide composed of approximately 13% D-galactose, 15% L-rhamnose, and 43% D-galacturonic acid. When exposed to water, it has the ability to absorb and swell up to 60-100 times its original volume. However, the high viscosity of this gum limits its applications as a binder and disintegrant in usual dosage forms. Nevertheless, it can serve as an alternative super-disintegrant to commonly used synthetic and semi-synthetic counterparts due to its low cost, biocompatibility, and easy availability[22].

4. Agar and Treated Agar

Agar is a dried gelatinous substance derived from various species of red algae such as Gelidium amansii, Gracilaria, and Pterocladia. It can be found in the form of divests, sheet flakes, or coarse powder, and typically appears as a yellowish-gray or white substance with a mucilaginous taste. Agar is composed of two polysaccharides: agarose, which contributes to its gel strength, and agaropectin, which determines the viscosity of agar solutions. The high gel strength of agar makes it a promising candidate as a disintegrant in the formulation of orally disintegrating tablets (ODTs). Gums, including agar, are generally used in concentrations ranging from 1 to 10%. However, they are not as effective as other disintegrating agents due to their relatively low capacity for rapid tablet disintegration[20,21].

5. Fenugreek seed muscilage

Fenugreek, scientifically known as Trigonella foenum-graceum, is an herbaceous plant belonging to the leguminous family. It is native to Western Asia and has since spread across Europe, the Mediterranean, and other parts of Asia. These seeds are notable for their high concentration of mucilage, a natural gummy substance found in the coatings of many seeds. This mucilage serves various functions, including acting as a disintegrant and food preservative. The mucilage derived from fenugreek seeds is an amorphous powder with an off-white to cream-yellow color. When dissolved in warm water, it forms a viscous colloidal solution. Research has indicated that this natural disintegrant exhibits superior disintegration properties compared to synthetic superdisintegrants like Ac-di-sol when used in the formulation of orally disintegrating tablets[23].

6. Soy Polysaccharide

Soy polysaccharide, derived from soybeans, is a natural super disintegrant that is free from starch or sugar content. This makes it suitable for use in nutritional products. A study investigated the use of soy polysaccharide as a disintegrant in tablets produced through direct compression, utilizing lactose and dicalcium phosphate dihydrate as fillers. As control disintegrants, cross-linked sodium carboxymethyl cellulose and corn starch were employed. The results showed that soy polysaccharide performed effectively as a

disintegrating agent in direct compression formulations, demonstrating comparable performance to cross-linked CMC[4,24].

7. Gellan gum

Gellan gum is a water-soluble polysaccharide produced by the bacterium Pseudomonas elodea. It is an anionic, high molecular weight gum derived from the fermentation of a pure culture of Pseudomonas elodea. The repeating unit of gellan gum consists of one α-L-rhamnose, one β-D-glucuronic acid, and two β-D-glucose residues. In a study by Antony and Sanghavi in 1997, the effectiveness of gellan gum as a disintegrant was evaluated and compared to other popular disintegrants such as dried corn starch, Explotab, Avicel (pH 10.2), Ac-di-sol, and Kollidon CL. The researchers found that gellan gum exhibited efficient disintegration properties. This may be attributed to its rapid swelling ability upon contact with water and its high hydrophilicity. The study concluded that gellan gum demonstrated superior performance as a disintegrant, resulting in thorough tablet disintegration[25,26].

8. Mango peel pectin

The peel of mangoes, which constitutes about 20-25% of mango processing waste, is a valuable source for extracting high-quality pectin. Pectin is a hydrophilic colloid and a heteropolysaccharide. The pectin obtained from mango peel is a natural and promising candidate for use as a super disintegrant. It exhibits excellent solubility and a high swelling index, making it suitable for formulating fast-disintegrating formulations. Additionally, mango peel pectin can be utilized in the preparation of films and jellies, further highlighting its versatility and potential applications[24].

9. Lepidium satium muscillage

The discarded mango peel, which makes up around 20-25% of mango processing waste, is a valuable resource for extracting high-quality pectin. Pectin, a hydrophilic colloid and heteropolysaccharide, is commonly used in the preparation of films and jellies. Mango peel pectin, obtained naturally, demonstrates great potential as a super disintegrant. Its excellent solubility and high swelling index make it suitable for use in fast-disintegrating formulations. Therefore, mango peel pectin is a promising option for enhancing the disintegration properties of pharmaceutical tablets and promoting their rapid dissolution[27].

10. Plantago ovate seed muscilage

Psyllium, also known as ispaghula, refers to several species within the Plantago genus whose seeds are commercially used for producing mucilage. The mucilage derived from Plantago ovata has unique properties such as binding, disintegrating, and sustaining capabilities. In a study, fast-disintegrating tablets of amlodipine besylate were prepared using the direct compression method, incorporating various concentrations of Plantago ovata mucilage as a natural superdisintegrant. The formulations underwent evaluation for weight variation, hardness, friability, disintegration time, drug content, and dissolution. The optimized formulation exhibited a significantly shorter in vitro disintegration time of 11.69 seconds, accompanied by rapid in vitro dissolution within 16 minutes. The in vitro disintegration time decreased as the concentration of the natural superdisintegrant increased[28].

11. Aeglememalos gum

AMG (Aegle marmelos gum) is derived from the fruits of Aegle marmelos, a plant belonging to the Rutaceae family. It exhibits superior disintegration properties compared to croscarmellose sodium. The ripe fruit pulp of Aegle marmelos is red and has a mucilaginous and astringent taste. It contains various elements such as carbohydrates, proteins, vitamin C, vitamin A, Angeline, marceline, dictamen, O-methyl ordinal, and isopentyl halfordinol. AMG is prepared through a heat treatment technique and is known to enhance the solubility of poorly soluble drugs. It has effects on glucose levels, glycosylated hemoglobin, plasma insulin, and liver glycogen in diabetic patients. Additionally, it reduces lipid peroxidation, stimulates macrophage functioning, and significantly affects glutathione (GSH) concentration in the liver,

kidney, stomach, and intestine. Purged bael gum polysaccharide primarily consists of D-galactose (71%), D-galacturonic acid (7%), L-rhamnose (6.5%), and L-arabinose (12.5%)[18].

12. Locust bean gum

Carob bean gum, also known as locust bean gum, carubin, or algaroba, is derived from the endosperm of the seeds of the carob (locust) tree, scientifically known as Ceratonia siliqua (L.) Taub, belonging to the Leguminosae family. This tree is a large evergreen with elongated brown pods that contain hard brown seeds known as kernels. The kernels are separated from the husk by treating them with dilute sulfuric acid or through thermal mechanical treatment. To control the microbiological load, the gum may be washed with ethanol or isopropanol, resulting in washed carob bean gum. Additionally, it can undergo further clarification (purification/extraction) by dispersing it in hot water, recovering it with isopropanol or ethanol, filtering, drying, and milling, yielding clarified carob bean gum. The gum appears as a nearly odorless powder, ranging in color from white to yellowish white. It is insoluble in most organic solvents, including ethanol, partially soluble in water at room temperature, and fully soluble in hot water. Complete solubility of carob bean gum typically requires heating it to above 85ºC for 10 minutes. The main component of carob bean gum is galactomannans, which are high molecular weight polysaccharides with a range of approximately 50,000 to 3,000,000. The clarified gum generally has a higher content of galactomannans. The ratio of mannose to galactose in carob bean gum is approximately 4:1, with mannose accounting for 73-86% and galactose accounting for 27-14% of its composition[29].

13. Mangifera indica gum

Mangifera indica, commonly known as mango, belongs to the Anacardiaceae family. It is a versatile ingredient used in various formulations as a disintegrant, binder, suspending agent, and emulsifying agent. The gum powder of mango is typically white to off-white and readily soluble in water, while being nearly insoluble in acetone, chloroform, ether, methanol, and ethanol. Mango is easily accessible, and its gum is non-toxic, with each component of the tree exhibiting pharmacological activities such as diuretic, astringent, and potential benefits for conditions like diabetes, asthma, diarrhea, urethritis, and scabies[31].

14. Hibiscus rosa-Sinensis

Hibiscus rosa-Sinensis, commonly known as the shoe-flower plant, China rose, and Chinese hibiscus, belongs to the Malvaceae family. It is abundantly found in India and its mucilage has been recognized as a valuable super-disintegrant for orally disintegrating tablets (ODTs). Mucilages derived from this plant have versatile applications as thickeners, suspending agents, water retention agents, and disintegrants. The plant is easily accessible, and its leaves contain mucilage composed of L-rhamnose, D-galactose, D-galacturonic acid, and D-glucuronic acid. In a study conducted by Shah et al., hibiscus Rosa Sinensis leaf mucilage was employed in the preparation of aceclofenac oral disintegrating tablets using the direct compression method. The tablets exhibited rapid disintegration within a timeframe of less than 20 seconds[22].

15. Dehydrated banana powder

Processed bananas are used to create banana powder, which is known for its high dietary fiber content. Research has demonstrated that banana powder exhibits excellent disintegrant properties when incorporated into mouth dissolving tablet formulations. The disintegration time achieved by tablets containing banana powder is comparable to that of commonly employed disintegrants, making it an effective ingredient for fast dissolving tablets. As a result, banana powder has emerged as a promising pharmaceutical excipient for various solid dosage forms, particularly in the development of fast dissolving tablets[4].

CONCLUSIONS

Natural polymers exert a greater influence on the performance of fast dissolving tablets compared to synthetic polymers. They enhance the release rate of the drug from the tablet and and also disintegration time. Natural polymers serve as

binders, superdisintegrants, and diluents in tablet formulations. They are preferred over synthetic polymers due to their non-toxic nature, easy availability at low cost, requirement of low concentration, and natural extraction providing nutritional benefits. Various natural superdisintegrants such as Plantago ovata, Lepidium sativum, gum karaya, Guar gum, Fenugreek seed mucilage, mango peel pectin, among others, have been studied and compared to artificial superdisintegrants. The use of natural superdisintegrants results in faster drug dissolution, improved bioavailability, effective therapy, and enhanced patient compliance. Therefore, natural superdisintegrants can be effectively employed in tablet formulations as disintegrants.

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