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"A REVIEW ON SUPERDISINTEGRANTS IN FAST DISSOLVING TABLET FORMULATIONS"

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Abstract : Fast dissolving tablets (FDTs), which dissolve quickly in the oral cavity without the need for water, are a significant development in oral medication administration methods. These dosage forms are especially helpful for dysphagic, elderly, and paediatric patients as well as in emergency situations that call for quick action. By encouraging quick tablet disintegration through processes such swelling, wicking, deformation, and particle repulsion, superdisintegrants play a critical role in the formulation of FDTs, improving drug release and therapeutic efficacy. The idea, benefits, drawbacks, and formulation elements of fast-dissolving tablets are the main topics of this review paper, with a focus on the function of superdisintegrants. There includes a thorough discussion of several classes of superdisintegrants, such as natural, synthetic, semi-synthetic, and co-processed superdisintegrants. The characteristics, modes of action, and effectiveness of popular synthetic superdisintegrants like crospovidone, croscarmellose sodium, and sodium starch glycolate as well as natural substitutes like Plantago ovata, chitosan, xanthan gum, and Lepidium sativum mucilage in FDT formulations are examined. All things considered, proper superdisintegrant selection and optimisation greatly shortens disintegration times, enhances drug dissolving, boosts bioavailability, and improves patient compliance. Future fast-dissolving tablet formulations that are safe, efficient, and patient-friendly have a bright future thanks to the increased interest in natural and co-processed superdisintegrants.

IndexTerms **- Fast Dissolving Tablets (FDTs),Superdisintegrants, Tablet Disintegration ,Patient Compliance, Rapid Onset of Action, Bioavailability Enhancement .**

INTRODUCTION :

The first and most common method of giving medications has been through traditional drug delivery methods. The most popular and generally recognised of them is the oral route of medication delivery. Because they allow for self-administration and are comparatively less expensive than other medication delivery methods, oral dosage forms are widely used. By developing a suitable dosage form for administration and encouraging improved patient compliance, the most recent advancements in innovative drug delivery systems (NDDS) aim to improve the safety and toxicity of pharmacological molecules. The creation of fast-dissolving tablets, which seek to offer an efficient medication delivery method, is a prominent illustration of such an approach. To help break up tablets and some encapsulated formulations into smaller particles in a wet environment, disintegrants are included. This facilitates quicker drug release by increasing the drug substance's surface area. Disintegrants encourage moisture infiltration and tablet matrix dispersion. Rapid tablet disintegration, which is impacted by a number of variables, is necessary to achieve quick medication release. In order to counteract the effects of tablet binders and the physical forces involved in the compression process, which ultimately affects the tablet's efficacy, disintegrants are essential. A tablet's ability to dissolve quickly is essential for unrestricted medication dissolution.[16-18]. The active medicinal ingredient can be absorbed more quickly with these formulations, especially when partial Bypassing first-pass metabolism, absorption takes place in the oral mucosa. Additionally, when compared to liquid formulations, FDTs improve drug stability, transportability, and storage. By using sophisticated formulation techniques like lyophilization and nanonization, they can also help increase the bioavailability of medications with low water solubility. The development of FDTs is further supported by the pharmaceutical industry's emphasis on tailored and focused treatments, particularly in the management of chronic diseases where long-term adherence is crucial.[19,21]In order to provide paediatric and elderly

patients with an alternative to traditional dose forms, fast dissolving drug delivery systems were initially created in the late 1970s. These tablets are intended to dissolve or break down quickly in saliva, usually in less than 60 seconds [1,2]. United States Food and Drug Administration (USFDA) defined fast dissolving tablet (FDT) as "a solid dosage form containing a medicinal substance or active ingredient which disintegrate rapidly usually within a matter of seconds when placed upon the tongue" [3]. Super disintegrants such as crosscarmellose sodium, sodium starch glycolate, and crosspovidone are the first of two methods used in the formulation of mouth-dissolving tablets. Optimising the tablets' pore structure using vacuum and freeze drying is another technique. Certain medications may have higher bioavailability because of oral cavity absorption and pre-gastric absorption of saliva that contains scattered medications that travel to the stomach. Additionally, compared to normal tablets, less medication is vulnerable to first pass metabolism.[4,5,6]. Oral fast dissolving/disintegrating (FDDS)/melt-in-mouth tablets are a novel delivery method that is becoming more and more popular. These oral dose forms can be ingested without the requirement for drinking water because they dissolve quickly in saliva . One crucial factor in the creation of mouth-dissolving tablets is the removal of bitterness [7]. There is no chance of choking because the quickly dissolving solid dosage form transforms into a liquid or soft paste for easy swallowing.[8-10]. Many people may not take their prescriptions as directed because they have trouble swallowing hard gelatin capsules and tablets. This issue is thought to impact 50% of the population, which leads to a high rate of noncompliance and inefficient treatment.[11-13]. Fast-dissolving tablets are an innovative drug delivery method that, with or without water consumption, dissolves, disintegrates, or disperses the API in saliva in a matter of seconds. The absorption and commencement of the therapeutic impact occur more quickly when the drug dissolves more quickly in the solution. Certain medications may become more bioavailable as a result of oral absorption or pregastric absorption from saliva that travels to the stomach. Mucilage, cross-linked carboxymethyl cellulose (croscarmellose), sodium starch glycolate (primogel), polyvinyl pyrollidone, and other natural and artificial superdisintegrants offer fast tablet disintegration and make it easier to build delivery systems with desired characteristics. For medications used in emergency situations, these kinds of formulations are frequently advised.[14,15].

Advantages of FDTs :

1. **Improve patience compliance:** By resolving swallowing difficulties and convenience of administration, fast dissolving tablets (FDTs) increase patient compliance. FDTs are perfect for patients who have trouble swallowing, such as children, the elderly, and people with dysphagia, because they dissolve quickly in the mouth without the need for water. Adherence is greatly increased by the ease of discretely taking medication at any time and from any location, particularly for chronic diseases. Additionally, FDTs' rapid beginning of action results in quicker symptom relief, improving patient satisfaction and medication trust. Better long-term adherence and more successful illness management are ensured by this ease of use and the removal of obstacles to medicine ingestion.[21,22]
2. **No need for water in fast dissolving tablets (FDTs):** The fact that fast dissolving tablets (FDTs) don't need water to be administered is one of its main advantages. For patients who might not have access to water, such those who are travelling or in an emergency, this makes them especially practical. When FDTs come into contact with saliva in the mouth, they quickly dissolve and absorb without the need for more fluids. Paediatric, elderly, and dysphagic patients who have trouble swallowing conventional tablets or capsules can particularly benefit from this feature. FDTs improve patient compliance and convenience by streamlining the drug process and removing the need for water, especially in situations where water may not be easily accessible.[21,23]
3. **Rapid onset of action in fast dissolving tablets (FDTs):** Because they dissolve quickly in the oral cavity, fast dissolving tablets (FDTs) offer a speedy beginning of action. The pill dissolves in saliva in a matter of seconds after delivery, facilitating rapid medication release and absorption—either directly via the oral mucosa or swiftly into the gastrointestinal system. This is particularly helpful for ailments like pain, allergies, or nausea that need to be treated right away. By offering immediate relief, the quick onset improves therapy effectiveness and patient satisfaction. Furthermore, absorption through the oral mucosa can avoid the liver for medications with high first-pass metabolism, potentially increasing bioavailability and therapeutic efficacy (International Journal of Pharmaceutical Research and Development). FDTs are therefore perfect for acute therapies and emergency use due to their quick onset.[21,24]
4. **Better bioavailability in some cases with fast dissolving tablets (FDTs):** For some medications, particularly those that undergo significant first-pass metabolism, fast dissolving tablets (FDTs) can provide

increased bioavailability. FDTs can be absorbed directly through the buccal or sublingual mucosa when they dissolve in the oral cavity, partially avoiding the liver and more effectively entering the systemic circulation. Drugs with poor gastrointestinal absorption or stomach breakdown can have their bioavailability greatly increased by this mechanism. The drug's surface area is further increased by the quick disintegration and breakdown, which facilitates quicker absorption and dissolution in the digestive system. FDTs are particularly helpful for unstable or poorly soluble medications, where quick release and little exposure to severe GI conditions improve therapeutic results.[21,25].

LIMITATIONS:[26,27]

1. The mechanical strength of the tablets is typically inadequate. Therefore, during the manufacturing process, careful handling is necessary.
2. If the pills are not made correctly, they may leave the oral cavity with an unpleasant taste and/or grittiness.
3. Larger-dose medications, such as rifampin (600 mg) and ethambutol (1000 mg), are challenging to incorporate into FDT.

ADVANTAGES OF SUPERDISINTEGRANTS:[28-31,33,95-97]

1. It can be used with common excipients and medicinal substances.
2. It doesn't adhere to punches or dyes and is biodegradable.
3. It works well at lower concentrations.
4. It is more effective intergranularly and less effective in terms of compressibility and flow ability**.**
5. A considerable propensity for dampness that leads to fast disintegration.
6. Upon disintegration, there is no lumping.
7. Compatible with frequently used medicinal agents and excipients.
8. They don't adhere to the dyes and punches.
9. A propensity to function at lower concentrations.
10. Less effect on compressibility and flow capacity.
11. Higher intragranular efficiency.
12. Some of them may partially bind to cationic drugs in vitro due to their anionic nature.
13. They decompose naturally.
14. Accessible locally.[20]

DISADVANTAGES OF SUPERDISINTEGRANTS:[28,32,53,98]:

1. It works well with a variety of pharmaceuticals and excipients.
2. It breaks down fast and doesn't stick to punches or dyes.
3. It functions at reduced concentrations.
4. Its flow ability and compressibility are reduced.
5. Intergranular communication works better.
6. It is Expensive .
7. Difficult and time-consuming.
8. More hygroscopic and sensitive.
9. Moisture sensitivity causes instability.[99]

SUPERDISITGRANTS' IDEAL ASPECTS: [28,31,32,35,93,94]

1. It ought to break down rapidly.
2. It ought to be insoluble in water.
3. It should have good flow and moulding qualities.
4. It should have a good compressibility index, hydration capacity, and particle size.
5. Compactable and less friable tablets should be produced.
6. It should have a pleasing mouthfeel and be nontoxic.
7. Excellent flow and moulding properties.
8. More capable of generating more potent action at extremely low concentrations
Drug compounds shouldn't be easily formed in it.
9. It should work well with the other excipients and have good tableting properties.
10. They should easily blend together and split into small pieces.
11. The drug's or substance's unpleasant taste needs to be masked or enhanced.

12. They should be loaded with medications.
13. They must have a positive oral experience.
14. There should be minimal to no residual in their oral cavity after dose.
15. They should be as unaffected by outside variables as possible, such as moisture, temperature, and so on.
16. They should be easy to administer to mentally sick and obstinate individuals.
17. They should be transported without any fragility issues.
18. Standard tablet manufacturing and packaging equipment must be used to create them at the lowest feasible cost.
19. It needs to have a very good particle size, an excellent hydration capacity, and a compressibility index.
20. It needs to produce tablets that are less friable and more compact.
21. It should taste good and be safe.

TYPES OF SUPERDISINTEGRANTS :

1. **Natural superdisintegrants**
2. **Traditional Superdisintigrats**
3. **Synthetic superdisintegrants**
4. **Semi-Synthetic superdisintegrants**
5. **Co-processed superdisintegrants**

1] Natural superdisintegrants :

i. **Chitosan and chitin:** Shrimp and crab shells contain a naturally occurring polymer called chitin (β-(14)-N-acetyl-D-glucosamine). Unlike chitosan, it contains an amino group covalently connected to an acetyl group[33,34]. Chitosan is produced once chitin is deacetylated. The applications of chitosan in wound healing, tissue engineering technologies, drug delivery, and other fields are currently being investigated. Additionally, chitosan has been used in a number of studies to substitute other materials in electrical applications, such as sensors, actuators, and transducers. Wetting time and the DT in the oral cavity could be studied using free energy at the surface. Chitosan is the most well-known natural polysaccharide due to its numerous applications in the pharmaceutical industry.[35-39]

ii. **Ispaghula Husk Mucilage (Plantago Ovata):** The dried seeds of the Plantago ovata plant are used to make ispaghula husk, which contains mucilage from the seeds' epidermis. To release all of the mucilage into the water, Plantago ovata seeds were soaked in distilled water for 48 hours before being briefly boiled. Mucilage from Plantago ovata has a number of properties, such as the ability to bind, dissolve, and sustain. When compared to other superdisintegrants, mucilage has a very high swelling index (around 89±2.2 percent v/v), which makes it a superdisintegrating agent used to manufacture fast-dissolving tablets. The marc was squeezed through muslin cloth in order to filter and separate it.[28,40-42] This plant's seeds and psyllium husk are important sources of mucilage and fibres. In the pharmaceutical sector, psyllium husk is utilised as a laxative, to reduce the glycaemic index, and to create formulations with controlled release. Because psyllium husk absorbs water quickly, its weight can grow up to ten times. Ten to thirty percent of psyllium husk is composed of hydrocolloids, which are water-soluble polysaccharides that, when exposed to water, create mucilage layers. Mucilage splits during hydrolysis, yielding a variety of polysaccharides such as xylose, arabinose, galacturonic acid, rhamnose, and galactose. These substances could be used as natural disintegrants in the production of pharmaceuticals and are what give psyllium husk its disintegrative qualities.[28,43] To precipitate the mucilage, an equivalent volume of acetone was added to the filtrate. The separated mucilage was dried at a temperature below 60°C in an oven. Compared to crospovidone, Plantago ovata mucilage has a super disintegration property, making it a recent breakthrough. Compared to crospovidone, it disintegrates more quickly.

iii. **Xanthan Gum**: With its strong hydrophilicity and minimal gelling tendency, xanthan gum—derived from Xanthomonas campestris—is an approved USP. It dissolves more quickly due to its wide swelling properties and limited water solubility.[28,44] The bacterium Xanthomonas campestris is used in the fermentation process to make xanthan gum, which has a high hydrophilicity and a low inclination to gel. Every second glucose unit of xanthan gum's β-(1→4)-D-glucose backbone is joined to a trisaccharide made up of mannose, glucuronic acid, and mannose. At the right pH, glucuronic acid's negatively charged carboxylates enable it to generate extremely viscous fluids. Despite being regarded as a nongelling gum, its weak connections cause it to produce a viscous media. In sustained release formulations, it inhibits medication release despite being quite swellable. The resulting modified xanthan gum showed favourable swelling dynamics, was directly

compressible, and was biodegradable, making it a suitable hydrophilic excipient for quickly dissolving tablets. The quickly dissolving roxithromycin pills The optimised formulation, which showed nine-fold reductions in lag time, was stable for a full year, and maintained the rapid disintegration characteristics until the conclusion of the measured time period, was chosen. It was made using a lower amount of modified xanthan gum and a higher level of MCC.[28,45]

iv. **Mucilage of Lepidum Sativum (Asaliyo):** In India, Lepidum sativum, sometimes referred to as asaliyo, has long been utilised as a natural remedy. It is inexpensive and readily accessible in the neighbourhood market. Leaves, roots, oil, seeds, and other materials are utilised. There is more mucilage with dimeric compounds in seeds. Two new monomeric imidazole alkaloids, semilepidinoside A and B, and the imidazole alkaloids lepidine B, C, D, E, and F. Lepidium sativum mucilage possesses a variety of characteristics, including binding, dissolving, and gelling. Thus, the mucilage from seeds was separated and utilised in a study to create a fast-dissolving tablet.[28,46] The super disintegrants derived from Lepidium sativum mucilage have favourable physiochemical characteristics and The mucilage and husk from Lepidium sativum had swelling indices of 27 and 25, respectively. Rapid water absorption is linked to the swelling factor, and rapid swelling causes pills to disintegrate quickly. The mucilage and the husk powder exhibit good flow characteristics with moderate compressibility, according to the compressibility index and angle of repose value. Using a direct compression process, many batches were created with varying ratios of medication, mucilage, and Lepidium sativum seed husk. Additional excipients were added to the formulation, including talc, magnesium stearate, sucrose, and microcrystalline cellulose.[28,47]

v. **Hibiscus Rosa sinesis linn:** Hibiscus rosa-sinensis leaves A significant amount of linn's mucilage can be added to medicinal compositions. Tablet hardness, thickness, percentage friability, and other pre- and post-compression parameters were assessed for the prepared tablets. wetting time, which was determined to be within acceptable bounds. Tablet formulations with 6% mucilage and 4% crosspovidone were shown to disintegrate in vitro in 24 and 42 seconds, respectively. In vitro drug release experiments were conducted in phosphate buffer pH 6.8 based on in vitro disintegration time.[28,48] It was extracted from the leaves of Hibiscus rosasinensis, and its effectiveness was contrasted with that of manufactured superdisintegrants like crosspovidone. The mucilage of Hibiscus rosasinensis was separated and identified using chemical testing and micrometric characteristics. Quick utilising Hibiscus rosa-sinensis mucilage (2–8% w/w), Avicel PH 102 as diluents, and mannitol as a sweetener to improve mouth feel and compressibility, dissolving tablets of imipramine were created utilising the direct compression method.[28,49]

vi. **Agar and Treated Agar:** It is a dried gelatinous material derived from multiple species of red algae, including Pterocladia and Gracilaria, and Gelidanceae, such as Gelidium amansii. Agar has a mucilaginous taste, is inodorate, and ranges from yellowish-gray to white to almost colourless. and is present in the form of coarse powder, sheet flakes, or divests. Agarose and agar pectin are the two polysaccharides that make up agar. Agar pectin is in charge of the viscosity of agar solutions, while agarose is in charge of gel vigour. Agar's high gel vigour makes it a possible disintegrant.[28]

vii. **Gaur Gum:** A linear chain of β-(1→4)-linked D-mannose units makes up guar gum. D-galactose is joined to each other mannose unit by α-(1→6) connections to create short side chains. Guar gum has a high low-shear viscosity but does not self-gel. Due to its nonionic nature, it is not impacted by pH or ionic strength[28,47,50]. The bulk of guar gum is composed of galactomannans, which have a significant molecular weight (between 50,000 and8,000,000). It is used as a thickening and is legal in practically every nation. emulsifier and stabiliser (e.g., EU, USA, Japan, and Australia). It's a naturally occurring gum. It is a naturally occurring polymer made of freely flowing, completely soluble sugar units that can be used in food. pH, moisture content, and tablet matrix solubility have little effect on it. The colour of alkaline tablets can vary from off-white to tan and is not always pure white. Additionally, it tends to tarnish over time.[33,51]

viii. **Gum karya:** Gum Karaya is a complex polysaccharide with a high molecular weight and a negative colloid. The hydrolysis of galactose, rhamnose, and galacturonic acid produces Rhamnose, galactose, and galacturonic acid Gum Karaya is a guar gum derivative that has been partially acetylated. It is the dried exudate of the Sterculia Uren tree, which belongs to the Sterculiaceae family. Its synonyms include Karaya, sterculia, Indian tragacanth, Bassora tragacanth, Kadaya, Kadira, and Katila. Gum Karaya is compatible with proteins, carbohydrates, and other plant hydrocolloids[33,52]. Gum karaya is a vegetable gum that is exuded by trees of the genus Sterculia. The high viscosity of gum keeps it from serving as a disintegrant or binder in the creation of dosage forms. Gum karaya's potential as a tablet disintegrant has been investigated. Several

research indicate that modified gum karaya accelerates the disintegration of tablets. Commercially available synthetic and semi-synthetic superdisintegrants can be replaced with gum karaya[53].

ix. **Fenugreek seed mucilage:** Fenugreek is the common name for Trigonella foenum-graceum, a type of herb in the leguminous family. A significant amount of fenugreek seeds are composed of mucilage, a naturally occurring sticky substance present in the coats of many seeds. Water does not dissolve mucilage. However, it turns into a sticky, viscous material when it comes into touch with liquids. Like other materials with mucilage, fenugreek seeds swell and become slick when exposed to liquids. The study found that the natural disintegrant fenugreek mucilage has more preponderant disintegration capabilities than the synthetic superdisintegrant Ac-di-sol, which is most commonly used in FDT formulations. Studies show that the extracted mucilage is both a helpful medicinal adjuvant and a breaking agent.[35] In the current study, M. Sumathi et al. examined the superdisintegrant potential of fenugreek seeds. When fenugreek was used as a superdisintegrant, the tablets broke down considerably more quickly and reliably than when plantago ovate and cross carmellose sodium were used. The results suggest that fenugreek seeds could be used as a natural superdisintegrant in the manufacture of fast-dissolving tablets.[33,54]

x. **Soy polysaccharides:** It is a natural superdisintegrant that doesn't contain sugar or starch and can be used in wholesome products. A class of high molecular weight polysaccharides derived from soy is called soy polysaccharide. beans was evaluated as a disintegrant in direct compression tablets with fillers made of lactose and dicalcium phosphate dihydrate. As control disintegrants, maize starch and cross-linked sodium carboxymethyl cellulose were used. When used as a disintegrating agent in direct compression formulations, soy polysaccharide produces outcomes similar to those of cross-linked CMC.[33,54] Formulas for orodispersible tablets with The fastest water absorption rate (82), the fastest wetting and disintegration times (20 and 35 seconds, respectively), and the highest dissolving rate (100 percent after 20 minutes) were all exhibited by Emcosoy as superdisintegrant and Pullulan as diluent. In summary, the best option for increasing water solubility and, consequently, bioavailability are orodispersible tablets that contain simvastatin hydroxy butyl-cyclodextrin and are made utilising Emcosoy as a superdisintegrant and pullulan as a diluent.[56,33]

xi. **Gellan gum:** Pseudomonos elodea is the source of gellan gum (GG), a biodegradable linear anionic polymer used in food preparation. It is composed of repeats of linear tetra saccharides. Agar (AG) (Gelidaceae) is made from Gelidium amansii (Gelidanceae) and other red algae species like Gracilaria (Gracilariaceae) and Pterocadia (Pterocadiaceae).[57,33] Gellan gum is a water-soluble polymer produced by the bacteria Pseudomonas elodea. Gellan gum is a deacetylated exocellular gum composed of anionic, high molecular weight polysaccharides. Antony and Sanghavi looked at gellan gum as a disintegrant. in 1997. The efficacy of the gum was compared to other widely used disintegrants, such as Explotab , dry maize starch.[35] Ac-di-sol and Kollidone CL exhibit remarkably similar disintegration patterns and in vitro dissolving speeds; the same concentration formulation with explotab took 36 minutes to release 90% of the drug, whereas it took 220 minutes for the same concentration formulation with starch. Gellan gum has been shown to be a superdisintegrant, according to the study's findings .[33,58]

xii. **Mango peel pectin:** It was found that mango peel, which accounts for 20 to 25 percent of the waste produced during the processing of mangos, may be used to extract high-quality pectin that can be used to make pleasant jelly and film. Although they are not as effective as artificial superdisintegrants, Studies have shown that mango skin pectin is a potentially useful superdisintegrant. It can be used to manufacture tablets that dissolve quickly because of its high swelling index and superior solubility.[35] M. Rishabha et al. found that mango peel pectin was a good candidate for functioning as a superdisintegrant. Even yet, it lacks the strength of synthetic Sodium starch glycolate can be utilised to create quickly dissolving tablets due to its better solubility and improved swelling index.[33,59]

xiii. **Mucilage of Lepidium sativum**: L. sativum (family: Cruciferae), often known as Asaliyo, is widely utilised as a herbal remedy in India. It is fairly priced and extensively accessible on the market. Seeds, oil, roots, leaves, and so on are some of the ingredients. Mucilage is more abundant in seeds, two first Semilepidinoside A and B are monomeric imidazole alkaloids; lepidine B, C, D, E, and F are dimeric imidazole compounds (alkaloids). L. sativum mucilage exhibits a variety of properties, including binding, dissolving, gelling, and more.[35]

xiv. **Mucilage from Plantago ovata seeds:** Many species of plants of the genus Plantago, whose seeds are used commercially to create mucilage, go by the common names psyllium and ispaghula. Among the many characteristics of Plantago ovate mucilage are its capacity to bind, break down, and keep up. In one study, the direct compression method was utilised to make fast-dissolving amlodipine besylate tablets utilising different amounts of Plantago ovate mucilage as natural superdisintegrants.[35] FT-IR analyses revealed that

amlodipine besylate and other excipients did not interact physicochemically. Every formulation's weight was assessed. fluctuation, drug content, solubility, hardness, friability, and disintegration time. Formulations based on Plantago ovata had a faster in vitro dissolving time of 16 minutes and a faster in vitro disintegration time of 11.69 seconds. Consequently, we discovered that dried isabgol mucilage might be utilised as a superdisintergrant when creating tablets that dissolve quickly.[33,60]

xv. **Aegle marmelos gum (AMG)**: It comes from A. marmelos fruits, which break down more quickly and steadily than croscarmellose sodium. The mature, scarlet berry pulp has a mucilaginous, astringent taste. Carbohydrates, amino acids, O-methyl fordinol , dictamine, angelenine, and marmeline The pulp contains vitamins C and A, as well as isopentenyl halfordinol. Therapy from AMG is made via the heat process. which increases the solubility of poorly soluble drugs Purified bael gum polysaccharides contain L-rhamnose (6.5%), D-galactose (71%), D-galacturonic acid (7%), and L-arabinose (12.5%).[35] It is made from the fruits of the Aegle marmelos tree, which is native to India and belongs to the Rutaceae family. The ripe fruit pulp has a mucilaginous, astringent texture and is reddish-brown in hue. taste. Carbohydrates, protein, vitamins C and A, angelenine, marmeline, dictamine, O-methyl fordinol, and isopentyl halfordinol are all present in the pulp.[33,61]

xvi. **Locust bean gum:** dissolve, however it is moderately soluble in room The seeds of the Mediterranean tree Ceretonia siliqua are used to make carob bean gum, sometimes referred to as locust bean gum, a galactomannan vegetable gum extract. It is frequently utilised as a substance used in the food industry to thicken and gel. According to reports, it also possesses an adhesive and solubility-enhancing property.[33,62] We refer to it as cocoa bean gum. This galactomannan vegetable gum comes from the seeds of the carob tree (Ceratonia siliqua). Locust bean gum is utilised in the food industry as a thickening, gel-forming agent, and bioadhesive that improves solubility. The gum is a powder with no smell that varies between white and yellowish-white. It is not dissolved by most organic solvents, including ethanol. It needs to be heated to a temperature above 850 degrees for ten minutes in order to fully temperature water and soluble in hot water.[35,63]

xvii. **Ficus indica Fruit Mucilage:** The sticky material utilised as a superdisintegrant is made from the pulp of the ficus indica fruit .The gigantic Ficus indica tree can grow up to three meters in height. It has aerial roots and long branches, and it grows rapidly. Cherry-sized fruits are made by the plant Ficus indica. It has both nutritional and therapeutic benefits. The uncooked, dried fruit of Ficus indica has 230 kcal (963 KJ) per 100 grammes, or 3.5 ounces. Fever, pain, inflammation, wound healing, blood problems, and urinary problems are all treated with it.[35]

xviii. **Mangifera indica gum:** Mango is the common name for M. indica, which belongs to the Anacardiaceae family. It is used in many different compositions as a non-toxic disintegrant, adhesive, suspending, and emulsifying agent. Although the gum powder dissolves in water, practically insoluble in acetone, ether, methanol, alcohol, and chloroform. Its colour ranges from white to off-white.[35,64] Mangifera indica is a non-toxic plant that is frequently employed in a variety of formulations as an emulsifier, binder, suspending agent, and disintegrant. It is a member of the Anacardiaceae family. The white to off-white gum is soluble in water but nearly insoluble in solvents such as ethanol, methanol, ether, acetone, and chloroform. It is readily accessible and non-toxic, and many tree parts exhibit pharmacological qualities, such as diuretic and astringent effects, as well as advantages for ailments including diabetes, asthma, diarrhoea, urethritis, and scabies.[65,66]

xix. **Hibiscus rosa-sinensis mucilage and treated agar:** It is a member of the Malvaceae family and is also known as the Chinese hibiscus, shoe flower plant, or China rose. Mucilage functions as a thickening, disintegrating, suspending, and water-retaining agent. The plant's mucilaginous leaves, which contain D-rhamnose, D-galacturonic acid, D-glucuronic acid, and galactose are all readily available. "Treated agar" is agar that has been submerged in water for a whole day.[35]

xx. **Dehydrated banana powder (DBP):** Bananas are also known as plantains. DBP is derived from the Ethan and Nethran (Nenthra vazha) banana types and belongs to the Musaceae family. Because it contains vitamin A, it is used to treat stomach ulcers and diarrhoea. It also contains vitamin B6, which aids in reduce anxiety and solicitousness. It is an excellent source of energy due to its high carbohydrate content, and it also contains potassium, which controls more dominating brain activity.[35,67,68]

2 Traditional Superdisintigrats :

i. **Starch:** Starch, a common carbohydrate obtained from potatoes and other sources, is used as a disintegrant in dispersible tablets due to its higher swelling index. Starch is

found in seeds, vegetables, and green plants. It serves as a disintegrant, binder, and filler. It is believed that swelling plays a significant role in its disintegrant activity. The size and form of the starch granules, as well as the percentage of amylose and amylopectin in the head components, are all typical for the species. It is believed that some carbs are addictive. Starch is one of the oldest and most often used disintegrants due to its promising qualities, which include swelling in nature, the fastest tablet breakdown, and the start of medicine release. Rapid water retention in the mechanism system causes uniform and quick disintegration, which greatly increases granule volume. Disintegrants are pharmaceutical excipients that are added to tablet formulations to help compacted tablets separate into tiny particles in aqueous environments. Enhanced tablet splitting in aqueous fluids enhances the bioavailability, absorption, and disintegration of oral controlled medications.[53,69-73]

ii. **Cellulose:** Similar to methylcellulose and carboxymethylcellulose, cellulose is derived from plants and is used as a superdisintegrant due to its capacity to retain water and swelling capacity. Cellulose is used in the production of fast-dissolving tablets due to its rapid beginning of action and ability to be ingested without the use of water.[53,74,75]

4. Synthetic superdisintegrants:

i. **Modified Starch (Sodium starch glycolate, Primojel):** The sodium salt of a starch carboxymethyl ether is called sodium starch glycolate. Potato starch is crosslinked to create these modified starches, which have the best dissolving qualities. The extent of substitution and cross-linking are crucial elements in evaluating these compounds' performance as superdisintegrants. Crosslinking has the effect of lowering the polymer's water-soluble percentage as well as its water-dispersion viscosity. The volume of the modified starches increases by 200–300 percent in water, while the natural pre-dried starches swell by 10–20 percent.[28,76,77] Sodium starch glycolate is the Na+ derivative of carboxymethyl ether starch. These modified starches, which are created by cross-linking potato starch, have excellent disintegration properties. The degree of cross-linking and substitution is important for the superdisintegrating effect variables.[35,78,79]

ii. **Cross-linked Polyvinyl Pyrrolidone (Crospovidone**): In order to create the volume expansion and hydrostatic pressure required for fast disintegration in the mouth, crospovidone swiftly wicks saliva into the tablet. Under a scanning electron microscope, crospovidone particles appear to be granular and extremely permeable. This special porous quality speeds up disintegration and makes it easier for liquid to wick into the dosing systems. Even at a high ratio, crospovidone has almost little tendency towards gel formation, in contrast to other superdisintegrants such sodium starch glycolate and croscarmellose sodium.[28,80] Crosspovidones distinct particle shape makes them extremely compressible materials. In direct compression, wet, and dry granulation procedures, crospovidone is employed as a superdisintegrant at low concentrations (2–5%).[28,81]

iii. **Modified Celluloses (Croscarmellose Sodium):** Cross-linked sodium carboxymethylcellulose has a high absorption capacity and is a white, free-flowing powder. It offers quick disintegration and drug dissolution at lower levels because of its high swelling capacity. Additionally, it has exceptional water wicking capabilities, and its Excellent swelling capabilities are produced by an insoluble, hydrophilic, highly absorbent substance with a cross-linked chemical structure. A concentration of 0.5–2.0%35 is advised. One definition of croscarmellose sodium is a cross-linked polymer of carboxymethylcellulose. The starch and cellulose polymers differ in a number of ways, one of which being the synthetic methods employed to alter the polymer. Croscarmellose sodium can be utilised in tablet formulations in both wet-granulation and direct compression techniques. To maximise the disintegrant's wicking and swelling properties, croscarmellose sodium should be applied throughout both the wet and dry phases of the process (intra- and extra-granularly).[28,82] Tablet disintegrants contain up to 5% w/w of croscarmellose sodium, 2% w/w of tablets made by direct compression, and 3% w/w of tablets made by wet granulation. This CMC sodium polymer is cross-linked internally. Due of its low gelling and high swelling capacity, it breaks down swiftly.[35,83,84]

iv. **Microcrystalline Cellulose (Avicel):** Microcrystalline cellulose is a white, tasteless, odourless, crystalline powder made of porous particles that has been partially depolymerised and purified. A concentration of less than 10% of Avicel exhibits improved disintegration. This system is dependent upon Water enters the tablet matrix through capillary holes, disrupting or breaking the hydrogen connection between adjacent cellulose microcrystal bundles. High concentrations, especially in oral disintegrating tablets, have a tendency to adhere to the tongue because of rapid capillary absorption and surface dryness. Because of its quick water wicking rate, it works well with starch in tablet formulations for efficient and quick disintegration. It is sold commercially in a variety of moisture grades and particle sizes, each with unique qualities and uses.[28,35,85-87]

v. **Alginates**: These are hydrophilic colloidal components that are either chemically enhanced from natural sources, such as alginic acid or alginic acid salts, or naturally derived from specific kinds of kelp. Alginic acid is a polymer made of L-glucoronic and D-mannuronic that is extracted from seaweeds. units. It is a great disintegrant due to its strong sorption capacity and affinity for water absorption. Sodium alginate is utilised as a disintegrant at concentrations of 2.5–10%, while alginic acid is employed at concentrations of 1–5%. It works well with multivitamin and ascorbic acid formulations.[28,85]

vi. **Indion 414:** This polymer is inexpensive, readily accessible, and safe for ingestion. It is an ion exchange resin by nature, and when employed as a superdisintegrant instead of a typical one, it swells when hydrated without dissolving and has no sticky tendency, resulting in homogeneous tablet breakdown. They don't clump together, don't adhere to tablet press parts, and are compatible with other pharmaceutical requirements and frequently used active medicinal substances. When the pills are compressed, they provide improved hardness. In hydrophobic formulations, Indion 414 works better than traditional disintegrants. The concentration of Indion 414 utilised in the tablets ranges from 0.5 to 2% for successful disintegration.[28,88]

vii. **Resins:** Because of their strong affinity for water, resins function as disintegrants even though they are insoluble. They are also superdisintegrant because of the quick pace of swelling brought on by their small size of particles. They not only provide the pills strength but also prevent them from lumping like conventional disintegrants do. Because of their physicochemical stability, benign nature, uniformly sized spherical shape that allows coating, and equilibrium driven repeatable release of pharmaceuticals in an ionic environment, ion exchange resins have been promoted for application in drug delivery systems. Insoluble polymers having basic or acidic functional groups that can exchange counter-ions in nearby aqueous solutions are known as ion exchange resins.[35,89]

viii. **Calcium Silicate:** Wicking is how this lightweight, very porous superdisintegrant operates.[35,90]

5. Semi-Synthetic Superdisintegrants: A semisynthetic superdisintegrant is a material that is partially made of organic materials and somewhat modified chemically to enhance its disintegration properties in pharmaceutical formulations. These materials are suitable for a range of dosage forms where rapid dissolution and disintegration are essential because they combine the advantages of natural materials with specialised qualities attained through chemical modification.[35,91]

6. Co-processed Superdisintegrants: a particular type of additive used in pharmaceutical formulations, particularly in oral dosage forms that are solid. is referred to as a co-processed superdisintegrant, such as tablets and capsules. Unlike single-component superdisintegrants, co-processed superdisintegrants are created by combining two or more distinct excipients employing a specific manufacturing process to enhance their functionality and disintegrant performance. Together, co-processed excipients increase tablet dissolving and disintegration rates, which boosts medicine bioavailability and patient compliance.[35,92]

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