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A Desktop Reference Guide to Natural Disintegrants Used in Oral Dosage Form

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Abstract:

The compositions' medicinal action is produced through disintegration and then dissolution. For tablets and capsules to have the best bioavailability, disintegrants are necessary. The compounds that hasten disintegration are known as disintegrants. Disintegrants break down tablets into smaller pieces that break down more quickly than when the disintegrants aren't present. Super-disintegrants are better disintegrants; even at low concentrations, they speed up or prolong the disintegration process. This review provides a concise overview of the product's mechanism of action and how super disintegrants evolved from herbs and insects. According to the study, various natural super disintegrants were successfully used in the formulations.

Keywords **—Gums, Mucilage, Mouth dissolving, Natural, Solubility.**

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I. INTRODUCTION

Orally delivered medications are the best, most comfortable, and least expensive options. It is well known that super disintegrants are tablet additives that dissolve quickly in or separate from the dosage form without water. Children and the elderly are particularly troubled by the disadvantages of oral dosage forms, which can be avoided by promptly solubilizing tablets with the addition of super disintegrants [1, 2]. Natural disintegrants are preferable to synthetic disintegrants because they are non-reactive, non-toxic, affordable, environmentally friendly, and easily accessible [3]. These natural super disintegrants have special properties in a dosage form as a binder, diluents, and good dissolving potential for less hydrophilic pharmaceuticals, which affect the pace of solubilization and supply as nutritional supplements[4].

Disintegrants are substances that are regularly added to tablets and other preparations to help break down tablets and capsules into smaller pieces when submerged in water (Raghu et al., 2018). The surface area grows, as a result, improving the medicine's efficiency of release. Disintegrants have piqued the interest of researchers as a necessary step in achieving rapid drug release [5]. The main goal of the disintegrants is to weaken the binding

power of the tablet binder and the physical forces that compress the tablet into a tablet shape [6, 7]. When the super disintegrants come into contact with water, they change the tablet by expanding, hydrating, and gaining mass. The best super disintegrants increase compatibility while maintaining the preparations' physical efficacy.

The majority of dosage forms use natural polymers, which are preferable to synthetic ones due to their following benefits [8-10]:

- Biodegradable
- Easily available in adequate quantities
- Economical
- Greater patient adherence
- Nontoxic
- Renewable
- Without adverse consequences

2. Assortment of Super disintegrants

In order to choose a decent super disintegrant, it is important to keep the following things in mind [11].

- Amount and type of blending
- Can be compressed to create whole tablets
- Excellent flowability
- Pleasant mouthfeel
- Tablet toughness
- The number of disintegrates in a recipe
- The presence of surface-active substances

3. Mechanism of super disintegrants

The primary and secondary mechanisms of super disintegrants are as follows [12-15].

- **Wicking:** Tablets lose their air content when they come into contact with water because of the capillary action. This causes the tablet's bonds to weaken and break, resulting in the formation of tiny particles.
- **Swelling:** A tablet with a high porosity disintegrates poorly because there is insufficient swelling force. The dissolution fluid has a tough time entering the dosage form if compression is quite high.
- **Particle disgusting forces:** The tablet disintegrates as a result of the non-swellable disintegrants' electric revolting forces between particles.
- **Deformation:** Disintegrants alter the shape of the tablet during compression before returning to the original shape when they come into touch with water. The tablet eventually breaks as a result of this.

Today, there are many herbal medicinal excipients available, and numerous researchers have looked at the effectiveness of some of these herbal materials as super disintegrating medicines [16]. Due to their accessibility locally, ecological design, biocompatibility, renewable supply, and reduced costs compared to significant synthetic items, plant products are used as alternatives to synthetic products [17]. Due to their capacity to produce a wide range of materials and qualities based on their molecular weight, polysaccharides, and proteins are the main focus of research on natural polymers for disintegration activities. Mucilage and gums are examples of polysaccharide hydrocolloid structures that are prevalent in nature and are present in many higher plants.

Because of the high concentration of hydroxyl groups in polysaccharides, mucilages often have a great capacity to retain water [18]. This has prompted research for your study of plant water conditions. It has been proposed that plants may have a defence against drought in the form of their mucilage capacity to water themselves. Natural mucilages and gums are therefore employed and extensively studied as disintegrants. Since ancient

times, people have used mucus and gum for their medicinal powers [19]. They are now often used in pharmaceuticals as thickeners, aids for retaining water, suspension agents, etc. The main components of viscous mucilages include polysaccharides and proteins [20, 21]. Due to its geographic location and environmental conditions, India is typically a reliable supplier of such goods. The following are some examples of how mucus and gums have been used as super disintegrants. These dosage forms have a strong affinity for water, which has a significant impact on moisture stability. The material is stored under accelerated stability conditions. Tables 1, 2, and 3 lists some natural super disintegrants that have been applied as disintegrants in their research.

TABLE I
LIST OF NATURAL SUPER DISINTEGRANTS (MUCILAGE)

Common name	Botanical name	Plant part	Family
Agar [22]	*Gelidium amansii*	Weed	*Gelidanceae*
Banana [23]	*Nenthra vazha*	Ethan and nenthran	*Musaceae*
Basil [24]	*Ocimum bacilicum*	Seeds	*Lamiaceae*
Bel [25]	*Aegle marmelos*	Fruits	*Rutaceae*
China rose [26]	*Hibiscus Rosa-sinensis*	Leaves	*Malvaceae*
Fenugreek 27]	*Trigonellafoenum-graceum*	Seed	*Fabaceae*
Indian Fig [28]	*Ficus indica*	Fruits	*Cactaceae*
Garden cress [29]	*Lepidium sativum*	Plant	*Cruciferae*
Ispaghula Husk [30]	*Plantago ovata*	Seeds	*Plantaginaceae*
Ispaghula [31]	*Plantago ovata*	Seeds	*Plantaginaceae*
Mango Pectin [32]	*Mangifera indica*	Peel pectin	*Anacardiaceae*
Soy fiber [33]	Glycine max	Seeds	*Leguminosae*

TABLE III
LIST OF NATURAL SUPER DISINTEGRANTS (GUMS)

Common name	Botanical name	Plant part used	family
Golden shower [34]	*Cassia fistula*	Seeds	Fabaceae
Guar Gum [35]	*Cyamopsis tetragonoloba*	Fruits	Fabaceae
Karaya gum [36]	*Sterculia urens*	Plant exudates	Lgumes
Locust Bean gum [37]	*Ceretonia siliqua*	Seeds	Fabaceae
Mango gum [38]	*Mangifera indica*	Plant exudates	*Anacardiaceae*
Winter squash [39]	*Cuccurbita maxima*	Pulp	*Cucurbitus*

TABLE IIII
LIST OF NATURAL SUPER DISINTEGRANTS (INSECTS)

Common name	Biological name	Part used	family
Chitin and Chitosan [40]	Crab (*Brachyura*) and shrimp (*Caridea*)	Shells	*Cancridae Crangonidae*
Gellan Gum [41]	*Sphingomonas elodea*	Bacterium	*Sphingomonadaceae*.
Xanthan gum [42]	*Xanthomonas campestris*	Fermented polysaccharide	*Pseudomonaceae*

II. CONCLUSIONS

Natural super disintegrants are additives used inpharmaceutical formulations to enhance the disintegration and dissolution of tablets or capsules. They promote the rapid breakup of the dosage form into smaller particles, thereby increasing the surface area available for drug dissolution. This, in turn, leads to faster drug release and improved bioavailability.Natural super disintegrants, derived from various sources such as plants, seaweeds, or microbial polysaccharides, possess unique properties that make them effective in enhancing the disintegration process. Examples of natural super disintegrants include croscarmellose sodium, crospovidone, sodium starch glycolate, agar, alginate, and carrageenan.By incorporating natural super disintegrants into tablet formulations, the disintegration time of the tablets can be significantly reduced. This means that the tablets disintegrate more rapidly when they come into

contact with fluid, such as saliva or gastrointestinal fluids. As a result, the drug particles are released faster and can be readily dissolved and absorbed in the body, leading to improved drug efficacy.The use of natural super disintegrants offers several advantages in pharmaceutical formulations. It enhances patient acceptance and compliance since faster disintegration and dissolution result in a quicker onset of action and improved drug availability. Additionally, it allows for the development of low-dose or fast-dissolving formulations, which can be particularly beneficial for pediatric, geriatric, or patients with swallowing difficulties.Overall, the inclusion of natural super disintegrants in pharmaceutical formulations plays a crucial role in improving the dissolution characteristics of medications, enhancing their bioavailability, and ensuring effective therapy.

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