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Review article

NATURAL SUPERDISINTEGRANTS - OVERVIEW

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ABSTRACT

In dosage forms solid orals gain maximum popularities, about 85 % because of many advantages over others. The therapeutic activity of these formulation is obtained through a typical manner like disintegration followed by dissolution. Hence disintegration has major role for facilitating drug activity and thus gain popularity among other dosage forms. Disintegrant are substances or mixture of substances added to the drug formulation that facilitates the breakup or disintegration of tablet or capsule content into smaller particles that dissolve more rapidly than in the absence of disintegrants. In recent years several newer agents have been developed known as superdisintegrants. Super disintegrants are used to improve efficacy of solid dosage form and influence the release of dosage form. The plant derived natural superdisintegrants comply with many requirements of pharmaceutical excipients as they are non-toxic, stable, easily available, associated with less regulatory issues as compared to their synthetic counterpart and inexpensive. This review discuss about the development of various kinds of natural super disintegrating agents along with their role in the tablets disintegration and as potent candidate to be used in oral dispersible tablets which are being used in the formulation to provide safer, effective drug delivery with patient compliance.

Key Words:-Super disintegrants, Plantagoovata, *Lepidumsativum*, Fenugreek seeds, Mango peel pectin.

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INTRODUCTION

Disintegrant are substances or mixture of substances added to the drug formulations, which facilitate dispersion or breakup of tablets and contents of capsules into smaller fragments for quick dissolution. The task of developing rapidly disintegrating tablets is accomplished by using a suitable superdisintegrants (Chougule D *et al.*, 2010). In recent years several newer agents have been developed known as"Superdisintegrants (Mangal M *et al*., 2012). These are the substances, which facilitate the faster disintegration with smaller quantity in contrast to disintegrant. Superdisintegrants provide quick disintegration due to combined effect of swelling and water absorption by the formulation. Due to swelling of superdisintegrants, the wetted surface of the carrier increases, this promotes the wettability and dispersibility of the system, thus enhancing the disintegration and dissolution (Deshmkh H *et al*., 2012).

There are various factors Considered during selection of Superdisintegrants (Shrivastava P and Sethi V, 2013).

- Amount of disintegrants present in formulation.
- Hardness of tablets.
- Type of addition and mixing.
- Nature of drug.
- It should have good flow ability.
- Presence of surface active agents.
- Compactable to produce less friable tablets.
- Produce good mouth feel to the patient.

A superdisintegrants used in granulated formulation processes can be more effective if used both "intragranularly" and "extra granularly" thereby acting to break the tablet up into granules and having the granules further disintegrate to release the drug substance into solution. However, the portion of super disintegrant added intragranularly (in wet granulation processes) is usually not as effective as that added extragranularly due to the fact

that it is exposed to wetting and drying (as part of the granulation process) which reduces the activity of the super disintegrant. Since a compaction process does not involve its exposure to wetting and drying, the super disintegrant used intragranularly tends to retain good disintegration activity. There are three methods of incorporating disintegrating agents into the tablet: A. Internal Addition (Intragranular) B. External Addition (Extragranular) C. Partly Internal and External. The proper choice of a disintegrant or a super disintegrant and its consist performance are of critical importance to the formulation development of capsule and tablets (Mohanachandran PS *et al*., 2011). Ideal properties of Super disintegrants (Omidian H and Park K, 2008)

- It should have poor solubility.
- Poor gel formation.
- Have good hydration capacity.
- It must have good flow properties.
- No tendency to form complexes with the drugs.
- It should have good mouth feel.
- Inert.
- Non toxic.

Mechanism of action of Superdisintegrants (Singh AK et al., 2007)

1. By Swelling.
2. Capillary action (wicking).
3. Due to heat of wetting.
4. Enzymatic reaction.
5. Due to release of gases.
6. Deformation.
7. Combination action.
8. Chemical reaction.
9. Electrostatic repulsion.

By Swelling

It is a mechanism in which certain disintegrating agents (such as starch) impart the disintegrating effect. When it comes in contact with water it swell, the adhesiveness of other ingredients in a tablet is overcome causing the tablet fall apart as in figure 1.eg: Sodium starch glycolate (Grasono, 2009)

Capillary Action

Disintegrants that do not swell they act through porosity and capillary action. Tablet porosity provides pathways for the penetration of fluid into tablets. The disintegrant particles (with low cohesiveness & compressibility) themselves enhance porosity and provide these pathways into the tablet. Liquid is drawn up or "wicked" into these pathways through capillary action and rupture an inter particulate bonds causing the tablet to break apart. E.g.Crospovidone, Cross carmillose (Khairnar DA *et al.*, 2014).

Due to heat of wetting

when disintegrants with exothermic properties get wetted, localized stress is generated due to capillary air expansion, which helps in disintegration of tablet. However, is limited to only a few types of disintegrants and cannot describe the action of most modern disintegating agents (Pahwa R and Gupta N, 2011).

Enzymatic reaction

Some enzymes present in the body also act as disintegrants. These enzymes reduce the binding ability of binder and helps in disintegration. Due to swelling, pressure is exerted in the outer direction that causes the tablet to burst or enhance absorption of water leads to an enormous increase in the volume of granules to improve disintegration (Kuchekar BS *et al.*, 2005).

Due to release of gases

Carbon dioxide released within tablets on wetting due to interaction between bicarbonate and carbonate with citric acid or tartaric acid. The tablet disintegrates due to generation of pressure within the tablet. This effervescent mixture is used when pharmacist needs to formulate very rapidly dissolving tablets or fast disintegrating tablet. As these disintegrants are highly sensitive to small changes in humidity level and temperature, strict control of environment is required during manufacturing of the tablets. The effervescent blend is either added immediately prior to compression or can be added in to two separate fraction of formulation (Shihora H and Panda S, 2011).

Deformation

Starch grains are generally "elastic" in nature means that grains that are deformed under pressure will return to their original shape when that pressure is removed. But, when the compression forces involved in tableting applied, then these grains are deformed permanently and are said to be "energy rich" with this energy being released upon exposure to water. In other words, the ability for starch to swell is higher in "energy rich" starch grains than it is for starch grains that have not been deformed under pressure. It is believed that no single mechanism is responsible for the action of most disintegrants. But rather, it is more likely the result of inter-relationships between these major mechanisms.

Combination reaction

In this mechanism, the disintegrants act through the combination of both wicking and swelling action (Reddy LH *et al.*, 2002). E.g.Crosspovidone.

Acid base reaction

By internal liberation of CO2 in water due to interaction between tartaric acid and citric acid (acids) with alkali metal carbonates or bicarbonates (bases) in presence of water tablet quickly broken apart. The tablet disintegrates due to generation of pressure within the

tablet. Due to liberation in Co_2 gas, the dissolution of active pharmaceutical ingredients in water as well as taste masking effect is increased. As these disintegrants are highly sensitive to small changes in temperature and humidity level, control of environment must be required during preparation of the tablets. The effervescent blend is either added immediately prior to compression or can be added in two separate fraction of formulation. The effervescent blend is added immediately before compression or can be added into two separate fraction of formulation.

Electrostatic repulsion

Guyot - Hermann has proposed a particle repulsion theory on the basis of his theory he observed that the particle with no swelling action also causes disintegration of tablets. Mechanism of disintegration based on electric repulsive forces between particles and water is required for it. Researchers found that repulsion is secondary to wicking (Hermann G and Ringard J, 1981).

Natural Superdisintegrants

These super disinegrating agents are natural in origin and are preferred over synthetic substances because they are comparatively cheaper, abundantly available, non-irritating and nontoxic in nature. The natural materials like gums and mucilage have been extensively used in the field of drug delivery for their easy availability, cost effectiveness, Eco friendliness, emollient and non-irritant nature, non-toxicity, capable of multitude of chemical modifications, potentially degradable and compatible due to natural origin. There are several gums and mucilage are available which have super disintegrating activity (Khinchi KP *et al.*, 2011).

Plantago ovata seed mucilage

Psyllium or Ispaghula is the common name used for several members of the plant genus Plantago whose seeds are used commercially for the production of mucilage. Mucilage of Plantago ovata has various characteristics like binding, disintegrating and sustaining properties. Isapghula consists of dried seeds of the plant plantago ovata and it contains mucilage which is present in the epidermis of the seeds. The seeds of Plantago ovata were soaked in distilled water for 48 hrs and then boiled for few minutes for complete release of mucilage into water. The material was squeezed through muslin cloth for filtering and separating out the marc. Then, an equal volume of acetone was added to the filtrate so as to precipitate the mucilage. The separated mucilage was dried in oven at temperature less than 60°C. It shows faster disintegration time than the super disintegrantCrosspovidone (Deveswaran R *et al*., 2009; Shirsand S *et al.*, 2009).

***Lepidium sativum* mucilage**

Lepidium sativum (family: Cruciferae) is known as Asaliyo and is widely used as herbal medicine in India. It is widely available in market and has very low cost. Parts used are leaves, root, oil, seeds etc. Seeds contain higher amount of mucilage, dimeric imidazole alkaloids lepidine B, C, D, E and F and two new monomeric imidazole alkaloids semilepidinoside A and B. Mucilage of Lepidium sativum has various characterisc like binding, disintegrating, gelling etc (Mehta KK *et al.,* 2010).

Fenugreek seed mucilage

Trigonella Foenum-graceum commonly known as Fenugreek, is an herbaceous plant of the Leguminous family. It has found wide applications as a food, a food additive, and as a traditional medicine. The leaves and both the ripe and unripe seeds of Trigonella Foenum-graceum are used as vegetables. Fenugreek has been used in treating colic flatulence, dysentery, diarrhoea, dyspepsia with loss of appetite, chronic cough, dropsy, enlargement of liver and spleen, rickets, gout, and diabetes. It is also used as gastro protective, anti urolithiatic, diuretic, antidandruff agent, Anti inflammatory agent and as antioxidant. The seed is stated to be a tonic. It also is used in post-natal care and to increase lactation in nursing mothers. Fenugreek seeds contain a high percentage of mucilage (a natural gummy substance present in the coatings of many seeds). Although it does not dissolve in water, mucilage forms viscous tacky mass when exposed to fluids. Like other mucilage containing substances, fenugreek seeds swell up and become slick when they are exposed to fluids. Hence, the study revealed that this natural disintegrant (fenugreek mucilage) showed better disintegrating property than the most widely used synthetic superdisintegrants like Ac di-sol in the formulations of FDT's. Studies indicated that the extracted mucilage is a good pharmaceutical adjuvant, specifically a disintegrating agent (Kumar R *et al*., 2009).

Mango peel pectin

Mango peel which constitutes 20–25% of the mango processing waste was found to be a good source for the extraction of pectin of good quality, suitable for the preparation of film and acceptable jelly. Pectin is a complex hetro-polysacharides which is a hydrophilic colloid. Mango peel pectin stand as a good candidate as super disintegrant though, not as stronger as synthetic super disintegrant but due to its good solubility and higher swelling index, it may be used in the formulation of fast dispersible tablets (Malviya R *et al*., 2011; Libermann HA *et al.,* 1989).

Agar and treated agar

Agar is the dried gelatinous substance obtained from Gelidium amansii (Gelidanceae) and several other species of red algae like Gracilaria(Gracilariaceae) and Pterocadia (Gelidaceae). Agar is yellowish gray or white to nearly colorless, odorless with mucilaginous taste and is

available in the form of strips, sheet flakes or coarse powder. Agar consists of two polysaccharides as agarose and agaropectin. Agarose is responsible for gel strength and Agaropectin is responsible for the viscosity of agar solutions. High gel strength of agar makes it a potential candidate as a disintegrant (Batham P *et al*., 1989).

Gellan gum

Gellan gum is a water-soluble polysaccharide produced by Pseudomonas elodea, a bacterium. Gellan gum is an anionic, high molecular weight, deacetylated exocellular polysaccharide gum produced as a fermentation product by a pure culture of Pseudomonaselodea2, with a tetra saccharide repeating unit of one α-L-rhamnose, one β-D-glucuronic acidand two β-D-glucose residues. The Gellan gum as a disintegrant and the efficiency of gum was compared with other conventional disintegrants such as dried cornstarch, explotab, avicel (pH 10.2), Ac-di-sol. and Kollidon CL. The disintegration of tablet might be due to the instantaneous swelling characteristics of gellan gum when it comes into contact with water and owing to its high hydrophilic nature. The complete disintegration of tablet was has proved itself as superior disintegrant (Minke R and Blackell J, 1978).

Soy polysaccharide

It is a natural superdisintegrant that does not contain any starch or sugar so can be used innutritional products. Khalidindi[32] et al 1982 evaluated soy polysaccharide (a group of highmolecular weight polysaccharides obtained from soy beans) as a disintegrant in tablets madeby direct compression using lactose and dicalcium phosphate dihydrate as fillers. A crosslinked sodium carboxy-methyl cellulose and corn starch were used as control disintegrants.Soy polysacchardie performs well as a disintegrating agent in direct compressionformulations with results paralleling those of cross-linked CMC (Rinaudo M *et al*., 2006; Antony PJ and Sanghavi NM, 1997).

Chitin and chitosan

Chitin (β-(1→4)-N-acetyl-D-glucosamine) is a natural polysaccharide obtained from crab and shrimp shells. It possess amino group covalently linked to acetyl group as compared to free amino group in chitosan. Chitosan is produced commercially by deacetylation of chitin,which is the structural element in the exoskeleton of crustaceans (such as crabs and shrimp)and cell walls of fungi. Bruscato et al 1978 reported that when chitin was included in theconventional tablets, the tablets disintegrated with in 5 and 10 minutes irrespective of solubility of the drug. The disintegration time in the oral cavity as well as wetting time could be analyzed by surface free energy. Chitosan is the best known natural polysaccharide used for its versatile applications in pharmaceutical industry (Bruscato FN and Danti AG, 1978).

Hibiscus rosa-sinensis Linn. Mucilage

Hibiscus rosa inensis Linn of the Malvaceae family is also known as the shoe-flower plant, China rose, and Chinese hibiscus. The plant is available in India in large quantities and its mucilage has been found to act as a superdisintegrant. The plant contains cyclopropanoids, methyl sterculate, methyl-2-hydroxysterculate, 2-hydroxysterculate malvate and β-rosasterol. The leaves contain carotene (7.34 mg/100 g of fresh material) moisture, protein, fat, carbohydrate, fibers, calcium, and phosphorus. Mucilage of Hibiscus rosasinensis contains L-rhamnose, D-galactose, D-galactouronic acid, and D-glucuronic acid. The percentage yield of mucilage is estimated as 17%. Other physicochemical parameters of mucilage are also evaluated. The results of swelling ratio, angle of repose, bulk density and compressibility index are observed as 9, 26.5o C, 0.65g/cc, 16% respectively (Khalidindi SR and Shangraw RF, 1982; Shah V and Patel R, 2010)

Cucurbita maxima pulp powder:

Cucurbita maxima fruit was cleaned with water to remove dust from surface and further peel was removed. The seed was removed and pulp was put into juicer mixer to form highly viscous liquid. This was further lyophilized to get solid porous mass. Size reduction was done and powder was collected. The collected powder was passed through 80 # sieve and stored for further study. Study revealed that Cucurbita maxima pulp powder have comparable dissolution behaviour to that of sodium starch glycolate. It also has comparable hardness and friability thus the naturally obtained Cucurbita maxima pulp powder stands as a good candidate to act as disintegrant and it is possible to design promising Fast disintegrating tablet using this polymer (Malviya R *et al*., 2010).

Locust Bean gum

Locust bean gum is extracted from the endosperm of the seeds of the carob tree Ceretoniasiliqua, which grows in Mediterranean countries. It is also called Carob bean gum. Some other familiar polysacharides are starch and cellulose, which are made of long chains of the sugar glucose. In locust bean gum, the ratio of mannose to galactose is higher than in guar gum, giving it slightly different properties, and allowing the two gums to interact synergistically so that together they make a thicker gel than either one alone. It shows as a binder and as a disintegrant property at different concentration. Pharmaceutical application of locust bean gum in various novel drug delivery systems. Locust bean gum has been widely used in food industry as a thickening and gelling agent. Locust bean gum has also been reported to have bioadhesive and solubility enhancement properties. There are various reports that Locust bean gum can be used in

pharmaceutical and biotechnological purpose (Malik K *et al.*, 2007).

Cassia fistula gum

Seeds of Cassia fistula gum obtained from cassia fistula tree. Gum obtained from the seeds of Cassia fistula comprises β- (1→4) linked d-mannopyranose units with random distribution of _α (1→6) linked d-galactopyranose units as side chain having mannose: galactose ratio of 3.0). Carboxymethylation as well as carbamoylethylation of Cassia gum is reported to improve cold water solubility, improve viscosity and increase microbial resistance as compared to native gum Therefore, an attempt was made to incorporate calcium or sodium salts of carboxymethylated or carbamoylethylated C. fistula gum as superdisintegrant in the formulation development of FDT (Rai PR *et al*., 2008).

Guar gum

Guar gum is mainly consisting of the high molecular weight (approximately 50,000 8,000,000) polysaccharides composed of galactomannans and is obtained from the endosperm of the seed of the guar plant, Cyamopsistetragonaloba (L) Taub. (syn.Cyamopsispsora loides). It is used as thickener, stabilizer and emulsifier, and approved in most areas of the world (e.g. EU, USA, Japan, and Australia. It is naturally occurring gum (marketed under the trade name jaguar). It is free flowing; completely soluble, neutral polymer composed of sugar units and is approved for use in food. It is not sensitive to pH, moisture contents or solubility of the tablet matrix. It is not always pure white and sometimes varies in color from off-white to tan tends to discolor with time in alkaline tablets[27]. In pharmaceuticals, guar gum is used in solid-dosage forms as a binder and disintegrant, and in oral and topical products as a suspending, thickening, and stabilizing agent, and also as a controlled release carrier. Guar gum has also been examined for use in colonic drug delivery (Liberman HA, 1971).

Gum Karaya

Gum Karaya is a negative colloid and a complex polysaccharide of high molecular weight. On hydrolysis it yields galactose, rhamnose and galacturonic acid. Gum Karaya occurs as a partially acetylated derivative. It is a dried exudation of sterculiaUrenstree (Family-Sterculiaceae). Its synonyms are Karaya, sterculia, Indian tragacanth, Bassoratragacanth, kadaya, Kadira,katila. Gum Karaya is compatible with other plant hydrocolloids as well as proteins and carbohydrates (Bansal N & Sharma G, 2011; Kokate CK, 2005). ·Gum Karaya is a vegetable gum produced as an exudate by trees of the genus Sterculia. Chemically, Gum Karaya is an acid polysaccharide composed of the sugars galactose, rhamnose and galacturonic acid. The high viscosity nature of gum limits its uses as binder and disintegrant in the development of conventional dosage form. Karaya gum has been investigated for its potential as a tablet disintegrant. Various results showed that modified Gum Karaya produce rapid disintegration of tablets. Gum Karaya can be used as an alternative superdisintegrants to commonly available synthetic and semi synthetic superdisintegrants due to their low cost, biocompatibility as well as easily availability (Shirwaikar A *et al*., 2008)

Aloe vera

Aloe vera has been used therapeutically for many centuries and is of particular interest due to its lengthy historic reputation as a curative agent and its widespread use in supplementary therapies. Aloe gel is the colorless gel contained in the inner parts of the fresh leaves. Chemical analysis has revealed that this clear gel contains amino acids, minerals, vitamins, enzymes, proteins, polysaccharides and biological stimulators (Madan J *et al*., 2009). Aloe vera has been used for many centuries for its curative and therapeutic properties. In the pharmaceutical industry, it has been used for the manufacture of topical products such as ointments and gel preparations, as well as in the production of tablets and capsules (Avachat AM *et al.*, 2011). Panigrahi R et al prepared fast dissolving tablets of lisinopril by direct compression method using Aloe vera gel, Plantago ovata and Hibiscus rosasinesis as natural superdisintegrants. It was concluded that in vitro disintegration time was reduced and *in vitro* release was significantly improved (Panigrahi R *et al.*, 2012).

Dehydrated banana powder

Dehydrated banana powder is prepared from the variety of banana called Ethan or nenthran (nenthravazha) and belongs to the family Musaceae. It contains vitamin A, so it is utilized in the treatment of gastric ulcer and diarrhoea. It also contains vitamin B6, which helps to reduce stress and anxiety. It is a very good source of energy due to high carbohydrate content and it contains potassium, which is responsible for more brain functioning (Prabakaran L and Sendhil D, 2011). Taksande JB et al formulated and characterized fast dissolving tablets of lornoxicam using different natural and synthetic super disintegrant by direct compression technique. The natural super disintegrant banana powder, soy polysaccharide and synthetic super disintegrant, crosspovidone were used. It was concluded that tablets prepared by addition of natural super disintegrant has less disintegration time, more water absorption and drug release (Taksande JB *et al.*, 2013). Bharathi A et al evaluated natural superdisintegrant banana powder in the orally disintegrating tablets using telmisartan as model drug. They compared it with other synthetic superdisintegrants in the preparation of orally disintegrating tablets. It was concluded that banana powder had excellent super disintegrant property which can be very well utilized for developing orally disintegrating tablets. Tablets containing banana powder as disintegrating

agent were dispersed rapidly within 15 sec and showed 92.09% drug release in 15 min (Bharathi A *et al.*, 2014).

Ocimum basilicum

Ocimum basilicum or sweet basil, a culinary herb. Ocimum basilicum is a common ingredient in Thai cuisine, with a strong flavour similar to aniseed, used to flavour curries and stir fries. It has been used as a folk remedy for an enormous number of ailments including boredom, convulsions, deafness, diarrhoea, epilepsy, gout, hiccup, impotency, insanity, nausea, sore throat, toothaches and whooping cough (Narwal S *et al.*, 2011). Ocimum basilicum is a rich source of anthocyanins and an abundant source of acylated and glycosylated anthocyanins. Aroma compounds are also extracted from O. basilicum and used in a wide variety of products such as cosmetics and natural flavors (Jayasinghe C *et al.*, 2013). Sharma A et al studied the effect of mucilage of Ocimum basilicum on formulation of rapid disintegrating tablets of lamotrigine and compared it with different novel synthetic superdisintegrants. Ocimum basilicum seeds mucilage was also characterized on the basis of its organoleptic properties, micromeritic properties along with melting point and solubility determination. They revealed that it would be possible to get the rapid onset of action of the anti-epileptic drug lamotrigine and thus can control the serious epileptic convulsions in the minimum time (Sharma A and Agrawal S, 2012). Hardikar S *et al* developed fast disintegrating tablets of paracetamol by employing the dried mucilage isolated from the seeds of Ocimum basilicum. Fast disintegrating formulations were prepared by using established disintegrants and dried mucilage as novel disintegrating agent. Tablets prepared by using dried mucilage as disintegrating agent resulted in rapid disintegration of the tablet comparable to established disintegrants (Hardikar S *et al.*, 2012). Panda BP et al optimized diclofenac sodium orodispersible tablets with natural disintegrants seed mucilage of Plantago ovata and seed mucilage of Ocimum basilicum using response surface methodology. Optimization studies by multiple regression analysis revealed that 6% of Plantago ovata and 5% of Ocimum basilicum was found to be optimum which has disintegration in 36 sec and cumulative drug release was 99.2% at 25 min (Panda BP *et al.*, 2013).

CONCLUSION

In the present study the disintegrating properties of the Seed Powder, Husk Powder and mucilage powder of Plantago ovata, Lepidium sativum, Gum Karaya, Guar Gum, Fenugreek seed, Mango peel pectin, Locust bean, Agar, Gellan gum, Hibiscus rosasinensis, Curcubita pulp powder, Cassia fistula, Aloe vera, Dehydrated Banana powder, Oscimum Bacillus, Soy polysaccharide, Chitosan etc. had been studied in comparison to artificial super disintegrants.Thus natural superdisintegrants exhibits faster drug dissolution and improved bioavailability,thereby helping in effective therapy and improved patient compliance. Thus the natural superdisintegrant can be effectively used as disintegrants in tablet formulations.

REFERENCES

Antony PJ, Sanghavi NM. A new Disintegrant for Pharmaceutical Dosage form. *Drug Dev Ind. Pharm*, 23, 1997, 413-415.

Avachat AM, Dash RR, Shrotriya SN. Recent investigations of plant based natural gums, mucilages and resins in novel drug delivery systems. *Indian J Pharm Educ Res*, 45(1), 2011, 86-99.

Bansal N & Sharma G. Formulation and Evaluation of Orally Disintegrating Tablets Of Ondansetron Hydrochloride Using Natural Superdisintegrants. *International Journal of Pharmtech Research*, 2011, 1616-1621.

Batham P, KalichamanSG, Osborne BE. A 52- Week Oral Toxicity Study of Gellan Gum in the Beagle Dog. Bio Research Lab. Ltd, Montreal, Canada, 1986.

Bharathi A, Basha SK, Deepti KNV, Phanindra MC. Formulation and evaluation of telmisartanorodispersible tablets by using banana powder. *Indian J Res Pharm Biotechnol*, 2(1), 2014, 982-987.

Bruscato FN, Danti AG. 1978 US Patent 4086365.

Chougule D, Ghodke D, ShahRR, Ghaste R. Fast Dissolving Tablets, An Overview, 2010.

Chudzikowski RJ. Guar gum and its Application. *J SocCosmt Chem*., 22, 1971, 43-60.

Deshmkh H, Nagesh C, Murade A&UsgaunkarS. Superdisintegrants: A Recent Investigation and Current Approach. *Asian J. Pharm. Tech*, 2(2), 2012, 19-25.

Deveswaran R, *et al.* Studies on the Disintegrant properties of Mucilage and Seed Powder of Plantagoovata. *International Journal of ChemTech Research*, 1, 2009, 621- 626.

Dey P, *et al.* Locust Bean Gum and Its Application in Pharmacy And Biotechnology: An Overview. *International Journal of Current Pharmaceutical Research*, 4, 2011, 7-11.

Grasono and Alesandro *et al*., US Patent, 6, 2001, 336, 2001.

Halakatti PK, Omer S, Gulgannavar RS and Patwari PK: Formulation and evaluation of mouth disintegrating tablets of Famotidine by using Hibiscus rosa-sinensis mucilage and treated agar. *International Journal of Research in Ayurveda and Pharmacy*, 1(2), 2010, 497-505.

Hardikar S, Bhosale A, Jamdade N. A concept proof of potential of experimental dried mucilage isolated from the seeds of Ocimumbasilicum as a disintegrant. *Int J Pharm Pharm Sci*, 4(4), 2012, 692-695.

Hermann G and Ringard, J. Disintegration mechanisms of tablets contain starches. Hypothesis about the particle-particle repulsive force. *Drug Dev Ind. Pharm*, 7(2), 1981, 155-77.

http:// www.anshulindia.com/pdfs/poly plasdone.

Iyad R, Mayyas AR, Eftaiha AA and Badwan A: Chitin-silicon dioxide coprecipitate as a novel superdisintegrant. *Journal of Pharmaceutical Science*, 97(11), 2008, 4969-55.

Jayasinghe C, Gotoh N, Aoki T, Wada S. Phenolics composition and antioxidant activity of sweet basil (Ocimumbasilicum L). *J Agric Food Chem*, 51(15), 2003, 4442 -4449.

Jyothi G & Lakshmi PK. Comparative evaluation of natural and synthetic super disintegrants with newer superdisintegrantKyron T-314. *Acta PharmaceuticaSciencia*, 2011, 35-44.

Khairnar DA, Anantwar SP, Chaudhari CS, ShelkePA.Superdisintegrants: An emerging paradigm in orodispersible tablets. *International Journal of Biopharmaceutics*, 5(2), 2014, 119-28.

Khalidindi SR and Shangraw RF. Evaluation of Soy polysaccharide as Disintegrating Agent. *Drug Development and Industrial Pharmacy*, 8, 1982, 215-235.

Khinchi MP, *et al*. Studies on the Disintegrant Properties Of Seed Powder, Husk Powder And Mucilage Of Plantago Ovata By Formulation Of Orally Disintegrating Tablet. *International Journal of Pharmaceutical Sciences and Research*, 2, 2011, 145-152.

Kokate CK, PurohitAP,Gokhle SB, Pharmacognosy , NiraliPrakashan, New Delhi, 2005.

Kuchekar BS, Bhise SB, Arungam V. Design of Fast Dissolving Tablets. *Indian J Pharm Edu*, 35, 2000, 150.

Kumar R, *et al*. Paschapur. Isolation and Evaluation of Disintegrant Properties of Fenugreek Seed Mucilage. *International Journal ofPharmTech Research*, IJPRIF, 1, 2009, 982-996.

Liberman HA, *et al*. Pharmaceutical Dosage Forms: Tablets, 2, 1989.

Libermann HA, Lachman L, Schawstr JB. Pharmaceutical Dosage Forms Tablets, 2, 1989, 173-177.

Madan J, Sharma AK, Singh R. Fast dissolving tablets of Aloe vera gel. *Trop J Pharm Res*, 8(1), 2009, 63-70.

Malik K, *et al*. Locust bean Gum as Superdisintegrant – Formulation and Evaluation of NimesulideOrodispersible Tablets. *Polimery w Medycynie*, 2011, 18-28.

Malviya R, *et al*. Applications of Mucilages in Drug Delivery A Review. *Advances in Biological Research*, 2011, 5, 1-7.

Malviya R, Srivastava P, Bansal M and Sharma PK: Preparation and evaluation of disintegrating properties of Cucurbita maxima pulp powder. *International Journal of Pharmaceutical sciences*, 2(1), 2010, 395-399.

Malviya R, Srivastva P, Kulkarni GT. Application of Mucilages and Drug delivery: A Review. *Advances in Biological Research*, 5, 2011, 1-7.

Mangal M, Thakral S, Goswami M, GhaiP.Superdisintegrants: An Updated Review. *International Journal of Pharmacy and Pharmaceutical Science Research*, 2(2), 2012, 26-35.

Mehta KK, Patel HH , Patel ND, Vora CN, Patel NJ. Comparative Evaluation of Natural& Synthetic Superdisintegrant for Promoting Nimuslide Dissolution for Fast Dissolving Technology. *Int J of Pharmacy and Pharm Sci*, 2, 2012, 102-108

Minke R and Blackell J. The Structure of Alpha-Chitin. *J Mol.Biology*, 120, 1978, 167- 181.

Mohanachandran PS, Sindhumol PG, Kiran TS. *International Journal of Pharmaceutical Sciences Review and Research*, 6(1), 2011, 109-105.

Narwal S, Rana AC, Tiwary V, Gangwani S, Sharma R. Review on chemical constituents and pharmacological action of Ocimumkilimandscharicum. Indo *Global J Pharm Sci*, 1(4), 2011, 287-293.

Omidian H and Park K. Swelling agents and devices in oral drug delivery. *Journal of Drug Delivery Science and Technology*, 18(2), 2008, 93-83.

Pahwa R and Gupta N. Superdisintegrantsinthe Development of Orally Disintegrating Tablets: A Review. *International Journal of Pharmaceutical Science and Research*, 1(2), 2011, 2767-80.

Panda BP, Patro CS, Kesharwani D, Rao MEB. Optimization of diclofenac sodium orodispersible tablets with natural disintegrants using response surface methodology. *Int J Pharm Sci Nanotechnol*, 6(3), 2013, 2172-2180.

Panigrahi R, Chowdary KA, Mishra G, Bhowmik M. Effect of combination of natural superdisintegrants on fast dissolving tablets of lisinopril. *Int J Pharm Res Allied Sci*, 1(3), 2012, 73-78.

Prabakaran L, Sendhil D. Formulation development of patient friendly dosage form: all in one natural excipient as binder, diluent and disintegrant. *Int J Pharm Pharm Sci*, 3(2), 2011, 97-102.

Prakash P, Chaudhry S, Porwal M, Vishwakarma DK. Natural Superdistegrant: *Recent Investigation and Current Approaches. Pharm Sci Monitor*, 2011, 2014-2026.

Rai RR, *et al.* Superior disintegrating properties of calcium cross-linked Cassia fistula gum derivatives for fast dissolving tablets. *Carbohydrate Polymers*, 87, 2012, 1098–1104.

Reddy LH, Ghosh B and Rajneesh. Fast dissolving drug delivery system: A review of literature. *Indian J Pharm Sci*, 64(4), 2002, 331-36.

Rinaudo M. Chitin & Chitosan. Properties and application. *Progress in Polymer Sci*, 31, 2006, 603-632.

Shah V and Patel R: Studies on mucilage from Hibuscusrosasinensislinn. as oral disintegrant. *International Journal of Applied Pharmaceutics*, 2(1), 2010, 18-21.

Sharma A, Agrawal S. Effect of Ocimumbasilicum on formulation and evaluation of rapid disintegrating tablet of lamotrigine. *Int J Pharm Tech*, 4(3), 2012, 2164-2173.

Shihora H, Panda S. Superdisintegrants, Utility in Dosage Forms: A Quick Review. *JPSBR*, 1(3), 2011, 148-53.

Shirsand S, Suresh S, Para M. Plantagoovata mucilage in the design of fast disintegrating tablets. *Indian Journal OfPhrmaceutical Science, 2009*, 71, 41-45.

Shirwaikar A, Prabhu SL, Kumar GA. Herbal Excipients in Novel Drug Delivery System. *Indian J Pharm Sci*, 2008, 415-420.

Shrivastava P and Sethi V. *International Journal of Drug Research and Technology*, 3(4), 2013, 76-87.

Singh AK. Rehni R. Kalra G. Joshi M. Ion Exchange Resins: Drug Delivery and Therapeutic Applications. *FABAD J. Pharm. Sci.*, 32, 2007, 91-100.

Taksande JB, Murade SS, Trivedi RV, Umekar MJ. Formulation and characterization of lornoxicam fast dissolving tablet using natural superdisintegrants. *Int J Res Pharm Biomed Sci*, 4(2), 2013, 459-464.

www.willy-benecke.com/karaya_f.html; www.drugs.com/npp/karaya-gum.html

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