A Desktop Reference Guide to Natural Superdisintegrants

Hindustan Abdul Ahad[1], U Raghu[2], C Haranath[1] K Haritha[2]
C Mamatha[2], K Sreenivasulu Naidu[1]

[1]Department of Industrial Pharmacy, Raghavendra Institute of Pharmaceutical Education and Research (RIPER), Ananthapuramu – 515721 Andhra Pradesh, India
[2]Department of Industrial Pharmacy, JNTUA-OTPRI, Ananthapuramu, Andhra Pradesh, India

Abstract - Drugs given via mouth are best, comfortable and low costs. Superdisintegrants (SD) are very well known as tablet additives which are soluble or breakdown from the dosage form in fewer spans without the aid of water. The drawbacks of oral dosage forms are mainly trouble in consuming by children and aged people, which can be avoided by quick solubilizing tablets by the addition of SD. Herbal SD are better compared to artificial SD, as they are non-reactive, no toxic, cheap, eco-friendly and effortlessly obtainable. These natural SD have unique features in a dosage form as a binder, diluents and good dissolving capability for less hydrophilic drugs which affects the solubilizing rate and supplies as nutritional aids.

Keywords: fast dissolving; natural; solubility

INTRODUCTION

Disintegrants are the substances regularly integrated with the tablets and a variety of preparations to support the scattering of the tablet/slugs/capsules into more small entities in an aqueous atmosphere. This leads to increment in the surface area and enhancing the discharge of the drug. Disintegrants got significant notice as a vital step in getting fast drug discharge. The disintegrants have the major aim to face the competence of the tablet binder and the physical powers that act under solidity to compose the tablet. Upon the connection with water the superdisintegrants (SD) swell, hydrate and gain in bulk which makes alterations in the tablet. Best SD delivers enhanced compatibility without affecting the physical strength of the preparations with high-dose drugs [1, 2].

Natural polymers are utilized in most of the dosage forms and are more favourable over artificial polymers as they have these advantages [3].

- Reasonable
- Nontoxic.
- Straightforwardly obtainable in the sufficient amount.
- Lacking side effects
- Biodegradable.
- More patient compliance
- Renewable

ASSORTMENT OF SUPERDISINTEGRANTS

The given factors are to be kept in mind in the selection of a good SD [4].

- Quantity of disintegrates present in a preparation
- Tablet hardness.
- Kind of accumulation and mixing.
- Drug nature.
- Good flowability.
- An Occurrence of surface-active agents.
- Compressible to formulate intact tablets.
- Good mouthfeel.

MECHANISM OF SUPERDISINTEGRANTS

The primary and secondary mechanisms of SD are as follows [5].

Wicking

Tablets upon contact with water, the fluid permeate due to the capillary action and displace the air in the tablets. This projected to the weakening and breaks of bonds in the tablet into fine particles.

Swelling

High porosity in a tablet has bad disintegration due to devoid of enough swelling force. If compression is very high, the dissolution fluid faces difficulty in entering into the dosage form.

Particle disgusting forces

The non-swellabledisintegrants have electric disgusting forces among particles leads to the disintegration of the tablet.

Deformation

During tablet compression, disintegrants deforms its shape and come back to its normal shape upon contact with the aqueous medium. This leads to the breakup of the tablet.

Various SD from nature were tabulated in **Table 1, 2 and 3** from mucilage,gums and insects respectively.

Table 1: List of natural superdisintegrants (mucilage)

Common name	Botanical name	Plant part	Family
Agar	*Gelidiumamansii*	Weed	*Gelidanceae*[6]
Banana	*Nenthravazha*	Ethan and nenthran	*Musaceae*[7]
Basil	*Ocimumbacilicum*	Seeds	*Lamiaceae*[8]
Bael	*Aeglemarmelos*	Fruits	*Rutaceae*[9]
China rose	*Hibiscus Rosa-sinensis*	Leaves	*Malvaceae*[10]
Fenugreek	*Trigonellafoenum-graceum*	Seed	*Fabaceae*[11]
Indian Fig	*Ficusindica*	Fruits	*Cactaceae*[12]
Garden cress	*Lepidiumsativum*	Plant	*Cruciferae*[13]
Isapghula Husk	*Plantagoovata*	Seeds	*Plantaginaceae*[14]
Ispaghula	*Plantagoovata*	Seeds	*Plantaginaceae*[15, 16]
Mango Pectin	*Mangiferaindica*	Peel pectin	*Anacardiaceae*[17]
Soy fiber	Glycine max	Seeds	*Leguminosae*[18]

Table 2: List of natural superdisintegrants (gums)

Common name	Botanical name	Plant part used	family
Golden shower	*Cassia fistula*	Seeds	Fabaceae [19]
Guar Gum	*Cyamopsistetragonoloba*	Fruits	Fabaceae [20]
Karaya gum	*Sterculiaurens*	Plant exudates	Sterculiaceae[21]
Locust Bean Gum (Carob tree)	*Ceretoniasiliqua*	Seeds	Fabaceae[22]
Mango gum	*Mangiferaindica*	Plant exudates	*Anacardiaceae*[23]
Winter squash	*Cuccurbita maxima*	Pulp	*Cucurbitus*[24]

Table 3: List of natural superdisintegrants (Insects)

Common name	Biological name	Part used	family
Chitin and Chitosan	Crab (*Brachyura*) and shrimp (*Caridea*)	Shells	*Cancridae*[25] *Crangonidae*[26]
Gellan Gum	*Sphingomonas elodea*	Bacterium	*Sphingomonadaceae* [27]
Xanthan gum	*Xanthomonascampestris*	Fermented polysaccharide	*Pseudomonaceae*[28]

CONCLUSION

Natural superdisintegrants (SD) incremented the drug release rate from the tablet and decremented the dissolution time. They are implemented as SD and additives. Thus natural SD exhibit faster drug dissolution and increased bioavailability, thereby, availing in successful therapy and impressed patient acceptance.

References

[1] Ansel, H. C., Popvich, N.G., & Allen L.V. Pharmaceutical Dosage Forms and Drug Delivery System, 1st edition. 1998, 1912-1917.
[2] Jain N. K. & Sharma, S. N. Text Book of Professional Pharmacy, 4th edition. 1998, 78.
[3] Yadav ND, Pingale PL, Tatane SR. Comparative study on effect of natural and artificial superdisintegrants in the formulation of fast dissolving aspirin tablet. Journal of Pharmacy Research. 2010; 3(7):1594-7.
[4] Schimidt PC, Brogramann B. The role of disintegrants in solid oral dosage manufacturing. Pharm Technol. 1988; 34:22.
[5] Ahad HA, Kumar BP, Haranath C, Reddy KS. Fabrication and evaluation of glimepiride Cordiadichotoma G. Forst fruit mucilage sustained release matrix tablets. Int J Chem Sci. 2009; 7(4):2555-60.
[6] Anupama S, Naveen G, Sahil K. Pelagia Research Library. Formulation and evaluation of ciprofloxacin hydrochloride dispersible tablets using natural substances as disintegrates, Der Pharmacia Sinica. 2011; 2(1).
[7] Prabakaran L, Sendhil D. Formulation development of patient friendly dosage form: all in one natural excipient as binder, diluent and disintegrant. International Journal of Pharmacy and Pharmaceutical Sciences. 2011; 3(supplement 2):97-102.
[8] Sayyad FJ, Sakhare SS. Isolation, Characterization and Evaluation of OcimumBasilicum Seed Mucilage for Tableting Performance. Indian Journal of Pharmaceutical Sciences. 2018 Apr 30; 80(2):282-90.
[9] Kulkarni U, Rao NG. Design and Development of Aceclofenac Fast Dissolving Tablets by Novel Hole Technology: A Novel Approach to Decrease the Disintegration Time and Increase the patient compliance. Drug Invention Today. 2011 Jun 1; 3(6).
[10] Ahad HA, Kumar CS, Kishore Kumar SC. Designing and evaluation of Diclofenac sodium sustained release matrix tablets using Hibiscus Rosa-Sinensis leaves mucilage. Int J of Pharm Sci Rev and Res. 2010; 1(2):29-31.
[11] Malik K, Arora G, Singh I. Locust bean gum as superdisintegrant—formulation and evaluation of nimesulideorodispersible tablets. Polimery w medycynie. 2011; 41(1):17-28.
[12] Ahad HA, Kumar CS, Ravindra BV, Sasidhar CG, Ramakrishna G, Venkatnath L, Gangadhar P, Navya K. Characterization and permeation studies of Diltiazem hydrochloride-ficusreticuleta fruit mucilage Transdermal patches. International Journal of Pharmaceutical Sciences Review and Research. 2010; 1:32-7.
[13] Hindustan AA, Kumar CS, Kumar BA, Reddy BA, Shekar AC, Ravindra BV, Venkatnath SL. Development and in vitro evaluation of Glibenclamide Aloe barbadensis Miller leaves mucilage controlled release matrix tablets. International Journal of PharmTech Research. 2010; 2(2):1018-21.
[14] Singh B. Psyllium as therapeutic and drug delivery agent. International journal of pharmaceutics. 2007 Apr 4; 334(1-2):1-4.
[15] Gokul G, Pande SD, Anwar A, Lalit J, Tushar B. Development and characterisation of fast disintegrating tablet of Amlodipine Besylate using mucilage of Plantagoovata as a natural superdisintegrant. International Journal of PharmTech Research. 2011; 3(2):938-45.
[16] Malviya R, Srivastava P, Kulkarni GT. Applications of mucilages in drug delivery-A review. Advances in Biological Research. 2011; 5(1):1-7.
[17] Rinaudo M. Chitin and chitosan: properties and applications. Progress in polymer science. 2006 Jul 1; 31(7):603-32.
[18] Rai PR, Tiwary AK, Rana V. Superior disintegrating properties of calcium cross-linked Cassia fistula gum derivatives for fast dissolving tablets. Carbohydrate polymers. 2012 Jan 15; 87(2):1098-104.
[19] Raghu U, Ahad HA, Satish P, Siddeshwara S, Dhanalakshmi AC, Tejeshwini H. A quick reference to plant gums and mucilages used as a tablet binder.
[20] Hindustan AA, Babu UA, Nagesh K, Kiran DS, Madhavi KB. Fabrication of glimepiride Datura stramonium leaves mucilage and poly vinyl pyrrolidone sustained release matrix tablets: in vitro evaluation. Kathmandu university journal of science, engineering and technology. 2012; 8(1):63-72.
[21] Ahad HA, Yesupadam P, Guruprakash P, Sravanthi M, Ramyasree P. Phytochemical and hypoglycemic evaluation of Alangiumsalviifolium root extract. Journal of Scientific Research. 2011 Apr 28; 3(2):393-402.
[22] Nayak RK, Patil SR, Patil M, Bhat M. Evaluation of disintegrating properties of mangiferaindica gum. RGUHS journal of pharmaceutical sciences. 2011; 1(1):11-21..
[23] Prasad Panda B, Gregory J. Extraction and Performance Evaluation of Salvia hispanica Mucilage as Natural Disintegrants for Optimization of Pyrilamine Maleate Fast Dissolving Tablets. The Natural Products Journal. 2015 Dec 1;5(4):288-98.
[24] Ahad HA, Kiranmaye N, Haripriya H, Ruksana H, Babu BM. Formulation and evaluation of glimepiride Cordiadichotoma G. Forst fruit mucilage sustained release matrix tablets. Asian Journal of Chemistry. 2010; 22(4):2943-7.
[25] Rinaudo M. Chitin and chitosan: properties and applications. Progress in polymer science. 2006 Jul 1; 31(7):603-32.
[26] Abhijeet P, Swati J, Jui J, Bhanudas K, Aniruddha C. In Situ-gelling Gellan Formulation as Vehicle for Oral Sustained Delivery of Famotidine, Inventi Rapid: NDDS, 2012; 3: 1-4.
[27] Bhardwaj TR, Kanwar M, Lal R, Gupta A. Natural gums and modified natural gums as sustained-release carriers. Drug development and industrial pharmacy. 2000 Jan 1; 26(10):1025-38.