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NATURAL POLYMERS USED AS BINDER IN PHARMACEUTICAL INDUSTRY AND RESEARCH- A REVIEW

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ABSTRACT

Binders are commonly known to use as cohesiveness to the granules for making of tablets. Tablet may intact after compression. New excipients may formed to use as binding agent in formulations of tablets. Various binding agents may be useful to form various tablet strengths and properties of drug release for different pharmaceutical perspectives. Some natural polysaccharides may be highly used in the pharmaceutical industries and food industries as excipients and additives too because it has low toxicity, biodegradable availability and low cost. Natural binders like various starches, gums, mucilages and dried fruits have strong binding capacity as compare to others such as disintegrants, filler, sustain release, and these polymers are most safest than polymers like PVP. Various starches like rice, potato, maize, corn, wheat, tapioca starch and gums like ferula gummosa boiss, gum olibanum, beilschmiedia seed gum, okra gum, aegle marmelos gum, gum cordial, okra gum and cassia roxburghii seeds gum and plant fruit like date palm fruit and orange peel pectin has been shows best potency as a binding agent.

KEYWORDS: Excipients; Polymer; Granule; Tablet; Gum.

INTRODUCTION

Nowadays, Natural polymers are contained from various natural sources and this review will give brief information about them according to their natural sources. (Deogade, 2012) Mostly polysaccharides are used as natural polymers which may be obtained from the plant cell wall. Most natural polymers may have the plant cell wall which may include cellulose, hemicelluloses and pectin cellulose. (Goswamis, 2014) Many plants, cellulose is a

compulsory component and shows the organic polymer. Cellulose is a linear unbranched polysaccharide consisting of β-1, 4-linked D-glucose units and many cellulose molecules obtained from crystalline micro fibrils. These crystalline micro fibrils are generally strong and highly resistant to enzymatic attack.

Generally, Cellulose is known as insoluble in water and mostly indigestible by the human body. It happens when digested by herbivores and termites. (Azadbakht and Fadakar, 2012) Mostly Cellulose may be contained from fibrous materials like wood and cotton. Also can be disintegrated to form a powdered cellulose which may be commonly used in the pharmaceutical industries in tablets. (Patil and Kulkarni, 2010) (Phani and Gangarao, 2011) Mostly good cellulose powder has been treated with hydrochloric acid formed microcrystalline cellulose which is for powdered cellulose because of free flowing contained non fibrous particles. (Hapgood et al., 2002) It is commonly known as diluents or binder in tablets for granulation and direct compression process. The structure of cellulose shows the formation of various derivatives of cellulose which is made up by the different hydroxyl moieties. (Rahim and Azam 2014) Hemicellulose is bound to the surface of cellulose microfibrils which may complex various polysaccharides which are not involved in micro fibrils. (Hossain et al., 2013) All these polysaccharides are called hemicelluloses and include xyloglucans, xylans, mannans and glucomannans. (Patel et al., 2012) (Patel and Agrawal, 2012) All of them were extracted from the plant cell wall with the aid of strong alkali.

Binders

Binders are made in the form of dry powders which may be added during granulation to promote granules and give cohesiveness compact during direct compression. (Naser and Varshosaz 2012) (Patel et al., 2012) It may provide strength to the tablet. Most binders may be in powder form and also in liquid form. (Itiola et al., 2006) Examples such as powder binders, cellulose, methyl cellulose, polyvinyl pyrrolidone, PEG Solution binders: gelatine, PVP, HPMC, PEG, sucrose, starch. Binders may be found in the following formulations which may be added as powder before wet granulation by this binder is further distributed. Found in liquid form this may be used as agglomeration solution in granulation, this may be called as liquid binder. In dry powdered form, this may get mixed with any of other ingredients before tableting this may be known as dry binder. (Karmarkar, 2016) Natural binders such as acacia and tragacanth are obtained in solution form in various concentrations, and they may be added as powder form for the direct compression procedure. Gelatine is

mostly used with acacia, this may form a better binding agent than two of natural polymers. Polymers like MC, HPMC are commonly used as dry powders. (Koli et al., 2008) Many of cases of direct compaction, they may be known as good binding agents, in liquid form they may act as great adhesives. Ethyl cellulose and HPMC may be used in alcoholic solutions and act as anhydrous adhesives. (Kundlik and Ranju, 2009) Binders may also be used in solid dosage forms.

Types of binders

Classification on the basis of their application:

Solution binders: Dissolved in solvents such as gelatin, cellulose, cellulose derivatives, polyvinyl pyrrolidone, starch, sucrose and polyethylene glycol.

Dry binders: These may be used in powder blend, wet granulation step, direct powder compression (DC) formula like cellulose, methyl cellulose.

Table 1: Types of polymer with examples.

Natural polymers	Synthetic polymer	Sorbitol sugar
Starch, pregelatinized starch, gelatin, acacia, tragacanth and gums.	PVC, HPMC, methyl cellulose, ethyl cellulose, PEG.	Glucose, sucrose.

Natural binding agent

Binding agents may give the quality of various formulations. In most cases the bioavailability of the tablets may receive considerable attention. Binders are highly useful in tablet formulation to increase plasticity by thus it may increase bonding strength into tablets. The promotions of new excipients used as binding agents in tablet formulations. Various binding agents can be useful in tablet strength and drug release properties for different pharmaceutical uses. Binders are agents used to increase cohesiveness of granules. This may show the tablet has increased after compression and improves its flow qualities by the formations of granules. One binder for a formulation of tablet provides extensive knowledge of the importance of binders for increasing the strength of the tablet. Powder formulations merged to formation of tablet is a binder, fillers and may not have good binding capacity, binder may added in dry mix or mix in granulation, matrix binder with fillers and drug involved in it, on drying solid binder may forms glue which used to holds the particles with each other, and the wet binder is one of the most important are hydrophilic.

Types of natural binders

Starch as binder

Natural gums as binder

Dried fruits as binding agent

Starch as binder

Various formations of starches like rice starch, maize starch, potato starch, wheat starch, corn starch are known for their binding properties but few other starches such as enset starch and banana starch also may be used as binding agents. (Shiva et al., 2010) Starch is mostly used as thickening, stabilizing, gelling, filling agent in many pharmaceutical formulations. It is mainly used in tablets as filler, binder or disintegrant. Starch is the main source of carbohydrate found in plant tubers and seed endosperm.

Dioscorea rotundata binding agent

Starch is mostly used as excipients in the manufacture of tablets. Various scratches may be used as good binders in mucilage or dry powder. (Tekade, 2011)While maize starch is the most commonly used excipient in tableting. Effects of pigeon pea and plantain starches on compressional, mechanical and disintegration properties of various tablets have been found and the ginger starch as binder also used in tablet formulations like paracetamol.

Starch 1500 as a binding agent

Starch 1500 is also used as a good binders agent used in formation of granules that may be compressible and helps to formulate Lamivudine tablets for improved hardness or friability which may be prepared with povidone. (Zhang and Johnson, 1997) The formation of Lamivudine tablets with Starch 1500 gives effect on the disintegration and dissolution process of the povidone.

Tapioca starch as a binding agent

Natural products like tapioca starch used as binding agents in the formulation of Diclofenac tablets were investigated. To find two other same used disintegrating agents are potato starch and maize starch were used to formulate the solid dosage form.

Table 2: Polymers and Their specific uses.

S. No.	Various Products	Types	Uses
1	Accroides	Resins	Binder in fireworks and flares

2	Candelilla	Wax	Binder in chewing gum.
3	Guar	Gums	Binder in baking, meat and tablets.
4	Gum Arabic	Gums	Binder in baking, cosmetics, incense, photography, watercolour paints, ceramic glazes and fireworks.
5	Karaya	Gums	Binder in baking and paper manufacturing.
6	Shellac	Shellac	Binder in mascara, eyeliners, fireworks and pyrotechnics.
7	Tragacanth	Gums	Binder in icing, tablets, incense and pastel paints
8	Xanthan	Gums	Binder in baking, laxatives and toothpaste

Advantages of natural binder

1. They can used to modify the release of drug and by this gives promote to the absorption and bioavailability of the drugs.
2. Natural binders are highly used in the pharmaceutical and food industry as excipients and additives because of their low toxicity, biodegradable, availability and low cost.

Disadvantages of natural binders

1. Natural binder may prefer to processing difficulties such as rapid over granulation, tablet hardness increases & dissolution performance decrease.
2. When these binders are selected addition of disintegrates which may require but may be expensive and give negative effect on product stability.

CONCLUSION

Many natural polymers may be used in pharmaceutical companies. Natural polymers like starches, mucilages, gums and also dried fruits can be used as binding agents. They may show good potential as binding agents. Natural polymers may show good binding property in wet granulation. They should be useful to modify the release of drugs and in bioavailability of the incorporated drug. Various starches like rice, potato, maize, corn, wheat, tapioca starch and gums like ferula gummosa boiss, gum olibanum, beilschmiedia seed gum, okra gum, aegle marmelos gum, gum cordial, okra gum and cassia roxburghii seeds gum and plant fruit like date palm fruit and orange peel pectin has be1. Deogaden shows best potency as a binding agent.

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