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CARBOHYDRATES POLYMERS

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Pharmaceutical applications of various natural gums, mucilages and their modified forms

Abstract

A large number of factory grounded pharmaceutical excipients are available moment. Epoxies and bonds are the most generally available factory constituents with a wide range of operations in pharmaceutical and ornamental diligence. They're being used due to their cornucopia in nature, safety and econom. They've been considerably explored as pharmaceutical excipients. They're biocompatible, cheap and fluently available. Natural accoutrements have advantages over synthetic bones since they're chemically inert, nontoxic, less precious, biodegradable and extensively available. They can also be modified in different ways to gain knitter-made accoutrements for medicine delivery systems and therefore can contend with the available synthetic excipients. Recent trend toward the use of factory grounded and natural products demands the relief of synthetic complements with natural bones . In this review, we describe the medicinal operations of colorful natural epoxies, bonds and their modified forms for the development of colorful medicine delivery systems.

❖ Keywords

Gums,Mucilage,Pharmaceutical excipients ,Pharmaceutical applications.

1. Introduction

In recent times, factory deduced polymers have elicited tremendous interest due to their different medicinal operations similar as diluents, binders, disintegrants in tablets, thickeners in oral liquids, defensive colloids in dormancies, gelatinizing agents in gels and bases in suppository & they're also used in cosmetics, fabrics, maquillages and paper- timber.

The factory grounded polymers have been studied for their operation in different pharmaceutical lozenge forms like matrix controlled system, film coating agents, buccal flicks, microspheres, nanoparticles, thick liquid phrasings like ophthalmic results, dormancies, implants and their connection and efficacity has been proven. These have also been employed as density enhancers, stabilizers, disintegrants, solubilizers, emulsifiers, suspending agents, gelatinizing agents and bioadhesives, binders in the below mentioned lozenge forms. numerous natural polymeric accoutrements have been successfully used in sustained- release tablets. These accoutrements include guar goo, isapghula cocoon, galactomannon from Mimosa scabrella, Gleditsia triacanthos Linn(honey locust goo), Sesbania goo, gum from the capsules of Hibiscus esculenta, tamarind seed goo, goo copal and goo dammar, agar, konjac, chitosan, etc. Industrial epoxies and bonds, which, for the utmost part are water-answerable polysaccharides, have tremendously large and broad operations in both food andnon-food diligence. Their use depends in the unique physicochemical parcels that they give, frequently at costs below those of synthetic polymers. The epoxies and bonds are constantly used as thickening, binding, emulsifying, suspending and stabilizing agents in medicinal diligence. They've also been used as matrices for sustained release of medicines. Epoxies and bonds are intriguing polymer for the medication of pharmaceutical phrasings, because of their high water- swellability,non-toxicity, low cost and free vacuity.

Polysaccharide hydrocolloids including bonds, epoxies and glucans are abundant in nature and generally set up in numerous advanced shops. These polysaccharides constitute a structurally different class of natural macromolecules with a broad range of physicochemical parcels which are extensively used for colorful operations in drugstore and drug. Although bonds can do in high attention in different factory organs, their physiological function in utmost cases is unclear. Bonds set up in rhizomes, roots and seed endosperms may act primarily as energy reserves whereas foliar bonds appear not to serve as storehouse carbohydrates.

Due to the high attention of hydroxyl groups in the polysaccharide, bonds generally have a high water- list capacity and this has led to studies of their part in factory water relations. It has been suggested that the capability of gum to hydrate may offer a medium for shops to repel failure By the term " gum in shops " is meant those substances which are answerable or at least swell veritably perceptibly in water and which, upon the addition of alcohol, are rained in a more or less unformed or grainy mass. Gum originates in the factory either as a part of the contents of the cell or as a part of the wall thereof.

The fact for increase in significance of natural factory grounded material is that factory coffers are renewable and if cultivated or gathered in a sustainable manner, they can give a constant force of raw accoutrements . still, substances from factory origin also pose several implicit challenges similar as being synthesized in small amounts and in fusions that are structurally complex, which may differ according to the position of the shops as well as other variables similar as the season. This may affect in slow and precious insulation and sanctification process. This review gives an sapience of operations of natural epoxies and bonds in pharmaceutical wisdom as an excipient. Specific references are also made to the use of natural epoxies, bonds and their modified form in the design of new lozenge form.

2. Chemical nature of gums and mucilages

Gums and mucilage, because of their polysaccharide nature,

produce an indefinite number of monosaccharides on hydrolysis.

Depending on the type of hydrolysis products obtained, they canbe further classified into pentosans (e.g. xylan) and hexosans (e.g.starch and cellulose). Gums are pathological products consisting of calcium, potassium and magnesium salts of complex substances known as'polyuronides'. Mucilages are physiological products related

togums, but they are generally sulfuric acid esters, the ester groupbeing a complex polysaccharide. Both gums and mucilages are closely related to hemicelluloses in composition, except that the sugars produced by hemicelluloses are glucose, mannose and xylose, whereas those produced by gums and mucilages are galactose and arabinose.

Identification of constituent sugar units in a polysaccharide is done by hydrolysis using dilute mineral acids, followed by separation of liberated monosaccharides using different chromatographic techniques. Estimation of total carbohydrate content of a polysaccharide and also the content of monosaccharides can be done by phenol–sulfuric acid method. Themode oflinkage betweenthemonosaccharides canbedetermined by methylation, periodate and lead tetra-acetate oxidation. Graded hydrolysis technique can be used to get a spectrum of oligosaccharides, which can be further analyzed to get information on sequence of different sugar remainders. NMR and mass spectroscopy ways can also be used for structural explication of epoxies and bonds.

3. Classification of gums and mucilages

Epoxies and bonds are present in high amounts in verities of shops, creatures, seaweeds, fungi andothermicrobial sources, where they perform a number of structural and metabolic functions; factory sources give the largest quantities. The different available epoxies are classified in Table 1.

Table 1

Classification of Gums

Sr.No.	Basis	Class	Example
01.	Charge	Non-ionic gums	Guar gum, locust bean gum, tamarind gum, xanthan gum
		Anionic gums	Gum arabic,karaya gum, Gellan gum, Carrageenans
02.	Shape	Short branch	Xanthan gum, guar gum
		Branch on branch	Gum arabic,Gum tragacanth.
03	Origin	Seed gums	Guar gum, locust bean gum,fenugreek.
		Plant exudates	Gum arabic,gum ghati,acacia gum.
		Microbial exudates	Dextran, gellangum, taragum, tragacanth.
		Seed weed	Sodium alginate,alginic acid,agar-agar
04	Gelatin behavior	Cold set gela	Gellan gum,flaxeed gum,gelatin.
		Heat set gela	Konjac
		Re-entrant gels	Xyloglucan
05	Chemical structure	Galactomannans	Fenugreek ,guar,locust bean gum,dhaincha gum,cassia gum.
		Glucomannans	

		Uronic acid containing gums Tri-heteroglycons Tetra-heteroglycons Penta-heteroglycons	Konjac Xanthan gum Gellan gum Gum arabic,psyllium gum Gum ghati,tragacanth

4. Pharmaceutical applications of gums and mucilages

Epoxies and bonds retain a complex, fanned polymeric structure because of which they parade high cohesive and tenacious parcels. similar parcels are largely useful in pharmaceutical medications. Hence, epoxies and bonds find different operations in drugstore. They're constituents in dental and other bonds and as bulk laxatives. These hydrophilic polymers are useful as tablet binders, disintegrants, emulsifiers, suspending agents, gelatinizing agents, stabilizing agents, thickening agents, defensive colloids in suspense and sustaining agents in tablets. Pharmaceutical operations of some epoxies and bonds that are used commercially as adjuvants in pharmaceutical phrasings are epitomized in Table 3- 5.

4.1 Applications in tablet formulations.

Epoxies and bonds find operations in tablet expression as binders because of their tenacious nature. They conduct cohesiveness to the greasepaint mass and convert them into grains, which are farther compressed into tablets. They can also be used as disintegrants in tablets. The disintegrant property of epoxies and bonds is due to their capability to absorb water and swell. They can swell up to 5 times their original volume and this lump leads to breakage of tablets into lower pieces, which in turn improves the dissolution rate. Different bonds have been used as binding agent in pharmaceutical phrasings. Gum has good list parcels a compared to numerous synthetic compounds. Binding property of gum was used to determine the capability of gum as pharmaceutical excipient in different exploration papers.

4.2 Applications as suspending and emulsifying agents.

Epoxies and bonds can act as emulsifying and suspending agents. They can effectively stabilize the conflation via interfacial immersion and the posterior expression of condensed flicks of high tensile strength that repel coalescence of driblets. They stabilize oil painting/ water mixes by forming a strong multi -molecular film around each oil painting drop and therefore slacken the coalescence by the presence of a hydrophilic hedge between the oil painting and water phases. Natural epoxies and bonds increase the tensile strength of the hydration sub-caste formed around the suspended patches, through hydrogen cling, and molecular relations. Since these agents don't reduce the face and interfacial tension, they serve stylish in the presence of wetting down agents. Epoxies and bonds are also constantly used as defensive colloids or thickeners. Natural epoxies and bonds are hydrophilic colloids, which form dissipation with water and increase the density of nonstop phase, so that the solid patches remain suspended in it for a sufficient long time to measure a livery cure.

Table 2

Classification of mucilages

Sr ,no	Basis	Source	Part
01.	Inta cell mucilage	Orchids sp. Agropyrum repens L,Beauvois Urgenia maritime L, Baker Allium sp.(onion, garlic) Viola tricolor L. Hagenia abyssinica, Bruce,gmelin Musa paradisiacal Aloe	Corn Rhizome Bulb Bulb Stem,leaf,flower,stamens. Flowers-stalks Pulp Succulent plant
02.	Cell membrane mucilage	Althaea officinalis L. Cinnamomum sp. Rhamnus fragula L. Sassfras variifolium , Salisbury Ulmus fulva Barosma betulina,Thunberg Linum usitatissimum L. S .nigra L.,Sinapis alba L., Cydonia vulgaris L.	Root Bark Bark Bark root Inner bark Leaves Seed-coat Seed-coat Seed-coat
03.	Secreting hairs	Viola tricolor L. Coffea Arabica L. Prunus avium	Leaf and calyx Leaf Leaf

4.3 Applications as sustaining material in dosage forms.

Among colorful lozenge forms, matrix tablets are extensively accepted for oral sustained release as they're simple and easy to formulate. Matrix system is the specific type of release system, which prolongs and controls the release of medicine that's dissolved or dispersed. Making medicine- bedded matrix tablets through the direct contraction of a mix of medicine, retardant material and complements is one of the simplest expression

approaches. The addition of polymeric accoutrements in a matrix system is a common system of modulating medicine release. colorful natural epoxies and bonds have been examined as polymer for sustained release phrasings. The use of natural polymers and theirsemi-synthetic outgrowth in medicine delivery continues to be an area of active exploration. medicine- release retarding polymers are the crucial players in matrix systems. colorful polymers have been delved as medicine braking agents, each presenting a different approach to the matrix system. Grounded on the features of the braking polymer, matrix systems are generally classified into three main groups hydrophilic, hydrophobic and plastic. Hydrophilic polymers are the most suitable for braking medicine release and there's growing interestin using these polymers in sustained medicine delivery.

These polymers when come in contact with water, get doused and form a gel. The medicine release from this gel will be generally prolixity controlled and hence the release will be sustained over a prolonged time.

Table 3

Pharmaceutical application of ntural gums

Sr .no	Common name	Botanical name	Family	Pharmaceutical application
01	Agar	Gelidium amansil	Gelidiaceae	Suspending agent, emulsifying agent, gelling agent in suppositories, surgical lubricant, tablet disintegrants, medium for bacterial culture, laxative
02	Albizia gum	Albizia zygia	Laguminoseae	Tablet binder
03	Carrageenan	Chondrus cryspus	Gigarginaceae	Gelling agent, stabilizer in emulsions and suspensions, in toothpaste, demulcent and laxative
04	Cashew gum	Anacardium accidenatale	Anacardiaceae	Suspending agent
05	Cassia tora	Cassia tora Linn	Leguminoseae	Binding agent
06	Guar gum	Cyamompsis tetragonobolus	Leguminoseae	Binder, disintegrant, thickening agent, emulsifier, laxative, sustained release agent, colon targeted drug delivery, cross-linked microspheres
07 08	Gum acacia Gum ghati	Acacia arebica Anogeissus lactifolia	Leguminoseae Combretaceae	Suspending agent, emulsifying agent, binder in tablets, demulcent and emollient in cosmetics, osmotic drug delivery

Table 3 continued

09	**Gum tragacanth**	**Astragalus gummifer**	**Leguminoseae**	**Suspending agent, emulsifying agent, demulcent, emollient in cosmetics and sustained release agent**
10	**Karaya gum**	**Sterculia urens**	**Sterculiaceae**	**Suspending agent, emulsifying agent, dental adhesive, sustaining agent in tablets, bulk laxative, mucoadhesive**
11	**Khaya gum**	**Khaya grandifolia**	**Meliaceae**	**Binding agent**
12	**Leucaena seed gum**	**Leucaena leucocephata**	**Fabaceae**	**Emulsifying agent, suspending agent, binder in tablets, disintegrating agents in tablet.**
13	**Pectin**	**Citrus aurantium**	**Rutaceae**	**Thickening agent, suspending agent, protective agent, beads,** **floating beads, colon drug delivery, microparticulate drug delivery, transdermal drug delivery,iontophoresis, hydrogels**
14	**Sodium alginate**	**Macrocytis pyrifera**	**Lessoniaceae**	**Suspending agent, gelation for dental films, stabilizer, sustained release agent, tablet coating,mucoadhesive microspheres**
15	**Tamarind seed polysaccharide**	**Tamarindus indica**	**Leguminoseae**	**Binding agent, emulsifier, suspending agent, sustaining agent, hydrogels, mucoadhesive agent and nasal drug delivery**
16	**Xanthan gum**	**Xanthomonas campestris**	**Xanthomonadaceae**	**Suspending agent, emulsifier, stabilizer in toothpaste and ointments, sustained release agent, buccal drug delivery system**

Table 3 continued

17	Gellan gum	Pseudomonas elodea	–	Pseudomonas elodea Disintegrating agent, floating drug delivery system, ophthalmic drug delivery, sustaining agent, hydrogels
18	Locust bean gum	Ceratonia siliqua	Fabaceae	Thickener, stabilizer and controlled release agent
19	Neem gum	Azadirachta indica A. Juss.	Meliaceae	Suspending agent, binder and transdermal film forming agent
20	Badam gum	Prunus amygdalus	Rosaceae	Binding, sustaining and transdermal film forming agent
21	_	Caesalpinia pulcherrima	Fabaceae	Mucoadhesive agent
22	_	Leucaena leucocephala	Fabaceae	Mucoadhesive agent, emulsifier and binder
23	_	Cissus populnea	Amplidaceae	Binding agent
24	_	Acassia senegal	Leguminosae	Binder, Disintegrant
25	Okra gum	Hibiscus esculentus	Malvaceae	Binder and hydrophilic matrix for controlled release drug delivery Kalu
26	_	Sterculia foetida	Malvaceae	Controlled release preparation
27	Honey locust gum	Gleditsia triacanthos	Fabaceae	Matrix tablet, sustained release formulation
28	Tara gum	Caesalpinia spinosa	Leguminosae	Thickener, stabilizer
29	Hakea gum	Hakea gibbosa	Proteaceae	Sustained release formulation, mucoadhesive agent
30	Konjac	Amorphophallus konjac	Araceae	Controlled release formulation, gelling agent
31	_	Mimosa scabrella	Mimosaceae	Release controlling agent

4.4 Applications as coating agents.

Numerous epoxies and bonds act as good coating agents, which can sustain the medicine release, or can cover the medicine from declination in stomach. The gum from forelimb polysaccharide(Moringa oleifera Lam.Syn.M. pterygosperma Gaertn.) has been reported to be a good film- coating polymer for paracetamol grains, which braked the medicine release form the grains when used at 2concentration. As the number of coatings increased, the medicine release was set up to reduce.

4.5 Applications as gelling agents.

The application of natural epoxies and bonds as base for pharmaceutical gels is a new conception. Epoxies and bonds can form gels either alone or in combinations with others. Gelling is a results of multitudinous inter and intra molecular associations to produce a three- dimensional network, within which the water motes are entangled. similar associations are brought about by either physical(pH change, altering temperature) or chemical(addition of suitable reagents) treatments. The medium of gelation in acidic polysaccharides similar as pectin is different. In this case, the macromolecular chains are extensively hydrogen clicked and as a result, junction zones are formed between hydrogen clicked parts of chains. In alginic acid, the gel conformation occurs as a result of commerce with calcium ions. Galactomannans interact synergistically with Xanthan goo or carrageenans to form elastic gels. Gum of colorful shops has been used as gelatinizing agent due to itsnon-toxicity, low cost, free vacuity, emollient and nonirritating nature.

4.6 Applications as mucoadhesive agents

Naturally being polymers, being biocompatible and biodegradable, are presently considerably delved for the development of new medicine delivery systems. Mucoadhesive medicine delivery ways are primarily controlled release medicine delivery systems, which gets retained in the stomach for longer period of time, therefore helping in immersion of medicine for the intended duration of time. It helps to improves bioavailability, reduces medicine destruction, ameliorate solubility of medicines that are less answerable at high pH terrain(e.g. weakly introductory medicines like domperidone and papaverine). Bioadhesion may be defined as the state in which two accoutrements , at least one of which is natural in nature, are held together for extended ages by interfacial forces. When the tenacious attachment is to mucus or a mucous membrane, the miracle is appertained to as mucoadhesion(Smart, Kellaway, & Worthington, 1984). The most extensively delved group of mucoadhesive is hydrophilic macromolecules containing multitudinous hydrogen bonds forming groups. Once the lozenge form forcefully sticks to the mucosal face, its gastric hearthstone time is dragging until itis spread by development of mucins or by some other means(Harding, Davis, Deacon, & Fiebrig, 1999).5. Characterization of gums and mucilages.

5.Application of mucilage and gums.

The birth and characterization of polysaccharide epoxies is an essential step in establishing their felicity as pharmaceutical excipients(Elijah & Barbara, 2010). The prospects of natural polymers are lustrously but indeed then expansive testing will be needed. A suitable strategy is needed to save plutocrat andtime.Over characterization isn't desirable, because inordinate usevof time and coffers could actually delay the launch of innovative excipients. The characterization of epoxies and bonds is originally achieved by only a multiple-fashion approach. For excipients analysis, logical ways can be classified according to the type of information generated.

Structural — Epoxies and bonds are polysaccharides and contain sugars. So, evidence of the different sugars is carried out by chromatography and structure explication can be carried out by NMR and mass spectroscopy. chastity — To determine the chastity of the named goo and gum, tests for alkaloids, glycosides, carbohydrates, flavanoids, steroids, amino acids, terpenes, saponins, canvases and fats, and tannins and phenols are carried out.

contamination profile — Testing for contaminations must be carried out using suitable logical ways. Physico-chemical parcels — Color, odor, shape, taste, touch, texture, solubility, pH, swelling indicator, loss on drying,

hygroscopic nature, angle of repose, bulk and true consistence, porosity and face pressure. Different ash values are also estimated. The microbial cargo and presence of specific pathogens are alsodetermined.In vitro cytotoxicity is also determined. Epoxies and bonds are largely thick in nature. So, the rheological parcels of excipients are important criteria for deciding their marketable use. The inflow geste of the samples is determined. Table 6 shows different primary confirmative tests for dried gumpowder.Toxicity — The acute toxin of epoxies andmucilages aredetermined by the entourages fixed- cure system as per OECD guidelineNo. 425. Asub-acute toxin study, determination of the LD50,etc., is carried out in rats and guinea gormandizers of bothsexes.Once analysis is complete, determination of the structure, composition and contamination profile enables a scientific dossier to be set describing the excipients. This information is of value for the nonsupervisory dossier of the final pharmaceutical product that would contain the given excipients.

Eventually, epoxies and bonds are added to pharmaceutical phrasings. So a comity study is important. The comity studies of goo or gum or medicines can be estimated or studied by spectrophotometry/ FTIR/ DSC.

Table 4

Pharmaceutical applications of mucilage

Sr.no	Common name	Botanical name	Family	Pharmaceutical applications
1.	Abelmoschus mucilage	Abelmoschus esculentus	Malvaceae	Binder in tablet, sustained release.
2.	Aloe mucilage	Aloe species	Liliaceae	Gelling agent, sustained release agent
3.	Asario mucilage	Lepidum sativum	Crucifera	Suspending agents, emulsifying agents, controlled release tablet.
4.	Bavchi mucilage	Ocimum canum	Labiatae	Suspending agents, emulsifying agents.
5.	Fenugreek mucilage	Trigonella foenum graceum	Leguminoseae	Gelling agent, disintegrants, tablet binder,emolinet and demulcent.
6.	Hibiscus mucilage	Hibiscus esculentus Linn	Malvaceae	Emulsifying agents, sustaining release agent, suspending agents
7.	Hibiscus mucilage	Hibiscus rosa sinesis Linn	Malvaceae	Suspending agents, sustained release agent
8.	Isapgol mucilage	Plantago psyllium	Plantaginaceae	Cathartic, lubricant, demulcent, laxative, sustaining agents, hydrogels, emulsifying agents, suspending agents.

9.	Ocimum seen mucilage	Ocimum gratissimum Linn	Labiatae	Suspending agents, binding agents
10	Satavari mucilage	Asparagus racemosus	Apocynaceae	Binding agents and sustaining agents in tablet
11	Cactus mucilage	Opuntia ficus indica	Cactaceae	Gelling agent in sustained drug delivery.
12		Anacardium Occidentale	Anacardiaceae	Gelling agent
13		Cassia sophera	Fabaceae	Binder
14		Chlorophyll um borivilianum	Aspargaceae	Binding agents and sustaining agents in tablet
15		Delonix regia	Fabaceae	Binder
16		Vinga mungo	Fabaceae	Binding agents
17		Cissus papulnea	Vitaceae	Binder
18		Caesalpinia pulcherrima	Fabaceae	Granulating agents and binders
19		Cassia angustifolia	Fabaceae	Granulating agents and binders
20		Mimosa pudica	Fabaceae	Bioadhesive polymers

Table 5

Pharmaceutical applications of gums and mucilages in drug delivery.

S. no.	Natural gum or mucilage	Model drug	Dosage form
01	Guar gum (97.3%)	Dexamethasone	Tablets
02	Guar gum (77.19%)	Indomethacin	Matrix tablets
03	Guar gum (125%)	Indomethacin	Tablets
04	Guar gum (20%)	Albendazole	Matrix tablets
05	Guar gum (20%)	Mebendazole	Matrix tablets
06	Guar gum (75%)	Diltiazem	Matrix tablets
07	Guar gum (65%)	Ornidazole	Matrix tablets
08	Guar gum (80%)	5 FU	Tablets
09	Guar gum	Tinidazole	Tablets

10	Guar gum	Calcium sennosides	Matrix tablets
11	Guar gum	Mesalazine	Tablets
12	Guar gum	Rofecoxib	Matrix tablets
13	Guar gum	Albendazole cyclodextrin	Matrix tablets
14	Guar gum	Ondansetron	Matrix tablets
15	Guar gum (44%)	Indomethacin	Pellets (coated with Eudragit
16	Methacrylic acid-g-guar gum (MAA-g-GG)	Metronidazole	Tablets
17	Guar gum–alginate combination cross-linked with glutaraldehyde	BSA	Hydrogels
18	Xanthan gum	Caffeine, indomethacin, s odium indomethacin	Matrix tablets
19	Xantan gum: guar gum (10:20)	5-FU	Matrix tablets
20	Xanthum gum:boswellia gum (3:1)	5-FU	Compressed coated tablets
21	Khaya gum (300 mg) and Albizia gum (400 mg)	Paracetamol and indomethacin	Tablets
22	Deacylated gellam gum cross-linked with calcium	Azathiopurine	Beads (coated with Eudragit S
23	Locust bean gum:chitosan (4:1) Compression	Mesalazine	coated tablets
24	Caesalpinia pulcherrima mucilage	Diclofenac sodium	Tablet
25	Cassia angustifolia seed mucilage	Diltiazem HCl	Tablet
26	Prosopis juliflora mucilage	Diclofenac sodium	Tablet
27	Plantago Psyllium seed	Paracetamol	Tablet

	mucilage		
28	Cassia fistula seed mucilage	Diltiazem HCl	Tablet
29	Dellinia indica mucilage	Oxytocin	Nasal gel

Table 6

Preliminary confermative test for dried mucilage powder

Sr.no.	Test	Procedure	Observation	Inference
1	**Molisch's test**	100 mg dried mucilage powder+Molisch's reagent + conc.H2SO4 on the side of a test tube	**green color observed at Violet the junction of two layers**	**Carbohydrates present**
2	**Ruthenium test**	Take a small quantity of dried mucilage powder,mount it on a slide with ruthenium red solution and observed it under microscope	**Pink colour develops**	**Mucilage present**
3	**Iodine test**	100 mg dried mucilage powder in 1ml 0.2 N iodine solution	**No colour observed in solution**	**Polysaccharides present**
4	**Enzyme test**	Dissolve 100mg dried mucilage powder in 20ml distilled water,add 0.5 ml of benzidine alcohol (90 %),Shak and allow stand for few minutes	**No blue colour produced**	**Enzyme absent**

Table 7

Example of modified gums with their applications

sr .no	Gums and mucilage	Modification technique	Applications
01	Karaya gum	Heat treatment at various temperatures in a hot air oven	Disintegrating agent
02	Agar and guar gum	Heat treatment at various temperatures in a hot air oven along	Disintegrating agent
03	Hypochlorite potato starch	Chemical modification of potato starch carried out in presence of hypochloride.	Disintegrating agent
04	Tragacanth	Chemical modification of tragacanth using epichlorhydrine	Disintegrating agent
05	Acacia gum	Chemical modification of acacia gum using epichlorhydrine	Disintegrating agent
06	Guar gum	Chemical modification of guar gum	Disintegrating agent
07	Cross-linked amylose	Chemical modification of amylase by substituting it in a one step reaction	Disintegrating agent
08	Cross-linked cellulse	Chemical modification of cellulose by epichlorhydrine.	Disintegrating agent
09	Polyalkylamine	Chemical modification of polyalkylamine	Disintegrating agent
10	Cyclodextrin	Physical modification – co-drying of micro crystalline cellulose with cyclodextrin	Disintegrating agent
11	Starch	Physico-chemical treatment of to starch for modification	Disintegrating and binding agent
12	Sesbania gum	Chemical modification of Sesbania gum with tartaric acid for a sustained release formulation and chemical modification of gum with acetone:chloroform mixture for gelling agent	Sustained release formulation, gelling agent
13	Guar gum	Chemical modification of guar gum with glutaraldehyde for colonic delivery, chemical modification using isopropanol as a filmcoating material	Colonic delivery, film coating, hydrogel
14	Tamarind powder	Chemical modification of tamarind powder using epichlorohydrin for a sustained release formulation and partial degradation of	Sustainedrelease formulation, rectal

		galactosidase for rectal drug deliver	**drug delivery**
15	**Psyllium**	**Chemical modification of psyllium was carried out to form N-hydroxy-methylacrylamide based hydrogels, chemical modification with tartaric acid**	**N-hydroxy-methylacrylamide based hydrogels, oral insulin drug delivery**

6 . Modification of existing gums and mucilages

Natural goo polysaccharides are promising biodegradable accoutrements for use in medicine delivery systems. still, these accoutrements have certain downsides, like unbridled rate of hydration, thickening, drop in density on storehouse, microbial impurity and bear some revision to overcome these problems(Balji & Nisha, 2008). These variations can be carried out by carboxymethylation/ carbomoylethylation, grafting orcross-linking ovinylmonomers ontopolysaccharides whichproduce a knitter- made material for medicine delivery systems. Certain variations like carboxymethylation and carbomoylethylation by relief of many free- OH groups increase the waterless solubility of epoxies(Vikas etal., 2011). It should be noted that numerous " old " accoutrements contend successfully moment after nearly a century of sweats to replace them. Itis the usual balance of economics and performance that determine the marketable realities. Carboxymethylation of epoxies increases their hydrophilicity and result clarity and makes them more answerable in waterless systems. revision of tamarind kernel greasepaint, cassia tora goo and guar goo were delved by Goyal, Kumar, and Sharma(2007). colorful styles are available to modify the state of molecular commerce between polymers. principally, two styles are availableas the physical system and chemical system.

Cross-linking of epoxies bear vacuity of active functional groups in their introductory structure. Hence, epoxies similar as guar goo, cashew goo or sterculia epoxies that retain free rummy and/ or carboxylic units feel to be a good choice for revision bycross-linking. still, it's essential to probe the vulne capability of thecross-linking to different pH in order to use the modified patch for point specific delivery. The high lump characteristiof natural epoxies in matrices which leads to burst release doesn't make them suitable for delivering medicines to distal corridor of the gut. similar high lump can be averted by phosphatecross-linking

7. Conclusion

The use of natural epoxies for medicinal operations is seductive because they're provident, readily- poisonous, and able of chemical variations, potentially biodegradable and with many exceptions, also biocompatible. numerous studies have been carried out in fields including food technology and medicinals using epoxies and bonds. It's clear that epoxies and bonds have numerous advantages over synthetic accoutrements . Systemic examinations of natural polysaccharides and their derivations can lead to intriguing discoveries in the fields of remedial and artificial exploration. colorful operations of epoxies and bonds have been established in the fields of medicinals. Natural epoxies can also be modified to have knitter- made products for medicine delivery systems and therefore can contend with the synthetic controlled release excipients available in the request. There are still several factory polysaccharides that aren't delved so far and studies on similar sources can make significant donation in this direction. thus, in the times to come, there will be continued interest in natural epoxies and their variations aimed at the development of better accoutrements for medicine delivery systems.

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