

HERBAL EXCIPIENTS: A STEP TOWARDS ECO-FRIENDLY HERBAL DRUG
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12-17.**ABSTRACT**

The Herbal or natural excipients have a great advantage over their synthetic analogues as these are non-toxic, less expensive and freely available. The enhance awareness about herbal excipients, polymers of natural origin, the pharmaceutical industry are more inclined towards their use in formulation development. The plant derived gums, carrageen, thauMATIN, lard, storax, agar, gum acacia, tragacanth and many more to comply with many requirements of pharmaceutical excipients. They are a powerful and affordable method of administering active pharmacological ingredients because they can be easily changed to match the demands of each individual patient. In view of their biocompatibility and capacity to provide additional nutrition to the established dosage form, natural excipients have the potential to be utilised as diluents, binder, disintegrants, and lubricants in a variety of formulation. Different kinds of formulations are found to be effective for treating certain diseases. Given that a dosage form is made up of an active pharmaceutical ingredient [API] and an excipient, it follows that an excipient is required for dosage forms. Natural excipients derived from plant sources such as gums, mucilage, starches, and cellulose have demonstrated promising functional properties, including swelling, gel formation, and mucoadhesion, which enhance drug delivery and therapeutic efficacy. Their biodegradability and minimal side effects.

KEYWORDS: Herbal Excipients, Natural pharmaceutical aids, Herbal binders, polymers, Gum.**INTRODUCTION**

A substance that is employed to deliver a medication, i.e., with just the purpose of serving as an inert carrier for the active ingredients, is referred to as an excipient. The Latin word excipients, which means to receive, together, to the out, is the origin of the English word excipient. Active pharmaceutical ingredients and excipients employed in the formulation affect the product's quality. Excipients are vital non-active ingredients in drug formulations, playing a significant role in achieving stability, bioavailability, and ease of administration. Excipients are primarily used as diluents, binders, disintegrants, adhesives, glidants and sweeteners in conventional dosage forms like tablets and capsules. The traditional view that excipients are inert and do not exert any therapeutic or biological action or modify the biological action of the drug substance has changed and

it is now recognized that excipients can potentially influence the rate and/or extent of absorption of a drug. As herbal excipients are non toxic and compatible, they have a major role to play in pharmaceutical formulation. Hence, this paper is an attempt to review herbal excipients used in NDDS. Excipients are the substances or compounds, apart from the active pharmaceutical ingredients and packaging materials, that have an effect on finished product quality, in some cases creating up nearly the entire formulation.^[1,2,3,4]

CLASSIFICATION OF HERBAL EXCIPIENTS



Excipients are commonly classified according to their application and function in the drug products

- Binders, Diluents
- Lubricants, Glidants, Disintegrants
- Polishing Film formers and coatings agents
- Plasticizers, Colorings
- Suspending agents, Preservatives, antioxidant.
- Flavorings, Sweeteners, Taste improving Agents
- Printing inks, Dispersing agents Gums.^[5]

formulation. Binders are used in the mixture to express plasticity or to increase the potential of binding between the formulated particles. Natural binders such as starch gums the mucilage of dried fruit have binding properties and some other characteristics Such as filler, disintegrants. Natural polymers are safe and economical than synthetic polymers. Some plant derived binders are mentioned in the below table.^[6]

HERBAL EXCIPIENTS IN HERBAL FORMULATION

Binder

Binders, as their name suggests, are the excipient used to bind or hold all the components used in the dosage

Table 1: List of some excipients used as binder

Sr. no.	Name of excipient	Source	Family
1	Tamarind seed	Tamarindus indica	Leguminosae
2	Fenugreek mucilage	Trigonella foenum graecum	Leguminosae
3	Mangifera indica gum	Mangifera indica	anacardiaceae
4	Gum acacia	Acacia Arabica	Combretaceae
5	Mucilage of Artocarpus Heterophyllus	Artocarpus Heterophyllus	Moraceae

Lubricant

Lubricant is required for Lubrication which is critical to the successful manufacture of herbal dosage forms; lubricants are required elements in robust formulations to accomplish this. Although lubricating concerns cause many failures in herbal manufacturing operations, lubricants do not receive appropriate attention in the creation of pharmaceutical formulations. The fundamental foundation on lubrication is provided in this work, followed by a discussion of the links between lubrication and friction/adhesion forces. The use of lubricant in the creation of pharmaceutical goods and production processes is then examined, with a focus on magnesium stearate.^[7]

Disintegrates

Herbal solid dosage forms [tablets or capsules] are the most often used method of delivering active

pharmaceutical ingredients [APIs] to patients. Tablets are often powder compacts that contain a variety of excipients in addition to the API. Excipients are substances that are added to a formulation in order to achieve the required fill weight of a dosage form, increase process, or influence drug release behaviour in the body. As these complicated porous systems come into touch with physiological fluids, they go through a variety of pathways. The disintegration and dissolving behaviour of the powder compact has the greatest influence on the performance of a drug.^[7]

Preservative

Preservatives are additives—natural or synthetic—that are added to foods such fruits, vegetables, foods, cosmetics, and pharmaceuticals to extend their shelf lives while maintain their quality and safety by delaying microbial contamination, fermentation, acidification, and

decomposition. Food was stored in receptacles like clay jars before the invention of preservatives to prevent it from going bad or contamination. Due to the need for moisture for most germs and fungi to develop, drying food was a common method of preservation. Fruits, vegetables, and meats were frequently dried as a means of preservation. Many meats, including hams, and fish are still kept by salting. Jams and jellies are preserved as high-sugar solutions.^[8]

Example

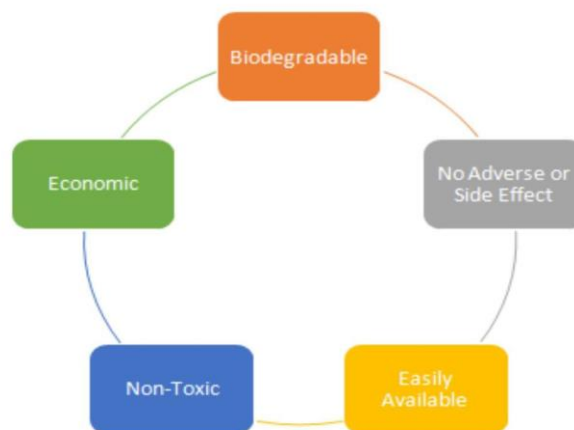
1. Clove oil - This contains highest number of phenolic compounds such as eugenol, eugenol acetate and gallic acid, while β -pinene, limonene, benzaldehydes, 2-Heptanone and ethylhexanoate are other volatile compounds that occur in lower levels in clove oil. Clove is strong antioxidant and antimicrobial activities among the others. Clove essential oil is generally accepted as a safe substance at levels below 1500 mg / kg. The world health organization defined that the appropriate intake of clove per day is 25mg/kg of weight in individuals.

2. Neem oil- This herb is outstanding because all parts of this plant are medicinal. The seeds, leaves, flowers and bark are all very essential and are used to make herbal medicines. Some popular terms are Nim, Vepa, Margosa plant, Nimbay. This medicinal herb is used globally and is widely used to cure colds, chest pain as well as diabetes in some countries such as Jamaica.^[9]

Diluents

A diluent is a diluting agent [also known as a filler, diluent, or thinner]. Some liquids are either too thick to

Advantages



Biodegradable: Naturally occurring polymers which is produced by all living organisms. They have no adverse effects on the environment or human being.

Safe and avoid side effects: They are from a natural source and hence, safe and without side effects.

Biocompatible and non-toxic: Chemically, plant materials are carbohydrates in nature and composed of

flow from one place to another or too viscous to be easily pumped. This can be problematic since it might not be profitable to transfer these fluids in this form. To help with the restricted mobility, diluents are utilised. This lowers the cost of pumping and transporting as well as the viscosity of the fluids. Examples of some natural diluents: Starch, cellulose, Lactose, mannitol etc.^[10]

Flavoring Agents

Flavors are a combination of the senses of taste, touch, smell, and sight. Many artificial flavors are now made with the use of technology in the flavoring industry. Flavors are used in a variety of medicinal formulations, including cough syrups, sedatives, antimalarials, and antibiotics. Flavors are commonly employed in the food industry as well. Flavoring agents are classified as organoleptic agents. Flavors are utilized as taste masking agents, a disagreeable taste or dosage form order.^[11]

Anti-oxidants

A substrate known as an antioxidant prevents molecules within a cell from oxidising. It is a well-known chemical process that enables the removal of electrons or hydrogen from a substance. Antioxidants are frequently used as food supplements, and researchers have looked into how well they help shield against illnesses like cancer and heart disease. Examples of flavouring agents include sweeteners, flavour enhancers, and flavouring agents. Some herbal plants are used as antioxidant property.

Example: Beetroot, Broccoli, spinach, carrots and potatoes.^[12]

repeating monosaccharide units. They are non-toxic in nature.^[13]

Local availability: In developing countries, governments promote the production of plant like guar gum and tragacanth because of the many applications in a variety of industries.

Patient tolerance as well as public acceptance: There is less chance of side effects and adverse effects with natural materials compared with synthetic one. For example, PMMA, povidone.^[14]

Cost effectiveness: Many herbal excipients more cost-effective compared to synthetic and alternatives, especially when sourced locally.

Antioxidant properties: Some herbal excipients possess antioxidant properties, which can help in preserving the stability of formulations.

There is a most preferable herbal excipients in regulatory frameworks, which can easy for the approval process for new formulations.

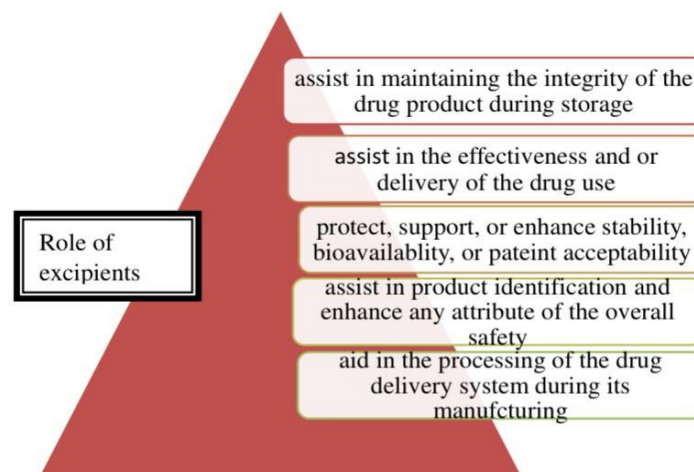
Easy availability: In many countries, they are produced due to their application in many industries and easily availability.^[15]

Disadvantages

Risk of microbial contamination: As natural substances, these excipients are susceptible to microbial growth, and more chance of microbial contamination due to moisture content.

Allergen potential: Some plant-based excipients could trigger allergic reactions in individuals who are sensitive.^[16]

Application



Starch in rubber

In 1970s, replacement of coom by starch was studied in the research centers of northern are in the USA. Action of rubber caused by cross-linked starch xanthate was similar to that of moderate coom. France that mixed natural latex with starch to establish natural starch-rubber compound material.^[20]

Guar gum

Guar gum comes from the endosperm of the seed of legume plant *Cyamopsis tetragonolobus*. guar splits are

Variation: Synthetic manufacturing is controlled procedure with fixed quantities of ingredients while production of natural polymers which is dependent on environment and physical factors like temperature.

The uncontrolled rate of hydration: Due to differences in the natural materials at different times, as well as differences in region, species, and climate conditions the percentage of chemical constituents present in a given material are different.^[17]

Reduction of viscosity on storage: gums and mucilages come into contact with water there is an increase in the viscosity of the formulations. it has been found that after storage there is reduced in viscosity.^[18]

Lower Stability: The herbal excipients tend to degeneration at a faster rate than their synthetically prepared parts. This is highly chances to degradation when environmental factors such as temperature, light, or moisture are exposed to products, that causes lowering shelf life.

Complicated Extraction and Processing: The process for extraction and purification the active constituents of herbal excipients is generally more challenging and expensive than synthetic which makes their cost higher.^[19]

obtained when the fine layer of fibrous material, which forms the husk, which is removed and separated from the endosperm halves by polishing. Strong acids can cause hydrolysis and loss of the viscosity, and alkalis in strong concentration also tend to reduce viscosity and also insoluble in most hydrocarbon solvents.



Hakea Gum

Hakea gum a dried exudates from the plant *Hakea gibbosa* family Proteaceae. Gums that are acidic arabinogalactans [type A]. Molar proportions [%] of sugar constituents⁷ Glucuronic acid, Galactose, Arabinose, Mannose.^[21]



Alginates

Alginates are naturally occurring polysaccharide polymers that were extracted from brown seaweed. Alginate can be transformed into its salts, of which sodium alginate is the most widely utilised type right now. Alginates have a wide range of uses in drug administration, including the transfer of biomolecules in tissue engineering applications, matrix type alginate gel beads, liposomes and modifying agent.^[22]

Khaya gum

Khaya gum is a polysaccharide which is obtained from the incised trunk of the tree *Khaya grandifoliola* [family-Meliaceae]. The gum is naturally available, inexpensive and non-toxic has also the interest in developing the gum for pharmaceutical use. Further work has also shown its potential as a directly compressible matrix system in the formulation of 61 controlled release tablets.^[23]

Aloe mucilage

It is obtained from the leaves of *Aloe barbadensis* Miller. The aloe parenchyma tissue or pulp has been contain proteins, lipids, amino acids, vitamins, enzymes, inorganic compounds and small organic compounds in

addition to the different carbohydrates. Many investigators have partially acetylated mannan as the primary polysaccharide of the gel, while others found pectic substance as the primary polysaccharide.^[24]

Menthol

It is obtained by steam distillation of the flowering tops of *Mentha piperita* belonging to the family Labiatae. 2% w/w hydroxypropyl methylcellulose [HPMC] gel as a reservoir system containing menthol as penetration enhancer and 60% v/v ethanol-water as solvent system prepared. This is also known as in vivo evaluation of nimodipine. The results showed that the menthol-based TTS patch of nimodipine provided steady plasma concentration of the drug with improved bioavailability in comparison with the immediate release tablet dosage form.^[25]

Pectin

Pectins are most widely used herbal excipients in herbal formulation which are non-starch, linear polysaccharides extracted from the plant cell walls. In the food industry, folic acid incorporated using alginate and combinations of alginate and pectin polymers so as to improve stability of folic acid. The blended pectin polymer matrix increased the folic acid encapsulation efficiency.^[26]

Ideal properties of herbal excipients

They can be used practically very useful.
They should be non-toxic and non-irritant in nature.
Herbal excipient should be non-volatile in nature & they should be easily available and cheap.
They should not have specific colour, odour and taste & They should possess good water and liquid solubility.
Herbal excipients should be pharmacologically inert.^[27]

CONCLUSION

Herbal excipients are most widely used in various herbal formulation. The need and quest for safer drug-delivery systems and more effective results lie in the use of herbal excipients, for future pharmaceutical formulations. natural sources enhance drug bioavailability, improve chemical stability and therapeutic activity. herbal excipients are promising biodegradable materials, these can be chemically compatible with the excipients in drug delivery systems. In addition herbal excipients are non-

toxic, freely available, and less expensive compared to their synthetic counterparts. natural excipients which are obtained from natural sources such as plant, microbes, marines, animal, and mineral. As the natural excipients are biodegradable compound. Human, a creation of nature is well supplied with natural materials that were used as medicament too since thousands year even in many traditional medical sciences including Ayurveda in India. In this regards these natural excipients used in Ayurvedic pharmaceuticals may play a major role as advance nurture for Ayurvedic medicament.

REFERENCE

1. Mam NM, Bias S, Manasi M. Review on herbal excipients. *Research Journal of Pharmacognosy and Phytochemistry*, Apr. 1, 2023; 15(2): 118-24.
2. Tiwari N, Rai V, Singh S. A Review on Herbal Excipients in Pharmaceutical Formulations. *IASR Journal of Medical and Pharmaceutical Science*, 2024; 4: 18-23.
3. Shirwaikar A, Shirwaikar A, Prabu SL, Kumar GA. Herbal excipients in novel drug delivery systems. *Indian journal of pharmaceutical sciences*, Jul. 2008; 70(4): 415.
4. Pal RS, Pal Y, Wal A, Wal P. Current review on plant based pharmaceutical excipients. *Open medicine journal*, 2019; 6(1): 1-5.
5. Singh P, Mahmood T, Shameem A, Bagga P, Ahmad N. A review on Herbal Excipients and their pharmaceutical applications. *Scholars Academic Journal of Pharmacy*, 2016; 5(3): 53-7.
6. Mittal DS, Pawar S. Herbal excipients: an overview. *Int J Pharmacognosy Pharm.*, 2019; 1: 05-9.
7. Zahid SA, Deshmukh R, Khan G, Salim MS, Ilyas AH. A review on herbal drug excipient used in NDDS. *International Journal of Research in Pharmacy and Allied Science [IJRPAS]*, Jul. 2023; 2(4): 124-35.
8. Markl D, Zeitler JA. A review of disintegration mechanisms and measurement techniques. *Pharmaceutical research*, May 2017; 34(5): 890-917.
9. Zahid SA, Deshmukh R, Khan G, Salim MS, Ilyas AH. A review on herbal drug excipient used in NDDS. *International Journal of Research in Pharmacy and Allied Science [IJRPAS]*, Jul. 2023; 2(4): 124-35.
10. Kayukawa T, Fujimoto T, Miyoshi K, Arai H. Development of supercritical water cracking process to upgrade unconventional extra heavy oil at wellhead. *Journal of the Japan Petroleum Institute*, Sep. 1, 2017; 60(5): 241-7.
11. Dherange DD, Pangavane RM. Review on : Excipients used in herbal drug technology. *Int J Res publ Rev.*, 2022; 3(2): 465-475.
12. Rao VR. Antioxidant agents. In *Advances in structure and activity relationship of Coumarin Derivatives*, Jan. 1, 2016; 137-150. Academic Press.
13. Selvadurai S, Divya S, Geetha A, Rohini K, Anbazhagan S. Herbal excipients-significance of substances of natural origin as excipients. *Int J PharmTech Res.*, 2020; 2020(3): 242-52.
14. Kottke KM, Edward MR. Tablet Dosage Forms. In: Banker GS, Rhodes CT, ed. *Modern Pharmaceutics*. New York: Marcel Dekker, Inc., 2002; 287-333.
15. Chaudhari DB, Jaju SO, Rawat SS, Jaybhaye SS, Mundada JR. OVERVIEW OF NATURAL EXCIPIENTS: BENEFITS AND APPLICATION IN PHARMACEUTICALS.
16. Jaju S, Rathod A, Jaybhaye S, Pawar P, Sapate R, Mundada J. A Review on Herbal Excipients Derived from Agro-Industrial Wastes. *International Journal of Scientific Research and Technology*, 2025 Apr 12.
17. Chavhan SA, Shinde SK, Sapkal SB, Shrikhande VN. Herbal excipients in novel drug delivery systems. *International Journal of Research and Development in Pharmacy & Life Sciences*, May 15, 2017; 6(3): 2597-605.
18. Jani GK, Shah DP, Prajapati VD, Jain VC. Gums and mucilages: versatile excipients for pharmaceutical formulations. *Asian J Pharm Sci.*, 2009; 4(5): 309-23.
19. Tiwari N, Rai V, Singh S. A Review on Herbal Excipients in Pharmaceutical Formulations. *IASR Journal of Medical and Pharmaceutical Science*, 2024; 4: 18-23.
20. Kumar T, Gupta SK, Prajapati MK, Tripathi D. Natural excipients: A review. *Asian J Pharm Life Sci.*, 2012; 2231: 4423.
21. Gadhav RG, Sonawane SS, Rode AR. A review of herbal excipients. *International Journal of Creative Research Thoughts [IJCRT]*, May 2023; 11[5].
22. Tønnesen HH, Karlsen J. Alginate in drug delivery systems. *Drug development and industrial pharmacy*, Jan. 1, 2002; 28(6): 621-30.
23. Dav V, McCarthy SP; Review of Konjac Glucomannan. *Journal of Environmental Polymer Degradation*, 1997; 5(4): 237.
24. Jain A, Radiya P, Wadekar R, Limaye S, Pawar C. Natural excipients-an alternative to synthetic excipients: a comprehensive review. *International Journal of Pharmaceutical and Medicinal Research*, Aug. 25, 2014; 2(4): 123-7.
25. Krishnaiah YS, Bhaskar P. Studies on the transdermal delivery of nimodipine from a menthol-based TTS in human volunteers. *Current Drug Delivery*, Apr. 1, 2004; 1(2): 93-102.
26. Madziva H, Kailasapathy K, Phillips M; Alginate-pectin microcapsules as a potential for folic acid delivery in foods. *J Microencap*, 2005; 22: 343-51.
27. Girish K, Dhiren JP, Shah VD, Prajapati VC; Gums and mucilages: versatile excipients for Pharmaceutical formulations *Asian J. Pharm. Sci.*, 2009; 4(5): 309-332.

