



Plant Based Mucilage And Its Application In Different Pharmaceutical Formulation.

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Abstract: Mucilage is a gelatinous substance that mimics plant gum and is made up of protein and polysaccharide. Thanks to advancements in drug delivery applications, excipients are now integrated in various dosage forms to fulfil specific functions. Natural medications and excipients are gaining popularity all over the world. We investigated mucilage as a viable candidate for use in a number of pharmacological applications in this paper. We've also collected a list of potential mucilage producing sources as well as extraction methods. The basics of employing natural polymers as a binding agent, suspending agent, gelling agent, and dissolving agent in formulations are covered in this article. This review covers the majority of these plant-derived polymeric compounds, as well as their sources. The chemical ingredients and their uses, as well as their varied qualities, have been thoroughly examined, making it a viable option for usage as a pharmaceutical excipient.

Index Terms - : Mucilage, Polysaccharide's, Excipients, and Pharmaceutical Application

INTRODUCTION

Natural mucilage is employed as a binder, tablet disintegrants, emulsifying agents, suspending agents, gelling agents, and sustaining agents in the pharmaceutical industry. ⁽¹⁾ Biocompatible, affordable, and easily available polymers, such as natural gum and mucilage, are chosen over semi-synthetic and synthetic excipients due to their lack of toxicity, low cost, soothing action, and non-irritant nature. They're utilized in the production of cosmetics, textiles, paints, and paper. ^(2,3,4) Excipients have long been utilized in pharmaceutical formulation. The original purpose of inert vehicles was to provide the necessary weight, consistency, and volume for the correct administration of the active ingredient; however, they are now used for a variety of purposes in modern pharmaceutical dosage forms, including modifying release and improving stability and bioavailability of the active ingredient, Increasing patient acceptance and ensuring manufacturing simplicity New and improved excipients are also being developed. Designed to meet the needs of a high-tech drug delivery system ⁽⁵⁾ Plant-based polymers have been studied for their adaptability and efficacy in a wide range of pharmaceutical dosage Forms, including matrix controlled systems, film coating agents, buccal films, and nanoparticles, and also Viscous liquid formulations like ophthalmic solution, suspension, and implants. Emulsifiers, suspending agents, gelling agents, and binders have all been utilized as viscosity enhancers, stabilizers, disintegrates, and solubilizes. ^(6,7) The article discusses the advancements in natural mucilage for use in pharmaceutical sciences.

The Advantages of Natural Plant Based Mucilage: Natural plant based mucilage has a numerous advantages, which are listed below. ⁽⁸⁾

- 1) Biodegradable and biocompatible.
- 2) Expense and non-toxic.
- 3) Market and medicinal garden availability.
- 4) Environmentally friendly processing because they do not require the use of toxic solvents.
- 5) Maintain a minimal cost structure.

The Disadvantage of Natural Plant Based Mucilage: Natural mucilage has a number of drawbacks, which are stated below ⁽⁸⁾

- 1) Variation form batch to batch due to harvesting seasons.
- 2) Microbial infection due to the minimal amount of moisture retained.
- 3) Due to the complexities of gums and mucilages, viscosity decreases with storage.
- 4) Because they collected different materials under different conditions, the percentage of chemical constituents present in a given material may vary.

EXTRACTION:

The dry part of the plant mucilage is drained using hot distilled water in a ratio of 1 part plant to 10 parts water. With efficient and appropriate stirring or shaking, the extraction is continued for one day, or 24 hours, and the viscous extract is filtered through muslin before being reintroduced to the vessel for two further extractions. To remove extraneous particles, the extracted extracts are filtered through glass wool and cotton, and the filtrate is then dissolved in alcohol, yielding a gelatinous product. Mucilage filtration, re-solution, and reprecipitation may be performed several times, with the product being precipitated in gradually higher concentrations of alcohol, dried at 40-50 degrees, and stored in a desiccator. ⁽¹⁷⁾

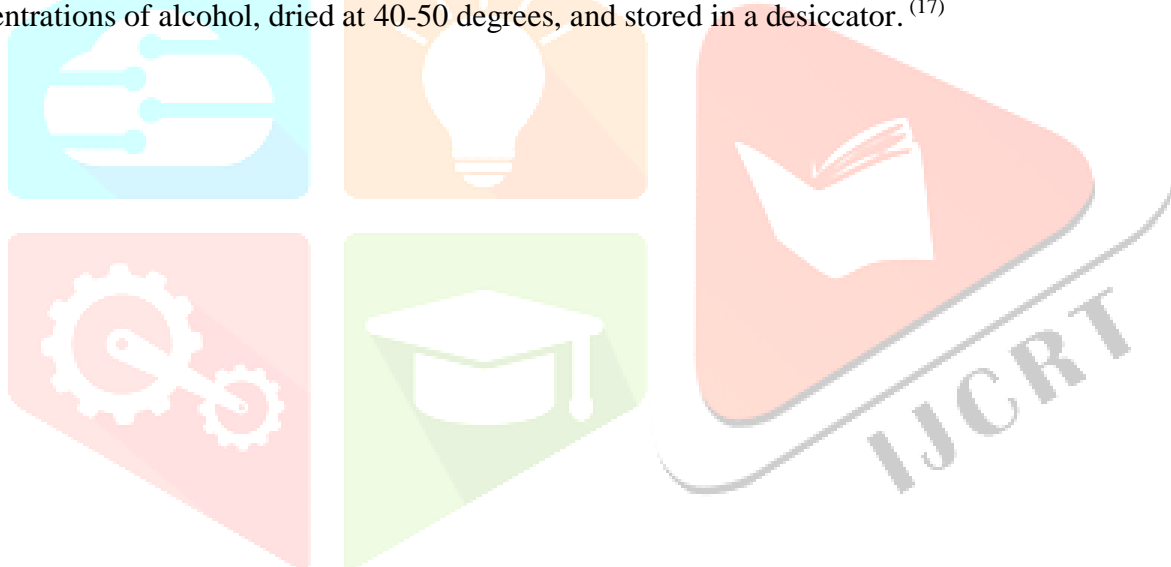


Table 1. Some of the important botanical source of mucilage and its family and chemical constituents.

Common name	Botanical Name	Family	Chemical constituents.	Ref
Aloe mucilage	<i>Aleo vera (L).</i>	Xanthorrhoeaceae	Galactan, Arabinan, Arabinonorhamnogalacton, Glucuronic Acid, Polysaccharides.	9
Mimosa mucilage	<i>Mimosa pudica (L)</i>	Fabaceae	D-xylose, D- glucuronic acid.	10
Fenugreek Mucilage	<i>Trigonella Foeniculum Graecum L.</i>	Fabaceae	Mannose, Xylose, Galactose.	11
Hibiscus Mucilage	<i>Hibiscus rosa – sinensis L.</i>	Malvaceae	L-rhamnose ,D- galactose ,D- galacturonic acid D- Glucuronic acid.	12
Phoenix mucilage	<i>Phoenix dactylifera L.</i>	Arecaceae	Sucrose, Mannose, Glucose Starch ,Fructose Carbohydrates 44-88%, Cellulose	12
Cassia Tora mucilage	<i>Senna tora (L) Roxb</i>	Fabaceae	Cinnamaldehyde, Tannins, Essential oils, Coumarins.	13
Cocculus Mucilage	<i>Cocculus hirsutus(L)</i>	Menispermaceae	Polysaccharides, Gelatinous type of material.	14
Ocimum Mucilage	<i>Ocimum americanum L.</i>	Lamiaceae	Xylose, Arabinose, Rhamnose, Galacturonic acids.	15
Asario mucilage	<i>Lepidium sativum L.</i>	Brassicaceae	-----	16

PHARMACEUTICAL APPLICATION:

Mucilage is a gelatinous substance used in pharmaceuticals for binding, thickening, suspending, disintegrating, emulsifying, stabilising, and gelling agents, as well as for prolonged and controlled release formulations. ⁽¹⁸⁾ Because of their positive rise in popularity over the last decade, plant-derived polymers such as mucilage can be employed as natural thickeners or emulsifiers in the human diet, and so act as a replacement for synthetic polymers or additives. ⁽¹⁹⁾

1) Binding Agent:

Pharmaceuticals have employed mucilage of various forms as a binding agent. Mucilage has a good binding property when comparable to several synthetic substances. The binding property of mucilage has been used in several research publications to estimate the potential of mucilage as a medicinal excipient. As a binding agent, mucilages from *Asparagus racemosus* were compared to starch powder. ⁽²⁰⁾ Mucilage generated from *Cassia auriculata* seeds has been thoroughly investigated in terms of binding characteristics. ⁽²¹⁾ Diltiazem

HCL was used as a model drug to study *Cassia angustifolia* seed mucilage, which was found to have high granulating binding characteristics. ⁽²²⁾ Vingo mungo (L) was evaluated as a tablet binder and found to be very effective. ⁽²³⁾ The binding properties of mucilage derived from *Plantago Psyllium* seeds have been examined using paracetamol as a model medication ⁽²⁴⁾.

2) Encapsulating Agent:

Encapsulating food, pharmaceutical, and nutraceutical ingredients, for example, is an effective way to boost the stability of some chemicals while simultaneously increasing their delivery properties. ⁽²⁵⁾ Several food-grade polymers have been found for nano and microencapsulation applications, including lipids, proteins, and carbohydrates. The ability of mucilage to form a thick networks during drying, as well as its high - molecular - weight carbohydrates polymers, make it ideal for nanoparticles and microencapsulation of food and pharmaceuticals. ⁽²⁶⁾

3) Gelling Agent

A gelling agent is a chemical that enhances the viscosity of an aqueous mixture without significantly changing its other qualities, such as flavour. They provide added chemicals body, increase stability, and improve suspension. Gels are a type of pharmaceutical formulation that is applied to the outside of the body. In recent years, the nasal route of administration has attracted a lot of attention as a convenient and reliable approach for both local and systemic medication administration. Mucilage is found in many plants and gives a high sugar content. When polysaccharide solutions are mixed and interact with one another, the viscous of the mixture can increase. They may even form a gel under certain conditions, a phenomenon known as rheology synergism. ⁽²⁷⁾ Mucilage is a gelling agent found in a wide variety of plants due to its non-toxicity, cheap cost, emollient, and non-irritating properties. ⁽²⁸⁾ Leaf mucilage collected from *Cocculus hirsutus* was utilised to prepare gel flubiprofen, and the study revealed that the leaf mucilage was utilised as a precursor for gel preparation. ⁽²⁹⁾ Mucilage from *Anacardium occidentale*, used as a gelling agent for nonsteroidal anti-inflammatory medications. ⁽³⁰⁾

4) As Coating Material

Mucilage has a high tensile strength and gas barrier properties, enabling coated products to maintain their firmness and weight. ⁽³¹⁾ An edible covering of *Shahri Balangu* seed mucilage mixed with cumin essential oil was applied to beef slices in a study by Alizadeh Behbahani ET. Al ⁽³²⁾ and sensory analysis of beef thin strips was undertaken over a 9-day storage period. The oxidation process, microbial count, *E. coli*, yeast, and moulds were all shown as decreased when beef slices were coated using mucilage.

5) Suspending Agent:

Suspending agent is used to improve the stability of the formulation. In the pharmaceutical sector, suspension has a variety of applications. They are used to administer liquid medication dosages to patients. Suspending agents come in three varieties in nature: natural, semi-synthetic, and synthetic. Mucilage is a natural excipient that can be used in the formulation of suspensions because it is inexpensive and effective. *Cassia Tora* mucilage has a good Suspending property when compared to gelatin and tragacanth gum. ⁽³³⁾ In paracetamol suspension, *Abelmoschus esculentus* mucilage shows good suspending properties. ⁽³⁴⁾

6) Emulsifying Agent:

Mucilage acts as an emulsifier. By providing a charge to dispersed droplets and producing multimolecular sheaths around emulsion droplets by increasing material viscosity, naturally emulsifying derived substances from plants have effective emulsifying properties. ⁽³⁵⁾ *Linnaeus' Cucumis Sativus* The emulsifying properties of mucilage were compared to those of commercially available tragacanth and gelatin, as well as their combined effect on emulsion properties. *Cucumis sativus* Linnaeus has been proven to have significant emulsifying potential as a major emulsifying agent for oil-water emulsions.

7) Sustained Release Polymer:

Matrix tablets are very well for oral sustained release as they come in a number of dosage formulations and are simple to make. The matrix system is a type of release mechanism that controls the amount of dissolved or distributed medications that are released. Various natural gums and mucilages have been studied as polymers for long-term release compositions. A variety of polymers have been evaluated as drug delaying agents, each having its own approach to the matrix system. *Cactus* mucilage has been used to make an edible covering for medicinal formulations. ⁽³⁶⁾ The plant *Aloe barbadensis* grows in the desert. *Miller* mucilage has been used as a pharmaceutical excipient in the manufacturing of sustained-release tablets ⁽³⁷⁾. Buccal discs

containing fluconazole were made utilising mimosa pudica seed mucilage as a bucoadhesive polymer in one investigation ⁽³⁸⁾

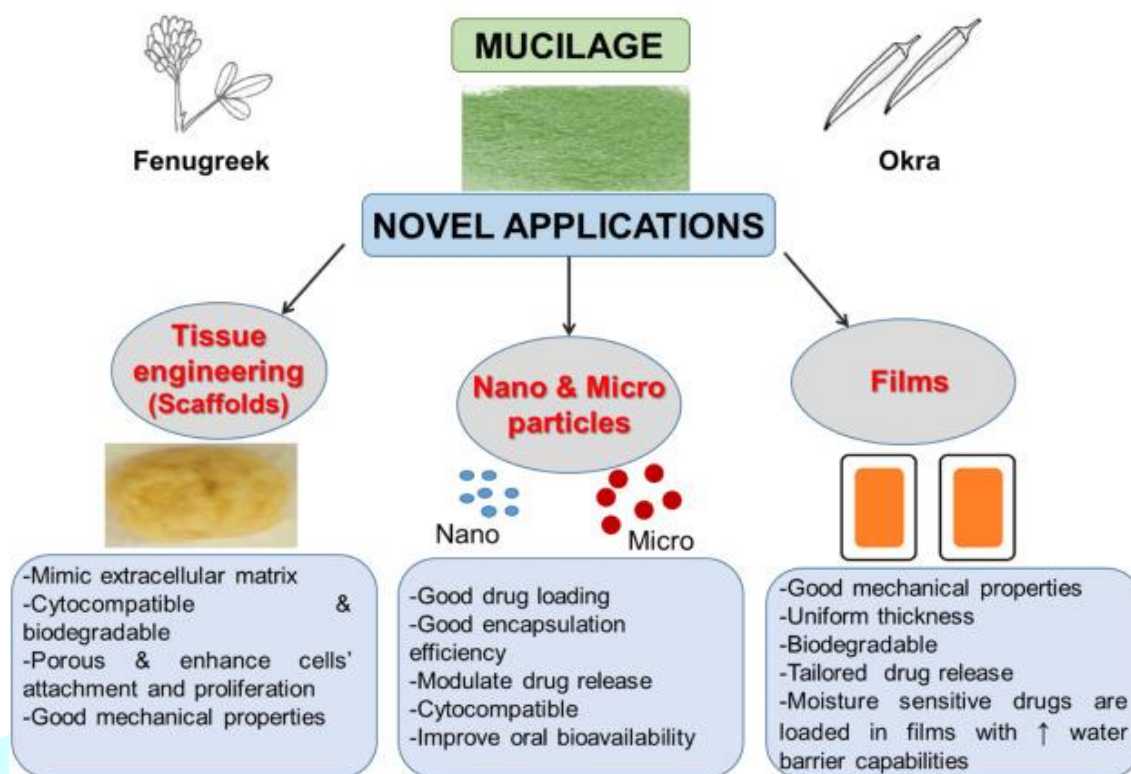


Fig. Novel Application of Mucilage.

DISCUSSION:

Mucilage is a polysaccharide derived from plant roots, seeds, and some other sources as a viscous or gelatinous solution. Mucilage is a water-soluble, edible adhesive substance made up of carbohydrate and uranic acid units that can be found in a variety of plant components. ⁽³⁹⁾ Mucilage is a natural metabolic product that is generated in the cell and does not dissolve easily in water. Mucilage is also vital for germination control, dispersal, and soil adhesion reduction. For dried mucilage, preliminary confirmation tests such as the Molish and Ruthenium tests are used. Mucilage has the ability to hold both water and oil, as well as emulsifying, antioxidant, and bactericidal characteristics. Mucilage is utilised in tablet formulation as a binding agent, encapsulating agent, suspending agent, gelling agent, and disintegrating agent. Mucilage is commonly used in the medical field.

CONCLUSION:

Natural polymers like mucilage and gum are widely used in pharmaceutical formulations. Mucilage is a natural substance that can be used for binding, gelling, encapsulating, dissolving, sustain-releasing, suspending, and emulsifying functions. Natural polymers shown great binding capacity in wet granulation. Natural binders are a low-cost, non-polluting, and renewable source of excipients or products in the pharmaceutical industry.

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