Pharmaceutical Upgrade and Natural Perspective on Mucilage and Gum Applications in Pharmacology and Nanomedicine

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Dear Editor,

Gums and mucilages are sustainable natural polysaccharides. Plant-based gums and mucins are utilized in food processing, pharmaceuticals, and nanomedicine. Gum tragacanth (from various members of the genus Astragalus) and gum arabic (*Acacia senegal* (L.) Willd.) are two outstanding examples of these. Natural materials offer superior structural, affordable, nontoxicity, adaptability, biocompatibility, and potential. Plant-based gums and mucilages are preferred for pharmaceutical applications due to biodegradability. They enhance physical and chemical properties and are now primary components in many formulations. Plant-based gums and mucilages are recognized as potential drug delivery materials, enhancing understanding and potential applications in pharmaceutical applications as modified polymeric materials. Advancements in nanotechnology enable plant-based gums and mucilage for innovative drug delivery systems [1]. Natural gums are abundant, inexpensive, non-toxic, capable of chemical modification, potentially biodegradable, and biocompatible, making them a particularly appealing choice for pharmaceutical excipients. The use of synthetic polymers in the pharmaceutical industry raises numerous health-related difficulties. As a result, it is vital to discover additional natural plant-based sources for developing innovative drug formulations and alternative delivery strategies.

Thus, a new window of hope has been created for resolving the current drug delivery problems with the use of natural gums and their modifications intended for the production of improved biomedical materials for drug delivery. New plant-based gums and mucilages are explored for pharmaceutical applications, increasing gum use in formulation manufacturing [2]. Natural gums and mucilage are used in medicinal formulations, with polymers evolving for diverse functionality in various industries. Due to their innate flexibility and advantages over synthetic polymers, such as their prolific manufacture, affordable availability, nontoxic nature, biodegradability, and biocompatibility, natural polymers are chosen [3]. Gums are essential ingredients in medicinal products, with a new study exploring their gelling and matrix-forming properties for drug delivery systems. Characterizing natural gums for pharmaceutical use and their applicability in formulations is crucial [4].

Pharmaceutical dosage forms include additives to enhance active components and achieve desired effects. Plant Mucilages are crucial polysaccharides in the pharmaceutical industry with a variety of uses, including thickening, binding, dissolving, suspending, emulsifying, stabilizing, and gelling agents. Mucilages that are naturally occurring are preferred to manufactured materials because they are non-toxic, inexpensive, emollient, and non-irritating. Synthetic polymers face drawbacks like high costs, toxicity, environmental damage, and non-renewable resources; mucilages offer potential drug delivery methods [5]. The present study provides the efficacy of *Spinacia oleracea* L. leaves' mucilage as a suspending agent. Considering the widespread availability of spinach, it may be inferred from the observations that the isolated mucilage from *Spinacia oleracea* L. leaves has the potential to be utilized as an inventive suspending agent, even at a low concentration, as well as a pharmacological adjuvant [6]. Natural mucilages are used in innovative drug delivery systems to perform many tasks and, in some circumstances, directly or indirectly regulate the rate and amount of drug release. The recent trend toward the usage of organic and plant-based products necessitates the substitution of natural additives for synthetic ones. The globe is now becoming more and more interested in natural medications and excipients. These natural mucilages offer advantages over synthetic ones because they are readily available, inexpensive, nontoxic, and chemically inert [7].

Gums are used in various applications, including pharmaceutical dosage forms, confectionery, and drug-release modifiers. Due to their strong swellability at acidic pH, they require high

concentrations for efficient use. Modifications like functional group derivatization, polymer grafting, and ion cross-linking can improve their efficiency and suit various applications [8]. The use of mucilage derived from natural sources as a tablet binder to create tablets with good hardness, reduced friability, controlled disintegration time, and improved dissolve rate. It therefore offers flexible excipient properties for traditional dosage formulations. Mucilages produced from various sources, however, function as antiulcer agents. Mucilage therapy has a gastroprotective effect, which helps to both prevent and treat ulcers. Therefore, finding new sources of plant mucilage to meet pharmaceutical demand has become crucial [9]. Gums and mucilages are widely used plant compounds in pharmaceutical and cosmetic sectors due to their abundance, safety, and affordability. Natural materials are cheaper, nontoxic, and biocompatible, making them competitive with synthetic excipients. The trend towards organic and plant-based products requires the substitution of natural additives [10]. We discussed the natural perspective on mucilage and gum applications in pharmacology and nanomedicine and pharmaceutical upgrade.

Reference

[1] M. S. Amiri, V. Mohammadzadeh, M. E. T. Yazdi, M. Barani, A. Rahdar, and G. Z. Kyzas, "Plant-based gums and mucilages applications in pharmacology and nanomedicine: a review," *Molecules,* vol. 26, no. 6, p. 1770, 2021.

[2] R. B. Malabadi, K. Kolkar, and R. Chalannavar, "Natural plant gum exudates and mucilage: pharmaceutical updates," *Int J Innov Sci Res Rev,* vol. 3, no. 10, pp. 1897-1912, 2021.

[3] V. Prajapati, S. Desai, S. Gandhi, and S. Roy, "Pharmaceutical Applications of Various Natural Gums and Mucilages," in *Gums, Resins and Latexes of Plant Origin: Chemistry, Biological Activities and Uses*: Springer, 2022, pp. 25-57.

[4] S. Muruganantham *et al.*, "Gums as Pharmaceutical Excipients: An Overview," *Gums, Resins and Latexes of Plant Origin: Chemistry, Biological Activities and Uses,* pp. 145-189, 2022.

[5] K. Chandravanshi, M. Sahu, R. Sahu, N. Sahu, S. Lanjhiyana, and A. Chandy, "Isolation of Mucilage from Herbal plants and its Evaluation as a Pharmaceutical Excipients," *Research Journal of Pharmacognosy and Phytochemistry,* vol. 14, no. 3, pp. 171-178, 2022.

[6] A. K. Nayak, D. Pal, D. R. Pany, and B. Mohanty, "Evaluation of Spinacia oleracea L. leaves mucilage as an innovative suspending agent," *Journal of Advanced Pharmaceutical Technology & Research,* vol. 1, no. 3, p. 338, 2010.

[7] S. Bahadur, U. K. Sahu, D. Sahu, G. Sahu, and A. Roy, "Review on natural gums and mucilage and their application as excipient," *Journal of applied pharmaceutical research*, vol. 5, no. 4, pp. 13-21, 2017.

[8] V. Rana, P. Rai, A. K. Tiwary, R. S. Singh, J. F. Kennedy, and C. J. Knill, "Modified gums: Approaches and applications in drug delivery," *Carbohydrate polymers*, vol. 83, no. 3, pp. 1031-1047, 2011.

[9] M. Chowdhury, A. Sengupta, L. Datta, and S. Chatterjee, "Role of mucilage as pharmaceutical additives and cytoprotective agent," *Journal of Innovations in Pharmaceutical and Biological Sciences*, vol. 4, pp. 46-52, 2017.

[10] V. D. Prajapati, G. K. Jani, N. G. Moradiya, and N. P. Randeria, "Pharmaceutical applications of various natural gums, mucilages and their modified forms," *Carbohydrate polymers*, vol. 92, no. 2, pp. 1685-1699, 2013.