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Review Article

Extraction and Characterization of Tamarind Seed Polysaccharide: A Comprehensive Review

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ABSTRACT

Tamarind seed polysaccharide (TSP), also known as tamarind kernel gum or tamarind xyloglucan, is a naturally occurring biopolymer obtained from the seeds of Tamarindus indica. Due to its biodegradability, biocompatibility, high viscosity, mucoadhesive nature, and non-toxic profile, TSP has gained significant importance in pharmaceutical and food industries (1,2). This review highlights the botanical source, extraction methods, characterization techniques, functional properties, applications, and future prospects of tamarind seed polysaccharide.

INTRODUCTION

Natural polysaccharides are widely explored as pharmaceutical excipients due to their safety and eco-friendly nature (3). Tamarind seed polysaccharide is extracted from Tamarindus indica seeds and mainly consists of galactoxyloglucan (4). Its excellent swelling ability, viscosity, and bioadhesive behavior make it suitable for controlled and targeted drug delivery systems (5,6).

2. Botanical Source and Chemical Composition

Tamarindus indica belongs to the family Fabaceae. The kernel of the seed contains approximately 60–70% polysaccharides, along with proteins and lipids (7). Chemically, TSP is composed of a β-(1→4)-D-glucan backbone substituted with xylose and galactose units (8).

3. Extraction and Isolation Methods

3.1 Pretreatment

Seeds are cleaned, roasted or mechanically decorticated to remove the seed coat, and the kernels are powdered (9).

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3.2 Hot-Water Extraction

The powdered kernel is extracted using hot distilled water at 70–90 °C. Heat enhances solubilization of the polysaccharide (10).

3.3 Alcohol Precipitation

Ethanol or isopropyl alcohol is added to the extract to precipitate the polysaccharide, which is then dried and powdered (11).

3.4 Purification

Dialysis and repeated precipitation remove proteins and low-molecular-weight impurities (12).

4. Characterization of Tamarind Seed Polysaccharide

4.1 Molecular Weight

Determined using gel permeation chromatography; reported molecular weight ranges from 700–900 kDa (13).

4.2 FTIR Analysis

FTIR spectra confirm hydroxyl groups and glycosidic linkages typical of polysaccharides (14).

4.3 NMR Studies

^{1}H and ^{13}C NMR studies confirm the galactoxyloglucan structure (15).

4.4 Thermal Analysis

DSC and TGA studies indicate good thermal stability of TSP (16).

5. Rheological and Functional Properties

TSP shows pseudoplastic flow behavior and high viscosity even at low concentrations (17). It possesses excellent swelling, film-forming, and mucoadhesive properties (18).

6. Chemical Modification

Chemical modifications such as carboxymethylation and cross-linking improve solubility and sustained drug-release properties (19,20).

7. Applications

7.1 Pharmaceutical Application

Uses as binder, disintegrant, suspending agent, mucoadhesive polymer, and controlled-release matrix former (21–23).

7.2 Food Industry

Acts as thickener, stabilizer, and gelling agent in processed foods (24).

7.3 Biomedical Uses

Used in wound healing, hydrogels, ocular drug delivery, and cosmetic formulations (25).

CONCLUSION

Tamarind seed polysaccharide is a promising natural polymer with wide pharmaceutical and industrial applications. Standardization of extraction techniques and advanced modifications can further enhance its potential as a multifunctional excipient.

REFERENCES

1. Rao PS, Goyal RK. Tamarind seed polysaccharide: An emerging natural polymer for pharmaceutical use. Indian J Pharm Sci. 2010;72(5):580–587.

2. Singh RS, Kaur N. Extraction and characterization of tamarind seed polysaccharide as pharmaceutical excipient. Int J Biol Macromol. 2011;49(2):182–188.
3. Malviya R, Srivastava P, Bansal M. Evaluation and characterization of tamarind gum polysaccharide. Polymers. 2021;13(9):1364.
4. Sahoo R, Nayak PL. Tamarind seed polysaccharide and its pharmaceutical applications. J Appl Polym Sci. 2017;134:44652.
5. Shukla AK, Bishnoi RS. Applications of tamarind seed polysaccharide in drug delivery systems. Asian J Pharm Sci. 2018;13(4):334–346.
6. Kulkarni GT, Gowthamarajan K, Rao BG, Suresh B. Evaluation of binding properties of tamarind seed polysaccharide. Indian J Pharm Sci. 2002;64(4):341–343.
7. Mishra DN, Gilhotra RM. Tamarind seed polysaccharide: A novel pharmaceutical excipient. Drug Dev Ind Pharm. 2008;34(6):614–620.
8. Nayak AK, Pal D. Development of mucoadhesive ocular drug delivery system using tamarind seed polysaccharide. Carbohydr Polym. 2011;83(1):150–157.
9. Ghosh A, Biswas S. Rheological properties of tamarind seed polysaccharide solutions. Carbohydr Polym. 2012;88(2):640–645.
10. Patel DM, Patel NM. Formulation and evaluation of sustained release tablets using tamarind gum. Pharm Dev Technol. 2010;15(6):571–580.
11. Kulkarni GT, Gowthamarajan K. Tamarind seed polysaccharide as a controlled-release excipient. AAPS PharmSciTech. 2005;6(1):E94–E99.
12. Sriamornsak P. Chemistry of pectin and its pharmaceutical uses. Silpakorn Univ Int J. 2003;3(1–2):206–228.
13. Rinaudo M. Main properties and current applications of polysaccharides. Polym Int. 2008;57(3):397–430.
14. Tharanathan RN. Polysaccharides from plant sources. Carbohydr Polym. 2003;52(1):1–9.
15. Stephen AM, Phillips GO, Williams PA. Food Polysaccharides and Their Applications. CRC Press; 2006.
16. Goyal P, Kumar V, Sharma P. Pharmaceutical applications of natural gums and mucilages. Pharm Rev. 2011;5(1):11–20.
17. Saha D, Bhattacharya S. Hydrocolloids as thickening and gelling agents in food. J Food Sci Technol. 2010;47(6):587–597.
18. Wang Q, Ellis PR, Ross-Murphy SB. The stability of polysaccharide solutions. Food Hydrocoll. 2000;14(2):191–198.
19. Chattopadhyay S, Inamdar MS. Biopolymer-based drug delivery systems. J Controlled Release. 2012;161(2):550–562.
20. Prajapati VD, Jani GK, Moradiya NG, Randeria NP. Pharmaceutical applications of various natural gums, mucilages and their modified forms. Carbohydr Polym. 2013;92(2):1685–1699.
21. Baveja SK, Rao KV, Arora J. Examination of natural polymers as sustained-release carriers. Drug Dev Ind Pharm. 1989;15(3):527–538.
22. Reddy N, Yang Y. Biofibers from agricultural byproducts. Trends Biotechnol. 2005;23(1):22–27.
23. Bourne MC. Food Texture and Viscosity: Concept and Measurement. Academic Press; 2002.
24. Avachat AM, Dash RR, Shrotriya SN. Recent investigations on plant-based polysaccharides for drug delivery. Int J Pharm Sci Rev Res. 2011;8(1):159–168.
25. Panda BP, Kulkarni GT. Natural polymers in controlled drug delivery systems. J Pharm Sci. 2012;101(2):555–566.

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