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Cassia tora Gum: Structural Modification and Pre-Formulation Studies

Pavuluri Bhargavi[1], Deepti Tripathi[1], Gul Naz Fatima[1]*

1 Faculty of Pharmacy, Babu Banarasi Das Northern India Institute of Technology, Lucknow, Uttar Pradesh, India

*Correspondence should be addressed to Gul Naz Fatima (email: gul08fatima@gmail.com)

Abstract

Background: Natural gums are biodegradable, biocompatible, non-toxic, easily available, and accessible. However, certain associated disadvantages, such as low swelling ability, viscosity, and flow ability, make them unsuitable for pharmaceutical applications. The study aims to modify *Cassia tora* gum (CTG) through cross-linking by exploring the free hydroxyl groups.

Methods: The CTG obtained from the seeds was taken with the cross-linking reagent and were subjected to the synthetic procedure for the preparation of the cross-linked CTG batches. The reagents utilized as cross-linking agents include Borax (B), Epichlorohydrin (ECH), and 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC). The reagents were utilized at varying concentrations of 1%, 2%, and 3%, with the most optimal concentration selected for the final batch preparation. The envisaged cross-linked gums were characterized by spectral techniques, and evaluated for physical and rheological parameters.

Results: The cross-linked gums were found to possess modified parameters. The CTG-B was found to be the most optimized gum among others, in terms of flowability (1.31±0.02), freeze-thaw stability (84.9%), flocculation efficiency (62.43% turbidity removal), and sedimentation volume (2.15±0.28 mL). In addition, the fabricated gums exhibited distinct surface morphology, suggesting enhanced drug-loading capacity.

Conclusion: Thus, a novel bio-polymeric materials was developed in the study, which demonstrates promising formulation properties as compared to the native gum.

Keywords: Biomedical-pharmaceutical applications, borax, carbodiimide, *Cassia tora* gum, cross-linking, epichlorohydrin

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Introduction

Materials science is a rapidly evolving field, with carbohydrate polymers leading synthetic/petrochemical-based polymers in formulation development [1]. They find wide application in agriculture, biomedical, and pharmaceutical industries [2]. In the pharmaceutical industry, they are a paramount constituent used for controlling the viscosity of solutions, stabilization of suspensions, granulation, film-forming/coating, binding, and thickening[3], gel-forming [4], and controlling solubility in controlled delivery systems [5]. These are also employed as agents in water-purification, wastewater treatment [6], and biodegradable packaging [7].

Bio-polymeric materials have the advantage of interacting with skin surface proteins and lipids and display peculiar physicochemical properties [8]. In addition, they are biodegradable, non-toxic, and biocompatible [9]. However, polymers, particularly those of natural occurrence, have certain associated drawbacks, which include water solubility issues, viscosity, and flowability. The expanding industrial utility of natural gums has led to intensified research into existing gums and their modification procedures. The process of chemical modification, such as cross-linking, may help to overcome drawbacks and enhance the acceptability of these polymers [10].