



## Chitosan-Collagen Based Hydrogel Incorporating Binahong (*Anredera cordifolia*) Leaf Extract as a Candidate for Topical Hemostatic Agent

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### Abstract

Uncontrolled bleeding is a critical challenge in emergency and surgical settings, requiring fast-acting and biocompatible hemostatic agents. Because many conventional materials face limitations such as slow clotting performance, limited biodegradability, or the presence of harmful substances, safer natural alternatives are urgently needed. This study developed and characterized a chitosan-collagen hydrogel incorporating Binahong leaf extract to evaluate its viability and determine its optimal composition as a topical hemostatic agent. Hydrogels were synthesized by mixing chitosan and collagen at a 1:1 ratio, followed by crosslinking with glutaraldehyde, and the incorporation of Binahong leaf extract at concentrations of 0.1% (K1), 0.15% (K2), 0.2% (K3), and 0.25% (K4) w/v. The samples were evaluated using Fourier-transform infrared spectroscopy (FTIR), water uptake, cytotoxicity, coagulation, and hemolysis assays. FTIR analysis confirmed successful crosslinking between the hydrogel components. All hydrogels exhibited high fluid retention capacity exceeding 1200%. Cell viability remained above 60% across most samples, indicating good biocompatibility, with the exception of K4 (39.18%). Coagulation assays revealed normal Prothrombin Time (PT) values across all formulations, with an extended activated partial thromboplastin time (APTT) observed in K3. All samples were also found to be non-hemolytic. The K1 formulation (1:1 chitosan-collagen with 0.1% Binahong extract) demonstrated optimal safety and physical properties, establishing it as a highly promising natural alternative for bleeding control and accelerating wound healing.

**Keywords:** *hydrogel, chitosan, collagen, binahong leaf extract, topical hemostatic agent*