

ABSTRACT

The excessive use of chemical preservatives and plastic packaging in the cosmetic industry has led to environmental pollution and potential health risks. This study introduces SILVERA, an innovative encapsulation of Aloe vera gel using silk fibroin from *Bombyx mori* silkworms and bionanosilica derived from sugarcane bagasse as a sustainable green cosmetic solution. The encapsulation process protects Aloe vera's bioactive compounds from degradation due to oxidation, hydrolysis, and temperature changes, enhancing its stability and shelf life. The silk fibroin serves as a biocompatible polymeric matrix, forming a protective β -sheet structure, while bionanosilica provides additional structural support and moisture retention. Experimental results showed that encapsulated Aloe vera remained stable for seven days without significant changes in odor, shape, or color. A soil burial test also confirmed SILVERA's biodegradability, indicating its potential as an eco-friendly alternative to conventional cosmetic preservatives and packaging. Further studies are recommended to optimize the extraction process, analyze long-term stability, and assess SILVERA's effectiveness in cosmetic applications. This research highlights a step towards plastic-free, sustainable cosmetics, supporting environmental conservation while preserving natural bioactive compounds.

Keywords: *Aloe vera, silk fibroin, bionanosilica, encapsulation, sustainable cosmetics, biodegradable packaging, bio-preservative.*