

ABSTRACT

Abroma augusta is a well-documented mucilaginous plant with several ethnomedicinal claims. Physicochemical characterization of the stem of *A. Augusta* mucilage (AAM) indicated the presence of glucose, galactose, deoxy sugar rhamnose and uronic acid as major sugar constituents. Based on the prebiotic score, gelation properties, viscoelastic and thermal behaviour, AAM polysaccharide was used in the delivery of probiotic bacteria, bioactive polyphenol and antimicrobial nanoparticles.

Three different probiotic bacterial strains were co-encapsulated in AAM polysaccharide matrix. Microscopic analysis confirmed the encapsulation of probiotic bacteria. The encapsulated matrix so obtained offered high values of probiotic encapsulation efficiencies with enhanced storage stability. The survival of encapsulated bacteria in simulated gastric and intestinal fluid clearly indicated their ability to withstand the harsh gastrointestinal conditions.

Efforts were further made to deliver bioactive polyphenols, i.e., curcumin, quercetin and green tea extract using AAM polysaccharide. Encapsulated pearl like curcumin nano-sphere, quercetin nano-fibers, and spherical green tea nano-packets were developed by modified evaporation-induced self-assembly. The encapsulated polyphenol offered significant improvements in solubility, stability, functional activity and colon specific targeted delivery.

Further, a simple photo triggered synthesis, and hierarchical assembly of the silver-silver oxide core-shell hydrogel system was developed from green tea encapsulated AAM matrix. This hydrogel system with internal silver nanoparticles assembled core and passivation oxide film as shell protected hydrogel from bulk oxidation and offered excellent antimicrobial activity. This entity also reduced the concern of silver toxicity via efficient assembly of silver in natural AAM hydrogel system.

The physicochemical and functional activity of AAM polysaccharide and the successful delivery schemes taking probiotic bacteria and polyphenols indicated AAM polysaccharide as an efficient carrier of nutraceutical and functional food applications. Besides, green tea encapsulated AAM matrix as a precursor material synthesizing silver-silver oxide antimicrobial hydrogel offered reduced host toxicity. Thus the functional activity of AAM polysaccharide like prebiotic score, thermal stability, gelling properties and reduction

potential of host toxicity may serve various other functional utilities after exploring with further research.

Keywords: *Abroma augusta* mucilage, polysaccharide, prebiotic, probiotic, polyphenol, carrier, self-assembly, antimicrobial
