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Encapsulation of Anthocyanins from *Garcinia indica* in the Nano-complexes formed by Sodium Caseinate and Carboxymethyl Cellulose

Chaitra Chandrakant Shanbhag, Regupathi Iyyaswami*, Tshering Samdrup, Prajna Rao Krishnapura, Prasanna D. Belur

Department of Chemical Engineering, National Institute of Technology Karnataka, Mangalore, Karnataka, 575025, India

* Corresponding Author's Email ID: regupathi@nitk.edu.in; regupathi@yahoo.com

ABSTRACT

Despite the huge advantages of Anthocyanin (ACN) as food additive and in the medical application, its application has been limited due to its stability loss under changing physical and chemical conditions. Therefore, there is a need for developing new approaches for the stabilization of these compounds to widen their application in the industry. Encapsulation is one of the widely used approaches which is considered in this study to enhance the stability of (ACNs). The concentrated aqueous ethanolic extract (70 %, w/w) of *Garcinia indica* was encapsulated using protein and polysaccharide combination of sodium caseinate (NaCs) with carboxymethyl cellulose (CMC) respectively. CMC, an anionic polysaccharide that can interact with positively charged proteins to form a stable dispersion system, thus increasing the activity and bioavailability of functional ingredients. Effect of ACN concentration during encapsulation with polysaccharide showed lower concentration ACNs of 0.01mg/mL resulted in higher encapsulation efficiency. Individual effect of CMC and XG on encapsulation efficiency of ACNs was studied over different concentration ranges of each. Concentration of CMC at 1 % w/v and XG at 0.75 % w/v achieved highest encapsulation efficiency of 59.58 % and 45.44 % respectively. The aggregation of protein polysaccharide complex was overcome by improving ionic strength of encapsulation system with the addition of 0.5M $C_6H_5 K_3O_7$, 0.1M K_2HPO_4 and 0.1M $CaCl_2$. Comparative study was performed by preparing ACNs-loaded nano-complexes using different sequences of adding NaCs, CMC, and ACNs with a concentration of 0.5%, w/v, 1%, w/v and 0.01mg/mL: the three different nano-complexes formed were Complex I (CMC - ACNs- NaCs), Complex II (NaCs- ACNs -CMC), and Complex III (CMC- NaCs- ACNs). Complex I showed 72.42 % encapsulation efficiency which is the maximum amongst three complexes. These results emphasized that the order of addition of wall-materials strongly influences the encapsulation efficiency which in turn enhanced the stability of ACNs.

Keywords: Encapsulation, *Garcinia indica*, Anthocyanin, Sodium caseinate, Carboxymethyl cellulose, Xanthan gum

