

ABSTRACT

The negative impact of synthetic dyes and the instability of natural dyes have encouraged the development of dye encapsulation methods from natural materials. Encapsulation is a coating technique with a more stable material that serves to protect and increase the stability of the active substance. In this study, chitosan and alginate were used because of their physicochemical properties and easy availability. Dragon fruit was chosen as the raw material because it is abundant and has a fairly high content of natural dyes in the form of anthocyanins. This study examined the natural anthocyanin dye encapsulated Chitosan-Alginate/Ca in dyeing cotton fabrics. Anthocyanins were extracted with a polar solvent in acidic conditions and adsorbed with Chitosan-Alginate/Ca, then applied to the fabric. Characterization of the material and fabric after dyeing was carried out using FTIR, binocular microscope, SEM, spectrophotometer, and colorimeter. Evaluation of material performance was carried out by testing the encapsulation efficiency and effectiveness as well as color fastness retention. The results showed that the TAC content in dragon fruit was 359.54 mg/L. The encapsulated product was a hard, irregular, and red solid. The EE value was 98.31%. The best stability of the encapsulated product was obtained at a storage temperature of 4°C. SEM analysis showed an uneven and denser morphology compared to Cs-Alg/Ca. SEM on the fabric showed a denser layer indicating successful dye fixation. The fabric dyeing produced a yellowish red color with fastness according to SNI (4-5). The highest dyeing effectiveness was obtained with alum mordant of 59.93% and retention of 93.35%. Thus, anthocyanin encapsulation using Cs-Alg/Ca was proven to increase the intensity and stability of anthocyanin as a textile dye.

Keywords: anthocyanin, encapsulation, chitosan-alginate, natural dye, dragon fruit.