ABSTRACT

The use of synthetic plastics for food packaging poses environmental concerns due to their non-biodegradable nature, while conventional packaging fails to provide real-time visual information regarding product freshness. The development of biopolymer-based smart packaging offers a promising solution through the utilization of chitosan and bacterial cellulose from kombucha SCOBY, which are biodegradable and possess favorable mechanical properties. Although anthocyanins have potential as natural pH indicators, their color stability remains low under environmental influences. This study developed a biodegradable packaging film based on chitosan–SCOBY–purple sweet potato peel extract (KSEU) with the addition of tannic acid (TA) as a co-pigment. Film characterization included FTIR, UV–Vis analysis, physicochemical properties, antibacterial activity, biodegradability, and application on strawberries. The results demonstrated that the addition of tannic acid enhanced the color stability of anthocyanins through a co-pigmentation mechanism, characterized by bathochromic and hyperchromic effects in the UV–Vis spectra. Tannic acid also functioned as a cross-linking agent that increased the tensile strength, accompanied by an increase in porosity up to 22.16%, a decrease in swelling down to 120.15%, and enhanced antibacterial activity. The films exhibited color responses to pH changes, degraded completely within 24–75 days, and at a TA concentration of 3 mg/mL, were able to extend the shelf life of strawberries up to 7 days, compared to films without TA which lasted approximately 3 days.

Keywords: biodegradable, chitosan, SCOBY, purple sweet potato peel, tannic acid.