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Comparisons of physicochemical properties of pumpkin (*Cucurbita maxima*) flour and isolated starches and their biofilms

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Synthetic polymeric thin films which are used to extend the storage time of fruits and vegetables are nonbiodegradable. Biofilms are biodegradable and the objective of this research was to develop biofilms from pumpkin starch. Pumpkin starches were isolated by filtering water paste of pumpkin flour through 250 μm sieve (starch 1) and by filtering the settled sediment (starch 2). In pumpkin flour, starch1 and starch 2 the percentage moisture content were 10.65 ± 0.26, 5.72 ± 0.33 and 3.57 ±0.13 respectively, and β-carotene contents were 74.75 ± 0.41, 11.95 ± 0.08, 4.36 ± 0.02, mg/100-g -respectively. Pumpkin starch based biofilms were prepared by addition of Sorbitol/glycerol 10, 20, 30, 40 (%wt.) as plasticizers and 10, 15 and 20 (%wt.) of citric acid (CA) as a crosslinking agent. All biofilms were in good appearance and easily removable from the plates without bubbles or cracks. The density and thickness of biofilms were 1.0685-1.4138 g cm^{-3} and 0.08 to 0.17 mm respectively. The effect of CA and sorbitol/glycerol on pumpkin biofilms was analysed using ANOVA and Tukey's post hoc tests at a confidence level of 95% ($P < 0.05$). Biofilms of pumpkin starch containing 30% sorbitol and 20% CA had accepted levels of transparency, renewability, biodegradability, and absence of odour or color. The optical micrographs of biofilms confirmed that the materials are totally plasticized. FT-IR spectra showed partial crosslinking between CA and sorbitol/glycerol in the biofilms matrix. In conclusion, pumpkin starch could be used to tailor biodegradable edible biofilms.

Keywords: pumpkin, physicochemical properties, starch, flour, biofilms

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