

---

## **Biodegradability and plasticizing effect of sorbitol and citric acid on cassava starch edible films**

Nilmini W.A.S. and Panamgama L.A.\*

*Department of Chemistry, University of Ruhuna, Wellamadama, Matara, Sri Lanka.*

This work explores the development of cassava starch-based biofilms using solvent casting process for food packaging applications. Cassava starch has shown low moisture content (13.09%), ash content (0.43%), water solubility (1.49%), swelling capacity (2.02 g/g), and gelatinization temperature (70.17 °C). A series of cassava starch biofilms with varying concentrations of sorbitol 10, 20, 30, 40 and 50 (%wt.) and 5, 10 and 15 (%wt.) citric acid (CA) was produced. All the tested formulations resulted in biofilms of 0.20 to 0.23 mm thickness with good appearance and were easily removable from the plates without bubbles or cracks. The effect of CA and sorbitol on the biofilms was analysed using ANOVA and Tukey's post hoc tests at a confidence level of 95% ( $P < 0.05$ ). 10 percent CA was positively affected for the 30% sorbitol formulated biofilms on the characteristics such as moisture content (10.99%), swelling capacity (2.45 g/g) and water solubility (21.75%). A partial crosslinking between CA and cassava starch in biofilms matrix was found by FTIR spectra. X-ray diffraction analysis displayed a crystalline character with increasing in sorbitol and CA contents. Water vapor permeability properties of all the biofilms were adequate, ranging from 2.77 to  $4.82 \times 10^{-12}$  g/ms Pa. In vitro tested biofilms biodegraded within 15 days. Filmogenic formulation containing 30% sorbitol and 10% CA incorporated cassava starch had acceptable properties of transparency, renewability, biodegradability, and absence of characteristic odour or color. Morphological aspects of the films were also characterized. In conclusion, cassava starch could be used to tailor biodegradable edible films with enhanced properties and future fruit coating applications.

**Keywords:** Cassava starch, Sorbitol, Citric acid, Edible coating, Plasticizer

\*Corresponding author: asoka@chem.ruh.ac.lk