

DEVELOPMENT OF FUNCTIONAL BIODEGRADABLE FOAM CUPS FROM MANGO PEELS AND BANANA STEM FIBER USING BAKING MOLD TECHNOLOGY

**Somasundaram Rishankari^{*}, Vaishnavy Saravanan¹, U. L. Abdul Majeed² and
Rajeetha Jeisunthar¹**

¹*Department of Biosystems Technology, Faculty of Technology, University of Jaffna*

²*Department of Biosystems Technology, Faculty of Technology, Southeastern University of
Sri Lanka*

Abstract

Petroleum-based plastics are poorly biodegradable, and their widespread use has caused serious environmental pollution. Agro-industrial residues containing cellulose, hemicellulose, and pectin offer a promising alternative for sustainable packaging materials. This study aimed to develop biodegradable foam cups from mango peel and banana stem fiber using baking mold technology. Three formulations were prepared with different mango peel-cassava starch fiber ratios: T1 (2:1), T2 (1:1), and T3 (2:3), with a constant amount of banana fiber, glycerol, and citric acid. The ingredients were mixed with warm water to form slurries, poured into molds, and baked at 120°C for 40 minutes. Physical properties, including thickness, moisture content, and water absorption, were evaluated, while mechanical properties (hardness, adhesiveness, and springiness) were measured using a texture profile analyzer. Results showed significant differences among the treatments. Thickness increased with starch content, with T3 exhibiting the highest (2.99±0.20mm) and T1 the lowest (1.57±0.08mm). Moisture content (9.73%-5.63%) and water absorption (28.0%-40.33%) also increased with starch due to enhanced gelatinization and hydrophilicity. Hardness ranged from 5.0 N (T3) to 19 N (T1), indicating a stronger structure in T1, while adhesiveness remained low (0-0.5 mJ) and springiness slightly decreased in harder foams (0.77-0.86). Overall, T1 produced harder, thinner, and less water-absorbing cups, T3 produced softer, thicker, and highly hydrophilic cups, and T2 provided a balanced combination of structural integrity and water resistance, indicating potential suitability for functional applications. These findings suggest that mango peel powder and banana stem fiber can be effectively valorized for biodegradable packaging.

Keywords: Baking mold technology, Banana stem fiber, Biodegradable packaging, Biopolymer, Mango peel

**Corresponding author: rishankaris@gmail.com*