

Valorization of Sweet Lime (Mosambi) Peel and Pomace for Pectin Extraction: Process Optimization and Functional Characterization

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Abstract: Sweet lime (Mosambi) peel and pomace, the principal by-products of juice processing, represent valuable sources of pectin widely used in the food industry for gelling, thickening and stabilizing applications. In the present study, pectin was extracted from both the peel and pomace of sweet lime using acidified water with nitric acid (HNO_3) as the extraction medium. Optimization of the extraction parameters was carried out using a Box-Behnken design within the framework of response surface methodology (RSM), using three independent variables: extraction time (30–90 minutes), temperature (30–90 °C) and pH (1–2). Pectin yield, methoxyl content, anhydrouronic acid (AUA) content and degree of esterification (DE) were evaluated as response parameters. Among the variables studied, extraction pH significantly influenced pectin yield from both substrates. Optimal conditions were 78.64 °C, 59.12 min and pH 1.32 for peel and 56.87 °C, 68.45 min and pH 1.58 for pomace, yielding 20.87% and 13.5% pectin, respectively. Peel-derived pectin exhibited higher water and oil holding capacities, highlighting its superior potential for commercial pectin production and agro-industrial waste valorization.

Keywords: Pectin, Pomace, Sweet lime, peel, Response surface methodology (RSM), methoxyl content