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Microwave assisted extraction of pectin from the peel of *Citrus reticulata*

P. H. T. D. De Silva and H. I. C. De Silva*

Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka

*hicdesilva@chem.cmb.ac.lk

Pectin is a heteropolysaccharide mainly consists of a linear chain of linked galacturonic acids. Citrus fruits like lemon, orange, and apple pomace are rich in pectin. Pectin is utilized in food, cosmetics, and pharmaceutical industries due to its gelatinizing capacity and stabilizing ability. Conventional pectin extraction involves direct boiling of plant material with strong acids such as HCl, HNO₃ and H₂SO₄, which has drawbacks as consumption of large volumes of acids and the impact on environment. Microwave assisted extraction is a green approach which gives high extraction yield with high purity and low or no use of solvents. Main objective of this research study was to optimize the conditions for microwave assisted extraction of pectin from the peel of *Citrus reticulata* (Heen naran), which is an agricultural waste, using mild acids as a green method of pectin extraction. Citrus peel powder was suspended in double distilled water and the pH of the medium was adjusted using citric acid and oxalic acid separately and heated at 65^oC in the microwave reactor. Reaction conditions were optimized in three different parameters as pH (1.5, 2.5 and 3.5), reaction time (5, 10 and 15 min) and micro-wave power (300, 600 and 900 W). Extracted pectin was analyzed by the FT-IR spectroscopy. Qualitative characteristics such as colour and solubility, and quantitative parameters such as equivalent weight, methoxyl content, acetyl value, moisture content and degree of esterification were determined. Preeminent conditions to gain the highest yield of pectin (82.6%) were identified as pH 1.5, 15 min of reaction time at microwave power of 600 W with citric acid. The equivalent weight, methoxyl value and acetyl value of pectin extracted from optimum conditions were 196.46, 2.54% and 0.09%, respectively. Extracted pectin could be categorized as low-methoxyl pectin because its degree of esterification was less than 50%. According to the FT-IR spectrum, band at 3386.4 cm⁻¹ denotes the O-H stretching and band at 2808.2 cm⁻¹ is due to the C-H stretching of galacturonic ring. Esterified vs unesterified functional groups region is 1750-1350 cm⁻¹. The band at 1236.4 cm⁻¹ denotes C-O stretching of the glycoside ring and 1102.5 cm⁻¹ band stands for O-H stretching of glycoside ring. In conclusion, *Citrus reticulata* (Heen naran) peel can provide an alternative feed stock for pectin production in an eco-friendly way, which will add value to this agricultural waste.

Keywords: *Citrus reticulata*, green approach, micro-wave extraction, pectin