

## Optimization of Acid Extraction of Pectin from Industrial Lime Peel Waste

S. Sangheetha<sup>1</sup>, D. C. K. Illeperuma<sup>2</sup>, C. V. L. Jayasinghe<sup>3\*</sup>

<sup>1</sup>*Department Food Technology, University College of Jaffna, Jaffna, Sri Lanka*

<sup>2</sup>*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka*

<sup>3</sup>*Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Sri Lanka*

\**cjayasinghe@wyb.ac.lk*

Lime peel is the major waste after extracting lime juice in food processing industry. The lime peel, which is openly disposed, is a good source of pectin. The optimum conditions for acid extraction of pectin from industrial lime peel wastes were investigated in the present study. A 3-factor-3-level Box-Behnken Design of response surface methodology was employed to determine the effect of pH, temperature and time on yield of pectin extracted from lime peel. Fifteen experimental runs with different combinations of pH (1.3, 2.5 and 3.7), temperature (60, 75 and 90 °C) and time (45, 90 and 135 min) were employed in the pectin extraction process. The yield of lime peel pectin obtained in the experimental runs ranged from 8.10 to 21.90 %. The empirical quadratic polynomial model developed for the effect of pH, temperature and time on yield of pectin was significant ( $p=0.003$ ) and fitted to all experimental data with high co-efficient of determination (97.03). Significant contribution ( $p<0.050$ ) of the main and interaction effects of pH, temperature and time on yield of lime peel pectin was evident resulting in an optimum yield of 23.23% (dry basis) at pH 1.7, temperature 81.2 °C and 126 min. Degree of esterification of lime peel pectin was significantly affected ( $p<0.050$ ) by pH, time and the interactive effects of pH, temperature and time. Lime peel pectin extracted under optimized conditions exerted an equivalent value of  $857 \pm 24$ , methoxyl content of  $8.3 \pm 0.4$  %, degree of esterification of  $70.0 \pm 0.5$  %, anhydro uronic acid content of  $77.0 \pm 2.1$  % and gel grade of 190. As the developed empirical quadratic polynomial model was in good agreement with experimental data, it could be used to predict the yield during commercial-scale extraction of pectin from lime peel.

**Key words:** Box-Behnken, Industry waste, Lime peel, Optimization, Pectin

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