



239/B

### **Impact of extraction conditions on the degree of esterification of pectin from lime peel wastes**

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

<sup>1</sup>*Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawilla.*

<sup>2</sup>*Department of Food Technology, University College of Jaffna, Kokuvil, Jaffna.*

<sup>3</sup>*Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, Peradeniya.*

Pectin has multiple uses in food industry such as gelling agent, thickening agent and stabilizer. Degree of Esterification (DE) is the ratio of esterified galacturonic acid units to total galacturonic acids in pectin which determines the gelling ability of pectin and its ability to be used in various foods. The objectives of the present study were to investigate the effect of pH, temperature, and time on DE of pectin extracted from lime peel using conventional acid extraction method and to derive a model to predict the extraction conditions for the extraction of pectin with required DE. Box-Benkhen design of Response Surface Methodology (RSM) was employed to study the effect of extraction conditions. The complete design consisted of 15 different sets of pH (1.3, 2.5 and 3.7), temperature (60, 75 and 90 °C) and time (45, 90 and 135 min) combinations with the triplicate sets of center points of each conditions. All experiments were conducted in randomized order. The pectin with highest DE (82%) was obtained at pH 3.7, 75°C for 135 min. Multiple regression statistical predicted the second order polynomial model:

$$DE = 173.7 - 17.30 \text{ pH} - 0.575 \text{ Time} - 2.056 \text{ Temperature} + 0.562 \text{ pH} \times \text{pH} - 0.000128 \text{ Time} \times \text{Time} + 0.00743 \text{ Temperature} \times \text{Temperature} + 0.0984 \text{ pH} \times \text{Time} + 0.1901 \text{ pH} \times \text{Temperature} + 0.00542 \text{ Time} \times \text{Temperature}$$

Analysis of variance revealed that DE of pectin obtained in 15 treatments was significantly different from each other. Moreover, it showed that all 3 extraction conditions had significant interactive effects on DE. The insignificant lack of fit ( $P = 0.072$ ) at  $P < 0.050$  and higher  $R^2$  (95.18) denoted that predicted quadratic model was well fit to all experiment data and highly accurate. Therefore, the present study demonstrated that pH, temperature and time had significant interactive effects on DE and the derived model could be used to predict the DE of lime peel pectin extracted at specified pH, temperature and time.

**Keywords:** Esterification, Gelling agent, Lime, Response surface methodology.

**Acknowledgement:** Financial assistance by National Science Foundation with the research grant of RG/2017/AG/2

**E-mail:** [ssangheetha06@gmail.com](mailto:ssangheetha06@gmail.com)