

Optimization of Oil Extraction from Gac (*Momordica cochinchinensis* Spreng) Aril Using a Screw Press

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ABSTRACT

*We extracted oil from the aril of *Momordica cochinchinensis* Spreng using a screw press to determine the optimal conditions and mathematical equations to predict the oil extraction efficiency; the β -carotene and lycopene contents; and the iodine, acidity, and peroxide values using a 2-factor, 5-level, central composite design. The two factors were compression length (1.18, 1.30, 1.60, 1.90, and 2.02 cm) and rotational speed (10.14, 11.30, 14.10, 16.90, and 18.06 rpm). The optimal conditions were those that maximized oil extraction efficiency, β -carotene and lycopene content, and iodine value and minimized acidity and peroxide values. Under the optimal conditions, the predicted values were $65\pm 15\%$ extraction efficiency, 15 ± 5 mg of β -carotene per 100 g, 4 ± 2 mg of lycopene per 100 g, $65\pm 5\%$ iodine value, and 2 ± 2 mg potassium hydroxide per gram of acidity. The extraction efficiency increased with higher rotational speeds. Increasing both the compression length and rotational speed increased the iodine value, the β -carotene content, and the lycopene content. To validate the mathematical model, the predicted values were compared to experimental data; they deviated by less than 10%, indicating that the model predictions were very good. The L^* , a^* , b^* , Hue angle, and viscosity of oil extracted from gac aril were 6.4, 23.0, 9.0, 21.25° , and 135 mPa.s, respectively.*

Keywords: Aril, Gac fruit, Oil extraction, Optimization, Screw press

INTRODUCTION

Momordica cochinchinensis Spreng (gac) is a plant found in tropical Asian countries, including Vietnam, Laos, Thailand, China, Bangladesh, and India (Kubola et al., 2013; Kubola and Siriamornpun, 2011). Gac, a local vegetable, is a rich nutrient source, high in β -carotene and lycopene (Tinrat et al., 2014). Its aril contains sufficient quantities of β -carotene and lycopene (twice as much as the flesh) to help prevent coronary artery disease and some cancers, including prostate, lung, and stomach cancer. The aril of gac contains approximately 102 mg oil/g of edible portion, including up to 69% unsaturated fatty acids (Vuong et