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Optimization of ultrasound-assisted extraction condition for polyphenol and flavonoid compound from clone PBC 140 Malaysia cocoa shell (*Theobroma cacao*) using response surface methodology

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Statement of the Problem: Cocoa shell is a byproduct left unutilized by the cocoa industry. They are being removed before, during or after either in a cocoa bean or chocolate making process. It is estimated about 75% of the cocoa fruit become a waste during a process. There is a recent study on the polyphenols on the cocoa plant, including their flower, cocoa pod husk, cocoa shell, cocoa nib, etc. This bioactive compound can be used in the cosmetic or other application. Hence, it is good if the polyphenols from the cocoa shell are optimized to obtain a high phenolic compound.

Materials & Methods: Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) of cocoa shell from clone PBC 140 were determined by Folin-Ciocalteu reagent and aluminium chloride ($AlCl_3$) using gallic acid and rutin as standards, respectively.

Results & Discussion: The response surface methodology used to evaluate the complex interaction of three variables which are ethanol concentration (70-90 v/v%), temperature (45-65 °C) and ultrasound irradiation time (30-60 minutes). The result revealed the optimum condition to obtain TPC and TFC are 63.18%, 80%, 55 °C and 45 minutes respectively with the value of 38.46 mg GAE/g DW and 7.72 mg RE/g DW. The results show both models were significant ($p < 0.0001$) with a coefficient of determination (R^2) above 92% and no significant in the lack of fit. The value from validation experimental TPC and TFC were 38.69±0.05 mg GAE/g DW and 7.42±0.09 mg RE/g DW, respectively under condition 64.02%, 80.98%, 54.52 °C, 57.57 °C, 60.97 minutes and 43.54 minutes.

Conclusion: The validation reveals that polynomial model equation fits the data and can be used to predicting the future observation within the model design range.

Biography

Arief Huzaimi M Y is currently pursuing his MSc at Halal Products Research Institute, University Putra Malaysia, Serdang in Halal Products Development Program. He is also working as a Research Officer of Malaysian Cocoa Board, a government organization for more than 3 years mainly in cocoa-based cosmetic products process development.

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