UNIVERSITI TEKNOLOGI MARA

PRE-TREATMENT AGENTS, PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF LOCAL BANANA (*Musa* sp.*)* PEEL FLOURS AND ITS APPLICATION IN BISCUIT

SYARIFAH KHADIJAH BINTI SYED ABU BAKAR

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Syarifah Khadijah binti Syed Abu Bakar
Student I.D. No.	:	2016429206
Programme	:	Master of Science (Food Science and Technology) – AS752
Faculty	:	Applied Sciences
Thesis Title	:	Pre-treatment Agents, Physicochemical and Functional Properties of Local Banana (Musa sp.) Peel Flours and Its Application in Biscuit
Signature of Student	:	syarifah khadijah ……..
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ABSTRACT

Banana peels are usually discarded or used as animal feed although it contains a high number of bioactive compounds. This study was conducted to determine the effectiveness of various anti-browning agents and concentrations as a pre-treatment method for banana peel flour preparation, assess the physicochemical and functional properties of banana peel flour (BPF) and evaluate the quality and glycaemic index of biscuits added with BPF. Four banana cultivars were used in this study; *Nangka, Tanduk, Berangan* and *Rastali.* Pre-treatment of banana peels was conducted using solutions containing citric acid, sodium metabisulfite and a combination of citric acid and sodium metabisulfite at concentrations of 0.2%, 0.3%, 0.5% and 1.0%. The L* values and browning index of banana peel flour treated with 0.2% of the combined anti-browning agent was effective to inhibit the browning activity of banana peel. Physicochemical (yield, pH, moisture, ash, fat, protein, carbohydrate, dietary fibre, starch and total phenolic content) and functional properties (water holding capacity, oil holding capacity, swelling power, water soluble and absorption index) of local cultivars in banana peel flours were compared. It was revealed that the total dietary fibre (TDF), insoluble dietary fibre (IDF), soluble dietary fibre (SDF) and starch content were significantly different between the banana peel cultivars. *Nangka* and *Tanduk* BPF showed no significant difference ($p<0.05$) in water holding capacity (WHC) while *Rastali* BPF exhibited significantly lower ($p<0.05$) in oil holding capacity (OHC) and water-absorption index (WAI) but higher in water-soluble index (WSI) and swelling power (SP). The application of *Berangan* BPF in biscuit productions prepared at different levels of substitution (0%, 10%, 20%, 30% and 40%) to replace wheat flour were analysed for its physicochemical properties and sensory acceptability. The increase of *Berangan* BPF percentage resulting high TDF, IDF and SDF contents in the biscuits. The physical attributes of the biscuits were affected similarly like the hardness and spread ratio of biscuits. Biscuits substituted with up to 20% showed a significant decrease ($p<0.05$) in colour score compared to control biscuits. However, biscuits with up to 20% substitution of *Berangan BPF* obtained higher scores for appearance, texture, taste attributes and overall acceptability. *In-vitro* starch hydrolysis and estimated glycemic index (eGI) showed that substitution of *Berangan* BPF significantly decreased ($p<0.05$) the starch digestion rate, glycemic load (GL) thus lowered the eGI of biscuits from high to medium eGI food. Biscuits substituted with *Berangan* BPF showed lower eGI compared to control hence had a great potential to be used as a functional ingredient in foods for diabetic and obese individuals. Present study suggested that substitution of BPF up to 20% can maintain the physical quality of biscuit. Finally, the application of BPF might increase the utilisation of banana waste in food products.

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