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PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF MANGO SEED DIETARY FIBER EXTRACT (MSDFE), PAPAYA SEED DIETARY FIBER EXTRACT (PSDFE) AND HONEYDEW SEED DIETARY FIBER EXTRACT (HSDFE)

by

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A dissertation submitted in partial fulfilment of the requirements for the degree of Bachelor of Technology (B. Tech) in the field of Food Technology

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Aug 2020

DECLARATION BY AUTHOR

This dissertation is composed of my original work and contains no material previously published or written by another person except where due reference has been made in the text. The content of my dissertation is the result of work I have carried out since the commencement of my research project and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution.

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LIST OF ABBREVIATIONS

Abbreviation	Caption
µg	Microgram
ºC	Degree Celsius
ANOVA	Analysis of variance
AOAC	Association of Official Analytical Chemists
BC	Bioactive compound
CHD	Coronary heart disease
CVD	Cardiovascular disease
DF	Dietary fiber
EA	Emulsion ability
ES	Emulsion stability
FDA	Food and Drug Administration
FOS	Fructooligosaccharide
G	Gram
GLC	Gas-Liquid Chromatography
GO-POD	Glucose oxidase-Peroxidase
H	Hour
HPa	Hectopascal
HPLC	High-Performance Liquid Chromatography
IBS	Irritable bowel syndrome
IDF	Insoluble dietary fiber
LDL	Low-density lipoprotein
M	Molarities
MANS	Malaysian adult nutrition survey

mBar	Millibar
Mg	Milligram
Min	Minute
Ml	Millilitre
Mm	Millimeter
mM	Millimolar
Nm	Nanometer
NRV	Nutrient Reference Value
OHC	Oil holding capacity
RPM	Revolutions per minute
S	Second
SDF	Soluble dietary fiber
SOD	Superoxide dismutase
TDF	Total dietary fiber
UV	Ultraviolet
USDA	United States Department of Agriculture
WHC	Water holding capacity
WSC	Water swelling capacity

SIFAT-SIFAT FIZIKOKIMIA DAN SIFAT-SIFAT FUNGSIAN SERAT YANG DIEKSTRAK DARIPADA BIJI BUAH MANGGA, BETIK DAN TEMBIKAI SUSU

ABSTRAK

Biji buah telah dibuang sebagai sisa menyebabkan pencemaran alam sekitar dan kehilangan biojisim yang berharga. Namun, kajian terkini menunjukkan bahawa biji buah adalah berpotensi sebagai sumber serat (DF) dan bahan penting dalam diet seimbang. Dalam kajian ini, DF telah diekstrak daripada biji buah mangga, betik dan tembikai susu dan keadaan pengekstrakan optimum ditentukan. Semua biji sampel menunjukkan hasil pengekstrakan DF maksimum apabila diekstrak pada suhu 80 °C selama 3 jam dengan menggunakan 3% natrium hidroksida pada nisbah cecair kepada pepejal adalah 15:1. Komposisi pemakanan, pH dan beberapa sifat fizikal serta sifat fungsian bagi ekstrak DF kemudiannya diperiksa. Kesemua ekstrak DF mengandungi kelembapan, protein, lemak dan abu yang rendah, tetapi mempunyai jumlah gula, kanji dan jumlah diet serat (TDF) yang agak tinggi. Ekstrak DF daripada biji buah mangga menghasilkan jumlah kanji (28.68 g/100 g ekstrak kering) dan jumlah gula (41.77 g/100 g ekstrak kering) yang tertinggi, manakala ekstrak DF daripada biji buah tembikai susu (HSDFE) mempunyai kandungan TDF yang tertinggi (81.96 g/100 g ekstrak kering). Perbezaan yang ketara telah didapati dalam nisbah kandungan serat tidak larut (IDF) kepada kandungan serat larut dalam ekstrak DF daripada biji buah betik dan HSDFE. Selain bersifat asid dan mempunyai kepadatan pukal yang rendah, kesemua ekstrak DF berwarna kuning. Kesemua ekstrak DF juga mempunyai keupayaan menahan air (WHC), kapasiti pembengkakan air (WSC) dan kapasiti

menahan minyak (OHC) yang tinggi. Selain daripada itu, keupayaan emulsi (EA) dan kestabilan emulsi (ES) bagi semua ekstrak DF juga adalah tinggi, dengan julatnya masing-masing berada dalam lingkungan 21 hingga 28.51 mL/100mL dan 34.29 hingga 46.46 mL/100mL. Keputusan menunjukkan bahawa kesemua ekstrak DF mempunyai sifat fizikokimia dan sifat fungsian yang baik. Namun, HSDFE adalah yang terbaik, disebabkan kandungan lemak dan kepadatan pukal yang rendah, kandungan protein, IDF dan TDF yang tinggi, sifat neutral dan WSC, OHC, EA dan ES yang tinggi.

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ABSTRACT

Fruit seeds were previously discarded as waste, which could lead to environmental pollution and loss of valuable biomass. Recent research, however, has indicated that the seeds may have potential use as dietary fiber (DF) source and important ingredient of a healthy diet. In this research, DF was extracted from mango, papaya and honeydew seeds and the optimum extraction conditions were determined. All fruit seeds showed maximum DF extraction yield when extraction was conducted at 80 °C for 3 h using 3% NaOH at a liquid-solid ratio of 15:1. The nutritional composition, pH value and some physical and functional properties of the extracted DF were then examined. Analyses revealed that all DF extracts exhibit low moisture, fat, ash and protein contents and present high amounts of total sugar, starch and total dietary fiber (TDF). Of the three DF extracts, mango seed dietary fiber extract produced the highest amounts of starch (28.68 g/100 g dry extract) and total sugar (41.77 g/100 g dry extract) whilst honeydew seed dietary fiber extract (HSDFE) revealed the highest TDF content (81.96 g/100 g dry extract). A great difference in the ratio of insoluble dietary fiber (IDF) to soluble dietary fiber contents was found in papaya seed dietary fiber extract and HSDFE. Besides slightly acidic and low bulk density, all DF extracts were yellowish in colour and showed high water holding (WHC), water swelling (WSC) and oil holding capacities (OHC). Moreover, all DF

extracts exhibited excellent emulsion ability (EA) and stability (ES) ranging from 21.21 to 28.51 mL/100mL and 34.29 to 46.46 mL/100mL, respectively. Results indicated all three DF extracts have good physicochemical and functional properties. However, HSDFE is the best, due to its low fat content and bulk density, high protein, IDF and TDF content, nearly neutral pH and excellent WSC, OHC, EA and ES.