ENZYMATIC HYDROLYSIS AND LACTIC ACID BACTERIA FERMENTATION OF OKARA

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JUNE 2020

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Sekian, terima kasih.

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ENZYMATIC HYDROLYSIS AND LACTIC ACID BACTERIA FERMENTATION OF OKARA

by

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Thesis submitted in the partial fulfilment of the requirements for the degree of
Bachelor of Technology (B.Tech) in the field of Bioprocess Technology
School of Industrial Technology
Universiti Sains Malaysia

JUNE 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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Nur Adilla Binti Mahmud

June 2020

ACKNOWLEDGEMENT

Firstly, I would like to express my special thanks of gratitude to my supervisor, Dr Tan Joo Shun and my co-supervisor, Madam Wan Zafira Ezza Wan Zakaria for their guidance, encouragement, wise counselling and useful critiques throughout my final year project. I really appreciate their words of advice and personal support in order to finish up my project. This work would not have been successfully completed without their guidance.

Besides, I would like to specially thank my parents, Mahmud Bin Ibrahim and Rasidah Binti Rejab, who keep motivating me all the time. Next, I would also like to extend my sincere thanks to all Industrial Technology staff, especially lab assistants A204, Mr. Azmaizan Yaakub and Mrs Najmah Hamid for tremendous amount of helps, support and providing sufficient materials and apparatus throughout my final year project. Furthermore, I would like to thank the School of Industrial Technology for allowing me to use the available facilities and equipments throughout my research study. Ultimately, I would like to thank to my fellow course mates and friends who supported me and gave me a lot of encouragement during my research study.

Last but not least, I am grateful to everyone who lent me their hand either direct or indirect way and making this research possible to complete.

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LIST OF SYMBOL

Symbol	Caption
+	Plus
-	Minus
x	Multiply
%	Percentage
=	Equal
°C	Degree Celsius
α	Alpha
β	Beta
<	Less than
>	Greater than

LIST OF ABBREVIATIONS

Abbreviation	Caption
h	hour
kg	kilogram
g	fram
mg	miligram
mL	milimetre
µmol	micromole
µl	microlitre
µg	microgram
v/w	Volume per weight
L	litre
Kcal	kilocalorie
min	minute
M	molarity
rpm	Revolutions perminute
nm	nanometre
RSM	Respond surface methodology
LAB	Lactic acid bacteria
DH	Degree of hydrolysis
SOS	Soybean oligosaccharides
DPPH	2,2-diphenyl-1-picrylhydrazyl
ABTS	2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic

	acid)
RBB	Reactive brilliant blue
L-F	Langmuir freundlich
MRS	DeMan, Rogosa and Sharpe
HPLC	High performance liqiud chromatography
ANOVA	Analysis of variance
pH	Potential of hydrogen
R^2	Coefficent of determination
Pr(>F)	Probability (>F value)
3D	Three dimensional
2D	Two diemnsional
Df	Degree of freedom
L	lactobacillus
Cfu/mL	colony-forming units per milliliter
$Ca(OH)^2$	Calcium hydroxide
SiO^2	Silicon dioxide
SiC	Silicon carbide
NaCl	Sodium chloride
$(NH_4)^2SO_4$	Ammonium sulphate
NaOH	Sodium hydroxide
HCL	Hydrochloric acid
Ca	Calcium

HIDROLISIS ENZYMATIK DAN PENAPAIAN LAKTIK ASID BAKTERIA BAGI OKARA

ABSTRAK

Pengeluaran produk kacang soya telah meningkat di seluruh dunia dan terdapat peningkatan yang sama dalam jumlah sisa dadih soya atau okara yang dibuang. Pembuangan okara telah menjadi masalah yang harus diselesaikan kerana pencemarannya kepada alam sekitar. Okara kaya dengan serat, lemak, protein, vitamin dan unsur surih. Okara memiliki potensi untuk pemprosesan dan pemanfaatan nilai tambah yang secara bersamaan menjanjikan peningkatan keuntungan ekonomi serta penurunan potensi pencemaran untuk alam sekitar. Dalam kajian ini, keadaan optimum untuk hidrolisis enzimatik okara pada pelepasan gula telah diselidiki dan kandungan protein okara setelah penapaian oleh bakteria asid laktik telah dikira. Pengoptimuman hidrolisis enzimatik dengan viscozyme dilakukan dengan menggunakan analisis R dalam metodologi permukaan tindak balas (RSM) dengan tiga faktor iaitu kepekatan enzim, pH dan suhu untuk mendapatkan tindak balas kandungan gula. Berdasarkan hasil pengoptimuman, keadaan optimum untuk hidrolisis enzimatik masing-masing adalah 4.8% (v/w), 5.5 dan 27 °C kepekatan enzim, pH dan suhu dengan tindak balas 1000.222 μg/mL kandungan gula. Penapaian okara dilakukan oleh *Lactobacillus plantarum* dengan fermentasi kelalang selama 72 jam. Selepas fermentasi, kelangsungan sel sel diperhatikan. Kandungan protein yang diperoleh setelah fermentasi adalah pada 33.3 % yang meningkat secara signifikan sebelum fermentasi. Komposisi gula setelah penapaian adalah glukosa, sukrosa dan fruktosa masing-masing diperoleh pada kadar 0.18 mg/mL, 0.15 mg/mL dan 0.004 mg/mL.

ENZYMATIC HYDROLYSIS AND LACTIC ACID BACTERIA FERMENTATION OF OKARA

ABSTRACT

The production of soybean products has been increasing throughout the world and there has been a corresponding increase in the quantity of soybean curd residue or okara being thrown out. The dumping of okara has become a problem to be solved due to its contamination to the environment. Okara is rich in fiber, fat, protein, vitamins and trace elements. Okara has potential for value-added processing and utilization which simultaneously hold the promise of increased economic benefit as well as decreased pollution potential for the environment. In this study, the optimum condition for enzymatic hydrolysis of okara on release of sugar was studied and the total protein content of okara after fermentation by lactic acid bacteria (LAB) was investigated. The optimization of enzymatic hydrolysis by viscozyme was performed using R analysis in response surface methodology (RSM) with three factors which are enzyme concentration, pH and temperature to obtain maximum sugar content as response. Based on the optimization result, the optimal condition for enzymatic hydrolysis were 4.8 % (v/w), 5.5 and 27 °C of enzyme concentration, pH and temperature respectively with the response of 1000.222 μg/mL of sugar content. The fermentation of okara was carried out by *Lactobacillus plantarum* by shake flask fermentation for 72 hours. After fermentation, the cell viabilty of the cell was observed. The protein content obtained after fermentation was at 33.3 % which are significantly increased before fermentation. The sugar composition after fermentation are glucose, sucrose and fructose were obtained at 0.18 mg/mL, 0.15 mg/mL and 0.004 mg/mL respectively.