



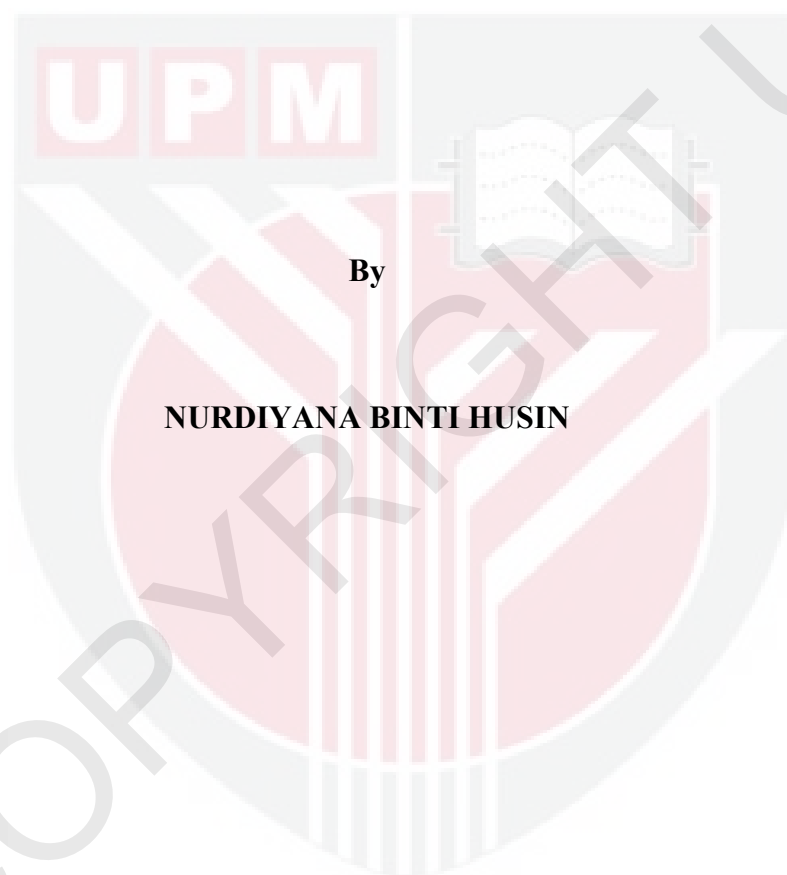
UNIVERSITI PUTRA MALAYSIA

***RECOVERY OF PEPTONES FROM MIXED
SARDINE AND MACKEREL WASTES***

NURDIYANA BINTI HUSIN

FK 2012 54

**RECOVERY OF PEPTONES FROM MIXED SARDINE AND MACKEREL
WASTES**



By

NURDIYANA BINTI HUSIN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirement for Degree of
Master of Science**

August 2012

Specially dedicated to....

My loving parents...

My wonderful siblings ...

My friends...

for their support and encouragements...



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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the partial requirements for the Degree of Master of Science

RECOVERY OF PEPTONES FROM MIXED SARDINE AND MACKEREL WASTES

By

NURDIYANA BINTI HUSIN

August 2012

Chairman: Assc. Prof. Siti Mazlina Mustapa Kamal, PhD

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Presently, the demand for fish canned products is increasing among Malaysians, and this situation leads to the increasing amount of fish waste generated by the fish processing industries. The abundance of fish waste from the fish processing industries contributes an opportunity to convert the waste into more valuable products. One of the possible products that can be harvested from the fish waste is peptone, a product usually utilized as a carbon and/or nitrogen source for microorganism growth. Therefore, the main goal of this study was to optimally harvest peptones from protein hydrolysate of fish waste that had good functional properties and apply it as a component of a medium for microorganism growth. This study utilizes the mixture of sardines and mackerels waste for the recovery of peptones. These two types of fish are largely used for fish canned products in Malaysia fish processing industry. The hydrolysis of fish waste, which produced fish protein hydrolysate, was achieved using alkaline and enzymatic hydrolysis. Both hydrolysis were coupled with Response Surface Methodology (RSM) to obtain optimum conditions in terms of protein concentration and degree of hydrolysis. The optimum protein concentrations in the enzymatic hydrolysis using Alcalase and

Protamex enzymes were 7.72 mg/mL and 4.12 mg/mL, respectively. For degree of hydrolysis, the values obtained were 58.37 % and 23.50 % for Alcalase and Protamex enzymes, respectively. The optimized results for the alkaline hydrolysis were 1.03 mg/mL for protein concentration and 18.80 % for degree of hydrolysis. The response values at optimum conditions revealed that the enzymatic hydrolysis using Alcalase was superior compared to the alkaline and Protamex enzyme hydrolysis. The peptones from different methods of hydrolysis and commercial peptone were analyzed for their physicochemical and functional properties before being supplied as a nitrogen source for microorganism growth. Their physicochemical properties such as pH, colors, particle sizes, moisture contents, and protein content were different between fish waste peptones and commercial peptone due to the different hydrolysis method and source of fish. In the functional properties analysis, the fish waste peptone from enzymatic hydrolysis using Alcalase showed good result in solubility (97.23%), water holding capacity (75.00%) as well as whippability (0.04%) compared to the other peptones. The results of microorganism growth showed that the fish waste peptone produced from enzymatic hydrolysis using Alcalase was a superior source of nitrogen for *B. subtilis* and *S. cerevisiae* growth. Performance of peptones for microorganism growth was found to be affected by hydrolysis method and its quality in functional properties, such as solubility. Conclusively, the peptones produced from fish waste at optimum hydrolysis conditions (enzymatic hydrolysis using enzyme alcalase) have potentials to replace existing commercial peptone for microorganism growth.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi sebahagian daripada keperluan untuk Ijazah Master Sains

**PENGHASILAN PEPTON DARIPADA CAMPURAN SISA BUANGAN
SARDIN DAN MACKEREL**

Oleh

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Pengerusi: Prof. Madya Siti Mazlina Mustapa Kamal, PhD

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Permintaan terhadap produk makanan ikan dalam tin pada masa kini sedang meningkat di kalangan rakyat Malaysia. Keadaan ini menyebabkan bilangan sisa buangan ikan daripada industri pemprosesan ikan meningkat. Sisa buangan ikan ini boleh digunakan sebagai sumber nitrogen iaitu pepton, dimana bahan ini merupakan salah satu bahan penting dalam proses pertumbuhan mikroorganisma. Justeru, matlamat utama kajian ini dijalankan adalah untuk menghasilkan pepton daripada protein hidrolisat sisa buangan ikan secara optimum yang mempunyai ciri fungsian yang baik dan mengaplikasikannya sebagai komponen medium untuk pertumbuhan mikroorganisma. Kajian ini menggunakan campuran sisa sardines and mackerels untuk penghasilan pepton. Kedua jenis ikan ini adalah yang terbanyak digunakan dalam produk ikan tin dalam industri pemprosesan ikan di Malaysia. Hidrolisis sisa buangan ikan diperolehi melalui proses hidrolisis alkali dan hidrolisis enzim yang menghasilkan protein hidrolisat. Kedua-dua hidrolisis telah diaplikasikan menggunakan *Response Surface Methodology* (RSM) bagi mendapatkan keadaan optimum dari segi kepekatan dan darjah hidrolisis. Kepekatan protein yang optimum dalam proses hidrolisis enzim menggunakan enzim Alcalase dan Protamex masing-masing adalah 7.72 mg/ml dan 4.12 mg/ml. Bagi darjah hidrolisis menggunakan

enzim Alcalase, nilainya ialah 58.37%, manakala bagi enzim protamex, nilainya ialah 23.50%. Bagi hidrolisis alkali, kepekatan protein yang optimum adalah sebanyak 1.03 mg/ml dan darjah hidrolisis adalah 18.80%. Nilai respon ini menunjukkan bahawa proses hidrolisis menggunakan enzim Alcalase adalah lebih baik berbanding hidrolisis alkali dan hidrolisis enzim (Protamex). Pepton dari kaedah hidrolisis yang berlainan dan komersial telah dilaksanakan analisa fizikal-kimia dan ciri fungsian, sebelum semua pepton itu diaplikasikan sebagai sumber nitrogen dalam pertumbuhan mikroorganisma. Analisis fizikal-kimia seperti pH, warna, saiz partikal, kandungan lembapan dan kandungan protein menunjukkan nilai yang berbeza antara pepton sisa buangan dan komersial yang berpunca daripada kaedah hidrolisis yang digunakan dan perbezaan spesis ikan. Bagi analisis ciri fungsian, pepton sisa buangan dari hidrolisis enzim Alcalase menunjukkan keputusan analisis terbaik di dalam analisis keterlarutan (97.23%), pegangan kapasiti air (75.00%) serta ciri kebuihan (0.04%) berbanding pepton lain. Keputusan terhadap pertumbuhan mikroorganisma menunjukkan bahawa pepton sisa buangan dari hidrolisis enzim Alcalase adalah sumber nitrogen terbaik terhadap pertumbuha *B. subtilis* dan *S. cerevisiae* berbanding pepton lain. Prestasi pepton bagi pertumbuhan mikroorganisma telah didapati bergantung kepada kaedah hidrolisis dan kualiti ciri fungsian pepton tersebut. Kesimpulannya, pepton sisa buangan yang dihasilkan melalui keadaan optimum hidrolisis didapati mempunyai potensi untuk menggantikan pepton komersial sediaada bagi digunakan sebagai pertumbuhan mikroorganisma.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Allah S.W.T. for His entire blessings towards me and all the strength that He gave me in finishing this study.

My sincere appreciation goes to the members of my supervisory committee, Dr. Siti Mazlina Mustapa Kamal (Chairman) and Prof. Dr. Ling Tau Chuan for their guidance, constructive comments and assistance during my study. My deepest gratitude and million thanks to my loving parents, Husin bin Hj. Siman and Jalilah binti Md. Zin and not forgetting, my siblings (Amirul Ashraf and Anis) for their love and continuous support.

I also would like to thank the Head of Section of Bioengineering Technology, UniKL MICET, Dr Ruzainah Ali @ Jaafar and former Head of Section, Muhamad Yusuf Hasan for all the support and understanding given to me in completing this thesis. Special thanks to the colleagues in UniKL MICET, Junaidah, Fara Wahida, Rozyanti, Faezawaty, Norhani, Zatul, Ilham, Norhayati, Shima, Syahnizam, Shukri, Yusuf, Yana and many others for the continuous moral and technical support given to me.

Last but not least, to the students of Bioprocess Engineering, who always put their trust in me and giving me strength to complete this study. May Allah S.W.T. bless all of us.



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This thesis was submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the partial requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for the quotations and citations which have been duly acknowledge. I also declare that it has not been previously and is not concurrently submitted for any other degree at Universiti Putra Malaysia or other institutions.



NURDIYANA BINTI HUSIN

Date: 27 August 2012



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