



UNIVERSITI PUTRA MALAYSIA

***FORMULATION OF MINIMUM MEDIUM FOR BACTERIOCIN
PRODUCTION BY *Lactobacillus plantarum* strains***

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FBSB 2013 3

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**MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA**

2013

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PRODUCTION BY *Lactobacillus plantarum* strains**

By

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

January 2013

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

FORMULATION OF MINIMUM MEDIUM FOR BACTERIOICIN PRODUCTION BY *Lactobacillus plantarum* strains

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January 2013

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The production of bacteriocin, an antimicrobial compound produced by lactic acid bacteria, has been reported to be affected by several environmental factors including carbon and nitrogen sources. The selective de Mann Rogosa Sharpe (MRS) medium is the common medium that extensively used to cultivate *Lactobacillus sp.* and for bacteriocin production. The main disadvantage of employing this complex media is that it is costly for media application. The minimum requirement of nutrient is essential to be determined to produce bacteriocin economically. Therefore, the main objective of this study was to formulate minimum medium composition for the six strains of *L. plantarum* to attain comparable bacteriocin activity that obtained with MRS medium. A total of 20 g/L of carbon source and 22 g/L of nitrogen source were employed in each modified medium, which was similar to the amount of carbon and nitrogen source in MRS media. The results obtained in this study showed that yeast

extract was the best nitrogen source as compared to other nitrogen sources when combined with either molasses or glucose for the production of bacteriocin by *L. plantarum* strains, suggesting that molasses and glucose are compatible carbon sources. In addition, subsequent inclusion of meat extract and/or peptone into the basic designed growth medium did not increase bacteriocin activity further. Similar results were obtained when more than two different nitrogen sources were combined in the basic growing medium, implying that both meat extract and peptone were not essential nitrogen sources for the production of bacteriocin by *L. plantarum* strains. However, the requirement of trace elements, minerals and other nutrients for bacteriocin production was strain dependent. Moreover, the bacteriocin production profile was dependent on the carbon source that included in growth medium. *L. plantarum* I-UL4 was chosen as a model to study the growth and bacteriocin production in 3 L bioreactor and result showed that both bacteriocin and cell mass were produced earlier as compared to static growth method. Generally, the results obtained in this study indicated that the elimination of unnecessary nutrient elements as found in selective MRS medium is feasible to reduce the production cost of bacteriocin by *L. plantarum* substantially.

Abstrak thesis ini dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**PEMFORMULASIAN MEDIUM MINIMUM UNTUK PENGHASILAN
BAKTERIOSIN DARIPADA STRAIN *Lactobacillus plantarum***

Oleh

NURZAFIRAH MAZLAN

Januari 2013

Pengerusi : Profesor Madya Foo Hooi Ling, PhD

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Penghasilan bakteriosin, suatu sebatian antimikroorganisma daripada bakteria asid laktik; telah dilaporkan di pengaruhi oleh beberapa factor persekitaran termasuk sumber karbon dan nitrogen. Media de Mann Rogosa Sharpe (MRS) merupakan media pertumbuhan biasa untuk pertumbuhan *Lactobacillus sp.* dan juga penghasilan bakteriosin. Namun kosnya yang mahal menyebabkan medium kompleks ini tidak sesuai untuk kegunaan industri. Penentuan keperluan minimum nutrien adalah penting untuk menghasilkan bakteriosin secara lebih ekonomi. Oleh itu, objektif utama kajian ini adalah memformulasikan media minimum bagi enam jenis *Lactobacillus plantarum* untuk mendapatkan aktiviti bakteriosin yang setara dengan media (MRS). Sebanyak 20 g/L sumber karbon dan 22 g/L sumber nitrogen di gunakan dalam setiap media formulasi. Ini adalah bersamaan dengan jumlah sumber karbon dan nitrogen di dalam media MRS. Keputusan yang diperolehi daripada kajian menunjukkan bahawa ekstrak yis merupakan sumber nitrogen terbaik

berbanding dengan sumber nitrogen yang lain apabila di campurkan dengan molas atau glukosa, untuk penghasilan bakteriosin daripada pelbagai jenis *L. plantarum*. Keputusan ini juga mencadangkan bahawa molas dan glukosa adalah sumber karbon yang serasi. Penambahan ekstrak daging dan/atau pepton ke dalam media asas yang dihasilkan untuk pertumbuhan tidak menunjukkan sebarang penghasilan bakteriosin. Keputusan yang sama juga diperolehi apabila lebih daripada dua sumber nitrogen yang berbeza dicampurkan ke dalam medium ringkas pertumbuhan, menunjukkan bahawa ekstrak daging dan pepton adalah sumber nitrogen yang tidak penting untuk penghasilan bakteriosin daripada pelbagai jenis *L. plantarum*. Namun begitu, berdasarkan keputusan yang diperolehi, permintaan terhadap unsur surih, mineral dan nutrien adalah bergantung kepada jenis bakteria. Selain itu, profil pertumbuhan bakteria dan aktiviti bakteriosin bergantung kepada sumber karbon yang dicampur kepada medium pertumbuhan bakteria. *L. plantarum* I-UL4 telah dipilih sebagai model untuk kajian aktiviti bakteriosin dan pertumbuhan sel bakteria menggunakan 3 L bioreactor. Berdasarkan keputusan yang diperolehi, aktiviti bakteriosin dan jisim sel dihasilkan lebih awal berbanding dengan cara pertumbuhan statik. Secara umumnya, keputusan ini menunjukkan bahawa penyingkiran unsur-unsur nutrient tidak penting yang terdapat dalam media MRS boleh dilakukan untuk mengurangkan kos penghasilan bakteriosin daripada *L. plantarum*.

ACKNOWLEDGEMENTS

Alhamdulillah.

I would like to express my very great appreciation to my supervisor Assoc. Prof. Dr. Foo Hooi Ling for her guidance and encouragement throughout the completion of this project. My deep gratitude goes to my co-supervisors Prof. Dr. Raha Abd Rahim and Assoc. Prof. Dr. Rosfarizan Mohamad for their valuable and constructive suggestion during the planning and development of this research.

I would like to also extend my thanks to my second family – my lab mates, for the friendship and kind assistance.

To my dear ‘sisters’ Ain and Noly; and my bestfriend Wanis; thank you for being there through thick and thin.

The biggest supporter, my parents and families, thank you for supporting all the way.



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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirements for the degree of Master of Science. The members of the Supervisory Committee were as followed:

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DECLARATION

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

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Date: 3rd January 2013

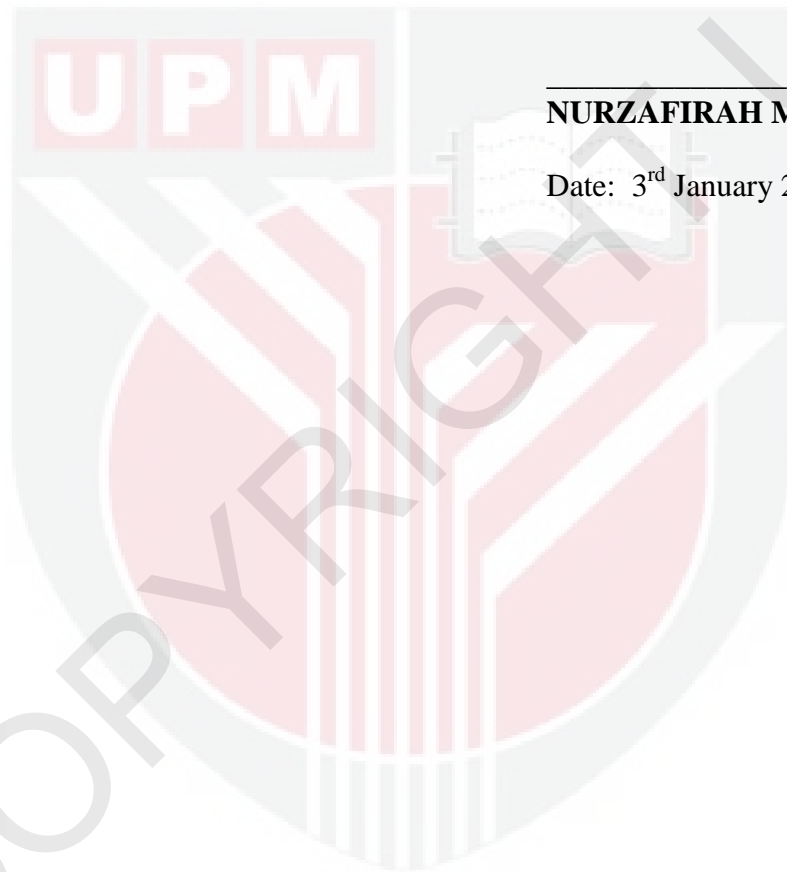


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