EFFECTS OF SUB-LETHAL TEMPERATURE STRESSES ON THE CULTURABILITY AND MORPHOLOGY OF *Escherichia coli*

JUSNIM BINTI MOHAMAD

FACULTY OF AGROTECHNOLOGY AND FOOD SCIENCES
UNIVERSITI MALAYSIA TERENGGANU

2008

Effects of sublethal temperature stresses on the culturability and morphology of Escherichia colia / Jasmin Mohamad.

Lihat Sebelah

EFFECTS OF SUBLETHAL TEMPERATURE STRESSES ON THE CULTURABILITY AND MORPHOLOGY OF *Escherichia coli*

By
Jasmin Binti Mohamad

Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Food Science (Food Service and Nutrition)

Department of Food Science
FACULTY OF AGROTECHNOLOGY AND FOOD SCIENCE
UNIVERSITI MALAYSIA TERENGGANU
2008

BORANG PP3

FAKULTI AGROTEKNOLOGI DAN SAINS MAKANAN
UNIVERSITI MALAYSIA TERENGGANU

PENGAKUAN DAN PENGESAHAN LAPORAN PROJEK PENYELIDIKAN I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

Effects of Sublethal Temperature Stresses on the Culturability and Morphology of Escherichia coli

oleh Jasmin binti Mahamad, No.Matrik UK12KU

telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Makanan

sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Makanan (Pemakanan Makanan dan Pemakanan),

Fakulti Agroteknologi dan Sains Makanan, Universiti Malaysia Terengganu.

Disahkan oleh:

MN

Penyelia Utama

Nama: DR. MOHD NIZAM LANI

Cop Rasmi: Lecturer
Department of Food Science
Faculty of Agrotechnology and Food Science
Universiti Malaysia Terengganu
21030 Kuala Terengganu.

Tarikh: 21/12/08

Penyelia Kedua (jika ada)

Nama:

Cop Rasmi

Tarikh: .....

DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

Signature : .....
Name : JASMIN MOHAMAD
Matric No. : UK 12040
Date : 21/12/08

ACKNOWLEDGEMENT

Praised and thanks to the Almighty Allah s.w.t for giving me the strength, patience and capability to complete this project and salawat and salam to His messenger, Prophet Muhammad s.a.w.

It has been a quite journey with joy and tears, and this project would not have been possible without support, encouragement and prayer of these people. With a deep sense of gratitude, I wish to express my sincere thank to my supervisor, Dr. Mohd Nizam bin Lani, for his advice, guidance and kindness.

I also thank to the lab staffs, especially Pn. Zarina Mohd Shariff and En. Ahmad Azman for their support and assistance during my lab work and accompany me until night to finish up my laboratory work. Special thank to all my friends; Sharifah Fatimah, Salwa, Intan, Aini, Fitri, Husna, Ikin, Imah and Premila who give me support and advice to overcome all the obstacles during this research. I acknowledge the support and love from my family and friends during my study.

ABSTRACT

This research was conducted in order to study the effects of sublethal temperature stresses on the culturability and morphology of *Escherichia coli.* The growth curve of *E. coli* was established by using agitated and static cultivation methods. Since the results of both cultivation methods were not significantly different, the static cultivation method was chosen to carry on this research. *E. coli* was grown in Tryptone Soya Broth (TSB) at 37°C using static cultivation method prior to shifting the bacterium to three sublethal temperature stresses (20°C, 40°C and 45°C) at log and stationary phases. This study also determined percentage injury for *E. coli* after exposure to sublethal temperature stresses. The percentage injury of *E. coli* was highest after shifting temperature of 37°C to 45°C compared to shifting temperature from 37°C to 20°C and 45°C. Results from this research also showed that population growth at stationary phase was more resistance compared to log phase at both temperature 40°C and 45°C but at 20°C the susceptibility of *E. coli* was higher at stationary phase compare to log phase. For the observation of morphological changes, it was concluded that the cells shape of *E. coli* at log phase for three sublethal temperatures were more susceptible than at stationary phase.

ABSTRAK

Kajian ini dijalankan untuk mengetahui kesan tekanan suhu melampau pada pertumbuhan dan morfologi *Escherichia coli*. Pada peringkat pertama, graf pertumbuhan *E. coli* di hasilkan dengan menggunakan dua kaedah iaitu secara statik dan juga secara mengocak. Memandangkan kedua-dua kaedah (statik dan mengocak) yang digunakan untuk menghasilkan graf pertumbuhan *E. coli* tidak menunjukkan perbezaan yang ketara, maka kaedah statik telah dipilih untuk meneruskan kajian ini. Pada permulaan, *E. coli* dihidupkan pada suhu optima iaitu 37°C dengan menggunakan kaedah statik sebelum di ubah ke tiga tekanan suhu melampau (20°C, 40°C dan 45°C) pada fasa bakteria yang berbeza iaitu fasa pertumbuhan dan fasa pegun. Kajian ini juga dapat mengenalpasti peratusan pada *E. coli* yang cedera setelah didedahkan pada tekanan suhu melampau. Peratusan *E. coli* yang cedera paling banyak adalah apabila diubah dari suhu 37°C ke suhu 45°C berbanding *E. coli* yang didedahkan pada suhu 40°C dan 20°C. Keputusan yang diperoleh dari kajian ini juga menunjukkan populasi pertumbuhan *E. coli* adalah paling resistan pada fasa pegun berbanding fasa pertumbuhan pada kedua-dua suhu 40°C dan 45°C. Namun bagi suhu 20°C, populasi pertumbuhan *E. coli* adalah paling tinggi pada fasa pertumbuhan berbanding fasa pegun. Secara pemerhatian terhadap perubahan morfologi *E. coli*, dapat disimpulkan bahawa perubahan bentuk *E. coli* adalah sangat ketara untuk ketiga-tiga suhu pada fasa pertumbuhan berbanding fasa pegun.