OPTIMIZATION OF CAROTENOIDS EXTRACTION FROM SHRIMP WASTE BY VEGETABLE OILS USING RESPONSE SURFACE METHODOLOGY

MOHAMMAD RIDZUAN BIN MOHAMED NOOR

Final Year Project Report Submitted in
Partial Fulfilment of the Requirement for the
Bachelor of Science (Hons.) Food Science and Technology
In the Faculty of Applied Sciences
Universiti Teknologi MARA Malaysia

NOVEMBER 2008

ACKNOWLEDGEMENTS

I would like to express my deepest appreciation and gratitude to my supervisor, Assoc. Prof. Dr Zainal Samicho for his invaluable guidance, understanding, patience, support and constant encouragement through out the course of my study. My appreciation also for Assoc. Prof. Dr Norizzah Abd Rashid, Head of Programme of B.Sc (Hons.) Food Science and Technology and other lecturers for their support and guidance.

My deepest appreciation is also goes to my father, my mother, and my family for their enormous amount of love, support, encouragement and sacrifice that had given to me. Special thanks to Pn. Azizah Othman for her encouragement, patience and support.

I would like to extend my thanks to all laboratory staff, Puan Norahiza Mohd Soheh, Encik Osman Abdul Rahman, Puan Siti Marhani Mardi, Cik Nor Suhadah Mohammad Samri, and Encik Muhammad Fazli Kamarudin for their untiring assistance and guidance. I also would like to thank all my senior, for their suggestions, guidance and constructive comments towards the preparation of this project. To all my friends, especially my classmate, thanks for their opinions through out my study.

Finally to people whose are directly or indirectly contribute towards the completion of this study, Thank You.

TABLE OF CONTENTS

ABSTRACT

OPTIMISATION OF CAROTENOIDS EXTRACTION FROM SHRIMP WASTE BY VEGETABLE OILS USING RESPONSE SURFACE METHODOLOGY (RSM)

The purpose of this study was to optimise the carotenoids extraction from shrimp waste by vegetable oils using Response Surface Methodology (RSM) of MINITAB Software (Version 14). Experimental design was created by RSM whereby test variables; heating temperature (^{0}C), heating time (min), oil: waste ratio, centrifuge speed (xg) and centrifuge time (min) were used. Shrimp waste were blended and mixed thoroughly in different volumes of vegetable oils and treated differently in terms of heating temperature and heating time as suggested by the experimental design of RSM. The optimal centrifugal speed also was investigated and relative centrifugal field (RCF) of 3473 x g for 27 minutes showed the best performance. This combination condition was able to give 50.2% carotenoids extraction from shrimp by sunflower oil. Carotenoids measurement was carried using UV/VIS spectrophotometer (PerkinElmer Lambda 35). Carotenoids extracted from shrimp waste are 6.168 μg/g at the optimum condition; using sunflower oil heating temperature: 76.8 °C for 72 minutes, oil: waste 1.01:1, centrifuge speed at 3473 xg for 26 minutes. In addition, the significant regression equation or model at 5% level of confidence was also established for the estimation of the carotenoids extraction from shrimp waste using sunflower oil. This indicates that sunflower oil is a potential solvent to be employed to extract carotenoids from shrimp waste.

CHAPTER 1

INTRODUCTION

1.0 Background

Over the past two decades the shellfish industry has experienced a significant expansion, making crustacean waste material available concentrated in some area and in large quantities. The most commercially harvested crustacean species are crab, shrimp, prawn, antarctic krill and cray fish. Used of these crustaceans' wastes has been of interest to researcher for two reasons: (1) this waste is highly perishable and creates environmental pollution (2) these are the rich sources of protein, chitin and carotenoids. These large quantities of waste materials are useful in production of chitin, which is the second most abundant natural polymer on earth (Babu *et al.*, 2007).

The seafood processing industry is one of the major food processing industries. Processing of shrimp invariably generate solid waste in form of head and body carapace. The major components (dry weight basis) of shrimp are protein (35-50%), chitin (15-25%), mineral (10-15%) and carotenoids. At present, a small quantity of this waste is used in the dry form as an ingredient in animal feed and for the production chitin or chitosan. However, large