

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

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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 ($^{\circ}\text{C}$), 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 $3473 \times g$ 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 $6.168 \mu\text{g/g}$ 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