

**OPTIMIZATION OF PROTEIN DETERMINATION USING
DESIGN OF EXPERIMENT METHODOLOGY IN
EARTHWORM (*Eisenia foetida*) POWDER**

SITI NURSHEELA BINTI ABU MANSOR

**SCHOOL OF BIOPROCESS ENGINEERING
UNIVERSITI MALAYSIA PERLIS
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by

SITI NURSHEELA BINTI ABU MANSOR

SCHOOL OF BIOPROCESS ENGINEERING



MAY 2010

APPROVAL AND DECLARATION SHEET

This project report titled Optimization of Protein Determination Using Design of Experiment Methodology in Earthworm (*Eisenia foetida*) Powder was prepared and submitted by Siti Nursheela Binti Abu Mansor (Matrix Number: 061140698) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Bioprocess Engineering) in Universiti Malaysia Perlis (UniMAP).

Checked and Approved by

(DR. ZARINA ZAKARIA)
Project Supervisor

**School of Bioprocess Engineering
Universiti Malaysia Perlis**

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ABSTRAK

Pengoptimuman Kandungan Protein Di Dalam Serbuk Cacing (*Eisenia foetida*) Dengan Menggunakan Kaedah Design of Experiment (DOE).

Protein telah sekian lama dipercayai mempunyai kepentingan nutrisinya yang tersendiri, malah perkataan protein dalam Greek membawa maksud sesuatu yang diberi keutamaan. Kajian telah dijalankan terhadap komposisi kimia, longgokan tahi cacing *Eisenia foetida*, serta bendalir di dalam badannya. Perbandingan juga telah dilakukan ke atas kepelbagaian sumber makanan lain dan makanan haiwan. Analisis nutrisi membuktikan bahawa cacing *Eisenia foetida* mengandungi kandungan protein yang tinggi iaitu diantara lingkungan 54.6 ke 76.0% jisim kering. Kandungan protein dan komposisi asid amino dalam cacing *Eisenia foetida* bukan sahaja menyerupai sajian ikan dan telur, malah kandungan proteinnya lebih tinggi berbanding tepung susu lembu dan sajian soya. Melalui kajian ini juga, cacing *Eisenia foetida* didapati mempunyai potensi untuk dijadikan makanan tambahan kepada makanan haiwan berikutan kandungan proteinnya yang tinggi. Justeru, harga makanan ikan yang kini melonjak naik telah memberi kesan kepada perkembangan penternakan ikan terutamanya ikan air tawar. Oleh yang demikian, cacing *Eisenia foetida* adalah pilihan yang terbaik untuk menggantikan makanan ikan. Dengan menggunakan kaedah Kjeldahl dan Design of Experiment (DOE), analisis protein telah dilakukan dan membuahkan hasil yang memuaskan. Kesemua parameter yang dikaji memberi kesan yang positif dan ini menunjukkan bahawa parameter memainkan peranan yang penting di dalam kajian ini.

ABSTRACT

Optimization of Protein Determination Using Design of Experiment (DOE) Methodology in Earthworm (*Eisenia foetida*) Powder.

Proteins have long been considered very important nutrients; in fact the word 'protein' is derived from the Greek and means 'holding first place'. The chemical compositions of the earthworm *Eisenia foetida*, its casts and body fluids were investigated and compared with those of a variety of common foods and animal feeds. Nutrient analyses showed that *Eisenia foetida* meal has high protein content in the range of 54.6 to 76.0% dry matter. The protein content and amino acid composition were close to those of fish meal and eggs, and higher than cow milk powder and soybean meal. With this study, *Eisenia foetida* has the potential to be used as a food supplement for animals especially in fish meals. The cost of fish meals has been recognized as a major factor affecting the development and expansion of aquaculture enterprise. Therefore, the earthworm *Eisenia foetida* was a good choice to be replaced as fish meals. Analysis of proteins was done by using Kjeldahl method and Design of Experiment (DOE). Furthermore, the study was achieved successfully which to obtain the significant parameters for each performance of time digestion for the Kjeldahl method and variable of sulfuric acid (98%) volume.

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LIST OF SYSMBOLS, ABBREVIATIONS OR NOMENCLATURE

| | |
|-------|-------------------------|
| DOE | Design of Experiment |
| ANOVA | Analysis of Variance |
| RSM | Response Surface Method |

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