



UNIVERSITI
TEKNOLOGI
MARA

Fakulti
Sains Gunaan

**SUBMISSION FOR EVALUATION
FINAL YEAR PROJECT 2 - RESEARCH PROJECT**

**CHARACTERIZATION AND APPLICATION OF BLUE PEA FLOWER (*Clitoria ternatea*) NATURAL DYES
ON COTTON FABRICS THROUGH A STUDY OF THREE PRE-TREATMENT TECHNIQUES**

Name : Mohammad Shukri Mohammad Suib
Student ID : 2023502253
Program : AS245
Course code : FSG671
Mobile Phone :
E-mail : mohdshukrisli23@gmail.com

Approval by Main Supervisor :

I certify that the work conducted by the above student is completed and approve this report to be submitted for evaluation.

Supervisor's name : Mdm Noor Hafizah Binti Uyup
Date : 16th February 2026
Turnitin Similarity % : 3%
Signature :

NOOR HAFIZAH UYUP
Penasihat Kanan (Kimia)
Fakulti Sains Gunaan
Universiti Teknologi MARA
Cawangan Perlis

**CHARACTERIZATION AND APPLICATION OF BLUE PEA FLOWER (*Clitoria ternatea*)
NATURAL DYES ON COTTON FABRICS THROUGH A STUDY OF THREE PRE-
TREATMENT TECHNIQUES**

MOHAMMAD SHUKRI MOHAMMAD SUIB

**Final Year Project Report Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Applied Chemistry
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

FEBRUARY 2026

This Final Year Project entitled “Characterization and Application of Blue Pea Flower Natural Dyes on Cotton Fabrics Through a Study of Three Pre-Treatment Techniques” was submitted by Mohammad Shukri Mohammad Suib in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by

Noor Hafizah Binti Uyup
Supervisor
B. Sc. (Hons.) Applied Science
Faculty of Applied Sciences
Universiti Teknologi MARA
02600 Arau
Perlis

Farhana Binti Othman
Project Coordinator
B. Sc. (Hons.) Applied
Chemistry
Faculty of Applied Science
Universiti Teknologi MARA
02600 Arau
Perlis

Dr. Nur Nasulhah Kasim
Head of Programme
B. Sc. (Hons.) Applied
Chemistry
Faculty of Applied Science
Universiti Teknologi MARA
02600 Arau
Perlis

Date: February 2026

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF SYMBOLS	viii
LIST OF ABBREVIATIONS	ix
ABSTRACT	x
ABSTRAK	xi
CHAPTER 1 INTRODUCTION	
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Research Questions	2
1.4 Objectives	2
1.5 Significance of Study	3
1.6 Expected Outcome	3
CHAPTER 2 LITERATURE REVIEW	
2.1 Introduction	4
2.2 Natural Dyes and Their Potential in Sustainable Textiles	6
2.2.1 Blue Pea Flower as a Source of Dye	6
2.3 Dyeing Properties and Colour Spectrum	7
2.3.1 Spectral Properties and Colour Range	7
2.3.2 Colour Development Influencing Factors	8
2.3.3 Colour Difference in Blue Pea Flower Varieties	9
2.4 Cotton Fabric Natural Dyeing	10
2.5 Role of Mordants and Pre-treatment in Natural Dyeing	11
2.5.1 Copper Mordanting	12
2.5.2 Hydrogen Peroxide as a Scouring Agent	13
2.6 Colourfastness Testing in Natural Dye Studies	15
2.7 Tropical Semi-Field Testing	16
2.8 Economic and Commercial Viability	17

ABSTRACT

CHARACTERIZATION AND APPLICATION OF BLUE PEA FLOWER NATURAL DYES ON COTTON FABRICS THROUGH A STUDY OF THREE PRE-TREATMENT TECHNIQUES

This paper has explored the use of *Clitoria ternatea* (Blue Pea Flower) as natural dye of cotton fabrics, and it has focused on enhancing the dye uptake, colour intensity and fastness attributes using chemical pre-treatment and mordanting. An aqueous method was used to extract fresh blue pea flowers. Three treatment conditions were applied to cotton fabrics, first were not treated (control), second were copper mordanting, and the third one were hydrogen peroxide pre-treatment with copper mordanting. Evaluation test of the dyed fabrics consisted of ISO based on colourfastness tests, semi-field exposure to sunlight and rain and through UV-Vis spectrophotometric analysis. These findings showed that the pre-treatment of the tissue using hydrogen peroxide and copper mordanting gave the dark and most consistent blue coloration and the best resistance to washing, rubbing, exposure to light and environmental effects. Based on UV-Vis analysis, an increase in absorbance intensity of dye baths and spectral changes in copper-treated dye baths indicate that the anthocyanin has been more stable as a result of metal-ligand coordination. Overall, the results demonstrate that proper fibre surface alteration and mordanting have a significant impact on the performance of *Clitoria ternatea* dyes, which can justify their possible utilisation as an alternative to dye textile application in terms of sustainability.