

**EXTRACELLULAR BIOSYNTHESIS OF IRON-BASED
NANOPARTICLES BY ISOLATED BACTERIA FROM
SOIL**

DURRA SHAHIRAH BINTI MOHD AZMAN

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

JULY 2015

ACKNOWLEDGEMENTS

Alhamdulillah, endless gratitude and highest praise to God the Almighty for His countless blessings for allowing me to finally finish this final year project with success. I would also like extending my thankful thought to my supervisor, Miss Siti Suhaila binti Harith for her supportive comments and continuous encouragement to me throughout the whole process of completing this project, from the very beginning till the day of this report's submission. Not to forget, special thanks to Dr. Aiza binti Harun for lending me her great suggestion and ideas in my process to improvise this project.

I couldn't be more thankful to my project partner, Siti Mariam binti Mohamad Shah for the team work efforts and tasks, not to mention for limitless hours and days spent together in laboratory in our progress to finish the experiment. I would also express my gratitude towards my family for trusting me and reminding me not to give up too quick. My sincere appreciation is also extended to all laboratory assistants at Biology and Chemistry laboratories and to everyone who directly or indirectly gives helps and advices that lead towards the successful completion of this project.

Durra Shahirah Binti Mohd Azman

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	x
ABSTRAK	xi
CHAPTER 1: INTRODUCTION	
1.1 Background of study	1
1.2 Problem statement	2
1.3 Significance of the study	2
1.4 Objectives of the study	2
CHAPTER 2: LITERATURE REVIEW	
2.1 Iron metal	3
2.2 Nanoparticles	4
2.3 Biosynthesis of iron nanoparticles	6
2.4 Techniques for nanoparticles characterization	6
2.4.1 Scanning Electron Microscope (SEM)	6
2.4.2 X-ray Diffraction (XRD)	7
2.4.3 Fourier Transform Infrared Spectroscopy (FT-IR)	7
2.5 Type of extracellular bacteria that can synthesis iron nanoparticles	8
CHAPTER 3: METHODOLOGY	
3.1 Materials	9
3.1.1 Raw materials	9
3.1.2 Chemical	10
3.1.3 Apparatus	10
3.2 Methods	11
3.2.1 Sample collection and serial dilution	12
3.2.2 Preparation of agar	12
3.2.3 Bacteria isolation	12
3.2.4 Preparation of stock culture and pure culture	13
3.2.5 Bacteria screening	13

CHAPTER 4 : RESULTS AND DISCUSSION	
4.1 Bacteria Isolation	14
4.2 Screening of potential bacteria	27
CHAPTER 5 : CONCLUSION AND RECOMMENDATIONS	35
CITED REFERENCES	37
APPENDICES	42
CURRICULUM VITAE	

ABSTRACT

EXTRACELLULAR BIOSYNTHESIS OF IRON-BASED NANOPARTICLES BY ISOLATED BACTERIA FROM SOIL

Nowadays, nanotechnology has exposed the great advancement of technology to humans, lifting the world to more advanced levels. Iron nanoparticles synthesis has been gaining attention due to its high demand from industry. Biological synthesis seems to be one of the best approachable ways because it is safe to environment. The main objectives of this study are to isolate potential bacteria that can produce iron-nanoparticles from soil and to screen potential bacteria using UV-Vis Spectrophotometer. A total of 17 bacteria were isolated from three different soil samples. Based on colony morphology, the isolates number had been reduced to only 5 distinctive bacteria. Bacteria A was found in crenated edge, rough surface, irregular, opaque and pale white in colour. The description for bacteria B was circular in shape, smooth, undulating, translucent and yellow in colour. Bacteria C, it was appeared smooth, circular, translucent, undulating, orange in colour. Bacteria D appeared to be undulating, irregular, dull, opaque, and white in colour. It also was claimed to be a motile organism based on spread growth. Meanwhile, bacteria E appeared to be circular, smooth surface, opaque, and light yellow in colour. Spectrophotometer analysis had shown that supernatant bacteria A contained 0.093 mg/mL of Fe_2O_3 , bacteria B, 0.149 mg/mL; bacteria C, 0.124 mg/mL; bacteria D, 0.103 mg/mL and in supernatant bacteria E, amount of Fe_2O_3 present was 0.098 mg/mL. Since supernatant bacteria A contained the lowest amount of Fe_2O_3 , it indirectly became the most highly potential bacteria in synthesizing Fe_3O_4 .