

**PERFORMANCE OF RED SEAWEED FOR
AZO DYE REMOVAL : ACID YELLOW 17**

FARAH AQILAH BINTI MUSTAFA

B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG



SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

(Supervisor's Signature)

Full Name : HASMANIE BINTI ABDUL HALIM

Position : LECTURER

Date : 19 JUNE 2017



STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

(Student's Signature)

Full Name : FARAH AQILAH BINTI MUSTAFA

ID Number : AA13234

Date : 19 JUNE 2017

PERFORMANCE OF RED SEAWEED FOR AZO DYE
REMOVAL : ACID YELLOW 17

FARAH AQILAH BINTI MUSTAFA

Thesis submitted in fulfillment of the requirements
for the award of the
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG

JUNE 2017

ACKNOWLEDGEMENTS

First of all, I am using this opportunity to express my gratitude to everyone who supported me throughout the course of this final year project. I am thankful for their aspiring guidance, invaluable constructive criticism and friendly advice during the project work. I am sincerely grateful to them for sharing their truthful and illuminating views on a number of issues related to the project.

I wish to express my sincere thanks to Pn. Hasmanie bt Abdul Halim, my supervisor, and Pn. Nadiah bt Mokhtar for sharing expertise, and sincere and valuable guidance and encouragement extended to me. Without their help, this study would hardly been completed.

My thankfulness is also to the staff of Environmental Lab of Universiti Malaysia Pahang for their assistance and support. I take this opportunity to express gratitude to all of the Department faculty members for their help and support.

Above ground, I want to thank my parents for the unceasing encouragement, support and attention. I am also grateful to my partner and friends who supported me through this venture. I also place on record, my sense of gratitude to one and all, who directly or indirectly, have lent their hand in this venture.

TABLE OF CONTENT

	TITLE PAGE
DECLARATION	
ACKNOWLEDGEMENTS	ii
ABSTRAK	iii
ABSTRACT	iv
TABLE OF CONTENT	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF SYMBOLS	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1 INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statement	5
1.3 Objectives	5
1.4 Scope of Study	6
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Classification of Dyes	8
2.3 Problems Associated with Dyes	10
2.3.1 Method In Removal Of Dye Compounds	11
2.3.2 Biological Method	11

2.3.3	Chemical Method	12
2.3.4	Physical Method	12
2.4	Adsorption	13
2.5	Acid Yellow 17 Dye	15
2.6	Marine Seaweed As Biosorbent	16
2.6.1	Classification of Marine Seaweed	16
2.6.2	Uses of Seaweed	17
2.6.3	Euchema Spinosum (Red Seaweed)	18
CHAPTER 3 METHODOLOGY		21
3.1	Introduction	21
3.2	Preparation and Characterization of Biosorbent	22
3.3	Point of zero charge	24
3.4	Preparation of dye solution	24
3.5	Analytical measurements	26
3.5.1	Calibration Curve	26
3.5.2	Calculation of uptake capacity (q_e)	27
3.5.3	Calculation of percentage removal of dye	27
3.5.4	Effect of change in contact time on adsorption	28
3.5.5	Effect of change in absorbent dosage of seaweed on adsorption	29
3.5.6	Effect of change in pH of solution on adsorption	29
3.5.7	Effect of change in initial concentration of solution on adsorption	29
CHAPTER 4 RESULTS AND DISCUSSION		30
4.1	Introduction	30
4.2	Point of zero change	30

4.3	Effect of change in contact time on adsorption	31
4.4	Effect of change in absorbent dosage of seaweed on adsorption	35
4.5	Effect of change in pH of solution on adsorption	39
4.6	Effect of change in initial concentration of solution on adsorption	41
CHAPTER 5 CONCLUSION		44
5.1	Conclusion	44
REFERENCES		45

LIST OF TABLES

Table 4.1	Readings of initial pH, final pH, and difference in pH	30
Table 4.2	Different concentrations of dye solution	30
Table 4.3	The tabulation of data for contact time for removal of dye by Acid Yellow 17	30
Table 4.4	Different concentrations of dye solution	30
Table 4.5	The tabulation of data for dosage for removal of dye by Acid Yellow 17	30
Table 4.6	The tabulation of data for pH for removal of dye by Acid Yellow 17	30
Table 4.7	Data of initial concentration of 50mg/L for removal of Acid Yellow 17 dye	41
Table 4.8	Data of initial concentration of 50mg/L for removal of Acid Yellow 17 dye	41 - 42
Table 4.9	Data of initial concentration of 50mg/L for removal of Acid Yellow 17 dye	42

LIST OF FIGURES

Figure 1.1	The dyeing of fabric process	2
Figure 1.2	Advantages and disadvantages of physical and chemical methods of dye removal	3
Figure 1.3	<i>Euchema Spinosum</i>	4
Figure 2.1	The breakdown of dyes	9
Figure 2.2	Method of removal of dyes for textile effluents	11
Figure 2.3	Adsorption, where molecules will stick to the surface of the solid	14
Figure 2.4	The reaction between the ions of the molecules	14
Figure 2.5	The chain structure of Acid Yellow 17	15
Figure 2.6	Acid Yellow 17 in powder form	16
Figure 2.7	Brown algae, green algae, red algae	17
Figure 2.8	The location of red seaweed, <i>Semporna</i> , Sabah	18
Figure 2.9	<i>Euchema Spinosum</i> or also known as <i>Eucheuma denticulatum</i>	19
Figure 3.1	Process flow of removal of Acid Yellow 17 by <i>E. Spinosum</i> seaweed	21
Figure 3.2	Raw seaweed in its moist condition	22
Figure 3.3	Seaweed was first washed and rinsed with tap water, was thoroughly washed with doubly distilled water.	22
Figure 3.4	Seaweed was oven-dried at 60°C for 24 hours	23
Figure 3.5	Dried seaweed	23
Figure 3.6	Dried seaweed was blended to desired particle sizes, 0.7mm – 1.5mm	24
Figure 3.7	201987 SIGMA-ALDRICH Acid Yellow 17 dye	25
Figure 3.8	100mg/L Acid Yellow 17 dye	25
Figure 3.9	Vials containing mixed solution was placed in shaker	28
Figure 4.1	Graph of difference in pH against initial pH	31
Figure 4.2	Analysis of the dye concentrations	32
Figure 4.3	Effect of contact time on removal of Acid Yellow 17	34
Figure 4.4	Analysis of the dye concentrations	36
Figure 4.5	Effect of dosage on removal of Acid Yellow 17	38
Figure 4.6	Effect of pH on removal of Acid Yellow 17	40
Figure 4.7	Effect of concentrations on removal of Acid Yellow 17	43

LIST OF SYMBOLS

AY17	Acid Yellow 17
FAO	Food and Agriculture Organization of the United Nations
UV	Ultraviolet
ZPC	Zero Point of Charge
Fe	Iron
Ca	Calcium
OH	Hydroxide
DNA	Deoxyribonucleic acid
COD	Chemical oxygen demand
abs	absorption spectrum
rpm	revolutions per minute
HCl	Hydrochloric acid
NaOH	Sodium hydroxide
C.I.	Colour Index
AC	Activated Carbon
E.Spinosum	Euchemia Spinosum

LIST OF ABBREVIATIONS

AY17	Acid Yellow 17
FAO	Food and Agriculture Organization of the United Nations
UV	Ultraviolet
ZPC	Zero Point of Charge
Fe	Iron
Ca	Calcium
OH	Hydroxide
DNA	Deoxyribonucleic acid
COD	Chemical oxygen demand
abs	absorption spectrum
rpm	revolutions per minute
HCl	Hydrochloric acid
NaOH	Sodium hydroxide
C.I.	Colour Index
AC	Activated Carbon
E.Spinosum	Euchemia Spinosum