

THE CORRELATION OF MATERIALS DAMAGE WITH
TEMPERATURE AND HUMIDITY

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DNA CHARACTERIZATION OF NORMAL AND DAMAGE GILLS FOLLOWING
ZINC EXPOSURE

By
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This project report is submitted in partial fulfillments of the requirement for the degree of
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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk :

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Table of Contents

ACKNOWLEDGEMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	viii
LIST OF PLATES	x
LIST OF SYMBOL	xi
LIST OF APPENDIXES	xii
ABSTRACT	xiv
ABSTRAK	xv
CHAPTER 1	
Introduction	1
CHAPTER II	
Literature Review	
2.1 Red Tilapia Fish	5
2.2 Heavy Metal in Fish	9
2.3 Zinc	12
2.4 96 hours LC ₅₀ Acute Toxicity Test	13
2.5 Gills	16
2.6 Randomly Amplified Polymerase Chain Reaction	18
2.6.1 Analysing the DNA product	22
2.6.2 Mixture Reaction in PCR	23

CHAPTER III

Methodology

3.1	Study Site	28
3.1.1.	Experimental Design	28
3.1.2.	Part A: Determination of 96 hours LC ₅₀ of Zinc on Tilapia	31
3.1.3.	Statistical Analysis Test	32
3.2	Uptake and Accumulation of Zinc in Tilapia Fish	32
3.3	Equipment	34
3.4	Part B: Determination of Metal Concentration in Tissue Tilapia Fingerlings at 7, 14 and 21 Days Exposure to Zn	35
3.4.1	Tissue Sampling	35
3.4.2	Tissue Preparation for Determination of Metal Concentration the Gills	35
3.4.3	Open Acid Digestion	36
3.4.4	Metal Recovery Measurement	36
3.4.5	Heavy Metal Measurement in the Tissue Gills of Tilapia Fingerlings	38
3.5	Part C: DNA Analysis of Normal and Exposure Tilapia Fingerlings at 7,14 and 21 Days Exposure to Zn.	39
3.5.1	DNA Extraction	39
3.5.2	Purification and Quantification of DNA	40
3.5.3	DNA Amplification by RAPD	43

3.5.4	Database Establishment	45
3.5.5	Data Analysis	45
CHAPTER IV		
	Results	47
4.1	Part A: Determination of 96-h LC ₅₀ zinc for Nile /Red Tilapia (<i>Oreochromis niloticus</i>)	47
4.2	Part B: Uptake and Accumulation of Zinc on Nile / Red Tilapia Fingerlings` s gills during 7, 14 and 21 Days Exposure	48
4.2.1	Metal Recovery Measurement	48
4.2.2	Accumulation of Zinc on Tilapia Fingerlings	48
4.3	Part C: Effect of Zinc on the Genomic of the Nile/Red Tilapia Fingerlings after 7, 14 and 21 Days Exposure.	54
4.3.1	DNA Extraction	54
4.3.2	Result for RAPD-PCR	59
CHAPTER V		
	Discussion	64
CHAPTER VI		
	Conclusion	70
	References	71
	Appendixes	76
	Curriculum Vitae	91

LIST OF TABLES

2.6.2a	Universal Primers.	24
3.2.1	Concentration Design for Uptake and Accumulation of Zn ²⁺ in Tilapia Fingerlings for 21 Days of Period.	33
3.4.4	Summary of DOLT-3 Dogfish Certified Metal Concentration Trace Elements-(mg kg ⁻¹)	37
3.5.3a	Final concentration of PCR mixture.	44
3.5.3b	Amplification Profile.	44
4.1.1	96-h LC ₅₀ using Probit Method Computer Programme.	47
4.2.2a	96-h LC ₅₀ Median Lethal Concentration for the Uptake and Accumulation	49
4.2.2b	The Statistical Correlation and Regression for the Metals Accumulated in Nile Tilapia (<i>Oreochromis niloticus</i>) within 21 days.	50
4.3.1a	Absorbance Reading by Biophotometer at 260 and 280 Wavelength and Concentration of DNA.	54
4.3.2a	PCR Fingerprinting Pattern of Tilapia Fish (<i>Oreochromis Niloticus</i>) During 7 Days Exposed To Zinc.	60
4.3.2b	PCR Fingerprinting Pattern of Tilapia Fish (<i>Oreochromis niloticus</i>) during 14 Days Exposed to Zinc.	61
4.3.2c	PCR fingerprinting pattern of tilapia fish (<i>Oreochromis niloticus</i>) during 21 Days Exposed to Zinc	61

LIST OF FIGURES

2.1.1	Taxonomy of Nile Tilapia (<i>Oreochromis niloticus</i>)	8
2.2.1	Toxicity Affects the Overall Structure of Environment.	11
2.5.1	Diagram of Fish Gills.	17
2.6.1	An Illustration how the DNA was Amplified.	21
2.6.2	The Exponential Amplification of the Gene in PCR	21
2.6.3	An illustration on PCR techniques work.	22
3.5.2b	Summary of the Process Testing the DNA Genomic of Tilapia Fingerlings by Electrophoresis Method.	43
4.2.2a	Zinc Concentration in Gill Tissue at 7, 14 and 21 Days Exposure	49
4.2.2b	Zinc Concentration in Tissue According to Body Weight During 7 Days Exposure.	51
4.2.2c	Zinc Concentration in Tissue According to Body Weight During 14 Days Exposure	51
4.2.2d	Zinc Concentration in Tissue According to Body Weight During 21 Exposure.	51
4.2.2e	Zinc Concentration in Tissue According to Size During 7 Days Exposure.	52
4.2.2f	Zinc Concentration in Tissue According to Size During 14 Days Exposure.	52
4.2.2g	Zinc Concentration in Tissue According to Size During 21 Days Exposure.	52
4.3.1a	The Pattern Genomic DNA of Gills Tilapia Fingerlings by Electrophoresis Exposed to 7 Days.	56
4.3.1b	The Pattern Genomic DNA of Gills Tilapia Fingerlings by Electrophoresis Exposed to 14 Days.	57

4.3.1c	The Pattern Genomic DNA of Gills Tilapia Fingerlings by Electrophoresis Exposed to 21 Days .	57
4.3.2a	The RAPD Fingerprinting Profile Of Tilapia Fingerlings (<i>Oreochromis Niloticus</i>) Exposed to Zinc During 7 Days Exposure.	60
4.3.2b	The RAPD Fingerprinting Profile For Tilapia Fingerlings (<i>Oreochromis Niloticus</i>) Exposed to Zinc During 14 Days Exposure.	61
4.3.2c	The RAPD Fingerprinting Profile for Tilapia Fingerlings (<i>Oreochromis Niloticus</i>) Exposed to Zinc During 21 Days Exposure.	62

LIST OF PLATE

2.1.1 Red Tilapia Fingerlings (<i>Oreochromis niloticus</i>)	7
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LIST OF ABBREVIATIONS

bp	base per pair
cm	centimeter
dw	dry weight
gm	gram
HCl	Hydrochloric Acid
HNO ₃	Nitric Acid
H ₂ O ₂	Hydrogen Peroxide
H ₂ SO ₄	Sulfuric Acid
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
L	Liter
mg	milligram
mgL ⁻¹	milligram per liter
PCR	Polymerase Chain Reaction
RAPD-PCR	Randomly Amplified Polymerase Chain Reaction
ppm	parts per million / mgL ⁻¹
ppb	parts per billion / µgL ⁻¹
µgL ⁻¹	microgram per liter
µg	microgram
Zn	Zinc
Zn ²⁺	Zinc in ionic form

LIST OF APPENDIXES

I	Standard Stock Solution of Zinc (Zn^{2+})	76
II	Toxicity Testing- Number of mortality of Nile Tilapia (<i>Oreochromis niloticus</i>) at Different Time Exposed to Different metal Concentrations (Replicate I)	77
III	Toxicity Testing- Number of mortality of Nile Tilapia (<i>Oreochromis niloticus</i>) at Different Time Exposed to Different metal Concentrations (Replicate II)	78
IV	Toxicity Testing- Number of mortality of Nile Tilapia (<i>Oreochromis niloticus</i>) at Different Time Exposed to Different metal Concentrations (Replicate III)	79
V	Toxicity Testing-Summary on Calculation the LC_{50} values of Zinc using Probit Method Computer Program (Replicate 1)	80
VI	Toxicity Testing-Summary on Calculation the LC_{50} values of Zinc using Probit Method Computer Program (Replicate II)	81
VII	Toxicity Testing-Summary on Calculation the LC_{50} values of Zinc using Probit Method Computer Program (Replicate III)	82
VIII	Volumes of Zinc at Each Concentration for the part B (Uptake and Accumulation)	83
IX	Total Length, Body Length, Total Body Weight, Wet Weight and Dry Weight of <i>Oreochromis niloticus</i> at 7, 14, 21 Days Exposure	84
X	Concentration of Metal in the Gills Tissue (μg^{-1}) and Total Body Length (cm) of Nile /Red Tilapia Fingerlings at 7, 14 and 21 Days Exposure	85
XI	Statistical Analysis (ANOVA 2 ways with blocking): Mean Accumulation of Zinc in Gills Tissue of Nile Tilapia Fingerlings for 21 Days.	86

XII	Summary of the Process Testing the DNA Genomic of Tilapia Fish by Electrophoresis Method	87
XIII	Summary of the Process Open Acid Digestion (Heavy metal Analysis)	88
XIV	Summary of the Extraction method using Genomic DNA Purification Kit #K0512	89
XIIV	Apparatus	90

ABSTRACT

The aim of this study is to predict how genomic of Nile/Red Tilapia (3.0cm - 4.0 cm) of normal and exposed respond to heavy metal (zinc) exposure. To complete this study, three parts of experiment were done whereby which each part are related to each other. The first part is to determine the 96-h LC₅₀ value for tilapia fingerlings using the Probit Method (computer programme) and the value was 5.91ppm. This value then was used to design a series of sub-lethal concentration which will be used in the next part (uptake and accumulation). The concentrations are 0 ppm 5.91 ppm, 4.43 ppm, 2.95 ppm and 1.48 ppm derived from 0%, 25%, 50% and 75% of the 96h LC₅₀ value. At this part, fishes were killed every 7 days and the duration of experiment was 21 days. Genomic changes of the death fish will be amplified using RAPD-PCR method and concentration in this tissue will be analysis by using ICP-MS. From the result, it shows that tilapia fingerlings can take up to 3317.713 μg^{-1} of Zn accumulation from 5.91 ppm of concentration and DNA study reveals no significant changes on the genomic at 7 days exposed to Zn. After 14 days exposed to the Zn, one band (900bp) was disappeared at the highest concentration (5.91ppm) with 481.853 μg^{-1} of Zn have been accumulated in the dry tissue of gills. For the fingerlings that were exposed to the other concentration, there were no significant changes. There was one band disappeared at the 5.91 ppm and one band at 4.43 ppm during 21 days exposed (900bp). The accumulation of Zn at 4.43 ppm during 21 days exposed are 1600.353 μg^{-1}

ABSTRAK

Ciri-ciri DNA Bagi Insang Normal dan Rosak selepas Pendedahan dengan Logam Berat Zink

Tujuan kajian adalah untuk meramal perubahan genetik organisma akuatik ikan Tilapia Merah (3.0cm-4.0cm) yang normal dan yang telah didedahkan kepada logam berat Zink. Bagi menyempurnakan kajian ini, tiga peringkat eksperimen telah dijalankan dimana ianya berkaitan diantara satu peringkat dengan yang lain. Bahagian pertama ialah ujian penentuan ketoksikan akut Zn Nilai 96-h LC₅₀ yang telah diperolehi dengan menggunakan kaedah Probit-Method berkomputer ialah 5.91 ppm. Nilai ini kemudian digunakan untuk menghasilkan beberapa siri kepekatan yang akan digunakan dalam bahagian yang seterusnya iaitu ujian pengambilan dan pengumpulan zink dimana kepekatan yang digunakan ialah 0 ppm, 5.91 ppm, 4.43 ppm, 2.95 ppm dan 1.48 ppm setelah dikurangkan 0%, 25%, 50%, 75% daripada nilai 96-h LC₅₀. Pada bahagian ini ikan dibunuh setiap 7 hari dan ujian memakan masa selama 21 hari. Ikan yang telah mati diambil untuk memerhatikan perubahan genomik insang ikan Tilapia dengan menggunakan kaedah RAPD-PCR dan juga untuk menganalisa logam berat Zn untuk menentukan akumulasi Zn pada tisu ikan yang kering dengan menggunakan ICP-MS. Didapati tisu ikan yang kering boleh mengumpul logam Zn sehingga sebanyak 3317.713 μg^{-1} berat kering yang didedahkan pada kepekatan 5.91 ppm. Berdasarkan ujian yang telah dilakukan, tidak ada

perubahan genomic pada insang yang didedahkan pada hari ketujuh pada semua kepekatan Zn. Selepas 14 hari didedahkan kepada Zn, terdapat satu jalur stabil DNA (900bp) telah hilang pada kepekatan 5.91 ppm iaitu kepekatan yang tertinggi dengan 481.853 μg^{-1} akumulasi Zn pada tisu kering insang. Pada ikan yang didedahkan pada kepekatan yang lain, tiada sebarang perubahan genomik yang jelas didapati. Terdapat satu jalur yang hilang pada kepekatan 5.91 ppm (900bp) dan satu jalur juga hilang pada kepekatan 4.43 ppm (900bp) pada hari ke 21. Akumulasi Zn adalah 1600.353 μg^{-1} pada kepekatan 4.43 ppm pada hari ke 21 ini.