

**EVALUATION OF TWO BIOMARKERS:
GLUTATHIONE (GSH) AND LYSOSOMAL
DESTABILIZATION (LyD) FOR DETECTING
COPPER (Cu) AND CADMIUM (Cd)
ACCUMULATION IN MILKFISH (*Chanos chanos*)**

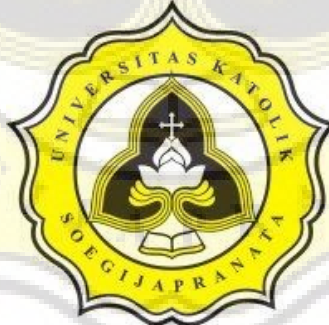
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BANDENG (*Chanos chanos*)***

BACHELOR THESIS

Submitted to the Faculty of Agriculture Technology in partial fulfillment
of the requirements for obtaining Bachelor Degree

By:

**JOHANA LANNA CHRISTABELLA
12.70.0093**



**DEPARTMENT OF FOOD TECHNOLOGY
FACULTY OF AGRICULTURAL TECHNOLOGY
SOEGIJAPRANATA CATHOLIC UNIVERSITY
SEMARANG**

2016

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**This thesis has been approved and defended in front of the examination
committees on 25th October 2016**

Semarang, 16th November 2016
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STATEMENT OF THESIS AUTHENTICITY

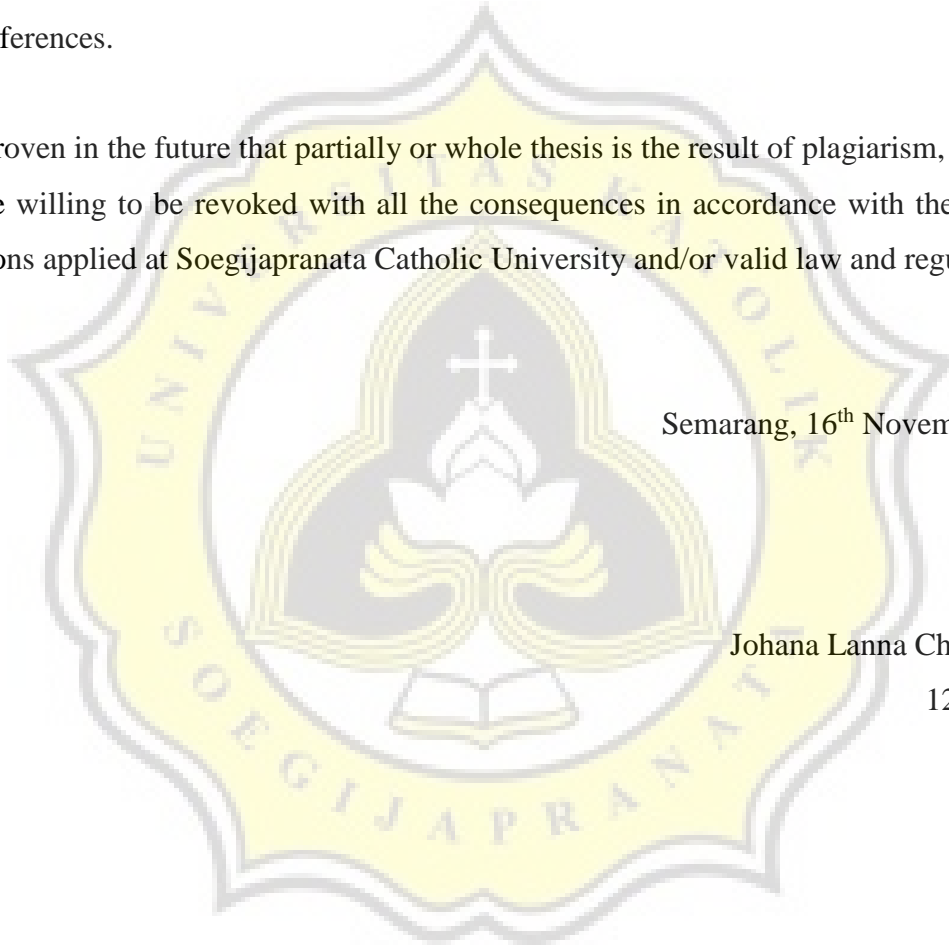
I hereby declare that the thesis entitled **“EVALUATION OF TWO BIOMARKERS: GLUTATHIONE (GSH) AND LYSOSOMAL DESTABILIZATION (LyD) FOR DETECTING COPPER (Cu) AND CADMIUM (Cd) ACCUMULATION IN MILKFISH (*Chanos chanos*)”** contains no work that ever proposed to acquire a bachelorship title in a University, and along to my knowledge, there is no work ever written or published by others, except the ones used as references in this thesis and mentioned in the list of references.

If it is proven in the future that partially or whole thesis is the result of plagiarism, therefore I will be willing to be revoked with all the consequences in accordance with the law and regulations applied at Soegijapranata Catholic University and/or valid law and regulations.

Semarang, 16th November 2016

Johana Lanna Christabella

12.70.0093



SUMMARY

Milkfish (*Chanos chanos*) is one of the most cultured fish in coastal ponds. Higher risk of pollutant as a result of waste disposal from industrial might be a threat to cultured fish, particularly milkfish. Many ways to evaluate metals on fish using toxicity assessment, such as observing growth and mortality. In most cases, those parameters are not sensitive enough to evaluate and too late to read the risk. A biomarker is able to detect the effect of slightest heavy metal concentration exposure in organism. Biomarker will find a potential risk and provide the early warning. Therefore, the aims of this study are to find out the accumulation of copper (Cu) and cadmium (Cd) in milkfish after exposed to polluted water and to compare two cellular biomarker methods, i.e. Glutathione (GSH) and Lysosomal Destabilization (LyD) bioassays in reflecting the extent of metal accumulation in milkfish. Juvenile milkfish were exposed to increasing metal concentrations of contaminants, i.e. Cu and Cd for determining concentrations. Two biomarker methods were compared after 20 days chronic toxicity test. Four fish from each replicate were randomly selected every 5 days. Muscle, liver and gill tissues were taken from three fish for GSH analysis, while the liver from one fish was used for LyD analysis. Elimination phase was conducted in the five last days by removing all contaminants and exposed with clean water. The result showed that the lower contaminant concentration detected by biomarker, the more sensitive the biomarker is. Gill and muscle were the most sensitive organs for GSH method to detect Cu and Cd contaminant respectively. By using LyD assay, liver was more sensitive to evaluate Cd rather than Cu. GSH and LyD method is an efficient biomarker to evaluate the risk of Cu and Cd exposure by using gill, muscle, and liver in 5 days.

RINGKASAN

Ikan bandeng (Chanos chanos) merupakan salah satu ikan budidaya yang sebagian besar dibudidayakan di tambak. Tingginya risiko polutan sebagai hasil dari pembuangan limbah industri dapat menjadi ancaman bagi ikan budidaya, khususnya ikan bandeng. Banyak metode yang dapat digunakan untuk mengevaluasi logam pada ikan menggunakan uji toksisitas, yaitu dengan pengamatan pertumbuhan dan mortalitas. Namun, parameter tersebut tidak cukup sensitif, dan bahkan dinilai terlambat untuk membaca risiko. Biomarker dapat mendeteksi efek pada organisme yang telah terpapar logam berat dalam konsentrasi yang sangat rendah. Biomarker akan menemukan potensi resiko dan memberikan tanda awal. Tujuan penelitian ini adalah untuk mengetahui akumulasi tembaga (Cu) dan cadmium (Cd) pada ikan bandeng setelah terpapar air yang tercemar logam berat, dan untuk mengevaluasi dua metode biomarker seluler, yaitu Glutathione (GSH) dan Lysosomal Destabilization (LyD) dalam mencerminkan sejauh mana akumulasi logam berat pada ikan bandeng. Ikan bandeng juvenil dipapar pada sejumlah konsentrasi Cu dan Cd untuk menentukan konsentrasi. Dua metode biomarker dibandingkan setelah dilakukan uji toksisitas 20 hari. Empat ekor ikan pada masing-masing ulangan diambil secara acak setiap hari ke 5. Jaringan otot, hati, dan insang diambil dari ketiga ikan untuk analisa GSH, dan jaringan hati dari satu ikan lainnya digunakan untuk analisa LyD. Fase eliminasi dilakukan dalam lima hari terakhir dengan menghilangkan seluruh kontaminan, dan mengganti dengan air bersih. Hasil penelitian menunjukkan bahwa semakin rendah konsentrasi yang dapat dideteksi oleh biomarker, maka semakin sensitif pula biomarker tersebut. Jaringan insang dan otot merupakan organ yang paling sensitif pada metode GSH dalam mendeteksi Cu dan Cd. Dengan menggunakan pengujian LyD, jaringan hati lebih sensitif dalam mendeteksi Cd daripada Cu. Metode GSH dan LyD merupakan biomarker yang efisien dalam mengevaluasi resiko paparan Cu dan Cd dengan menggunakan jaringan insang, otot, dan hati selama 5 hari.

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This research entitled “Evaluation of Two Biomarkers: Glutathione (GSH) and Lysosomal Destabilization (LyD) for Detecting Copper (Cu) and Cadmium (Cd) Accumulation in Milkfish (*Chanos chanos*)” can superbly done with the advice, support, help, and prayer from several individuals that the author very thankful for. The author would like to gratefully acknowledge those wonderful persons:

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Semarang, 16th November 2016

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Johana Lanna Christabella

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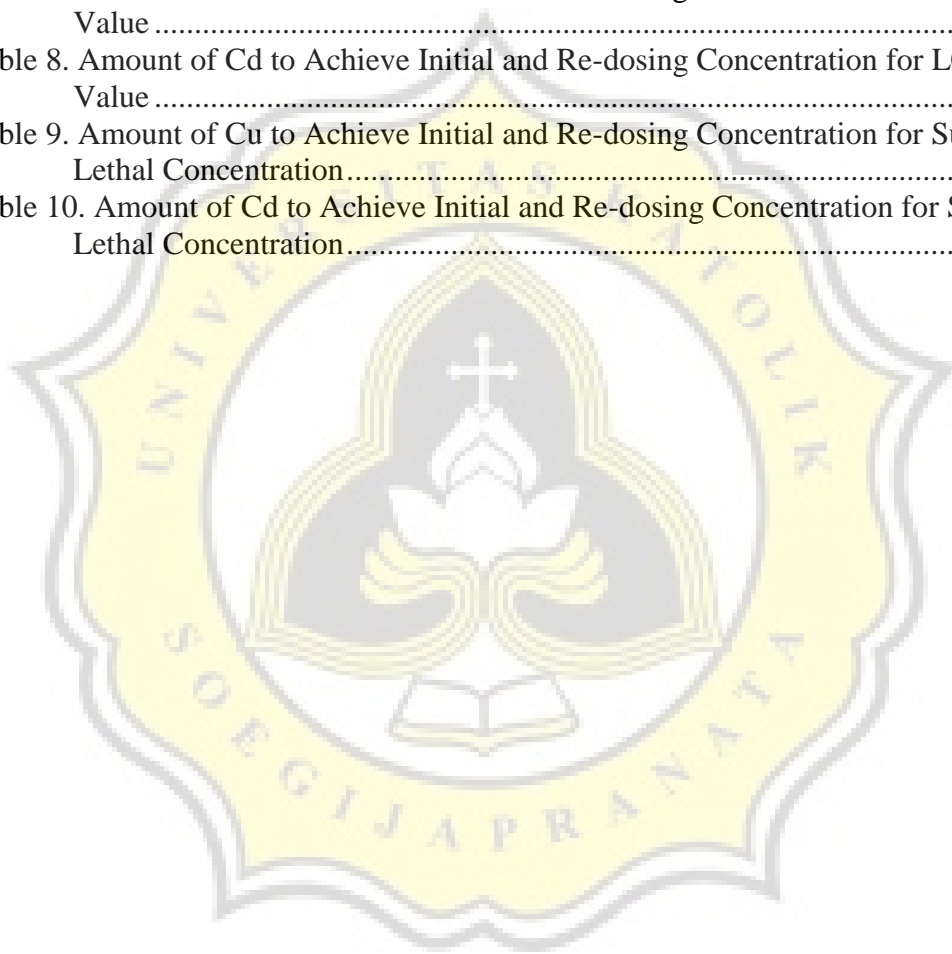
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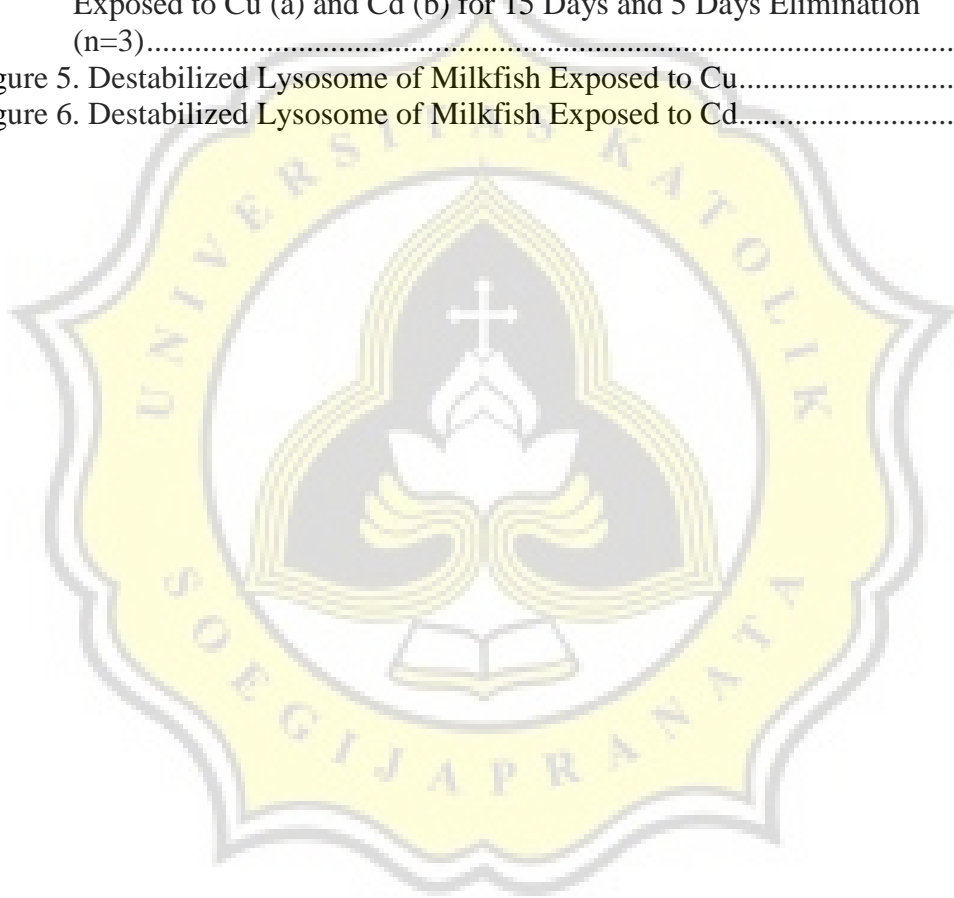
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