

**EVALUATION OF EFFECTIVENESS TWO BIOMARKERS
(GLUTATHIONE AND LYSOSOMAL DESTABILIZATION)
FOR COPPER AND CADMIUM EXPOSURES
IN NILE TILAPIA (*Oreochromis niloticus*)**

***EVALUASI EFEKTIVITAS DUA BIOMARKER (GLUTATHIONE
DAN LYSOSOMAL DESTABILIZATION)
UNTUK PAPARAN TEMBAGA DAN KADMIUM
PADA IKAN NILA (*Oreochromis niloticus*)***

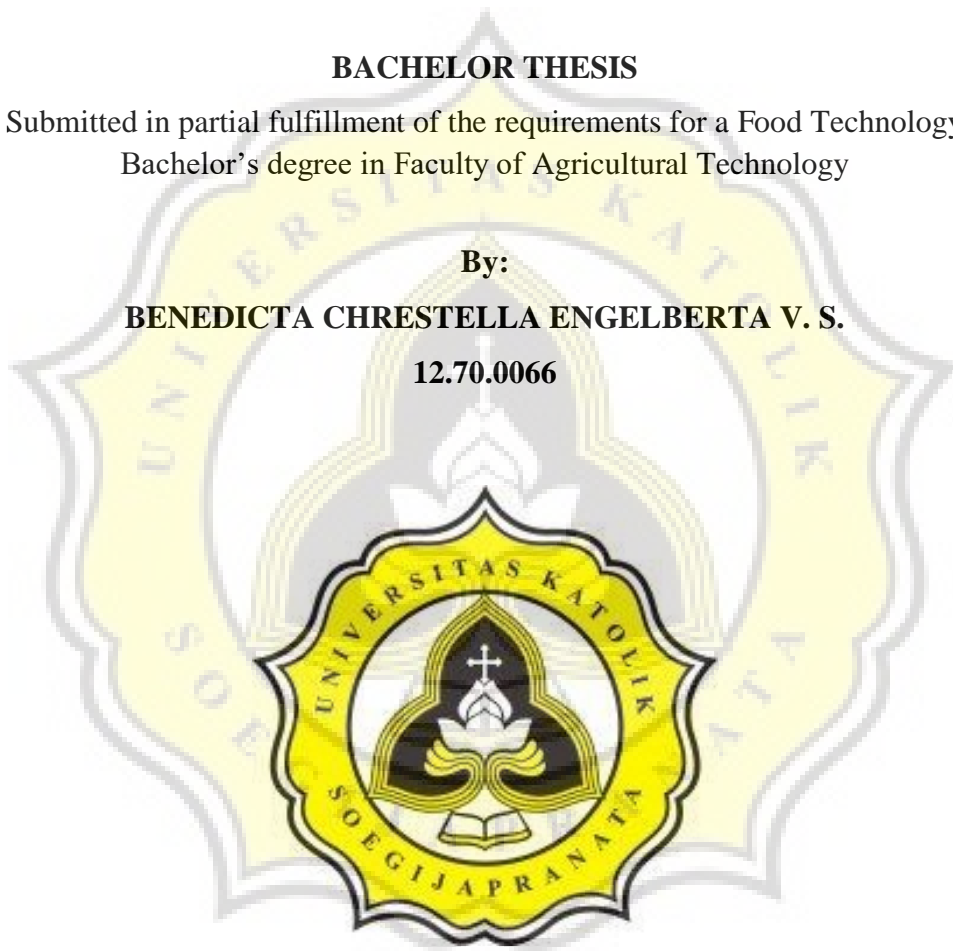
BACHELOR THESIS

Submitted in partial fulfillment of the requirements for a Food Technology
Bachelor's degree in Faculty of Agricultural Technology

By:

BENEDICTA CHRESTELLA ENGELBERTA V. S.

12.70.0066



**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 committee
on 25th October 2016**

Semarang, November 2016
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STATEMENT OF THESIS AUTHENTICITY

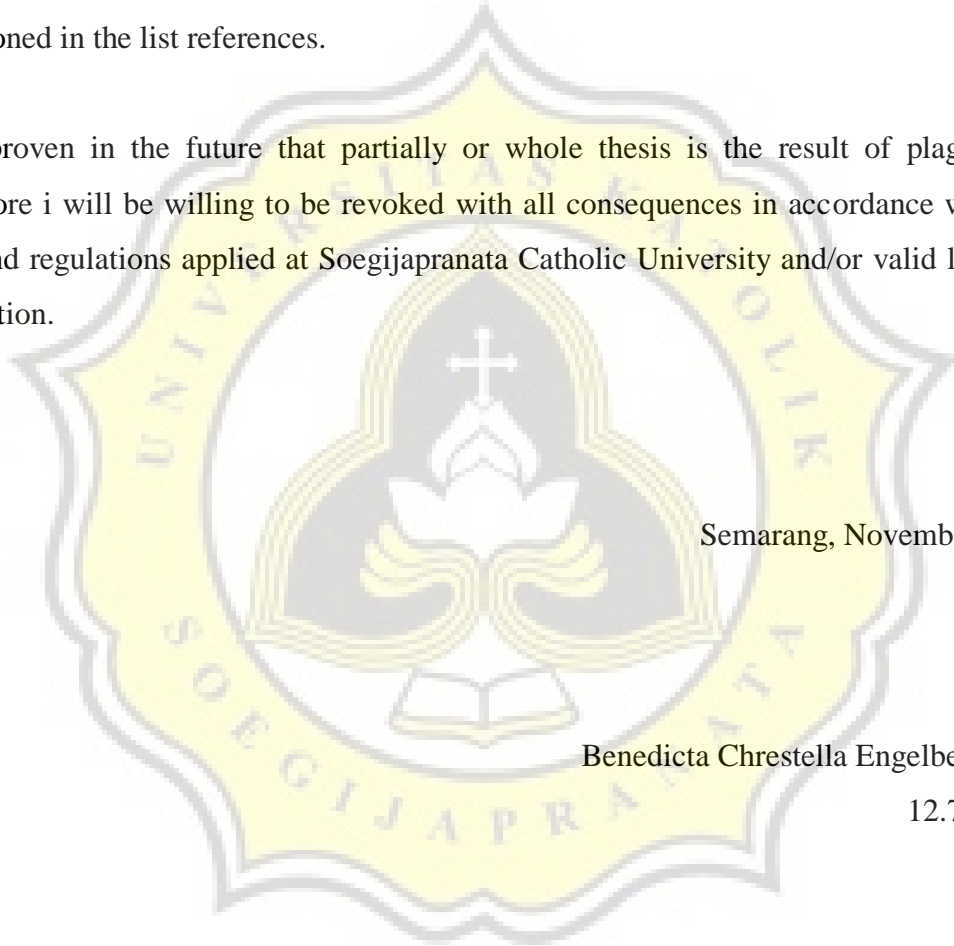
I hereby declare that the thesis entitled **“EVALUATION OF EFFECTIVENESS TWO BIOMARKERS (GLUTATHIONE AND LYSOSOMAL DESTABILIZATION) FOR COPPER AND CADMIUM EXPOSURE IN NILE TILAPIA (*Oreochromis niloticus*)”** contains no work that ever proposed to acquire a bachelorship title in a University, and along 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 references.

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

Semarang, November 2016

Benedicta Chrestella Engelberta V.S

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SUMMARY

Nile tilapia is one of the famous fish. Although Nile tilapia is freshwater fish, it is also cultivated in ponds along the north coastal areas of Java and usually located close to various industries that pose risk of contamination to water and fish. Heavy metals such as copper (Cu) and cadmium (Cd) is one class of contaminant that not only dangerous to the fish but also have a food safety implication. The consumption of contaminated fish may transfer these metals into human body and can cause negative health effects in the long term. To determine the severity of oxidative stress, the toxicity test is needed. For that, a number of biomarkers have been studied including reduced glutathione (GSH) and Lysosomal destabilization (LyD). These biomarkers are known to be sensitive to indicate metal contamination even in low concentration. In this case GSH and LyD are good candidates for effective early warning to Cu and Cd contamination in Nile tilapia. This study was started with fish acclimation in the laboratory water conditions prior to the toxicity test. It was then continued by determination of 96hr LC50 values. A series of concentrations was used for biomarker evaluation, i.e. 1/20 of LC50, 1/10 of LC50, and 1/5 of LC50. Biomarker evaluation was done by exposing the fish to the above metal concentrations for 20 days. Gill, liver, and muscles were dissected for GSH measurement, while for LyD measurement liver was dissected. It was found that GSH has a sensitivity and effectivity in gill and liver for copper exposure, and in liver for cadmium exposure. LyD was effective at 1/10 of LC50 day 5 and 1/20 of LC50 day 5, respectively for Cu and Cd. Both biomarkers are effective in determining copper and cadmium exposures in Nile tilapia even in low concentrations.

RINGKASAN

Ikan nila merupakan salah satu ikan yang populer. Meskipun ikan nila adalah ikan air tawar, nila juga dibudidayakan di tambak sepanjang daerah pesisir utara Jawa dan biasanya terletak berdekatan dengan berbagai industri yang menimbulkan risiko kontaminasi air dan ikan. logam berat seperti tembaga (Cu) dan kadmium (Cd) adalah salah satu jenis kontaminan yang tidak hanya berbahaya bagi ikan, tetapi juga memiliki implikasi keamanan pangan. Konsumsi ikan yang terkontaminasi dapat mentransfer logam tersebut ke dalam tubuh manusia dan dapat menyebabkan efek negatif bagi kesehatan dalam jangka panjang. Untuk mengetahui adanya kontaminasi, uji toksisitas diperlukan. Untuk itu, sejumlah biomarker telah dipelajari termasuk glutathione (GSH) dan lysosomal destabilization (LYD). Biomarker tersebut sensitif sebagai indikator kontaminasi terhadap metal walaupun dengan konsentrasi yang rendah. Dalam hal ini GSH dan LYD adalah kandidat yang baik untuk peringatan dini yang efektif pada kontaminasi Cu dan Cd dalam ikan nila. Penelitian ini dimulai dengan aklimasi ikan dalam kondisi air laboratorium sebelum uji toksisitas. Kemudian dilanjutkan dengan penentuan nilai LC50 96hr. Konsentrasi yang digunakan untuk evaluasi biomarker, yaitu 1/20 dari LC50, 1/10 LC50, dan 1/5 dari LC50. Evaluasi biomarker dilakukan dengan mengekspos ikan dengan konsentrasi logam (Cu dan Cd) selama 20 hari. Insang, hati, dan otot digunakan untuk pengukuran GSH, sedangkan untuk LYD menggunakan hati. Didapatkan hasil bahwa GSH memiliki kepekaan dan efektif dalam insang dan hati untuk paparan oleh tembaga, dan hati untuk kadmium. LYD efektif pada 1/10 LC50 hari 5 dan 1/20 dari LC50 hari 5, masing-masing untuk Cu dan Cd. Kedua biomarker tersebut efektif dalam menentukan paparan tembaga dan kadmium pada Nile tilapia bahkan dalam konsentrasi rendah.

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Semarang, October 2016

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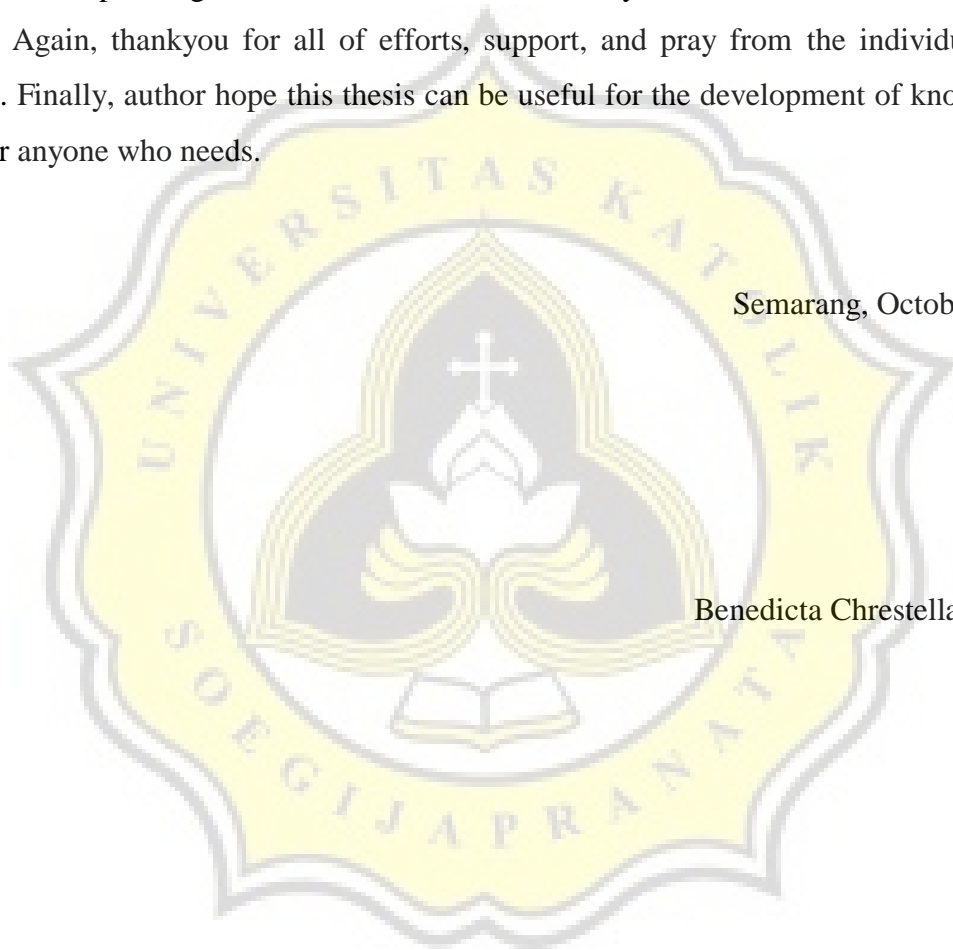


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