

**UTILIZATION OF CASSAVA (*Manihot esculenta*) STEM FOR
BIOETHANOL PRODUCTION**

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**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS
ENGINEERING
(Agricultural and Bioprocess Engineering)**

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This undergraduate thesis entitled "UTILIZATION OF CASSAVA (*Manihot esculenta*) STEM FOR BIOETHANOL PRODUCTION," prepared and submitted by AIRA MAE M. ARIOLA in partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AGRICULTURAL AND BIOPROCESS ENGINEERING), is hereby accepted:


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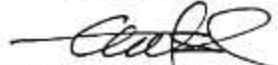

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BIOGRAPHICAL SKETCH

The author, Aira Mae Magno Ariola, was born on May 1, 1998 in Saverona, Talugtug, Nueva Ecija. She is the third child of Mr. Arnold T. Ariola and Mrs. Rodelia M. Ariola. She has one sister and two brothers namely: Rheadel, Arnel Jim, and Matt Dylan.

She started her elementary education in June 2004 at Saverona, Elementary School, Saverona, Talugtug, Nueva Ecija and graduated in March 2010. She continued her secondary education at Talugtug National High School, Cabiangan, Talugtug, Nueva Ecija where she actively participated in different competitions and extra curricular activities especially those related to mathematics. She graduated and got her high school diploma in March 2014. In college, she took and passed the entrance examination at Central Luzon State University (CLSU) where she enrolled Bachelor of Science in Agricultural and Biosystems Engineering major in Agricultural and Bioprocess Engineering.

Her family depends on farming and going to college was a challenge, so when she was offered to take an examination for a scholarship from the DOST-SEI, she grabbed the opportunity and did not hesitate to attend the review class in CLSU. She passed the examination and was able to pursue her studies through the scholarship from the DOST and became part of CLSU Association of DOST Scholars. She also undergone Summer Practical Training Program at East West Seed Co., Bulacan for two months as part of the scholarship.

In her last semester in CLSU, her family encountered a huge problem that made her depressed during the conduct of her study but despite of the different struggles she experienced, she was able to overcome it and stayed motivated to finish her studies.

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ABSTRACT

ARIOLA, AIRA MAE MAGNO, Bachelor of Science in Agricultural and Biosystems Engineering, Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines. June 2019. **UTILIZATION OF CASSAVA (*Manihot esculenta*) STEM FOR BIOETHANOL PRODUCTION.**

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The general objective of this study was to utilize cassava stem for bioethanol production. It aimed to determine the effect of the different boiling duration of liquid hot water pretreatment in the sugar concentration after enzymatic hydrolysis, to evaluate the effect of the different loading of yeast on the fermentation of the hydrolysates, and to determine the actual ethanol yield and alcohol recovery of the fermented hydrolysates.

For the study of pretreatment, cassava stem was subjected to liquid hot water pretreatment with different boiling duration of 5 minutes, 10 minutes, and 15 minutes. For the study of fermentation, different amount of yeast were used to ferment the liquid hot water pretreated hydrolyzed cassava stem. Different amount of yeast used were 1 g/L, 1.5 g/L, and 2 g/L of broth.

Results showed significant differences in the increase in sugar concentration of the biomass subjected to different boiling duration in the LHW pretreatment process. Results revealed that biomass without LHW pretreatment obtained the lowest increase in sugar concentration after hydrolysis which is 0.47 Brix while biomass pretreated for 15 minutes attained the highest increase in sugar concentration of 1.27 Brix. The result was used for the study of fermentation in which two conditions were considered, boiling duration of 10 minutes and 15 minutes prior to hydrolysis. Results showed that using different yeast

loading had significant effect on the reduction of sugar concentration, actual ethanol yield, and on the alcohol recovery. Yeast loading of 1.5 grams per liter of hydrolyzed cassava stem attained the highest reduction in sugar concentration, highest actual ethanol yield, and alcohol recovery for both conditions.

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