MAJOR PRACTICE ON THE BASIC CHARACTERIZATION OF SOYBEAN-NODULATING RHIZOBIA FROM SOILS COLLECTED IN BOHOL AND SORSOGON, PHILIPPINES CONDUCTED IN THE UNIVERSITY OF MIYAZAKI, JAPAN

EMMANUEL VICTOR DE VILLA BUNIAO

An Undergraduate Major Practice Manuscript Presented to faculty of the Department of Soil Science, College of Agriculture, Central Luzon State University in Partial Fulfillment of the Requirements for the Degree

BACHELOR OF SCIENCE IN AGRICULTURE
(SOIL SCIENCE)

JUNE 2017

MAJOR PRACTICE ON THE BASIC CHARACTERIZATION OF SOYBEAN-NODULATING RHIZOBIA FROM SOILS COLLECTED IN BOHOL AND SORSOGON, PHILIPPINES CONDUCTED IN THE UNIVERSITY OF MIYAZAKI, JAPAN

By

EMMANUEL VICTOR DE VILLA BUNIAO

An Undergraduate Major Practice Manuscript presented to faculty of the Department of Soil Science, College of Agriculture, Central Luzon State University in Partial Fulfillment of the Requirements for the Degree

APPROVED:

APOLINARIO L. DOMINGO
Adviser

Date Signed

APOLINARIO L. DOMINGO
Department Major Practice Coordinator

Date Signed

PURISIMA P. JUICO
Department Chairperson
6/8/2017
Date Signed

YUICHI SAEKI
Host Professor, University of Miyazaki
June 7 2017.
Date Signed

ACCEPTED:

ERNESTO A. MARTIN
Dean
6/8/2017
Date Signed

RECORDED:

ACE MUGSSY L. AGUSTIN
College Major Practice Coordinator
6/8/2017
Date Signed

BIOGRAPHICAL SKETCH

The author was born on July 20, 1993 in Ilo-Ilo city, Ilo Ilo. He has a brother and a sister and his parents are of Mr. Jose Ma R. Buniao and Imelda D. Buniao.

He finished his elementary education at Angelicum College, Quezon City in SY. 2008 and his secondary education at Kostka School, Katipunan Quezon City in SY. 2011.

He took up his tertiary education at Central Luzon State University, with Bachelor of Science in Agriculture, major in Soil Science. He joined the Soil Science Society on his third year of College.

AKNOWLEGDEMENT

The author would like to express his sincere gratitude and profound appreciation to the following persons that made their significant contribution for the completion of this major practice

to his adviser Dr. Apolinario L. Domingo, thank you for always being a strong adviser to guide and give advices from the start of the major practice until the end;

to his advisers while in Japan, Dr. Yuichi Saeki and Maria Luisa Tabing Mason for guiding the students and giving new knowledge especially in genetic analysis;

to Dr. Purisima P. Juico and Prof. Florida C. Garcia, for guiding the author in giving advices when conducting the major practice;

to his fellow Soil Science major students who gave the author friendly advices and helped in the conduct the major practice,

Lastly, to my family who are always there with me, being patient, giving advices, and hope to make all things possible and make my study a success.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LITERATURE CITED

Barril, P., & Nates, S. (2012). Introduction to Agarose and Polyacrylamide Gel Electrophoresis Matrices with Respect to Their Detection Sensitivities. Retrieved from http://www.intechopen.com/books/gel-electrophoresis-principles-and-basics/introduction-to-agarose-and-polyacrylamide-gel-electrophoresis-matrices-with-respect-to-their-detect. Date retrieved at February 2016

Fox, J. E., Gulledge, J., Engelhaupt, E., Burow, M. E., & McLachlan, J. A. (2007). Pesticides reduce symbiotic efficiency of. Retrieved from http://www.pnas.org/content/104/24/10282.full.pdf. Date retrieved at February 2016

Garibyan, L., & Avashia, N. (2013). Research Techniques Made Simple: Polymerase Chain Reaction (PCR). The Journal of Investigative Dermatology Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4102308/. Date retrieved at February 2016

Grisso, R., Alley, M., Holshouser, D., Thomason, W. (2009). Precision Farming Tools: Soil Electrical Conductivity. Retrieved from https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/442/442-508/442-508_pdf.pdf. Date retrieved at April 2016

Jordan, D.C., (1982). Transfer of Rhizobium japonicum Buchanan 1980 to Bradyrhizobium gen.nov., a genus of slow-growing, root nodule bacteria from leguminous plants. Int. J.Syst. Bacteriol., 32: 136-139. Date retrieved at March 2016

Kuykendall, L.D., Saxena, B., Cevine, T.E. & Udell, S.E. (1992). Genetic diversity in Bradyrhizobium Jordan 1982 and a proposal for Bradyrhizobium elkanii sp. nov. Can. J.Microbiol. 38: 201–505. Retrieved from http://www.nrcresearchpress.com/doi/abs/10.1139/m92-082#.WSGwCOuGPIV. Date retrieved at April 2016

Lamb, J. A., Fernandez, F. G., & Kaiser, D. E. (2014). Understanding nitrogen in soils. University of Minnesota extension Nutrient management Retrieved from http://www.extension.umn.edu/agriculture/nutrient-management/nitrogen/understanding-nitrogen-in-soils/docs/AG-FO-3770-B.pdf. Date retrieved at March 2016

Perry, L. (2003). pH for the Garden. Retrieved from http://pss.uvm.edu/ppp/pubs/oh34.htm. Date retrieved at March 2016

Rasmussen, D. H. (2012). Restriction Fragment Length Polymorphism Analysis of PCR-Amplified Fragments (PCR-RFLP) and Gel Electrophoresis - Valuable Tool for Genotyping and Genetic Fingerprinting. Roskilde,Denmark. Retrived from http://cdn.intechopen.com/pdfs/35104.pdf. Date retrieved at March 2016

Scholla, M.H. & Elkan, G.H. (1984). Rhizobium fredii sp. nov., a fast-growing species That effectively nodulates soybeans. Int. J. Syst. Bacteriol., 34: 484–486. Date retrieved at March 2016

Young, J.M. (2003). The genus name Ensifer Casida 1982 takes priority over Sinorhizobium Chen et al. 1988, and Sinorhizobium morelense Wang et al. 20is a later synonym of Ensifer adhaerens Casida 1982. Is the combination '*Sinorhizobium adhaerens*' (casida 1982) Willems et al. 2003 legitimate? Retrieved fromhttp://www.microbiologyresearch.org/docserver/fulltext/ijsem/53/6/2107.pdf?expires=1495380273&id=id&accname=guest&checksum=464B73BE4A36A64A3CFAC0CD45A08030. Date retrieved at March 2016

Zahran, H. H. (1999). Rhizobium-legume symbiosis and nitrogen fixation under severe conditions and in an arid climate. Microbiology and Molecular Biology Reviews Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10585971. Date retrieved at March 2016