

**PERFORMANCE OF SELECTED LINES OF PIGMENTED RICE AS
AFFECTED BY DIFFERENT ORGANIC FERTILIZER RATES
GROWN IN A CERTIFIED ORGANIC FARM**

JERVY CABUS BAUTISTA

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Department of Crop Science, College of Agriculture,
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fulfillment of the requirements
for the degree

**BACHELOR OF SCIENCE IN AGRICULTURE
(Crop Science - Organic Farming)**

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ACCEPTANCE SHEET

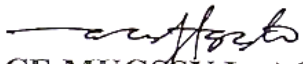
This undergraduate thesis entitled **“PERFORMANCE OF SELECTED LINES OF PIGMENTED RICE AS AFFECTED BY DIFFERENT ORGANIC FERTILIZER RATES GROWN IN A CERTIFIED ORGANIC FARM”**, prepared and submitted by **JERVY C. BAUTISTA**, in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (Crop Science – Organic Farming)**, is hereby accepted:


ELLEN S. ROMERO, M.Sc
Adviser

Sept. 4, 2019
Date Signed


JONATHAN L. GALINDEZ, Ph.D.
Critic

Date Signed

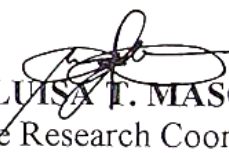

ACE MUGSSY L. AGUSTIN, M.Sc
Department Research Coordinator

Date Signed

Accepted as partial fulfillment of the requirement for the degree of **BACHELOR OF SCIENCE IN AGRICULTURE (Crop Science – Organic Farming)**:


ROSEMARIE T. TAPIC, Ph.D.
Department Chairperson

04 Sept 2019
Date Signed


MARIA LUISA T. MASON, Ph.D.
College Research Coordinator

Date Signed


ERNESTO A. MARTIN, Ph.D.
Dean, College of Agriculture

Date Signed

BIOGRAPHICAL SKETCH

The author, Jervy Cabus Bautista was born on the 6th day of May 1998 at Cuyapo, Nueva Ecija. He was the second son among the three children of Mr. Jimmy Tutaan Bautista and Vilma Cabus Bautista. His brother is Jimmy C. Bautista Jr. and his sister is Jinky C. Bautista. They are now residing in San Antonio, Cuyapo, Nueva Ecija. Jervy is usually called “Jervz” by his family and “Jerbaks” by his friends.

He took up Elementary education at San Antonio Elementary School and graduated on April 2011. He finished his secondary education at Dr. Ramon de Santos National High School located at Cuyapo, Nueva Ecija and graduated on March 2015. He took up Bachelor of Science in Agriculture, major in Crop Science and specialized in Organic Farming at Central Luzon State University (CLSU) located at Science City of Muñoz, Nueva Ecija.

As a Crop Science major student, the author joined the Society of Crop Science Majors (SCSM) and became member in 2018.

Like the other students, the author has experienced trials, encountered a lot of problems and difficult times. It took a lot of hard work, patience and help of Almighty God for these trials to be conquered

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ABSTRACT

BAUTISTA, JERVY C. Department of Crop Science, College of Agriculture, Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines, **July 2019. PERFORMANCE OF SELECTED LINES OF PIGMENTED RICE AS AFFECTED BY DIFFERENT ORGANIC FERTILIZER RATES GROWN IN A CERTIFIED ORGANIC FARM.**

Adviser: Ellen S. Romero

A study was conducted to evaluate the performance of three selected lines of pigmented rice as affected by organic fertilizer application conducted in a certified organic farm. The experiment was laid out in a Split Plot in a Randomized Complete Block Design (RCBD). Two rates of organic fertilizers namely 2 t ha^{-1} and 4 t ha^{-1} were used as the main plot and three selected lines of pigmented rice such as CL 147, CLS-2 and CLS-3 as subplots. Interaction effects on the application of the different rates of organic fertilizer to the yield of the three selected lines of pigmented rice showed highly significant results. The significant interaction between the rate of OF and different lines of pigmented is necessary to identify the best combinations suited for the growth and development of pigmented rice. The application of organic fertilizer at the rate of 4 t ha^{-1} in combination with CLS-2 showed significantly the highest yield of 2.34 t ha^{-1} followed by CLS-3 and CL 147 with 1.49 t ha^{-1} and 1.30 t ha^{-1} , respectively. The yield of 2.05 t ha^{-1} of CLS-2 in organic farming coincides with the yield obtained by the previous study of the Research Office, CLSU with $2\text{-}3 \text{ t ha}^{-1}$ yields during wet season using conventional farming. Among the three selected lines of pigmented rice, CLS-2 and CLS-3 were the lines that respondents like very much in which they rated them with a scale of 8. The aroma, physical appearance and taste contributed for the over-all acceptability of the two lines. It was concluded that CLS-2 can grow better with the application of organic fertilizer at 4 t ha^{-1} . Lowering the rate of organic fertilizer at the rate of 2 t ha^{-1} reduces yield. The physical attributes of CLS-2 and CLS-3 were

found to be more acceptable among the three lines evaluated. It is necessary to conduct another study during dry season to further evaluate the performance of the three pigmented rice.

Keywords: selected lines pigmented rice; organic fertilizer rates; certified organic farm

LITERATURE CITED

- Agustin, M.B., Garcia, F.C., Gajete, T.G., Mactal, A.G., & Romero, R.V. (2002). Terminal Report; Evaluation of Physico-Chemical Properties of a Two-hectare Rice-Based Area with Supplemental Application of Organic Fertilizer. Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines.
- Amado, T.J.C., S.B. Fernandez and J. Mielniczuk. (1998). Nitrogen availability as affected by ten years of cover crop and tillage systems in Southern Brazil. *J. Soil Wat. Con.*, 53(3):268-271.
- Ashrafi, R., Biswas, M.H.R., Mustafizur Rahman, G.K.M., Khatun, R. & Islam, M.R. (2010). Effect of organic manure on nutrient contents of rice grown in an arsenic contaminated soil. *Bangladesh Journal of Scientific and Industrial research.* 45 (3), 183-188.
- Atman, Bakrie, B. & Indrasti, R. (2018). Effect of cow manure dosages as organic fertilizer on the productivity of organic rice in West Sumatra, Indonesia. *International Journal of Environment, Agriculture and Biotechnology (IJEAB)*, 3(2):506-511. <http://dx.doi.org/10.22161/ijeab/3.2.25>
- Balicasan, A.M., L.S. Sebastian and Associates. *Securing Rice, Reducing Poultry-Challenges and Policy Directions.* (2006). ISBN 978-971-560-137-5.
- Beighley, D.H. (2006). Growth and production of rice. *Soils, Plant Growth and Crop Production- Encyclopedia of Life Support System*
- Bolton, H. JR., L.F. Elliott, R.I. Papendick and D.F. Bezdicek. (1985). Soil microbial biomass and selected soil enzyme activities: Effect of fertilization and cropping practices. *Soil Biol. Biochem* 17:297-302.
- Bot A. and J. Benites. (2005). The importance of soil organic matter. Key to drought-resistant soil and sustained food production. *FAO Soils Bulletin* 80.
- Bulatao R.M., L.B. Mabesa, R.M. Mabesa and F.E. Merca. (2016). Phytochemical and Functional Properties of Philippines Sprouted Brown Rice (*Oryza sativa* L.) and its Potential as Base Ingredients for functional beverages. *The Philippine Agricultural Scientist Journal.* Vol.95 No.3 Pages 225-226.
- Calegari, A. and I. Alexander. (1998). The effects of tillage and cover crops on some chemical properties of an oxisol and summer crop yields in south-western Paraíba, Brazil. *Adv. Geo. Ecol.*, 31:1239-1246.

- Clemente, J.M.T. (2015). Yield and quality of Basmati 370 rice (*Oryza sativa* L.) to different combinations of inorganic fertilizer and chicken manure. Unpublished undergraduate thesis, College of Agriculture, CLSU. Science City of Munoz.
- De Datta, S.K. (1981). Principles and practices of rice production. New York: John Wiley and sons.
- Dela Cruz, N.E., Aganon, C.P., Patricio, M.G., Romero, E.S., Lindain, S.A. & Galindez, J.L. (2006). Production of organic fertilizer from solid waste and its utilization in intensive organic-based vegetable production and for sustaining soil health and productivity. Extension Bulletin 587. Taiwan: Food and Fertilizer Technology Centre.
- Doran, J.W., M. Sarrantino, and M.A.Liebig. (1996). Soil health and sustainability. *Advances in Agronomy*. 56:1-54.
- Fallah, A. (2012). Interactive effects of nitrogen and irrigation methods on the growth and yield in rice in amol area. *International Journal of Agriculture*, 3 (4):111-113
- Gonsalves, JF and Arizala, (1986). The bio-intensive approach to small-scale household food production. Retrieved on June 2009, www.ruaf.org/system/files?file=agricultural_extension.pdf.
- Handayani A.P., R. Karim and K. Muhammad k. (2015). Optimization of Processing Conditions for Aqueous Pigmented Rice Extracts as Bases for Antioxidant drinks. *J Rice Research* page .1.
- Hu C., J. Zawistoski, W. Ling and D.D Kitts. (2003). Black rice (*Oryza sativa* L.) pigmented fraction suppresses both reactive oxygen species and nitric oxide in chemical and biological model system. *J. Agriculture Food Chemistry*.
- Ibrahim M.H., H. Jaafar, E. Karimi and A. Ghasemzadeh, (2013). Impact of Organic and Inorganic Fertilizers Application on the Phytochemical and Antioxidant Activity of Kacip Fatimah (*Labisia pumila* Benth).
- Islam, MD. S., A. Ahmed, S. Mahmed, T.R. Tusher and S. Khanom. (2012). Effect of *International Journal of Agricultural Science and Research*. ISSN 2250-0057 Vol.2, Issue 3. 116-128
- Jirapornchareon, S. (1993). The use of chemical and organic fertilizers in crop production in Thailand. Food Fertilizer Technology Center (FFTC) for the ASPAC region. Extension Bulletin n° 370.

- Khadka R.B., (2016). Evaluation of black rice under different fertilizer doses in Western Terai, Nepal. *Agronomy Journal of Nepal (Agron JN)*, Vol. 4. Pages 136-137.
- Kircher, M.J., A.G. Wollum ii, and L.D. king. (1993). Soil microbial populations and activities in reduced chemical input agroecosystems. *Soil Sci. Soc.Am.Jour* 57:1289-1295.
- Ling W.H., G.X. J. Cheng and T.Wang T. (2001). Red and black decreases Atherosclerotic plaque formation and increases antioxidant status in rabbits. *Journal of Nutrition*. Pages 1421-1426
- Malik, S.S., Chauhani, R.C., Laura, J.S., Kapoori, T., Abhilashi, r., QND Sharmal, N. (2014). Influence of Organic and Synthetic Fertilizers on Soil Physical Properties. *Int.J.Curr.Microbiol.App.Sci* (2014) 3(8) 802-810
- Manila Bulletin Agriculture Magazine Vol. X, No. 3, March (2006).
- Mendoza T.C., (2008). Evaluating the Benefits of Organic Farming in Rice Agroecosystems in the Philippines. Pages 93-115.
- Mendoza, T.C., Peadizo, L.M., and De Los Santos, W. (2001). *The Philippines Journal of Crop Science*. Published by the Crop Science Society of the Philippines, pp. 35-40. Retrieved on April 6, 2014
- Mishra, P.K., Thomas, A., Harishanker., and Kumar, P. (2014). Response of Scented Rice (*Oryza sativa* l.) cv. Pusa Basmati-1 to Different Forms of Organic manures and Systems of planting.
- Moe, K., Mg, K.W., Yamakawa, T. (2017). Combined effect of organic manures and inorganic fertilizers on the growth and yield of hybrid rice (Paethwe - 1). *American Journal of Plant Sciences*, 8:1022-1042. doi: 10.4236/ajps.2017.85068
- Philippine Rice Research and Development Highlights. (1995). Influence of organic and inorganic fertilizers on yield of irrigated transplanted rice. pp 295
- Reganold, J. P., L. F. Elliott, and Y. L. Unger. (1987). Long-term effects of organic and conventional farming on soil erosion. *Nature* 330: 370-372.
- Reganold, J.P. (1989). Comparison of soil properties as influenced by organic and conventional farming systems. *Amer.Jour. Alternative Agri.* 3:144-145.

- Ryu S.N., S. Z. Park and C.T. Ho. (1998). High Performance liquid chromatographic determination of anthocyanin pigments in some varieties of black rice. *Journal Food Drug Analysis* 6:4 Pages 729-736
- Santos, Z.B. (2001). Effect of Different Levels of Organic Fertilizer on the Seed Production of Eggplant. BSA Undergraduate Thesis (Unpublished). Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines.
- Senarante, R. (2003). Organic Farming: Scientific Basis and Strategies. *Organic Agriculture*, Vol.25. April to June 2000.
- Siavoshi, M., S. Lawre and A. Nasiri, (2011). Effect of organic fertilizer on the yield and yield components in rice (*Oryza sativa* L.). *The Journal of Agricultural Science*. Vol. 3, No.3. Pages 217-224.
- Soro, D., K. Ayolie, F.G BI Zro, F. Yao Yeboua, H.K Kouadio, S. Bakayoko, P.T Angui and J.Y Kouadio, (2015). Impact of Organic Fertilization on Maize (*Zea mays* L.) Production in a Ferralitic Soil of Centre – West Côte D’Ivoire
- Ullah M.S., M.S Islam, M.A Islam and T. Haque, (2008). Effects of organic manures and chemical fertilizers on the yield of brinjal and soil properties.
- Valdez, W.S. (2004). Improvement of Productivity of Tomatoes in Acid Soil by Fly Ash Application. BSA Undergraduate Thesis (Unpublished). Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines.
- Wang, Y.P and C.C.Chao. (1997). The effect of organic farming practices on the chemical, physical and biological properties of soil in Taiwan. *Rep.* 97 139.
- Yamada, H. (1988). Some experimental results obtained from the studies on technological evaluation of organic farming and gardening. *Agri. Technol.*43:433-437.
- Zerihun A. and D. Haile. (2017). The Effect of Organic and Inorganic Fertilizers on the Yield of Two Contrasting Soybean Varieties and Residual Nutrient Effects on a Subsequent Finger Millet Crop. *Agronomy*. doi: 10.3390/agronomy7020042