

REARING OF NILE TILAPIA (*Oreochromis niloticus*) FRY USING TWO BIO-SHADING MATERIALS IN TANK

by

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**An Undergraduate Thesis Presented to the Faculty of the College of Fisheries in Partial
Fulfillment of the Requirements of the Degree of**

BACHELOR OF SCIENCE IN FISHERIES

**Department of Aquatic Post-Harvest
COLLEGE OF FISHERIES
CENTRAL LUZON STATE UNIVERSITY
Science City of Muñoz, Nueva Ecija
Philippines**

2017



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ACKNOWLEDGEMENT

The author would like to extend his deepest gratitude to the following persons behind the success and accomplishment of this paper:

First of all, to our God Almighty for giving the author the strength, knowledge, wisdom, guidance and patience that he needed to finish this paper.

To his parents, Mr. Rodolfo L. Atayde, Sr. and Mrs. Emily D. Atayde and his siblings, Jimbo D. Atayde and Rodolfo D. Atayde, Jr. for the love and support they gave to the author which inspired him to give his best in making this paper.

To the author's adviser and mentor, Janet O. Saturno, for giving the author encouragement, advices and patience in finishing this paper;

To Dr. Jose S. Abucay, the author's critic for sharing his knowledge and support in making this paper the best;

To Dr. Remedios B. Bolivar, the College Research Coordinator, for giving him pieces of information and criticisms that helped the author a lot to improve this paper;

To Ate Juliet Hollasca for the pieces of advice and for the care she showed to the author during his conduct at the Wet Laboratory;

To Mr. Marcelo D.C. Joaquin, Ms. Diana Credo Rodriguez, Ramon Doctor, Felipe Doctor and to all author's titos and titas for attending to the author's need and helping him in the conduct of this thesis and for the support they gave the author in finishing the experiment and never fail to encourage him. They are worth thanking for;

To all the mentors of the author in the College of Fisheries who have exposed the author to the world of fisheries and have taught him the knowledge he needed to finish his degree;

Last but not the least, to all author's close friends and classmates specially to the author's special someone, Diana Credo Rodriguez who never left the author and for the happy thoughts they shared.

MARK JAYSON D. ATAYDE

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REARING OF NILE TILAPIA (*Oreochromis niloticus*) FRY USING TWO BIO-SHADING MATERIALS IN TANK^{1/}

ABSTRACT

The study was conducted to assess two bio-shading materials (water spinach and duckweed) for fry rearing in tanks in terms of growth performance of fish and water quality. Treatments used in the study were the following: T1 (25% covered with duckweed), T2 (50% covered with duckweed), T3 (25% covered with kangkong), T4 (50% covered with kangkong) and the unshaded tank which was the Control.

Results showed that the four (4) treatments which are covered with any aquatic plants were significantly lower pH in the morning compared to control. In the afternoon pH reading, Control was significantly higher than T3 and T4 but not significantly different with T1 and T2. T4 showed the highest potential in reducing pH which was significantly lower than T1 and T2 but not significantly lower than T3. In terms of weight gain, fish from the control significantly gained higher weight compared to other four treatments. Other than pH and weight gain, D.O, temperature, TAN, Total solid and survival rate were not significantly different between treatments.

The study showed that tanks covered with aquatic plants can significantly reduce pH, particularly water spinach. The study also showed that tank without shading can significantly increase weight gain compared with the other shaded treatments.

Based from the results the following were recommended for further studies: 1) screening of other macrophytes that have potential in maintaining good water quality; 2) use pond as experimental unit to observe actual fluctuation of water quality readings and; 3) conduct experiment during wet season.

^{1/}Undergraduate thesis presented to the faculty of the College of Fisheries, Central Luzon State University as partial fulfillment of the requirements for the degree Bachelor of Science in Fisheries. Prepared at the Department of Aquatic Post-harvest under the supervision of Professor Janet O. Saturno.

LITERATURE CITED

- Alaerts, G.J., M.D. Rahman-Mahbubar and P. Kelderman. 1996. Performance analysis of a full-scale duckweed-covered sewage lagoon. *Water Res.*, 30(4): 843–852.
- Arce, R. R. and E.A. Lopez. 1981. Effects of stocking weight on the culture of *Tilapia nilotica* in paddy field. Freshwater Aquaculture Center. Progress Report No. 12. Central Luzon State University, Muñoz, Nueva Ecija. p. 25-29.
- Austin, D.F. 2007. Water spinach (*Ipomoea aquatica*, Convolvulaceae) a food gone wild. *Ethnobotany Research & Applications*, 5:123-146.
- Azaza, M.S., M. Legendre., M.M. Kraiem and E. Baras. 2010. Size-dependent effects of daily thermal fluctuations on the growth and size heterogeneity of Nile tilapia *Oreochromis niloticus*. *Journal of Fish Biology*. p. 669-683.
- Bhatnagar, A. and P. Devi. 2013. Water quality guidelines for the management of pond fish. *International Journal of Environmental Sciences*, 3(6): 1980-2009.
- Boyd, C.E. 1990. *Water Quality in Ponds for Aquaculture*. Birmingham Publishing Company, Birmingham, AL. 482 pp.
- Canfield, D.E. and M.V. Hoyer. 1992. Aquatic macrophytes and their relation to the limnology of Florida lakes. Final Report. Department of Natural Resources, Bureau of Aquatic Plant Management. Tallahassee, Florida. 598 p.
- Carlos, M.H. and C.B. Santiago. 1988. Nursery and grow-out operation for tilapia and carp. *Aquaculture Development in Southeast Asia*. Tigbauan, Iloilo, Philippines. p. 282-292.
- Castillo, F.S. 1982. Oraphyl-a saline mouthwash powder from Kangkong (*Ipomoea reptans*) leaves. Retrieved from www.pchrd.dost.gov. On October 16, 2015.
- Durborow, R.M. and W.A. Wurts. 1992. Interactions of pH, Carbon Dioxide, Alkalinity and Hardness in Fish Ponds. Southern Regional Aquaculture Center. Kentucky State University. 4p.
- Edie, E.E. and B.W.C. Ho. 1969. *Ipomoea aquatica* as a vegetable crop in Hong Kong. *Economic Botany*, 23:32-36.
- Edwards, P. and H. Demaine. 1997. Rural aquaculture: overview and framework for country reviews. FAO Regional Office for Asia Pacific Publication No. 36. FAO. Bangkok, Thailand. 61p.
- El-Sayed A.-F.M. and S. Teshima. 1991. Tilapia nutrition in aquaculture. *Rev. Aquatic Science*. 5: 247-265.

- FAO. 1993. Water quality and fish health. EIFAC Technical Paper. Rome. 59p.
- Ferdoushi, Z., F. Haque, S. Khan and M. Haque. 2008. The effects of two aquatic floating macrophytes (*Lemna* and *Azolla*) as biofilters of nitrogen and phosphate in fish ponds. Turkish Journal of Fisheries and Aquatic Sciences, 8: 253-258
- Gaigher I.G., D. Porath and G. Granth. 1984. Evaluation of duckweed (*Lemnagibba*) as feed for tilapia (*Oreochromis niloticus* x *Oreochromis aureus*) in a recirculating unit. Aquaculture, 41: 235-244.
- Gangstad, E.O. 1976. Potential growth of aquatic plants in the Republic of the Philippines and projected methods of control. Journal of Aquatic Plant Management, 14: 10-14.
- Gasith, A. and M.V. Hoyer. 1998. Structuring role of macrophytes in lakes: changing influence along lake size and depth gradients. Springer. New York, USA. p. 381-92.
- Gilpin C. 2012. Dial temperature and dissolved oxygen patterns in sites with and without planktonic life stage of thomsodiniumintermedium in comal springs, Texas. Pp 37.
- Gorham, P. 2008. Aquatic weed management in waterways and dams. Retrieved from www.dpi.nsw.gov.au on October 19, 2015.
- Holm, J.C., T. Refstie, and S. Bo. 1990. The effect of fish density and feeding regimes on individual growth rate and mortality in rainbow trout (*Oncorhynchusmykiss*). Aquaculture. 89: 3-4.
- Islam, A.B.M.S. and M.Z. Haque. 1986. Growth of *Azolla* in association with rice crop culture and its contribution to soil fertility. Bangladesh Journal of Agriculture, 11: 87- 90.
- James, W.F. and J.M. Barko. 1990. Macrophyte influence on zonation of sediment accretion and composition in a north temperate lake. Hydrobiologia. 20: 129-142.
- Kapoor,S.L. and L.D. Kapoor. 1980. Medicinal plant wealth of the Karimnagar District of Andhra Pradesh. Bulletin of Medico-Ethnobotanical Research, 1:120-144.
- Landolt E. and R. Kandeler. 1987. The family of *Lemnaceae*. A monographic study: Phytochemistry, physiology, application, and bibliography. In Biosystematic Investigations in the Family of Duckweeds (*Lemnaceae*). Veroeffentlichungen des Geobotanischen Institute der ETH, StiftungRuebel, Zuerich. 4 (95): 638.
- Langeland, K.A. and K.C. Burks. 1998. Editors of identification and biology of non-native plants in Florida's natural areas. University of Florida, Gainesville. 146p.

- Leng, R.A., J.H. Stambolie and R. Bell. 1995. Duckweed- a potential high-protein feed resource for domestic animals and fish. *Livestock Research for Rural Development*, 7(1): 103-114.
- Levy, O., Z. Dubinsky, K. Schneider, Y. Achituv, D. Zakai, and M. Y. Gorbunov. 2004. Diurnal hysteresis in coral photosynthesis. *Marine Ecological. Program. Serbia*. 268: 105–117.
- Maltby, E. 1986. *Waterlogged Wealth*. International Institute for Environment and Development. London. 200 p.
- Mamun, S.M., U. Focken and K. Becker. 2007. Comparison of metabolic rates and feed nutrient digestibility in conventional, genetically improved (GIFT) and genetically male (GMNT) Nile tilapia, *Oreochromis niloticus* (L.). *Comparative Biochemistry and Physiology Part A: Molecular and Integrative Physiology*. p. 214-222.
- Martinez, C.A.P., C. S. Cristina and L.G. Ross. 1996. The effects of water temperature on food intake, growth and body composition of *Cichlasoma urophthalmus* (Güter) juveniles. *Aquaculture Research*. p. 455-461.
- Mesner, N., and J. Geiger. 2010. Understanding your watershed: Dissolved Oxygen. Retrieved from https://extension.usu.edu/files/publications/publication/NR_WQ_2005-16.pdf on november 10, 2016.
- Mitchell, D.S. 1974. *Aquatic vegetation and its use and control*. UNESCO. Paris. p. 99–106.
- Moss, B. 1990. Engineering and biological approaches to the restoration from eutrophication of shallow lakes in which aquatic plant communities are important components. *Hydrobiologia*, 200/201: 367-379.
- Naples, M.L. 2005. *Weeds of rain fed lowland rice fields of Laos and Cambodia*. M.S. Thesis, University of Leiden. Retrieved from <http://www.nationaalherbarium.nl> on September 3, 2015.
- Njuguna, S.G., 1992. Floating aquatic weeds in Kenya. *Biodiversity Journal*, 4(4): 471-482.
- Opuszynski, K. and J.V. Shireman. 1995. *Herbivorous fishes. Culture and Use for Weed Management*. CRS Press. Boca Raton, Florida. 223 p.
- Oron, G., A. de-Vegt and D. Porath. 1988. Nitrogen removal and conversion by duckweed grown on wastewater. *Water Res.* 22(2): 179–184.
- Pantastico, J.B. and J.P. Baldia. 1980. Ipil-ipil leaf meal as supplemental feed for *Tilapia nilotica*, in cages. *Fish. Research. Philippines*. 5(2):63-68.

- Patnaik, S. 1976. Autecology of *Ipomoea aquatic* Forsk. Journal of the Inland Fisheries Society of India, 8:77-82.
- Rommens, W., J. Maes N. DekezaP. Inghelbrecht T. Nhiwatiwa E. Holsters F. OllevierB. Marshall and L. Brendonck. 2003. The impact of water hyacinth (*Eichhornia crassipes*) in a eutrophic subtropical impoundment (Lake Chivero, Zimbabwe). I. Water quality. Archive Fur Hydrobiologie, (158): 373-388.
- Saeed, S. and A.M.A. Al-Nagaaway .2013. Impact of water hyacinth (*Eichhornia crassipes*) on physico-chemical properties of water, phytoplankton biomass and Nile tilapia production in earthen ponds. Journal of the Arabian Aquaculture Society, 8(2): 249-250.
- Santos, M.K.K. 2014. Potential of water hyacinth (*Eichhornia crassipes*) in reducing the nitrogen compounds of water in tanks with high soil organic matter. Department of Aquaculture. Central Luzon State University. 35p.
- Sculthorpe, C.D.1976. The biology of aquatic vascular plants. Edward Arnold. London. 388 p.
- Sekhar, N.U. and I. Ortiz. Undated. Aquaculture in the Philippines: Socio-economics, poverty and gender. Norwegian Institute for Water Research. Retrieve from http://aquaculture.asia/files/D18_PHILMNAQ_Socio-issues.pdf on October 26, 2015.
- Shammout M.W. and H. Zakaira. 2015. Water quality and growth trend of aquatic plant duckweed: management and benefits. Water, Energy and Environment Center, the University of Jordan. Amman, Jordan. 474 p.
- Shivhare, S. and A.K.S. Bhadoriya .2012. Study on aquatic plants and their chemical properties. International Journal of Research in Engineering and Applied Sciences, 2(2): 1832-1840.
- Sivaraman, D. and P. Muralidaran .2010. Hypolipidemic activity of *Ipomoea aquatic* Forsk. Leaf extracts on lipid profile in hyperlipidemic rats. International Journal of Pharmaceutical and Biological Archives, (2): 175-179.
- Steward,K.K. 1970. Nutritional removal potentials of various aquatic plants. Retrieved from www.plants.usda.gov on October 23, 2015
- Tellez T.R., E.M Lopez, G.L. Granado, E.A. Perez, R.M. Lopez, and J.M Guzman, 2008. The water hyacinth, *Eichhornia crassipes*: an invasive plant in the Canadian river basin (Spain). Aquatic Invasions. Vol. 3, issue 1: 42-53.
- USEPA. 2006. Turbidity and Total Solids. Voluntary Estuary Monitoring Manual. 12p.

- Van Heel, W.A. 1970. Some unusual tropical labyrinth seeds. *Biological and Medical Sciences* (73):298-301.
- Van Heel, W.A. 1971. Notes on some more tropical labyrinth-seeds. *Blumea*, 19:109-111.
- Werner, E.E., G.G. Mittelbach and D.J. Hall. 1981. The role of foraging probability and experience in habitat use by the bluegill sunfish. *Ecology*, 62: 116–25.
- Yassir, K.A.E., A-T. Mohsen and Mohammad A.H. Undated. Effect of protein level and stocking density on growth performance, survival rate, feed utilization and body composition of Nile tilapia fry (*Oreochromis niloticus* L.). Fish Ecology Department, Central Laboratory for Aquaculture Research. Abbassa, AboHammad, Sharkia, Egypt. 276p.
- Yilmaz, Z., I. Akyurt and G. Gunal. 2004. Use of duckweed, *Lemna minor*, as a protein feedstuff in practical diets for common carp, *Cyprinus carpio*, fry. *Turkish Journal of Fisheries and Aquatic Sciences*, 4: 105-109.