EFFECT OF NONI (*Morinda citriofolia*) AQUEOUS LEAF EXTRACT ON WATER QUALITY IN REARING NILE TILAPIA (*Oreochromis niloticus*) FINGERLINGS IN AQUARIA

By

ALEXIS RAMIREZ DUQUE

An Undergraduate Thesis submitted to the faculty of the College of Fisheries in partial fulfilment of the requirements for the degree

BACHELOR OF SCIENCE IN FISHERIES

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

The 90-day experiment was conducted to determine the effect of noni (*Morinda citriofolia*) leaf extract directly applied in the rearing water of Nile tilapia (*O. niloticus*) fingerlings in aquaria. The study aimed to assess the effect of leaf extract on the water quality of Nile tilapia fingerlings. The study had three treatments which were replicated thrice: T1 - control, T2 - 40 mg/ml of noni leaf extract and T3 - 80 mg/ml of noni leaf aqueous extract. The extract was applied daily in the rearing water.

The results on the water quality parameters such as DO, pH and TAN were not significant ($P > 0.05$) among treatments. All water quality parameter readings except DO were within the range for the rearing of Nile tilapia. The growth parameters evaluated are: initial weight, final weight, initial length, final length, gain in weight, and specific growth rate, feed conversion ratio. Analyses of variance of all growth parameters except final length were not significantly different. Analysis of variance showed that the mean operating expenses among treatments were significantly different.

It is suggested that to have another study be conducted using of other culture facilities such as pond or tanks. It is further recommended to use another extraction procedure and likewise to use higher concentration in the future studies.

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LITERATURE CITED

Abdel-Tawwab, M., A.M.E. Shalaby, M.H. Ahmad and Y.A.E. Khattab. 2004. Effect of supplemental dietary L-ascorbic acid (vitamin C) in mercury detoxication, physiological aspects and growth performance of Nile tilapia (*Oreochromis niloticus*). p. 159-161. *In*: R. Bolivar, G. Mair and K. Fitzsimmons (eds.).New Dimension in Farmed Tilapia. Proceedings of the Sixth International Symposium on Tilapia Aquaculture. Bureau of Fisheries and Aquatic Resources, Manila, Philippines, and American Tilapia Association, Charles Town, West Virginia, USA. 805 p.

Abdel-Tawwab, M., A.M. Abdel-Raman and N.E.M. Israel. 2008. Evaluation of commercial live bakes'yeast, *Saccharomyces ceresiae* as growth promoter for fry Nile tilapia, *Oreochromis niloticus*(L.) challenged in situ with *Aeromonas hydroohila*. Aquaculture, 280:185-189

Ali., S.M. and K.K. Mohamed. 2015. Effect of Dietary Supplementation with (*Moringa oleifara*) Leaves on Growth Performance Parameters on Nile Tilapia (*Oreochromis niloticus*). Research Journal of Fisheries and Hydrobiology. Retrieved from http://www.aensiweb.net/AENSIWEB/rjfh/rjfh/2015/November/10-14.pdf on December 3, 2018

Ancheta, C.G. 2010. Water quality of semi-intensive pond culture system as affected by varying levels of fermented whey. Undergraduate thesis. Central Luzon State University, Science City of Muñoz. Nueva Ecija, Philippines. 67 p. (unpublished).

Bolivar, R.B., M.D. Aragones and G.G. Garcia. 2004. Effect of methylene blue and sodium chloride on the bacterial load in the transport water with Nile tilapia (*Oreochromis niloticus L.*) fingerlings. p. 188-198. *In*: R. Bolivar, G. Mair and K. Fitzsimmons. Proceedings of the Sixth International Symposium on Tilapia Aquaculture. Bureau of Fisheries and Aquatic Resources, Manila, Philippines, and American Tilapia Association, Charles Town, West Virginia, USA. 805 p.

Bourhill, A. 2000. An assessment of the effect of the nursing strategy on tilapia (*Oreochromis niloticus* Linnaeus) fry quality and subsequent growth performance. Retrieved from https://webarchive.nationalarchives.gov.uk/20140609082223/http://r4d.dfid.gov.uk/PDF/Outputs/RLAquathesisBourhillR7052.pdf on December 1, 2018.

Boyd, C.E. 2001. Water quality standard, dissolved oxygen. Global Aquaculture Advocate, 92: 70-71.

Burr, G., D. Gatlin III and S. Ricke. 2005. Microbial ecology of the gastrointestinal tract of fish and the potential application of prebiotics and probiotics in finfish aquaculture. Journal of World Aquaculture Society, 36: 425-435.

Buttner, J.K., R.W. Soderberg and D.E. Terlizzi. 1993. An introduction to water chemistry in freshwater aquaculture. Northeastern Regional Aquaculture Center Fact Sheet 170. University of Massachusetts Dartmouth. North Dartmouth, Massachusetts. 4 p.

Camacho, S.H., T. Abella and M.M. Tayamen. 2001. Fish genetics research and development in the Philippines. p.71-76. *In*: M.V. Gupta and B.O. Acosta (eds.). Fish genetics in member countries and institutions of the International Network on Genetics in Aquaculture. Conference Proceedings Number 64. International Center for Living Aquatic Resources Management. Manila, Philippines. 179 p.

Cho, S.H. and S.M. Lee. 2012. Onion powder in the diet of the olive flounder *Paralichthys olivaceus*. Effect on growth, body composition, and lysozyme activity. Journal of the World Aquaculture Society, 43: 30-38.

Deas, M.L and C.L. Lowney. 2000. Water temperature modeling review. California Water Modeling Forum. Central valley. 113 p.

Department of Water Affairs and Forestry. 1996. South African Water Quality Guidelines. Volume 1. Domestic Use. Retrieved from http://www.dwa.gov.za/iwqs/wq_guide/Pol_saWQguideFRESH_vol1_DomesticuDo.PDF on November 30, 2018.

Dixon, A.R., H. McMillen and N.L. Etkin. 1999. Ferment this: the transformation of noni, a traditional Polynesian medicine (*Morinda citrifolia*, Rubiaceae). Economic Botany, 53: 51-68.

Duncan, S.H., H.J. Flint and C.S. Stewart. 1998. Inhibitory activity of gut bacteria against *Escherichia coli* 0157 mediated by dietary plant metabolites. Retrieved from https://academic.oup.com/femsle/article-abstract/164/2/283/942787 on December 1, 2018

Duque, M.J,R. 2013. Evaluation of noni plant (*Morinda citrifolia*) leaf extract on the growth performance and survival rate of Nile tilapia (*Oreochromis niloticus*). Undergraduate thesis. Central Luzon State University, Science City of Muñoz. Nueva Ecija, Philippines. 56 p. (unpublished).

Ebeling, J. undated. Water Quality. Research Engineer Aquaculture Systems Technologies, LLC. New Orleans, LA. 44 p.

El-Sayed, A.M. 2006. Tilapia Culture. CABI Publishing. U.K. 277 p.

FAO. 2000. The state of the world fisheries and aquaculture. Food and Agriculture Organization of the United Nations. Rome, Italy. 142 p.

FAO. 2006. The state of food insecurity in the world. Food and Agriculture Organization of the United Nations. FAO. Rome, Italy. p. 235-240.

Fitzsimmons, K. 2000. Tilapia: the most important aquaculture species of the 21st century. p. 3-10. *In*: K. Fitzsimmons and J. Carvalho Filho (eds.). Tilapia Aquaculture in the 21st Century. Proceedings of the Fifth International Symposium on Tilapia in Aquaculture. Ministry of Agriculture and Aquaculture and CRSP. Rio de Janeiro, Brazil. 682 p.

Karpagam, B. and N. Krishnaveni. 2014. Effect of Supplementation of Selected Plant Leaves as Growth Promoters of Tilapia Fish (*Oreochromis Mossambicus*). Research Journal of Recent Sciences, 3: 120-123. Retrieved from file:///C:/Users/Computer%20Man/Downloads/23.ISCA-ISC-2013-02AVFS-24%20(3).pdf on December 2, 2018.

Koprucu, K. and Y. Ozdemir. 2005. Apparent digestibility of selected feed ingredients for Nile tilapia (*Oreochromis niloticus*). Aquaculture, 250: 308-316.

Kovendan, K., K. Murugan, S.P. Shanthakumar, S. Vincent and J.S. Hwang. 2012. Larvicidal activity of *Morinda citrifolia* L. (Noni) (Family: Rubiaceae) leaf extract against *Anopheles stephensi, Culex quinquefasciatus,* and *Aedes aegypti*. Parasitol. Res., 111: 1481-1490.

Krauss, B.H. 1993. Plants in Hawaiian culture. Retrieved from. http://www.google.com.ph/books?hl=en&lr=&id=WOdrGIP3zksC&oi=fnd&pg=PR7&dq=Plants+in+Hawaiian+culture&ots=NL9V_QJAxR&sig=KPlmrRHFtiWtgFywnhYo3GaEY4&redir_esc=y#v=onepage&q=Plants%20in%20Hawaiian%20culture&f=false on October 02, 2016.

Lakshman, R. and P. Soundarapandian. 2008. Effect of commercial probiotics on large scale culture of black tiger shrimp *Penaeus monodon* (Fabricus). Research Journal Microbiology, 3: 198-203.

Landers, T.F., B. Cohen, T.E. Wittum and E.L. Larson. 2012. A review of antibiotic use in food animals: perspective, policy, and potential. Public Health Reports, 127: 4–22.

Li, P., D.H. Lewis and D.M. Galtin. 2004. Dietary oligonucleotides from yeast RNA influence immune responses and resistance of hybrid striped bass (*Morone chrysops x Morone saxatilis*) to streptococcus infection. Fish Shellfish Immunol., 16: 561–569.

Lim, C.E., C.D. Webster and M.H. Li. 2006. Feeding Practices. p. 547-559. *In:* C.E. Lim & C.D. Webster (eds.). Tilapia Biology, Culture and Nutrition. Haworth Press, Inc. New York. 678 p.

MacGibbon, DJ. 2008. The effects of different water quality parameters on prawn (*macrobrachium rosenbergii*) yield, phytoplankton abundance and phytoplankton diversity at new zealand prawns limited, wairakei, new zealand. Retrieved from https://core.ac.uk/download/pdf/41336189.pdf on December 2, 2018

Mathivanan, N., G. Surendiran, K. Srinivasan, E. Sagadevan and K. Malarvizhi. 2005. Review on the current scenario of Noni research: taxonomy, distribution, chemistry, medicinal and therapeutic values of *Morinda citrifolia*. International Journal of Noni Research, 1: 2-16.

Mjoun, K., K.A. Rosentrater and M. Brown. 2010. Tilapia: profile and economic importance. Retrieved from http://openprairie.sdstate.edu/extension_fact on August 13, 2017.

Morton, J.F. 1992. The ocean-going Noni or Indian mulberry (*Morinda citrifolia*, Rubiaceae) and some of its colorful relatives. Economic Botany, 46: 241-56.

Popma, T. and M. Masser. 1999. Tilapia: life history and biology. Southern Regional Aquaculture Center (SRAC) Publication No. 283. Stoneville, Mississippi. 4 p.

Romana-Eguia, M.R.R., M.A. Larona and M.R. Catacutan. 2013. On-farm feed management practices for Nile tilapia *(Oreochromis niloticus)* in the Philippines. p. 131-158. *In:* M.R. Hasan and M.B. New (eds.). On-farm feeding and feed management in aquaculture. FAO Fisheries and Aquaculture Technical Paper No. 583. Rome, FAO. 28 p.

Robert, M.D., M.C. David and W.B. Martin. 1992. Ammonia in fish ponds. Southern Regional Aquaculture Center Publication No. 463. Stoneville, Mississippi. 2 p.

Sivaram, V., M.M. Babu, T. Citarasu, G. Immanuel, S. Murugadass and M.P. Marian. 2004. Growth and immune response of juvenile greasy groupers (*Epinephelus tauvina*) fed with herbal antibacterial active principle supplemented diets against *Vibrio harveyi* infections. Aquaculture, 237: 9–20.

Siddiqui, A.Q., M.S. Howlader and A.B. Adam. 1989. Culture of Nile tilapia, *Oreochromis niloticus* (L.), at three stocking densities in outdoor concrete tanks using drainage water - Aquacult. Fish. Manag., 20: 49-57.

West, B.J., C.J. Jensen and J. Westendorf. 2006. Noni juice is not hepatotoxic. World Journal of Gastroenterology, 12(22): 3616-3619.

West, B.J., C.J. Jensen, J. Westendorf and L.D. White. 2006. A safety review of Noni fruit juice. Journal of Food Science, 71: 101-106.

/est, B.J., C.J. Jensen, A.K. Palu and S. Deng. 2011. Toxicity and antioxidant tests of *Morinda citrifolia* (noni) seed extract. Advance Journal of Food Science and Technology, 3(4): 303-307.

'ancey, J.W.S., J.K. Apple and E.B. Kegley. 2008. Effects of *Morinda citrifolia* (Noni) pulp on growth performance and stress responses of growing cattle. Retrieved from http://arkansasagnews.uark.edu/563-20.pdf on September 20, 2016.

ttp://www.fao.org/3/a-i7851e.pdf

ttp://www.scribd.com/document/333888290/Feeding-of-Tilapia

ttps://www.organicfacts.net/health-benefits/beverage/noni-juice.html

ttps://www.linkedin.com/in/dr-tohid-nooralvandi-7750978b