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Effect of *Terminalia catappa* Leaf Extract Enhanced Diet on the Growth and Survival of Freshwater Prawn *Macrobrachium rosenbergii* (de Man, 1879)

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Abstract

Aquaculture practices strive to advance human lives and provide more affordable resources for profitable production. *Terminalia catappa* has been reported to be nutrient-rich feedstuff for livestock; however, information on its potential as a feed enhancer is very limited in aquaculture. Thus, the efficacy of *Terminalia catappa* leaf (TCL) extracts as feed enhancers in the diet of Freshwater Prawn *(Macrobrachium rosenbergii)* with 1.4 grams average body weight at stocking was evaluated over a period of the 60-day rearing period. Four (4) concentrations for the experimental diets: To – Control Diet, T1 – 5%, T2 – 10% and T3 – 20%, were formulated and replicated thrice. Mean Weight gain (MWG), Specific Growth Rate (SGR), Feed Conversion Ratio (FCR) and Survival Rate (SR) were measured. Data were analyzed using Analysis of Variance at P = 0.05. Results showed that the Freshwater Prawns fed with 10 percent TCL extract enhanced diets had higher values in MWG, SGR, FCR, and SR and they were significantly different ($p<0.05$) in terms of growth in weight and survival rate compared to those in the control diet. The results suggest that the inclusion of 10 percent TCL extract in the diets could positively affect the growth of Freshwater Prawn *(Macrobrachium rosenbergii)* post larvae and can be incorporated into commercial feeds for better growth and survival.

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Introduction

Aquaculture plays an important role in economic development, health and the environment. It is one of the fastest developing growth sectors in the world. Freshwater Prawn *Macrobrachium rosenbergii* (de Man, 1879) or locally known as *Ulang* is one of the aquaculture commodities commonly cultured in many parts of the country because it is hardy and easily farmed. It was first introduced in Asia as well as in other parts of North and South America in the 1970s (Hermogenes, 2011). It was also reported that the production of *M. rosenbergii* in 2007 was over 99% of global farmed production in Asia, while the other major producing regions are South America and Central America (Banu, 2016). The economic factors that hinder aquaculture production are the subsequent high cost of conventional feeding materials as well as the need to minimize or eliminate feed antibiotics as growth enhancers. This led up to the thought of finding sustainable, safe and efficient natural alternatives. The current trend as feed additives includes plant extracts, herbs and their essential oils. Scientists have confirmed that the addition of plants or their extracts in the diets has a beneficial effect on improving growth parameters and protecting from diseases in aquaculture (Johnson and Banerji, 2007).

Terminalia catappa or Tropical Almond, also known as Indian almond, Country Almond and Sea Almond is a tropical tree that grows mainly in the tropical regions of Asia, Africa and Australia. It is a large, deciduous tree with smooth grey bark and whorled branches forming a canopy (Inbaraj and Sulochana, 2006). All parts of the tropical almond tree contain secondary metabolites that are used in traditional medicine. Tropical almond is a rich source of essential amino acids such as lysine, leucine, valine and others, suitable for complementing a high carbohydrate diet (Falaye, 2018). The inclusion of tropical almond extract at 2% significantly enhances productivity in the aquaculture industry (Olusola and Igbasan, 2018). It is also a source of raw materials for feed ration formulation, which is known among nutritionists especially because of its very high protein content (19%-22%) and oil which is 50%-52% (Julius and Mariatu, 2015). Several experimental studies reported the use of its leaves as being effective against parasites, bacteria and fungi in fish (Chansue, 2007; Chansue and Assawawongkasem, 2008). *T. catappa* leaves solution produces hydrolyzable tannin when they are soaked in the water. Tannins have antibacterial properties (Chung *et al.*, 1998). They are believed to aid the fish in a number of ways, like increasing fertility, health, and vigour. It also aids in the recovery of diseased or damaged fish (Purivirojkul, 2012).

The rapid evolution of research and experiments has gone way far in studying the utilization of various essential plant compounds as a source of nutrients and feed components for enhanced growth and improved nutrition for better survival. Thus, this study aims to evaluate the effect of Tropical almond leaf extract as a feed enhancer on the survival rate and growth performance of Freshwater Prawn post larvae in a freshwater tank.

Materials and methods

Research design

This study used a single factor design laid out in Randomized Complete Block Design (RCBD) in freshwater circular tanks with four (4) concentrations of Tropical almond leaves extract added to feeds as treatments: T0 –No extract added (Control), T1 –5%, T2 - 10% and T3 – 20% in three (3) corresponding replications. The study was carried out for 60 days.

Tank preparation and stock procurement

The study was conducted in a shaded freshwater plastic tank at the Bureau of Fisheries and Aquatic Resources – Freshwater Fish Farm, Caluwasan, Clarin, Bohol. Preparation of circular plastic tanks with a diameter of 1.2 meters and 1.4 meters in height which were used in the experimental study, was done. The 240 healthy freshwater prawns were secured from BFAR Clarin, Bohol, Philippines. The prawns with an initial weight of 5 grams and a total body length of 7 cm were stocked in the compartments at a rate of 20 individuals per m^2.

Leaf extraction and feed preparation

Tropical Almond leaves collected were washed and air-dried at room temperature for five days, cut into small pieces and pounded to get leaf powder. Tropical Almond powder extraction was done using distilled water as solvent. The process was carried out by the maceration method according to the procedure of Wahyuningrum *et al.* (2008). To do this, the Tropical Almond powder was weighed according to the dosage: T1 = 5g, T2 = 10g, and T3 = 20g and mixed with 100 mL of distilled water. The mixture was stored at room temperature and left for 24 hours. The extract obtained was filtered using a Shec filter paper 9 cm medium speed, transferred in a glass container, tightly closed with aluminum foil and stored in a refrigerator until use.

The treatment feeds were prepared by mixing the extract solution of each concentration into the feed with a ratio of 1:10 so that in 1 kg of prawn feed, 100 mL of Tropical almond leaf powder extract was added. Mixing the extract solution was done following the method of Bukasiang *et al.* (2019). The different extract concentrations were transferred in a hand sprayer and sprayed evenly in the diet prior to feeding.

Growth, survival and water quality monitoring

Initial weight (g) and length (mm) of the culture species were carried out prior to stocking. Sampling was done every fifteen (15) days to determine the ideal feeding rate and daily feed allocation of the cultured species. Water parameters such as temperature (˚C) and pH were monitored daily.

The stocks were harvested after 60 days, counted individually and weighed using 0.1g precision electronic weighing scale and length measured using Vernier caliper to the nearest 0.01cm. In computing the mean weight gain (MWG), specific growth rate (SGR), feed conversion ratio (FCR) and survival rate (SR), the following formulas were used: MWG = W2– W1, where W1 is the initial mean weight of prawn at the beginning of the experiment and W2 is the final mean weight of prawn at the end of the experiment. SGR = [(ln final weight – ln initial weight)/days] x 100. Where: ln = natural logarithm of final and initial weight. FCR = weight of feeds consumed/weight gained and SR = (recovered stocks/total stocks) × 100.

Statistical analysis

Data were subjected to one-way ANOVA. Differences were considered significant at the $p < 0.05$ level. Post hoc analysis was performed using Tukey's HSD Test.

Results and discussion

Growth, survival, nutrient utilization and mean water quality parameters of the cultured freshwater prawns are presented in Table 1. The experimental prawn fed with TCL extract showed an increment in weight, which indicated that the prawns were able to convert feed protein to extra muscles as weight gain and species growth rate is usually considered the most important measurement of productivity of diets. Mean weight gain and specific growth rate were higher in prawns fed with 10 percent TCL at 3.33 g and 5.55% day-^{1}, respectively and were significantly higher compared to feeds with no added TCL extract as shown in Table 2. In terms of length, prawns fed with 10 percent TCL extract in Treatment 2 also got the highest growth increment and specific growth rate among other treatments. The feed conversion ratio is also favourable in Treatment 2, which is 2.67. Results showed that incorporation of *Terminalia catappa* leaf extract in the diet enhanced the growth of Freshwater prawns.

This corroborated with the findings of Olusola and Igbasan (2018), who reported that the inclusion of *Terminalia catappa* leaf extract with Vitamin C positively enhanced the growth of *Clarias gariepinus* juveniles. Moreover, Nugroho *et al.* (2019) used Tropical almond leaves in powdered form, added into the locally available commercial diet as feeds for *Pangasianodon hypophthalmus* or shark catfish.

Increased feed conversion ratio (FCR) and survival rate were achieved using 250 mg of leave powder per kg of commercial feeds.

Table 1. Growth, Survival, Nutrient Utilization and Mean Water Quality Parameters of Experimental Freshwater Prawns Fed with Varying Concentration Levels of *Terminalia catappa* Leaf Extract.

Parameters	TCL Extract Concentration Level			
	T_0 0%	T_1 5%	T_2 10%	T_3 20%
Culture Period (days)	60	60	60	60
Initial Mean Weight (g)	1.28	1.48	1.48	1.41
Final Mean Weight (g)	3.06	3.99	4.81	4.13
MWG (g)	1.78	2.51	3.33	2.72
SGR (% BW day-^{1})	2.97	4.18	5.55	4.53
Growth Increment L (cm)	2.42	2.02	2.72	2.16
FCR	4.31	3.54	2.67	3.11
Survival Rate (%)	72	90	93	88
pH (Mean)	7.5	7.5	7.4	7.4
Temperature °C (Mean)	27.5	27.3	27.4	27.1

The survival rate in Treatment 2 also got the highest percentage of 93 percent. The control treatment (T_0) has the lowest survival rate (72 percent) and was significantly higher in mortality rate compared to other treatments with added TCL extract in their diets. Tropical almond helps in the recovery of diseased or damaged fish (Purivirojkul, 2012), they are believed to aid the fish in a number of ways like increasing fertility, health, and vigour. Most of the mortality happened during the moulting stage of the cultured Freshwater prawn, where the prawns' resistance to infections and stress is weak and cannibalism also happens. The risk of infection is raised during moulting as the exoskeleton forms a structural and chemical barrier to pathogens and they may gain entry into the body during moulting if there is any damage seen in the new structures (Subramanian and Kamalam, 2016). Mortality of the cultured Freshwater prawn could also be attributed to starvation due to low feed intake.

Table 2. One-Way Analysis of Variance for Specific Growth Rate, Growth Increment (in Length) and Survival Rate of Freshwater Prawn *Macrobrachium rosenbergii* Fed with *Terminalia catappa* Leaf Extract Enhanced Diet.

Sources of Variation	SS	DF	MS	F- Value	F-Critical Value	Decision
Specific Growth Rate						
Between Groups	10.21457	3	3.404856	6.153817	4.066181	Reject H_o
Within Groups	4.426333	8	0.553292			
Growth Increment (Length)						
Between Groups	0.867092	3	0.289031	1.6478367	4.0661805	Accept H_o
Within Groups	1.4032	8	0.1754			
Survival Rate						
Between Groups	841.6667	3	280.5556	4.488889	4.066181	Reject H_o
Within Groups	500	8	62.5			

The water quality parameters recorded during the experiment were within the tolerable range for freshwater culture in tanks; the pH was 7 to 7.9 and the temperature at 26.8°C to 27.6°C. Maintaining good water quality is very important for freshwater prawn culture in concrete tanks. The prawns typically thrive in natural rivers, lakes, swamps, estuaries and other inland bodies of water.

Conclusion

In conclusion, addition of *Terminalia catappa* leaf extracts in feeds has showed noticeable observation in

the growth and survival of Freshwater Prawn *(Macrobrachium rosenbergii)*. The best treatment promoting the highest survival rate and best growth performance was obtained at 10% concentration level. Thus, *Terminalia catappa* leaf extract is a potential feed additive for growth enhancerment and will improve survival percentage in prawn aquaculture.

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References

Ahmed N, Thompson S. 2019. The blue dimensions of aquaculture: A global synthesis. Science of the Total Environment **652,** 851-861. https://doi.org/10.1016/j.scitotenv.2018.10.163

Bukasiang S, Manoppo H, Lantu S, Bataragoa NE, Lumenta C, Kreckhoff RL. 2019. The potential of catappa leave to prevent Aeromonas hydrophila infection in nile tilapia Oreochromis niloticus. Jurnal Ilmiah Platax **7(2),** 341-346. https://doi.org/10.35800/jip.7.2.2019.23722

Chung KT, Lu Z, Chou MW. 1998. Mechanism of inhibition of tannic acid and related compounds on the growth of intestinal bacteria. Food and Chemical Toxicology **36(12),** 1053-1060. https://doi.org/10.1016/s0278-6915(98)00086-6

Falaye AE, Elezuo KO. 2018. Effect of processing methods on the nutritional value of tropical almond (Terminalia catappa L.) kernel meal for aqua feed. Continental Journal of Biological Sciences **11(1),** 24-40. https://doi.org/10.5281/zenodo.1326569

Nugroho RA, Aryani R, Anggraini WDC, Hardi EH, Rudianto R, Kusumawati E, Sudrajat S, Nur FM, Manurung H. 2019. Dietary Terminalia catappa leaves reduced growth performance but increased hematological profiles and survival rate of Pangasianodon hypophthalmus. IOP Conference Series: Earth and Environmental Science **348**, 012033.

Okpako EC, Louis H, Magu TO, Akwo JK, Akakuru OU, Bisong EA. 2017. Phytochemical screening and proximate nutritional analysis of brown leaves of indian almond. International Journal of Scientific and Research Publications **7(3),** 141-144.

Olusola SE, Igbasan VT. 2018. Efficacy of almond (Terminalia catappa) leaves extracts and vitamin c supplemented diet on growth performance and nutrient utilization of Clarias gariepinus juveniles. Electronic Data Information Source https://docplayer.net/183492180-Introduction-corresponding-author-abstract.html

Purivirojkul W. 2012. Potential application of extracts from Indian almond (Terminalia catappa Linn.) leaves in Siamese fighting fish (Betta splendens Regan) culture. Communications in Agricultural and Applied Biological Sciences **77(4),** 439–448.

South East Asian Fisheries Development Center – SEAFDEC. 2016. Giant freshwater prawn hatchery and grow-out. Electronic Data Information Source https://www.seafdec.org.ph/wpcontent/uploads/2016/03/ulang- hatchery-grow-out-flyer.pdf

Subramanian S, Kamalam BS. 2008. Moulting and behavior changes in freshwater prawn. Electronic Data Information Source https://thefishsite.com/articles/moulting-and-behaviour-changes-in-freshwater-prawn