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Sayeda M. Ali, Eman M. Younis, and Hassan A. A. El-badryn (Hydrobiology Department, Microbiology Laboratory, National Institute of Oceanography and Fisheries, NIOF, Aswan Research Station, Aswan, Egypt)

Effectiveness of endophytic bacteria for some medicinal plants as probiotics for nile tilapia (*Oreochromis niloticus*)

Indonesian Aquaculture Journal, 18(2), 2023, 87-95

The main objective of this research is to study the possibility of using endophytic bacteria isolated from some medicinal plants (*onion*, *Allium cepa*, *brassicales*, *Salvadora persica*, *fenugreek*, and *Trigonella foenum-graecum*) as probiotics for Nile tilapia (*Oreochromis niloticus*). Fish growth was evaluated using fish growth performance indices and proximate fish composition. Fish health was assessed by quantifying some biochemical compounds in fish serum, and at the end of the experiment, a challenge test was performed with *Vibrio parahaemolyticus*. Endophytic bacteria increased all growth performance indicators compared to the control group. Endophytic bacteria of fenugreek recorded higher growth performance than other plants. Moreover, in all treatments except for onion, bacteria mixed with feed significantly supported fish growth performance compared to bacteria added to rearing water. Endophytic bacteria of onion and fenugreek recorded higher concentrations of protein in muscles than the control group by 56 and 49%, respectively. Furthermore, 88, 75 and 63% of the treatments recorded a decrease in albumin, ALT and AST concentrations compared to the control group. Although the concentration of urea in the blood was higher than the control group by about 7.4 to 44.3%, challenge test showed that all treatments had a 20% mortality rate compared to the control group (10%). As a result, the endophytic bacteria of onion, brassicales and fenugreek are recommended as probiotics for Nile tilapia. Further study is needed to elucidate the optimal bacterial concentration necessary for tilapia growth.

KEYWORDS: Endophytic bacteria; Probiotic bacteria; Medicinal plants; Nile tilapia

Irin Iriana Kusmini, Wahyulia Cahyanti, Rudhy Gustiano, Sri Sundari, Andri Iskandar, Deni Radona, Kurniawan Kurniawan, Vitas Atmadi Prakoso, Fera Permata Putri, Otong Zenal Arifin, Jojo Subagja, Anang Hari Kristanto, Tri Heru Prihadi, Mulyasari, Yosmaniar, and Subaryono (Research Center for Applied Zoology, National Innovation Research Agency, Bogor, Indonesia)

First generation reproductive performance and second generation larval production on the domesticated tinfoil barb, *Barbonymus schwanenfeldii* (Bleeker, 1854)

Indonesian Aquaculture Journal, 18(2), 2023, 97-104

Tinfoil barb, *Barbonymus schwanenfeldii* (Bleeker, 1854), is a potential freshwater fish for Indonesian aquaculture. Before widely used, the candidate needs to be evaluated. This research aimed to evaluate the reproductive performance of the first generation (G1) and larval performance of the second generation (G2) of domesticated tinfoil barb. A total of 68 female and 24 male broodstocks were selected for the artificial breeding program. The gonadal maturity test was carried out by canulating the eggs every month. Before spawning, GnRHa hormone was injected into the dorsal area (0.5 mL/kg for female and 0.2 mL/kg for male). Fecundity, fertility rate, hatching rate, embryogenesis, and larvae ontogeny were recorded. The results showed that the first matured G1 males of tinfoil barb were at the standard length of 16.01 ± 1.18 cm, while females at 15.79 ± 1.23 cm. The mature broodstock indicated by the gonad maturity stage III and IV confirming higher estradiol concentration (above 400 pg mL^{-1}). The fecundity of two mature broodstock-sized of 217.2 g and 197.3 g were 12,495 and 15,782 eggs, respectively. The spawning season of G1 tinfoil barb was in October and November (rainy seasons). The fertilized eggs latency time was 10 hours 44 minutes at 25°C and hatched after 23 hours 7 minutes. The fertility rate was 96.96 % and the hatching rate was 95.16 %. The survival rate of G2 normal larvae was 100 % at three days of the rearing period. The G2 larvae production in this experiment provides an excellent opportunity for fish diversification both for aquaculture and restocking.

KEYWORDS: Aquaculture; breeding; domestication; reprodution; tinfoil barb

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Mira Mawardi, Agustin Indrawati, Angela Mariana Lusiastuti, and I Wayan Teguh Wibawan (Division of Medical Microbiology, School of Veterinary Medicine and Biomedical Sciences, IPB University)

Characterization of spore-forming bacteria isolated from tilapia (*Oreochromis niloticus*) and their potential for a probiotic candidate

Indonesian Aquaculture Journal, 18(2), 2023, 105-114

Gram-positive spore bacteria are widely used as probiotics in general sectors. However, there are still limited bacterial isolates as probiotic candidates available from indigenous isolates, especially in aquaculture. This study aimed to obtain potential spore-forming isolates as probiotic candidate for tilapia. Tilapia fish samples were collected from Sukabumi, Ciamis, Serang, and Papua. Bacterial isolates were isolated from the digestive tract of tilapia. Bacteria were identified based on their morphological, molecular characteristics, complete genome composition, and cell surface identification based on hydrophobic properties. In this study, six bacteria were isolated and identified by molecular characteristics using 16S rRNA sequences. Based on the phylogenetic analysis, the 9 PP isolate was Priestia megaterium basonym: *Bacillus megaterium*, CMS 16N isolate was *Brevibacillus halotolerans*, PPN 10 isolate was *Bacillus sp*., 3.1 SKBM isolate was B*acillus mycoides*, CMS 22 N and SRG32 isolate were *Bacillus subtilis*. Six bacteria had different phenotypicals, ATGC sequence compositions, and a higher proportion of total G ~ C sequence composition above 50%. The coherent cell surface hydrophobicity test was positive on the SAT, SA, AA, and compact growth patterns in soft-agar media for 9 PP, CMS 22 N, and SRG32 isolates. From our study, the indigenous spore-forming bacteria isolated from tilapia stomachs are enzymatic bacteria, which have a strong attachment to host tissue and high potential as a probiotic candidate for fish. Various hydrophobicity test results from each isolate indicate that the protein composition in the cell surface is different.

KEYWORDS: *Bacillus megaterium, Brevibacillus halotolerans, Bacillus mycoides, Bacillus subtilis*, probiotic; tilapia fish

Deni Radona, Agus Oman Sudrajat, Alimuddin, Wasmen Manalu, Odang Carman, and Raden Roro Sri Pudji Sinarni Dewi (National Research and Innovation Agency, Indonesia)

Effect of a supplemented diet with melatonin on performance of javaen barb *Systomus orphoides* (Valenciennes, 1842) juvenile

Indonesian Aquaculture Journal, 18(2), 2023,115-122

Javaen barb is a native fish in Indonesian inland water with economic value and the potential to be developed as cultured fish resources and ornamental commodities. In the development of aquaculture, there are still problems, such as the low adaptability of the larvae, so that their survival is also low. This study was conducted to evaluate the effect of melatonin supplementation on the productivity of Javaen barb fish juveniles in culture containers. This study was conducted experimentally using a completely randomized design consisting of four treatments with different doses of melatonin supplementation, i.e., A) control (without melatonin supplementation), B) 0.2 mg/100 g of feed, C) 0.4 mg/100 g feed, and D) 0.6 mg/100 g feed, each treatment was repeated three times. Javaen barb juveniles were kept in an aquarium measuring 30 × 36 × 60 cm with a water level of 40 cm, consisting of 12 units. Each aquarium was stocked with 150 individuals and given an aeration system with the same air pressure intensity. Feeding was carried out *ad-libitum* with a frequency of three times daily for 180 days of rearing. The results showed that melatonin supplementation of as much as 0.6 mg/100 g of feed was able to increase the growth of Javaen barb fish juvenile with the highest survival rate (81.33 ± 0.54 %) and feed conversion ratio (2.61 ± 0.14). Melatonin supplementation of 0.6 mg/100 g of feed had higher total leukocyte ($3.41 \pm 0.73 \times 10^4$ cells/mm^3) and hemoglobin (5.07 ± 0.12 g%) values and provided the best production performance in Javaen barb juveniles.

KEYWORDS: FCR; growth; haematology; productivity; survival rate

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Vo Van Ha, Huynh Ba Di, and Nguyen Van Phuoc (Kien Giang University, Agriculture Faculty, Agronomy Department, Vietnam)

Improving profitability of integrated rice-shrimp farming in brackish area: a case study of Mekong Delta, Vietnam

Indonesian Aquaculture Journal, 18(2), 2023, 123-131

Rotation between rice and shrimp farming by way of filter ponds and diversification of farm activities was studied with the aims of testing the efficiency of filter ponds and evaluating the combination of incorporating the growing of upland-crops on dikes of rice fields. Three groups of farmers participated in study trials which were the pilot group used a filter pond and applied new methods, the control group had a filter pond and applied the recommended new methods, and the normal practice (control) group not having a filter pond. Results showed that the rice-shrimp farming system using a filter pond improved water quality (pH, alkalinity and salinity) and reduced input costs. Growing upland crops on the dikes had a high financial return; though for both vegetables and the grass for the dairy cows will strongly depend on the market. On one hectare of land, farmers using a filter pond for rice-shrimp farming combined with upland-crops had a higher economic return than the traditional rice-shrimp farming system (2,812 compared with 854 USD/ha/year). However, implementing this model requires farmers to build filter ponds to aid freshwater storage, proper management skills and family labour resources. Diversification of farm activities such as integrated rice-shrimp culture may be a strategy for farmers for adapting to the impacts of climate change such as extreme weather events, less rain and saltwater intrusion.

KEYWORDS: Filter pond; financial return; rice-shrimp farming; upland-crop

Sudirman Adibrata, Aditya Pamungkas, Agung Priyambada, La Ode Wahidin, and Syahrin Imron Hidayat (Aquatic Resource Management Study Program, Faculty of Agriculture, Fisheries and Biology – Bangka Belitung University, Indonesia)

The environmental parameters suitability for multispecies-based mariculture in Pongok Island Waters, Bangka Belitung

Indonesian Aquaculture Journal, 18(2), 2023, 133-145

Pongok Island possesses small islands surrounded by waters with some primary commodities of sea farming. Seeking appropriate locations for marine aquaculture is a careful planning step to acquire optimal results. The sustainability of sea farming areas should be set based on considering species for easy implementation. This research aimed to analyse the area's suitability for aquaculture activities of seaweed cultivation, rearing groupers, and lobsters in floating net cages, and pearl oyster farming. This research occurred from June to November 2022 in Pongok Islands, South Bangka Regency, Indonesia. The method used in this research consisted of parameters weighting and scoring for cultivating seaweeds, groupers, or lobsters utilizing floating net cages and pearl oysters. Sea water samples analysis was processed in the Marine Science Laboratory of Bangka Belitung University and PT Global Quality Analytical, Bogor – West Java. Collected data were then scaled based on expert justification of scaling priority on aquaculture suitability. The mapping area of sea farming locations based on potential resources was then determined using map software. This research indicates that cultivating seaweeds is recommended to be established in two stations, 1 (149.79 ha) and 2 (186.46 ha), that are very suitable (S1) and the suitable (S2) categories, respectively. Station 3 (325.41 ha) and 4 (4.11 ha) are grouped into very suitable (S1) categories for pearl oysters and groupers or lobsters using floating net cages, respectively. The total estimate for sea farming in the waters of Pongok Island is 665.77 ha. Allocating seawater spaces should be assigned for sustainable fishery management. Maps of area suitability for sea farming can obviate conflicts in seawater areas.

KEYWORDS: Floating net cages; groupers; lobsters; pearl oysters; seaweeds; suitableness

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Nuttarin Sirirustananun, Rattanakorn Saenthumpol, and Thammasart Chantarat (Agricultural management program, Faculty of Agricultural and Industrial Technology, Phetchabun Rajabhat University, Phetchabun, Thailand)

The suitability of black soldier fly larvae combined with a commercial diet on growth and feed performances of hybrid catfish (*Clarias gariepinus x C. macrocephalus*)

Indonesian Aquaculture Journal, 18(2), 2023, 147-153

The black soldier fly larvae (BSFL) have been numerous benefits for aquaculture. This study aimed to investigate the suitability of BSFL combined with a commercial diet (CMD) on growth and feed performances of hybrid catfish (*Clarias gariepinus* x *C. macrocephalus*). A completedly randomized design was used to consist of four treatments and three replications with 100:0 (control), 75:25, 50:50, and 25:75 of CMD and fresh BSFL blended feeding. Fish were reared in 2 m^2 inland canvas cages for 60 days. The results indicated that fish were fed 100% CMD had better average weight gain (AWG), daily weight gain (DWG), specific growth rate (SGR), food conversion ratio (FCR), feed efficiency (FE), and survival rate (SR) than the other treatments, but there was no statistically significant difference ($p>0.05$) when compared to 75:25 and 50:50 CMD:BSFL feeding. At the end of the experiment, the SR of fish was 81-91% and showed no significant difference ($p>0.05$) when compared between treatments. Therefore, hybrid catfish rearing can compensate CMD by fresh BSFL up to 50% of the feed amount per day. However, feeding with fresh BSFL can have side effects concerning steatosis.

KEYWORDS: BigOui; BSF; BSFL; growth; hybrid catfish

Sukarman, Siti Murniasih, Rendy Ginanjar, Rina Hirnawati, Mochammad Zamroni, Lili Solichah, Nina Meilisza, Megarizka Aulia, and Ratna Komala (Research Center for Applied Zoology, National Research and Innovation Agency, Bogor, Indonesia)

Sand crab (*Emerita sp.*) meal as a novel feed ingredient for koi carp (*Cyprinus carpio*)

Indonesian Aquaculture Journal, 18(2), 2023, 155-167

Sand crab (*Emerita* sp.) is a marine biodiversity, but it has not been used as a fish feed ingredient. This study aimed to evaluate the nutritional value of sand crabs and to understand its effect when used as feed ingredient on the performance of Koi carp. The study was conducted in two steps, which is evaluation of the nutritional value of sand crab and its effect on fish performance. The proximate composition, amino acids, and fatty acids were measured using AOAC methods, and then the carotenoid content was determined by spectrophotometry. In the second step, the sand crab was added to fish feed at doses of 0, 5, 10, and 15 percent, and fed to koi fish for 42 days. The parameters observed were length gain (LG), weight gain (WG), and feed efficiency (FE). Nutritional data were analyzed by description and compared with fish feed ingredients from previous studies. Fish performance were analyzed by one-way ANOVA. When significant, Tukey's significant mean test was applied. The result showed that the nutritional value of sand crab was comparable to other feed ingredients with a protein content of 37.88%, while carotenoid content was superior. The best performance of Koi carp was obtained with a dose of 15% sand crab in the diet, with LG, WG, and FE values of 0.93 ± 0.05 cm, 0.48 ± 0.06 g, and 63.50 ± 7.05 %, respectively. Based on this result, it can be concluded that sand crab has a high nutritional value and can be used up to 15% in Koi carp diet.

KEYWORDS: *Emerita*; nutritional value; Cyprinus; feed

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Ishaaq Saputra, and Bayu Priyambodo (Faculty of Engineering and Sciences, Curtin University, Malaysia)

The development of lobster puerulus (*Panulirus orantus* and *Panulirus homarus*) in captivity environment

Indonesian Aquaculture Journal, 18(2), 2023, 169-177

The present study was conducted to investigate the development of *Panulirus ornatus* and *P. homarus* puerulus larvae into juveniles in a captive environment. Pueruli were collected from the local fishermen and transported by air to the research facilities. Puerulus of each species were stocked into 3 floating plastic compartments (5 cm × 12 cm × 17 cm) with sufficient holes, aeration, and a filtration system until reached their first moulting. Results indicated that both puerulus species were completely moulted after 6 days of stocking with the survival rate of 100% and 93.3%. Moulting began on Day 5 for *P. ornatus* and Day 4 for *P. homarus* pueruli. The weight of *P. ornatus* increased significantly after the metamorphosis ($P < 0.05$). The initial and final weights of *P. ornatus* were significantly greater than *P. homarus* ($P < 0.05$). In addition, the total and carapace lengths of both species were significantly increased ($P < 0.05$). Morphological observations indicated that there was a significant distinguishing feature such as the antenae form and body pattern colour of both species. In conclusion, proper handling of the pueruli according to each species is required to preserve the quality in order to achieve greater success in metamorphosis into juveniles.

KEYWORDS: Puerulus; early juvenile; lobster; *P. ornatus*; *P. homarus*; metamorphosis

Author index

SEND INSTRUCTIONS FOR WRITING AND PUBLISHING ARTICLES OF INDONESIAN AQUACULTURE JOURNAL 2016 (12pt Bold)

I Nyoman Adiasmara Giri*)#, Ketut Sugama), Alimuddin***), and Anang Hari Kristanto****)**

*) Research and Development Institute for Mariculture, Gondol

**) Center for Fisheries Research and Development, Jakarta

***) Bogor Agricultural University, Bogor

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Table 1. Response to selection and final mean body weight of the third generation compared to the control population of the African catfish *Clarias gariepinus* at the end of larval rearing, nursery and grow-out phases

Phases	Periods (days)	Final mean body weight (g)		Response to selection	
		Third generation	Control	Gram (g)	Percentage (%)
Larval rearing	25	0.19 ± 0.10	0.19 ± 0.07	-	-
Nursery	30	6.12 ± 2.93	5.80 ± 3.50	-	-
Grow-out	60	198.67 ± 82.82	165.22 ± 71.09	33.45	20.24

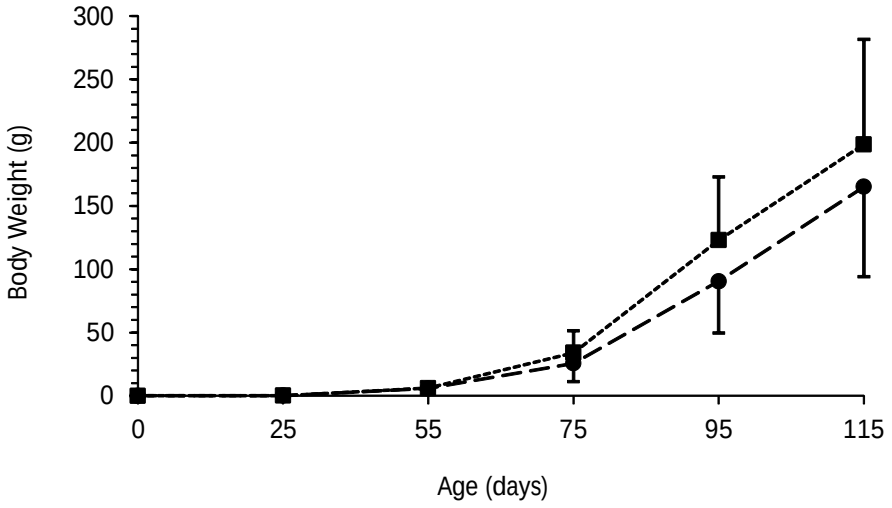

Figure 1. Growth performances based on body weight during 25 days of larval rearing phase, 30 days of nursery phase and 60 days of grow-out phase (based on samplings of 2% populations) of the third generation (■) and control population (●) of the African catfish (*Clarias gariepinus*) genetic improvement program held at Research Institute for Fish Breeding, Sukamandi. Vertical lines represent its each standard deviation

ACKNOWLEDGEMENTS: thanks mainly devoted to research funders. Acknowledgements can also be delivered to the parties that support the implementation of the research and writing of the manuscript.

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11. References

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