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Mugi Mulyono, Mutia Safa Salsabila, Mohammad Rasnijal, Siti Fadilah, and Angkasa Putra (Jakarta Technical University of Fisheries, Ministry of Marine Affairs and Fisheries)

Callus induction in *Kappaphycus alvarezii* using indole-3 acetic acid (IAA) and 6-benzylaminopurine (BAP) for seedstock development

Indonesian Aquaculture Journal, 20(1), 2025, 1-10

The commercially important red seaweed Kappaphycus alvarezii is extensively cultivated for carrageenan production. Despite its economic value, large-scale reproduction and genetic enhancement remain limited due to its low regeneration potential. This study aimed to optimize plant growth regulator (PGR) concentrations for efficient callus induction in K. alvarezii. A completely randomized design was employed, comprising five treatments with varying concentrations of indole-3-acetic acid (IAA) and 6-benzylaminopurine (BAP), along with a control lacking PGRs. A total of 180 explants from meristematic tissues of acclimatized thalli were cultured (30 explants per treatment). The highest callus induction rate (88%) was achieved with 1.50 mg/L IAA and 5 mg/L BAP (Treatment F), with visible callus formation beginning around day 38. A progressive color change from brown to white was observed, indicating active cellular proliferation. Other treatments exhibited lower induction rates, ranging from 0% (control) to 61% (Treatment D). These findings underscore the critical influence of auxin–cytokinin interactions on callogenesis and offer an optimized hormonal regime for improving in vitro culture efficiency. The established protocol provides a valuable platform for future large-scale propagation and genetic improvement strategies in K. alvarezii, contributing to the advancement of seaweed biotechnology.

KEYWORDS: *Kappaphycus alvarezii*, callus induction, tissue culture, indole-3-acetic acid, 6-benzylaminopurine, seaweed biotechnology

Dinamella Wahjuningrum, Erina Tri Ramadhina, Sri Nuryati, Ita Rizkiyanti, and Taufik Abdullah (Department of Aquaculture, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia)

Effect of dietary banana pseudo-stem simplicia, commercial vaccine, and their combination on the growth, health status, and immunity performance of Nile tilapia against *Aeromonas hydrophila*

Indonesian Aquaculture Journal, 20(1), 2025, 11-22

The sustainability of Nile tilapia production faces challenges from motile Aeromonas septicemia (MAS), caused by Aeromonas hydrophila. The use of antibiotics to control MAS has negative impacts on aquatic environments and consumer health. As alternatives, plant-based treatments and vaccination have been increasingly applied to replace antibiotics. This study aimed to evaluate the effects of banana pseudo-stem (BS), a commercial vaccine (CV), and their combination (BS+CV) on the growth, health status, and immune performance of Nile tilapia against A. hydrophila. A completely randomized design was used with five treatments: a negative control (C-), a positive control (C+), BS, CV, and BS+CV—each coated onto feed. Each treatment had three replications. Fish were reared in 36-L aquaria for 42 days to evaluate growth performance, followed by a challenge test with A. hydrophila on day 43. Survival was monitored for 14 days post-challenge. The highest growth performance was observed in the BS treatment compared to the other treatments. Meanwhile, survival rate (SR) and feed conversion ratio (FCR) did not show significant differences ($P > 0.05$) among treatments. After the challenge, survival rates in the BS (96.67%), CV (73.33%), and BS+CV (76.67%) groups were significantly higher ($P < 0.05$) than in the positive control group (50.00%). The BS group did not differ significantly ($P > 0.05$) from the negative control group (100.00%). These findings indicate that BS, CV, and BS+CV enhance the immune response of Nile tilapia against A. hydrophila, with BS being the most effective in improving both growth and disease resistance.

KEYWORDS: *Aeromonas hydrophila*; Banana pseudo-stem simplicia; Immune response, Nile tilapia, vaccine

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Administration of *Curcuma* spp. extract to control *Aeromonas hydrophila* infection in striped catfish (*Pangasianodon hypophthalmus*)

Indonesian Aquaculture Journal, 20(1), 2025, 23-36

Curcuma spp. is a phytobiotic with potential application in fish farming. This study aimed to evaluate the potential of *Curcuma zedoaria*, *Curcuma aeruginosa* and *Curcuma mangga* extracts in striped catfish infected with *Aeromonas hydrophila*. The study used a complete randomized design (CRD) consisting of six treatments: KN (negative control), KP (positive control, fish infected without treatment), PE (*C. zedoaria* extract 6.25 g kg⁻¹), HE (*C. aeruginosa* extract 6.25 g kg⁻¹), ME (*C. mangga* extract 6.25 g kg⁻¹) and KE (combination of *C. zedoaria* extract 2.1 g kg⁻¹ + *C. aeruginosa* extract 2.1 g kg⁻¹ + *C. mangga* extract 2.1 g kg⁻¹). A total of 360 striped catfish, 10 ± 0.5 cm were kept in 18 aquariums measuring 50 × 40 × 35 cm³ and fed the treatment for 30 days. The challenge test was conducted on day 31 by injecting *A. hydrophila* suspension (10⁶ colony-forming units (CFU) mL⁻¹) intramuscularly into fish. The results showed that the treatment administered were able to stimulate the expression of interleukin-1², interferon-³ 2a, 2b genes, increase the number of red and white blood cells, hematocrit, hemoglobin, phagocytosis activity, respiratory burst, reduce the population of *A. hydrophila* in the intestine, and reduce tissue damage in striped catfish. Striped catfish treated with the extracts showed significantly higher survival rates ($p < 0.05$) compared to the positive control group. The survival rates were: KN (100.00 %), KP (53.33%), PE (93.33 %), HE (91.67 %), ME (93.33 %), and KE (88.33 %). In conclusion, the treatment administered were able to enhance the immune response and resistance of striped catfish infected with *A. hydrophila*.

KEYWORDS: *Aeromonas hydrophila*; *Curcuma aeruginosa*; *Curcuma mangga*; *Curcuma zedoaria*; phytobiotic; striped catfish

Tristiana Yuniarti, Sri Hastuti, Ristiawan Agung Nugroho, Fajar Basuki, Diana Chilmawati, and Raka Gilang Saputra (Department of Aquaculture, Fisheries and Marine Sciences, Diponegoro University)

The effect of thyroxine hormone and recombinant growth hormone (rGH) soaking on the rate of egg yolk absorption and growth of tawes fish (*Barbonymus gonionotus*)

Indonesian Aquaculture Journal, 20(1), 2025, 37-47

Tawes fish (*Barbonymus gonionotus*), also known as lampan, is an indigenous freshwater species with significant economic value and cultivation potential. However, suboptimal growth remains a common challenge in aquaculture. Hormonal treatments such as thyroxine and rGH are known to enhance metabolic processes, potentially improving egg yolk absorption and larval growth. This study aimed to evaluate the effects of thyroxine and rGH hormone immersion on the rate of egg yolk absorption and development of newly hatched tawes fish larvae. The experimental design employed a CRD with four treatments and three replications: A (thyroxine 0 mg/L + rGH 2.5 mg/L), B (thyroxine 0.1 mg/L + rGH 0 mg/L), C (thyroxine 0 mg/L + rGH 2.5 mg/L), and D (thyroxine 0.1 mg/L + rGH 2.5 mg/L), with hormone immersion conducted for 60 minutes. The results demonstrated that the combined immersion of thyroxine and rGH significantly ($P < 0.05$) improved the absolute weight gain, absolute length increment, and survival rate of tawes fish larvae. The highest values for absolute weight (0.043 ± 0.002 g) and length (12.77 ± 0.15 mm) were observed in treatment D (thyroxine 0.1 mg/L + rGH 2.5 mg/L), while the best survival rate ($70.00 \pm 2.00\%$) was recorded in treatment A (thyroxine 0 mg/L + rGH 2.5 mg/L). These findings suggest that the combined use of thyroxine and rGH can effectively enhance the early growth and development of tawes fish larvae.

KEYWORDS: Tawes fish; larvae growth; Recombinant Growth Hormone (rGH); Yolk absorption rate

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Yogi Himawan, Imron, Otong Zenal Arifin, Jojo Subagja, Supriyanto, and Joni Haryadi (National Research and Innovation Agency, Research Center for Fisheries)

Hybrid vigor and growth performance of hybrid mahseer (*Tor* spp.) in grow-out

Indonesian Aquaculture Journal, 20(1), 2025, 49-58

Mahseer (Tor spp.) is a freshwater fish commodity with a high market value. However, its slow growth to reach consumable size has resulted in inadequate production. The aim of this study is to analyze the hybrid vigor - that are heterosis, heterobeltiosis, and growth performance - of a crossbred population of Mahseer (Tor spp) resulting from interspecies breeding. Broodstock of Mahseer from three different species were prepared for reciprocal breeding, producing nine offspring populations consisting of six hybrid offspring and three purebred offspring populations. The breeding process was carried out using artificial breeding methods, employing intramuscularly injected breeding stimulant hormones. Results show that the hybrid population of Tor soro and Tor tambroides exhibits better heterosis and heterobeltiosis in final weight, specific growth rate, and survival rate. The crossbreeding of Tor soro and Tor tambroides also exhibited better growth performance compared to other crossbred population in terms of final weight growth, specific growth rate, and survival rates, which were 64.20 g, 1.42%/day, and 100%, respectively.

KEYWORDS: Final growth; SGR; survival rate; interspecies breeding

Baref Agung Wicaksono, Widanarni, Munti Yuhana, Muhamad Gustilatov, and Usamah Afiff (Department of Aquaculture, Faculty of Fisheries and Marine Science, IPB University)

Effectiveness of biofloc, probiotics and the combinations on growth, immune responses and resistance of vannamei shrimp infected with *Vibrio parahaemolyticus*

Indonesian Aquaculture Journal, 20(1), 2025, 59-73

*Vibrio parahaemolyticus strain that produces PirA and PirB toxins is the main causative agent of Acute Hepatopancreatic Necrosis Disease (AHPND) in vannamei shrimp. This study aimed to evaluate the effect of biofloc application, probiotic *Pseudoalteromonas piscicida* 1Ub, and their combination on growth, immune response and resistance of vannamei shrimp infected with *V. parahaemolyticus* strain. This study used a completely randomized design consisting of biofloc-based system treatment with or without probiotic 1Ub and normal seawater as control. All treatment groups were challenged with *V. parahaemolyticus* AHPND strain at a cell density of 10⁵ CFU mL⁻¹ through immersion, while the negative control was reared without being pathogenic challenged. The shrimp used were in averaged body weight of 1.3 ± 0.002 g, reared for 21 days and fed five times a day at 06:00, 10:00, 14:00, 18:00, and 22:00 WIB. The results showed that the B+Pro combination challenge test treatment resulted the best growth performance (specific growth rate, absolute length gain and feed conversion ratio) ($P < 0.05$) compared to other challenge test treatments. Shrimp treated with B+Pro also showed a lower intestinal cell population of *V. parahaemolyticus* RfR, and significantly higher immune response values ($P < 0.05$) than those of other challenge test treatments and K+. Furthermore, those parameters supported positive impact on final shrimp survival rates in the experiment. This study shows that the application of combination of biofloc and 1Ub probiotic bacteria can significantly protect and increase the resistance of vannamei shrimp to *V. parahaemolyticus* AHPND infection.*

KEYWORDS: Vannamei shrimp; AHPND; *Vibrio parahaemolyticus*; biofloc; probiotic 1Ub

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Luan Thanh Nguyen, Thong Hoang Nguyen, Loc Hong Nguyen, Nguyen Hoang Khoi Le, Suong Thao Nguyen, Thanh Minh Nguyen, Tri Nhu Nguyen, and Sang Van Nguyen (Research Institutes for Aquaculture No.2, Ho Chi Minh City, Vietnam)

Species identification and genetic diversity of Portuguese Oyster (*Crassostrea angulata*): implications for breeding in Vietnam

Indonesian Aquaculture Journal, 20(1), 2025, 75-86

*Cupped oyster has emerged as the predominant mollusk farmed domestically in Vietnam because of its exceptional adaptability to the local subtropical and tropical climates. However, considerable confusion remains regarding the identity of the cultivated species due to the taxonomic ambiguity between Portuguese cupped oyster (*Crassostrea angulata*) and Pacific cupped oyster (*Crassostrea gigas*). This study aims to clarify the species identity of the most commonly farmed cupped oysters in Vietnam and to evaluate genetic diversity and the suitability of oyster strains for a breeding program including three Vietnamese strains (Quang Ninh, Khanh Hoa, and Vung Tau) and one wild population from Taiwan. Based on mitochondrial DNA cytochrome c oxidase subunit I (COI) sequences, our results confirmed that all samples in Vietnam and Taiwan are *C. angulata*. Furthermore, this study performed genetic analyses using mtCOI sequences and five microsatellites. Populations in Vietnam and Taiwan maintain high levels of genetic diversity, with the average number of alleles per population varied between 7.80 to 16.0, and there was no statistical difference between observed and expected heterozygosity ($P > 0.05$), except in the hatchery population Vung Tau. The samples collected from this population suffered a great loss of heterozygosity and occupied the highest F_{is} value ($F_{is} = 0.3$), which is likely due to the small size of founding stock and longterm artificial breeding by local hatchery farmers, resulting in a strong genetic bottleneck and inbreeding depression. Pairwise F_{ST} calculated by microsatellites with a range of 0.043 to 0.093 revealed significant ($P < 0.05$) levels of genetic differentiation among oyster lines. Collectively, our findings clarify the taxonomic status of farmed oysters in Vietnam and highlight the importance of crossing among different strains in future breeding programs to maximize the genetic gain and avoid inbreeding, especially when using the oyster strain from Vung Tau.*

KEYWORDS: Genetic diversity; microsatellites; mtCOI marker; Portuguese cupped oysters; species; identification

Supono and Arief Rahman Rivaie (Aquaculture Department, Faculty of Agriculture, Lampung University)

A review of the development pacific white shrimp (*Litopenaeus vannamei*) farming in Indonesia

Indonesian Aquaculture Journal, 20(1), 2025, 87-95

*Pacific white shrimp (*Litopenaeus vannamei*) cultivation in Indonesia has been carried out since the early 2000s with satisfactory results. This shrimp is able to replace the previously cultivated black tiger (*Penaeus monodon*), which experienced cultivation failure due to disease attacks. The pond construction used includes an earthen pond, a lining pond, and a concrete pond, which are equipped with paddlewheels as a source of dissolved oxygen. Pacific white shrimp are mostly cultivated using semi-intensive, intensive, and super-intensive systems, depending on technological input and stocking density. Semi-intensive stocking density is around 50 PL/m², intensive 100 PL/m², and super-intensive 500 PL/m², with productivity of 10 tons/ha, 15 tons/ha, and 42 tons/ha, respectively. There are two types of harvests carried out by farmers in Indonesia, namely partial harvests and total harvests. The main aim of partial harvest is to reduce excessive shrimp biomass, as indicated by a decrease in dissolved oxygen content. Problems that often arise during the cultivation process are disease attacks such as white spots and infectious myonecrosis (IMN) caused by viruses, White Feces Syndrome (WFS) and Acute Hepatopancreatic Necrosis Disease (AHPND) caused by *Vibrio parahaemolyticus* and *Enterocytozoon hepatopenaei* (EHP). To increase the productivity of whiteleg shrimp cultivation, the advice given is to minimize disease attacks, namely by installing several biosecurity devices, such as bird scaring devices (BSD), crab protection devices (CPD), and water filtration. In addition, the application of a recirculation aquaculture system, biofloc technology, aquamimicry and whiteleg shrimp cultivation at low salinity (inland) can be an alternative cultivation in the future.*

KEYWORDS: Aquamimicry; biosecurity; infectious myonecrosis; inland; white spot

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Effect of different substrates on biofilm growth and lipid content of diatom *Thalassiosira* sp.

Indonesian Aquaculture Journal, 20(1), 2025, 97-105

Diatoms are valuable as natural feed in aquaculture due to their lipid content and the presence of essential polyunsaturated fatty acids (PUFAs), including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). While traditional suspended cultivation has its limitations, attached cultivation offers advantages such as reduced water use and enhanced lipid productivity. This study evaluated the growth, biomass, and lipid content of Thalassiosira sp. grown on polycarbonate (PC) and polyvinyl chloride (PVC) as attachment substrates. The control group was cultured in the standard suspended cultivation method. Test attachment substrates were submerged in sterile seawater enriched with F-medium, and growth was monitored for four days. At day 4 of the culture, cell density was significantly higher on PC (13.08×10^5 cells mL⁻¹) and PVC (13.01×10^5 cells mL⁻¹) compared to the control (7.93×10^5 cells mL⁻¹). The specific growth rate was also significantly higher on both substrates, exhibiting a doubling time of 0.20 days. Biomass accumulation was highest on PC (27.47 mg 100 mL⁻¹), followed by PVC (26.87 mg 100 mL⁻¹), representing increases of 38.39% and 35.37% over the control (19.85 mg 100 mL⁻¹), respectively. Lipid content was higher in the attached culture system, reaching 8.50% on PC and 7.45% on PVC, corresponding to increases of 167.30% and 134.28% over the control (3.18%). These findings highlight the potential of PC and PVC as effective substrates for biofilm-based cultivation of Thalassiosira sp., demonstrating superior growth, biomass yield, and lipid accumulation compared to the suspended culture method.

KEYWORDS: *Thalassiosira* sp.; biofilm formation; polycarbonate; polyvinyl chloride; lipid content

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

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KEYWORDS: Author guidelines; research journal; aquaculture; article template

1. Introduction

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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

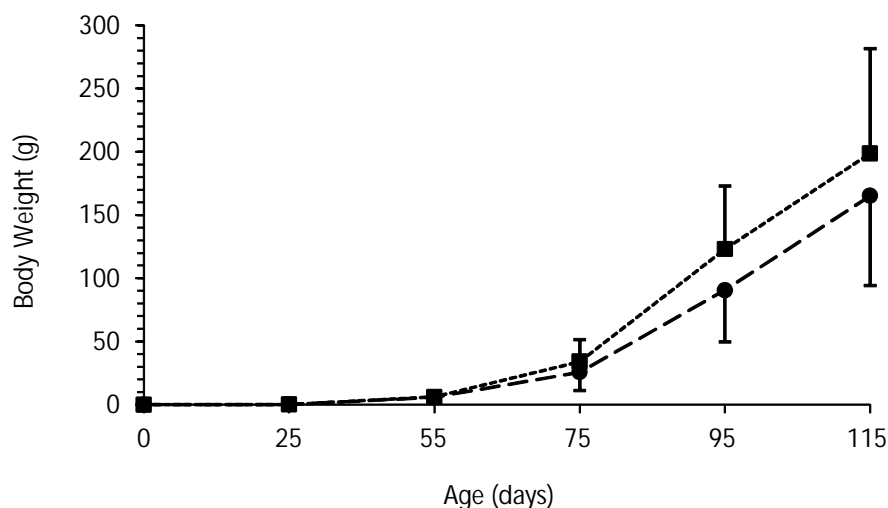


Figure 1. Growth performances based on body weight during 25 days of larval rearing phase, 30 days of nursery phase and 60 days of grow-out phase (based on samplings of 2% populations) of the third generation (■) and control population (●) of the African catfish (*Clarias gariepinus*) genetic improvement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

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Each equation is written centered and numbered columns are written in parentheses and placed at the end of the right margin. Equations should be written using Equation Editor in MS Word or Open Office (Primack, 1983).

$$RPS = \left(1 - \frac{\% \text{ fish mortality of vaccinated}}{\% \text{ Fish mortality of control}} \right) \times 100$$

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11. References

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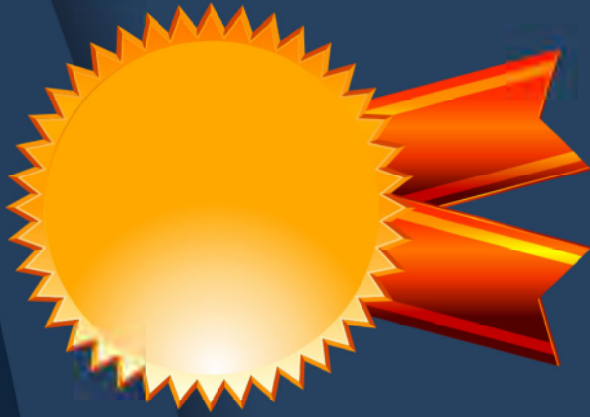
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