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Kata kunci bersumber dari artikel. Lembar abstrak dapat dicuplik tanpa izin dan biaya

Diah Ayu Satyari Utami, Wahyu , Liga Insani, I Gusti Putu Gede Rumayasa Yudana, and Teguh Harijono (Department of Aquaculture, Marine and Fisheries Polytechnic of Jembrana, Jembrana; Marine and Fisheries Polytechnic of Bitung, Bitung; Marine and Fisheries Polytechnic of Sidoarjo, Sidoarjo)

Growth performance and intestinal bacterial population of pacific white shrimp (*Penaeus vannamei*) fed with different dietary prebiotics-supplemented feed

*Kinerja pertumbuhan dan populasi bakteri usus udang vaname (**Penaeus vannamei**) dengan pemberian pakan prebiotik berbeda*

Jurnal Riset Akuakultur, 19(1), 2024, 1-13

Prebiotic applications in aquaculture are mainly given in the form of single or mixed prebiotics. A number of studies compared the effects of different doses or frequencies of a single prebiotic application. However, studies comparing different prebiotics in order to find the most effective ones for certain farmed species are limited. This study aimed to evaluate the effects of different dietary prebiotics on the growth performances and intestinal bacterial populations of Pacific white shrimp (*Penaeus vannamei*). Four treatments with triplicates were arranged in a completely randomized design (CRD). The treatments consisted of feed supplemented with different dietary prebiotics for Pacific white shrimp, including control (without dietary prebiotic), 0.5% honey (v/w), 0.5% mannan-oligosaccharide (MOS) (w/w), and 0.5% inulin (w/w). Pacific white shrimp (1.59 ± 0.12 g) were randomly stocked in 12 glass tanks ($60 \times 30 \times 40$ cm³) with a stocking density of 15 shrimp per tank. The shrimp were fed the experimental feed to apparent satiation four times daily for 30 days. Growth parameters observed consisted of final weight, specific growth rate (SGR), feed conversion ratio (FCR), survival of Pacific white shrimp, total bacterial count, total *Vibrio* count, and dominance of *Vibrio* in the intestine of experimental shrimp. Dietary prebiotics improve the growth performances of Pacific white shrimp. The highest growth performances were found in the shrimp treated with dietary honey. The improvement in growth performance may be due to the ability of honey to boost the proliferation of beneficial bacteria in the intestines of Pacific white shrimp.

KEYWORDS: growth; honey; inulin; MOS; Pacific white shrimp; prebiotics

*Pemanfaatan prebiotik dibagi menjadi dua kelompok yang terdiri atas prebiotik tunggal dan prebiotik campuran. Banyak penelitian sebelumnya yang berfokus pada perbandingan dosis atau frekuensi satu jenis prebiotik tetapi tidak membandingkan jenis prebiotik yang berbeda untuk menemukan prebiotik yang paling efektif untuk spesies tertentu. Penelitian ini bertujuan untuk mengevaluasi pengaruh pemberian pakan prebiotik yang berbeda terhadap kinerja pertumbuhan dan populasi bakteri usus udang vaname (**Penaeus vannamei**). Penelitian ini dilakukan melalui rancangan acak lengkap (RAL) dengan empat perlakuan dan tiga ulangan. Perlakuan yang diberikan dalam penelitian ini terdiri atas pemberian pakan prebiotik yang berbeda pada udang vaname meliputi kontrol (tanpa prebiotik), madu 0,5% (v/b), mannan-oligosakarida (MOS) 0,5% (b/b), dan inulin 0,5% (b/b). Udang vaname ($1,59 \pm 0,12$ g) ditebar secara acak dalam 12 akuarium kaca ($60 \times 30 \times 40$ cm³) dengan padat tebar 15 udang per akuarium. Udang diberi pakan percobaan sampai kenyang empat kali sehari selama 30 hari. Parameter yang diamati terdiri atas bobot akhir, laju pertumbuhan spesifik (LPS), rasio konversi pakan (RKP), kelangsungan hidup udang vaname, jumlah bakteri total, jumlah *Vibrio* total, dan dominasi *Vibrio* dalam usus udang percobaan. Pemberian pakan prebiotik meningkatkan kinerja pertumbuhan udang vaname. Kinerja pertumbuhan tertinggi ditemukan pada udang yang diberi madu. Peningkatan kinerja pertumbuhan ini mungkin disebabkan oleh kemampuan madu dalam meningkatkan perkembangbiakan bakteri menguntungkan di usus udang vaname.*

KATA KUNCI: inulin; madu; MOS; pertumbuhan; prebiotik; udang vaname

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Sri Dwi Hastuti, Anis Zubaidah, dan Siti Fatimah (Program Studi Akuakultur, Jurusan Perikanan, Fakultas Pertanian dan Peternakan, Universitas Muhammadiyah Malang)

Respons kekebalan bawaan ikan nila (*Oreochromis niloticus*) yang diberi pakan dengan suplementasi daun alpukat (*Parsea americana mill*)

*The innate immune responses of tilapia (*Oreochromis niloticus*) fed with feed supplementation of avocado (*Parsea americana mill*) leaves*

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Penyakit pada budidaya ikan nila merupakan permasalahan utama yang dapat menurunkan produksi dan menyebabkan kerugian. Selama ini upaya pengobatan dan pencegahan penyakit dilakukan dengan menggunakan antibiotik dan bahan kimia yang tidak ramah lingkungan, sehingga dapat meninggalkan residu pada daging ikan dan mencemari perairan. Oleh karena itu perlu alternatif penanggulangan penyakit dengan pemanfaatan bahan alami seperti daun alpukat yang mengandung senyawa saponin, tanin, flavonoid, alkaloid, dan fenol yang dapat berfungsi sebagai imunostimulan. Penelitian ini bertujuan untuk mengevaluasi respons kekebalan nonspesifik ikan nila yang diberi pakan dengan suplementasi daun alpukat. Metode yang digunakan adalah eksperimen dengan rancangan acak lengkap menggunakan empat perlakuan dan tiga ulangan. Dosis perlakuan yang digunakan adalah: perlakuan P1 (suplementasi daun alpukat 0,25%); perlakuan P2 (suplementasi daun alpukat 0,5%); perlakuan P3 (suplementasi daun alpukat 0,75%); dan perlakuan P0 (kontrol tanpa suplementasi daun alpukat). Hasil penelitian menunjukkan bahwa ikan nila yang diberi pakan mengandung daun alpukat menunjukkan level hematokrit, leukokrit, dan aktivitas fagositosis yang berbeda nyata ($P < 0,05$) dengan ikan yang diberi pakan kontrol. Hematokrit tertinggi diperoleh pada dosis 0,5%; sedangkan leukokrit tertinggi diperoleh pada dosis 0,75% dan aktivitas fagositosis terbaik diperoleh pada dosis 0,75% dengan nilai sebesar 33,69, 2,44, dan 72% secara berturut-turut. Suplementasi daun alpukat pada pakan tidak berpengaruh nyata terhadap pertumbuhan dan kelangsungan hidup ikan nila. Dari hasil penelitian dapat disimpulkan bahwa daun alpukat memiliki potensi dalam meningkatkan sistem kekebalan bawaan ikan nila, khususnya pada hematokrit dan leukokrit serta aktivitas fagositosisnya.

KATA KUNCI: aktivitas fagositosis; diferensial leukosit; hematokrit; leukosit

Disease in tilapia farming is a major problem that can reduce production and inflict irrevocable economic losses. Conventionally, efforts to treat and prevent diseases are carried out using antibiotics and chemicals that are not environmentally friendly, leaving residues on the fish flesh and polluting the aquatic environment. Therefore, alternative disease preventions and cures are increasingly researched, focusing on natural ingredients such as avocado leaves, which contain saponins, tannins, flavonoids, alkaloids, and phenols that can function as immunostimulants. This study aimed to evaluate the nonspecific immune response of tilapia fed with feed supplemented with avocado leaves. The study used experimental units consisting of four treatments and three replications arranged in a completely randomized design. The treatment doses were: treatment P1 (0.25% avocado leaves supplementation); treatment P2 (0.5% avocado leaves supplementation); treatment P3 (0.75% avocado leaves supplementation); and treatment P0 (control without avocado leaves supplementation). The results showed that tilapia fed with feed containing avocado leaves showed levels of hematocrit, leukocrit, and phagocytic activity that were significantly different ($P < 0.05$) from the fish fed with the control feed. The highest hematocrit was obtained at the dose of 0.5%; while the highest leukocrit was obtained at the dose of 0.75% and the best phagocytic activity was obtained at the dose of 0.75% with values of 33.69, 2.44, and 72%, respectively. Supplementation of avocado leaves in feed did not have a significant effect on the growth and survival of tilapia. Based on the results, This study concludes that avocado leaves have the potential to improve the innate immune system of tilapia, especially in hematocrit and leukocrit as well as phagocytic activity.

KEYWORDS: differential leucocytes; haematocrit; leukocrit; phagocytosis activity

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Anis Zubaidah, Yussandra Khartika Sari, Sri Dwi Hastuti, dan Hany Handajani (Program Studi Akuakultur, Fakultas Pertanian dan Peternakan, Universitas Muhammadiyah Malang)

Efikasi vaksin aeromonas hydrophila terhadap imunitas ikan lele sangkuriang (*Clarias gariepinus*) dengan metode infiltrasi hiperosmotik

Efficacy of Aeromonas hydrophila vaccine on immunity of sangkuriang catfish (Clarias gariepinus) using the hyperosmotic infiltration method

Jurnal Riset Akuakultur, 19(1), 2024, 31-44

Kendala yang sering dialami pembudidaya ikan lele salah satunya yaitu serangan motile *Aeromonas septicemia* (MAS). Vaksinasi melalui perendaman merupakan cara yang efektif untuk meningkatkan sistem imun pada tubuh ikan lele, namun kurang memberikan hasil yang optimal sehingga perlu adanya penambahan metode infiltrasi hiperosmotik untuk memaksimalkan penyerapan vaksin. Penelitian ini bertujuan untuk menentukan kisaran salinitas yang baik dalam memaksimalkan penyerapan vaksin *Aeromonas hydrophila* pada ikan lele. Penelitian ini menggunakan metode eksperimental rancangan acak lengkap dengan lima taraf perlakuan dan tiga kali ulangan, antara lain kontrol negatif (Kn), kontrol positif (Kp), perendaman salinitas 3 ppt (P1), perendaman salinitas 6 ppt (P2), dan perendaman salinitas 9 ppt (P3) pada ikan lele berukuran 12-15 cm. Parameter yang diamati antara lain titer antibodi, relative percent survival, survival rate (SR), total eritrosit, total leukosit, kualitas air, dan gejala klinis. Hasil penelitian menunjukkan nilai tertinggi yaitu pada P2 (6 ppt) dengan nilai titer antibodi sebesar $8,0 \pm 0,0$, relative percent survival 100%, survival rate 100%, dan total eritrosit $2,80 \times 10^6$ sel mm^{-3} , namun total leukosit pada P2 (6 ppt) menunjukkan nilai terendah karena leukosit melawan serangan patogen sehingga jumlah sel menurun. Disimpulkan bahwa perendaman dalam salinitas 6 ppt merupakan salinitas terbaik pada ikan lele dan berbeda nyata ($P < 0,05$) dengan perlakuan lainnya karena proses penyerapan vaksin terjadi secara maksimal sehingga dapat meningkatkan sistem imun ikan lele.

KATA KUNCI: osmoregulasi; perendaman; salinitas; vaksinasi

One of the obstacles often experienced by catfish farmers is attacks by the motile Aeromonas septicemia (MAS). Vaccination through immersion is an effective way to improve the immune system in the body of catfish, but it does not provide optimal results so it is necessary to add a hyperosmotic infiltration method to maximize vaccine absorption. This study aimed to determine an optimum salinity range to maximize the absorption of the Aeromonas hydrophila vaccine in catfish. This study used a completely randomized design experimental method with five treatment levels and three replications, including negative control (Kn), positive control (Kp), 3 ppt salinity immersion (P1), 6 ppt salinity immersion (P2), and 9 ppt salinity immersion (P3) in catfish sizing 12-15 cm. The parameters observed included antibody titer, relative percent survival, survival rate (SR), total erythrocytes, total leukocytes, water quality, and clinical symptoms. The results of the study showed that the highest value was at P2 (6 ppt) with an antibody titer value of 8.0 ± 0.0 , relative percent survival 100%, survival rate 100%, and total erythrocytes 2.80×10^6 cells mm^{-3} , while total leukocytes in P2 (6 ppt) showed the lowest value because leukocytes fought against pathogen attacks so that the number of cells decreased. It was concluded that immersion in 6 ppt salinity was the best salinity for catfish and was significantly different ($P < 0.05$) from other treatments because the vaccine absorption process occurred optimally so that it could improve the catfish's immune system.

KEYWORDS: immersion; osmoregulation; salinity; vaccination

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Nuril Azhar, Ervia Yudiati, Ambariyanto, Rabia Alghazeer, and Agus Trianto (Department of Marine Science, Faculty of Fisheries and Marine Science, Diponegoro University; Tropical Marine Biotechnology, Faculty of Fisheries and Marine Science, Diponegoro University; Department of Chemistry, Faculty of Sciences, University of Tripoli, Tariq Sayyidi al Misri Road, Tripoli, Libya)

Immunostimulatory effects of ulvan on trypsin-mediated protein digestion in the gut of pacific whiteleg shrimp (*Litopenaeus vannamei*)

Efek imunostimulasi ulvan dan digesti protein tripsin pada pencernaan udang vaname (*Litopenaeus vannamei*)

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Litopenaeus vannamei has emerged in the aquaculture industry. Production consistency, nutrition, and disease management play critical roles, particularly the digestive enzymes such as trypsin. This study assesses Ulvan, an immunostimulant from *Ulva lactuca*, on shrimp trypsin activity. Trypsin has been found to significantly enhance the activity of hemocyanin phenoloxidase, a crucial component of humoral immunity. This study aims to evaluate the potency of ulvan related to trypsin as an immunostimulant agent, extracted from *Ulva* sp. Ulvan, extracted using various methods (P-HWE, O-HWE, P-A-HWE, and O-A-HWE), was evaluated using different doses of (0 g kg⁻¹ (Control), 0.75 g kg⁻¹ (ULV-0.75), 1.50 g kg⁻¹ (ULV-1.50), and 3.00 g kg⁻¹ (ULV-3.00) of feed). The O-A-HWE exhibited the fastest and highest increase in trypsin activity on day 4, surpassing the control on days 2, 3, 7, and 8. The P-HWE, O-HWE, and P-A-HWE also showed significant changes in trypsin activity compared to the control on specific days. Meanwhile, trypsin activity in Ulvan-fed shrimp did not significantly differ from the control on days 0 and 1. The differences emerged on day 2 and 3, notably between ULV^{-1.50} g kg⁻¹ and ULV^{-0.75} g kg⁻¹. The ULV^{-3.00} g kg⁻¹ showed no significant difference from ULV^{-1.50} g kg⁻¹. O-A-HWE demonstrated significant differences in trypsin activity compared to other Ulvan extracts, suggesting its potential to enhance shrimp health.

KEYWORDS: immunostimulant; shrimp; trypsin activity; ulvan

Litopenaeus vannamei memiliki peran yang besar dalam industri akuakultur. Konsistensi dalam produksi, nutrisi, dan pengelolaan terhadap penyakit merupakan bagian yang sangat penting, terutama enzim pencernaan, di antaranya tripsin. Tripsin berfungsi untuk meningkatkan fenoloksidase hemosianin, yang peranannya penting untuk kekebalan. Studi ini mengevaluasi Ulvan, yaitu bahan yang bersifat imunostimulan dari *Ulva* sp., terhadap aktivitas tripsin udang. Ulvan, diekstraksi menggunakan berbagai metode (P-HWE, O-HWE, P-A-HWE, dan O-A-HWE), dievaluasi menggunakan perlakuan dosis yang berbeda (0 g kg⁻¹ (Kontrol), 0,75 g kg⁻¹ (ULV-0,75), 1,50 g kg⁻¹ (ULV-1,50), dan 3,00 g kg⁻¹ (ULV-3,00) pada pemeliharaan udang vaname selama 10 hari. O-A-HWE menunjukkan peningkatan aktivitas tripsin tercepat dan tertinggi pada hari ke-4, melebihi kontrol pada hari ke-2, 3, 7, dan 8. P-HWE, O-HWE, dan P-A-HWE juga menunjukkan perubahan signifikan dalam aktivitas tripsin dibandingkan dengan kontrol pada hari-hari tertentu. Sementara aktivitas tripsin dalam udang yang diberi Ulvan tidak berbeda secara signifikan dari kontrol pada hari ke-0 dan 1, perbedaan mulai terlihat pada hari ke-2 dan 3, terutama antara ULV^{-1,50} g kg⁻¹ dan ULV^{-0,75} g kg⁻¹. ULV^{-3,00} g kg⁻¹ tidak menunjukkan perbedaan yang signifikan dari ULV^{-1,50} g kg⁻¹. O-A-HWE menunjukkan perbedaan signifikan dalam aktivitas tripsin dibandingkan dengan ekstrak Ulvan lainnya, sehingga berpotensi dalam meningkatkan kesehatan udang.

KATA KUNCI: aktivitas tripsin; imunostimulan; udang; Ulvan

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Danang Yonarta, Tanbiyaskur, I Gede Arya Weda, and Fitra Gustiar (Department of Aquaculture, Faculty of Agriculture, Sriwijaya University; Department of Agroecotechnology, Faculty of Agriculture, Sriwijaya University)

Application of different feed and feeding periods during rearing of malay combtail (*Belontia hasselti*) larvae

Aplikasi jenis pakan dan periode pemberian pakan yang berbeda pada pemeliharaan larva ikan selincah (Belontia hasselti)

Jurnal Riset Akuakultur, 19(1), 2024, 57-67

Feed type and feeding period play critical roles in growth and survival of fish larvae during rearing period, for which no related studies are available for Malay combtail larvae. This research aimed to determine the best feed type and feeding period for growth and survival of Malay combtail larvae. The research experiment was arranged in a completely randomized design with five treatments of different feed and feeding periods with three replications, namely (P1) nauplii *Artemia* sp. (4-15 days), *Moina* sp. (14-24 days), and *Tubifex* sp. (23-35 days), (P2) nauplii *Artemia* sp. (4-13 days), *Moina* sp. (12-20 days), and *Tubifex* sp. (19-35 days), (P3) nauplii *Artemia* sp. (4-11 days), *Moina* sp. (10-16 days), and *Tubifex* sp. (15-35 days), (P4) nauplii *Artemia* sp. (4-11 days), *Moina* sp. (12-20 days), and artificial feed (19-35 days), and (P5) nauplii *Artemia* sp. (4-11 days), *Moina* sp. (10-16 days), and artificial feed (15-35 days). The results showed that P4 was the best treatment, where larvae had better absolute growth in length and weight and survival of 11.09 ± 0.03 mm, 0.083 ± 0.001 g, and $50.67 \pm 1.15\%$, respectively. Variations of water quality parameters during the experiment in all treatments ranged between 6.0-6.6 for pH, 0.017-0.091 mg L⁻¹ for ammonia, and 4.03-4.43 mg L⁻¹ for dissolved oxygen. The results of this research that the sequential and early application of live feed and much later artificial feed application in combination with the timely feeding period and the larval development improve growth and survival of Malay combtail larvae.

KEYWORDS: feeding period; growth; Malay combtail; survival rate; type of feed

*Jenis pakan dan periode pemberian pakan memainkan peran penting dalam pertumbuhan dan kelangsungan hidup larva ikan selama masa pemeliharaan, hingga saat ini belum ada penelitian terkait mengenai larva ikan selincah. Penelitian ini bertujuan untuk mengetahui jenis pakan dan lama pemberian pakan yang terbaik untuk pertumbuhan dan kelangsungan hidup larva ikan selincah. Penelitian disusun dalam rancangan acak lengkap dengan lima perlakuan pakan dan lama pemberian pakan berbeda dengan tiga ulangan yaitu (P1) nauplii *Artemia* sp. (4-15 hari), *Moina* sp. (14-24 hari), dan *Tubifex* sp. (23-35 hari), (P2) nauplii *Artemia* sp. (4-13 hari), *Moina* sp. (12-20 hari), dan *Tubifex* sp. (19-35 hari), (P3) nauplii *Artemia* sp. (4-11 hari), *Moina* sp. (10-16 hari), dan *Tubifex* sp. (15-35 hari), (P4) nauplii *Artemia* sp. (4-11 hari), *Moina* sp. (12-20 hari), dan pakan buatan (19-35 hari), dan (P5) nauplii *Artemia* sp. (4-11 hari), *Moina* sp. (10-16 hari), dan pakan buatan (15-35 hari). Hasil penelitian menunjukkan bahwa P4 merupakan perlakuan terbaik, di mana larva mempunyai pertumbuhan panjang dan berat absolut yang lebih baik serta kelangsungan hidup masing-masing sebesar $11,09 \pm 0,03$ mm, $0,083 \pm 0,001$ g, dan $50,67 \pm 1,15\%$. Variasi parameter kualitas air selama percobaan pada semua perlakuan berkisar antara 6,0-6,6 untuk pH, 0,017-0,091 mg L⁻¹ untuk amoniak, dan 4,03-4,43 mg L⁻¹ untuk oksigen terlarut. Hasil dari penelitian ini adalah pemberian pakan hidup secara berurutan dan dini serta pemberian pakan buatan yang dikombinasikan dengan periode pemberian pakan yang tepat waktu dan perkembangan larva akan meningkatkan pertumbuhan dan kelangsungan hidup larva ikan selincah.*

KATA KUNCI: ikan selincah; jenis pakan; kelangsungan hidup; periode pemberian pakan; pertumbuhan

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Hamdan Syakuri, Satrio Haryu Wibowo, Anandita Ekasanti, Petrus Hary Tjahja Soedibya, Sri Marnani, Emyliana Listiowati, Dewi Nugrayani, dan Purnama Sukardi (Program Studi Akuakultur, Fakultas Perikanan dan Ilmu Kelautan, Universitas Jenderal Soedirman)

Isolasi, identifikasi, dan analisis ekspresi gen pengkode growth hormone pada ikan sidat (*Anguilla bicolor*)

Isolation, identification, and analysis of growth hormone coding genes expression in eel (Anguilla bicolor)

Jurnal Riset Akuakultur, 19(1), 2024, 69-83

Gen hormon pertumbuhan (*growth hormone*, GH) perlu dipelajari untuk mendukung domestikasi ikan sidat (*Anguilla bicolor*) di Indonesia. Penelitian ini bertujuan untuk mengisolasi dan mengidentifikasi gen pengkode GH serta menganalisis ekspresinya pada sampel ikan sidat *A. bicolor*. Primer untuk amplifikasi gen GH ikan sidat *A. bicolor* didesain berdasarkan sekuen gen GH dari beberapa spesies ikan sidat lain yang tersedia di GenBank. Sampel cDNA hipofisa dan otak ikan sidat digunakan untuk amplifikasi gen GH. Hasil amplifikasi disekuensing dan hasilnya dianalisis menggunakan analisis BLAST, *multiple sequences alignment*, hormon *signature*, dan filogenetik. Analisis ekspresi gen GH dilakukan menggunakan teknik realtime PCR dengan metode delta-delta CT pada 14 sampel ikan sidat ($23,1 \pm 19,6$ g; $24,5 \pm 4,2$ cm). Fragmen DNA sepanjang 486 bp berhasil diamplifikasi dan disekuensing. Sekuen gen GH *A. bicolor* memiliki similaritas nukleotida sebesar 98,49-99,14% jika dibandingkan dengan gen GH ikan sidat *A. anguilla*, *A. australis*, dan *A. japonica*. Sekuen parsial tersebut secara *in silico* diketahui mengkode bagian dari protein GH sepanjang 155 asam amino (aa). Sekuen asam amino protein GH *A. bicolor* sangat mirip dengan sekuen spesies ikan sidat lain dengan hanya tiga perbedaan asam amino dan membentuk satu percabangan pada pohon filogenetik. Tingkat ekspresi gen GH pada sampel ikan sidat memiliki variasi yang tinggi. Hasil penelitian ini dapat menjadi dasar untuk studi selanjutnya khususnya berkaitan dengan peran gen GH dalam pertumbuhan ikan sidat *A. bicolor*.

KATA KUNCI: *Anguilla bicolor*; ekspresi gen; hormon pertumbuhan; RT-PCR; sekuen gen

The growth hormone (GH) gene needs to be studied to support the domestication of the Anguilla bicolor eel in Indonesia. This study aimed to isolate and identify the GH coding gene and analyze its expression in samples of the eel A. bicolor. Primers for amplification of the GH gene of A. bicolor eels were designed based on GH gene sequences from several other eel species available in GenBank. Pituitary and brain cDNA samples of eel were used for GH gene amplification. The amplification results were sequenced and the results were analyzed using BLAST analysis, multiple sequence alignment, hormone signature, and phylogenetic analysis. The GH gene expression analysis was carried out using the real-time PCR technique with the delta-delta CT method on 14 eel samples (23.1 ± 19.6 g; 24.5 ± 4.2 cm). The 486 bp DNA fragment was successfully amplified and sequenced. The GH gene sequence of A. bicolor has a nucleotide similarity of 98.49-99.14% when compared with the GH gene of other eel species A. anguilla, A. australis, and A. japonica. This partial sequence was found in silico to code 155 amino acids (aa) GH protein. The amino acid sequence of the A. bicolor GH protein is very similar to that of other eel species with only three amino acid differences and forms one branch on the phylogenetic tree. The expression level of the GH gene in eel samples had high variations. The results of this study could be a basis for further studies, especially regarding the role of the GH gene in the growth of the eel A. bicolor.

KEYWORDS: *Anguilla bicolor*; expression of gene, growth hormone; RT-PCR; sequence of gene

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AUTHOR GUIDELINES OF JURNAL RISET AKUAKULTUR FOR WRITING FORMAT AND PUBLICATION PROCESS

Ilham¹⁾, Diah Ayu Satyari Utami^{2)#}, dan Hatim Albasri^{3*)}

¹⁾Department of Aquaculture, Marine and Fisheries Polytechnic of Jembrana, Bali

²⁾Research Center for Fisheries, National Research and Innovation Agency, Jakarta

#Correspondence: diah.utami@kkp.go.id

ABSTRACT

Abstract is written in bahasa and English using 12-point Times New Roman single space with justified alignment. English abstract is followed by the English version of the title which is typed using bold capitalized each word letters. Abstract must not exceed than 250 words and contains the brief outline of the problem statement and aims of the study, brief methodology, the main findings or results, and conclusion.

KEYWORDS: author guidelines; Jurnal Riset Akuakultur; publication process; writing format

ABSTRAK: *Panduan Format Penulisan Jurnal Riset Akuakultur (Terjemahan dari Judul Artikel yang ditulis dalam Bahasa Indonesia Maksimal 20 Kata)*

Abstrak ditulis dalam bahasa Indonesia dan Inggris menggunakan font Times New Roman 12 spasi satu dengan rata kiri dan kanan. Abstrak bahasa Inggris diikuti dengan judul naskah versi bahasa Inggris yang diketik tebal dengan huruf pertama kapital pada setiap kata. Abstrak tidak boleh lebih dari 250 kata dan berisi ringkasan masalah dan tujuan penelitian, metodologi singkat, temuan utama atau hasil penelitian, dan kesimpulan.

KATA KUNCI: *format penulisan; Jurnal Riset Akuakultur; petunjuk penulisan; proses publikasi*

INTRODUCTION

Introduction must be concise and at least has several components including an adequate background related to the research, problem statement, some literature review from previous studies, the research gap, and the aims of the study. Introduction is written using double space line, single column, 12-point Times New Roman with justified alignment. Text citation of references uses author-date style according to APA 7th Edition and multiple references are listed in alphabetical order separated by semicolon among references to differentiate citations, e.g. (Smith & Jones, 2016; Williams, 2014). Use “and” when giving a citation in sentences and “&” for parentheses, e.g. Smith and Jones (2016) or (Smith & Jones, 2016).

MATERIALS AND METHODS

This section presents a clear and concise research procedures for others to be able to replicate the study. The use of subsections is allowed to explain some different continued-procedures. This section also provides ethical clearance statement for the research which applies an experiment on animals or human. The materials and equipment used must be mentioned with their specifications consisting of the trademark, supplier or manufacture name, and region or country. This section also covers a brief narration about data analysis. Methods that have been published should be summarized and completed with in-text-citation. Modified methods should be clearly described its modification from the previous cited methods. Use the international system of units (SI) or SI-derived units to express unit of measurements. Minus index is suggested being used rather than using slash (/), e.g.: mg L⁻¹, g L⁻¹, not mg/L or g/L. This section is typed in 12-point Times New Roman, double space line, a single column with justified alignment.

RESULTS AND DISCUSSION

Results and discussion must be combined in one section. The statement of the results can be summarized from the data appeared in the figures and tables. Discussion should explore the significance of the results or comparison to previous studies and represent the causal factors why and how the results were taken place, do not re-express the mentioned data in figures and tables in the form of sentences within results. Figures and tables can be placed in this section completed with cross-reference of the figures or tables stated in the text. This section is written in 12-point Times New Roman, double space line, a single column format with justified alignment.

Tables and figures must be placed within the main text, those can be placed in sections of materials and methods or results and discussion (if applicable). The preparation of tables can follow the guidance below:

1. Provide an editable form of tables, do not place any tables in the form of images.
2. The titles of tables should be consecutively numbered using Arabic numerals, please cite the tables in the text or give cross-reference of tables in the text.
3. The titles of tables are written in both in bahasa and English for the manuscript written

in bahasa, or only in English for the manuscript in English. Type the title using 12-point Times New Roman, single space with sentence case letters in justified alignment, and give hanging indent for the second and consecutive lines of the table title.

4. The body of the table is typed in 10-point Times New Roman, single space with left alignment, only column headings are typed in bold.
5. Please provide bahasa and English versions of any text in the body of the table for the manuscript submitted in bahasa, use italic font to type the English version of the text, while all the text in the table body of the manuscript submitted in English is only provided in English.
6. Use single horizontal lines to separate column heading and to indicate the end of the table, other horizontal lines are not needed. Vertical lines should not be used in the tables.
7. Capitalize only the first letter of the first word in each column and row entry.
8. All abbreviations and symbols or any statistical explanation and used literatures in the table body must be described in footnotes placed below the table and written in 10-point Times New Roman, single space in justified alignment.

An example of table format can be seen below.

Table 1. Average of survival rate, absolute weight growth, absolute length growth, and daily growth rate Asian redtail catfish fry fed different percentages of fermented sago dregs and anchovy head meal feed.

<i>Treatments</i>	<i>SR (%)</i>	<i>AWG (g)</i>	<i>ALG (cm)</i>	<i>DGR (% day⁻¹)</i>
P1	56,67 ± 22,5	0,12 ± 0,01 ^b	1,47 ± 0,39	0,57 ± 0,06 ^b
P2	58,33 ± 10,4	0,11 ± 0,01 ^b	1,42 ± 0,54	0,56 ± 0,03 ^b
P3	75,00 ± 10,0	0,16 ± 0,01 ^c	1,54 ± 0,17	0,78 ± 0,06 ^c
P4	66,67 ± 25,6	0,07 ± 0,00 ^a	1,20 ± 0,07	0,32 ± 0,01 ^a

Note: Values with different superscript letters in the same column indicate significantly different results ($P < 0,05$). P1 = Feeding with percentages of 6%, P2 = 8%, P3 = 10 %, P4 = 12% from body weight of fish fry. SR = survival rate; AWG = absolute weight growth; ALG = absolute length growth; DGR = daily growth rate

The preparation of figures should refer the guidance below:

1. Figures should be provided in either vector art formats (Illustrator, EPS, WMF, FreeHand, CorelDraw, PowerPoint, Excel, etc.) or bitmap formats (Photoshop, TIFF, GIF, JPEG, etc.). Bitmap images should be of 300 dpi resolution. Provide an editable form of charts, not as images.

2. The titles of figures should be consecutively numbered using Arabic numerals, please cite the figures in the text or give cross-reference of figures in the text.
3. The titles of figures are written in both in bahasa and English for the manuscript written in bahasa, or only in English for the manuscript in English. Type the title using 12-point Times New Roman, single space with sentence case letters in justified alignment, and give hanging indent for the second and consecutive lines of the table title. Place the figure title below the figure.
4. Please provide bahasa and English versions of any text in the body of the figure for the manuscript submitted in bahasa, use italic font to type the English version of the text, while all the text in the figure body of the manuscript submitted in English is only provided in English.
5. Capitalize only the first letter of the first word in any text contained in the figure body.
6. All abbreviations and symbols or any statistical explanation and used literatures in the figure body must be described in footnotes placed below the figure title and written in 10-point Times New Roman, single space in justified alignment.

An example of figure format is presented below.

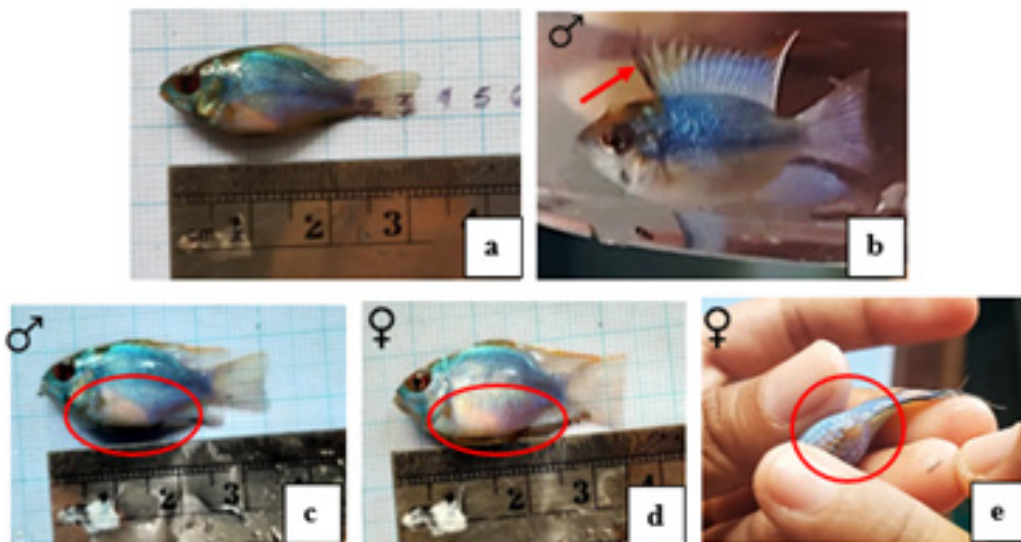


Figure 1. Visual observations of gonad matured ramirezi broodstock: (a) research start (b) ramirezi male at the end of the research with a black elongated front dorsal fin (c) ramirezi male with a bluer body and belly (d) ramirezi female with a pink belly (e) prominent and yellow urogenital

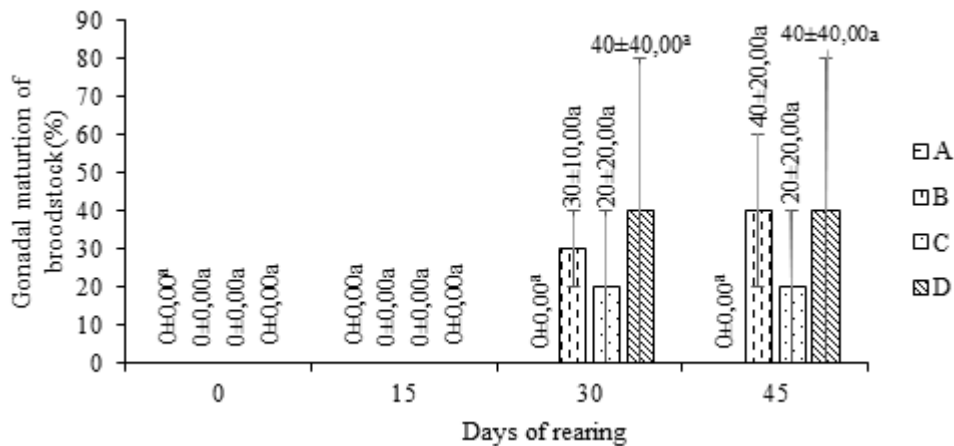


Figure 2. Accumulation percentage of gonadal mature ramirezi broodstock after treatments (combined ratio of artificial feed to bloodworms (*Chironomus* sp.): (A) 3:0, (B) 0:3, (C) 2:1, and (D) 1:2) on day 0 to day 45. The results presented are based on data normalization. Different superscripts in the same days of rearing indicate significantly differences at a confidence level of 95% ($P < 0.05$)

CONCLUSION

Conclusions must summarize the results and answers the research questions or aims. Conclusions should be combined with the summary of the discussions which explains why or how the highlighted results obtained. This section is written in 12-point Times New Roman, double space line, a single column format with justified alignment.

ACKNOWLEDGMENTS

This section is used to acknowledge any institutions or individuals that provide funding sources or help during the study. The research which was funded by a research grant must mention the name of research grant and its detail such the funding organization and associated grant number (if applicable). This section is written in 12-point Times New Roman, double space line, a single column format with justified alignment.

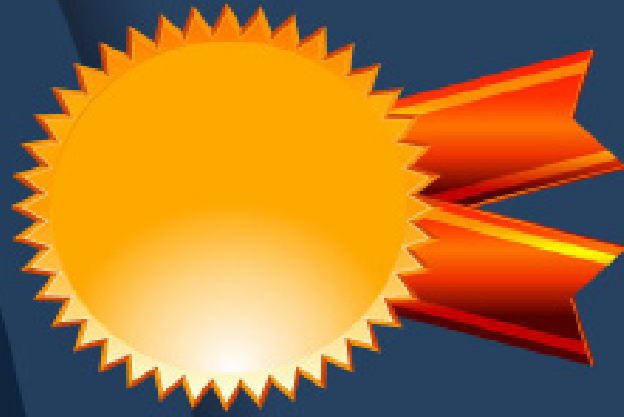
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