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EFFECT OF ADDING VITERNA PLUS TO ARTIFICIAL FEED AT DIFFERENT DOSAGES ON THE GROWTH AND SURVIVAL RATE OF SIAMESE CATFISH (*Pangasius hypophthalmus*)

Pengaruh Penambahan Viterna Plus pada Pakan Buatan dengan Dosis Berbeda Terhadap Pertumbuhan dan Kelangsungan Hidup Ikan Patin Siam *(Pangasius hypophthalmus)*

Yolly Rifyoni, Boni Ikhlas*, Endryeni, Reffi Aryzegovina

Aquaculture Study Program, Nahdlatul Ulama University of West Sumatra

S. Parman Street No.119 A 25136 Padang, West Sumatra

*Corresponding Author: boni.ikhlas@gmail.com

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ABSTRACT

This study aimed to analyze the effect of adding Viterna Plus to artificial feed at different doses on the growth, survival, and length–weight relationship of Siamese catfish (*Pangasius hypophthalmus*), as well as to determine the optimal dose for the best performance. The research was conducted at Si Pujuk Farm, Padang City, over 40 days using a Completely Randomized Design (CRD) with four treatments: P0 (without Viterna Plus), P1 (7 mL/kg feed), P2 (14 mL/kg feed), and P3 (21 mL/kg feed), each with three replicates. Observed parameters included specific growth rate (SGR), absolute weight and length growth, feed conversion ratio (FCR), survival rate (SR), length–weight relationship, and water quality. The results showed that the 14 mL/kg feed treatment (P2) produced the highest mean values for SGR (1.05 ± 0.25%), absolute weight (20.23 ± 11.86 g), absolute length (2.05 ± 0.38 cm), the lowest FCR (10.85), and the highest SR (97.77 ± 3.84%). Analysis of the length–weight relationship indicated a b value < 3, suggesting negative allometric growth, meaning that length increased faster than weight. Based on ANOVA results, the addition of Viterna Plus had no significant effect ($P > 0.05$). Throughout the study, water quality remained within the optimal range for Siamese catfish cultivation.

Keywords: Siamese catfish, Viterna Plus, growth, survival, length–weight relationship, water quality, artificial feed

ABSTRAK

Penelitian ini bertujuan untuk menganalisi pengaruh penambahan Viterna Plus pada pakan buatan dengan dosis berbeda terhadap pertumbuhan, kelangsungan hidup, serta hubungan panjang-berat ikan patin siam *(Pangasius hypophthalmus)*, selain itu, penelitian ini juga menentukan dosis optimal yang menghasilkan performa terbaik. Kegiatan Penelitian dilakukan di Si Pujuk Farm, Kota Padang, selama 40 hari dengan menggunakan Rancangan Acak Lengkap (RAL) 4 yang terdiri dari empat perlakuan, yaitu perlakuan P0 (tanpa Viterna Plus), P1 7ml/kg pakan, 14 ml/kg pakan, 21 ml/kg pakan dan tiga ulangan. Parameter yang diamati meliputi laju pertumbuhan spesifik (SGR),

pertumbuhan bobot dan panjang mutlak, rasio konversi pakan (FCR), kelangsungan hidup (SR), hubungan panjang-berat, serta kualitas air. Hasil penelitian menunjukkan bahwa perlakuan dosis 14 mL/kg pakan (P2) menghasilkan nilai rata-rata tertinggi pada SGR (1,05 ± 0,25%), bobot mutlak (20,23 ± 11,86 g), panjang mutlak (2,05 ± 0,38 cm), FCR terendah (10,85), dan SR tertinggi (97,77 ± 3,84%). Analisis hubungan panjang-berat menunjukkan nilai $b < 3$ yang menunjukkan pertumbuhan bersifat alometrik negatif, artinya pertambahan panjang lebih cepat dibandingkan pertambahan berat. Berdasarkan, hasil uji ANOVA, penambahan Viterna Plus tidak berpengaruh signifikan (P>0,05). Selama penelitian, Kualitas air berada pada kisaran optimal untuk budidaya ikan patin.

Kata kunci: Ikan Patin, Viterna Plus, pertumbuhan, kelangsungan hidup, hubungan panjang-berat, kualitas air, pakan buatan

INTRODUCTION

The Siamese catfish (*Pangasius hypophthalmus*) is a highly economically valuable freshwater fish widely cultivated in Indonesia. This fish is known for its fast growth, ease of maintenance, and adaptability to low oxygen levels (Krisnaneny, 2022). Furthermore, catfish are popular with the public for their delicious flavor, soft texture, and high nutritional content (Mulyani & Haris, 2021).

In aquaculture, several factors significantly influence the success of fish growth, including feed type, water quality, and maintenance system (Effendi, 1997). Of these three factors, feed is the most crucial aspect as it serves as the primary source of energy and nutrition for the fish (Qothrunnada & Prabowo, 2023). Feed even contributes the largest portion, accounting for 60-70% of total production costs in aquaculture, making feed efficiency a key factor in business sustainability (Arief & Subekti, 2014).

Artificial feed is typically composed of plant and animal ingredients, taking into account nutritional needs, availability, and fish size. The use of artificial feed offers advantages because the nutritional content can be more precisely regulated and tailored to the specific needs of the fish (Andrian *et al.,* 2021). However, during the manufacturing process, some vitamins and minerals are often damaged due to oxidation, heating, or improper storage. This can lead to nutritional imbalances that impact fish growth and endurance (Rioeh *et al.,* 2024).

To address this issue, one alternative is the addition of feed supplements such as Viterna Plus. This product, a plant-based and animal-based supplement, functions to increase appetite, strengthen the immune system, improve digestion, and accelerate fish growth. The amino acids, vitamins, and minerals in Viterna Plus play a crucial role in increasing the efficiency of nutrient absorption and the effectiveness of fish metabolism (Robi *et al.,* 2015).

RESEARCH METHODS

Place and Time

The research was conducted at Si Pujuk Farm in Koto Panjang Ikua Koto, Koto Tangah District, Padang City, West Sumatra, from May to June 2025 for 40 days.

Tools and Materials

The equipment used included a reservoir, 12 tarpaulin pools measuring 100 x 100 x 50 cm, measuring cups, sprayers, digital scales, thermometers, DO meters, pH meters, sieves, scoops, basins, and stationery.

The research materials consisted of 180 Siamese catfish fingerlings measuring 12-15 cm, as well as artificial feed made from fish meal (30%), tofu dregs, decaf, corn flour, tapioca flour (a binder), palm kernel meal, and Viterna Plus supplements.

Research Design

This study used a completely randomized design (CRD) with four treatments and three replications, resulting in 12 rearing ponds. The treatments varied in dosage of Viterna Plus in the artificial feed, namely:

P0 : 0 ml/kg feed (control)
P1 : 7 ml/kg feed
P2 : 14 ml/kg feed
P3 : 21 ml/kg feed

The aim of this design is to determine the effect of different doses on the growth and survival rate of Siamese catfish (*Pangasius hypophthalmus).*

Feed Formulation Composition

The artificial feed used for catfish at Sipujuk Farm is a sinking feed. The feed formulation used in this study is a previously implemented formula. The feed formulation can be seen in the table below.

Table 1. Test feed formulation used

No	Feed Ingredients	Protein Content
1	Fish meal	30%
2	Tofu dregs	25%
3	Cornstarch	20%
4	Bran	15%
5	Tapioca flour	5%
6	Palm kernel meal	5%
	Total	100%

Source: Sipujuk Farm

Test Feed Preparation

All feed ingredients are mixed evenly according to the formulation, then molded using a printing machine. After the molding process, the feed is dried in the sun until dry. The addition of Viterna Plus is done by mixing the supplement into 100 mL of water as done by (Renaldi *et al.,* 2024) to ensure that the Viterna Plus content used is not too concentrated, then sprayed evenly on the feed using a sprayer and aired until it is not sticky before being given to the fish. The spraying process is carried out once a week.

Test Fish Maintenance

Each pond was stocked with 15 catfish. Before treatment began, all fish were weighed and their initial length measured. Feed was provided twice daily at 8:00 AM and 5:00 PM. The water was changed once a week, approximately 20-30% of the total water volume, to maintain the quality of the media.

Research Parameters

The parameters measured in this study included specific growth rate, absolute weight, absolute length, feed conversion, feed efficiency, fish survival, and water quality in the Siamese

catfish (*Pangasius hypophthalmus*) rearing medium. Measurements were conducted every 20 days to determine fish length and weight. The parameters measured in this study were as follows:

1) Feed Conversion Ratio (FCR)
   The calculation of feed conversion is determined using the Goddard (1996) formula as follows:

$$FCR = \frac{\text{F}}{(\text{Wt} + \text{Wd}) - Wo}$$

   Information:
   FCR : Feed conversion ratio
   F : Amount of feed consumed (g)
   Wt : Biomass of test animals at the end of the study (g)
   Wd : Biomass of dead fish during research (g)
   Wo : Biomass of test animals at the beginning of the study (g)

2) Specific Growth Rate (SGR)
   The specific growth rate was calculated at the end of the treatment using the Effendi, (1997) formula:

$$\text{SGR} = \frac{Ln\ Wt - Ln\ Wo}{t} \times 100\%$$

   Information:
   SGR : Specific growth rate (%)
   Wo : Average weight of fish at the start of maintenance (g/tail)
   Wt : Average weight of fish at the end of maintenance (g/tail)
   t : Maintenance period (days)

3) Absolute Weight Gain
   Absolute weight growth is calculated using the formula from (Zonneveld *et al.,* 1991) as follows:

$$W = Wt - Wo$$

   Information:
   W : Absolute Weight Growth (g)
   Wo : Average weight of fish at the beginning of the study (g)
   Wt : Average weight of fish at the end of the study (g)

4) Absolute Length Growth
   Absolute length growth is calculated using the formula from (Zonneveld *et al.,* 1991), namely as follows:

$$L = Lt - Lo$$

   Information:
   L : Absolute length growth (cm)
   Lo : Average length of fish at the start of the study (cm)
   Lt : Average length of fish at the end of the study (cm)

5) Relationship between Length and Weight
The relationship between length and weight was analyzed based on the analysis procedure for the relationship between length and weight of fish, as stated by (Le Cren, 1951), with the formula:

$$W = aL^b$$

Information:
W : total weight (g)
L : total length (cm)
a and b : Length-weight relationship constant

This equation is then transformed into a logarithm so that it becomes a linear equation as follows:

$$\text{Log } W = \log a + b \log L$$

To see whether the growth is:
a. Isometric if b = 3 then the growth in weight and length is balanced
b. Positive allometric if b > 3 then weight is faster than length
c. Negative allometric if b < 3 then length is faster than weight

6) *Survival Rate* (SR)
The formula used to calculate the survival rate can be calculated using the formula proposed by (Effendie, 1979) as follows:

$$SR = \frac{Nt}{No} \times 100\%$$

Information:
SR : Survival rate (%)
Nt : Number of fish at the end of maintenance (tails)
No : Number of fish at the start of maintenance (tail)

7) Water Quality
Water quality parameters including temperature, pH, and dissolved oxygen (DO) levels were measured in the catfish seed maintenance media in the morning and evening.

Data Analysis

Observation data were analyzed using Analysis of Variance (ANOVA) to determine the effect of differences between treatments. If a significant difference ($P < 0.05$) was found, a Duncan test was conducted to determine the best treatment (Aprilia *et al.,* 2018). Meanwhile, water quality data was presented descriptively to illustrate the condition of the media during the study.

RESULT

Feed Conversion Ratio (FCR)

The results of the FCR calculation for Siamese catfish during the 40-day rearing period can be seen in Table 1 below.

Table 2. Feed Conversion of Siamese Catfish (*Pangasius hypophthalmus*)

Treatment	Amount of feed consumed	Final biomass	Dead Fish Biomass	Initial biomass	FCR
Treatment 0	1750	1.311	59,95	936	4,02
Treatment 1	1647	1.211	86,5	860	3,76
Treatment 2	1835	1.442	32,3	974	3,66
Treatment 3	1570	1.236	95,07	963	4,26

Source: Primary Data, 2025

The P2 treatment (14 mL/kg feed) produced the lowest FCR value (3.66), indicating the highest feed conversion efficiency compared to the other treatments. The lowest FCR value indicates that fish feed is effectively converted into fish biomass, while the highest FCR was found in the P3 treatment (4.26), indicating the lowest efficiency.

Specific growth rate of Siamese catfish (*Pangasius hypophthalmus)*

The average specific growth rate of Siamese catfish obtained during the study is presented in Table 2.

Table 3. Average Specific Growth Rate of Siamese Catfish (*Pangasius hypophthalmus*))

Treatment	Wo(g/tail)	Wt(g/tail)	SGR (Average ± SD.)
Treatment 0	20,79	30,49	0,95 ± 0,12
Treatment 1	19,11	28,81	1,04 ± 0,32
Treatment 2	21,64	32,73	1,03 ± 0,09
Treatment 3	21,4	31,71	1,00 ± 0,83

Source: Primary Data, 2025

The highest specific growth rate (SGR) was obtained in treatment P1 (1.04 ± 0.32%), followed by P2 (1.03 ± 0.09%). Although the SGR in P1 was slightly higher, the large standard deviation indicated quite high inter-replication variation. In contrast, P2 had more stable and consistent results, making it biologically considered the most optimal dose. Meanwhile, the lowest value was in P0 (0.95 ± 0.12%).

Absolute Weight Growth of Siamese Catfish (*Pangasius hypophthalmus)*

The average absolute weight growth of Siamese catfish obtained during the study is presented in Table 3.

Table 3. Average Absolute Weight Growth of Pangasius (*Pangasius hypophthalmus*) Over 40 Days

Treatment	Wo(g)	Wt(g)	Absolute Weight (Average) ± SD.)
Treatment 0	20,79	30,49	9,69 ± 1,80
Treatment 1	19,11	28,81	9,70 ± 2,37
Treatment 2	21,64	32,73	11,09 ± 1,04
Treatment 3	21,4	31,71	10,31 ± 0,31

Sumber : Data Primer, 2025

The highest value was obtained in P2 (11.09 ± 1.04), while the P0 (control) treatment had the lowest growth (9.69 ± 1.80). This indicates that the addition of Viterna Plus at a dose of 14 mL/kg was able to optimally increase fish weight growth.

Absolute Length Growth of Siamese Catfish (*Pangasius hypophthalmus)*

The average absolute length growth of Siamese catfish obtained during the study is presented in Table 4.

Table 5. Average Absolute Length Growth of Pangasius (*Pangasius hypophthalmus*) Over 40 Days

Treatment	Lo(cm)	Lt(cm)	Absolute Length (Average ± SD.)
Treatment 0	13,51	14,98	1,46 ± 0,49
Treatment 1	13,26	14,66	1,39 ± 1,06
Treatment 2	13,74	15,49	1,75 ± 0,13
Treatment 3	13,67	14,943	1,27 ± 0,78

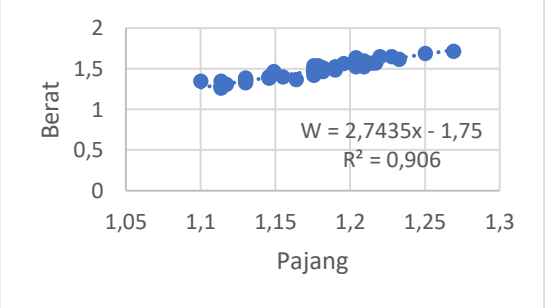
Source: Primary Data, 2025

The highest length increase value was found in P2 (1.75 ± 0.13), while the lowest was in P3 (1.27 ± 0.78). A dose of 14 mL/kg feed showed the most efficient results in increasing length growth.

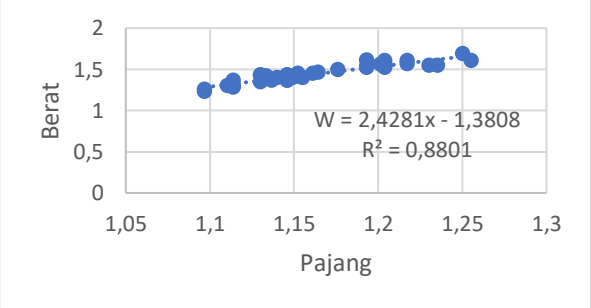
Relationship between Length and Weight

Analysis of the relationship between weight and weight of Siamese catfish (*Pangasius hypophthalmus*) at the time of measurement and weighing, obtained results as in the following figure:

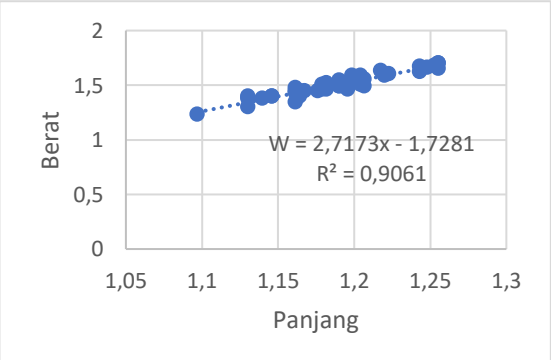
(a).



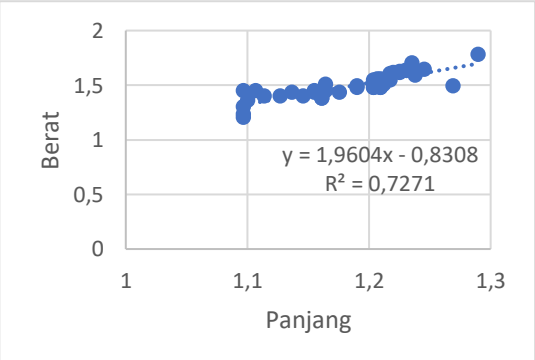
(b).



(c).



(d).



The results of the study showed a relationship between the length and weight of Patin fish in various treatments of Viterna Plus administration. In the control treatment (without Viterna Plus), the regression equation obtained log W = -1.75 + 2.7435 log L with a coefficient of determination (R^2) of 0.906, indicating a relatively strong length-weight relationship even without supplementation. Treatment P1 produced the equation log W = -1.3808 + 2.4281 log L with R^2 = 0.8801, showing a growth pattern similar to the control. Treatment P2 showed the most optimal results, with a regression equation log W = -1.7281 + 2.7173 log L and R^2 = 0.9061, indicating the highest length-weight relationship and balanced growth between length and weight. In contrast, in treatment P3, the regression equation log W = -0.8308 + 1.9604 log L with R^2 = 0.7271 indicates a decrease in the length-weight relationship. The b value = 1.9604 indicates a weak correlation between length and weight due to excessively high doses, which has the potential to reduce the efficiency of fish metabolism.

***Survival Rate* (SR)**

The results of observations on the survival of Siamese catfish (*Pangasius hypophthalmus*) are presented in Table 5:

Table 5. Average survival rate (SR) of Siamese catfish (*Pangasius hypophthalmus)*

Treatment	Viterna Plus Dosage (mL/kg feed)	Initial Amount (Tail)	Final Amount (Tail)	survival (Average ± SD.
Treatment 0	0	45	43	95,55 ± 3,84
Treatment 1	7	45	42	93,33 ± 6,66
Treatment 2	14	45	44	97,77± 3,84
Treatment 3	21	45	42	93,33 ± 0

Source: Primary Data

Treatment P2 (14 mL/kg feed) had the highest survival rate, at 97.77±3.84%, while the lowest was in P1 and P3 (93.33%). The optimal dose was able to maintain the health and endurance of the fish, while doses that were too high or too low actually reduced fish survival.

Water Quality

Water quality parameters during the study were within the optimal range for Siamese catfish growth. Measurement results are presented in Table 6.

Table 6. Water Quality Measurement Results

Treatment	Temperature (°C)	pH	DO (mg/L)
Treatment 0	27,1-28,8	7,30-8,45	6,2-6,9
Treatment 1	27,6-28,7	7,38-8,23	6,1-6,7
Treatment 2	27,2-28,8	7,20-8,25	6,3-6,8
Treatment 3	28,2-28,6	8,05-8,25	6,2-6,8

Source: Primary Data

The water temperature ranges from 27.1°C to 28.8°, pH 7.2 – 8.4, and DO 6.1 – 6.9 ml/, all within the ideal range for Siamese catfish (H. Effendi, 2003).

DISCUSSION

The results of this study indicate that administering Viterna Plus supplements at different doses to artificial feed significantly affected the growth and survival of Siamese catfish (*Pangasius hypophthalmus*). In general, treatment P2 (14 mL/kg feed) provided the best weight, length, and survival rates compared to the other treatments, although statistically no differences were found (P>0.05). Higher SGR values and absolute weight gain at this dose indicate that the fish optimally utilize the nutrients in Viterna Plus for metabolism and growth (Aprilia *et al.,* 2018). A similar study by Renaldi *et al.,* 2024, also showed that the addition of Viterna Plus can increase feed utilization efficiency in red striped catfish.

According to Sihombing & Batubara (2024), administering supplements or probiotics to fish at too low a dose will not significantly impact growth. Conversely, doses that are too high will also not be optimally utilized by the fish. Fish weight growth is strongly influenced by the nutritional content of the feed. However, environmental factors and water quality also play a significant role. Poor water quality can cause stress in fish, disrupting nutrient absorption and decreasing growth (Sebayang *et al.,* 2020).

The lowest FCR value in treatment 2 indicates better feed conversion efficiency. According to (Lumuan *et al.,* 2020), an FCR value between 1 and 3 is within the optimal range, where the lower the FCR, the more efficient the feed utilization. Viterna Plus contains amino acids, vitamins, and minerals that play a role in improving feed digestibility and energy utilization efficiency. According to (Sedana & Sumadana, 2020), probiotics and nutritional supplements can improve feed efficiency through the production of digestive enzymes.

The relationship between fish length and weight shows negative allometric growth (b<3) in all treatments, meaning length growth is faster than weight gain. This indicates that the fish are still in the active growth phase. According to (Adi & Suryana, 2023), the b value is influenced by feed quality, nutrient availability, and aquatic environmental conditions. Meanwhile, (Muttaqin *et al.,* 2016) added that b <3 can be caused by suboptimal feed quality, high stocking density, or environmental stress that prevents the fish from maximizing energy utilization for weight gain.

The survival rate (SR) in all treatments was quite high (93-97%), indicating that environmental conditions were within a supportive range. Water quality parameters such as temperature, pH, and dissolved oxygen were within optimal limits for catfish, according to (Effendi, 2003), which states that optimal water temperature is 26°C-30°C, water pH ranges from 6.5-8.5, and DO not less than 5 mg/L.

CONCLUSION

The administration of Viterna Plus in artificial feed at various doses did not show a significant effect (P > 0.05) on the specific growth rate, absolute weight and length gain, or survival of Siamese catfish. However, a dose of 14 mL/kg of feed provided the most optimal results, indicated by the highest specific growth rate (SGR), maximum absolute weight and length gain, the lowest feed conversion ratio (FCR), and the highest survival rate (SR). The results of the length-weight relationship analysis showed negative allometric growth (b < 3), which means that the increase in length of the fish was faster than the increase in weight. During the study, water quality conditions remained within optimal limits for catfish cultivation, so it was not a factor limiting growth or survival.

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REFERENCES

Adi, C. P., & Suryana, A. (2023). Pola Pertumbuhan Ikan Nila *Oreochromis niloticus* di Fase Pendederan. *Knowledge: Jurnal Inovasi Hasil Penelitian dan Pengembangan*, *3*(2), 147–158. Https://Doi.Org/10.51878/Knowledge.V3i2.2372

Andriani, R., Muchdar, F., Ahmad, K., & Juharni. (2021). Pemanfaatan Bahan Baku Lokal Sebagai Pakan Ikan untuk Kelompok Budidaya Ikan di Kota Ternate. *Indonesian Journal of Fisheries Community Empowerment*, *1*(3), 231–239. Https://Doi.Org/10.29303/Jppi.V1i3.455

Aprilia, P., Karina, S., & Mellisa, S. (2018). Penambahan Suplemen Viterna Plus pada Pakan Benih Ikan Patin (*Pangasius* sp.). *Jurnal Ilmiah Mahasiswa Kelautan Perikanan Unsyiah*, *3*(1).

Arief, & Subekti. (2014). Pengaruh Pemberian Probiotik Berbeda pada Pakan Komersial Terhadap Pertumbuhan dan Efisiensi Pakan Ikan Lele Sangkuriang (*Clarias* sp.). *Jurnal Ilmiah Perikanan dan Kelautan*, *6*(1), 5.

Effendi, H. (2003). *Telaah Kualitas Air: Bagi Pengelolaan Sumber Daya dan Perairan*. PT Kanisius.

Effendie, M. I. (1979). *Metode Biologi Perikanan*. Yayasan Dewi Sri. Bogor, 112.

Effendi, M. I. (1997). *Budidaya Perikanan*. Yayasan Pustaka Nusantara. Yogyakarta, 163.

Goddard S. 1996. *Feed Management in Intensive Aquaculture*. New York (US): Chapman and Hall.

Krisnaneny, D. F. (2022). Pengaruh Penambahan Transglutaminase Terhadap Gugus Fungsi dan Profil Asam Amino Gelatin Kulit Ikan Patin *(Pangasius hypophthalmus)* Terhadap Gugus Fungsi dan Profil Asam Amino Gelatin Kulit Ikan Patin *(Pangasius hypophthalmus).Skripsi*. Universitas Teknologi Sepuluh November.

Le Cren, E. D. (1951). The Length-Weight Relationship and Seasonal Cycle in Gonad Weight and Condition in The Perch (*Perca Ffuviatilis*). *The Journal of Animal Ecology*, 201–219.

Lumuan, A., Agustina, S. S., & Wuniarto, E. (2020). Penambahan Probiotik Viterna pada Pakan Komersial Terhadap Pertumbuhan dan Rasio Konversi Pakan Benih Ikan Nila (*Oreochromis niloticus*) Addition of Viterna Probiotics in Commercial Feed to Growth and Feed Conversion Ratio of Tilapia Seed (*Oreochromis niloticus*). *Zona Akuarik Banggai*, *1*(1), 32–39.

Mulyani, R., & Haris, R. B. K. (2021). Penambahan Tepung Maggot pada Pelet Tepung Komersil Terhadap Pertumbuhan Benih Ikan Patin *Pangasius hypophthalmus*. *Jurnal Ilmu-Ilmu Perikanan Dan Budidaya Perairan*, *16*(2), 72–81. Https://Doi.Org/10.31851/Jipbp.V16i2.6990

Muttaqin, Z., Dewiyanti, I., Aliza, D., Studi, P., Perairan, B., Kelautan, F., Perikanan, D., Hewan, K., & Darussalam, B. A. (2016). Study of Long-Weight Relationship and Condition Factor of *Oreochromis niloticus* and Mugil Cephalus In Matang Guru River, Madat Subdistrict, East Aceh District. *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah*, *1*(November), 397–403

Qothrunnada, A., & Prabowo, C. A. (2023). Dampak Penggunaan Jenis Pakan yang Berbeda Terhadap Laju Pertumbuhan Benih Ikan Patin *(Pangasius hypophthalmus)*., *48*(2), 288–297.

Renaldi, I., Putra, I., & Rusliadi, R. (2024). Pemeliharaan Ikan Nila Merah (*Oreochromis*

niloticus) pada Sistem Resirkulasi dengan Penambahan Suplemen Viterna Plus pada Pakan. *South East Asian Aquaculture*, *2*(1), 35–44.

Rioeh, M. I., Aliyas, & Putri, D. U. (2024). Evaluasi Dosis Vitamin Premix dalam Meningkatkan Pertumbuhan dan Kelangsungan Hidup Benih Ikan Gurame. *Arborescent Journal*, *1*(1), 1–5.

Robi, H., Rully, & Mulis. (2015). Pengaruh Pemberian Viterna Plus dengan Dosis Berbeda pada Pakan Terhadap Pertumbuhan Benih Ikan Lele Sangkuriang di Balai Benih Ikan Kota Gorontalo. *Jurnal Ilmiah Perikanan dan Kelautan*, *3*(2), 84–88.

Sebayang, E. P., Hudaidah, S., & Santoso, L. (2020). Kajian Pemberian Pakan Berbahan Baku Lokal dengan Kandungan Protein Berbeda Terhadap Pertumbuhan Benih Lele (*Clarias* sp.). *Journal of Aquatropica Asia*, *5*(2), 8–15.

Sedana, I. M., & Sumadana, I. K. (2020). Kaji Terap Pengaruh Penambahan Probiotik pada Pakan Komersil Terhadap Efisiensi Produksi Ikan Patin (*Pangasius* sp) di Kabupaten Jembrana. *Jurnal Penyuluhan Perikanan dan Kelautan*, *14*(1), 45–56. Https://Doi.Org/10.33378/Jppik.V14i1.181

Sihombing, N. S., & Batubara, L. H. S. (2024). Pengaruh Pemberian Pakan Pasta yang Diperkaya *Bacillus* sp. dengan Dosis yang Berbeda Terhadap Pertumbuhan dan Kelulushidupan Ikan Patin (*Pangasius hypophthalmus*). *Jurnal Penelitian Terapan Perikanan Kelautan*, *6*(2), 59–64.

Zonneveld, N., Huisman, E. A., & Boon, J. H. (1991). *Prinsip-Prinsip Budidaya Ikan.* PT Gramedia Pustaka Utama.