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Research Article

Efektivitas dosis viterna terhadap sintasan dan kinerja pertumbuhan ikan bawal (*Colossoma macropomum*)
[Effectiveness of viterna addition to feed on survival and growth rate of freshwater pomfret (*Colossoma macropomum*)]

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ABSTRACT | Pomfret *(Colossoma macropomum)* is one of the freshwater fish commodities that is widely cultivated and widely consumed by Indonesian people. This research aims to determine the effectiveness of doses of viterna addition on feed to the survival and growth rate of pomfret. The method used in this study was an experimental method with four treatments and repeated three times. Viterna doses were PI: 0 ml (control), P2: 10 ml, P3: 15 ml and P4: 20 ml. The result showed that there was a significant effect on absolute length growth, absolute weight growth, and daily growth rate. While the survival and feed conversion rate did not have a significant effect. The highest absolute length growth result was P4=3.82 cm, while the lowest absolute length growth result was P1 3.01 cm. The highest absolute weight growth result was P4 9.88 g, while the lowest absolute weight growth was P1 6.40 g. The highest daily growth rate was P4 2.35%, while the lowest daily growth rate was P1 1.77%. From the results of adding viterna with different doses to the feed, the higher the dose of viterna given, the resulting growth has a better category.

Key words | *Colossoma macropomum*, feed, growth, probiotic, survival

ABSTRAK | Ikan bawal *(Colossoma macropomum)* merupakan salah satu komoditas ikan air tawar yang banyak di budidayakan serta banyak dikonsumsi oleh masyarakat Indonesia. Penelitian ini bertujuan untuk mengetahui efektivitas penambahan dosis viterna pada pakan terhadap sintasan dan kinerja pertumbuhan ikan bawal. Metode yang digunakan dalam penelitian ini adalah metode eksperimen dengan empat perlakuan dan diulang sebanyak tiga kali. Dosis viterna adalah P1: 0 ml (kontrol), P2: 10 ml, P3: 15 ml dan P4: 20 ml. Hasil penelitian menunjukkan bahwa terdapat pengaruh yang nyata terhadap pertumbuhan panjang mutlak, pertumbuhan bobot mutlak, dan laju pertumbuhan harian. Sedangkan sintasan dan laju konversi pakan tidak memberikan pengaruh yang nyata. Hasil pertumbuhan panjang absolut tertinggi adalah P4 3,82 cm, sedangkan hasil pertumbuhan panjang absolut terendah adalah P1 3,01 cm. Hasil pertumbuhan bobot absolut tertinggi adalah P4 9,88 g, sedangkan pertumbuhan bobot absolut terendah adalah P1 6,40 g. Laju pertumbuhan harian tertinggi adalah P4 2,35%, sedangkan laju pertumbuhan harian terendah adalah P1 1,77%. Dari hasil penambahan viterna dengan dosis berbeda pada pakan, semakin tinggi dosis viterna yang diberikan maka pertumbuhan yang dihasilkan mempunyai kategori lebih baik.

Kata kunci | ikan bawal, pakan, pertumbuhan, probiotik, sintasan

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INTRODUCTION

Pomfret fish (*Colossoma macropomum*), has high economic value in fish commodities as consumption or decorative fish. For consumption, pomfret fish has a tasty flavor, so it is favorable for consumers (Febri *et al.*, 2020). This condition makes many fishermen cultivate it and become a profitable business opportunity (Santoso and Agusmansyah, 2011). The demand for fish consumption is increasing yearly.

This situation become attractive to increase fish cultivation and become the most optional choice business for fisherman. The choice of pomfret cultivation business i.e. hatchery and enlargement fish business is according to consumer demand. The fish cultivation business can be life support for many communities because provide great benefits as a main business (Hendrasaputro *et al.*, 2015).

Feed is an important element in supporting the growth and survival of fish apart from genetics, sex, age, disease, cultivation container, season, physical activity, water parameters and so on (Meizanu *et al.*, 2022). In fish cultivation, the feed factor becomes the component that spends the highest cost, about 60-70%, so effective and efficient of feed management is needed to increase production. One of the efforts to increase production is to provide good quality feed but cheap in an economic way.

Pomfret fish cultivation is highly developed in Indonesia, especially after spawning successfully. While to increase production can be achieved by growth acceleration, especially by feeding treatment. In feeding treatment, what must be noticed are the amount of the feed, time, and nutrients that are contained in the feed that are fit to fish needed. The nutrient consists of protein, fat, carbohydrates, vitamins, and minerals. The nutrient source can be retrieved from natural or artificial. The advantage of commercial feed can use raw materials including natural feed that is floured (Yuniarti *et al.*, 2022). One of the efforts to increase fish growth is adding growth supplements, such as viterna.

The study about the addition of Viterna supplements to fish feed is still limited because this supplement is commonly used in cattle. So far, study about fish is limited to catfish, tilapia fish, and Hoven's carp fish, but there has been no study about viterna addition for pomfret fish. Arief *et al.* (2015) reported that viterna addition to fish feed has significant results on tilapia growth with optimal doses of 15 ml/kg feed. Hendrasaputro *et al.*, (2015) also reported that viterna addition has significant results on Sangkuriang catfish (*Clarias gariepinus*) growth with treatment 15ml/kg feed showed the highest growth average of 3,14 g. Based on Susilo *et al.*, (2022) viterna addition to fish feed also showed a significant result in the growth rate and survival rate of Hoven's carp fish with doses of 20 ml/kg feed and has the best growth up to 4,74%.

Success in aquaculture is generally determined by high growth and survival rates. The low growth rate of pomfret fish requires the application of a supplement to increase it. Good quality feed products are commonly produced at high prices, therefore is important to find alternative feed ingredients that can assist in the digestion process and can increase the growth rate of pomfret fish with low prices. One alternative to accelerate growth is the addition of viterna supplements to feed. It is necessary to increase survival and pomfret growth rate by viterna addition in commercial fish feed with different doses, so researchers know the proper doses for survival and growth rate of pomfret fish. This is needed to trigger pomfret growth in a relatively short period.

This research aims to analyze the effectiveness of adding viterna to commercial feed and determine the best dose of viterna for the survival and growth performance of pomfret. The benefits of this research are expected to provide information to fisherman and the public regarding the benefits of adding viterna to commercial feed and information on using the right dosage and viterna mixing system to support the growth of pomfret.

MATERIALS AND METHODS

MATERIAL

The research was done for 40 days from November to December 2022, in the hatchery laboratory of the Aquaculture Department, Faculty of Agriculture, Samudra University. The research tools used in this study were 25 L jars, Aeration, Sliders, Stationery, Rulers, Digital Scales, Siphon hoses, and Water quality checkers. While the materials used were Viterna, commercial feed, pomfret, and Progol.

Ethical approval

All laboratory test processes and experimental protocols had been approved by the Laboratory of Fish Nutrition, Aquaculture Department, Faculty of Aquaculture and Marine, IPB, and at the Hatchery Laboratory of Aquaculture Department, Faculty of Agriculture, Samudra University.

Method

Experimental design

This research method was conducted by experimental method, using a completely randomized design (CRD), with 4 treatments and 3 repetitions for each treatment to see the effect on survival and growth

performance rate of pomfret. The four treatments were: P1 (without viterna/control), P2 (10 ml/kg of feed), P3 (15 ml/kg of feed), and P4 (20 ml/kg of feed).

Container preparation

The container used for maintenance was a 25L jar. At initial, the preparation of tools and materials was carried out before the pomfrets were reared. Preparation was begun by cleaning the container using clean water. Then labeling the container was done based on the randomization technique. Then, the container was filled by water as much as 70% of the container's volume.

Fish preparation

The spreading of pomfret was done in the morning to avoid stress condition. The fishes used must be intact, not disabled, active, and 4-5 cm in size. Each container consisted of 10 pomfret fishes.

Feed coating

The commercial feeds with 35% of protein were mixed with progol 5 g/kg pelleted feed and Viterna with different predetermined doses (0 ml, 10 ml, 15 ml, 20 ml). Binders or adhesives are additives that are deliberately added to feed formulas to unite all the raw materials used in making feed (Hasan *et al.*, 2021). As a substitute for the function of eggs and fish oil, it has great adhesive energy and is instant to use, does not interfere with multivitamins and antibiotics that are to be mixed with feed. Then dissolved in 125 ml of distilled water and then put into the bottle that had been provided and sprayed evenly onto the pelleted feed that had been spread on the tray and stirred until evenly distributed. Furthermore, the feed is air-dried and stored in containers or plastic bags.

Biochemical test

Feed proximate was a test to determine the nutrients contained in a material which includes protein, fat, fiber, ash, crude fiber, and moisture content. All stages of this proximate test were carried out in the laboratory of the Bogor Agricultural Institute.

Pomfret rearing

Pomfret rearing was carried out for 40 days in a rearing medium. During the research activities, the feeds were given as much as 3% of the total weight of the fish, 3 times a day at 08.00, 12.00, and 17.00 GMT+7. Weighing of fish was done every 10 days to determine fish weight and fish body length. While, the water quality was checked according to the life tolerance and growth of pomfret.

Analysis Data

Parameters observed during the study included absolute length growth, absolute weight growth, daily growth rate, survival rate, feed conversion ratio, and water quality. Data collection was done every 10 days, then they were analyzed using ANOVA to determine the effect of all treatments. If there was a difference due to the use of the given viterna dose on the growth and survival of pomfret, it would be continued by the Duncan test at a 95% confidence interval. While the water quality data would be analyzed descriptively.

Absolute Length Growth

The absolute length growth was determined based on the increase in the length of the fishes in each treatment. Absolute length growth could be calculated by the formula (Mufidah *et al.*, 2009):

$$L = Lt - Lo$$

Note: L = Length growth (cm); Lt = Final average length growth (cm); Lo = Initial average length growth (cm)

Absolute Weight Growth

Absolute weight growth could be calculated by the formula (Steffens, 1989 in *Nazlia et al.*, 2023):

$$W = Wt - Wo$$

Note: W = Absolute weight (g); Wt = Final average weight growth (g); Wo = Initial average weight growth (g)

Daily Growth Rate

The daily growth rate (%) was determined based on the difference between the final average weight and the initial average weight then compared to the maintenance time with the formula (Febri *et al.*, 2020):

$$SGR = \frac{LnWt - LnWo}{t} \; x \; 100$$

Note: SGR = Specific growth rate (%); Wo = Initial average weight (g/individual); Wt = Final average weight (g/individual); t = time (day)

Survival Rate

The survival rate could be calculated by the formula (Febri *et al.*, 2020):

$$SR = \frac{Nt}{No} \; x \; 100$$

Note: SR = Survival rate (%); No = Initial number of fish (individu); Nt = Final number of fish (individu)

Feed Conversion Ratio

Feed conversion could be calculated by the formula (Febri *et al.*, 2020):

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

Note: FCR = Feed conversion ratio; Wt = Final fish weight (g); Wo = Initial fish weight (g); F = Total feed consumed (g); D = Dead fish weight (g)

Water Quality

Water quality measurements included temperature, pH, DO and ammonia contents in media. Measurements were taken once every 10 days during the study on days 0, 10, 20, 30, and 40. Water quality measurements were carried out directly during the research using the tools provided.

RESULTS

Feed Proximate Test

Feed that has good quality must fulfill the criteria, including the nutritional content of the feed, especially protein that must be in the fish nutrition requirement and feed nutrition can be absorbed easily by fish body. Proximate test or also called chemical test is a method of chemical analysis to determine the nutritional content of fish such as protein, carbohydrates, fat, and fiber in fish feed. The proximate test of experimental feeds in this study is shown by Table 1 below.

Table 1. Feed proximate test in dry weight percentage (%)

Treatments	Ash	Fat	Protein	Rough Fiber	BETN
P1 (0 ml)	11.78	3.27	34.27	3.30	47.39
P2 (10 ml)	11.27	3.24	35.24	3.65	45.61
P3 (15 ml)	11.39	3.20	35.75	3.49	46.19
P4 (20 ml)	11.39	3.22	37.94	3.38	44.08

Note: Proximate analysis result in Laboratory of Fish Nutrition, Aquaqulture Department, Faculty of Aquaculture and Marine, IPB, 2022.

The nutrient content contained in each treated feed showed different results. The artificial feed used in the study (P1) contained 34.27% minimum crude protein, 3.27% minimum crude fat, 3.3% maximum crude fiber, 11.78% maximum crude ash, and 47.39% of BETN. Then, addition of viterna into the artificial feed with certain doses showed the increase of protein content as the main nutrition for fish.

The highest dose of viterna (20ml) in artificial feed had the highest protein content at 37.94%. Meanwhile, other nutritions namely ash, fat, and fiber were relatively similar to other treated feeds. However, nitrogen free compounds of viterna 20 ml-feed was lower than others.

Performance of Growth

The ANOVA test result showed that the addition of viterna to fish feed with different doses had a significant effect ($P<0.05$) on the performance of absolute length growth, absolute weight growth, and daily growth rate of pomfret while survival and feed conversion ratio had no significant effect ($P>0.05$), as presented at Table 2. Based on the Duncan's test results, the absolute length growth of pomfret treated by viterna 20ml-feed (P4) had significantly different from other treatments. While the absolute weight and daily growth rate of pomfret at P4 was significantly different from P1 and P2 but not significantly different from P3.

The results of adding viterna to feed with different doses had a positive effect on the growth performance of pomfret. The addition of viterna at a dose of 20 ml/kg in feed was the best treatment. This showed that the higher viterna dose given, the higher effect on the growth performance of pomfret showed. This results were also supported by the feed proximate test, inwhere the addition of a 20 ml/kg viterna dose increase protein up to 37.94% higher than the other treatments.

Table 2. Results of Absolute Length Growth (L), Absolute Weight Growth (W), Daily Growth Rate (SGR), Survival Rate (SR) and Feed Conversion Ratio (FCR).

Parameter	Treatments			
	P1 (0 ml)	P2 (10 ml)	P3 (15 ml)	P4 (20 ml)
L (cm)	3.01±0.34^{a}	3.18±0.29^{a}	3.24±0.19^{a}	3.82±0.06^{b}
W (g)	6.40±1.18^{a}	7.32±1.01^{a}	8.10±1.00^{ab}	9.88±0.82^{b}
SGR (%/day)	1.77±0.22^{a}	1.95±0.21^{a}	2.08±0.15^{ab}	2.35±0.11^{b}
SR (%)	86.67±5.77^{a}	90.00±10.00^{a}	93.33±11.55^{a}	96.67±5.77^{a}
FCR	1.48±0.09^{a}	1.43±0.18^{a}	1.35±0.11^{a}	1.27±0.15^{a}

Note: Numbers followed by same alphabet indicated non-significantly result by DMRT test with α= 5%.

Water Quality

The results of water quality during pomfret rearing in this study were within a good range to support pomfret life (optimal tolerance limit). Water quality parameters observed during the study can be seen in (Table 3). Water quality measurements were carried out every 10 days. The changes in water quality parameters could affect the functional and structural of pomfret reared.

Table 3. Water quality during pomfret rearing

Treatments	Water Quality Parameters			
	Temperature (°C)	pH	DO (mg/l)	Ammonia (mg/l)
P1	27.2-27.4	7.6-7.7	5.76-6.22	0.30-0.31
P2	27.2-27.3	7.2-7.4	5.80-6.18	0.34-0.35
P3	27.2-27.4	6.9-7.1	6.00-6.36	0.30-0.41
P4	27.3-27.4	7.1-7.2	5.60-6.24	0.30-0.34
Standart	27.2-27.4 *Alimuddin et al.* (2010)	5-9 Yustiati *et al*, (2020)	4-6 Alputra (2022)	<0.01 Arisfa *et al.* (2021)

DISCUSSION

Based on the feed proximate test, it was known that adding viterna into commercial feed could increase protein in feed. However, it did not affect ash, fat, and crude fiber in each treatment. This was caused by viterna's protein content which was 42.82% (Mufidah *et al.*, 2009). Therefore, the higher dose of Viterna addition, the higher protein content in treated feed. The protein content of each treated feed was suitable for pomfret consumption. According to Gamise *et al.* (2019), the protein requirement for pomfret ranges from 25-37%, and can utilize vegetable protein by 75% to 100%.

Protein is a macro-nutrient that is needed by fish in addition to carbohydrates and fats to support growth. Levels of protein in feed affect growth rates and feed consumed by fish (Yulisman, 2012). Excess protein and fat can cause fat accumulation and lack of appetite, this can inhibit growth in fish (Arief *et al.*, 2015). The higher the protein content of the feed given, the higher the growth produced. The addition of viterna can increase the nutritional content of fish feed such as protein, vitamins, minerals and amino acids, this is in accordance with the content in viterna (Febri *et al.*, 2021). Also, the addition of viterna will increase the number of beneficial microbes that enter the fish's intestines, thus helping the fish's digestive process (Jefri *et al.*, 2020). Viterna that has been mixed into the feed has ingredients such as protein and fat which will be digested by fish for energy and growth needs (Hendrasaputro *et al.*, 2015).

Based on the research, the addition of viterna with different doses was able to increase the absolute weight growth of pomfret. The highest absolute weight growth was gained at treatment P4 with a dose of 20 ml/kg viterna in feed. This was due to the high nutrition content in feed, so that it could accelerate the growth of absolute weight. The best daily growth rate was in the P4 treatment with a dose of 20 ml/kg viterna in feed. The protein content in feed consisted of 20 ml/kg of viterna could fulfill the needs of pomfret for its growth. According to Fran and Akbar (2003), protein and fat will be digested, absorbed, and metabolized, then converted into useful energy.

The nutrients consumed by pomfret fish were digested in the digestive tract, absorbed by the walls of the digestive tract, and appear in the bloodstream as its component molecules (Simamora *et al.*, 2022). Protein is hydrolyzed into various types of amino acids, and fats and various other building blocks. These molecules flow in the body and are taken up by various types of tissues to then undergo various chemical reactions, both molecular breakdown or catabolism, as well as molecular synthesis or anabolism. The results of previous studies stated that the addition of viterna at a dose of 20 ml/kg of feed could increase the growth rate of hoven's carp fish (Susilo *et al.*, 2022). Furthermore, Fadilah (2020) reported that the addition of viterna to the feed was able to increase the growth of tilapia, with the best results in the addition of 20 ml/kg of feed.

The growth of pomfret fish in each treatment occurred due to the supply of energy contained in the feed, inwhere the energy resulted by consuming feed exceeded the energy requirements for the maintenance of the body and other body activities, so that the excess energy could be used optimally by the fish. Fish feed is one of the factors that plays an important role in the process of fish growth. Fish growth can run optimally if the amount, quality, and

nutrient content are properly fullfil (Marie *et al,* 2018).

The protein needs from the feed consumed and suitable environment for pomfret could support the digestion of protein by pomfret easily (Santoso and Agusmansyah, 2011). This was reinforced by Fran (2003), the protein requirement of fish is influenced by the level of feeding and energy content. Feed that has the right protein-energy balance with the right feeding will produce good growth performance. If the energy level of protein exceeds the need, consumption will decrease, so that the intake of other nutrients, including protein, will decrease (Phonna *et al.*, 2022).

Based on the results, the addition of viterna at different doses had no effect on the survival of pomfret (Table 2). Mortality in fish during the study was due to stress of fish which affected the metabolic rate and the feed was not utilized properly. According to Salamah (2020), fish survival is determined by the availability of good feed and good water quality treatment. Availability of feed and environmental water quality such as temperature, DO, pH, and ammonia can affect survival rate (Ranggayoni *et al.*, 2021). In general, the survival rate during the study was still relatively good because it was in the range of 85% to 95%. Survival rate determined the successful of raising pomfret. According to Fadilah and Salam (2020) survival is categorized as good if the SR value is > 70%. Factors that affect the high and low survival rates are biotic factors including competitors, population density, age and ability to adapt to the environment (Abrar, 2019).

The addition of viterna at different doses also had no effect on the feed conversion ratio (FCR) of pomfret (Table 2). In general, the FCR during the study was classified as good ratio because it had a low value, in the range of 1.27 to 1.48. According to Bidhan *et al.*, (2014), the low of FCR value is due to the greater digestibility and absorption of fish feed compared to other treatments so that the amount of feed consumed is more optimal and the energy produced is greater to be utilized optimally in increasing growth. Ayusi (2011) stated that the value of the FCR is related to the quality of the feed, the lower the FCR value, the better the quality of the feed and the more efficient of fish in utilizing the feed they consume for growth.

The water quality during rearing pomfret fish was in good condition for fish growth. The water temperature for rearing pomfret during the study ranged from 27.2 - 27.4°C. According to Alimuddin *et al.*, (2010), fish will grow well in an environment with water temperatures ranging from 25-32°C. The degree of acidity or pH of the water during the study ranged from 6.9 - 7.7. The pH value determined the feasibility of an aquatic environment for pomfret. According to Yustiati *et al.*, (2020), the general pH range that is suitable for all types of fish ranges from 5-9.

Dissolved oxygen (DO) ranged from 5.60 - 6.36 mg/l. According to Alputra (2022), the range of dissolved oxygen that is good for pomfret fish is around 4 - 6 mg/l. Ammonia in pomfret rearing during the study ranged from 0.30 - 0.41 mg/l and was still within the fish tolerant range. According to Arisfa *et al.*, (2021) stated that the limit for ammonia levels in rearing fish is <0.1 mg/l.

CONCLUSION

Different doses of viterna that were added into the feed had a significant effect on absolute length growth, absolute weight growth, and rate daily growth of freshwater pomfret (*Colossoma macropomum*) seeds. While the survival and feed conversion ratio did not get influence of viterna addition in feed. Addition of viterna at a dose of 20 ml/kg in feed could increase the survival and growth performance of freshwater pomfret fingerlings.

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