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# Effect of Different Multivitamins on Growth Performance and Survival of Depik Fish (*Rasbora tawarensis* Weber & de Beaufort, 1916)

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## Abstract

Depik Fish (*Rasbora tawarensis*) is an endemic fish species found in Tawar Lake, with a threatened status. Domestication efforts are being undertaken to conserve the Depik Fish population. This study aimed to analyze the effectiveness of different vitamins on the growth and survival of Depik Fish. The study was conducted at Balai Benih Ikan (BBI), Pegasing - Central Aceh Regency, from December 2021 to January 2022. A Complete Random Design (CRD) with four treatment levels and four replications was employed, including a control group and three experimental groups: 300 mg/kg feed of vitamin C, vitamin B complex, and Viterna Plus. The results of the ANOVA test indicate that the dosage of vitamin C, vitamin B complex, and Viterna Plus in commercial feed significantly influenced the absolute weight growth, absolute length growth, and specific growth rates of the Depik Fish ($P<0.05$). However, it did not have a significant effect on feed efficiency and survival. Duncan's test revealed significant differences among the treatment groups, with the highest values observed in the application of Viterna Plus at a dosage of 300 mg/kg feed, which resulted in increased growth and survival of the Depik Fish. Therefore, the use of Viterna Plus in fish feed is recommended.

## INTRODUCTION

Depik fish *(R. tawarensis*) is an endemic pelagic species (Muchlisin *et al*., 2017) found exclusively in Laut Tawar Lake, Central Aceh Regency (Weber and de Beaufort, 1916). This economically valuable fish is in high demand by the public and is known to contain protein, fat, and omega-3, making it suitable for consumption (Munthe *et al*., 2016; Muzaifa, 2015; Novia *et al*., 2014).

The declining population of depik fish, attributed to high demand and reliance on natural catches, necessitates the need for domestication to ensure its sustainability (Rahmi *et al*., 2021). Domestication involves conditioning the environment to align with the fish's biological, ecological, and feeding habits (Augusta, 2016; Lorenzen *et al*., 2012; Rahmawati *et al*., 2013; Shen *et al*., 2021).

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Challenges such as slow growth, high mortality rates, and infectious diseases often arise during the domestication process, leading to a perception in the community that intensive rearing of these fish is not feasible (Delima *et al*., 2021; Komariyah and Afrizal, 2019). Consequently, efforts are required to enhance feed quality with the appropriate multivitamin supplements to improve growth performance and disease resistance in depik fish.

Multivitamins combine several essential nutrients needed by the body in small quantities, playing a crucial role in maintaining normal bodily functions and reactions (Fuadi *et al*., 2019; Masumoto *et al*., 1991). Additionally, multivitamins have been shown to promote fish growth and enhance stress resistance (Henrique *et al*., 1998; Ibrahem *et al*., 2010; Ibrahim *et al*., 2020; Ortuño *et al*., 2003; Thompson *et al*., 1993). In cases of deficiency, vitamin insufficiency can even hinder growth (De Silva and Anderson, 1994; Jusadi *et al*., 2006).

Previous studies have reported the positive effects of vitamins on growth, life activation, and immunity in various fish species. For example, Fitriani and Akmal (2020) and Purwati *et al*. (2015) found that vitamins enhanced the growth and vitality of the Climbing perch (*Anabas tastudneus*).

Gunawan *et al.* (2014) and Komalasari *et al*. (2017) observed increased growth in Nile tilapia (*Oreochromis niloticus*) with vitamin supplementation. Setiawati *et al*. (2013) reported improved growth in Shark catfish (*Pangasius* sp.) due to vitamin use. Similarly, Siregar and Adelina (2009) and Alfisha *et al*. (2020) demonstrated enhanced growth and immune response in Humpback grouper (*Cromileptes altivelis*) and Snakehead (*Channa striata*) with vitamin supplementation, respectively. Zulkarnain *et al.* (2017) observed increased growth in Tawes Fish (*Puntius javanicus*) with vitamin supplementation.

Furthermore, the use of Viterna Plus has been shown to enhance the growth performance of various fish species. Hendrasaputro *et al*. (2015), Muharam *et al*. (2019), and Rahardja *et al*. (2009) found increased growth in Catfish (*Clarias gariepinus*) with the use of Viterna Plus. Aprilia *et al*. (2018) reported improved growth in Shark catfish with Viterna Plus supplementation. Fadilah *et al*. (2020) observed enhanced growth in Nile tilapia with the use of Viterna Plus. Similarly, Irfan *et al*. (2020) demonstrated increased growth in Humpback grouper with Viterna Plus supplementation.

Based on the previous findings, this study aims to analyze the effectiveness of vitamins on the growth and survival of depik fish (*R. tawarensis*).

## METHODOLOGY

### Ethical Approval

During this research, no animals were harmed or subjected to improper treatment. The test animals involved in the study were treated appropriately, ensuring an optimal environment, including factors like temperature, pH, and availability of dissolved oxygen. The research protocol underwent approval during the due diligence session and proposal seminar.

### Place and Time

This research was conducted at UPTD BBI Lukub Badak, Pegasing District, Central Aceh Regency. The study was conducted from December 2021 to January 2022.

### Research Materials

In this study, the tools used were 16 aquariums (45x45x35 cm), aerators (Hiblow Hp-100 Air Pump, Japan), pH Meter (Hanna Hi98107, China), DO Meter (Lutron PDO-519, Taiwan), thermometer (Digital TPM-10), millimeter block paper, digital scales (FSR-B 1200 gr, accuracy of 0.01 gr, Fujitsu, Japan), and water chiffon hoses, while materials used such as depik

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fish (age 21 days), commercial feed (protein 35%) and some multivitamins namely Vitamin C (Ascorbic Acid), Viterna Plus, and Vitamin B Complex (Booster).

## Research Design

This study used a completely randomized design (CRD) with four treatments and four replications. The treatment given was in the form of artificial feed with different vitamins. Based on Abdan *et al*. (2017), vitamin C at a dose of 300 mg/kg commercial feed with the oral method is the best for the growth and survival of *Tor* sp. The results of research on catfish (*C. gariepinus*) also show that 300 mg/kg of feed can increase growth and survival (Hendrasaputro *et al*., 2015).

The treatments used in this research were; (P1) Without the addition of multivitamins (control), (P2) Addition of vitamin C at a dose of 300 mg/kg feed, (P3) Addition of vitamin B Complex with an amount of 300 mg/kg feed, and (P4) Addition of vitamin Viterna Plus with a dose of 300 mg/kg feed.

## Work Procedure

The research procedure involved preparing 16 aquariums, each with a volume of 50 liters of water, to accommodate the fish. Each aquarium was cleaned and then filled with 22.5 liters of water, providing aeration for the oxygen supply. Before stocking, seed samples of *R. tawarensis* fish were taken to measure the length and weight of 20% of the total population, serving as the initial data for the study. This measurement was repeated every ten days for a period of 50 days. The *R. tawarensis* fish were stocked at a density of 15 individuals per 22.5 liters of water. Fish stocking was carried out at low temperatures to ensure that the fish did not experience stress.

The feed utilized in this study consisted of commercial sinking pellets (flour) with a protein content of 35%. The feed was enriched with vitamin B Complex (300 mg/kg feed), vitamin C (300 mg/kg feed), and Viterna Plus (300 mg/kg feed). Feeding was conducted twice a day using the satiation method, at 08:00 and 17:00 WIB. As for the water quality treatment, the debris at the bottom of the tank was cleaned daily prior to feeding.

Observations were carried out for 40 days. The parameters observed were absolute length growth, absolute weight growth, specific growth rate, feed efficiency, and survival rate.

Absolute length growth was calculated based on the formula (Effendie, 1978):

$L = L_t - L_0$

Where:

L = absolute length growth (cm)
$L_t$ = final average length (cm)
$L_0$ = initial average length (cm)

Absolute weight growth was calculated based on the formula (Effendie, 1978):

$W = W_t - W_0$

Where:

W = absolute weight growth (g)
$W_t$ = final average weight (g)
$W_0$ = initial average weight (g)

The specific growth rate, according to (Marzuqi *et al*., 2012):

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

Where:

SGR = specific growth rate (%)
$W_0$ = initial average weight (g)
$W_t$ = final average weight (g)
t = time of maintenance (days)

Feed efficiency is calculated using Tacon (1987) formula as follows:

$$FE = \frac{1}{FCR} \times 100$$

Where:

FE = feed efficiency (%)
FCR = feed conversion ratio

The survival rate can be calculated using the Effendie (2002) formula:

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

Where:

SR = survival rate (%)
$N_t$ = final number of fish
$N_0$ = initial number of fish

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## Data Analysis

Data processing is done by statistical calculations using the ANOVA (Analysis of Variance) method to find the best treatment.

## RESULTS AND DISCUSSION

The growth rate of depik fish's total length during a 40-day rearing period showed an increase in all treatments, including the control (0.84±0.06 cm), vitamin C (1.38±0.12 cm), vitamin B complex (1.22±0.17 cm), and Viterna Plus (1.71±0.08 cm) (Figure 1). However, the results of the ANOVA indicated a significant difference in growth rates among the treatments ($p<0.05$). The highest absolute length growth was observed in the Viterna Plus treatment with a range of 1.71 cm, while the control treatment exhibited the lowest growth rate at 0.84 cm. Duncan's test revealed a significant difference in absolute length growth between the Viterna Plus treatment and the control, vitamin C, and vitamin B treatments (Table 1).

Growth in fish is closely associated with bone development, and the addition of Viterna Plus, a multivitamin, promotes the growth of depik fish. According to Subandiyono and Hastuti (2016), proteins and fats are digested, absorbed, and metabolized to provide valuable energy. In addition to protein, fats also contain vitamins A, D, E, K, B complex, C, and minerals. These vitamins and minerals are digested in the digestive tract and utilized for energy and growth processes. Saputri *et al*. (2019) have also reported similar findings, stating that the enrichment of *Daphnia* sp. with Viterna can enhance the growth of depik fish (*R. tawarensis*).

The application of Viterna Plus exhibited a visible average absolute weight growth, ranging from 0.26 grams, while the control treatment showed the lowest total weight at 0.18 grams (Figure 2). Duncan's test revealed a significant difference between the control treatment and the vitamin C, vitamin B complex, and Viterna Plus treatments. Viterna Plus, when mixed into the feed, contains proteins and fats that can be easily digested by the fish for energy and growth requirements. Therefore, the addition of this vitamin can significantly influence the absolute weight growth of depik fish. Similar results were also observed in the specific growth rate, where the application of Viterna Plus resulted in higher growth compared to the other treatments. Duncan's further test indicated significant differences among the treatments (Table 1).

According to Subandiyono and Hastuti (2016), proteins and fats are digested, absorbed, and metabolized into valuable energy. Nutrients consumed by fish are processed in the digestive tract, absorbed through the digestive tract wall, and transported through the bloodstream in the form of molecular components (Hendrasaputro *et al*., 2015; Krogdahl *et al*., 2005).

Proteins are hydrolyzed into various amino acids, while fats are broken down into multiple fatty acids and other constituent components (Fountoulakis and Lahm, 1998; Zhu *et al*., 2008). These molecules are then absorbed by various body tissues and undergo various chemical reactions, including molecular breakdown, catabolism, and synthesis or anabolism. The outcome of these processes is the release of energy from the molecules or the growth of organisms, which occurs as a result of excess energy derived from the feed (Kardana *et al*., 2012; Mahasri *et al*., 2015; Masriah and Alpiani, 2019).

Feed efficiency increased in each treatment with average values, including control 67.04±21.07%, vitamin C 77.72± 9.38%, vitamin B complex 70.55±8.33, and viterna plus 86.12±6.42%. However, after the results of the ANOVA were carried out, the maintenance of depik fish fry did not have a significant effect on feed efficiency ($P<0.05$).

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The highest feed efficiency is obtained in the viterna plus treatment, and the viterna can improve fish health, causing a healthier fish with an increase in healthy fish (Saputri *et al*., 2019). According to Aslianti and Priyono (2009), Viterna Plus is one of the constituent elements of essential nutrients that fish need to maintain body vitality, and it will stimulate appetite. Better use of feed iron in food occurs well. Then this iron will flow through blood and circulate through the fish's body tissue (Abdan *et al*., 2017; Siregar and Adelina, 2009).

Sandnes (1991) stated that vitamins can be absorbed by the body in a small amount and are suitable for fish needs; if too excessive, absorption through the intestine will be limited. Lovell (1989) explained that the fish size, age, growth rate, and feed composition influence the level of vitamin needs. The results of survival research show the addition of multivitamins in feed (Vitamin C, Vitamin B complex, and viterna plus); the highest percentage value was found at 98%, which is no difference between treatments (Table 1).

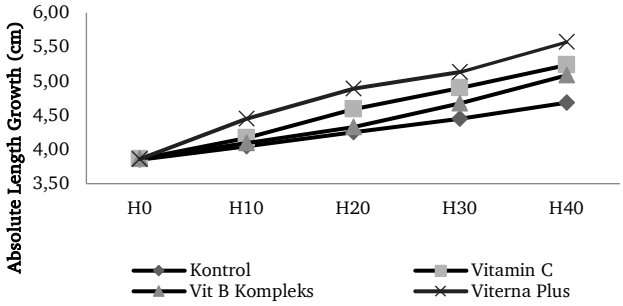


Figure 1. Absolute length growth of *R. tawarensis*.

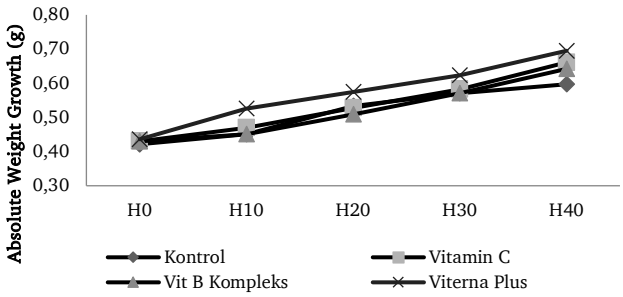


Figure 2. Absolute weight growth of *R. tawarensis*.

According to Effendie (2002), the survival level is one of the factors that becomes the value of the ratio between the number of initial organism values expressed in a percent unit. Survival is strongly influenced by the health of the fish obtained through adequate nutrition and fish endurance. The addition of vitamins in feed can improve the health of fish; this is seen from the high level of living class in vitamin treatment.

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Table 1. Growth performance of depik fish with the application of different multivitamins.

| Parameter | Treatments | | | |
|---|---|---|---|---|
| | No multivitamin | Vitamin C | Vit. B Complex | Viterna Plus |
| Absolute Weight Growth (g)±SD | 0,84±0,06[a] | 1,38±0,13[b] | 1,22±0,18[b] | 1,71±0,09[c] |
| Absolute Length Growth ±SD | 97,00±3,85[a] | 98,00±3,33[a] | 98,00±3,33[a] | 98,00±3,33[a] |
| Specific Growth Rate (SGR) (g) ±SD | 0,18±0,01[a] | 0,23±0,01[b] | 0,21±0,02[b] | 0,26±0,01[c] |
| Feed Efficiency (%) ±SD | 67.04±11.07[a] | 77.72±9.38[a] | 70.55±8.33[a] | 86,12±6.42[a] |
| Survival Rate (%) ±SD | 97.00±3.85[a] | 98.00±3.33[a] | 98.00±3.33[a] | 98.00±3.33[a] |

The results of previous studies were reported by Ashraf *et al.* (2008) that vitamin C 60 mg/kg feed could increase the survival of *Cirrhinus mgrigala* fish. A dose of 300 mg/kg of feed-in *Tor* sp. fish (Abdan *et al*., 2017)), and other studies at 10 ml/kg Viterna doses also increase the survival of *C. gariepinus* and *Trichogaster leeri* (Basri, 2015; Hendrasaputro *et al*., 2015).

Other supporting factors of survival are environmental conditions. The results of physical-chemical parameters obtained by the parameter are still in the normal range or that can be tolerated by depik fish, namely the temperature in the field of 19.7-24.1°C, the degree of acidity (pH) in the range of 7.5-8.3 and the dissolved oxygen (DO) with a range of 7.4-9.2 mg/l. Safraini *et al*. (2019) state that the life of depik fish will be good at a temperature of 20-27 °C, as well as with dissolved oxygen (DO) of 5.8-8.5 ppm and a good pH in the range of 6-7 for fish from the genus *Cyprinedea* (Haryono and Subagja, 2008).

## CONCLUSION

The application of vitamins in the suitable feed in depik fish is the addition of Viterna plus 300mg/kg of feed that can increase absolute length growth, weight growth, specific growth rates, feed efficiency, and survival of depik fish.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest regarding the publication of this article.

## AUTHOR CONTRIBUTION

Abdan, M: Lead author, responsible for research design, data collection, data analysis, and article writing. Hasri, S: Major contributor, provided significant contributions in research design, data analysis, and article writing. Putri, L: Contributor, assisted in data collection and analysis, and provided important input in article writing. Fahmi, R: Contributor, involved in research design, and data collection, and made contributions in article writing. Susanti, Z. and F. Rhidana: Contributor, provided important input in research design, data analysis, and article writing.

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