Growth performance and survival rate of Asian seabass (*Lates calcarifer*) with the utilization of vitamin C in feed

Muhammad Aris[1*], Fatma Muchdar[1]

[1)] Lecturer of Aquaculture Study Programe, Fishery and Marine Faculty,
Khairun University, Ternate
*Corresponding author: M. Aris, amboasse100676@gmail.com

Abstract

This study aimed to determine the effect of vitamin C enrichment on fresh trash feed on the growth of Asian seabass (*L. calcarifer*) and their optimal dosage. The study used a completely randomized design with 4 treatments and 5 replications for each treatment. The treatment given was a dose of vitamin C 3.5 g / kg of fresh trash feed (A); dose of vitamin C 4 g / kg fresh trash feed (B); dose of vitamin C 4.5 g / kg fresh trash feed (C); and fresh trash feed without vitamins (D). Enrichment of vitamin C in fresh trash feed significantly affected the absolute growth of Asian seabass. Treatment A, 17,60; treatment B, 19.79; treatment C, 17.11; and treatment D 13.32 g. Enrichment of vitamin C in fresh trash feed also significantly affected the specific growth of Asian seabass. Treatment A, 2.41%; treatment B, 2.60%; treatment C, 2.37%; and treatment D 2.04%. Enrichment of vitamin C in fresh trash feed did not significantly affect the survival of Asian seabass. Treatment A, 42.5%; treatment B, 47.5%; treatment C, 45%; and 40% D treatment.

***Keywords*:** Asian seabass, vitamin C, growth, survival rate

INTRODUCTION

Asian seabass *L. calcarifer* is one of the marine fish that has important economic value and contains high nutritional value as a consumption fish (Yue *et al.,* 2009). Asian seabass has become a commercial business to develop (Aswathy and Joseph, 2019). One component that plays an important role in the system of Asian seabass *L. calcarifer* culture is feed (Fadhliyatud, 2018).

Feed is the most important element in supporting the growth and survival of fish. Asian seabass *L. calcarifer* is a carnivorous fish. For carnivorous fish, feeding of fresh trash fish is relatively cheaper than pellets, especially during the fishing season (Glencross, 2006). Feed is also an important component in the success of cultivation, so the quality and quantity need to be developed (Widya *et al.*, 2018). Utilization of vitamin C in improving feed quality can be developed so as to increase the growth and survival of fish (Liu *et al.*, 2018).

Vitamin C functions as a support in growth, reduces stress levels and can accelerate wound healing in fish (Lin and Shiau, 2005; Mohamed *et al.*, 2019). Vitamin C is an organic compound that plays an important role in the process of food metabolism and fish physiology (Siregar and Adelina, 2009). This study aimed to determine the effect of vitamin C enrichment on fresh trash feed on the growth of Asian seabass *L. calcarifer* and their optimal dosage.

RESEARCH METHODS

Experimental Fish

As much as 160 individuals of Asian seabass with an average length of 8 cm was used. The fish were acclimatized first in 20 containers with a density of 8 individuals each.

Feeding

The feed given was trash fish which was still fresh. Feed was given 4 times a day with a frequency of 5% of body weight. Before being given, the fresh trash feed supplemented with vitamin C by putting it in the feed and given egg white as an adhesive. The feed was dried for 2-3 minutes and ready to be given.

Experimental design

The study used 4 treatments and 5 replications for each treatment. The treatment given was a dose of vitamin C 3.5 g / kg of fresh trash feed (A); dose of vitamin C 4 g / kg fresh trash feed (B); dose of vitamin C 4.5 g / kg fresh trash feed (C); and fresh trash feed without vitamins (D).

Parameters

a. Absolute Growth (W)

Absolute growth was calculated using the formula (Effendie, 2002):

$$W = Wt - Wo$$

Where:
W = Absolute weight growth (g)
Wt = Biomass weight at the end research (g)
W = Biomass weight at the beginning research (g)

b. Specific Growth Rate (SGR)

The specific growth was calculated using the formula (Effendie, 2002):

$$SGR = \frac{LnWt - LnWo}{t} x100\%$$

Where:
SGR = Growth rate of specific weights (%)
Wt = Biomass weight at the end research (g)
Wo = Biomass weight at the beginning research (g).
t = Maintenance period (days)

c. Survival rate (SR)

Survival rate was calculated using the formula (Effendie, 2002):and

$$SR = \left({}^{Nt}/_{No}\right) x100\%$$

Where:
S = Survival rate (%)
Nt = Number of fish that live on end of maintenance
No = Number of fish at the start maintenance

d. Water quality

Water quality is one of the main factors for the success of Asian seabass cultivation. The parameters observed in this study, namely temperature, salinity, pH, and dissolved oxygen (DO).

Data analysis

Data analysis used analysis of variance (ANOVA). Meanwhile, to see the difference in influence between treatments, a further BNT / LSP test was conducted.

RESULTS AND DISCUSSION

The average absolute weight value of Asian seabass can be seen in Figure 1. Results of analysis of variance (Table 1) showed that the enrichment of vitamin C in fresh trash feed significantly affected the growth of absolute weight of Asian seabass. Fish that were not given vitamin C treatment that is at treatment D showed the lowest absolute weight growth, which is 13.32 g. The highest absolute weight growth was found in treatment B, 19.79 g, while treatments A, 17.60 g and C, 17.11 g.

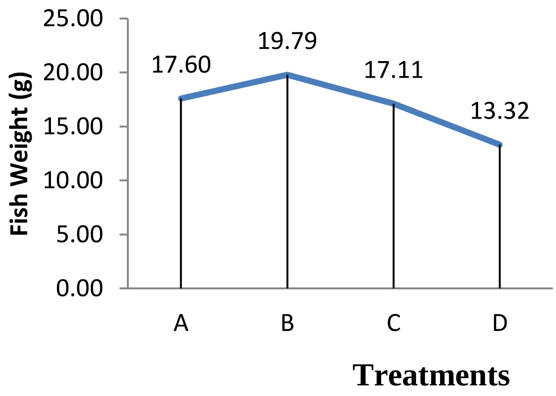

Figure 1. Absolute growth (g) of Asian seabass

In some studies, the use of vitamin C in fish can increase growth rates. Tiger groupers (*Epinephelus fuscoguttatus*) which are fed with vitamin C content show increased growth (Giri *et al.*, 2006), as well as *Tor* sp. (Abdan *et al.*, 2017).

The average growth rate for specific weight of Asian seabass can be seen in Figure 2. Results of analysis of variance (Table 2) showed that the enrichment of vitamin C in fresh trash feed significantly affected the specific growth of Asian seabass . Fish that were not given vitamin C (that is in treatment D) also showed the lowest specific growth rate, which is 2.04%. The highest absolute growth was found in treatment B which was 2.60% while treatments A, 2.41% and C, 2.37%.

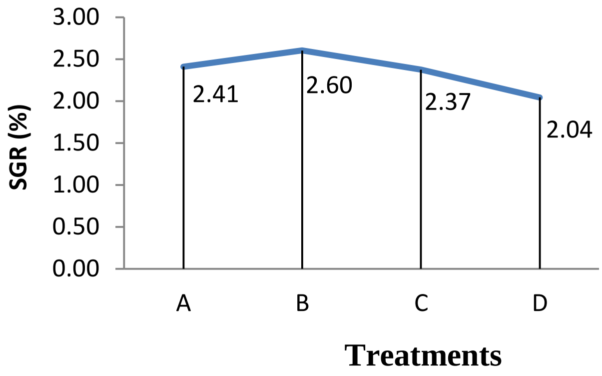

Figure 2. Specific growth rate (%) of Asian seabass

Growth is influenced by several factors, namely internal factors and external factors. Internal factors include heredity, resistance to disease and ability to use food, while external factors include the physical, chemical and biological nature of the waters. Food and water temperature factors are the main factors that can influence fish growth (Hidayat *et al.*, 2013).

The average survival rate of Asian seabass can be seen in Figure 3. Based on the figure 3, the survival rate of Asian seabass in each treatment varies, this is due to the death (mortality) of the test fish during the study. Fish that were not given vitamin C treatment that is in treatment D also showed the lowest survival rate, which is 40%. Treatment B is the treatment with the highest survival rate, which is 47.5%. While treatments A, 42.5% and C, 45%.

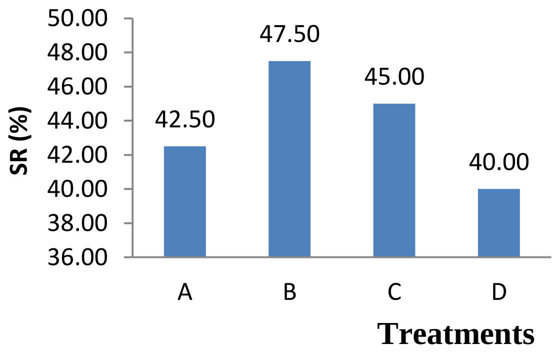

Figure 3. Survival Rate (%) of Asian seabass

Survival rate of Asian seabass for 42 days of maintenance in all treatments ranged from 40% - 47.5%. This level is a moderate survival rate. Survival rate ≥ 50% is good, 30-50% survival is moderate and less than 30% is not good (Mulyani *et al.*, 2014).

Results of analysis of variance (Table 3) showed that vitamin C enrichment in fresh trash feed had no significant effect. However, when compared with the control treatment, the survival rate in the treatment of fresh trash feed enriched with vitamin C is greater. This is because vitamin C functions to increase the growth and survival of fish.

In some studies, the use of vitamin C in fish can increase survival rates. Tiger grouper (*Epinephelus fuscoguttatus*) which is fed with vitamin C content shows an increased survival rate (Giri *et al.,* 2006). Duck groupers (*Cromileptes altivelis*) and *Tor* sp. also showed increase survival rates (Siregar and Adelina, 2009; Abdan *et al.,* 2017).

The survival rate of Asian seabass at a moderate level is thought to be caused by other factors. Fish survival is very dependent on the adaptability of fish to food and the environment, fish health status, stocking density, and water quality that is sufficient to support growth (Murjani, 2011). Based on observations, Asian seabass during the maintenance period in all treatments stricken with the disease. The clinical symptoms that appear are silting around the mouth of the fish and a wound in the operculum.

In the Asian seabass culture system, the emergence of disease outbreaks is one of the main threats to the sustainability of production (Senapin et al., 2018). From the symptoms shown, the disease that attacks Asian seabass during the study was vibirosis which is one of the dangerous diseases in the white snapper culture system (Mohamad et al., 2019).

Vibiosis in Asian seabass that causes anorexia, darker color, hemorrhage in the mouth and skin surface, decay of the skin and fins, lack of appetite, surface swimming, and enlargement of the liver and spleen to death (Tendencia, 2002; Ransangan and Mustafa , 2009)

The results of water quality observations (Table 4) show the temperature at the time of maintenance ranges between 27-28 ℃, pH in the normal range of 7.7, salinity of 25 ppt, and dissolved oxygen 4-5 ppm. According to Sartika, (2017) the ideal water quality for raising Asian seabass is 29–32 ℃; salinity 30-34 ppt; DO 5-7 ppm; and pH 7-8.5.

The temperature during maintenance is lower than the optimal range. Thus weakening the immune response and causing Asian seabass more susceptible to disease to death. According to Nugroho and Nur (2018), low temperatures affect fish metabolism and weaken the body's immune response.

Salinity at the time of maintenance is also lower than the optimal range does not affect the Asian seabass, this is because has a high tolerance for changes in environmental salinity (*eurihaline*). According to Sudradjat (2015), the natural habitat of Asian seabass is the sea. These predatory fish have a high tolerance for changes in environmental salt levels (*eurihaline*). While the pH and dissolved oxygen levels are in the optimal range for Asian seabass.

Table 1: Analysis of variance of absolute growth (W)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
						0,05	*0,01*
Between Groups	108,433455	3	36,144485	4,201609817	0,022650041	3,238872	5,292214
Within Groups	137,64052	16	8,6025325				
Total	246,073975	19					

Table 2: Analysis of variance of SGR

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
						0,05	*0,01*
Between Groups	0,805455	3	0,268485	3,905520401	0,028680967	3,238872	5,292214
Within Groups	1,09992	16	0,068745				
Total	1,905375	19					

Table 3: Fingerprint analysis of SR

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*	
						0,05	*0,01*
Between Groups	156,25	3	52,08333333	0,666666667	0,584667111	3,238872	5,292214
Within Groups	1250	16	78,125				
Total	1406,25	19					

Table 4: Results of water quality observations.

Treatments	Temperature (^{0}C)	pH	Salinity (ppt)	Dissolved oxygen (ppm)
A	27-28	7,7	25	4-5
B	27-28	7,7	25	4-5
C	27-28	7,7	25	4-5
D	27-28	7,7	25	4-5

CONCLUSION

The addition of vitamin C to the trash feed can affect the growth of white snapper fish (*L. calcalifer*) with an effective optimal dose was 4 g / kg of fresh trash feed.

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