# Addition of Cafein in Commercial Feed on The Performance Of Windu Shrimp (*Penaeus monodon*)

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**Abstract:** Windu Shrimp (Penaeus monodon) is a fishery commodity with high economic value. Efforts to increase productivity in tiger shrimp farming can be done by implementing efficient feed use. One of the ingredients to reduce the large feed costs in feed production is the type of caffeine compound. This study aims to analyze the best dose of caffeine added in feed for growth and efficiency of shrimp feed. The method used was a completely randomized design (CRD) experiment with 5 treatments and 3 replications. The caffeine dosage used was 0; 0.5; 1; 1.5; and 2 grams per kg of feed. This research was conducted for 35 days at the Hachery Faculty of Fisheries and Marine Sciences, Tuku Umar University. The parameters observed were survival, growth, feed efficiency, and FCR as well as water quality parameters including temperature, salinity, pH, and DO. The targeted outputs are international journals, international proceedings, HKI and books with ISBN.
**Keywords** Cafein, Performance, Windu Shrimp

## Introduction

Tiger shrimp (*Penaeus monodon*) is still one of the mainstay fisheries commodities in Indonesia. In 2014, with a size of 30 head per kg, the price of tiger prawns was around Rp. 70,000 at the cultivator level, and the export price could reach Rp. 120,000 (WWF Indonesia, 2014). The high selling price has an impact on the high demand for tiger prawn seeds. The cultivation of tiger prawns is currently experiencing a fairly rapid development. However, in the field conditions, various obstacles often arise due to the lack of socialization of the cultivation system and the lack of mastery of specific technology in tiger prawn cultivation.

Efforts to increase productivity in tiger shrimp farming can be carried out by implementing efficient feed use because feed absorbs 60% -70% of the total cost of shrimp production. Nutritional needs, especially protein, fat and fiber, differ according to species, age, physiological condition and environment. Foods that have a balance of protein, fat and fiber will produce good growth of shrimp, but if there is a lack of nutrients due to low feed quality, shrimp growth will be stunted, resulting in increased production costs due to long maintenance times.Apart from being determined by the quality of the feed, shrimp growth is also very much determined by the digestibility of the feed it consumes.

One of the ingredients to reduce large feed costs in feed production is the type of caffeine compound. Caffeine is a natural alkaloid or xanthine alkaloid found in coffee beans, tea leaves, cocoa beans, nuts and other plants (Nonthakaew, 2015). The use of caffeine in aquaculture has been carried out in fresh fish (carp, catfish and tilapia) and marine fish (Sparus aurata). According to Chatzifotis et al., (2008) the use of caffeine in feed on Sparus aurata can reduce the FCR value by 1.8 at a dose of 1 gram of caffeine in 1 kg of feed. Therefore, research on the role of caffeine compounds in tiger shrimp feed can emphasize feed efficiency so that feed production costs can be reduced.

Feed has an important role in increasing the production of cultivation activities. The feed given must be of high quality, nutritious and meet the requirements for shrimp consumption, and be available continuously so that it does not interfere with the production process and can provide optimal growth. The formulation of the problem that needs to be done in this study is to determine the growth and efficiency of tiger shrimp feed with the addition of caffeine in commercial feed.

**Discussion**

**Tiger Shrimp Survival**

The survival results of tiger prawns reared for 35 days showed that the highest survival value was at P2, namely 74.45% and the lowest at P0 of 60%. The results of the calculation of the survival of tiger shrimp are presented in Figure 1. as follows:

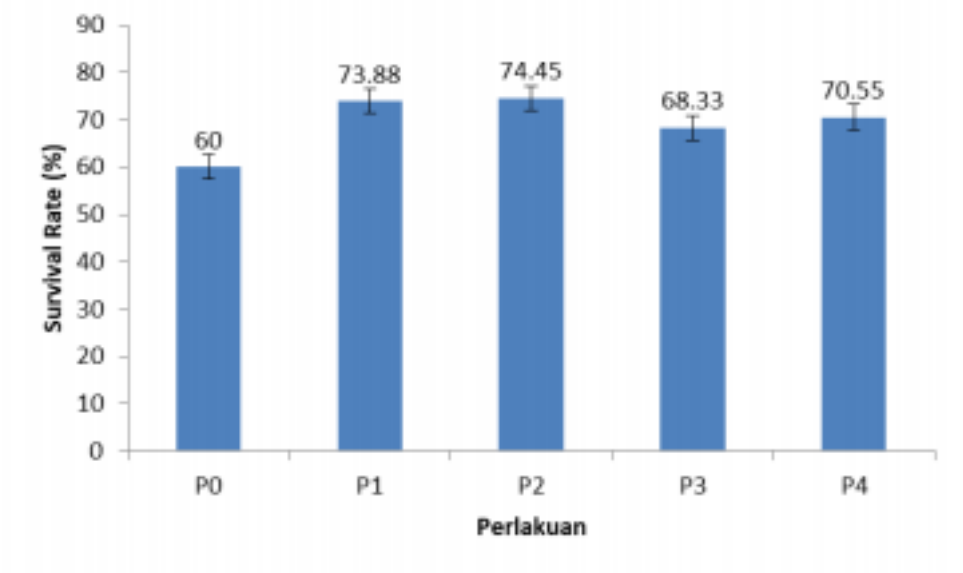


Figure 1. Survival of Tiger Shrimp

Survival is the ratio of the initial number of fish when stocked to the final number during a certain maintenance period (Mulqan et al., 2017). Survival can be used as a measure to determine the tolerance and ability of cultivated organisms to live (Irianti et al., 2016). The survival of tiger prawns for 35 days of maintenance ranges from 60 - 74.45%. The analysis of variance (ANOVA) showed that the addition of caffeine to commercial feed had no significant effect ($P > 0.05$) on the survival of tiger prawns.

Based on Figure 1, it can be seen that the highest survival rate is in P2 treatment of 74.45%. These results indicate that giving 1 g of caffeine in 1 kg of feed can support the survival of tiger prawns with the highest survival rate compared to other treatments. The high percentage of survival indicates that the number of shrimp can survive until the end of the rearing period. This is presumably because the tiger prawns in P2 are able to receive feed given treatment (caffeine) and good environmental conditions to sustain their life during the maintenance period. According to Taqwa et al., (2011) which states that feed plays an important role that needs to be considered to increase the survival and growth of shrimp for the better, where feed is food as a source of energy and material. The caffeine content in feed is thought to accelerate the metabolism of tiger prawns, thus supporting the high survival rate of shrimp in P2. The same study was also conducted by Chatzifotis et al. (2008)

stated that giving 1 gram of caffeine in 1 kg of feed can affect the metabolism of marine fish.

The survival rate of tiger prawns in P2 is in good category. According to Muliyani et al. (2014), the survival rate ≥ 50% is classified as good, 30-50% survival is moderate and if the survival rate is only ≤ 30% it is classified as not good. The survival rate of tiger shrimp was known to vary in each treatment until the end of the study, where the lowest survival rate was found in treatment P0 of 60%. This is presumably because the feed given does not contain caffeine, so that the nutrients in the feed given are also relatively less which causes the shrimp's condition to be easily stressed, so that cannibalism can occur. Cannibalism is one of the characteristics of crustacean animals that occurs when shrimp experience stress,

insufficient feed, density in a water quality culture container, and failure during molting (Irianti et al., 2016). According to Fitriana et al. (2019), when molting, the shrimp emits an odor containing amino acids, which triggers healthy shrimp to prey on shrimps that are molting. In addition, the molting process that does not coincide with one another tends to cause cannibalism against molting shrimp (Anggoro, 1992).

**Growth of Absolute Weight of Tiger Shrimp**

The results of the growth of the absolute weight of tiger prawns with the highest weight were in P2 treatment with an average value of 0.48 grams, the lowest weight growth of tiger prawns was at P0 with an average value of 0.46 grams. Based on the results of ANOVA calculations, it shows that the addition of caffeine to commercial feed has no significant effect (P> 0.05) on the absolute weight growth of tiger shrimp. The results of the calculation of the growth in absolute weight of tiger prawns are presented in Figure 2. as follows:

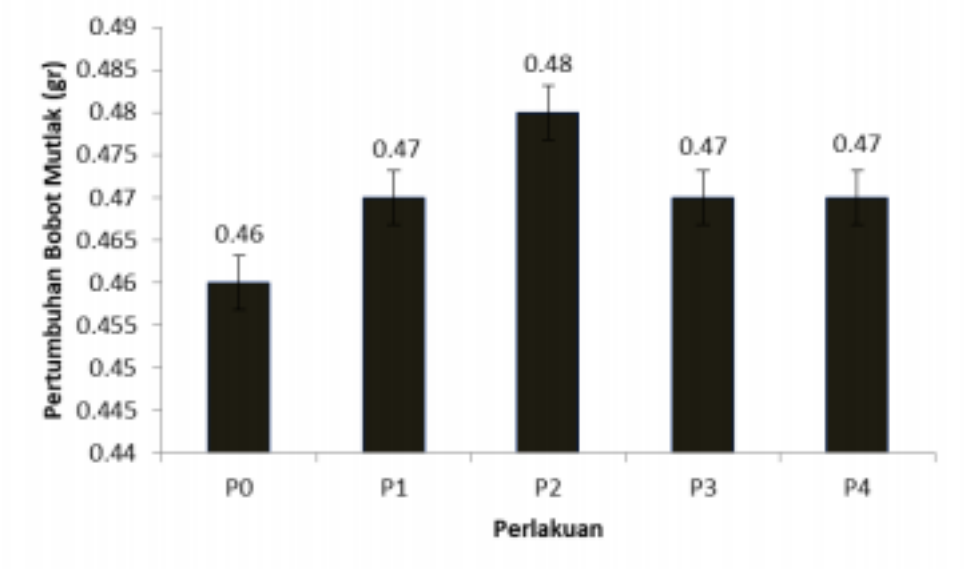


Figure 2. Growth of Average Absolute Weight of Tiger Shrimp

One of the parameters of success in shrimp farming is to produce optimal weight growth. The results of the growth in absolute weight of tiger prawns during maintenance ranged from 0.46 to 0.48 grams. Based on Figure 2, it can be seen that the highest shrimp weight growth in P2 treatment reaches 0.48 grams. This is presumably because the shrimp in P2 is able to

absorb all the nutrients of the feed given and the caffeine content in P2 is thought to be able to support the growth of shrimp weight.

Growth in shrimp occurs when the shrimp can molt properly. This is in accordance with the opinion of Kaligis et al. (2010) stated that growth in crustacean occurs periodically just after molting. Therefore, the addition of caffeine is thought to also support the growth of tiger prawns by activating calcium ions (Ca2 +) in the shrimp's body to carry out molting, where the balance of calcium ions with the environment is needed by the shrimp body so that energy is needed for the continuity of the shrimp shell formation process when molting. less. According to Fitriana et al. (2019), if there is a hypoionic or hyperionic condition of calcium in the shrimp body, it will complicate the balance between the body's calcium ions and the environment, thus requiring greater energy for the shell formation process when molting. Therefore,

The growth of absolute weight of tiger prawns given caffeine in feed (P1, P2, P3 and P4) on average shows a higher weight gain compared to P0 (without the addition of caffeine). The lowest weight growth is thought to be caused by the feed given that does not contain caffeine, so that the nutrients in the feed given are also relatively less which causes the growth of shrimp to be stunted. According to Susanti et al. (2015) stated that the level of feed consumption will affect the optimal growth of postlarvae shrimp at the end of rearing.

**Growth of Absolute Length of Tiger Shrimp**

The results of the absolute length growth of tiger prawns for 35 days of maintenance are presented in Figure 3 as follows:

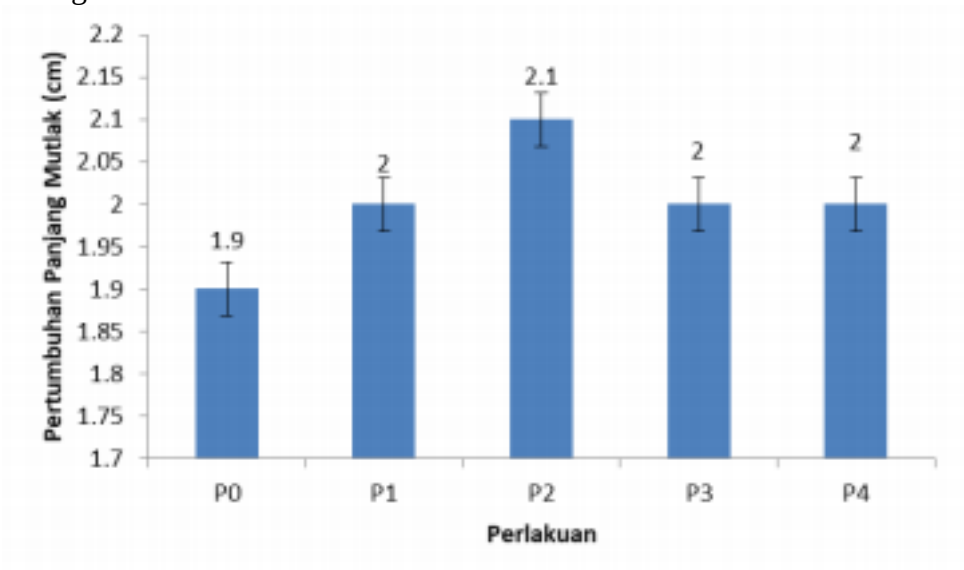


Figure 3. The Average Growth of Absolute Length of Tiger Shrimp

Based on Figure 3 shows that the absolute length growth yield of tiger prawns is highest at P2 with an average value of 2.1 cm. The lowest length growth was found at P0 with an average value of 1.9 cm. Based on the results of ANOVA calculations, it shows that the addition of caffeine to commercial feed has no significant effect (P> 0.05) on the absolute weight growth of tiger prawns.

The absolute length growth of tiger prawns during rearing shows that the highest value of length is thought to be able to make good use of the feed content for the growth of its body length, especially the energy fulfillment for fast molting and skin regeneration. The highest length growth is also caused by the content of caffeine which can work directly on the central nervous system which can cause an increase in metabolism in the body of tiger prawns. According to Vieira et al. (2015), caffeine content can stimulate the mobilization of free fatty acids in tissues and support the work of the lipase enzyme. Lipase enzyme is one of the digestive enzymes needed to help facilitate absorption of feed nutrients in the digestive process. Therefore, The nutrients contained in the feed will be absorbed more quickly and used as energy so that they can support the shrimp's body length growth when molting. This is in accordance with the opinion of Nuhman (2009) which states that the energy obtained by shrimp from feed is not only used for activity and maintenance, but also used for growth. According to Mahendra and Rizal (2019), providing caffeine in feed can increase the growth of giant prawns.

The lowest absolute length growth of tiger prawns was found in treatment P0. As it is known that the feed at P0 there is a change in the quality of the feed due to not being given caffeine, so it is suspected that the feed given cannot support the growth of tiger prawn body length optimally. It is assumed that the feed consumed by tiger prawns at P0 can only be used for survival purposes only. This is in accordance with the opinion of Waluyo et al. (2018), growth can occur in living things if the amount of food eaten exceeds the need to sustain life

**Water quality**

Water quality parameters observed in this study include water temperature and pH. The results of water quality measurements during this study are presented in Table 1. as follows:

Table 1. Water quality parameters

| Treatment | Observed parameters | |
|---|---|---|
| | Temperature (oC) | pH |
| | Morning | Morning |
| P0 | 26 - 29 | 6 - 7 |
| P1 | 26 - 29 | 6 - 7 |
| P2 | 26 - 29 | 6 - 7 |
| P3 | 26 - 29 | 6 - 7 |
| P4 | 26 - 29 | 6 - 7 |
| Optimal Range | 26 - 30 ° C (Kisworo et al., 2015) | 7 - 8 (New et al., 2002) |

Tiger prawns need water as the most important medium or habitat for their life. According to Syukri (2016), good water quality plays an important role for shrimp life because it can be a factor that supports metabolic processes and accelerates skin molting which can facilitate the osmoregulation process.

Based on the results of water quality measurements during maintenance, it is known that in general the water quality measured in each treatment P0, P1, P2, P3, and P4 are still within the appropriate limits for the maintenance of tiger prawn fry (Table 1). This is because during the research efforts have always been made so that the quality of the water in

the maintenance media can support life and optimal growth for tiger prawns by performing penyiponan every 2 days. According to Mas'ud and Rahayu (2018), penyiponan is one way of managing water quality in a culture which aims to reduce ammonia levels in water.

Temperature is one of the water quality parameters that can affect the life and growth of tiger shrimp fry. Temperature can affect the survival of tiger shrimp, especially in the metabolic process of the shrimp body. Waluyo et al., (2018) said that metabolic activities in fish bodies are directly proportional to water temperature. Syukri (2016) adds that high temperatures cause the metabolism of shrimp fry to increase, while at lower temperatures the body's metabolic process slows down. Manurung et al., (2018) added that too cold temperatures cause a decrease in shrimp appetite which affects growth and weight gain to slow down and if the temperature is too extreme it causes shrimp death. The results of measuring the temperature of the maintenance media during the study obtained a temperature range between 26-29$^{o}$C. This value indicates that the water temperature of the rearing media is still within the normal range that can be tolerated by tiger prawn fry. This is in accordance with the opinion of Waluyo et al., (2018), that the optimal water temperature for tiger shrimp growth ranges from 25 - 31$^{o}$C, and grows optimally in the temperature range of 28 - 30$^{o}$C.

Another water quality parameter that plays a role in supporting the success of tiger shrimp cultivation is pH. The pH value is a value that indicates the level of acidity of a medium. Based on water quality data (Table 1), the pH range during maintenance ranges from 6 - 7, which indicates that the rearing media has a pH range that is still acceptable for shrimp for the survival and growth of tiger prawns. According to Saputra (2015), shrimp can live at a pH ranging from 6 - 8. According to Waluyo et al. (2018), shrimp can experience good growth if they are in waters with low alkalinity (neutral), whereas if the pH value is low it will have an impact on shrimp growth which has decreased.

## Conclusions

The addition of caffeine to commercial feed has no significant effect on the survival and growth of tiger prawns. The best treatment based on the graph is in P2 treatment (1 gram of caffeine per kilogram of feed) on the survival of tiger prawns, absolute weight growth, and absolute length growth with a percentage of 74.45% each; 0.48 grams; and 2.1 cm

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