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GROWTH AND SURVIVAL RATE OF RED TILAPIA (*Oreochromis niloticus)* FED BY RESULTED COCONUT TESTA FERMENTATION (*Saccharomyces* sp)

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KeyWords
coconut testa, Fermentation, growth, red tilapia, survival rate

ABSTRACT

This study aimed to determine the effect of fermented coconut testa by *Saccharomyces* sp on the growth of red tilapia (*Oreochromis niloticus*)**.** This study was conducted at the Aquaculture Laboratory Building IV, Faculty of Fisheries and Marine Sciences, Padjadjaran University from December 2019 to February 2020. This study design use was completely randomized design (CRD) with 4 treatments and 3 replications. Treatmens included A (0% of fermented coconut testa in the feed), B (17,59 % of fermented coconut testa in the feed), C (35,19 % of fermented coconut testa in the feed) and D (52,79% of fermented coconut testa in the feed).~~,~~ The results showed that using fermented coconut testa by *Saccharomyces* sp diet had no significant difference (P>0,05) growth and survival rate of the fish. The conclusion of this research was using fermented coconut testa in the feed can be used up to 52,79% for red tilapia

Introduction

Tilapia aquaculture offers a promising souce of Indonesia economic and healty protein for humankind to improve wellbeing and business prospects. Tilapia has a fast growth rate and high level of productivity (Aliyas et al 2007) This has raised attention to an increasing development of tilapia aquaculture industry. The development of fish farming often faces high feed cost, approximately 35,19 % of total production (Suprayudi 2010). The increase in the price of artificial feed is influenced by the increase in the price of feed raw materials such as corn flour, bran, soybean meal and rice bran (Putri et al 2012). The increasing demand for feed and the price of fine rice bran led to counterfeiting of rice bran by mixing it with husks. So that the quality will decrease due to the presence of lignin content which is anti-nutritional (Maulana 2007). Apart from the other anti-nutritional lignin content in the bran, phytate is a part of crude fiber. In selecting the alternative feed ingredients, several factors should be considered (the cost, the availability of the materials, nutrients, the competition with humans and the other animals. Sugiyono (2015) states that compared to garlic skin, young jackfruit seeds and bean sprouts, coconut husks have the best potential to be used as feed because of their high metabolic energy. Coconut husks can be used as raw material for energy sources.). One way to reduce the feed cost can be coconut waste (coconut testa) as an alternative for fish feed. Coconut testa was hampered by its poor nutritional value as well as high fat, fiber and antinutrition (lignin) content which could be overcome through fermentation by *Saccharomyces* sp. Crude fiber is a component which is difficult to be digested by tilapia. in the *Saccharomyces* sp fermentation process in which the reaction occours complex compound is converted into simpler compounds (Purwadaria *et al* 1995). S. cerevisiae improved the efficacy of the immune system, improved intestinal lumen health, increased digestion and absorption of nutrients, which resulted in better performance (Spring 2000)

The addition of Saccharomyces sp can increase growth because the yeast Saccharomyces sp contains nucleotides. According to Li and Galtin (2003) yeast Saccharomyces sp contains nucleotides include alkaline, purines and pyrimidines as much as 0.9%. The results of a study by Burrels et al (2001) showed that the growth of salmon increased after being given a feed containing added nucleotides for 8 weeks. The same result is also known from the research of Lin et al (2009) that the content of nucleotides in feed can increase the weight and length growth of groupers In general, omnivorous fish can utilize 30-40% carbohydrates and 3-18% fat in their feed . Based on the aforementioned background, research is needed to determine the extent to which the use of alternative feed ingredients for carbohydrates and fat from fermented coconut testa by Saccharomyces sp on the survival and growth of red tilapia.

Research Methods

Research Material

This study was conducted at the Aquaculture Laboratory, Faculty of Fisheries and Marine Sciences, Padjadjaran University from December 2019 to February 2020 for about 35 days. The research material used included of fish meal, soybean flour, fine bran, premix and fermented coconut testa, pH mater, DO meter and aquarium.

Research Procedure

The study began with feed manufacturing of fermented coconut testa by *Saccharomyces* sp. Coconut testa were fermented at room temperature (17,59 -30^{o}C) and acidic pH (4-5) by *Saccharomyces* sp (dose of 2%) for 3 days (Purwadaria 1995). The Feed Meterial and ingredients content of constituens of feed can be seen in table 1. The research used 12 units of aquarium with 6 fish/aquarium. The stocking density is 1 fish / 2 liters of water (Yulianti 2003). The feeding treatment given was 4% of the fish biomass with the frequency of two times a day at 08.00 an and 05.00 pm.

Table 1. Feed Meterial and Ingredients

Feed Meterial	**Ingredients (g)**			
	A	B	C	D
Fish meal	13,30	13,30	13,30	13,30
Soybean flour	13,30	13,30	13,30	13,30
Fine bran	70,38	52,79	35,19	17,59
Fermented coconut testa	0	17,59	35,19	52,79
Premix	3	3	3	3
Total	100	100	100	100
Protein (%)	17,59 ,77	17,59 ,77	17,59 ,77	17,59 ,77
Crude Fat (%)	9,76	10,71	11,67	12,62
Crude Fiber (%)	6,5	7,22	7,89	8,56
DE (kkal/kg)**)	2661,96	3052,79	3488,17	3901,27

This study design use was completely randomized design (CRD) with 4 treatments and 3 repetition, so there were 12 experimental units. Treatmens included A (0% of fermented coconut testa in the feed), B (17.35% of fermented coconut testa in the feed), C (35,19 % of fermented coconut testa in the feed) and D (52,79% of fermented coconut testa in the feed). The variables observed were the amount of body weight growth, body lenght growth and survival rate. The data were analyzed by the analysis of variance, duncan's multiple advance tests were used.

Result and Discussion

Survival Rate

Effendy (2004) states Survival rate or commonly known as SR was the number of fish that can survive from seeding to harvesting.

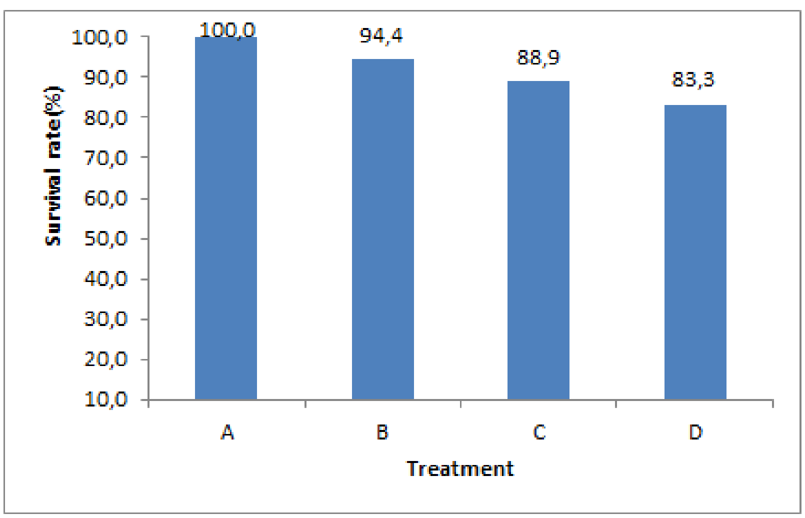

Figure 1. Survival Rate

The results showed (Figure 1) that using fermented coconut testa by *Saccharomyces* sp diet had no significant difference (P>0,05). even though all treatments had a survival degree in accordance with indonesian national standart because SR treatment was included in the 83% - 100% susceptibility. The value of the quality standard of survival for tilapia production is 52,79% (SNI 2009). The result of the treatment analysis shows that the highest survival rate was obtained in the A treatment (0% of fermented coconut testa in the feed) which was 100%. The lowest feed conversion was shown by the treatment D (52,79% of fermented coconut testa in the

feed). The occurrence of death in treatment caused by parasites from microbacteria tuberculosis (*Pop eye)*. The degree of survival can also be influenced by other biotic factors (parasites) (Effendie 1997).
Pop eye caused by temperature fluctuations, low water temperatures and high levels of ammonia. Ammonia caused by food residue left at the bottom of the pond. Even though there was death due to pop eye¸ the survival rate in this research was still above the SNI limit, so fermented coconut testa could still be applied in cultivation activities.
Tilapia live optimally at a temperature of 25 -30 °C (Suyanto 2003) but the result of the research, the water temperature 23,2 – 24,7 °C. Rukmana (1997) argues low temperature conditions less than 25 °C distrupted fish growth. Tilapia active in warmer temperatures than cold temperatures. Temperature conditions greatly affect fish life. If the fish in low temperature, the fish will tend to get sick easily. Sukarman (2015) argues that feed from coconut testa not harmful to the growth of tilapia. The result of the Sukarman treatment analysis shows that survival rate above 90%. Even the treatment analysis shows that the highest survival rate wes obtained in the treatment (17,59 % of subtitution coconut testa in the feed) which was 100%.

Growth

The result of observation of fish growth for 35 days are as follows :

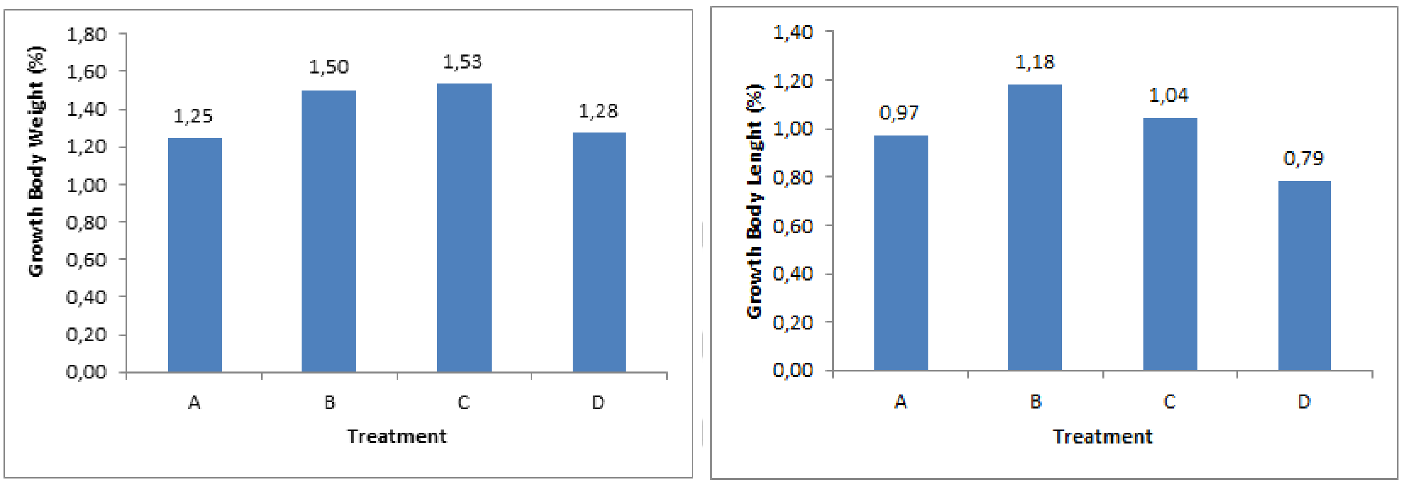

Figure 2. Growth Body Wight and Body Lenght

The results showed that using fermented coconut testa by *Saccharomyces* sp diet had no significant difference (P>0,05). The highest growth body weight is shown by the treatment C (35,19 % of fermented coconut testa in the feed) and highest growth body lenght is shown by the treatment B (17,59 % of fermented coconut testa in the feed). considering whether to use treatment A, B, C or D feed, use of B feed (17,59 % fermented coconut husk substitute) or C feed (35,19 % fermented coconut husk substitute) are good choices.
The results showed that the insignificant difference could be caused by the sinking speed of the feed and the fish preference level which was not significantly different. Sinking speed can describe the speed at which fish find feed. Tilapia can find pellets quickly even when given submerged feed, one research from Cruz (2001) even suggests that sinking feed (drowning feed) is better for tilapia growth when compared to floating feed. So that when choosing the best treatment among all treatments, the cultivator can choose B feed (17,59 % of fermented coconut testa in the feed) or C feed (35,19 % of fermented coconut testa in the feed) which is easy to sink feed.The palability test in this study had not much difference between the treatments, this could cause fish growth to not have different results. Treatment B (17,59 % of fermented coconut testa in the feed) or C (35,19 % of fermented coconut testa in the feed) the most preferred feed by fish, this is proven with the remaining feed in the aquarium treatments B and C had less feed left compared to treatments A and D. Shows that the Treatment B and C in the feed the higher the palability of the fish toward the feed.
Fermented coconut testa by *Saccharomyces* sp contains nukeotides. In several studies stated that *Saccharomyces* sp contains nucleotides this positively affected the growth rate of the fish. Nucelotides usualy can stimulate palability, nucelotides in fish feed can increase fish appetite so that feed intake increases, causing growth to also increase. Nucleotides are semi-essential nutrients and this material is needed by the fish body in the growth and multiplication of cells in living organisms and optimizes cell division functions (Rawung and Henky 2014). one research from Lara-Flores et al., (2003) showed that the addition of *Saccharomyces* sp improve diet and protein digestibility which may explain the better growth with *Saccharomyces* sp supplements. The improved fish growth and feed utilisation may possibly be due to the improved nutrient digestibility.the feed containing the highest fermented coconut testa (treatment D) had a low growth when compared to treatment B and C. Treatment D too much Saccharomyces sp content in the feed. Based on the statement Sumardiyani (2020) the content of *Saccharomyces* sp in too much feed is not good for

fish growth. Mohammadi (2016) *Saccharomyces* sp can attach to the intestine during the digestive process which causes amylase secretion to increase and can increase the activity of digestive enzymes so that the digestibility of nutrients becomes faster before they are properly absorbed. So that nutrition in the feed cannot be used optimaly for the formation of the body tissues. Francis et.al (2001) stated that the maximum provision of fermented coconut testa in the treatment can cause high content of glucomanan and mannan, which can lead into anti-nutrients problems as these substances can lead to the ineffective work of enzyme in the digestive tract, making it difficult to digest food substances, and the reduction of nutrients absorbed by the body results in stunted growth. Treatment D body growth decreased, but still higher than treatment without the fermented coconut testa. Such decline in growth of a treatment D body weight is caused by the maximum provision of fermented coconut testa in treatment. Research from Olivia-Teles (2001) showed that *Saccharomyces* sp cells into fry Nile tilapia diet induced growth performance, feed utilization and immunity, and is promising as an alternative method to antibiotics for disease prevention in tilapia aquaculture. *Saccharomyces* sp may be used has positive effect on growth and nonspecific immune response of several fish species.

The difference in length and weight that occurs in the research occurs due to the amount of feed consumption. The difference in the amount of feed consumption is due to palability. the addition of fermented yeast in feed raw materials can have a positive effect on tilapia feed consumption. When compared with the control treatment, the treatment containing fermented coconut testa had better growth.The peptide content in *Saccharomyces* sp cells plays an important role in enzymatic digestion, so that fish are able to digest food more efficiently (Whittington et al 2005). Lara-Flores et al (2003) stated that the content of Saccharomyces sp in feed can increase the digestibility of feed and protein. The better the digestibility level of the feed, the better the utilization of fish feed, so that it makes the use of feed more efficient, resulting in better fish growth.

Water Quality

The result of observation of water quality for 35 days are as follows :

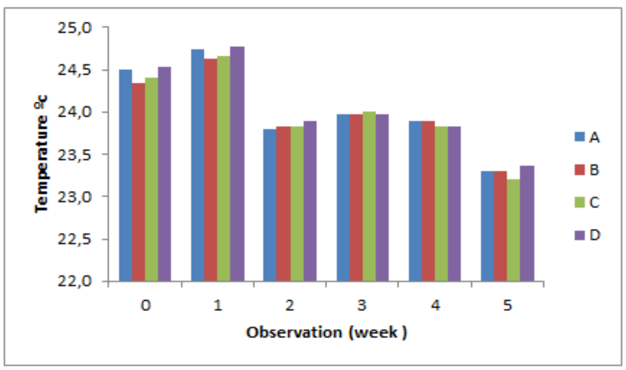

Figure 3. Temperature

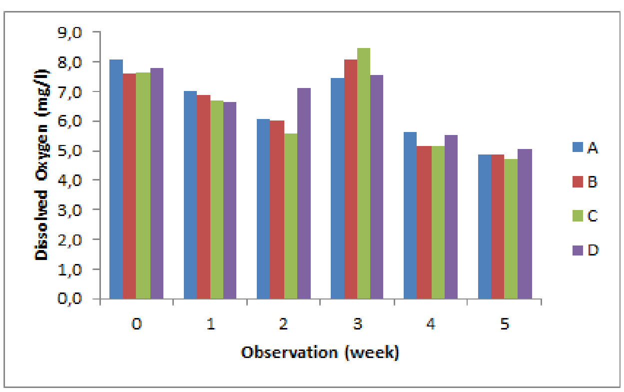

Figure 4. Dissolved Oxygen

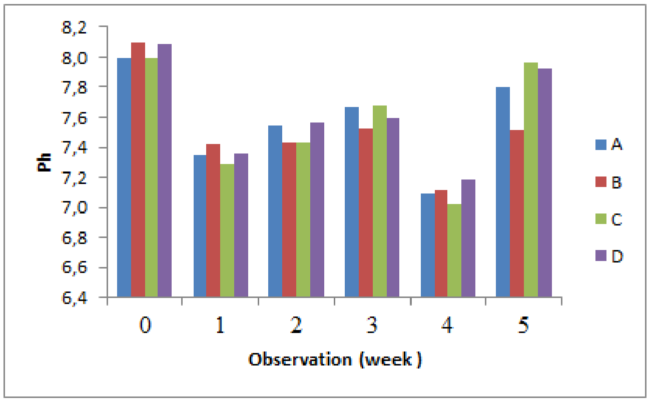

Figure 5. Degree of Acidity (pH)

Tilapia live optimally at a temperature of 17,59 -30 °C (Suyanto 2003) but in this research activity it is known that the water temperature used is 23.2 - 24.7 C, this is below the temperature determined by Suyanto (2003). According to Suyanto (2003), tilapia growth will be optimal at a pH of 7-8 while in this research it is known that the media used has a pH between 7-8.1 so that the water quality in this research is in accordance with the limits set by Suyanto (2003). optimal growth of tilapia requires an oxygen content of at least 3 mg / L. Oxygen content is an important factor for fish life. DO observation data during the research and it is known that the research fish live in the DO range 5.1 - 8.1 mg / L, this indicates that tilapia are already living in DO conditions.

Conclusion

Based on the research results, each treatment showed results that were not significantly different in terms of SR, length growth and weight.So that fermented coconut testa based feed can be used up to 57,5% of fermented coconut testa in the feed but The highest survival rate and growth body weight is shown by the treatment C (35,19 % of fermented coconut testa in the feed).

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