

## The Effect of Chicken Manure and Tofu Dregs on Biomass Growth of Silkworm

<sup>2</sup>Nurmaya Bonse, <sup>1,2</sup>Hasim, <sup>2</sup>Rully Tuiyo

<sup>1</sup>hasim@ung.ac.id

<sup>2</sup>Department of Aquaculture, Faculty of Fishery and Marine Sciences  
Universitas Negeri Gorontalo

### Abstract

This study aims to determine the effect of using chicken manure and tofu dregs on the growth of biomass and silkworm (*Tubifex* sp.) populations. The research method used was a completely randomized design (CRD), with four treatments and three replications. The treatments are the use of 100% Mud (A); 25% Chicken manure, 75% Tofu dregs (B); 50% chicken manure, 50% tofu dregs (C); and 75% Chicken Manure, 25% Tofu Dregs (D). Silkworms were kept for 21 days. The results showed that the highest growth of biomass and population was found in treatment C with a biomass of 15.22 g and a population of 7269 individuals. Data analysis was carried out using Analysis of Variance (ANOVA): showed that the treatment of using chicken manure and tofu dregs had a very significant effect.

**Keywords:** Silkworm; growth; biomass; population; chicken manure; tofu dregs.

### Introduction

Hatchery activities are the main part of cultivation activities (Effendi, 2004). Hatcheries are one of the aspects that determine the success or failure of fishery production, because during larval and fry stages the fish body is susceptible to disease and the surrounding environment (temperature, pH, and dissolved oxygen) so that fish seeds need appropriate food intake so that their growth can be optimal. One of the intakes that are often used by cultivators, especially in fish hatchery activities, is silkworm (*Tubifex* sp.).

According to Pursetyo et al (2011), silkworms have an important role because they can stimulate fish growth faster than other natural feeds such as water fleas (*Daphnia* sp. and *Moina* sp.), this is because silkworms have advantages in terms of nutrition. The nutritional content of silkworms is 41.1% protein, 20.9% fat, 1.3% crude fiber and 6.7% ash content (Muria et al., 2012). Silkworms (*Tubifex* sp) are Oligochaeta that grow in fresh waters where the water is clear and flowing, especially shallow ones and generally makes holes in the mud (Pennak, 1953). *Tubifex* worms are usually given to ornamental fish and young fish (juvenile) or fish larvae aged 17 days and over (Effendi, 2004). Silkworms are usually found in polluted waters (dense residential areas) and contain organic matter with high protein content.

One of the obstacles often experienced by fish farmers in hatchery activities is the unavailability of silk worms throughout the year, especially during the rainy season. This is because silkworms in nature are carried by heavy currents due to high rainfall (Hadiroseyani et al., 2007). So far, the need for silkworms is obtained from natural fishing, especially from rivers that have muddy bottom waters with calm water flows and have high sources of organic matter (Masurutun, 2014).

Tofu dregs and chicken manure can be used as a source of organic material for silkworms because the content in them can accelerate the growth process of silkworms. Based on this facts, it is necessary to conduct a study on the effect of the use of chicken manure and tofu dregs on the biomass growth of silkworm.

### Research Methods

This research was conducted from June to July 2017 at the Fish Seed Center (BBI) Gorontalo City, Gorontalo Province. The test animals used in this study were silk worms obtained from the Center for the Development of Freshwater Fish Cultivation (BPBIAT) in Bendungan Village as much as 120 grams. Referring to Nurfitriani et al, (2014), silkworm rearing containers are made of guttering pipes with length (50 cm), width (13 cm) and height (10 cm). Before being used, this

container is designed in advance to form a rectangle, and on one of the wide sides of the container a hole is made that serves as the entrance and exit of water. In the water storage container, an aquarium pump is installed to push the maintenance water into the silkworm rearing containers. The water flow will be rotated through the paralon pipes of the containers.

The growing media was of mixture of mud, chicken manure and tofu dregs. The mud was separated from garbage and other benthic organisms before dried under the hot sun for about 3 days, grounded and sieved. The chicken manure is sun-dried until it is completely dry then grounded and sieved to be mixed with the dregs. The mud used was 1.49 kg/container, while the mixed dose of chicken manure and tofu dregs was 1,052 kg/container (Nurfitriani et al, 2014).

The media was left for one week, then watered with slow flow of circulation evenly on the media surface during maintenance and inoculation. The inoculants (seedlings) of silkworms will be stocked first, each container is weighed as much as 10 grams. The silkworms are placed in a maintenance container in the form of a gutter pipe measuring: length (50 cm), width (13 cm) and height (10 cm) with a media height of 4 cm and is inundated with water as high as 2 cm from the top of the media. Inoculation was carried out in the morning or evening to avoid stress of the *Tubifex* sp.

The maintenance of silkworms in test containers was carried out for 21 days. During the maintenance, a water check is carried out to ensure the water flow steadily in order to maintain oxygen supply. During the maintenance period, no fertilizer was added, referring to the previous research by Suharyadi (2012).

After 21 days of maintenance, the harvesting stage is carried out. The water flow is turned off, the media is dismantled and washed with water from the hose and then shaken to separate the silkworm. After the silkworms were cleared off the mud, they were put into 12 jars sealed with a strimin cloth which was spread evenly over the surfaces. On top of the strimin cloth again covered with black crackle and the lid of the jar covered again with cardboard so that the inside of the container was really dark. Silkworms are sensitive to light. If there is no light, the silkworms will rise

to the surface of the strimin cloth. The silkworms on the surface were taken, washed thoroughly and weighed. Harvesting of silkworms is carried out in the morning or evening so that the silkworms do not experience stress.

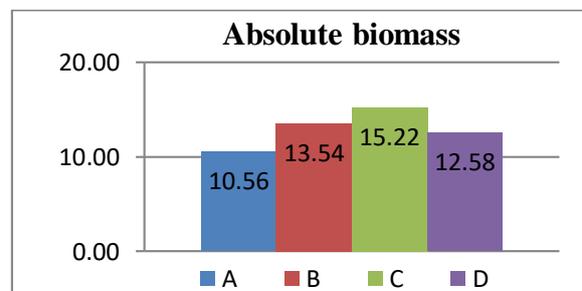
The statistical analysis used was Completely Randomized Design (CRD) to determine the effect of the use of chicken manure and tofu dregs on the growth of the population biomass. Randomness is carried out for each placement of the experimental container. Observation was done on each different cultivation media with each treatment consisting of four treatments and three replications. Treatment A: Control; Treatment B: media with a mixture of chicken manure (25%) and tofu dregs (75%); Treatment C: chicken manure (50%) and tofu dregs (50%); Treatment D: chicken manure (75%) and tofu dregs (25%).

The variables observed were the absolute growth of biomass and population of silkworms. Absolute growth is calculated according to Effendie, 1997. The total population of silkworms was determined by counting the samples directly, 1 gram of the sample was taken and then converted to the amount of silkworm biomass obtained from each rearing container (Hadiroseyani et al., 2007).

## Results and Discussion

### Absolute biomass growth

Worms generally can consume a variety of organic materials, the amount and type of organic matter available greatly affect the growth of biomass and population growth of silkworms. The results on the effect of using chicken manure and tofu dregs to produce an average absolute biomass of different silkworms can be seen in Figure 1.



**Figure 1.** Biomass growth of *Tubifex* sp in each treatment

Each treatment has different results. Treatment A (control) has the lowest biomass growth of 10.56 g, while Treatment C has the highest biomass growth of 15.22 g. Treatment B has a biomass growth of 13.54 gr and Treatment D has a biomass growth of 12.58 gr.

Treatment C gave the highest yield of biomass growth presumably because it is sufficient meet the needs of silk worms, where 50% of tofu dregs can be used by silk worms as food to meet their nutritional needs. In accordance with Diana's statement (2014) that giving fermented tofu dregs causes protein to be more easily absorbed by silkworms so that it can increase silkworm biomass production. Febrianti (2004), also stated that fermented chicken manure in the media will be decomposed by bacteria and converted into organic particles as feed ingredients. In the process of decomposition of organic matter, microbes utilize organic matter as a feed source in a complex series of reactions. This process involves enzymes to speed up the reaction or as a catalyst. According to Subandiyono and Hastuti (2010), the nutritional quality of feed is determined by the level of digestibility and chemical composition. The protein and energy content in the feed must be balanced because a lack or excess of energy can reduce growth rates.

Treatment B had the second highest biomass growth, while Treatment D had the lowest biomass growth after the Treatment A (control). This is presumably because the use of tofu dregs in Treatment B contains appropriate nutrients, while in Treatment D, the protein in fermented chicken manure cannot be absorbed by the worms and the dosage mixture is not suitable for the nutrients needed by the silkworms.

According to Diana (2014), the enrichment of culture media using organic tofu dregs in higher doses is able to provide the nutritional needs of silkworms to grow so that the absolute biomass growth becomes higher. The given tofu dregs contain protein that has been processed and has been fermented, so that it is more easily absorbed by silk worms. The fermentation process will simplify the particles of feed ingredients so that it will increase the nutritional value and quality. In addition, the fermentation of tofu waste will

convert protein into amino acids and will indirectly reduce the crude fiber content of tofu waste.

Tofu waste is produced by the soybean processing industry into tofu. Tofu dregs have high nutritional content and can be used as animal feed. The nutritional content of tofu dregs is 18.21% crude protein, 3.26% ash, 26.81% crude fiber, 7.79% fat, 4393% extract without nitrogen (BETN), 0.47% Ca, 0.10 % P (Wahyuni, 2003).

Tofu dregs also contain micro and macro mineral elements, namely for micro: Fe 200-500 ppm, Mn 30-100 ppm, Cu 5-15 ppm, Co less than 1 ppm, Zn more than 50 ppm (Tarmidi, 2012). Tofu dregs contain nutrients that are in accordance with the needs of silk worms (Suharyadi, 2012). Tofu dregs can be used as a source of nitrogen in fermentation media and can be used as a source of feed protein, because it contains high crude protein (Nuraini, 2009).

Treatments B, C, and D had higher average biomass growth compared to Treatment A. This was presumably because treatments B, C and D had higher nutrient content than treatment A. Low nutrition in treatment A led to the less-availability of feed. According to Findi (2011) that silkworms need food for growth and reproduction.

### Population growth

Based on the results of the study, the effect of using chicken manure and tofu dregs on the population growth of silk worms with different treatments resulted in a different average population growth. The average population growth of silkworms for each treatment can be seen in the following graph in Figure 2.

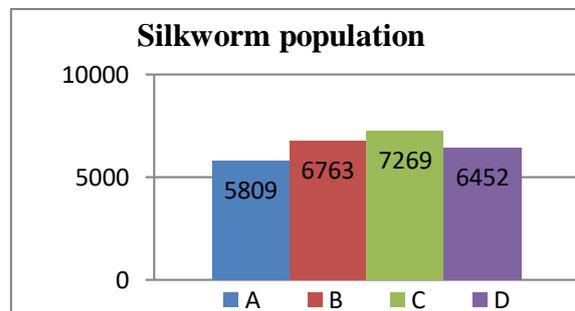


Figure 2. Pupulation of silkworms in each treatment.

The different doses of chicken manure and tofu dregs indicate different population growth of silkworms. Treatment C has the highest

population average compared to treatment B, D and A, this is presumably because treatment C has a mixture of chicken manure and tofu dregs that is right for silkworm population growth. In addition, the nutritional content produced by mixing tofu dregs and chicken manure becomes more complete and higher so that it can support the growth of the silkworm population.

Chicken manure is the most widely used manure for silkworm cultivation. According to Fidiyati (2011), chicken manure is the richest manure because chicken manure contains 29% organic matter, 1.5% nitrogen, 1.3% phosphorus in the form of P<sub>2</sub>O<sub>5</sub> and 0.8% potassium in the form of K<sub>2</sub>O. The nutrient content is greater than other manure, chicken manure is an organic fertilizer that decomposes quickly.

The nutritional content of tofu dregs varies, this is due to differences in the varieties of soybeans used as the basic ingredients for making tofu, the equipment used in the tofu making process and the processing carried out (Wahyuni, 2003).

Treatment B had the highest population growth after treatment A, this is presumably because in treatment B the nutritional content was better for the growth of silk worms. Diana (2014), explained that with the addition of tofu dregs organic matter is thought to increase protein and carbohydrates in silkworm culture media.

Cultivation media plays a very important role in the success of silkworm cultivation. Silkworms require media containing organic and inorganic materials. Organic materials are organic compounds containing carbon, nitrogen, oxygen, and hydrogen, while inorganic materials are minerals and water. The media used for silkworm cultivation is a food source for silkworms. Media that has high organic matter is very important and affects the growth of silkworms. In media with low organic matter conditions, it is difficult to find silk worms (Suharyadi, 2012).

### Water qualities

In general, the range of water quality including temperature, pH and DO for the cultivation of silkworm during the study was in a

good range for the growth of biomass and silkworm population. Temperature is not a limiting factor for worms of the Oligochaeta family, but can affect the physical and chemical properties of water and can accelerate biochemical processes. If the water temperature increases, the metabolic rate and the need for oxygen also increase, as well as the toxicity of pollutants. So that the optimum temperature is needed for each phase of its life. The temperature range during the rearing period between 27-28°C is considered appropriate for the maintenance of silkworms. The allowable range is between 25-30°C (Shafrudin 2005).

According to Masurutun (2014), the optimum pH range for maintenance of *Tubifex* sp is 5.44 - 7.48. In general, bacteria grow well at neutral pH, because bacteria can normally break down organic matter into simpler organic matter so that it is ready to be used by *Tubifex* sp. As for dissolved oxygen, Findy (2011) stated that a good DO value for the maintenance of *Tubifex* sp is 1.64 – 3.95 mg/l.

### Conclusion and suggestion

The use of chicken manure and tofu dregs in the culture media for silkworms (*Tubifex* sp) has a very significant effect on population growth.

The treatment that produces the best biomass and population growth is Treatment C, this is presumably because Treatment C has a right mixture of chicken manure and tofu dregs that is right for silkworm population growth. In addition, the nutritional content produced by mixing tofu dregs and chicken manure becomes more complete and higher so that it can support the growth of the silkworm population.

Further research is needed on the use of chicken manure and tofu dregs with gradual harvesting to find out more clearly the growth of silkworms.

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