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# PEMANFAATAN EKSTRAK FERMENTASI AIR DEDAK HALUS DENGAN DOSIS YANG BERBEDA TERHADAP POPULASI CACING SUTRA (*Tubifex* sp)

# UTILIZATION OF FINE BRAN WATER FERMENTATION EXTRACT WITH DIFFERENT DOSES AGAINST POPULATION OF SILK WORMS (*Tubifex* sp)

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**Abstract**

The purpose of this study was to determine the effect of fermented bran extract with different doses on the biomass growth of Silkworms (*Tubifex* sp). This research was conducted in August 2021 at the Laboratory of the Fish Seed and Feed Production Technology Study Program, Politeknik Indonesia Venezuela. The design used was a non-factorial completely randomized design consisting of 4 treatments and 4 replicates. The highest biomass of silkworms (*Tubifex* sp) was obtained in treatment A (without the addition of fine bran fermentation extract) with an average biomass of 32.5 grams, while the best absolute length growth of silkworms was obtained in treatment D (Addition of 200 ml fine bran fermentation extract) with a length value of 2.5 cm. The results of the analysis of variance showed that the addition of fermented bran extract had a significant effect (P>0.05) on biomass and absolute length growth of silkworms (*Tubifex* sp). Water quality results showed pH ranged from 8.4 - 10.4 and water temperature ranged from 26.9-27$^0$C.

***Keywords**: Silkworm, Fine Bran, Fermentation*

**Abstrak**

Tujuan penelitian ini mengetahui pengaruh ekstrak fermentasi dedak halus dengan dosis berbeda terhadap pertumbuhan biomassa Cacing Sutra (*Tubifex* sp). Penelitian ini dilakukan pada Agustus 2021 di Laboratorium Program Studi Teknologi Produksi Benih dan Pakan Ikan, Politeknik Indonesia Venezuela. Rancangan yang digunakan Rancangan Acak Lengkap non faktorial yang terdiri dari 4 Perlakuan dan 4 ulangan. Biomassa Cacing Sutra (*Tubifex* sp) yang tertinggi diperoleh pada perlakuan A (tanpa penambahan ekstrak fermentasi dedak halus) dengan jumlah rata -rata biomassa yaitu 32,5 gram, sedangkan pertumbuhan panjang mutlak cacing sutra terbaik diperoleh pada perlakuan D (Penambahan ekstrak fermentasi dedak halus 200 ml) dengan panjang nilai 2,5 cm. Hasil analisis sidik ragam menunjukkan pemberian ekstrak fermentasi dedak halus berpengaruh nyata (significant) (P> 0.05) terhadap biomassa dan pertumbuhan panjang mutlak cacing sutra (*Tubifex* sp). Hasil kualitas air menunjukkan pH berkisar antara 8,4 – 10,4 dan suhu air berkisar antara 26,9-27$^0$C.

**Kata Kunci :** Cacing Sutra, Dedak Halus, Fermentasi

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## INTRODUCTION

One of the natural feeds in fisheries cultivation, especially the maintenance of larvae and seeds that have very high nutritional content is silkworms (*Tubifex* sp.). Fish seeds really like silkworm feed, especially freshwater fish seeds (Hafsah *et al.*, 2023). The use of natural feed has several advantages as follows, does not damage water quality, has cheaper prices, and contains better nutritional value (Thaib *et al.*, 2023). Sari *et al.* (2021), explain that silkworms live at low depths, environments with high organic content, muddy or sandy substrates, and fluctuating variations in different organic matter content.

The source of availability of natural silkworm feed still comes from nature, with several disadvantages including, only being available in the rainy season and not having good quality, and easily contaminated with heavy metals in the waters. The increasing need for silkworm feed with limited stock makes the price expensive, making silkworm cultivation a potential for development. (Singh *et al.*, 2007).

Silkworm cultivation is still not widely practiced in the community because silkworm cultivation is relatively difficult. This is because the type of cultivation media that produces high biomass has not been found. Soft, easily decomposed substrates with high organic content are needed by silkworms as a medium for living and growing (Afifi *et al.*, 2017). Organic materials that decompose and settle on the bottom of the waters become nutrients for silkworms to reproduce. Detritus, diatoms, thread algae, or plant remains dissolved in mud are the main food for silk worms (Raharjo *et al.*, 2018). Setiadi *et al.* (2023), explained that the cultivation of silkworms with various media has been widely carried out, including catfish wastewater (Supriyono *et al.*, 2015), fermented chicken manure (Putri *et al.*, 2014), solid paper mill waste (Wahyu *et al.*, 2013), quail manure, rejected milk powder, tapioca flour (Sari *et al.*, 2021). These various media contain organic materials that are used as nutrients for the growth of silkworms (Fatah *et al.*, 2021).

Rice bran is one of the agricultural wastes utilized by some livestock farmers in Indonesia. Rice bran has great potential as a feed ingredient that is a source of energy for livestock. Rice bran has a protein ranging from 12-13.5%. This rice milling waste can be used as a growth medium with a fine condition which functions as a food source for silkworms. (Nurali, *et al.*, 2020). This is the background to this study, the purpose of this study was to examine the use of fine rice bran as a growth medium, as well as to determine the effect of differences in rice bran concentration on the biomass and growth of silkworms.

## RESEARCH METHODS

This research was conducted in August 2021 in the laboratory of the Fish Seed and Feed Production Technology Study Program, Politeknik Indonesia Venezuela. The tools used in this study were basins, pH meters, DO meters, digital scales, water pumps, pipes, wooden shelves, stationery, and plastic sacks, while the materials used were carp wastewater, silkworms (*Tubifex* sp), fine bran, and tape yeast. This study used a completely randomized design, with different

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treatments of fine bran fermentation extract using tape yeast consisting of four levels with four replications so that 16 experimental units were obtained. The treatments were:
A = Addition of 0 ml fine bran fermentation extract
B = Addition of 100 ml fine bran fermentation extract
C = Addition of 150 ml fine bran fermentation extract
D = Addition of 200 ml fine bran fermentation extract.

**Research Procedure**

**Preparation of Culture Rack, Aerator, and Water Media.**

The preparation of the culture rack is done as a place to put a basin as a container for silkworms, then an aerator is installed to circulate water and enrich oxygen in the culture container. Water from carp waste taken from the cultivation pond of the Indonesian Polytechnic Venezuela is used as a culture medium for silkworms, the amount of water taken is according to the needs of each container that has been determined.

**Fine Bran Fermentation Process**

The method used to increase the nutrient content so that it is easier to digest is fermentation. Fine bran and tape yeast are the materials used in the fermentation process. Fine bran is obtained from a rice mill in Cot Suruy Village, Ingin Jaya District, Aceh Besar Regency, while tape yeast is obtained from Lambaro Market. The manufacture of this fine bran fermentation uses a ratio of tape yeast and fine bran of 1:2. The two ingredients are stirred evenly, and then fermented for 3 days. After the fermentation process, the fine bran is then filtered and the extract is used directly in the culture media.

**Preparation of Test Organisms**

The silkworms used in the study were obtained from a fish shop in the Banda Aceh area. 100 grams of silkworms were placed in each designated container. The placement of the silkworms was carried out in the morning.

**Provision of Fine Bran Extract**

The provision of fine bran extract was carried out every 3 days according to the predetermined treatment levels, namely A (0 ml of fine bran fermentation extract), B = (100 ml of fine bran fermentation extract), C = (150 ml of fine bran fermentation extract), D = (200 ml of fine bran fermentation extract). The administration of fine bran extract was carried out by mixing it into the water medium.

**Research Data Parameters and Analysis**

This study was conducted for 30 days, then the analysis was carried out. The parameters tested in this study were the absolute growth of silkworm biomass (*Tubifex* sp), absolute length measurements, and water quality. The measurement results obtained were analyzed using

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ANOVA (one-way variance test) with a 95% confidence interval, followed by Duncan's further test.

## RESULTS AND DISCUSSION

### Biomass of Silk Worms (*Tubifex* sp)

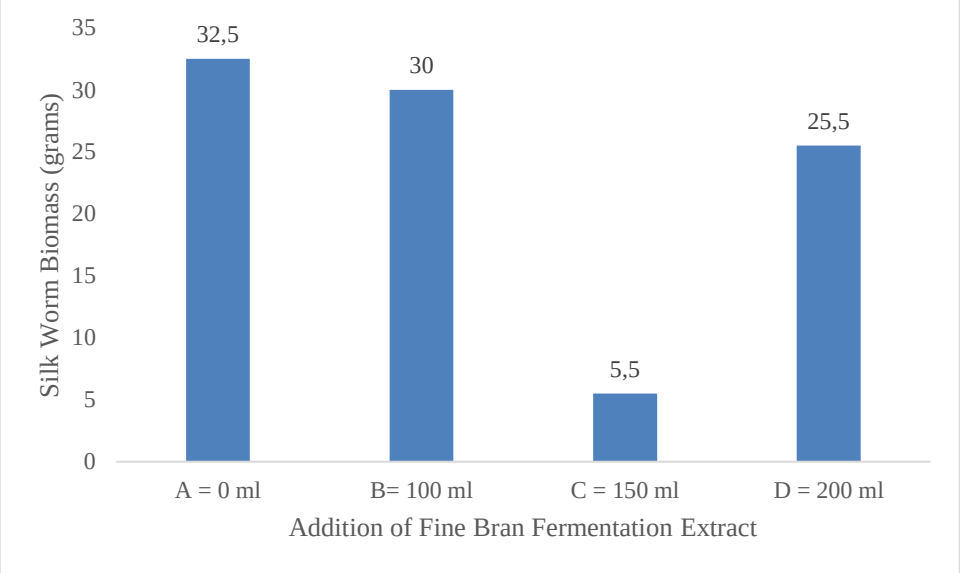


**Figure 1**. Effect of Addition of Fine Bran Fermentation Extract on Silk Worm Biomass

The results of the analysis of variance (ANOVA) showed that the addition of fine bran fermentation extract to the silkworm (*Tubifex* sp) media had a significant effect at a confidence level of 0.05 on the biomass of silkworms. The highest silkworm biomass was obtained in treatment A (0 ml of fine bran fermentation extract) which was 32.5 grams, while the lowest average silkworm biomass was obtained in treatment C (150 ml of fine bran fermentation extract) which was 5.5 grams. Figure 1 above shows the effect of adding fine bran fermentation extract on the biomass of silk worms.

Umidayanti *et al*. (2020), explained that carbohydrates used as a mixture of media or feed for silkworms can come from rice bran. The protein content of 2.41% is found in feed with a composition of 25% fermented bran, the low value is caused by the dry condition of the raw materials. This is not to the results of the study where the extract used was in liquid form. The high crude fiber content in feed will make minerals and proteins difficult to digest because they are bound to phytate compounds. Fermentation in feed can increase nutritional value, because there is a breakdown of complex compounds into simpler compounds so that they are easier to digest (Chilmawati *et al*., 2015).

Setiadi *et al*. (2023), explained that rice bran is a source of carbohydrates that is widely used as a mixture in both media and feed in silkworm cultivation. The nutritional content of rice bran was used with a carbohydrate content of 37.63% crude fiber BETN 30.32%, protein 5.58%, fat 1.96%, ash 17.14%, and water 7.46.

Chilmawati *et al*. (2015), that to increase the nutritional value of silkworm cultivation media can be through the decomposition process of complex compounds, such as fat, carbohydrates, and proteins into simpler molecules by involving microorganisms so that they change the taste, aroma and are easy to digest, so that they are easier to use as food, because silk worms eat organic particles that are broken down by bacteria. Media that contain a lot of nutrients become food intake for silk worms which can accelerate growth, this is because bacteria and organic particles become food for silkworms (Hayati *et al*., 2021).

Alfiansyah *et al*. (2023), explained that increasing biomass and bacterial population requires the role of protein and carbohydrates. As a source of energy, carbohydrates are used by microorganisms for metabolism, so that they will accelerate the growth of bacteria, with high bacterial growth will accelerate the results of decomposition of organic matter. *Tubifex* sp growth requires high protein and carbohydrates as a source of nutrients.

**Absolute Length Growth of Silk Worms**

The results of the analysis of variance (ANOVA) showed that the addition of fermentation extract to the silkworm media (*Tubifex* sp) had a significant effect at a confidence level of 0.05 on the absolute length growth of silkworms, Figure 2 below shows the results of the study of the highest absolute length growth obtained in treatment D (Addition of 200 ml of fine bran fermentation extract) with an average value of 2.5 cm, while the lowest value was in treatment C (Addition of 150 ml of fine bran fermentation extract).

The results of observations on the growth of silkworms during the 30-day maintenance period showed that treatment D had the highest absolute length growth. These results are to the research of Hamron *et al*. (2018), which stated that the low growth of silkworms in treatments A, B, and D was suspected of having excess or insufficient energy content in the formulation so the worms were slow to reproduce. According to Setiadi *et al*. (2023), stated that the protein and energy content must be balanced in feed because a lack or excess of energy can inhibit reproduction and reduce the growth rate of silkworms.

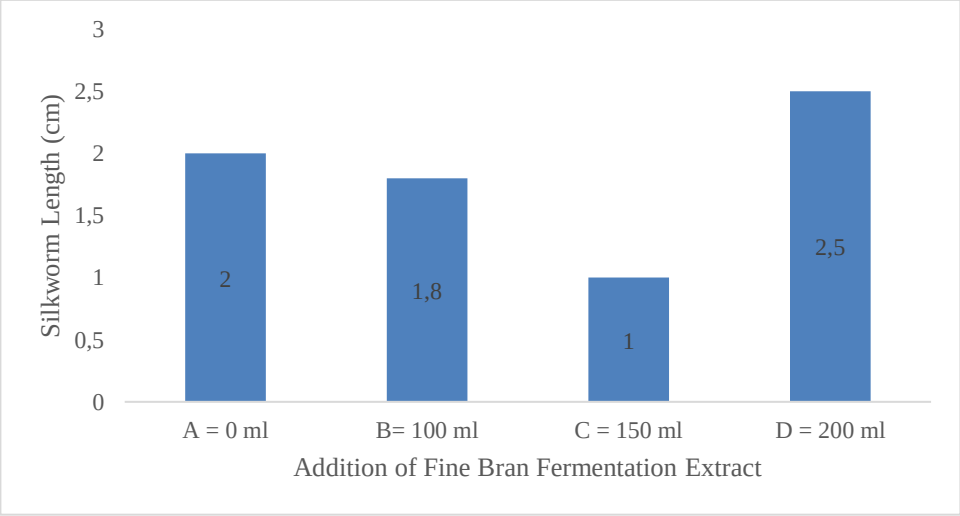


**Figure 2**. Effect of Addition of Fine Bran Fermentation Extract on Absolute Length Growth of Silkworms

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**Water Quality**

The results of observations of the average water quality for 30 days showed that the water quality was still in good condition. Water quality in organism cultivation can be known from several parameters, namely temperature, DO, and pH. Temperature is an important factor in the life process of organisms. Water quality is a limiting factor for the life of living things in water. Important factors related to water quality that need to be considered include water temperature, dissolved oxygen levels (DO), and acidity levels (pH). The results of water quality parameters in this study can be seen in Table 1.

**Table 1** . Water Quality

| No | Water Quality Parameters | Treatment | | | | SNI (01-6141-1999) |
|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | |
| 1 | DO | 6,8 | 6,7 | 0,0 | 6,9 | 2,04 – 3,5 |
| 2 | pH | 9,0 | 8,4 | 10,4 | 9,1 | 7,0 - 9,0 |
| 3 | Temperature | 26,9 | 27,0 | 27,0 | 27,0 | $25^{O}C$- $30^{O}C$ |

The highest DO value of 6.9 was obtained in treatment D (Addition of 200 ml of fine bran fermentation extract) while the lowest DO value was obtained in treatment C (Addition of 150 ml of fine bran fermentation extract), this was due to problems in recirculation in treatment C, while in treatments A, B, and D the recirculation process ran normally so that the water quality remained good. DO water quality measurements ranged from 0.0 - 6.0 ppm. The DO value obtained in this study exceeded the optimal range for the growth of silkworms. The utilization of oxygen by silkworms causes the water temperature in the media to increase, this causes a decrease in the DO value (Devani *et al*., 2024). Based on Raharjo, et.al, 2018 which states that Tubifex can survive at low oxygen content because of its ability to respire. The highest pH value was obtained in treatment C due to the very alkaline water quality of 10.4 due to the problematic water recirculation process. While the pH value in other treatments meets the SNI standard (01-6141-1999) which ranges from 7.0 - 9.0. The temperature in treatments A, B, C, and D ranges from 26.9OC - 27OC, thus meeting the established temperature criteria. During the study, the water temperature was in the range of 26.4-26.7˚C and 26.4-26.6˚C. The temperature range obtained in this study is still optimal for the growth of silkworms where the optimum water temperature for goldfish maintenance ranges from 25.7 – to 29.7˚C (Humeira *et al*., 2024). Based on the results of the study, it can be concluded that the water quality with the addition of fine bran fermentation extract is not suitable for the growth of silkworms

## CONCLUSION

The Effect of Addition of Fine Bran Fermentation Extract has a significant effect on the biomass and absolute length growth of silkworms (*Tubifex* sp). The best biomass of silkworms was obtained in treatment A (without the addition of fine bran fermentation extract), while the best absolute length growth was obtained in treatment D (addition of 200 ml of fine bran fermentation extract).

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