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THE EFFECT OF DIFFERENT FERMENTED FEEDS ON THE GROWTH OF TUBIFEX SP. WORMS BIOMASS

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ABSTRACT

This study aims to determine the type of fermented feed that provides the best biomass growth for silk worms (Tubifex sp.). This study used an experimental method with a completely randomized design (CRD) model using four treatments and three replications. The treatment used was fermented feed from mustard leaves, jackfruit seeds, tilapia fish waste and fish pellets. Tubifex sp. worms maintained for 14 days. Parameters observed included biomass growth and FCR (Feed Conversion Ratio) of *Tubifex* sp. as well as water quality. The data obtained were analyzed descriptively. The results showed that the growth of Tubifex sp. worm biomass. the highest occurred in the fermented fish feed treatment, which was equal to 1.69 g, while the lowest occurred in those fed fermented mustard greens. The lowest FCR value occurred in Tubifex sp. which was given fermented fish feed, which was equal to 1.38 and the highest was in the fermented mustard greens treatment with a value of 1.69. Water quality in Tubifex sp. culture media. is within the normal range, i.e. Fermented feed does not produce quality within the normal range, namely temperature 24.1 – 24.4ºC, DO 2.41 – 2.63 mg/L, pH 6.51 – 7.16 and NH3 levels 0.057- 0.061mg/L. Based on the results of the study it can be concluded that the use of fermented fish pellet feed is the most effective for triggering the growth of *Tubifex* sp. worms more efficiently and has no effect on the water quality of the culture media.

Keywords: Fish feed, fermentation, growth, *Tubifex* sp.

1. INTRODUCTION

Feed is an important factor in fish farming. There are two types of feed that are often used, namely natural feed and artificial feed, natural feed is generally used when hatching fish, while artificial feed is used when growing fish. Fish growth is not only determined by the quantity of feed, but also by the quality of the feed. *Tubifex* sp. worms is a good natural feed given to fish during the hatchery stage, because it has a high nutritional value [1 yanti]. The protein content of *Tubifex* sp. 59%, 9% fat, and 0.01% fiber [2Mohanta and Subramanian, 2002]. In general, *Tubifex* sp. obtained by the community in nature, namely in water channels containing organic matter. However, the availability of *Tubifex* sp worms in nature is limited and their collection requires intensive labor, so *Tubifex* sp. worms. These worms need to be cultivated, besides that *Tubifex* sp worms are not available in nature all year round, especially during the rainy season, because these worms are carried away in nature by heavy currents due to high rainfall [3 Cahyono et al., 2015]. Natural food for Tubifex sp. in nature has relatively little availability compared to the development of aquaculture. Meanwhile, the demand for silk worms in the market is very high and supplies originating from nature and traditional sellers have not been able to meet market demand. The problem of limitation of Tubifex sp worms. in nature as natural food, can be overcome by cultivating [4 Yanti et al]. According to Efendi (2013) [5] natural feed type *Tubifex* sp. can be cultured in large quantities in a relatively short time. In nature, Tubifex sp. consume sediments and obtain nutrients by selectively digesting the bacteria present in them and absorbing molecules through the body wall [6 Rodriguez et al. 2001].

In *Tubifex* sp worm culture fertilizer is usually used as a source of nutrition which aims to meet the food needs of the worms, so as to increase the biomass growth of the silk worms. Various fertilizers that can be used for the cultivation of silkworms, namely, using cow manure [7 Findy 2011], chicken manure [8 Fadilah and Febriyanti 2004]. This study used liquid organic fertilizer as additional fertilizer to see the effect on silkworm population and biomass. Other fertilizers that can be used are liquid organic fertilizers derived from the fermentation of organic materials derived from plant residues, animal and human feces with more than one nutrient content. The advantages of this liquid organic fertilizer are that it is able to overcome nutrient deficiencies quickly and has no problems in nutrient leaching and is also able to provide nutrients quickly [9 Hadisuwito et al. 2012]. Therefore the aim of this study was to determine the most effective type of fermented natural fertilizer to stimulate the growth of Tubifex sp. biomass. The natural ingredients used are mustard leaves, jackfruit seeds, tilapia fish waste and fish pellet feed.

2. MATERIALS AND METHODS

The equipment used in this study included 12 transparent plastic cups with a volume of 250 mL, 12 aeration pipe regulators, 1 unit analytical scale, 2 wooden planks, 16 aeration regulators, 2 m water pipe, 60 grams of Tubifex sp., sludge, some fermented materials, namely mustard leaves, jackfruit seeds, tilapia fish waste and fish pellets.

This study used an experimental method of Completely Randomized Design consisting of four treatments and three replications. This research was conducted for 14 days. The treatment to be tested is the provision of fermented feed on *Tubifex* sp.

S : Mustard leaves
BN : Jackfruit seeds

N : Tilapia fish waste
Ktr : Fish pellets.

Preparation for Maintenance of *Tubifex* sp.

A container in the form of a transparent plastic cup with a volume of 250 ml was prepared as a place for raising silkworms for 14 days. This container at the final stage of maintenance will be equipped with an inlet and outlet. The inlet is in the form of a stream of water whose flow volume is regulated by an aeration regulator, the water that flows then enters through a hole that has been adjusted so that only water can enter. The outlet is a hole with a diameter of 0.5 cm located 1 cm below the lip of the glass. The plastic cup is placed on a wooden board which has been perforated according to the size of the plastic cup.

Mud Preparation

The mud used as a substrate medium for the maintenance of *Tubifex* sp. worms is in the form of fine mud originating from the bottom of the catfish rearing pond. The sludge is collected in a bucket which is then sterilized by heating it in the sun for 1 day. Then the sludge is put in each plastic container as high as ¾ of the volume of the container, and is ready to be used for the maintenance of *Tubifex* sp. worms.

Preparation of Fermented Feed

The process of making fermented feed begins with peeling, chopping/mashing each ingredient, namely mustard leaves, jackfruit seeds, tilapia fish waste, and fish pellets until smooth, as much as 100 g each. Each material that has been chopped, then mixed with a probiotic solution consisting of 10 ml of EM4, 20 ml of molasses and 30 ml of water. Then put it in a plastic jar and close it tightly, and store it in a shady place not exposed to direct sunlight for fermentation. On the 8th day after storage the fermented material is ready to be used as a feed ingredient to be given to *Tubifex* sp. However, previously the fermented feed ingredients were observed for nutritional content.

Tubifex sp. Preparation

The *Tubifex* sp. seeds used are between 1.5 and 3.2 cm/individual. The *Tubifex* sp seeds were then put in each plastic glass container which had mud with a weight of 5 g per container.

Treatment of Tubifex sp. Worms with Fermented Feed

Before being treated with fermented feed, plastic cups containing *Tubifex* sp. mud and worms placed randomly and equipped with water installations for inlet and outlet as well as aeration. The plastic cups are assembled and placed under full sun with an average irradiation power of between 500 and 1000 lux. Then *Tubifex* sp. worms are ready to be treated with fermented feed as much as 30% of the body weight of Tubifex sp worms. for each treatment container. Treatment feed was given once every 3 days during the 14-day maintenance period.

Parameters observed

1. The nutritional content of each fermented material. The observed nutrient content included nitrogen, protein, fat, fiber, water and ash content.
2. Biomass Growth. Data on growth of Tubifex sp. worm biomass. taken at the end of maintenance, namely on the 14th day. Tubifex sp. worms after being harvested, then weighed. The data from the weighing results is then entered into the formula from Effendi (1997) [10], namely:

$$W = Wt - Wo$$

Information :
W : Absolute growth (g)
Wo : Biomass at the beginning of the observation (g)

Wt : Biomass at the end of the observation (g)

3. Feed Conversion Rate (FCR)

Feed conversion rate, observed with the aim of knowing the efficiency of the feed given, is calculated using the formula :

$$FCR = \frac{F}{(Wt + D) - W0}$$

Information :
FCR : Feed Conversion Rate.
W0 : Biomass weight of silkworms at the start of the observation.
Wt : Weight of silkworm biomass at the end of the observation.
D : The number of dead silkworms
F : Amount of feed consumed

4. Water Quality
5.

Water quality parameters measured include; dissolved oxygen (DO), temperature, ammonia (NH_3) and pH measured on day 1 and 14.

6. Data analysis

The data obtained, namely the nutritional content of feed ingredients, weight growth, Feed Conversion Rate (FCR) of Tubifex sp. and water quality were analyzed descriptively.

RESULTS AND DISCUSSION

Nutritional Content of Fermented Feed Materials

Based on the results of the proximate test, each fermented feed ingredient contains different nutrients. The observed nutrient content included different nitrogen, protein, fat, fiber, ash and water (Table 1).

Table 1. Nutritional Content of Fermented Feed Materials

No.	Feed Ingredients	Nutritional Content					
		Nitrogen	Protein (%)	Fat (%)	Fiber (%)	Water (%)	Ash (%)
1	Mustard Greens (Sw)	42.90	27.09	3.28	4.24	19.22	7.51
2	Jackfruit seeds (Bn)	48.09	22.96	3.86	3.83	17.39	7.7
3	Tilapia waste (In)	35.9	32.88	4.65	3.69	17.54	9.03
4	Fish pellets	52.38	25.89	3.12	3.77	11.99	6.62

In Table 1 it can be seen that feed from fermented tilapia waste has the highest protein, fat and ash content compared to other feeds, respectively 32.88%, 4.65% and 9.03%. Feed ingredients from fermented mustard leaves had the highest fiber and water content compared to other treatments, respectively 4.24% and 19.22%. The highest nitrogen content was found in feed ingredients from fermented fish pellets, namely 52.38%. Although sourced from plants, mustard leaves and jackfruit seeds have a relatively high protein content, namely 27.09 and 22.96%, respectively. This shows that fermentation has a good effect on increasing the nutrition of a material. As according to Suprihatin (2004) [11] fermentation can cause an increase in the nutritional value of feed due to the loss of toxic substances contained in an ingredient and the conversion of starch into protein. The effects of fermentation can also cause high-fiber ingredients to become simple compound feed ingredients that are easy to absorb and digest [12 Kompiang et al (1997).

Biomass Growth of Tubifex sp. Worms

Based on the results of observing the growth of Tubifex sp. worm biomass. for 14 days resulted in different growth for each treatment (Fig. 1).

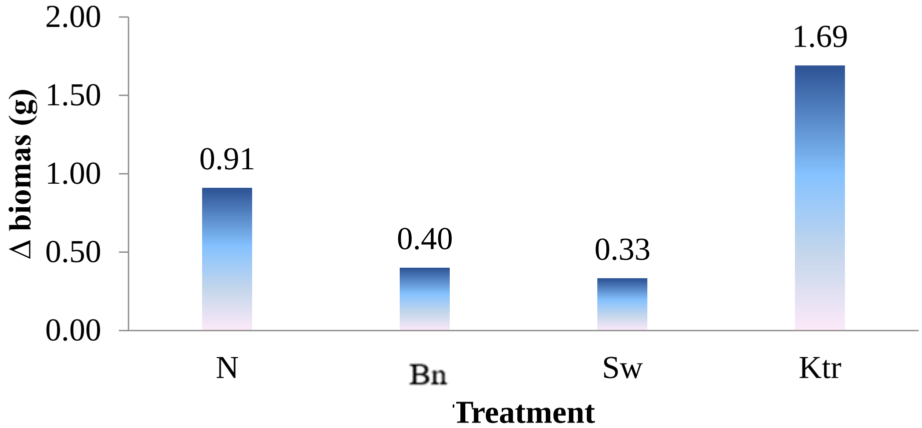

Figure 1. Biomass of each silk worm reared in a container fed with fermented feed from different material. (Remarks: N = tilapia, Bn = jackfruit seeds, Sw = mustard and Ktr = fish pellets)

Figure 1 shows *Tubifex* sp. worms. fed feed sourced from tilapia waste (N) and fermented fish pellets (ktr) resulted in high biomass growth compared to other treatments. However, the highest silk worm biomass growth occurred in the treatment given fermented fish pellets (ktr), which was 1.69 g and the lowest in Tubifex sp. worms. which was given fermented mustard leaves (W), namely 0.33 g. The high growth of *Tubifex* SP. biomass fed on feed sourced from fermented fish pellets, is presumably because the protein content is sufficient to meet the needs of the worm's growth, besides that the feed has a softer texture, so it is easy to digest, converts well into protein. For aquatic biota and other living things, protein is a source of essential amino acids needed to support growth [13 Marzuqi (2007). Although the protein content of fermented tilapia feed (N) is higher, it has not given maximum effect on the growth of *Tubifex* sp. biomass, it is suspected that the high protein content of *Tubifex* sp. requires more energy for the process of digestion and absorption, so that the energy needed for growth is slightly reduced. In addition, the type of nutrient content in organic fertilizer will affect the increase as a food source so that it can meet the needs of silk worms to live. Types of organic feed will also affect the number of bacteria and filamentous algae as worm feed in rearing media [14 Fadhlullah].

Feed Conversion Rate (FCR)

Based on the results of observing the growth of Tubifex sp. worm biomass. for 14 days resulted in different FCR values for each treatment, even though the amount of feed given was the same (Figure 2).

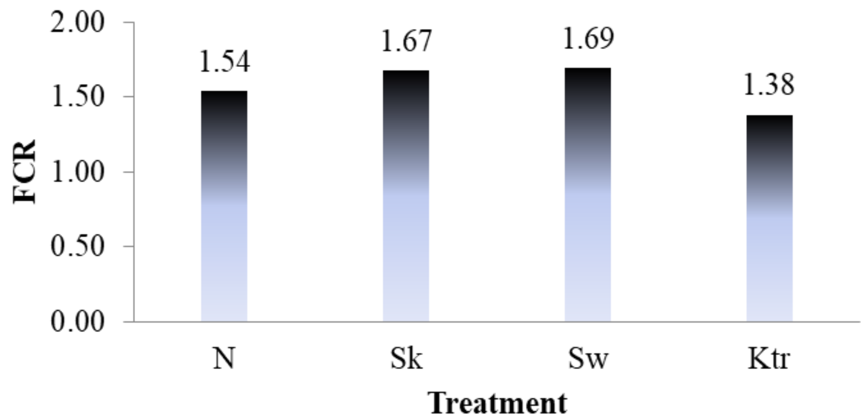

Figure 2 . Tubifex Worm FCR Value in Each Treatment. (Remarks: N = tilapia, Sk = jackfruit seeds, Sw = Mustard greens and Ktr = fish pellets)

Figure 2 shows the FCR value of *Tubifex* sp. showed different values even though the amount of feed given was the same. This shows that the nutritional value of the feed affects the level of the FCR value. The lowest FCR value (1.38) occurred in the ktr treatment, which was fed with fermented fish pellets. This shows that the feed given can be digested efficiently to produce growth. As the results of the growth of *Tubifex* sp. biomass. in this treatment was higher than the other treatments. The lowest FCR value occurred in the N treatment, namely Tubifex sp. fed with fermented tilapia waste, this indicates that the feed given is less efficient if given to Tubifex sp. According to Hasan and Soto (2017) [15] the FCR value for aquatic organisms is strongly influenced by the type of commodity, strain, size and health.

From the description above, it shows that a high protein content of a material cannot reduce the FCR value. This shows that the nutritional content of a material including protein can be digested by an organism at a certain level. As according to Craig (2009) [16] the FCR value can be reduced by increasing the dose of amino acids (protein) in the feed needed for the growth of the organism to a certain extent. The appropriate amount and content of amino acids tends to be more efficient in the feed consumed and converted into meat. In addition to nutritional factors, there are several environmental factors that affect the FCR value, including temperature, dissolved oxygen, ammonia, pH and pollutants. If these environmental factors are appropriate and optimal for the life of an organism, it will support a low FCR value [17USAID, 2011].

Water Quality

Water quality data measured at the start before sowing and just before harvest are shown in (Table 2). `

Table 2. Water Quality Data on *Tubifex* sp.

No.		Water Quality Measurement Results	Normal Range

	Parameter	Beginning of culture	End of culture	
1	Suhu (ºC)	24,1	24,4	24 - 32
2	DO (ppm)	2,41	2,63	0,94 – 5,84
3	pH	6,51	7,16	5,44 – 7,48
4	NH_3 (ppm)	0,057	0,061	0 – 0,26

Table 2 shows the water quality during maintenance and before harvesting Tubifex sp. are in good condition. The temperature during the study period was still within the appropriate range for the survival of Tubifex sp. i.e. 24.1-24.4°C. According to Hadiroseyani et al. (2007) [18] the range of water temperatures suitable for silkworm culture ranged from 24 ± 32°C. DO concentrations during the study showed a suitable range for the life of silk worms, namely 2.41-2.63 ppm. in accordance with the statement of Efendi (2013)[5] that the range of DO feasibility for *Tubifex* sp. can live and reproduce is 2.5 - 7 ppm. The range of pH values during the study was 6.51-7.16. The range of pH values was good for the cultivation of Tubifex sp. This is in accordance with the opinion of Efendi (2013) [5] that the optimal pH range for *Tubifex* sp. culture is 5.5 ± 8.0.

CONCLUSION

Based on the results of the study it can be concluded that the use of fermented fish feed is the most effective for triggering the growth of *Tubifex* sp. worms more efficiently and has no effect on the water quality of the culture media.

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