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Effect of Bioslurry Concentration in Feed on The Growth and Survival of Milkfish (*Chanos chanos* Forsskal)

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Abstract

Bioslurry is cow excreta waste processed anaerobically as a nutritional by-product of biogas production, which contains proteins, carbohydrates, fats and minerals. This study aims to determine the concentration of solid bioslurry in feed and the concentration of liquid bioslurry in feed containing solid bioslurry, which is optimal for increasing the growth and survival of milkfish. The results showed that the best feed with a concentration of 50% solid bioslurry resulted in a growth of 100.05 grams ± 6.98 and a survival rate of 96.67% ± 1.15. A significant growth increase in feed with a high bioslurry content indicates that bioslurry contains nutrients capable of increasing growth energy in milkfish. The growth of milkfish continues to increase along with the increasing concentration of bioslurry liquid waste added to the feed as a source of probiotics. Adding 50 ml of liquid bioslurry into 100 grams of feed resulted in the best growth of 165.33 grams ± 2.08. Liquid bioslurry contains probiotic microbial bioactivators and functions to increase growth.

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Bioslurry,
probiotic,
feed,
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solid

Introduction

One of the primary commodities of pond cultivation in Pangkep Regency is milkfish. Milkfish have a high protein content (FAO, 2020). Many milkfish farming activities are supported by the area's potential to have ponds reaching 13,000 hectares by 2020 (statistik.kkp.go.id, 2020). Currently, the pond cultivation system has developed from a traditional system that utilizes natural feed to an intensive that relies on artificial feed (Nasution & Yanti, 2015) and the use of a waterwheel. Feed is an essential component in the cultivation process because the availability of feed will affect the growth and survival of fish (Zaenab & Massiseng, 2021). The feed consumed by fish must contain nutrients easily digested and absorbed by fish (Masriah, 2020., Nasser et al., 2022).

Commercial feed in the market is costly because of the high price of raw materials. The more complete the feed composition, the higher the feed cost because raw material prices also increase. Therefore fish cultivators look for alternative raw materials that can be used as a quality feed that is easily available and of good quality. Good feed contains complete

nutrition, especially protein (Hussain et al., 2021) and carbohydrates which can support the growth and survival of fish.

Bioslurry is an alternative that can be used as raw material for making feed. Bioslurry is cow excreta waste processed anaerobically as a by-product of biogas production (Islam et al., 2020). Currently, many biogas reactors produce bioslurry waste as solids and liquids. The cow excreta in the reactor produces nearly the same amount of bioslurry (Farihah, 2020). The results of converting cow dung into biogas with a fermentation process in the reactor will produce methane gas (CH_4) (Seran et al., 2020) and bioslurry. Bioslurry contains nutrients in the form of protein, carbohydrates, fatty, calcium (Ca) and phosphorus (P) (Romadhon et al., 2013; Seran et al., 2020).

Using bioslurry as a raw material for making fish feed can reduce feed costs because it is easy to obtain at a low price and has a complete nutritional content. This study aims to determine the concentration of solid bioslurry in feed and the concentration of liquid bioslurry in feed containing solid bioslurry that is optimal for increasing the growth and survival of milkfish.

Materials and Methods

Research design

This research was divided into two research stages, namely (1) the percentage of solid bioslurry waste in feed and (2) the percentage of liquid bioslurry waste in feed containing solid bioslurry waste. The two stages of this study were designed using a Completely Randomized Design (CRD). The study's first phase consisted of 4 treatments and 3 replications (12 experimental). The treatment tested was the concentration of solid bioslurry in the feed and used commercial feed as a control (K). The concentration of bioslurry in processed feed is presented in Table 1.

Table 1. The concentration of bioslurry and raw material composition in processed feed

Raw material	Feed A (20%)	Feed B (35%)	Feed C (50%)
Solid bioslurry (%)	20	35	50
Dregs of tofu (%)	10	10	10
Fish flour (%)	5	5	5
Fine bran (%)	45	30	15
Seaweed waste (%)	10	10	10
Fat (%)	10	10	10
Total (%)	**100**	**100**	**100**

The layout of the experimental container used in this first stage of research:

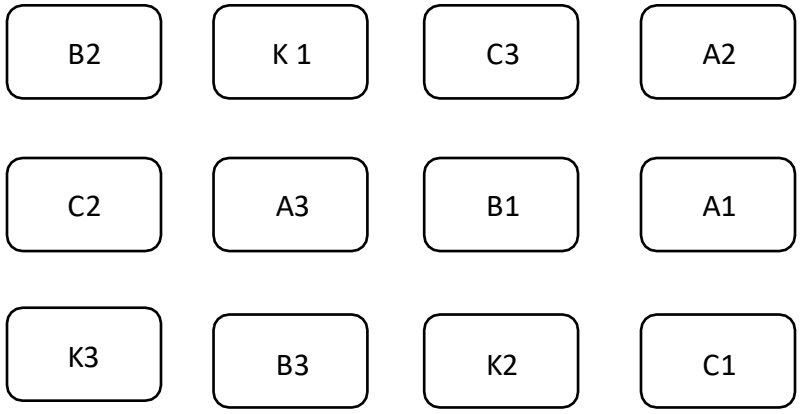

Figure 1. The layout of the experimental set-up during the first phase of the study

The second research stage is adding bioslurry liquid as a source of probiotics to the best feed obtained in the first research stage. The mixing process is carried out by spraying the feed as pellets.

The research design used in this phase 2 study was randomized entirely, consisting of 5 treatments and 3 replications (15 experimental). The treatments tested in this phase 2 study were as follows, and the layout of the experimental container in Figure 2:

A : Control (without liquid bioslurry probiotics)
B : 30 ml of bioslurry probiotic liquid / 100 g of feed
C : 40 ml of bioslurry probiotic liquid / 100 g of feed
D : 50 ml of bioslurry probiotic liquid / 100 g of feed
E : 60 ml of bioslurry probiotic liquid / 100 g of feed

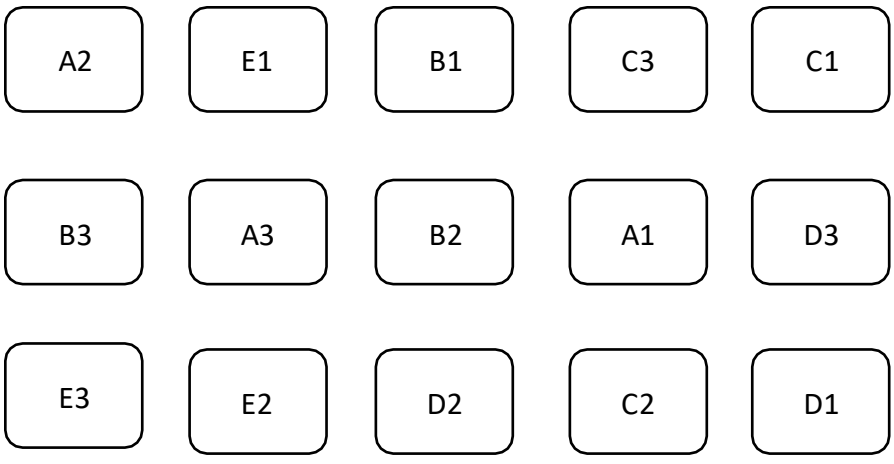

Figure 2. The layout of the experimental containers in the second phase of the research

Parameters observed

In the first and second phase of the research, the parameters observed were as follows:

a. Absolute Weight Growth Rate

Absolute weight growth (W) is calculated using the formula Arifin and Rupawan (1997):

$$W = W_t - W_0$$

Information:

W : growth weight (g)
W_0 : initial weight (g)
W_t : final weight (g)

b. Survival Rate

Survival rate is the percentage of the number of live fish and the number of fish stocked during maintenance, calculated by Effendi's formula (2002):

$$SR = \frac{Nt}{N0} \text{ x } 100$$

Information:

SR : seed survival (%)
N_t : The number of fish stocked at the end of the study (fish)
N_0 : Number of fish stocked at the start of the study (fish)

Data Analysis

This study's growth and survival rate data were analyzed for variance (ANOVA) using the SPSS application. If the data show significant differences between treatments (sig <0.05), proceed with the W-Tuckkey test.

Results and Discussions

Growth and survival of milkfish fed with various concentrations of solid bioslurry

The growth and survival of milkfish fed bioslurry solid waste with various concentrations are presented in Table 1.

Table 1. The effect of the concentration of solid bioslurry in feed on the growth and survival of milkfish

Treatments	Parameter ± std	
	Growth rate (g)	Survival rate (%)
Control (commercial feed)	33,42 ± 6.67 ^{a}	65,33 ± 6,11 ^{a}
20% Bioslurry	47,57 ± 7.69 ^{a}	68,00 ± 2,00 ^{a}
35% Bioslurry	64,94 ± 4.01 ^{b}	86,67 ± 4,16 ^{b}
50% Bioslurry	100,05 ± 6.98 ^{c}	96,67 ± 1,15 ^{c}

Note: *different superscripts in the same column indicate significant differences between treatments (sig. <0.05) at the 95% confidence level.*

Based on the results of the analysis of variance (ANOVA), the effect of the concentration of solid bioslurry in the feed had a significant (sig<0.05) effect on the growth and survival of milkfish with a 95% confidence level. The development and survival of milkfish increase with the increase in bioslurry solid waste in the feed. The best growth and survival rates were seen in the feed treatment with a 50% solid bioslurry waste concentration compared to the control treatment, which was 20% and 35% solid bioslurry. More specifically, the relationship between the concentration of bioslurry solid in feed and increased growth and survival of milkfish is presented in Figure 3.

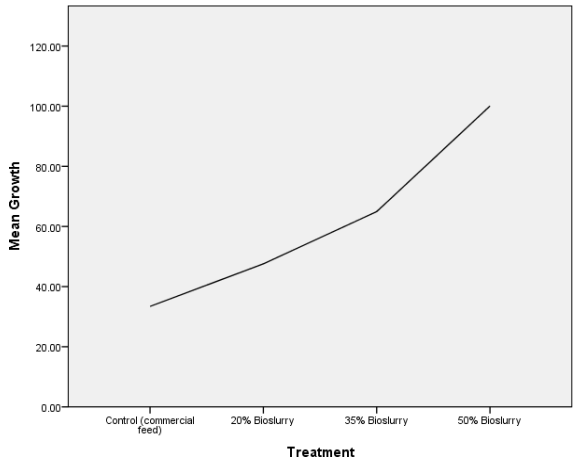

Figure 3a. Graph of the relationship between the concentration of bioslurry in the feed and the growth of milkfish

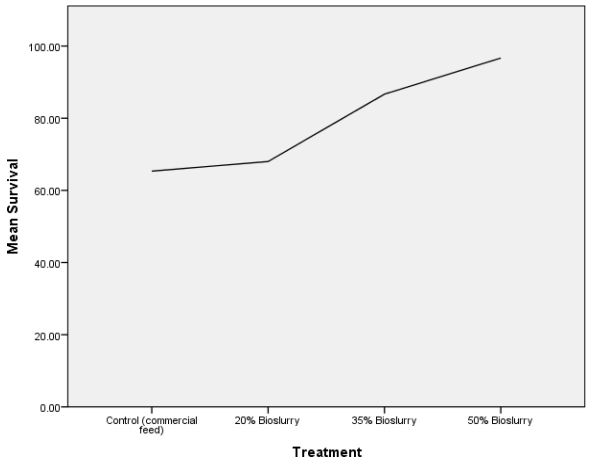

Figure 3b. Graph of the relationship between the concentration of bioslurry in feed and the survival of milkfish

There was an increase in the growth and survival of milkfish in line with the rise in the concentration of solid bioslurry because it contains nutrients that can increase growth energy in milkfish as the organism that consumes it. As (Zulaehah and Supraptom 2018) mention, several benefits of bioslurry, including complete and quality nutrition and can be used as an excellent mixed feed ingredient for fish and eel. Furthermore (Singgih and Yusmiati 2018) explained that solid bioslurry derived from biogas digesters has excellent potential to be used as raw material for fish feed because it contains nutrients in the form of amino acids, fatty acids, humic acids, vitamin B12, auxin hormone, cytokinins, antibiotics, and micronutrients such as iron (Fe), copper (Cu), zinc (Zn), manganese (Mn), and molybdenum (Mo) which play an essential role in the growth and survival of fish. In addition (Alfarizi, Repika, and Furqan 2022) also reported that fish feed containing 40% bioslurry had a suitable nutritional composition for the growth of tilapia (*Oreochromis* sp.), which contained 29.106% protein and 3.131% fibre. In addition (Rustidja 2003) also explained that fish feed which is formulated with a mixture of sludge (solid bioslurry waste) and other feed raw materials such as fish meal and soy flour does not reduce the quality of feed quality, in fact, the quality is the same as factory feed.

Growth and survival of milkfish fed with 50% solid bioslurry and various concentrations of liquid bioslurry

Table 2. The Effect of Concentration of Liquid Bioslurry as a Source of Probiotics in Feed on the Growth and Survival of Milkfish

Treatments	Parameter ± std	
	Growth rate (g)	Survival rate (%)
Control (without probiotics)	102,06 ± 5,56 ^{a}	95,33 ± 1,15 ^{a}
30 ml/ 100 g feed	118,86 ± 9,01 ^{b}	97,33 ± 1,15 ^{a}
40 ml/ 100 g feed	146,67 ± 4,99 ^{c}	95,33 ± 1,15 ^{a}
50 ml/ 100 g feed	165,33 ± 2,08 ^{d}	96,00 ± 2,00 ^{a}
60 ml/ 100 g feed	134,65 ± 4,15 ^{c}	95,33 ± 1,15 ^{a}

Note: *different superscripts in the same column indicate significant differences between treatments (sig. <0.05) at the 95% confidence level.*

Based on the analysis of variance (ANOVA), the effect of the concentration of liquid bioslurry as a source of probiotics on feed containing 50% solid bioslurry waste had a significant (sig<0.05) effect on growth and had no significant impact (sig.> 0.05) on survival milkfish at the 95% confidence level. The growth of milkfish continues to increase along with the increasing concentration of liquid bioslurry waste as a source of probiotics in the feed up to a certain concentration (50 ml/100 gram of dinner). However, if the concentration of liquid bioslurry waste is increased, the growth of milkfish will decrease. So the best growth of milkfish was seen in the treatment of 50 ml of liquid bioslurry waste per 100 g of feed compared to the treatment without liquid bioslurry waste or treatment with a higher concentration (60 ml/100-gram feed). In more detail, a graph of the relationship between the concentration of bioslurry wastewater as a source of probiotics in feed and the growth of milkfish is presented in Figure 4.

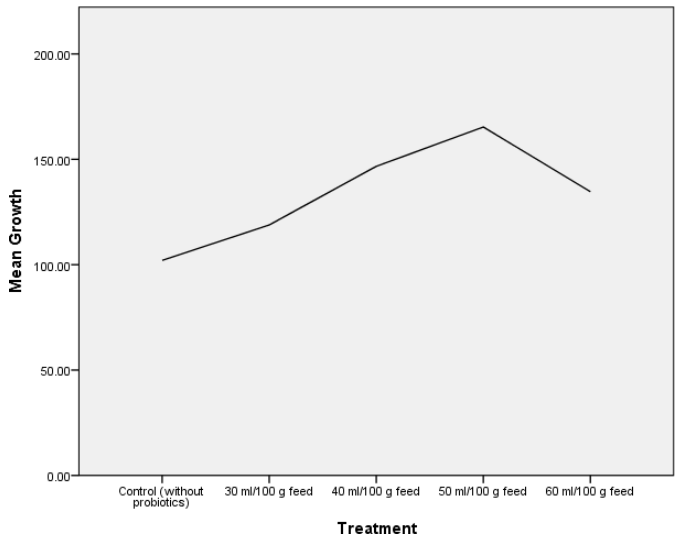

Figure 4. Graph of the relationship between the concentration of liquid bioslurry in the feed and the growth of milkfish

The increase in the growth rate of milkfish fed with liquid bioslurry waste indicates that the feed consumed can be digested and absorbed correctly due to microorganisms in the liquid bioslurry waste. It can assist digestion, which increases growth, such as (Zulaehah and Supraptom 2018) states that liquid bioslurry contains probiotic microbial bioactivators and growth regulators (hormones). In addition, (Rustidja 2003) explained that bioslurry contains coenzyme B12, an important substance that can help the growth process in fish. Furthermore, (Farihah 2020) reported that liquid bioslurry contains amino acids, micronutrients (Fe, Mn, Cu, Zn, Co, and Mo), B vitamins, various hydrolase enzymes, organic acids, plant hormones (growth), antibiotics and humic acid.

Conclusion

Based on the study's results, it can be concluded that the concentration of solid bioslurry waste in the feed that can optimize the growth and survival of milkfish is 50%. In comparison, the concentration of liquid bioslurry waste in feed containing 50% solid bioslurry can optimize milkfish. The growth rate is 50 ml/100 grams of feed.

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