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Original Article

Effect of Using Cow Dung as Organic Fish Pellets

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ABSTRACT

Freshwater cultivation is an economic endeavor for welfare purposes and is currently facing problems. This problem occurs because pellets are not economical and cause environmental pollution. The purpose of this article is to analyze the effect of using cow dung as fish pellets on Abiotic, Biotic, and Cultural (Human Habits). This research is a Quantitative Experimental Research using a Completely Randomized Design (CRD) of 4 treatments with 6 replications, treatment in the form of feeding 3 g/day (Treatment 2) 6 g/day (Treatment 3) 9 g/day (Treatment 4) and Control (Treatment 1) uses chemical pellets 9 g/day. This design is used to see the effect of organic fish pellets on fish growth (biotic) such as fish weight and length. The hypothesis of this research is H1: There is an influence, H0: There is no influence. Hypothesis H1 is accepted if F count > F table. Then a measuring instrument is used to measure environmental parameters such as temperature, DO, pH, and Ammonia. The results of this research reveal: there is an influence of fish pellets on fish growth (Biotic), the use of cow dung pellets is still safe in the aquatic environment (Abiotic), cow dung pellets provide socio-economic value such as increasing income and creating new productive habits by making it a job. This research concludes that the use of cow dung pellets reduces environmental pollution, is economical, and is beneficial for humans. It is recommended that this research be further deepened and linked to other sciences.

Keywords: *Freshwater, Cow Dung, Pellets, Environmental Health.*

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INTRODUCTION

Freshwater cultivation is a productive economic endeavor for welfare purposes[1]. Freshwater cultivation in Indonesia is currently facing various problems. Problems such as chemical fish feed have been identified as fundamental to aquaculture in Indonesia[2]. Chemical fish feed is uneconomical and causes environmental pollution.

Environmental pollution is caused by excessive pellet residue which turns into toxic compounds for the environment such as Ammonia (NH_3) [3]. Ammonia is a compound formed from the decomposition of organic nitrogen. Sources of organic nitrogen in freshwater aquaculture systems are mainly formed from food waste and fish waste products [4].

Freshwater cultivation is threatened with stopping because of this, the solution to overcome this problem is the need to make efforts to cultivate freshwater waters that have sustainable principles and are environmentally friendly[5]. Making organic pellets from cow dung is a solution to reduce the use of expensive chemical or inorganic pellets on the market and reduce environmental pollution. Thus increasing fish production. Increasing production of these fish can also increase income[6].

The purpose of this article is to convey the influence of using cow dung as fish pellets and its influence on Abiotic, Biotic, and Culture (Human Habits) in the environment.

METHOD

This research is a Quantitative Experimental Research (looking at the effect of a treatment using a statistical approach) with a research design using Completely Randomized Design (RAL), 4 treatments with 6 replications, using 4 treatments with 6 replications based on the formula (t-1) (r- 1) > 15, t: treatment, r: replication. Treatment consisted of feeding 3 g/day (Treatment 2), 6 g/day (Treatment 3), 9 g/day (Treatment 4) and control (Treatment 1) using chemical pellets 9 g/day. This design is used to see the effect of organic fish pellets on fish growth (biotic) such as fish weight and length. The hypothesis of this research is H1: There is an influence, H0: There is no influence. Hypothesis H1 is accepted if F count > F table. Then measuring instruments are used such as a thermometer to measure temperature, a DO meter to measure oxygen in water (DO), a pH meter to measure pH and an Ammonia laboratory test to determine the ammonia value. The results of these measurements were to see the effect of organic fish pellets on the aquatic environment (Abiotic), as a control for water quality, cultivation water was used without processing and to see the effect of using cow dung on habits, the author conducted a literature review.

RESULTS

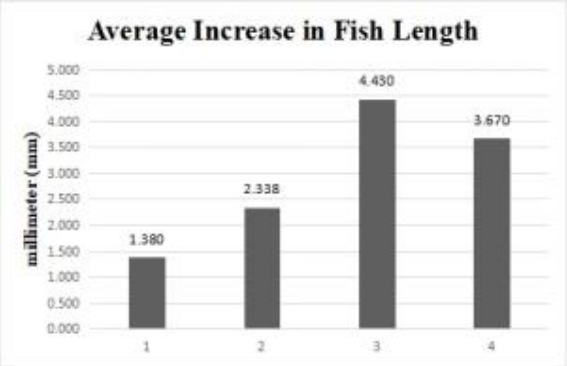

Figure 1. Increase in Fish Length

Table 1. Fish Length ANOVA

Sources of Variantion	db	JK	Average Squared	F Statistik	F table
Treatment	3	33.29	11.097	5.128	2.87
Error	20	43.28	2.164		
Total	23	76.57			

***Information** : F Calculation > F Table = H0 is rejected, H1 is accepted, Organic cow dung pellets increase fish body length*

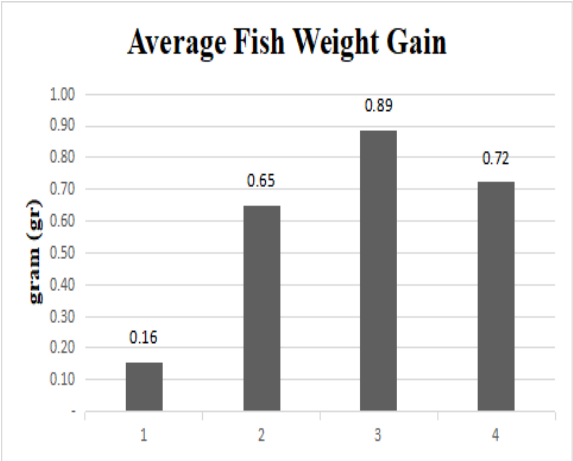

Figure 2. Fish weight gain

Table 2. Fish Weight ANOVA

Sources of Variantion	db	JK	Average Squared	F Statistik	F table
Treatment	3	1.78	0.593	3.148	2.87
Error	20	3.77	0.189		
Total	23	5.55			

***Information** : F Calculation > F Table = H0 is rejected, H1 is accepted, Organic cow dung pellets increase fish weight*

Table 3. Data from measurements of research environmental parameters

Parameters	Control	T1	T2	T3	T4	Quality standards C 2	C 3	Note
Temperature (ºC)	28.3	28.2	28.4	28.4	28.3	D3	D3	The differer e with the air tempera ure above the wat surface
DO (ppm)	3.85	3.8	5.1	3.3	3.0	4	3	
pH (0-14)	7	7	7	7	7	69	69	
Ammonia (mg/l)	0	0.231	0.393	0.132	0.413	0,2	0,5	

Note: T: Treatment, C: Class, D: Deviation

The table above reveals that the quality of environmental parameters obtained from environmentally friendly fish farming methods implemented during the research period. The quality of environmental parameters is classified as safe (not exceeding the established quality standards.

Table 4. Details of costs for making organic cow dung pellets

No	Material	Cost	Amount
1.	Bran Flour	Rp.10.000,00/ kg @1	Rp. 10.000,00
2.	Tapioca flour	Rp.14.000,00/kg@0,5	Rp. 7.000,00
4.	Cow dung	Rp.2.000,00/ kg @5	Rp. 10.000,00
5.	Coconut water	Rp.1000,00/ l@2	Rp. 2.000,00
6.	Black Plastic	Rp.2.000/ pcs@ 5	Rp. 10.000
Total cost			Rp. 39.000,00

Table 4 show that 1 kg of bran flour, 0.5 kg of tapioca flour are used to make 5 kg of cow dung pellets, so for 1 kg of cow pellets, the researcher spent Rp. 39,000.00/ 5 = Rp. 7,800.00.

Table 5. Comparison of prices for organic cow dung pellets and inorganic pellets

Pellet Type	Pellet Price
Organik	Rp. 7.800,00/ kg
Anorganik	Rp. 10.000,00/kg

Based on the research results obtained, organic pellets whose raw material comes from cow dung are more economical than the control (inorganic) pellets used in the research. Organic pellets from cow dung cost Rp. 7,800.00/kg, this is cheaper than the inorganic pellets used as a control in this study, these inorganic pellets are worth Rp. 10,000.00/kg.

DISCUSSION

1. The effect of cow dung fish pellets on fish growth (Biotics)

The results of analysis of data on increasing fish body length from this study revealed that F Calculated > F Table, which means that the initial hypothesis which said "There is an influence of using cow dung pellets on fish length" was accepted (H0 was rejected). Treatment 3 is the treatment that produces the highest fish body length, while the control using inorganic pellets produces the lowest fish body length.

The results of the analysis of data on fish body weight gain from this study revealed that F Calculated > F Table, which means that the initial hypothesis which said "There is an influence of the use of cow dung pellets on fish weight" was accepted (H0 was rejected). Treatment 3 or administration of fish waste pellets at a dose of 6 grams/day was the best result in this study, resulting in an average increase in fish weight of 0.89 grams during the study period. Meanwhile, when compared with the control treatment, the control treatment produced 0.16 grams and this was the lowest average of the 4 treatments applied.

Based on the results of this data analysis, it can be discussed that organic pellets derived from cow dung can be used as an environmentally friendly alternative feed for cultivating freshwater fish. Organic feed from cow dung waste has an effect on body weight and weight gain in fish [7]. Using cow dung increases body weight in fish [8]. Cow dung in fish farming has a positive impact on fish survival, including increasing body weight in fish[9]. Cow manure generally consists of 18.6% hemicellulose; cellulose 25.2%; lignin 20.2%; protein 14.9%; and dust 13%. Cow dung has high levels of organic matter, including N-Total (Amount of N in cow dung)[10].

Considering that cow dung has high organic material such as N-Total and also high protein, cow dung can be used as alternative fish feed (fish pellets). Fish growth is closely related to the availability of protein in feed, because protein is a source of energy for fish and protein is a nutrient that fish really need for growth [11].

2. The effect of cow dung fish pellets on the water environment (Abiotic)

The environmental parameters obtained from the influence of the use of freshwater fish cultivation methods that utilize cow dung as fish feed are still classified as safe (have not passed environmental quality standards for freshwater fish cultivation), meaning that the use of cow dung as raw material for making fish feed is an alternative for waste processing and repair of environmental damage. Using cow dung as feed will reduce the amount of cow dung in the environment (Cow Pen) and make the environment clean [12]. The use of cow dung can reduce piles of cow dung in pens. Cleaned cow dung helps reduce land, water and air pollution [13]. By reducing the impact of environmental degradation, the cattle farming industry within farmer groups will help realize an environmentally friendly concept [14].

Water quality for cultivating freshwater fish must meet several requirements because poor water will cause fish to be susceptible to disease. A good water source for fish cultivation must meet water quality criteria which include physical and chemical properties such as temperature, pH, DO, and so on. The quality of water in a cultivation business determines the level of success. High or low water quality will have fatal consequences for fish growth.

Temperature

Temperature is the degree of hot or cold measured with a thermometer. According to the Regulation of the Minister of Health of

the Republic of Indonesia No. 2 Years 2023[15] Quality Standards for a good temperature for a healthy water environment range between 15 - 35º C. If cultivation causes the temperature to exceed this Quality Standard, then life in the environment will be disrupted.

The results of the article synthesis carried out at this research stage, the temperature of the water environment which is influenced by cultivation activities is still in normal conditions, or can be said to be still within the range of environmental quality standards. The results of temperature measurements in the research showed an average value of 28º C, in accordance with the quality standard value, this condition is still considered safe for freshwater fish cultivation activities. Water temperature will increase when the decomposition of organic material by microbes increases[16]. The solubility of gases needed for photosynthesis, such as CO2 and oxygen, dissolves more easily in water at low temperatures than at high temperatures [17].

Increasing temperature increases the metabolism and respiration of aquatic organisms, which results in increased oxygen consumption [18]. Drastic changes in temperature can cause aquatic organisms to die [19].

Ph (Degree of Acidity)

The majority of aquatic organisms depend on the pH value of waters. For the criteria for waters used for cultivating freshwater fish, the pH value quality standard PP No. 22 of 2021 ranges from 6-9. The condition of these waters is considered good and ideal for the productivity of aquatic organisms, especially for cultivating freshwater fish [19].

According to the results of the article synthesis carried out at this research stage, the pH of the water environment which is influenced by cultivation activities is classified as safe for aquatic life or is still within the range of pH quality standards for aquatic environmental life. The results of pH measurements in this study showed a pH value of 7. This pH value of 7 is a pH value that is good for life, especially the life of freshwater fish.

Organisms are usually more resistant to waters with a neutral pH. Because the amount of dissolved oxygen in water decreases, acidic waters tend to be less productive and can kill farmed animals. In addition, because CO2 levels increase, the pH value of the waters becomes acidic [20].

DO (Dissolved Oxygen)

Oxygen dissolution value (DO) is a metric that shows the amount of oxygen (O_2) available in a body of water. A higher DO value in water indicates that the water is of good quality, while a lower DO value indicates that the water is polluted. In some waters, most fish die due to lack of oxygen because microorganisms break down organic material [21].

The research results show that the results of DO measurements during the research show a value of 3-5 ppm, this value is still included in the range of quality standards for the water environment, the quality standard limit for aquatic animal cultivation activities is in the range from 3 to above ($\geq$ 3). If it is below this value, aquatic animals, especially fish in this study, will be stressed due to lack of oxygen supply.

Ammonia (NH_3)

The research results show that the value of the Ammonia measurement is still below environmental quality standards, the results of the Ammonia measurement show a value of 0.1 - 0.4 mg/l. while the value for environmental quality standards for freshwater animal life ranges from 0.1 - 0.5 mg/l.

Ammonia is needed for chemical processes that occur in waters. However, it can be dangerous for the aquatic environment under certain conditions and levels, especially in fish farming systems. After dissolved oxygen, the main limiting factor in fish farming ponds, ammonia management is essential. This is done to avoid the accumulation of ammonia, which can harm fish in cultivation ponds. To increase the percentage of success in fish farming, feeding management can be an effective method for reducing ammonia levels in waters [22].

Metabolic waste or fish waste that settles at the bottom of waters can cause high levels of ammonia. High levels of ammonia in waters are caused by the accumulation of waste from aquaculture and aquatic biota. The result of the activity of microorganisms in the decomposition of materials, namely organic materials that are rich in nitrogen or protein [23].

The presence of ammonia causes disease in fish, thereby inhibiting their growth.

Ammonia is the end result of the protein decomposition process resulting from metabolism and leftover feed which settles in the water so that it can cause toxins in the water which are harmful to the fish being kept[24].

3. The Influence of Environmental Conditions on Fish Development

Temperature

Increasing temperature increases the metabolism and respiration of aquatic organisms, which results in increased oxygen consumption [18.] Drastic changes in temperature can cause aquatic organisms to die [17]. Temperature has a direct effect on the rate of photosynthesis and animal physiological processes (the metabolic rate of the reproductive process) which in turn affects how they eat and grow [25]. Water temperature is affected by brightness and depth. Shallow water and sunlight can increase water temperature**.**

One of the factors or parameters that greatly influences the life of fish (Oreochromis niloticus) is temperature. As the temperature increases in water, the level of oxygen solubility will also become lower, and its toxic power will actually become higher[26]. This temperature affects many aspects of the life of fish, namely survival rate, appetite, body stability level against disease, growth rate, fish movement, viscosity and blood flow, oxygen consumption, number of leukocytes, glucose levels in the blood, number of erythrocytes, number of platelets, reaction to change ammonium to ammonia, metabolic rate, response to feeding, fish stress level [27].

Ph (Degree of Acidity)

Water conditions at pH 6-9 are considered good and ideal for the productivity of aquatic organisms, especially for cultivating freshwater fish [19]. Organisms are usually more resistant to waters with a neutral pH. Because the amount of dissolved oxygen in water decreases, acidic waters tend to be less productive and can kill farmed animals. In addition, because CO2 levels increase, the pH value of the waters becomes acidic [20].

Fish can grow and develop well in aquatic environments with neutral acidity (pH) or low alkalinity [28]. That acidity levels (pH) that are not optimal can cause fish to become stressed, easily attacked by disease, and low fish productivity and growth. pH can also affect the feed conversion of fish because a low value of the degree of acidity (pH) will result in increased acidity. If this happens it will cause water conditions to decline which can result in a decrease in the fish's appetite [29].

DO (Dissolved Oxygen)

In some waters, most fish die due to lack of oxygen because microorganisms break down organic material [30]. Oxygen in waters is needed by biotic organisms because it is used in the respiration process [31]. The dissolved oxygen content in the water can determine the metabolic rate of fish [32].

Oxygen is an absolute factor that must be present so that fish can continue to live. Fish need oxygen for respiration and to support their metabolic processes. Oxygen also affects the speed of growth and development of fish. At oxygen levels <2 mg/l, fish will experience a decrease in appetite and their development will be less than optimal [33]. The factors causing the reduction in dissolved oxygen in waters include respiration of aquatic biota, decomposition or breakdown of organic material and the release of oxygen into the air [34].

Dissolved oxygen (O_2) together with temperature and pH have the most influence on fish length. Increased length causes increased growth. Decreasing dissolved oxygen (O_2), increasing temperature and pH affect fish mortality [35]. If the dissolved oxygen content in the rearing media is below 5, this can cause fish death or slow fish growth [36]. If dissolved oxygen is insufficient, it can inhibit the growth of fish.

Ammonia (NH3)

Ammonia in freshwater fish cultivation systems that use circulation tends to decrease in value, whereas in still ponds, the value of ammonia tends to increase according to the amount of metabolic waste and leftover feed [37]. The accumulation of ammonia in cultivation media is one of the causes of decreasing water quality which can result in failure of fish cultivation production [38].

Ammonia in water comes from the decomposition process of organic materials which contain lots of nitrogen compounds (protein) originating from food waste [39]. Ammonia levels of more than 1 mg/l are not

good for keeping fish. The limit of the lethal effect on fish is if the NH3 concentration in the water is not more than 1 mg/L because it can inhibit the absorption of blood hemoglobin. to oxygen and the fish will die [40].

Ammonia in the aquatic environment is in the form of Ammonia (NH3) and Ammonium (NH4 +). Both compounds are toxic or toxic to the environment [3]. This compound is formed from the decomposition of organic nitrogen. Sources of organic nitrogen in freshwater aquaculture systems are mainly formed from food waste and fish waste products [4].

4. The effect of cow dung fish pellets on habits (Culture)

Ecologically, cow dung is waste in the environment and can cause pollution if it is not used[41]. Farmers dispose of cow dung waste by throwing it behind houses and in ditches near residential areas without processing it first. Waste that is dis posed of carelessly will later become a source of pollutant for ground water when exposed to rainwater. This has an impact on the low quality of the water so that it is not suitable for use as raw drinking water. As a result of livestock management that does not pay attention to the environment, many livestock businesses are unsuccessful due to losses caused by waste that is not managed properly[42].

Cow dung waste still contains nutrients or solid substances that have the potential to encourage the life of microorganisms that can cause pollution. Apart from water, livestock waste often pollutes the environment biologically, namely as a medium for flies to breed. Cow dung waste even when dry can cause pollution, namely by generating dust[43].

Ecologically, cow dung waste has great potential as good quality feed and can reduce environmental pollution[44]. Cow dung has the potential to be used as organic fertilizer, biogas fuel and fish feed[45].

The social aspect of waste processing has a positive impact on breeders by creating good relationships with the surrounding community and the emergence of mutual cooperation[46]. Farmers are aware that processing cow dung waste can reduce pollution, namely air, water and soil. In the cattle farming business, farmer groups will contribute to realizing the green marketing concept by reducing the impact of environmental damage [47].

From an economic perspective processing cow waste has a positive impact on cattle breeders. This will have a positive impact on farmers who will use cow dung as raw material for making feed (pellets) [46]. The use of cow dung improves the community's economy [12].

Recycling cow dung has a positive impact, especially in improving the economy of farmers [47]. The use of cow dung provides additional income for farmers [48]. Utilizing cow dung as feed has also become a new livelihood [48]. This means that using cow dung as fish feed will reduce unemployment and improve welfare. Fish farmers will avoid losses after having a new alternative feed made from cow dung. This is a new breakthrough to reduce waste and improve the economy [49].

CONCLUSION

The conclusion of this research is that the use of cow dung pellets reduces environmental pollution, is economical and is beneficial for humans. It is recommended that this research be further deepened and linked to other sciencesis.

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