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THE EFFECT OF PROVIDING CHICKEN MANURE FEED SUBSTITUTION ON THE WATER QUALITY OF CATFISH (*CLARIAS GARIEPENUS*) CULTIVATION POND

Pengaruh Pemberian Pakan Subtitusi Pakan Manure Ayam Terhadap Kualitas Air Kolam Budidaya Ikan Lele (*Clarias Gariepenus*)

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ABSTRACT

Catfish are highly tolerant of changes in water quality, making them easier to cultivate. Catfish are omnivorous, consuming fish bones and catfish maggots. One way to substitute catfish feed is by adding chicken manure, made with other feed additives. This study used four treatments for chicken manure substitute feed: A1 (without MA), A2 (10% MA), A3 (15% MA), and A4 (20% MA). Chicken manure was fed 3 times a day and maintained for one month. Water changes were carried out once a week by reducing the water by 50%. Water quality testing was carried out twice, namely at the beginning and end of maintenance. Water quality sampling was carried out in fish pond conditions that had not been reduced. Water quality tests carried out were water physics tests, water chemistry tests and water biology tests which included temperature, nitrate, phosphate, ammonia, pH, DO, TSS and e-coli bacteria. The results of physical water quality obtained during maintenance were water temperature in each treatment had a relative range of 27-29oC at the beginning and end of maintenance. The results of chemical quality at the beginning and end were nitrite obtained in the range of 0.01-0.03 mg/l, phosphate range of 2.10-3.2 mg/l, DO range of 1.82-3.91 mg/l, ammonia range of 3.06-3.67 mg/l, TSS range of 0.20-0.60, pH range of 6.10-6.70. The biological water quality results obtained were e-coli values ranging from 90-130 CFU/ml. The water quality results obtained were still within the normal range for catfish cultivation and the water quality values obtained were compared with PP No. 82 2001, SNI Catfish Breeding, KMN Environmental No. 115 of 2003.

Keywords: water quality, catfish, feed substitution, chicken manure

ABSTRAK

Ikan lele merupakan ikan yang memiliki toleransi tinggi terhadap perubahan kualitas air sehingga lebih mudah dibudidayakan. Ikan lele merupakan ikan pemakan segala seperti sisa tulang ikan dan mato lele. Subtitusi pakan ikan lele salah satunya dengan tambahan manure

ayam yang dibuat dengan bahan pakan tambahan lainnya. Penelitian ini menggunakan pakan subtitusi manure ayam dengan 4 jenis perlakukan yaitu A1 (Tanpa MA), A2 (MA10%), A3 (MA15%), A4 (MA20%). Pakan manure ayam sebanyak 3 kali sehari dan dipelihara selama satu bulan. Pergantian air dilakukan satu minggu sekali dengan mengurangi air sebanyak 50%. Pengujian kualitas air dilakukan sebanyak 2 kali yaitu pada awal dan akhir pemeliharaan. Pengambilan kualitas air dilakukan dalam kondisi kolam ikan yang belum dilakukan pengurangan air. Uji kualitas air dilakukan adalah uji fisika air, uji kimia air dan uji biologi air yang meliputi, suhu, nitrat, fosfat, amonia, pH, DO, TSS dan bakteri e-coli. Hasil kualitas air fisika yang didapat selama pemeliharaan yaitu suhu air pada setiap perlakuan memiliki hasil yang relatif kisaran 27-29^{o}C pada awal dan akhir pemeliharaan. Hasil kualitas kimia pada awal dan akhir yaitu nitrit yang didapat kisaran 0,01-0,03 mg/l, fosfat kisaran 2,10-3,2 mg/l, DO kisaran 1,82-3,91 mg/l, amonia kisaran 3,06-3,67 mg/l, TSS kisaran 0,20-0,60, pH kisaran 6,10-6,70. Hasil kualitas air biologi yang didapat yaitu nilai e-coli kisaran 90-130 CFU/ml. Hasil kualitas air yang didapat masih dalam tahap normal untuk budidaya ikan lele dan nilai kualitas air yang didapat dibandingkan dengan PP No 82 2001, SNI Pembesaran Ikan lele, KMN Lingkungan Hidup No 115 Th 2003.

Kata Kunci: kualitas air, ikan lele, subtitusi pakan, manure ayam

INTRODUCTION

Catfish have a high tolerance for changes in water quality and the environment. Catfish are easy to cultivate in both earthen ponds, concrete ponds, and tarpaulin ponds. According to Ramdhani (2024), catfish are a fish that has been commercially cultivated by the Indonesian people. There are many advantages to cultivating catfish, including high market value, easy cultivation methods, simple maintenance techniques, fast harvest times, high production yields, and greater disease resistance, which are why they are widely cultivated.

Catfish are omnivorous, eating pellets, green plants, or even leftover food or bones. Catfish are nocturnal, so farmers feed them more at night. According to Mudjiman (2011), catfish feed requirements range from 20-60% to 30-36% protein. The quality of the feed and culture medium are factors that support catfish growth. To reduce feed costs, efforts are made to use local raw materials with nutritional quality close to that of imported raw materials, thereby reducing production costs.

Catfish feed has been widely modified with various additional ingredients such as chicken feather meal (Sentosa *et al.,* 2025), shell meal (Mahary, A. 2017), indigofera shoot meal (Mulyono, 2018) and other additives. In this study, the additional ingredient used was chicken manure mixed with other feed ingredients and formed into pellets and given three times a day. According to Puteri et al (2024), the growth of catfish with the use of chicken manure has better growth than feed that is not given manure. So for growth the percentage of manure used is 10%/1kg of fish feed.

Feeding ponds will affect the water quality, both from uneaten feed residue. According to Zaidy *et al.,* (2021), pond water quality will be affected by the presence of feces and feed residue deposited on the bottom of the pond. If left untreated, it will result in an odorous pond and decreased water quality, affecting fish growth. The use of chicken manure in this study is suspected to have affected the quality values obtained during the study. Therefore, water quality data was collected to determine the water quality values of catfish ponds. The resulting data is expected to serve as a reference for academics, fish farmers, and other communities to observe the results of water quality improvements in catfish ponds using chicken manure.

RESEARCH METHODS

Time and Place

The implementation of this research activity was carried out in 2022 at the Rizki Jaya Fam Pokdakan, Kenten Laut Village, Banyuasin Regency.

Tools and materials

The tools used in this study included water quality equipment such as a pH meter, thermometer, bucket, water, and an aerator. The materials used were catfish and catfish feed, according to the treatment.

Research Procedures

Research Design

This study used chicken manure feed with 4 treatments with 3 repetitions. The basic reference used in this study was (Yunuartono *et al.,* 2018) with the following treatment details:
A1 (feed without chicken manure)
A2 (additional chicken manure 10%)
A3 (additional chicken manure 15%)
A4 (additional chicken manure 20%)

Pisciculture

The catfish being raised are 5 cm in size. The fish pond used is a 1x1 m tarpaulin pond with a water level of 50 cm. The fish are acclimatized to the pond and then stocked. They are left for 4 hours for acclimatization, after which they are fed. The fish are cultured for 30 days.

Feeding

Catfish are fed chicken manure supplemental feed three times daily. The feed is given according to the treatment and is given up-libitum (until they are full)..

Water quality check

Chemical water quality testing, including ammonia, TSS, nitrate, and phosphate, and biological water quality testing, including E. coli, were conducted at the Palembang City Environmental Health Engineering and Disease Control Center (BTKLPP). Temperature and pH were checked directly daily in the cultivation ponds.

Data analysis

The water quality data for temperature, nitrite, phosphate, DO, pH, ammonia, TSS, E-coli produced are presented in table form and processed descriptively..

RESULTS

Physical Water Quality

The physical water quality results obtained during the research are as follows:

Table 1. Physical Water Quality of Catfish Maintenance Substituted with Chicken Manure.

Parameters/	A1	A2	A3	A4	Quality standards

Treatment		(Control)	(10%)	(15%)	(20%)	PP No 82 2001	SNI for Catfish Breeding	KMN Environment No 115 Th 2003
Temperature	Beginning	28	29	29	27	Deviasi 3	25-30	Normal ± 3
	End	29	28	27	29			

Source: BTKL, 2022

Chemical Water Quality

The chemical water quality results obtained during the research are as follow

Table 2. Chemical Water Quality for Catfish Maintenance Substituted with Chicken Manure

Parameters/Treatment		A1 (Control)	A2 (10%)	A3 (15%)	A4 (20%)	Quality standards		
						PP No 82 2001	SNI for Catfish Breeding	KMN Environment No 115 Th 2003
Nitrit	Beginning	0,03	0,01	0,01	0,01	0,06 mg/l	–	0,06 mg/l
	End	0,03	0,02	0,01	0,01			
Fosfat	Beginning	2,10	2,90	3,20	2,80	1 mg/l	–	–
	End	2,20	3,50	3,10	2,60			
DO	Beginning	2,44	2,62	2,77	1,82	3 mg/l	> 4	> 3
	End	3,02	3,91	3,03	2,26			
Amonia	Beginning	3,51	3,48	3,58	3,67	0,02 mg/l	< 0,01	0,02 mg/l
	End	3,14	3,16	3,28	3,06			
TSS	Beginning	0,50	0,60	0,40	0,60	400 mg/l	–	–
	End	0,30	0,20	0,20	0,20			
pH	Beginning	6,70	6,20	6,10	6,50	6 until 9	6,5 until 8,5	6 until8,5
	End	6,20	6,10	6,60	6,40			

Source: BTKL, 2022

Biological Water Quality

The results of biological water quality obtained during the research are as follows:

Table 3. Biological Water Quality of Catfish Maintenance Substituted with Chicken Manure.

Parameters/Treatment	A1	A2	A3	A4	Quality standards

	(Control)	(10%)	(15%)	(20%)	PP No 82 2001	SNI for Catfish Breeding	KMN Environment No 115 Th 2003
E-coli	125	90	130	105	10000 CFU/100 ml	_	_

Source: BTKL, 2022

DISCUSSION

The results of the physical water quality carried out were water temperature, water temperature measurements were carried out at the beginning of maintenance. Temperature affects the metabolic rate, growth, feed consumption, and the immune system of fish (Effendi, 2003). In this study, catfish cultivation was carried out with additional treatment of chicken manure feed in 4 treatments, namely A1 (control) temperature 28-29 OC, A2 (10%) temperature 28-29 OC, A3 (15%) temperature 27-29 OC and 43 (20%) temperature 27-29 OC. The results obtained showed that temperature changes between treatments did not have a significant difference between treatments that used manure and those that did not. This indicates that the use of chicken manure does not affect the water quality of the fish pond temperature. This is also stated by the comparison of water quality according to the SNI for Catfish Enlargement (SNI 01-6483.4-2000) namely the optimal temperature for catfish enlargement is 25-30°C.

All treatments in this study were within the recommended temperature range, thus not causing thermal stress to the catfish. Government Regulation No. 82 of 2001 states that the permissible water temperature for Class II water (which can be used for freshwater fish cultivation) must not exceed a deviation of ±3°C from the average monthly temperature in local waters. Assuming an average normal temperature of around 28°C, a deviation of 3°C results in a range of 25–31°C. The observed water temperatures were within this range and in accordance with the provisions of the regulation. The addition of chicken manure can increase the activity of microorganisms in the water, which has the potential to produce heat (biological heat) as a result of the decomposition of organic matter (Boyd, 1990). However, in this study, there was no significant increase in temperature in treatments A1–A4 compared to the control. This indicates that chicken manure concentrations of up to 20% do not significantly affect water temperature, or that the cultivation system has sufficient thermal resilience.

The results of chemical water quality obtained during the study were nitrite in treatment A1 (control) (0.03-0.03 mg/l), A2 (0.01-0.02 mg/l), A3 (0.01-0.01 mg/l) and A4 (0.01-0.01 mg/l) nitrite results were still in good stages in accordance with the water quality standards for fish farming in accordance with PP No. 82 of 2001 which states that the nitrite value for catfish farming is 0.06 mg/l. The results of phosphate water quality were A1 (2.1-2.2 mg/l), A2 (2.9-3.5 mg/l), A3 (3.1-3.2 mg/l) and A4 (2.6-2.8 mg/l) where the phosphate value obtained during the study was quite high when compared to the quality standards according to PP no. 82 of 2001, namely 1 mg/l. All the results of phosphate water quality showed above the quality standard so it is suspected that the catfish cultivation water contains high phosphate because of the feed consumed and feces produced by the catfish. This is in accordance with Lestari *et al.,* 2015, who stated that increased catfish growth results in increased metabolite waste such as leftover feed that settles at the bottom of the bucket. Effendi (2003) stated that organic phosphate sources will accumulate and decompose into dissolved inorganic ones.

The DO values produced during the study were A1 (2.44-3.02 mg/l), A2 (2.62-3.91 mg/l), A3 2.77-3.03 mg/l) and A4 (1.82-2.26 mg/l). The results of the DO values during the

study showed almost the same values at the beginning of maintenance, namely the range of 1.82-2.77 mg/l and at the end of maintenance, namely 2.26-3.91 mg/l, this indicates a difference between the initial and final DO values of the lecture, allegedly due to the influence of feeding which makes the DO value increase during maintenance, but the difference in initial and final water quality is still within the normal threshold. Based on SNI 6484.3 of 2014, the DO value> 3 mg/L is optimal for the growth and development of Sangkuriang catfish.

The ammonia values obtained during the study were in treatment A1 (3.14-3.51 mg/l), A2 (3.16-3.48 mg/l), A3 (2.77-3.03 mg/l), and A4 (3.06-3.67 mg/l). The ammonia results obtained during the study exceeded the quality standard threshold according to Government Regulation No. 8 of 2021, which is 0.02 mg/l. The high ammonia results are suspected because the use of chicken manure can affect the ammonia levels produced. This is similar to the results of research by Tuwitri et al. (2021) which obtained ammonia results of 2.87 mg/L-4.79 mg/L, which also exceeds the existing standard value. High ammonia levels in water can be caused by high levels of nitrogen and inorganic materials, organic carbon compounds, and sulfides originating from leftover fish feed and fish waste that accumulates and occurs long-term fertilization in the pond. According to the research results of Dhiba el al., 2013, it was stated that there was an increase in ammonia values in artificial feed treatments during the study compared to commercial feed.

The TSS values obtained during the study were treatments A1 (300-500 mg/l), A2 (200-500 mg/l), A3 (200-400 mg/l), A4 (200-600 mg/l). The TSS values obtained for all treatments were in the range of 200-600 mg/l, in the treatment using chicken manure substitution the TSS values obtained were higher and exceeded the water quality standards for fisheries activities, namely 400 mg/l. High TSS values can cause low oxygen levels due to the large amount of sedimentation from feces and waste from chicken manure feed. This is in accordance with the statement of Hardela *et al.,* (2019) TSS is not only an important measure of erosion in river channels, it is also closely related to the transport through the river system of nutrients (especially phosphorus), metals, and various industrial and agricultural chemicals.

The pH values obtained during the study were treatments A1 (6.2-6.7), A2 (6.1-6.2), A3 (6.1-6.6) and A4 (6.4-6.5). The pH values during the study were relatively the same in each treatment, namely the range of 6.1-6.7, the category of pH values obtained during the study was neutral according to the quality standards of PP no. 82 of 2001, the pH value for fisheries activities is 6 to 9. Barus (2002) stated that the pH value in many natural waters ranges from 4 to 9. A pH value of 5 can still be tolerated by fish but fish growth will be hampered. However, fish can experience optimal growth at a pH of 6.5-9.0. At a very low pH, the solubility of metals in water increases, which is toxic to aquatic organisms. Thus, measuring the water pH with the range of values above, indicates that it is still within the limits suitable for cultivation activities, and in this range all catfish activities and enlargement produce optimal values.

According to Mlejnkova and Sovova (2012), poultry manure is a hazardous organic material because it has potential risks to aquatic environmental health. E-coli levels in this study ranged from 90-130 CFU/100 ml, and the e-coli results in all treatments did not exceed the quality standard for fisheries activities according to government regulation no. 82 of 2001, which is 10,000 CFU/100 ml. Therefore, the e-coli values obtained during the study are still safe for the survival of catfish.

CONCLUSION

The conclusion obtained from the research that has been conducted is that the use of chicken manure in each treatment provides variations in water quality results including temperature, pH, DO, ammonia, nitrate, TSS, phosphate, and E-coli. Quite significant results occurred in ammonia quality in all treatments with values obtained above water quality standards and TSS values obtained at the end of the study experienced an increase that has

exceeded water quality standards. Suggestions for further research require fermentation for chicken manure feed to reduce residues that appear in manure feed that can increase ammonia levels.

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