Application Of The Completely Random Design Statistics Method For Analysis Of Different Filter Types In Fresh Water Fish Pool Water Recirculation System

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***Abstract*.**

In meeting their daily water needs (bathing and washing), the majority of the people of South Kalimantan (South Kalimantan) have been using river water and peat well water, as is the case for fresh water fisheries. However, the water used is cloudy and smells because it is water that is polluted by household waste, and of course it shows the quality of the water that is still being debated for the process of fish cultivation. In the process of cultivating freshwater fish, the standard mechanism is still used, namely by making tarpaulin ponds for fish ponds and river water as a medium for fish cultivation and the process of providing feed. In the process there are several things about water quality and conditions, and several other issues, namely about water circulation, temperature, humidity, pH and oxygen regulation of fish pond water. Fish excrete waste from leftover feed and metabolism which contain lots of ammonia (Effendi, 2003). Fish excrete 80-90% of ammonia through osmoregulation processes, feces and from urine. To produce quality pond water as a medium for fish cultivation, it is necessary to have a proper and good water filter. This study aims to obtain the best filter substrate in increasing the growth and survival of freshwater fish fry reared using polluted river water in a tarpaulin pond with a recirculation system. The filter method used in this study was an experimental method using one factor Completely Randomized Design (CRD) with four treatment levels and three replications. The treatments applied were P0 = Zeolite, Charcoal, Japmate, Bio Foam, P1 = Bamboo, Charcoal, Japmate, Bio Foam, P2 = Bioball, Charcoal, Japmate, Bio Foam and P3 = Bioring, Charcoal, Japmate, Bio Foam. The resulting data were analyzed for analysis of variance (ANOVA), then continued using the BNT test with 95% and 99% confidence intervals. From the results of the study, the measurement results obtained were for the specific growth rate test (SGR) of 1.15%, the survival test (SR) of 86.66% and the feed conversion ratio test (FCR) of 3.10%. While the supporting parameters are water quality, namely the results of water quality, namely, temperature 28.1 – 30.3 0C, pH 7.4 – 8.1, DO 5.24 6.53 mg/L, NH3 0.06 – 0.40 mg/L, NO2 0.056 – 0.90 mg/L and NO3- 0.28 – 0.190 mg/L. In addition to producing filter products that can support SGR, SR and FCR in freshwater fish, it is hoped that this research will also produce scientific paper outputs that will be published in International Conferences/International Journals and become part of the Study Program's Coursebook for the Accounting Department. Computerized Poliban Accounting and can be applied in the community through the Community Service program.

Keywords: *Filtration, RAL and Circulation*

I. INTRODUCTION

One of the areas in South Kalimantan that has the potential to develop freshwater fish farming is in the Banjarbaru area, one of which is in the North Banjarbaru District, North Loktabat Village, which is passed by the Kemuning river. In that area there are several fish cultivators who use narrow land and use Kemuning river water as a medium for fish ponds. In the cultivation process there are several problems, among others, specifically the problem of water quality as a medium for freshwater fish cultivation, apart from these other problems are about water circulation, temperature regulation, humidity, pH and oxygen in fish pond water which results in many fish dying and causing non-maximum results. In the process of cultivating this fish, water quality needs to get special attention in the process of cultivating fish because it greatly affects the increase in maximum fish growth.Water quality parameters in the fish farming process play a role in creating an environmental atmosphere for fish, so that pond waters are able to provide a comfortable atmosphere for fish movement, namely the availability of sufficient quality water to create water conditions that are in accordance with optimal fish living requirements (water chemistry, water physics , and water biology) according to the required parameters [16]. Growth is one of the parameters to determine changes in fish size in terms of weight, length, and volume over time [13].

So that the quality of freshwater fish farming is always stable, it is necessary to change the water regularly, because at the time of cultivation it must be ensured that the quality of the water is stable and at optimal levels according to the living conditions of the fish. One way to produce quality pond water media is to need a good water filter and to minimize water wastage is to use a recirculation system.This study aims to obtain the best filter substrate in increasing the growth and survival of freshwater fish fry reared in polluted river water with an aquaculture circulation system. The good filter selection method used in this study was an experimental method using a one-factor Completely Randomized Design (CRD) with four treatment levels and three replications. The treatments applied were P0 = Ziolite, Charcoal, Japmate, Bio Foam, P1 = Bamboo, Charcoal, Japmate, Bio Foam, P2 = Bioball, Charcoal, Japmate, Bio Foam and P3 = Bioring, Charcoal, Japmate, Bio Foam. The resulting data were analyzed for Analysis of Variance (ANOVA), then continued using the BNT test (test of Least Significant Different) or Least Significant Different (LSD) with 95% and 99% confidence intervals. Parameters measured in this study included specific growth rate (SGR), survival rate (SR) and feed conversion ratio (FCR). While the supporting parameters are water quality which includes temperature, pH, and dissolved oxygen (DO) content.

II. METHODS

The method used in this study was an experimental method using a one-factor Completely Randomized Design (CRD) with four treatment levels and three replications to minimize errors, so that 12 experimental units were needed. In detail the treatment used in this study is as follows:

P0 = Zeolite, Charcoal, Japmate, Bio Foam

P1 = Bamboo, Charcoal, Japmate, Bio Foam

P2 = Bioball, Charcoal, Japmate, Bio Foam

P3 = Bioring, Charcoal, Japmate, Bio Foam

Research procedures include:

1) Preparation of maintenance containers and filters,
2) Preparation and arrangement of filter materials,
3) Preparation of test fish,
4) Pool water preparation,
5) And fish maintenance

The experimental design used in this study was a completely randomized design (CRD) using four different treatments and three replications:

P0 : Treatment using Zeolite biofilter.

P1 : Treatment using a bamboo biofilter.

P2 : Treatment using Bioball biofilter.

P3 : Treatment using Bioring biofilter.

Treatment and repetition in this study were placed randomly using the lottery method. The research plan can be seen in the image below:

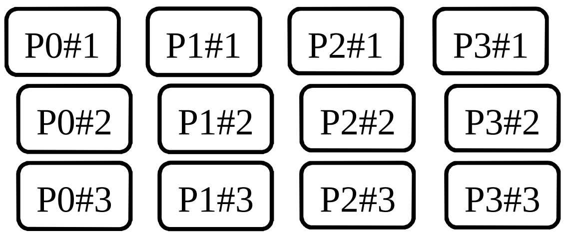

Fig 1. Randomization Results Research Plan.

Information :

P0, P1, P2 and P3: Treatment P0 (Zeolite), P1 (Bamboo), P2 (Bioball) and P3 (Bioring)

#1,#2 and #3: Repeat

2.1 Test Parameters

2.1.1 Main Parameters

The main parameters observed in this study were survival, growth rate of tilapia maintained for 45 days with different filter treatments using Zeolait, Bamboo, bioball and bioring filters.

a. *Survival Rate* (SR)

The survival of the test fish is to compare the number of test fish that are alive at the end of the study with the number of test fish stocked at the start of the study [47]. Calculation of this parameter using the equation:

$$SR = \frac{N_t}{N_0} x\ 100\%$$

Where :

SR = Pass Rate(%)

N_0 = Number of cultivars in the research crew

N_t = Number of cultivars at the end of the research

b. Specific Growth Rate (SGR)

The specific biomass growth rate is the % of the difference between the final weight and the initial weight, divided by the length of time of cultivation [47]. Calculation of SGR using the equation:

$$SGR = \frac{W_t - W_0}{t} x\ 100\%$$

Dimana :

SGR = Specific growth rate (%/day)

W_t = Final body weight (g)

W_0 = Initial body weight (g)

t = maintenance time (days)

c. Feed Convertion Ratio (FCR)

The feed conversion ratio is the result of a comparison of the total amount of feed given with the resulting weight gain. The feed conversion value is inversely proportional to the weight gain of the fish, so the lower the feed conversion ratio, the better the quality of the feed and the more efficient the fish are in utilizing the feed they consume for growth [26]. FCR calculation using the equation:

$$FCR = \frac{F}{(WT_t + D) - WT_0}$$

Dimana :

FCR = The total amount of feed given during rearing

WT_0 = The total weight of fish at the start of rearing

WT_t = Total weight of fish at the end of rearing

D = Total weight of fish that died during rearing

2.1.2 Supporting Parameters

Observations were made on the supporting parameters with the aim of knowing the suitability of the main parameters with the influential environmental factors. Supporting parameters observed in this study is water quality. Water quality is a parameter supporting the life of tilapia as well as for the bacteria found in the rearing medium. The measurements of water quality were carried out in the form of temperature, DO, pH of ammonia, nitrite and nitrate. In addition, DO, temperature and pH are parameters that are influenced by the environment, so they are parameters that must be observed to support the quality of aquaculture water.

2.1.3 Data analysis

The data obtained from the research results were analyzed statistically using analysis of variance (ANOVA) according to the design used, namely completely randomized design (CRD). If from the data of variance it is known that the treatments show significantly different (significant) or highly significant (highly significant) effects, then to compare the values between treatments it is continued with the BNT test (least significant difference) and regression.

III. RESULTS AND DISCUSSION

3.1 Main Parameter Calculation Results

3.1.1 Passing Nila Fish

The results of observing survival using different biofilters obtained the highest average survival data in treatment P3 (bioring) with an average yield of 86.66% and the lowest average survival value in treatment P0 (Zeolite) with an average result of 74, 66%.

Table 1. Table of the Average Passing Rate (SR) of Nila Fish in %

Treatment	Iteration			Sum	Average ± STDEV
	1	2	3		
P0	76,00	74,00	74,00	224,00	74,66 ± 2,31
P1	82,00	78,00	84,00	244,00	81,33 ± 2,31
P2	82,00	82,00	88,00	252,00	84,00 ± 4,00
P3	85,00	87,00	88,00	260,00	86,66 ± 2,31
Total				980,00	

Based on the table above, the average survival rate for Tilapia ranges from 74.66% - 86.66%, it can be seen that the P3 treatment (bioring) has an average survival rate of 86.66%, the P2 treatment (bioball) has a percentage the average survival rate for tilapia was 84.00%, in treatment P1 (bamboo) the average survival rate for tilapia was 81.33%, while in treatment P0 (Zeolite) the average percentage for tilapia survival was 74, 66%.Furthermore, the average results of observations of Tilapia survival during the study obtained data with each treatment can be seen in the bar chart presented in Figure 2.

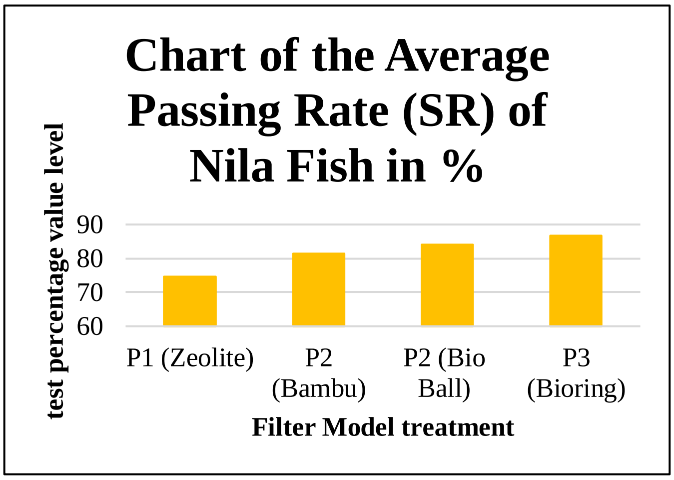

Fig 2. Bar chart of the mean Passing Life (SR) of Nila Fish

. To determine the effect of using different biofilter treatments on the survival of tilapia, a calculation of variance was carried out, which can be seen in table 2.

Table 2. Table of Nila Fish Passing Variety (SR) Fingerprints

Diversity	**db**	**JK**	**KT**	**Fcount**	**F5%**	**F1%**
Treatment	3	238,667	79,556	**9,944****	**4,07**	**7,59**
Random	8	64,000	8,000			
SUM	11	302,667				

Description ** : Significantly different

Based on the analysis of diversity in table 2, regarding survival, an F count of 9.94 is obtained, where the calculated F value is greater than the F table of 5% and less than the F table of 1%, which means that the use of different biofilters has a significantly different effect on survival. Parrot fish.

3.1.2 Specific Growth Rate

The results of observing the growth rate using different biofilters obtained the highest average growth rate data in the P3 (bioring) treatment with an average yield of 1.15% and the lowest average growth rate in the P0 treatment with an average result of 0 .85%. The results of the average graduation calculation can be seen in table 3.

Table 3. Table of Average Specific Growth Rate (SGR) of Nila Fish in %.

Treatment	Iteration			Sum	Average ± STDEV
	1	2	3		
P0	0,79	0,92	0,85	2,56	0,85 ± 0,06
P1	1,09	0,89	1,14	3,12	1,04 ± 0,13
P2	0,98	1,06	1,15	3,19	1,06 ± 0,08
P3	1,07	1,21	1,19	3,46	1,15 ± 0,08
Total				12,34	

Based on the table above, the average growth rate of Tilapia ranges from 0.85% - 1.15%, it can be seen that the P3 (bioring) treatment with an average Tilapia growth rate of 1.15%, the P2 treatment (bioball) with an average percentage of tilapia growth rate of 1.06%, treatment P1 (bamboo) with an average percentage of tilapia growth rate of 1.04%, whereas in treatment P0 with an average percentage of tilapia growth rate of 0.85%.Furthermore, the average results of observations of the growth rate of Tilapia during the study obtained data with each treatment which can be seen in the bar chart presented in Figure 3.

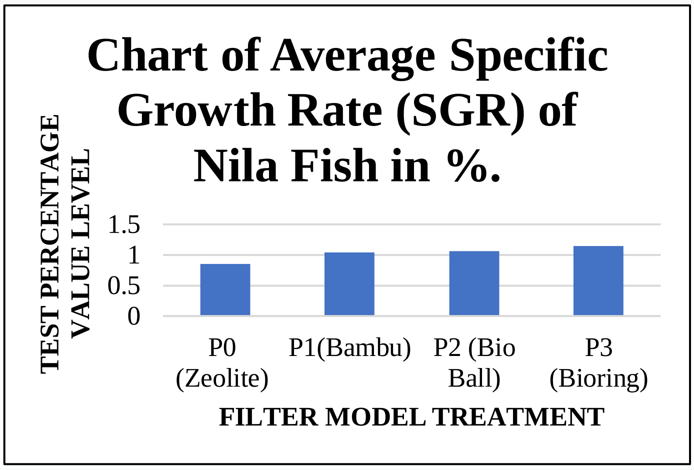

Fig 3. Bar chart of the average specific growth rate (SGR) of Nila Fish

The graph above shows the results that the highest average specific growth rate during the study was the bioring treatment with a value of 1.15% then the bioball treatment with a value of 1.06%, then the bamboo treatment of 1.04% and the lowest was the control treatment with value of 0.85%. Based on the diagram above, the results of the highest specific growth rate were obtained in the bioring treatment because the water quality was still better than the other treatments.Furthermore, to determine the effect of using different biofilter treatments on the specific growth rate of tilapia, a calculation of variance was carried out, which can be seen in table 4.

Table 4. Table of Specific Growth Rate Variations (SGR) of Tilapia

Diversity	db	JK	KT	Fhitung	F5%	F1%
Treatment	3	0,145	0,048	5,649*	4,07	7,59
Random	8	0,068	0,009			
SUM	11	0,213				

Description * : Significantly different

Based on the results of the variability analysis in Table 4, regarding the specific growth rate, an Fcount of 5.649 was obtained, where the Fcount was greater than the Ftable of 5% and less than the Ftable of

1%, which meant that the treatment using different biofilter media had a significantly different effect on Tilapia specific growth rate

3.1.3 Feed Conversion Ratio

The results of observing the feed conversion ratio using different biofilters obtained the highest average feed conversion ratio data in treatment C (bioring) with an average yield of 3.09% and the lowest average value of feed conversion ratio in treatment K (control) with average yield of 3.91%. The average results of calculating the conversion ratio of Tilapia feed during the rearing period can be seen in table 5.

Table 5. Table of Average Feed Conversion Ratio (FCR) of Nila Fish in %.

Treatment	Iteration			Sum	Average ± STDEV
	1	2	3		
P0	4,180	3,728	2,830	11,738	**3,913 ± 0,24**
P1	2,575	3,777	3,579	9,931	**3,310 ± 0,54**
P2	3,577	3,258	3,378	10,213	**3,404 ± 0,16**
P3	3,336	2,869	3,079	9,284	**3,095 ± 0,23**
Sum				41,165	

Based on the table above, the average tilapia feed conversion ratio ranges from 3.09% - 3.91%, it can be seen that the P3 (bioring) treatment with an average tilapia feed conversion ratio of 3.09%, the P2 treatment (bioball) with an average percentage of tilapia feed conversion ratio of 3.40%, treatment P1 (bamboo) with an average percentage of tilapia feed conversion ratio of 3.31%, whereas in treatment P0 with an average percentage conversion ratio Tilapia fish feed is equal to 3.91%.Furthermore, the average results of observations of the tilapia feed conversion ratio during the study obtained data with each treatment which can be seen in the bar chart presented in Figure 4.

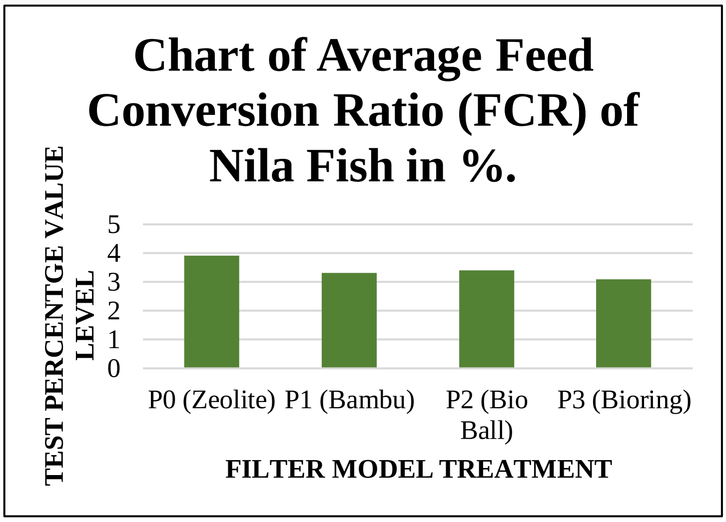

Fig 4. Bar chart of the average feed conversion ratio (FCR) of Nila Fish.

The graph above shows the results that the lowest average feed conversion ratio during the study was the bioring treatment with a value of 3.09% then the bamboo treatment with a value of 3.31%, then the bioball treatment was 3.40% and the largest was the control treatment with value of 3.91%. Based on the diagram above, the best feed conversion ratio results were obtained during the study, namely in the bioring treatment, because the water quality was still better than other treatments.Furthermore, to determine the effect of using different biofilter treatments on the conversion ratio of Tilapia feed, a calculation of variance was carried out, which can be seen in table 6.

Table 6. Table of Variations of Tilapia Feed Conversion Ratio (FCR) in %

Diversity	db	JK	KT	Fhitung	F 5%	F 1%
Treatment	3	1,082	0,361	2,611^{ns}	4,07	7,59
Random	8	1,105	0,138			
SUM	11	2,187				

Description ^{ns} : *non significant*

Based on the results of the calculation of the variance of the feed conversion ratio in table 6, it can be seen that the Fcount value is less than f1% and f5%, namely 2.611, so the results are not significantly different (non-significant). The best feed conversion ratio results were in the bioring treatment. The best feed conversion value obtained in the bioring treatment is because Tilapia is very good at utilizing feed because it is supported by good water quality as well. The main objective of raising fish is to obtain efficient conversion of feed into meat, the size of the feed conversion ratio is influenced by several factors, but the most important is the quality and quantity of feed, species cultured, size and water quality. The size of the feed conversion ratio determines the effectiveness of the feed.

3.2 Calculation Results of Supporting Parameters

From the results of calculating the supporting parameters, the results are as shown in table 7.

Table 7. Pool Water Quality During Research

Parameter	Unit	Water Quality Measurement			
		P0	P1	P2	P3
Suhu	mg/L	27,1-30	27,1-30,3	27,1-30,1	27,1-30,2
pH	-	7,4-8,1	7,4-8	7,4-8	7,4-8
DO	mg/L	5,05-6,23	5,05-6,46	5,15-6,32	5,05-6,53
Salinitas	Ppt	17,2	17,2	17,2	17,2
NH_3	mg/L	0,06-0,66	0,06-0,50	0,06-0,55	0,06-0,40
NO_2	mg/L	0,056-0,130	0,056-0,118	0,056-0,120	0,056-0,090
NO_3	mg/L	0,28-1,72	0,28-1,83	0,28-1,80	0,28-1,90

IV. CONCLUSION

From the results of the research that has been done, it can be seen that the use of different filter media for rearing red tilapia (Oreochromis niloticus) in fresh water with a recirculation system has a significant effect on the growth of absolute weight, absolute length and survival but has no significant effect on the daily growth rate. The best treatment was obtained in the P3 treatment (Bioring, Charcoal, Japmate, Bio Foam) giving water quality results, namely, temperature 28.1 – 30.3 0C, pH 7.4 – 8.1, DO 5.24 6.53 mg/ L, NH3 0.06 – 0.40 mg/L, NO2 0.056 – 0.90 mg/L and NO3- 0.28 – 0.190 mg/L, the highest survival test (SR) was in the bioring treatment of 86.66 %, the feed conversion ratio (FCR) test yielded 3.10%. while the specific growth rate (SGR) test for tilapia was 1.15%.

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