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Catfish (Clarias gariepinus) Fry Growth at Reduced Feeding Level in the Biofloc Culture System in Bandung Regency, Indonesia

Dr.Rita Rostika[1*], Dr.Yayat Dhahiyat[2] and Muhamad Muzni, SPi[3]

[1,2,3,]Universitas Padjadjaran- Indonesia

Abstract

The aim of the research was to observe catfish (Clarias gariepinus) growth at reduced feeding level in the biofloc culture system. Feed residues and metabolites from catfish farms contain toxic ammonia that can affect water quality and organism growth. However, the existing organisms involved in the biofloc system can change ammonia into a non-toxic nitrite. Biofloc can also be used as catfish feed.The research was carried out at the hatchery Fish Breeding Centers Ciparay Bandung Regency from April 2014 until June 2014. The research employed the Completely Randomized Design (CRD) design of experiment, which involved six different feeding level reduction treatments, each of which having a different amount of feed but the same amount of biofloc. The research administered the following treatments: (A) 0% feeding level reduction (positive control), (B) 5% feeding level reduction, (C) 10% feeding level reduction, (D) 15% feeding level reduction, (E) 20 % feeding level reduction, (F) 25% feeding level reduction. Each treatment was repeated three times.The parameter observed was Average Daily Gain (gram/day). Treatments A through F yielded the following results respectively: 0.32; 0.30; 0.29; 0.26; 0,29 and 0.30. Statistically, the results indicated no significant difference. In other words, reduction of feeding level for catfish fry had no effect on Average Daily Gain, and a 25% reduction even yielded the highest result. The water quality parameters observed, namely temperature, pH level, and dissolved oxygen (DO), indicated optimum figures for catfish fry rearing.

Keywords— catfish rearing, biofloc, reducted feed, Average Daily Gain.

Introduction

Waste from fish farms is dominated by biodegradable organic matter such as proteins, carbohydrates, and fats from unconsumed feed and its faeces. Such waste materials are organic matter which may be used by heterotrophic bacteria as a potential source of nutrition for biofloc supporting organisms, both as fish feed and water quality control. Biofloc is a combination of macro-and microorganisms including bacteria, microalgae, fungi, protozoa, metazoan, and nematodes (Tacon et al., 2002 in Kurniasari, 2010). Floc biomass formed in bodies of water may be consumed by fish as additional sources of feed and as water purifier (Aiyushirota, 2009).

In the biofloc technology, heterotroph bacteria are the organisms quickly converting NH_3 into bacteria biomass. NH_3 is a toxin, yet on the other hand provides the energy

*All correspondence related to this article should be directed to Dr.Rita Rostika, Universitas Padjadjaran- Indonesia
Email: ritarostika_unpad@yahoo.com

required to sustain the bacteria's life. The bacteria then combine with algae and other organisms to create aggregates as natural fish feed. Algae provide the necessary elements essential for the bacteria, which are then rearranged into the required compounds. Both bacteria and algae are naturally occurring and developing organisms. Biofloc technology is environmentally-friendly since it minimises water pollution and reduces the need for expensive commercial feed – biofloc is healthy and natural (Anonymous, 2013).

Review of Literature

Several studies have shown that the application of biofloc technology plays a role to improve water quality, biosecurity, productivity, feed efficiency, and reduce production costs through lowered feed expenses. Theoretically and practically, the application of biofloc technology improves water quality by controlling ammonia concentrations and improving nutrient consumption as it is consumed by the organism cultured (Ekasari, 2009).

Azim and Little (2008) found that the Feed Conversion Ratio value of the fish farmed using biofloc technology to be better compared to conventional methods. This is consistent with Widanarni et al. (2010), stating that the increased feed efficiency of biofloc technology is due to the presence of additional nutrition sources for the fish in the form of increased biofloc microbe biomass. In Riani (2012), the reduction of commercial feed by 25% for whiteleg shrimps increases its daily growth rate by 3.1679 %, improved its longevity by 92% with a feed conversion ratio of 0.73. Rostika (2014) found that shrimps whose feed are reduced by 25% experience similar weight increase to those fed at default level.

The findings of Rachmiwati (2008) concluded that tilapia fry using zero water exchange system may benefit from waste produced by catfish farms by developing heterotroph bacteria.Tilapia fry at a density of 125 fish per square metre are capable of growth exceeding 100% every 40 days and improves feed efficiency by 12.07 % through the conversion of waste by heterotroph bacteria from a 100 fish per square meter catfish farm. Adding Carbon element (molasses) in catfish farms increases the fish's survivability by 94.625 % kept over 46 days. The highest specific growth rate is 7.16 % with a feed efficiency value of 85.8 % (Gunadi, 2009).

The advantage of biofloc technology is that both waste management to control water quality and production of feed are conducted on site. Studies on heterotrophic culture making use of biofloc found that at a density of 100 fish per square meter each, the growth rates of catfish and tilapia are 2.51 % and 2.58 %, respectively, with a total production of 80.6 kg and a catfish survival rate of 94.4% and tilapia at 84.1 %. At the start of the study, the average weight of individual catfish is between 41.01 to 45.94 grams whereas by the end the average weight of individuals has risen to 113.73 to 125.51 grams (Kurniasari, 2010).

Research Methods

This study is conducted at Hatchery UPTD Pembenihan Ikan Ciparay, Bandung from April 2014 to June 2014.

Apparatuses and Materials

Water gallon, fibre basin, blower, heater, aeration hose and stone, pH meter, DO meter, thermometer, scale, fish net, plastic containers, measuring cylinders, plankton net, plankton identification instruments such as microscopes, counting chambers, cover glass, hand counter, pipette, plankton identification classification, Sangkuriang catfish stock measuring 9 to 10 cm weighing 6 to 7 grams, commercial probiotic, commercial fish feed, and molasses.

Research Method

The research method used is experimental with completely randomized design consisting of six treatments and three repetitions.

Treatment A : feed given at default level (control). Treatment B : feed reduced by 5% of default level. Treatment C : feed reduced by 10% of default level. Treatment D : feed reduced by 15% of default level. Treatment E : feed reduced by 20% of default level. Treatment F : feed reduced by 25% of default level.

The parameters observed are Average Daily Gain and Feed Conversion Ratio (Djajasewaka, 1995).

Result and Discussion

Average Daily Gain

Average Daily Gain (ADG) shows the percentage of daily weight gain where higher values equate to increased growth. The observed ADG range of catfish treated with less feed to the control is between 0.26% and 0.32%. Treatment A as control and Treatment F with 25 % less feed does not demonstrate any significant difference in their ADG values. Such lack of difference is due to supplemental nutrition from the biofloc in addition to commercial feed. Biofloc consists of several microorganisms, such as bacteria, fungi, microalgae, and zooplanktons such as rotifer (Figure 1).The microorganisms are natural fish feed containing enough nutrition to meet the dietary needs of the catfish.

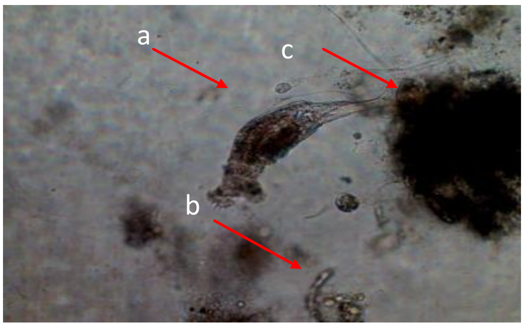

Figure 1. Bioflock (a:Rotifer, b:Alga, c:Flock)

Suprapto and Samtafsir (2013) state that in a fishery environment, biofloc serves as additional source of feed for fish and suppress the growth of pathogens. Biofloc contains polyhydroxy alkanoate (PHA), which when consumed is decomposed by digestive enzymes and forms alkanoic acid capable of reducing the growth of harmful gut bacteria and promotes digestion of consumed feed.

Table 1.

Sangkuriang Catfish Average Daily Gain

Treatment	**Feeding Level**	**Average Daily Gain (%)**
A	Default level	0,32
B	Feed reduced by 5%	0,30
C	Feed reduced by 10%	0,29
D	Feed reduced by 15%	0,26
E	Feed reduced by 20%	0,29
F	Feed reduced by 25%	0,30

Note:Values followed by similar letters shows no significant difference tested using Duncan's Multiple Range Test at 5%.

Feed conversion ratio

Treatment A as control and Treatment F with 25% less feed shows significant difference in its feed conversion ratio. The lowest feed conversion ratio during the period of this study is 0.795 in Treatment F (feed reduced by 25%) whereas the highest is 1.037 in Treatment A (feed at default value).

The feed conversion ratio of each treatment is in order of treatment (Figure 2). Higher feed level equates to higher feed conversion ratio. The reason is because catfish breed using biofloc experiences similar growth rates between treatments and does not show significant difference in weight increase when tested using Duncan's multiple range test. Thus, the lowest feed conversion ratio obtained in Treatment F (0.795) shows the prospect of producing a one kilogram catfish using only 0.795 kilogram of feed.

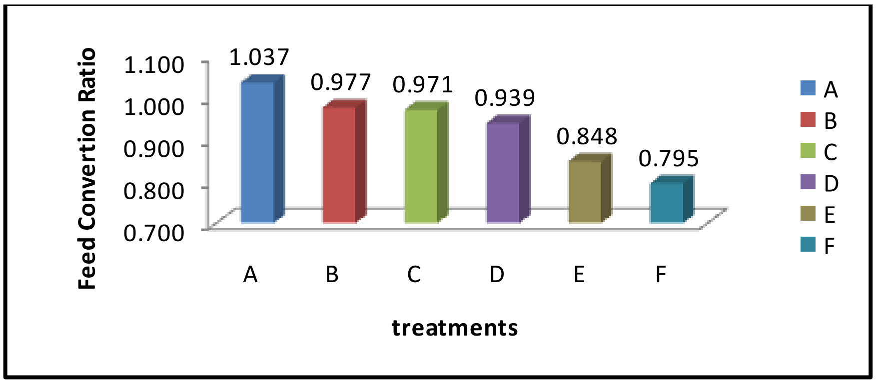

Figure 2. Feed Conversion Value

At the start of this study, the initial feed conversion ratio is deemed satisfactory with values ranging from 1.037 to 0.795 which is in agreement with the findings of Mudjiman (2008), where the feed conversion ratio of fish and shrimp range between 2 to 2.5. It should be noted that lower feed conversion ratio demonstrates efficient feed consumption. Such low conversion value also shows the fish's own ability to efficiently digest and convert the given feed into lean mass.

Conclusion

This study concludes that:

Catfish with reduced and default feed levels shows similar Average Daily Gain (ADG) values.

Catfish breed using the biofloc system and with reduced feed level shows significant difference in its feed conversion ratio.

Reducing catfish feed by 25% is a viable option to reach 0.30% ADG, 0.795 feed conversion ratio, and 90% survivability.

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