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Effects of Water Treated with Bio-disc on Growth Performance of *Clarias gariepinus* Fingerlings (Burchell 1822)

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Abstract

An eight-week experiment examined how Bio-disc-treated borehole water affected water quality and *Clarias gariepinus* fingerling growth. Fish in 20-liter plastic tanks (50cm Ч 40 cm Ч 30 cm) were fed a commercial diet with 40% crude protein twice daily. Each aquarium held 25 fish (average weight of 2.40g). Three replicates were used in four experiments (D1–D4). Per experimental needs, pre-conditioned borehole water was added to the tanks weekly. D2 water was energised with Bio-disc once a week, while D1 water was changed without treatment. D3 water was energised twice a week, and D4 water was thrice, using Bio-disc. The experiment water was energised by running water from the Bio-disc into the tanks for 30–60 minutes. D3 showed the best growth performance, with a weight gain of 27.64 ±0.70g and a specific growth rate of 4.49±0.05 g/d. The D2 and D4 significantly outperformed the control experiment (D1) ($p < 0.05$). D3 has much higher values than others, indicating that Bio-disc water treatment twice a week improves fish growth. Although Bio-disc treatment does not affect water quality, it improves water conditions and fish growth.

Keywords: Bio-disc, water quality parameters, *Clarias gariepinus*, growth performance.

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Introduction

The Nigerian has numerous water bodies like rivers, streams, lakes, reservoirs, flood plains, irrigation canals, and coastal swamps, all of which offer great potential for optimally managed aquaculture production. Water and its quality determine an aquaculture business's (Tower, 2015) ultimate success or failure. Thus, farmers must ensure optimal water quality parameters are maintained throughout the growing season. Water quality affects respiration, feeding, metabolism, reproduction and waste removal from the environment. Good water quality is vital for a healthy pond, river and ecosystem (Aazami *et al.*, 2015). Some basic water parameters must be met for aquatic life to thrive very well in the water. When these conditions are not optimal, aquatic organisms become stressed and ultimately affect the production cycles of the fish (Aiyelari *et al.*, 2007). Poor water conditions may cause the organisms to die. Thus, various water quality parameters need to be assessed to determine the water's health for fish production. Several parameters need to be considered to develop a water quality index, and these parameters can be categorised as physical, chemical, biological and radioactive parameters or heavy metals (Itodo and Itodo, 2010; Ugah *et al.*, 2018). Many physical parameters such as temperature, turbidity, total dissolved

solids, total suspended solids, etc., are used to evaluate water quality. Each of the parameters has a significant impact on the water quality. Dissolved Oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrates, total phosphate, metals, oil and grease are examples of chemical parameters used to determine water quality (Obaroh *et al.*, 2016).

The Bio Disc (Fig 1.) is a natural energy-generating device that produces Scalar energy frequencies with no side effects. The scalar energy is transferred to the water the fish use to carry out their activities. The energy created specifically rejuvenates molecular structures in all liquids. The molecular structure causes any liquid to become more hydrated, taste better and extend shelf life. Bio Disc has been proven to be a booster in the catfishing business and health and significantly affects fish production in Nigeria without any side effects (Arilewo *et al.,* 2019). It is good not only for fish but also for animal health. Most of the problems associated with fish during culture are pronounced in water quality and management; therefore, water problems need to be reduced to improve production (Omer, 2019). Bio discs have been used at home and in industry to induce water quality and address the problems associated with water in the culture medium. Bio-disc performs many functions, among which are improving the taste of all liquids, increasing drinking treated water energy level, increasing body energy level, maximise nutritional benefit, extending the shelf life of all vegetables, fruits and meats, improving wellness, enhancing the immune system, rejuvenate cells, increase blood oxygen level, calms and balances, and assists in pain relief (Obaroh *et al.*, 2016). The Bio-disc energy spins into the liquid counter clockwise, or the liquid picks up the resonance when poured over the disc. The resonance generated is similar to that found in the earth surrounding many healing spring waters of the world (Perven, 2009; Kerunwa and Ariche, 2020).

The effects of bio disc water treatment on the growth performance of *Clarias gariepinus* fingerlings have yet to be well investigated. Hopefully, this study will provide insight into how water quality can be improved technologically by using Bio-disc. Although bio-disc is very expensive, its uses will increase drinking water energy levels, thereby increasing farmers' yield and productivity. Therefore, this study examined the effect of bio disc treatment on water quality and its effects on the growth performance of *Clarias gariepinus*.

Fig.1. Sample of Bio disc

(https://www.nairaland.com/attachments/768863_bio_disc_jpga40573fee3f2a2d0ba60f92b66fa7566)

Materials and Methods

Study area

The experiment was carried out in the Department of Fisheries and Aquaculture Management research laboratory, Faculty of Agricultural Sciences, Ekiti State University, Ado-Ekiti. The university is about 8km from the centre of Ado-Ekiti in Western Nigeria. Ekiti State is situated entirely within the tropics. It is located between longitudes 40°51′ and 50°451′ East of the Greenwich meridian and latitudes 70°151′ and 80°51′ north of the Equator.

Experimental procedure

The 300 fingerlings of *Clarias gariepinus* (mean weight of 2.4g) were purchased from the Department of Fisheries, Ministry of Agriculture, Alagbaka, Akure, Ondo State. The fish were acclimatised for twenty-four (24) hours before the commencement of the experiment. The fish was selected for the experiment because of its high commercial value, growth potential, and difficulty handling. The plastic aquaria tanks of 50cm Ч 40 cm Ч 30 cm were used. Each tank was filled with 20 litres of water. The study was conducted for eight weeks. In a completely randomised design, the fish were randomly selected and stocked in the tank at 25 fingerlings per aquarium. The fish were fed *ad libitum* twice daily between (07.00 – 08.00hr and 17.00 – 18.00hr) with a commercial diet containing 40% crude protein. Each dietary treatment had three replicates. The experimental tanks were examined daily to remove dead fish, if any. Left-over feed and faecal pellets in each tank were siphoned out using Comet Liquid Pump (Camping HQ UK) each week to avoid bad water quality. The water in the tanks was changed to pre-conditioned borehole water every week, subject to each experimental need. The water in the control (D1) was changed once a week, while the water in D2 was energised with a bio-disc once a week. Also, D3 was energised twice a week, while D4 was energised thrice a week with bio-disc. The water for the experiment was energised by running the water on the surface of the Bio-disc into the experimental tanks for 30 – 60 minutes.

Determination of Physico-chemical parameters

The physiochemical parameters of the waters were determined at different stages, from the initial stage (before the introduction of the fish) through to the final stage (at the end of the experiment). The parameters, such as temperature, were measured using mercury in a glass thermometer at the Department of Fisheries and Aquaculture Management research laboratory. The pH, total dissolved solids and conductivity were determined using a (Hanna instrument H19813), and turbidity was analysed using TBN.801 20-1 Shanghai China. In contrast, the dissolved Oxygen (DO) was determined using the method of AOAC (2005) at the Department of Microbiology Laboratory, Ekiti State University, Ado-Ekiti.

Growth performance

Fish weight gain, specific growth rate and mortality were determined. The initial and final mean weights per treatment were computed as follows:

Weight gain = Final weight of fish - Initial weight of fish

The specific growth rate (SGR) was calculated with the formula:

SGR (% per day) = $\ln W_2 - \ln W_1$ Ч 100 (1) / $T_2 - T_1$

Where:

W_2 = Weight of fish at time T_2 (final)

W_1 = Weight of fish at time T_1 (initial)

T_1 = Initial time of the experiment and

T_2 = Final time of the experiment.

Mortality (M) was calculated as

$M = (N_0 - Nt)$ Ч 100 % $/N_0$

Where:

N_0 = number of fish at the start of the experiment

Nt = number of fish at the end of the experiment

Statistical Analysis

The data describing the growth performance and the water quality parameters collected from the experiment were subjected to one-way analysis of variance (ANOVA) using SPSS version 23 and Duncan Multiple Range Test to test for the significance level at $p<0.05$.

Results and Discussion

Physico-chemical parameters

Water quality affects the general condition of the cultured organism as it determines its

health and growth conditions. Table 1 presents the physico-chemical parameters of the experimental water. The results indicated no significant difference ($p>0.05$) in the values obtained for dissolved Oxygen. This shows that bio disc produced no significant effect on the dissolved Oxygen, but the dissolved Oxygen is high enough to sustain the fish. The values agreed with (Boyd, 1982 and (Swann, 2010), were reported to be within the range of good for the survival of aquatic organisms.

The result of the temperature during the experiment shows that the D1 is significantly higher ($p> 0.05$). However, the other experiments have no significant difference ($p>0.05$); other experiments are lower due to the constant water change. This shows that bio disc reduces the temperature, but the values remain within the recommended range for aquaculture (David, 2012).

The pH result shows no significant difference ($p>0.05$) in the values obtained for pH, and this shows that Bio disc does not affect the pH. The values are within the normal range to sustain the fish (David, 2012). The pH of water refers to the hydrogen ion concentration present in water. It ranges from 0 to 14. Water pH seven is considered neutral, while a lower one is called acid.

The result of the conductivity shows that there is a significant difference ($p>0.05$) in the control (D1) compared to D2 and D3, which are not significantly different ($p>0.05$) from each other. At the same time, D4 shows a significant difference ($p>0.05$) compared with the control. The value obtained was higher in D4 and much lower in D1. This shows that bio disc impacts more energy in terms of oxidation state and mobility of ions in the water, which increases the water conductivity. The result agrees with [15], who reported that the deep reservoirs' conductivity, dissolved Oxygen, and pH were within the World Health Organization (WHO, 2003) acceptable limit.

The result shows that the total dissolved solid is significantly higher in D2 and D4 but much lower in D1. Generally, the total dissolved solid (TDS) of the water used for the experiment is low and has no detrimental effect on the fish. The values agree with [16] that the values of TDS in most natural water range between less than 30 and 600mg/l.

The recorded turbidity values during the experiments were highest in D2 and lowest in D3. This shows that water in D2 gets cloudier than other treatments, though; it has no adverse effect on the dissolved Oxygen but affects the total dissolved solid, especially in D2. The water quality parameters required by aquatic organisms in any culture media could be improved by constant water exchange in the culture media at optimal levels
.

Table 1. Water quality parameters of the experiment

Parameters	D1 (Control)	D2	D3	D4
Dissolved Oxygen (mg/l)	7.4±0.10	7.29±0.02	7.33±0.04	6.43±0.07
Temperature (^{O}C)	$25.33±0.16^{b}$	$22.54±0.29^{a}$	$22.67±0.06^{a}$	$22.54±0.06^{a}$
pH	6.66±0.01	6.64±0.03	6.62±0.01	6.66±0.03
Conductivity (S/m)	$0.095±0.01^{a}$	$0.109±0.01^{ab}$	$0.105±0.01^{ab}$	$0.109±0.01^{b}$
Total dissolved solids (mg/l)	$67.42±1.32^{a}$	$79.65±1.02^{b}$	$76.27±0.83^{ab}$	$77.96±0.91^{b}$
Turbidity	$6.16±0.11^{ab}$	$7.59±0.10^{b}$	$6.85±0.10^{a}$	$6.42±0.10^{ab}$

The mean ± standard error values with the same superscript along the same row are not significantly different ($p<0.05$).

Growth Performance

The results of the growth performance of the fish are presented in Table 2 and Fig 2. The results show that D2 to D4 are significantly higher than the control (D1) ($p<0.05$), but

the values obtained were much higher in D3 than the others (Table 2). The results show that treatment of water with Bio-disc twice a week proves to be more effective in the growth performance of the fish (Fig 2). The changing of water or treatment of water with Bio-disc more than that which resulted in lower result in weight gain could be attributed to stress that may likely affect the fish growth; however, the lower reading of growth recorded in D2 could be attributed to a reduced level of scalar energy impacted into the water from the Bio-disc on the weight gain. D3 was significantly higher ($p<0.05$) than other experiments. Still, the control experiment was very low, which shows that treatment of water with Bio-disc twice a week produces more scalar energy and is more effective in the growth performance of the fish, as reported by (Jamabo *et al.*, 2016). The finding in this study agrees with Robert (2004) that the specific growth rate of organisms increased when amply supplied with favourable nutrients. Specific growth rates follow the same trends as observed for weight gain. Diet three is significantly higher ($p>0.05$) than other experiments. In contrast, the specific growth rate in the control experiment was very low, which shows that treatment of water with Bio disc twice a week produced more scalar energy and was more effective in the growth performance of the fish. The specific growth rate recorded in the study ranged between 3.62±0.10 and 4.49±0.09 which is higher than that of Ajiboye *et al.*, (2015), who reported a range of 1.99 ± 0.18 to 2.26 ± 1.16 for *Clarias gariepinus*, and similar to the report of Jamabo *et al.*, (2016) The differences recorded in this study could be attributed to the condition factor, water quality parameters and the effect of the scalar energy imparted by the Bio-disc on the culture media
.

Table 2. Growth performance of *Clarias gariepinus*

Parameters	D1(Control)	D2	D3	D4
Initial weight(g)	2.37±0.03	2.33±0.01	2.43±0.05	2.48±0.08
Final weight(g)	18.07±0.39^{a}	27.83±0.86^{b}	30.07±0.70^{c}	26.80±3.10^{b}
Weight gain (g)	15.70±0.43^{a}	25.49±0.86^{b}	27.65±0.70^{c}	24.32±3.18^{b}
Specific Growth Rate(g/d)	3.62±0.10^{a}	4.42±0.10^{b}	4.49±0.09^{b}	4.23±0.44^{b}

The mean ± standard error values with the same superscript along the same row are not significantly different ($p<0.05$).

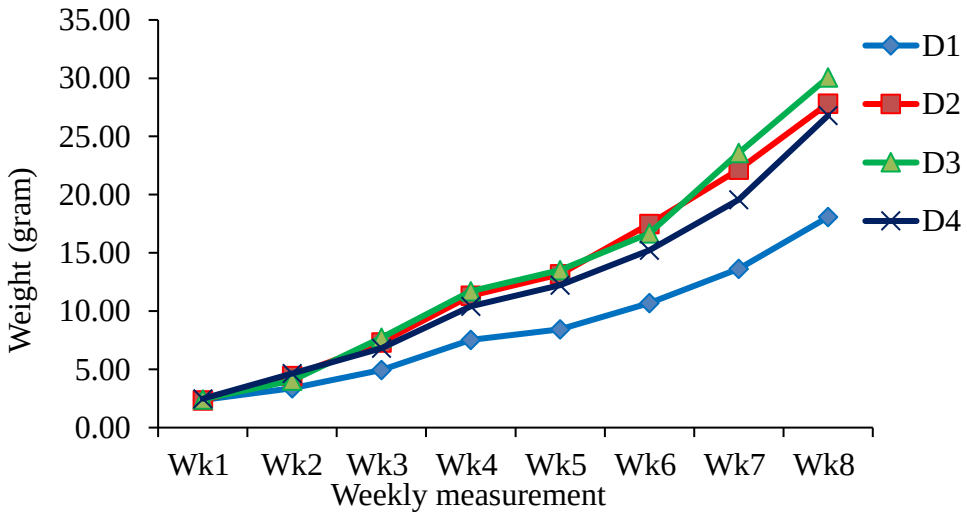

Fig 2. Growth pattern of the fish during the experiment

The percentage mortality rates during the experiment

During the experiment, D4 had the highest mortality (38.67%), followed by D3 (37.33%) and D2 (34.67%), while the lowest mortality was recorded in D1 (30.67%). The highest mortality rate observed in D4 could be attributed to stress due to changing water that may likely affect the fish growth, while D1, with the lowest mortality, may be due to less stress. This finding agrees with the reports of Shahu, (2019) and Shirlie, (2022) that ample water changes by more than 60%, rinsing gravel, and cleaning filter media lead to a complete, massive change in the water chemistry and fish put in these new conditions may likely experience temperature shock, stress, loss of appetite, and then death. The high mortality observed in D2 to D4 compared to D1 could also be attributed to the continuous interference with the dynamics of the tank water due to frequent disturbances and possible changes in water quality, as observed by Okomoda *et al.*.(2016). In this study, handling stress must have been responsible for the low performance of fish in treatment D4 with water continually renewed.

Conclusion

The present study revealed that the water quality and the growth performance of *Clarias gariepinus* reared in aquaria tanks with Bio-disc treatment increase their appetite and consequently improve the growth of the fish. It can be deduced that water treatment with Bio disc improves the water condition w0hich, resulting in higher growth performances. Although bio-disc is very expensive, it will increase drinking water energy levels, increasing farmers' yield and productivity. It will be necessary for public interest that further research be carried out in the state's water treatment system.

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