

INFLUENCE OF DIETARY SUPPLEMENTATION OF GARLIC (*Allium sativum*) ON SOME PERFORMANCE INDICES OF *Oreochromis niloticus* FINGERLINGS RAISED IN PLASTIC TANKS

Umaru, J*, Sadauki, A. M* and Nababa, A. S*

* Department of Fisheries and Aquaculture, Federal University Dutsin-Ma

Correspondence Author's Email: umarujoel@gmail.com/08137121106

ABSTRACT

The study was carried out for three (3) months to determine the effect of dietary supplementation of Garlic (*Allium sativum*) on some performance indices of *Oreochromis niloticus* fingerlings. Fish fingerlings (mean weight 5.8g) were randomly distributed into four triplicate treatment groups in twelve plastic tanks (80 lit) at a stocking density of ten (10) fish per tank. Garlic powder was supplemented in the diet of the treatment groups; 0g (control, C), 10g (T₁), 20g (T₂) and 30g (T₃). Water quality parameters were regularly monitored. The growth performance and nutrients utilization of *C. gariepinus* fingerlings between probiotic treated groups were significantly increased ($P < 0.05$) with increasing dosage of garlic powder. The best final mean weight (85.5g), mean weight gain (77.9g), percentage mean weight gain (1403), feed conversion ratio (1.46) and protein efficiency ratio (1.46g), was recorded in garlic treatment group T₃ (30g/kg). Garlic powder is recommended for inclusion in diet of *Oreochromis niloticus* fingerlings at 30g/kg.

Keywords; Garlic, performance indices, *Oreochromis niloticus*

Introduction

Fish is very important to humans due to the quality of protein it has as well as the essential amino acid which is required by the body for growth and maintenance of muscle tissue (FAO, 2020). Fish culture has become an important industry and also one of the world's fastest growing sector of Agricultural business (FAO 2020). Tilapia (*Oreochromis niloticus*) is an important and economical freshwater fish that are reared widely and considered one of the most commonly produced fish after *Clarias gariepinus* in Nigerian (Bolorunduro, 2016). It is more resistant to disease factors than other fish species especially with intensive culture (Hemat *et al.*, 2017). One of the major challenges to increase fish production in the developing world, including Nigeria, is the improvement of production efficiency, which is hampered by low digestibility and poor feed conversion efficiency of local feeds (Bolorunduro, 2016). Gabor *et al.* (2010) stated that the use of phytoadditives in fish feed stimulates fish appetite and also improve the nutritional value of the diet.

Feed additives especially immunostimulants, example Garlic (*Allium sativum*), could improve immunity of cultured fish species thereby increasing survival rate, enhance the utilization of feed and improved growth performance without adverse effects on both the farmed fish and its environment (Hemat *et al.*, 2017). In addition, it also contains some vitamins and macro minerals and trace elements (selenium & germanium). As a result, the goal is to see how food supplementation with *Allium sativum* affects some performance indices in *Oreochromis niloticus* grown in plastic tanks.

MATERIALS AND METHODS

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Formulation of experimental diets

The ingredient/proximate composition of the experimental diet is presented in Table 1. The basal feed comprising standard amounts of fish meal, yellow maize, soybean meal, vegetable oil, salt, vitamin premix and starch, was formulated according to Pearson square method with pre-determined values of 32% protein content. The pellets were dried at ambient temperature (27 -30°C).and stored in airtight jars at room temperature. Proximate composition of experimental diets were determined according to AOAC method (1990).

Experimental design

Complete Randomized Design (CRD) was used in setting up the experiment comprising of twelve plastic tanks (80 litres capacity). The experiment was conducted for three (3) months, on *Oreochromis niloticus* fingerlings ($n = 120$). One hundred and twenty fingerlings of *Oreochromis niloticus* were randomly distributed into four triplicate groups of 10 fish each: Control, C, and treatment groups comprising T_1 , T_2 , and T_3 corresponding to 10g, 20g and 30g supplementation of garlic powder respectively. The physico-chemical parameters (water pH, temperature, electrical conductivity and dissolved oxygen) were determined using LaMotte fresh water aquaculture test kit (Model: AQ-2, Code 363303).

Determination of Growth performance and nutrient utilization

Growth parameters were calculated according to Panasea *et al.*, (2018): as shown below;

Mean body weight Gain: Weight gain was determined between the final weight and initial weight of experimental fish.

Weight gain = Final weight -Initial weight

Mean Percentage Weight Gain:

The percentage (%) weight gain was determined as follows;

$$MPWG = \frac{\text{Mean weight gain}}{\text{Mean initial weight}} \times 100$$

Feed Conversion Ratio:

This was calculated using the formula

$$FCR = \frac{\text{Feed fed}}{\text{Fish weight gain}}$$

Mean Protein Intake:

$$\text{Where protein intake (g)} = \frac{\text{Protein (\% in feed)} \times \text{total weight (g) of diet consumed}}{100}$$

Data Analysis

All data collected were subjected to One way analysis of variance (ANOVA) to test for significant differences among treatments using IBM SPSS version 23, followed by Turkey's' Post-Hoc test which



was used to separate significantly different means. The level of significance set for treatments was $P \leq 0.05$.

Table 1 Ingredients/proximate composition of formulated diets (% Dry weight)

Ingredients	Control(0g)	T1(10g)	T2(20g)	T3(30g)
Fish meal (75%)	2.6	2.6	2.6	2.6
Soybean meal (44%)	2.7	2.7	2.7	2.7
Wheat brand (16.4%)	47.1	47.1	47.1	47.1
Yellow Maize (10%)	47.1	47.1	47.1	47.1
Cassava	2	2	2	2
Vitamin premix (a)	1.5	1.5	1.5	1.5
Mineral premix (b)	1.5	1.5	1.5	1.5
Garlic (g)	0	10	20	30
Total	100	100	100	100
Dry Matter	94	94	94	94
Crude protein	31.53	31.53	31.53	31.53
Crude fiber	1.19	1.19	1.19	1.19
Oil	4.69	4.69	4.69	4.69
Ash	8.04	8.04	8.04	8.04
Nitrogen free extract	45.10	45.10	45.10	45.10

Results

Within the garlic treatment groups as presented in Table 2, growth performance and nutrients utilization significantly increased with increase concentration of the garlic supplementation. The highest final meanweight (85.5g), (77.9g) and mean gain (1403%) were recorded in T3(30g/kg). Similarly, the best mean protein intake (508.3g), feedconversionratio (1.46) and protein efficiencyratio (2.5g), was recorded in T3. Similarly, survival rate of *Oreochromis niloticus* fingerlings was highest (95.5%) in T3.

Table 2 Effects on garlic (*Allium sativum*) supplementation on growth performance and nutrient utilization of *Oreochromis niloticus* fingerlings fed with experimental diets

Parameters	Control(0g)	T1(10g)	T2(20g)	T3(30g)
IMW(g)	5.6±0.09 ^a	5.9±0.26 ^a	5.6±0.07 ^a	5.5±0.20 ^a
FMW	60.5±2.62 ^c	70.0±1.42 ^b	73.8±0.47 ^b	85.5±2.54 ^a
MWG	53.3±2.45 ^c	62.1±1.38 ^b	66.2±0.53 ^b	77.9±2.39 ^a
PMWG	1075±45.5 ^d	1142±42.4 ^{cd}	1242.1±18.0 ^{bc}	1403±26.0 ^{ab}
MPI(g)	407.5±2.89 ^d	427.6±11.50 ^{cd}	485.4±5.78 ^{bc}	508.3±4.62 ^{bc}
FCR	1.63±0.02 ^a	1.52±0.04 ^{abc}	1.57±0.01 ^{ab}	1.46±0.00 ^c
%SURV.	88.9±2.20 ^c	91.1±2.20 ^c	93.3±0.00 ^{ab}	95.5±2.23 ^{ab}

IMW (Initial Mean Weight), FMW (Final Mean Weight), MWG (Mean Weight Gain) PMWG (Percentage Mean Weight Gain), MPI (Mean Protein), FCR (Feed Conversion Ratio) %SURV. (Percentage Survival)

Discussion

Growth performance and nutrients utilization

Supplementation of garlic in the diet improved growth and nutrient utilization of *Oreochromis niloticus* fingerlings than the control group. This agrees with Samson (2019) who reported a better growth, feed

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utilization, and survival rate of *Oreochromis niloticus* fingerlings fed garlic supplemented diet compared to the control. Similarly, Pashaki *et al.* (2018) observed significantly better FCR from *Cyprinus carpio* fingerlings fed with garlic extract supplemented. According to Khalil *et al.*, (2001), garlic powder contains allicin, which stimulates intestinal flora, leading to better digestion and utilization of energy that can result in improved growth. However, this result contrasts with Samson (2019), who observed a decrease in FCR with increasing garlic dosage. All garlic treatment groups recorded higher survival rates compared with the control. Several studies reported *Clarias gariepinus* (., Thanikachalam) that the inclusion of garlic in the diet of the cultured animals including *Oreochromis niloticus* (Aly *et al.*, 2008), *et al.* 2010 and *Carassius auratus* (Dadgar *et al.*, 2019) improved survival rate. Higher survival rates of garlic powder-supplemented treatments may be that, consumption of garlic results in immune stimulation and increase in fish resistance to diseases due to the presence of compounds such as vitamin A, vitamin C, and allicin (Khodadadi *et al.*, 2013).

Conclusion and recommendation

Garlic supplementation in the diet improved growth, nutrient utilization and survival of *Oreochromis niloticus* fingerlings than the control group. Similarly, dietary supplementation of garlic at 30g/kg is recommended for *Oreochromis niloticus* culture.

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