EFFECT OF OXYTETRACYCLINE ON GROWTH, ORGANOSOMATIC INDICES AND HISTOPATHOLOGICAL STUDIES ON JUVENILE *CLARIASGARIEPINUS*

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Abstract

The use of antibiotics as growth promoters have been reported to be of high prevalence among cat fish farmers in Nigeria due to high stocking density and prevalence of diseases. Several antibiotics have been used, but the most common is oxytetracycline due to its broad –spectrum activity. Its utilization is subject to various abused and uncontrolled dosages. Therefore this study evaluates the effect of oxytetracycline on growth, organosomatic indices and histopathological studies on juvenile Clariasgariepinus. The healthy juvenile (n=20, mean weight 10.94± 0.01) were randomly sorted, weighed and stocked into the experimental tank in triplicates using completely randomized design. The fish were fed at 5% body weight twice daily for 84 days. The result showed improved rearing indices such as total weight gain, mean weight gain, and specific growth rate among the fish feed experimental diet. There was significant variation within the organosomatic indices among treatments. Histopathological examination of the liver of C. gariepinus showmild diffuses vacuolation, with portal and central venous congestion with promiment melanomacrophage center. This result showed the efficacy of oxytetracycline as growth promotant, but its affect the health integrity of the fish due to promolong exposure

Key words: Aquaculture, fish medicine, catfish, growth promotant, dosages

Introduction

Fish farming is a rapidly growing industry worldwide. This increase has led to a concomitant increase in aquaculture intensity methods, which increase the susceptibility to disease outbreaks and the necessity to the use of medicated diet. (Jerbi *et al*., 2011). But the most dangerous is that, a large proportion of the worlds antimicrobial industrial production is used as prophylactics and as growth promoters that far outweigh their use as therapeutics (Bush *et al* 2011 and Cabello et al 2013). Especially, antibiotics are still used until now as growth promoters in some farms in Nigeria. Oxytetracycline has been widely used in aquaculture as therapeutic and prophylactic agent because of its broad –spectrum activity (USFDA, 2009). In Nigeria, the administration of veterinary drugs in food animals including fish is characterized by indiscriminate use without appropriate veterinary supervision, regulation and control to protect the consumers. Furthermore, the difficulty in calculating the appropriate dose of the antibiotics and drug misuse has posed a threat to human and animal's health, and environmental safety. However, despite the unabated use of the antibiotics in fish culture, there are paucity of data on the effect of prolonged use of oxytetracycline on growth, organosomatic indices and histopathological examinations in *Clariasgariepinus*. Therefore the present studies determine the effect of oxytetracycline on growth, organosomatic indices and histopathological studies.

Materials and methods

Study area: The study was carried out at the Department of Aquaculture and Fisheries Management's Teaching and Research Laboratory, University of Ibadan, Ibadan, Nigeria.

Formulation and preparation of experimental diets: The experimental diets were formulated using algebraic method (Adewole 2014). The diets were prepared with Oxytetracycline at the inclusion levels of 0.0, 0.1 and 0.5% based on the reported dosages from (Ahmad and Matty, 1989); and coded as TCC1 (Control), TCC2 and TCC3 respectively, following the methodology of Adewole, (2014) as shown in Table 1.

Table 1: Percentage composition of ingredients (g/100g diets) in tetracycline meal diets for feeding trial

Ingredients	TCC1(Control)	TCC2	TCC3
Fishmeal	28.55	28.55	28.55
Soybean meal	20.93	20.93	20.93
Groundnut cake	20.71	20.71	20.71
Yellow maize	20.76	20.66	20.26
Vegetable oil	2.50	2.50	2.50
Vitamin/mineral premix	1.50	1.50	1.50
Cassava starch (binder)	1.50	1.50	1.50
Common salt	0.50	0.50	0.50
Bone meal	1.00	1.00	1.00
Carboxyl/methylcellulose	2.00	2.00	2.00
Chromic oxide	0.05	0.05	0.05
Inclusion levels of Tetracycline	0.00	0.10	0.50
Total	**100**	**100**	**100**
Calculated crude protein	**40.00**	**40.00**	**40.00**

TCC =Tetracycline

Stocking of experimental fish and Experimental design: The healthy juvenile of *Clariasgariepinus*(n=20, mean weight 10.94± 0.01) were randomly sorted, weighed and stocked into the experimental tank in triplicates using A Completely Randomized Design. The fish were feed at 5% body weight twice daily for 84 days.

Sampling and Data collection: The length and weight of each fish in each tank was measured at following the standard method of Adewole and Awosusi, (2015). The data generated were analysed statistically using Analysis of Variance (ANOVA) at $\alpha_{0.05}$. and descriptive statistics following Statistical Analysis System (SAS, 2008) model, to determine the changes in growth rates.

Determination of organosomatic indices and Histopathological examination: The various organs from the fish samples were dissected, weighed and use to computed the organosomatic indices according to Adewole and Awosusi, (2015). Histopathological analysis was carried out following method of Roberts (1978).

Results

Growth performance and organosomatic indices of *Clariasgariepinus* fed tetracycline meal diets

The experimental fish did utilize the diets at the varying levels with significant variations in some of the growth parameters as shown in Table 2. Total Final Weight (TFW) attained ranged from 601.57 ± 21.23g to 1121.33 ± 27.33g. The highest value was from fish fed TCC2 diet and the lowest value was from the control diet. Mean Final Weight, Mean Weight Gain, Specific Growth Rate values ranged from (37.60±1.33g to 70.08±1.71g, 0.52±0.02 to 0.85±0.06%/day, 175.07±9.18(%/fish) to 412.03±12.48 (%/fish) ,690.08±10.99 to 2698.82±41.49 respectively) obtained across the treatments followed the same similar trend as in the total final weight (Table2). Cardiosomatic indices for the fish fed the experimental diets ranged from 0.10 ± 0.01 to 0.25 ± 0.01%. The highest value was from TCC2 diet, while the lowest value was from TCC3 diets. The fish fed the control and TCC2 diets had significantly higher ($p<0.05$) cardiosomatic indices than TCC2 diet (Table 3). All other organosomatic indices and fat deposit index showed significant ($P<0.005$) differences within the treatments and when compared with the control (Table 3). The transverse sections of the liver, of fish fed tetracycline meal (TCC2) diet, showed mild diffuse vacuolation, with portal and central venous congestion with promiment melanomacrophage center as shown in (Plate 1).

Table 2: Growth parameters of *Clarias gariepinus* fedTetracycline meal diets for 84 days.

PARAMETERS	TCC1	TCC2	TCC3
Initial total weight (g)	218.67 ± 0.44	219.00 ± 0.00	218.67 ± 0.33
Mean initial weight(g/fish)	10.94 ± 0.02	10.95 ±0.00	10.93 ±0.02
Total final weight (g)	601.57±21.23^{c}	1121.33±27.33^{a}	1022.17±10.81^{b}
Mean final weight (g/fish)	37.60 ±1.33^{c}	70.08 ±1.71^{a}	60.11±0.63^{b}
Total weight gain(g)	382.90±20.80^{c}	902.33±27.33^{a}	803.50±10.50^{b}
Mean weight gain(g/fish)	23.93±1.30^{c}	56.39±1.71^{a}	47.30±0.59^{b}
Specific growth rate (%)	0.52±0.02^{b}	0.87±0.01^{a}	0.85±0.06^{a}
Relative growth rate(%/fish)	175.07± 9.18^{c}	412.03±12.48^{a}	367.44±4.29^{b}
Fish Productivity Index	690.08±10.99^{c}	2698.82±41.49^{a}	2316±35.94^{b}
Initial condition factor	0.48 ± 0.01^{b}	0.44±0.03^{c}	0.58±0.01^{a}
Final condition factor	0.69±0.03^{a}	0.85±0.03^{a}	0.79±0.04^{a}
Number cropped	16.00±0.00^{b}	16.00±0.00^{a}	17.00±0.00^{a}
Survival (%)	80.00±0.00^{b}	80.00±0.00^{b}	85.00±0.00^{a}

Table 3: *Organosomatic indices of Clarias gariepinus fed tetracycline meal diets for 84 days*

PARAMETERS	TCC1	TCC2	TCC3
Cardiosomatic index	0.21±0.02^{a}	0.25±0.01^{a}	0.10±0.01^{b}
Hepatosomatic index	0.87±0.19^{b}	1.01±0.01^{b}	1.64±0.09^{a}
Renosomatic index	0.21±0.02^{b}	0.37±0.01^{b}	0.44±0.03^{a}
Visceral somatic index	2.32±0.30^{b}	0.37±0.01^{c}	3.06±0.17^{a}
Brain somatic index	0.62±0.05^{b}	0.87±0.01^{a}	0.45±0.03^{c}
Fat deposit index	2.73±0.23^{a}	2.13±0.01^{a}	0.89±0.23^{b}

Discussion

The fact that weight gain was reported in all the treatments was an indication that the fish responded positively to all the diets. Since the protein and energy contents of the experimental diets were adequately catered for to supply growth and energy of the fish. These further justify the term growth promotants used for/ as feed additives other than dietary nutrients which increase animal's growth rate. This corroborates the documented report of the beneficial effect of antibiotics on growth performance of farm animals (Jamorz. *et. al.*, 1998) and fish (Osineye et. al., 2015). In the present study the inclusion levels of Tetracycline (TCC) diets appeared to be an important factor influencing growth performance, organo-somatic indices and histopathological effects. Analysis of data from biometrics examinations of fish has been very useful in growth studies and estimation of physiological state of fish (Lagler, 1956). While organ/tissue biometry may indicate sub-optimal physiological status at an early stage. The organo-somatic indices of the *C. gariepinus* fed Tetracycline diets in the present study, showed that the cardio-somatic index was not dose dependent, and exhibited fluctuation with the increase in dosages of tetracycline. The present result findings is in line with (Love and Matty, 1980) that increases in growth brought about by the administration of drugs were without any effect on apparent general health of the fish or on somatic indices, could only be justified on the cardio-somatic index, which decreases at the highest concentration of tetracycline, but other somatic indices were reverse of the cardio-somatic index in *C. gariepinus* fed tetracycline diets. The results obtained here were lower (0.20-1.12 %) Sogbesan, (2007) who fed catfish skinned tadpole meal. The HSI obtained in the present study showed significantly high hepato-somatic index at the highest dose compared to the control, indicated that these organs (liver become enlarge which could have been as a result of toxicity of the drug or deposition of fat, the liver could not metabolized. Although the values obtained were similar to Ahmad and Matty (1989) who fed Carp two different graded levels of antibiotics at High Protein (HP) levels, but lower to values obtained from carp fed the same drug but with Lower Protein (LP) content. The renal-somatic index showed significantly higher value as the dosage increased compared to the control, indicating that the fish kidneys/organs were enlarged; this could be as a result of possible nephrotoxic effect of the drug. The values of RSI obtained here were lower (0.44±0.06 – 0.65±0.07) (Ahmad and Matty, 1989) fed carp with two antibiotics at HP content, while the result (0.35±0.03 – 0.42±0.03) was similar to Carp fed the same antibiotics but with

LP content.

The significantly high viscero-somatic index in fish fed TCC's diet at the highest dosage compared to the control indicated that these organs became enlarged; this may be due to the effect of the drug on the gross morphology or histology of the intestinal wall. The values of VSI obtained in the present studying were lower (3.69±0.13 – 3.85±0.22; 3.32±0.14 – 3.37±0.21) (Ahmad and Matty, 1989) who fed Carp with Virginiamycin, Tetracycline drugs, with HP contents and 2 antibiotic drugs at LP content. Cerebro-somatic index (CBI) showed fluctuations as the dosage of tetracycline increases. Although the tested (TCC2) diet had significantly higher CBI values compared to the control, this may be due to possible effect on the brain of the fish.

The liver plays a key role in the metabolism and biochemical transformation of pollutants from the environment, which inevitably reflects on its integrity by creating lesions and other histopathological alterations of the liver parenchyma or bile duct (Roberts,1978).Therefore the result of histopathological examination of *C.gariepinus* fed Tetracycline meal diet (TCC2) showed mild diffuse vacuolation, with portal and central venous congestion and prominent melanomacrophage centres which may not be unconnected with the effect of the antibiotics administered to the fish.

Fish hepatocytes are a good indicator of dietary quality (Hibiya, 1982; When fish are in bad condition from poor nutrition, melanomacrophages and lipopigments are formed in hemopoietic tissue (Kugler *et. al.*, 1987). Hepatic dysfunction is a common repercussion of oxytetracycline treatment in vertebrates. In several species, oxytetracycline administration causes acute hepatocellular injury that is often associated with intracellular fat deposition and cytoplasmic alteration (Weinstein, 1970).This result from the present study showed that tetracycline may be toxic due to prolonged administration to *Clariasgariepinus* based on the above submissions.

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