

GROWTH OF AFRICAN CATFISH, Clarias gariepinus (Teuglas) EXPOSED TO DIFFERENT DIETS OF VARYING HORMONE TYPES

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ABSTRACT

Replicates of Clarias gariepinus fingerlings were fed for 8 weeks on diet either treated with toad pituitary extract (TPE), synthetic hormone (SH), Clarias gariepinus pituitary extract (CGPE) or none (Control). Growth rate and food utilization in the different groups were compared. Results revealed that the best growth, parentage weight gain, specific growth rate, and apparent net protein utilization were obtained with the CGPE diet. The best food conversation ratio and protein efficiency ratio were obtained with TPE diet. There was no significant difference ($P>0.05$) in growth of all the treatments and within the weeks. The purchase of synthetic hormone just to accelerate growth rate and achieve greater increase in weight is ill-advised. The use of toad pituitary extract (TPE) is more economical than the use of C. gariepinus pituitary (CPE). It is also cheaper.

KEY WORDS: Clarias gariepinus, Hormones, Toad.

INTRODUCTION

Hormones have a variety of effects, some of which are potentially beneficial in culturing fishes. Sex hormones have been shown to effect growth. Yashaur and Eskstein (1965) observed that intramuscular administration of the female hormone, ethynlestradiol caused growth retardation, heavy mortalities and retardation of gonodal development in fish. Ashby (1957) observed that oestradiol in diet led to growth retardation of gonodal development in fish. Similarly, growth promotion effect of oestrogens was observed with diethylstibiesterol when fed Pleuroneds plates (Coway *et al.*, (1973).

The role of hormones in fish breeding has been documented. Huisman and Richtar (1987) carried out induced breeding in Clarias gariepinus using carp pituitary suspension, human chorionic gonadotropin and 17 x Phydrocy-protesterone (17 x P) respectively. Britz and Hecht (1988) used fish pituitary sources because of the relative ease of procurement (Ebietomiye and Ojo, 1982, Adigun *et al.* 1983). The fist breeder is still interested in cutting cost and as such both frogs and toads which have presently be experimented as substitute for fish meal can be utilized (Annune, 1991) at no cost.

This work therefore attempted to:

- a. Investigate the growth changes in Clarias gariepinus fed with diets with varying hormone types. The African common toad, Bufo regularis, synthetic hormone, and pituitary extract of Clarias gariepinus,
- b. Monitor the degree of stress imposed on the test fish by the diet through measuring Erythrocyte sedimentation rate (ESR) and packed cell volume (PCV) and
- c. Determine the diet that combines cheapness with availability with respect to the hormone type.

METHOD

C. gariepinus fingerlings of approximately equal weight (20g) were selected from samples collected from, River Kaduna. Physical injury was avoided during collection. Also the temperature of the water in the tank conveying the fish was regulated and maintained at 25°C with ice blocks or chips to avoid stress that might be caused by rise in temperature. The fish were kept in plastic tanks in the Biology Laboratory of Nigerian Defence Academy, Kaduna. Dechlorinated tap water was used for acclimation and oxygen supply maintained by the use of electric pumps. Acclimation lasted fourteen days. During acclimation, pelleted diet was used to feed the fish twice daily with a total of 3%. Four diets were composed and labeled A, B, C, D using Pearson-square methods, as shown in Table 1. The differences in the diets were found in the addition of hormonal extracts. Toad pituitary extract (TPE) was implicated in diet A; synthetic hormone (SH) was implicated in diet B; and pituitary extract of *C. gariepinus* (CGPE) was implicated in diet C. There was no hormone in diet D which was fed the fish and control tank. The synthetic hormone (methyltestosterone) was added at the rate of 5mg (dissolved in 95% alcohol) per 1kg of diet. The pituitary gland of toad, *Bufo regularis* and *Clarias gariepinus* were dissected out as described below. The hormones and vitality were additives (5mg/kg for hormones and 5mg/100g for vitality in all diets).

The toads were harvested from a neighboring pond in Rigasa, Kaduna North. They were weighed live using a mettler toploading balance (Gallenkamp model) after partial immobilization. The animals weighed 95 ± 4 g. After weighing, the animal was killed by a blow on the head using a wooden mallet. Hypophyses were extracted from the donor animals, dehydrated using acetone followed by drying (Vineen *et al.*, 1985); packed into paraffin-sealed glass specimen bottles, and stored in a desiccator in the presence of calcium chloride (CaCl_2) as absorbent. The hormones were implicated in the diet at the rate 5mg methyltestosterone crude extract per 1kg of diet. The mixed components shown in Table 1 were used to produce pelleted diets which were analysed for moisture, ash, protein, fat and nitrogen free extract (NFE) using standard methods of Association of Official Analytical Chemists (AOAC, 1980).

For the bioassay tests, four plastic tanks were filled with 20 litres of dechlorinated tap water. Into each tank were placed ten acclimated fingerlings of *C. gariepinus* of almost same weight (<20g). They were labeled tanks 1,2,3 and 4. The mean weight of the fish in each tank was taken. The experiment was triplicated making a total of twelve tanks. Tank 1 fish were fed with diet containing pituitary extract of *C. gariepinus* (CGPE). While tank 4 (Control) was fed with diet without hormone. The test fish were weighed weekly and fed twice daily on 3% body weight of feed pellets. The weight change experiment lasted eight weeks. Before this, fish were collected with a scoop net and anesthetized in benzocaine solution (Ufodike and Matty, 1983). The solution was prepared by pre-dissolving 0.1g of benzocaine power (Ethyl-p-aminobenzoate) in 1ml. of ethanol since it is insoluble in water this was then turned into 5 litres of water at a similar temperature as that contained in the experimental tanks. This prevented thermal stress in the fish. Anesthetization took place until the fish just stopped active movement but were still breathing (Kloutz and Smith, 1968). While still under anesthesia, the fish were quickly removed, dried by blotting with a damp soft tissue paper and the weight determined.

At the start of the experiment, the following were determined: Packed cell volume (PCV) 33%, Erythrocyte Sedimentation Rate (ESR) (19mm/h), laboratory temperature (25°C), pH of the water in the tank (7.8) and dissolved oxygen (5.4mg^{-1}) of the water in the tanks. While PCV and ESR were determined only at the start and at the end of the eight-week, the others were determined on the weekly basis. Carcass composition of the acclimated fish was determined

before the start of the weight change experiments. At the end of the eight-week fish samples from each tank were subjected to carcass composition determination.

The ESR was determined making use of heparinised microhaematocrit tubes of 1.1 to 1.2mm internal diameter and 75mm long after the method described by Onusiriuka and Ufodike (1990) adopted from Blaxhall and Diasley (1973). In deterring PCV, heparinised microchaematocrit tube was used. Microchaematocrit centrifuge and PCV reader were used. Total fat determination was determined by the soxhlet petroleum ether extraction method, using the mean of the loss in weight of the extraction thimbles and the gain in weight of extraction flasks, as the fat content of the sample is found to be more accurate approximation than relying on just the gain in weight of the extraction flask (Ufodike and Matty, 1983). Moisture content crude protein and total ash were determined following the AOAC (1980) method. Nitrogen free extract (NFE) was found by difference.

Dissolved oxygen was determined by Alsterberg (Azide) method. pH and temperature were measured using pH and temperature meter (Gallenhamp model). Specific Growth Rate (SGR) followed the method of Brow (1957) Protein Efficiently Ratio (PER) followed the method of Osborn *et al* (1919). Apparent Net Protein utilization (APP-NU) followed the method of Miller and Bender (1955). Percentage weight Gain and food conversion Ratio were also determined. Results were subjected to Analysis of variance (ANOVA).

Table 1: Composition of Feed (by weight)

Diets	Fish Meal (g)	Soya Bean (g)	Maize (g)	Mineral Mix (Vitalyte) (g)	Total (g)	Additive (Hormones) (Sources)
A	10	31.6	53.4	5	100	Toad Pituitary Extract
B	10	31.6	53.4	5	100	Synthetic Hormone
C	10	31.6	53.4	5	100	Pituitary Extract of <u>Clarias</u> <u>gariepinus</u>
D	10	31.6	53.4	5	100	None

Table 2: The Growth Values of *C. gariepinus* Fed Different Hormonal

Tanks	Initial Mean Weight(g) \pm SEM	Final Mean Weight(g) \pm SEM	Mean Weight Gain(g)	% Weight Gain(g)	Means Qty of feed fed(g)	Specific Growth Rate	FCR	PER	APPNU
1.	15.5+1.1	21.6+0.9	6.1	39.35%	4.926	0.25	0.8	4.69	1.78
2.	15.1+1.3	21.4+1.1	4.3	28.47%	4.925	1.09	1.09	3.28	1.60
3.	15.3+0.9	21.5+1.2	6.2	40.52%	4.832	0.26	0.78	4.67	1.90
4.	15.2+1.2	19.5+0.7	4.3	28.47%	4.613	0.19	1.07	3.46	1.66

Tank 1: Treated with diet a (Contain TPE)
 Tank 2: Treated with diet b (Contain SH)
 Tank 3: Treated with diet c (Contain CGPE)
 Tank 4: Treated with diet d (Contain None)

RESULTS

Results revealed that the *C. gariepinus* fingerlings fed with diets containing Toad Pituitary Extract (TPE) recorded the highest increase in weight in the eighth-week followed closely by those fed diets with *C. gariepinus* Pituitary Extract (CGPE) (Fig.1). At the end of the eighth-week, there was no significant change in the ESR ($P > 0.05$) as the values ranged from 20 ± 0.5 mm in the fish in control tank to 21.0 ± 0.7 mm in the fish fed diet with CGPE. Also there was no significant change in PCV as the values ranged from 33.7 ± 0.3 I the fish fed diet with the TPE to 33.8 ± 0.6 in the fish fed diet with CGPE.

The growth values, of *C. gariepinus* fingerlings fed with diets containing CGPE and TPE showed the highest values of 6.2g and 6.1g for mean weight gain respectively (Table 2). Their values for percentage weight gain followed the same trend (i.e. 40.52% and 39.35%) respectively. For the fingerlings fed with diet with CGPE the specific growth rate, food conversion ratio, protein efficiency ratio and apparent net protein utilization were 0.26, 0.78, 4.67 and 1.90 respectively followed closely by those of the fingerlings fed diet with TPE recording 0.24, 0.8, 4.69 and 1.78 respectively. The growth values, of the *C. gariepinus* fingerlings fed diet with synthetic hormones (SH) were very close to those of the fish in the control tank. Considering the carcass composition, the crude protein was seen to show increase from 16.88% before treatment to minimum of 18.90%. The fingerlings fed diet with TPE recorded 19.2% and those fed diet with CGPE recorded 19.4% and the fish in the control tank recorded 18.95%.

The mean temperature values for all tanks ranged from $26.3 \pm 0.15^{\circ}\text{C}$ to $26.4 \pm 0.18^{\circ}\text{C}$ and the mean pH values for all tanks ranged from 7.74 ± 0.07 to 7.84 ± 0.09 . Also the man dissolved oxygen, DO_2 , value for all tanks ranged from 5.28 ± 0.07 ppm to 5.42 ± 0.05 ppm. The laboratory temperature recorded a mean value of $26.6 \pm 0.6^{\circ}\text{C}$. Statistically (ANOVA and least significant difference, LS) there was non-significant difference ($P > 0.05$) between the treatment and none for weeks.

DISCUSSION

The weight changes have resulted probably from the different hormonal diets fed the fingerlings. Through differences were seen only in the treatments, they were not significant ($P > 0.05$). There was no difference within the weeks. The diets did not bring any stress on the fingerling as revealed by the values of ESR and PCV, which did not differ significantly with the initial values. The fingerlings fed with diet with Toad Pituitary extract, TPE and those fed diet with C. gariepinus pituitary extract (CGPE) showed higher percentage of crude protein than the fingerlings fed with diets implicated with synthetic hormones and control. The growth values (SGR, FCR, PER and APPU) confirm the above. The increase in fish weight brought about by the hormones agrees with fingerlings of Coway *et al* (1973) and Annune (1991) but disagrees with the findings of Ashby (1957). The fingerlings were not affected adversely by the pH, temperature and dissolved oxygen since they were not limiting in all the test tanks. No stress was imposed on the fish as confirmed by the ESR and PCV results. Ufodike and Madu (1986) revealed that the incorporation of androgen, methyltestosterone in the diets of fish enhanced protein anabolism and growth. Similar growth patterns were observed by Guerrereo (1975) in Tilapia aurea, Tayamen and Shelton (1978) in Sarotheredon niloticus and Donaldson and Hunter (1982) in rainbow trout.

CONCLUSION

The purchase of synthetic hormone just to accelerate growth rate and achieve greater increase in weight is ill advised. The use of toad pituitary extract (TPE) is more economical, more available and cheaper than the use of C. gariepinus pituitary extract. More importantly, it imposes no stress on the fish being cultured.

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