THE EFFECTS OF DIETARY TREATMENT ON THE MORPHOMETRICS AND HAEMATOLOGICAL CHARACTERISTICS IN CLARIAS GARIEPINUS

Salami, Adebowale Adekunle, Oluayo-Bello, Olasoji Olasogba, Lucy Folake.
Department of Fisheries and Wildlife,
Federal University of Technology,
P. M. B. 706, Akure.

ABSTRACT

Fingerling of *Clarias gariepinus* have been reported to have an optimal protein requirement of 40%. Not much is known about the effect that varying this protein level has in the haematological characteristics (i.e Packed cell volume, Red blood cell count, haemoglobin concentration and mean corpuscular haemoglobin concentration) and on some landmarks measured along the fish's body. The haematological parameter are useful in assessing the effect of dietary treatment on leanness or robustness in the fish. The results of these experiment reveals that of the 17 landmarks measured on the bodies of the fish species fed dietary protein levels of no protein 11% (low protein), 29% (Sub optimal) and 40% (optimal), only four of the landmarks show significant difference. Also, analysis of the haematological characteristics show significant difference ($P< 0.05$) in haematoant (PCV) and erthrocyte count (RBC) in all the treatments.

INTRODUCTION

Interest in fish culture is growing rapidly in Nigeria but the rearing of fry to adult stage of the widely accepted species such as *Clarias gariepinus* tends to constitute a major constraint to rapid development of aquaculture in Nigeria. One of the major problem is that of securing good quality fish seeds for stocking. A large number of the fish seeds used for stocking are harvested from natural waters where the available food of the seeds are not guaranteed.

The results of nutrition studies on these fish species indicate that the best growth rates and feed conversion efficiencies are achieved with a diet consisting of 38 to 42% crude protein and an energy level of 12kJ g-l calculated digestible energy (Uys, 1988). There is however the need to understand the well-being of the fish even when feed low dietary protein inclusions. It is important to determine the effect of low protein intake on the fish species. Fatturoti (1989) observed that there was no significant correlation between protein intake and blood serum protein and packed cell volume (PCV) of *Clarias gariepinus* fed supplementary feed and organic manure. Many fishes are capable of surviving considerable periods of starvation and still recover on refeeding (Love, 1970). The physiological consequences of short-term starvation (Hille, 1984) and long term starvation (Love, 1980) are well documented in fish blood and hence useful in diagnosing starvation. A starving fingerling in essence is predisposed to infection and weakness thus leading to death of fish seeds. Thus it is important in assessing the well being of fish seeds collected either from the wild or from reportable hatcheries. This is important because the definition of fish health for many years was the absence of disease i.e. It is only when a fish is diseased that it is recognized as having problem.

Wedemeyer and Yasutake (1977) listed a number of environmental and physiological variable which show relationships to fish health. This physiological characteristics include: amount of un-ionized ammonia in water, blood cell count; blood clotting time, haematocrit and haemaglobin. Morphometric relationship which have been found useful in fish taxonomy is another important tool in evaluating nutritional status (Powell and Chester, 1985). The objective of this paper is to evaluate the well being of fish seeds using haematological parameters and fish morphometrics. This will assist in minimizing loss of fish seeds through disease infestation and increase fish productivity.

MATERIALS AND METHODS

Two hundred and forty fingerlings of *Clarias gariepinus* were stocked in ten concrete tanks located on the Federal University of Technology Fish Farm Akure after two weeks of acclimatization during which they were fed 40% protein pellets. The capacity of the 10 concrete tanks was 2,500 litres of water each. Three sets of experimental diets were experimented (11%, 29%, 40%). The range was chosen arbitrarily to reflect low protein, sub-optimal and optimal. This study is assuming that 40% protein is optimal for *C. gariepinus*. The diets were formulated using groundnut cake, fishmeal, bloodmeal, cyster shell, starch, vegetable oil, rice bran and common salt.

Ten of the experimental fish were used for the initial determination of the haematological parameters. The experimental fish were fed 3% of their body weight twice daily at 8.00 hours and 17.00 hours. Two of the concrete tanks with 23 fingerlings such were abandoned for the whole of the experimental period lasting eight weeks. Water quality analysis were determined weekly. Proximate analysis of the feeds were carried out using the (A.O.A.C. 1975) methods. Live specimens of *Clarias gariepinus* fingerlings were sampled from each of the tanks. Blood samples were taken from the specimens and analysed one tank after the other. The procedure for taking blood samples include: Laying the specimens on its back, wiping the ventral side. dry with a tissue paper dissecting by making incision on the ventral side. The cardiac muscle was then exposed and the needle was inserted at an angle of 45°C, the needle was then pushed gently down into the muscle. Blood was taken under gentle aspiration after which the needle was withdrawn and the blood taken was stored in hyperenized bottles. The Erythrocyte counts, packed cell volume (PCV), Haemoglobin estimation were determined.
The following seventeen land marks were measured using a transparent ruler:

	DISTANCES	CONOTATIONS
1.	MTPN	Width of mouth
2.	MTDS	Length of the Head region
3.	MTDL	Distance from the tip of the mouth to the beginning of the dorsal fin.
4.	PMDS	From the left edge of its mouth to the beginning of the dorsal fin
5.	PMPV	From the left edge of the mouth to the rest of the pectoral fin.
6.	PMLL	From the left edge of the mouth to the beginning of the lateral line.
7.	PSAS	Distance between the roots of the pectoral and pelvic fins.
8.	PSL	Distance between the beginning of the lateral line and the beginning of the dorsal fins
9.	DSR	Length of the dorsal fin.
10.	DPE	From the root of the pectoral fin to the beginning of the lateral line
11.	DRAS	From the root of the pectoral fin to rightend of the dorsal fin

12.	ASTC	From the root of the pectoral fin to the beginning of the rightened of the caudal fin.
13.	BCAF	From the root of the pectoral fin to the left edge of the caudal fin.
14.	DRBC	Distance between the end of the dorsal fin and the right edge of the caudal fin.
15.	TCBC	Width of the caudal fin.
16.	DRTC	Distance between the end of the dorsal fin and the left edge of the caudal fin.
17.	DSAS	The beginning of the dorsal to the tip of the pelvic fin.

The statistical analysis employed was the analysis of variance, while significant difference were obtained and treated means tested according to Fishers regression analysis (1957).

RESULT AND DISCUSSION

The result showed that there was no significant difference (P>0.05) in the haemoglobin concentration mean corpuscular haemoglobin concentration in the four treatments, however, for the haematocrit (PCV) and the Erythrocyte count (RBC) there was significant difference in all the treatment as shown in Table 1.

Parameters	1(11%)	2(29%)	3(40%)	Initial
1. Packed cell Volume or Haematocrit (PCV)	32.00d	35.00b	38.00a	28.00
2. Erythrocyte Counts RBC	2.34c	2.56a	2.77a	
3. Haemoglobin (g/100ml)	6.45	6.57	8.52	
4. Mean corpuscular Haemogblobin	20.11	20.04	21.89	

Haematological parameters of C. gariepinus fed different dietary level. There was no significant difference (P>0.05) in 13 of the landmarks measured while four landmarks showed significant difference in morphometrics. These are PMLL, PMPV, DSL and DPF. The control stands out to be significantly smaller than the other treatments.

LANDMARK POINTS	11%	29%	10%	CONTROL
MTPM	-	-	-	-
MTDS	3.85	3.78	4.05	2.83
MTDL	3.32	4.05	4.30	2.58
PMDS	%.65	3.55	3.90	2.75
PMLL	3.01	3.43a	3.70a	2.10a
PMPV	2.20abb	2.05a	2.50a	1.55a
DSL	0.98a	0.98a	1.05a	0.70B
PSAS	2.78	2.78	2.83	1.83
DSR	6.80	6.00	7.25	4.68
DPF	2.08a	2.18a	2.15a	1.50b
DSAS	2.03	2.05	2.25	1.53
DRAS	nd.	nd.	nd.	nd.
ASTC	5.78	5.88	6.60	4.10
BCAF	5.69	5.83	6.50	4.13
DRBC	0.98	0.90	1.05	0.75
TCBC	0.80	0.60	0.95	0.65
DRTC	0.40	0.40	0.50	0.48

Table 2: Morphometrics of the landmark points.

Blood parameters of the experimental fingerlings were analysed based on the following parameters with the resultant ranges; for PCV (30 - 42)% RBC (16 - 24) $10^6/X^3$ for haemogblobin, (5.3 - 6.4)g/100ml for HCH (16.1 - 24.7)%. Ram Bhasker and Srinivasa Rao (1989) recommending the following ranges for a normal healthy fish - 2.3 (1.70 - 4.00) 10^6/ mm^3 for RBC, 43(22 - 48)% for PCV (Haematocrit), 7.5 (5.0 - 15.0)g/100ml for haemogblobin and 17.2 (10.9 - 38.1)% for MCRC.

Vedemeyer and Yasutake (1977) recommended a range of 0.77 - 1.53 (10^6/mm^3) for RBC, 5.4 - 9.3 (g/100ml) for haemoglobin and 24 - 43% for PCV (Haematocrit). The morphometric analysis showed that fish samples fed 40% protein pellets had the highest values in the 17 landmarks measured although only four of the landmarks showed significant difference. These four landmarks are likely to be the ones that would be useful in fingerling selection. The landmarks are the distance from the left edge of the mouth to the point at which the lateral line begins, the distance from the list edge of the mouth to the rest of the pectoral fin, the distance between the point at which the lateral line starts and the point at which the dorsal fin starts and the distance from the root of the pectoral fin to the beginning of the lateral lines.

In conclusion, the result of this work shows that apart from growth, protein requirement affects the PCV and RBC of this fish species and it also affect the morphometrics.

REFERENCES

Association of Official Analytical Chemists (1970).
Official methods of analysis. Washington, D. C. 957p.

Faturoti, E. O. (1989). Effects of Supplementary feeding and organic Manuring on the production of African Catfish *Clarias gariepinus* (Burchell 1822) Journal of West African Fisheries Vol. IV pp. 187 - 195).

Fishers R. A. (1957). The design of experiments. 6th Edition. Oliver and Boyd, Edinburgh.

Ram Bhasker B. & Srinvasa Rao K. (1989).
Influence of environmental variables on haematology and compendium of normal haematological ranges of milkfish, Chanos chanos (Forskal), brackishwater culture. Aquaculture 81.

Uys W (1988). Nutrition: In the culture of sharptooth Catfish, Clarias gariepinus in Southern Africa. Ed. T. Hecht, Wlo Uys and P. J. Britz (South African National Scientific Programmes report No. 153) pp. 47 - 61.