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Research Paper

Comparative studies on haematology of *Clarias gariepinus* from two different aquatic environments

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ABSTRACT

The comparative study on haematology of *Clarias gariepinus* (Burchell, 1822) from two different aquatic environments was carried out to find out if habitat could affect the haematology of fish. Standard methods were employed in the haematological analysis. For wild fish, RBC was 2.06 ±0.358 x 10^6 /mm^3, WBC 50.714 ± 6.465 x 10^3/mm^3, PVC 21.6 ± 2.879%, Hb 7.06 ± 0.900 g/dl, MCV 111± 8.309 fl, MCH 38.430 ± 1.475pg and MCHC 32.85 ± 0.423% while for pond raised cat fish, , RBC was 2.372 ±0.346 x 10^6 /mm^3, WBC 49.612 ± 6.596 x 10^3/mm^3, PVC 16.90 ± 4.721%, Hb 7.54 ± 0.558 g/dl, MCV 90.33± 33.298 fl, MCH 35.638 ± 5.438 pg and MCHC 96.552 ± 42.98% respectively. There were no significant difference ($p>0.05$) in haematological characteristics of wild and pond raised *Clarias gariepinus*.

Key words: Haematology, Wild and pond-reared cat fish (*Clarias gariepinus*), Aquatic Environment

INTRODUCTION

Fish has been reported to be an important and the cheapest source of animal protein which accounts for about 37% of Nigeria's total protein requirement (Ezeafulukwe *et al.,* 2015a). Fish occupies one of the foremost places among the food product of animal origin (poultry, meat and egg) in nutritive value due to the presence of valuable proteins and easily assimilated oil rich vitamins and minerals (Ezeafulukwe *et al.,* 2015b). Nigeria among one of the developing countries of the sub-Saharan African is facing a serious decline in the production and distribution of prodigious food items to meet the nutrition needs of the teeming population. Delgado and MeKenna, (1997) observed that 23% of the population of developing countries marked economics consume 20% below the level of food intake required to date. To reduce the high rate of malnutrition, Fish production, distribution and consumption should be encouraged. Anene (2005) stressed that the war against malnutrition in Nigeria could be fought and won successfully by using fishes based on their relative high protein content and as sources of minerals and vitamins.

Haematological indices are important parameters for the evaluation of fish physiological status. Their changes depend on the fish species, age, the cycle of sexual maturity and health condition (Hrubec *et al.,* 2001). Haematological parameters closely related to the response of the animal to environment are an indication that the environments where the fish live exert some influence on the haematological characteristics (Gabriel and Opabunmi, 2004). The indices are used to monitor the responses of fishes to the stressors and their health status under adverse conditions. Evaluation of the haemogram involves the determination of the total erythrocyte count (RBC), total white blood count (WBC), haematocrit (PCV), haemoglobin concentration (Hb), erythrocyte indices (MCV, MCH, MCHC) and thrombocytes. The family, *Clariidae* is the most important tropical fish cultured in ponds. This is as a result of their

unique qualities in culture systems, including hardiness, resistance to diseases and parasites, tolerance of environmental conditions in captivity, fast growth, good table size and palatability.

This study therefore seeks to evaluate the haematological parameters of wild and pond-raised catfish, *Clarias ganepinus* from two different aquatic environments in Imo State, Nigeria with a view to finding out if there is any difference in their packed cell volume (PCV), haemoglobin concentration (Hb), white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). It is hoped that the result will help close the gap in knowledge. The importance of the nutritional content of fish lies on the fact that the nutrients are required by the body as building blocks to help restore worn out tissues and body maintenance (Novikov, 1983). Therefore this study helps to determine the haematology of wild and pond-raised catfish to know if there is any difference in their nutritional status which will help the consumers to make a good choice in catfish consumption.

MATERIALS AND METHODS

Study area

Owerri the capital city of Imo State, Nigeria lies within latitude 06° 29 06s and longitude 07° 02 06s. The area experiences a longer wert season which lasts from April to November than dry season which last for the rest of the year. It has mean daily maximum temperature range of 28°C to 35°C, while daily minimum values ranges from 19°C to 24°C, with average humidity of 80%. The vegetation is dominated by semi-deciduous forest that has already been altered by agricultural and other anthropogenic activities and the dominant topsoil is moderately humus in composition. The study as carried out in the Fisheries and Aquaculture Research Farm of the Federal University of Technology Owerri which provided the farm-raised specimens used for the study. Oguta lake, the largest natural lentic environment in South Eastern Nigeria was the source of the wild fish specimens evaluated. Owerri, the study area lies within the humid tropical climate, between longitude 6° 45^1 and 6° 56^1 E and latitudes 5° 41^1 and 5° 44^1 N (Nwadiaro, 1976).

Experimental design

Ten (10) table-sized fish samples of *Clarias gariepinus* comprising of 5 from wild and sample pond raised were evaluated per month for a period of 3 month. Live samples of wild *Clarias gariepinus* were caught from Oguta Lake with the help of fishermen while the pond raised sample was sourced from the Federal University of Technology, Owerri Fisheries and Aquaculture Technology Fish Farm. The samples were transported live to the Department of Animal Science Technology Laboratory, Federal University of Technology Owerri, Imo State, Nigeria for analysis. After the fish were landed they were identified with the aid of fish identification keys by Loveque *et al.* (1990). After identification, the fish were weighed with top load salter balance in grams to the nearest 0.1 gram and length measured in centimeter to the nearest 0.1cm using a measuring board. The fish were then put in separate plastic buckets containing water and labeled as “wild” and “cultured”, after which they were taken for analysis without any form of preservation for haematology.

Analysis of fish samples for haematological parameter

Samples were analyzed chemically in accordance (AOAC, 2005). The weight of the fish samples was taken and the length measured. Blood samples were collected from the caudal region using heparinized 2ml syringes and later transferred into ethylene diamine tetracetic acid (EDTA) bottles for analysis. Blood parameters were then determined based on the methods of Blaxhall and Daisely, (1973).

Statistical analysis

The data emanating from haematology of fish was subjected to t-test classification in accordance with Ejiola and Fuller, (1979).

RESULTS

Table 1 presents result of proximate composition of *Claris gariepinus* from two different aquatic environments as evaluated. A total of eight parameters were considered including crude protein, crude fat, crude fibre, ash, moisture, dry matter (DM) nitrogen free extract (NFE) and gross energy (GE).

Proximate composition of *Clarias gariepinus* from the wild

Crude protein was (16.540±1.081), Crude fat (3.254± 0.405), Crude fibre (0.568±0.127), Ash (0.811±0.061), Moisture (74.360±1.261), Dry matter (25.640±1.261) NFE (4.474±1.204) and GE (3.953±0.258).

Proximate composition of cultured *Clarias garipinus*

Table 2 summarizes the nutrient composition of *Clarias gariepinus* from pond. Crude protein was (17.173±0.812),

Table 1. Comparison of Proximate Composition of Wild and Pond raised *Clarias gariepinus*

	CP	Fat	MC	Ash	DM	Fibre	NFE	GE
Wild	16.54[a]±	3.245[a]±	74.360[a]±	0.811[a]±	25.640[a]±	0.568[a]±	4.474[a]±	3.953[a]±
SE	1.081	0.405	1.261	0.061	1.261	0.127	1.204	0.258
Pond	17.173[a]±	5.998[b]±	72.835[a]±	0.920[a]±	27.006[a]±	1.348[b]±	1.773[b]±	4.104[a]±
SE	0.812	0.480	0.635	0.110	0.613	0.069	0.708	0.194
t(0.05)	NS	-3.594	NS	NS	NS	-6.061	NS	NS

Mean values in the same column similar superscripts are not significantly different at 0.05 level of significant.

Table 2. Comparison of Haematology of Wild and Pond raised *Clarias gariepinus*

	RBC	WBC	PCV	Hb	MCV	MCH	MCHC
Wild	2.060±	50.714±	21.6±	7.06±	111.00±	38.43±	32.85±
SE	0.358	6.465	2.879	0.900	8.309	1.475	0.423
Pond	2.372±	49.612±	16.9±	7.54±	90.33±	35.638±	96.552±
SE	0.346	6.596	4.721	0.558	33.298	5.438	42.198
t(0.05)	NS	-3.594	NS	NS	NS	-6.061	NS

Mean values in the same column with similar superscripts are not significantly different at 0.05 level of significant.

Crude fat (5.998±0.480), Crude fibre (1.348±0.069), Ash (0.92±0.110), Moisture {72.835± 0.635), DM (27.006±0.613),NFE (1.773±0.708) and GE (4.104±0.194). Table 2 present results of the haematology of *Clarias gariepinus* from two different aquatic environments. A total of seven parameters were analyzed including the red blood cells count, white blood cell, pack cell volume, haemoglobin concentration, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration.

Haematology of *Clarias gariepinus* from the wild

Red blood cell (2.372±0.346 x 10^6/mm^3), white blood cell (50.714±6.465 x 10^3/mm^3), pack cell volume (21.6±2.879%), haemoglobin (7.06±0.900 g/dl), mean corpuscular volume (111±8.09 fl), mean corpuscular haemoglobin (38.43±1.475pg) and mean corpuscular haemoglobin concentration (32.85±0.423%).

Haematology of *Clarias gariepinus* from the pond

Red blood cell (2.060±0.358 x 10^6/mm^3), white blood cell (49.612±6.596 x 10^3/mm^3), pack cell volume (16.9±4.721%), haemoglobin (7.540±0.558g/dl), mean corpuscular volume (90.33±33.298fl), mean corpuscular haemoglobin (35.638±5.438pg) and mean corpuscular haemoglobin concentration (96.553±42.198%). Table 2 shows the results of the comparison of haematology of Clarias gariepinus from wild and pond studied. The haematological result shows that wild catfish Clarias gariepinus had (2.06±0.358 x10^6/mm^3), red blood cell while the same fish from pond had (2.372±0.346 x 10^6/mm^3). The difference in the red blood cell of Clarias gariepinus from the wild and pond are not statistically significant.

DISCUSSION

Proximate composition of wild and cultured *clarias gariepinus*

Results further revealed that environment does not significantly change the nutritional quality of *Clarias gariepinus*. The proximate composition of wild and pond raised catfish varied significantly in terms of fat and fibre which was statistically higher in pond – raised fish and lower in wild fish. This finding however supports the findings of Alasalvar *et al*., (2002) on sea bass (*Dicentrarchus labrax*), Grigorakis *et al.,* (2002) on gilthead sea bream (*Sparius aurata*). Orban *et al*. (2013) reported higher lipid content in farmed *Labeo rohita* when compared with specimen from the wild. The difference might be as a result of factors like species, environment and types of diets. Age at maturity is the main difference between pond-raised catfish and wild catfish. Novikov, (1993) found that lipids in fish vary greatly and these variations are related to feed, migratory swimming or sexual changes in connection with spawning. In contrast to the present study, Nawar, (1996) did not find significant difference in lipid contents when comparing wild and farmed yellow perch.

Haematology of *Clarias gariepinus* from two different habitats

Haematological indices are vital parameters for the

evaluation of fish physiological status. Their changes depend on the fish species, age, the cycle of sexual maturity and health condition (Hrubec *et al.,* 2001). Red blood cell count at the range of (2.06±0.358 x 10^6/mm^3) for wild and (2.373±0.346x10^6/mm^3) in the study were within the range described by Gabriel *et al*., (2004) and Adeyemo *et al.,* (2003). The white blood cell count obtained from the study was also within the range of (50.714±6.645 x 106/mm3) for wild and (49.612±6.596 x 106/mm3) described by *Gabriel et al.,* (2004). The mean values of PCV of wild Clarias gariepinus (21.6 ± 2.879%) and (16.9 ± 4.721%) obtained from the study were within the range of the corresponding values described by Munkittrik and Leatherland (1983). The variations in RBC, WBC, Hb, PVC, MCV, MCH and MCHC of wild and pond – raised catfish is as a result of environmental conditions, age, origin, breeding system and feeding.

Conclusion

The study shows that there is no significant difference in the haematological parameters of Clarias gariepinus between the wild and pond-raised catfish. The results from the study provide a contribution to the knowledge of characteristics of blood cells and haematological parameters of Clarias gariepinus under normal condition. Pond catfish is also recommended for post-operation patients as it is a good healing agent.

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