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Original Article

Physical & Chemical Characteristics of Blood of two Fish Species (*Oreochromis niloticus* and *Clarias lazera*)

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ABSTRACT

The aim of this study is to determine normal range of fish blood (*Oreochromisniloticus* and *Clarias lezera*) in Khartoum State. Sixty samples of fish were examined, 30 samples of *Oreochromis niloticus* and 30 samples of *Clariaslazera*. The fish were selected from three different sites in Khartoum State, Jebel Awlia Reservoir, College of Science and Animal production Technology Fish Farm and Golden Arrow Co. Ltd. The experiment was conducted for one month, and the result revealed that the total protein percentage of *Oreochromis niloticus* range between (13.39 ± 39.25 mg/dl), Glucose (152.75 ± 56.45 mg/dl) and Urea (34.5± 22.95 mg/dl). The Red Blood Characteristics were Haematocrite (PCV) (16.3± 9.45%), Haemoglobin Hb (3.5±2.0 mg/dl), White blood cell (WBCs) (80.2± 79.7), Red Blood Cell (RBCs) (2.6± 1.5), MCV (74.1±40.6 ft), MCH (26.9±16.6 pg). The total protein of *Clarias lazera* was (157.85±193.35 mg/dl), Urea (45.45±23.4mg/dl) and Glucose (91.72± 128.35 mg/dl), while Red Blood Characteristics were Haematocrite (PCV) (20.15±4.7%), Haemoglobin Hb (9.95±2.8 mg/dl), White Blood Cells WBCs (119.23± 64.63), Red Blood Cells RBCs (2.6±0.59), MCV (76.49± 24.5 ft). MCH (36.25± 13.85 pg).

KEY WORDS: Blood, Fish, *Oreochromis niloticus*, *Clarias lazera*

INTRODUCTION

Many environmental and physiological factors are known to influence fish hematology. These include stress due to capturing, transportation, sampling, age and sex. Therefore, hematological studies have been widely used as means of assessing the state health of fishes. The establishment of hematology of fishes generally serves as standard for physiology, pathological and toxicological studies (Schreck, 1996).

Blood analysis is crucial in many fields of ichthyologic research and fish farming and in the area of toxicology and environmental monitoring as possible indicator of physiological or pathological changes in fishery management and diseases investigation (Adedeji et al., 2000). Hematological indices are very important parameters for the evaluation of fish physiological status. Their changes depend on fish species, age, the cycle of the sexual maturity of spanners, and diseases (Luskova, 1997; Golovina, 1996; Zhitrineva, 1989).

The aquatic environment, where fish and other aquatic organisms live, subjected to different types of pollutants which enter water bodies through industrial, domestic and living creatures. Stress is a general and non specific response to any factors disturbing homeostasis, stress reaction involves various physiological changes including alteration in blood composition and immune mechanisms *(*Svoboda, 2001; Witeska, 2003) it has also been linked as one major factor of disease outbreak, low productivity and mortality in aquaculture other toxic endpoints include decreased growth mobility and reproduction effect (Allen, 1995). Stress in fish may be induced by various a biotic environmental factors (changes in water temperature, pH, 02 concentration and pollution.

Hematological variables remain veritable tools in determining the submittal concentration of pollutants such as heavy metals in fish (Witeska, 2003). The most common hematological variables measured during stress included red and white blood cells count hemoglobin content, and hematocrit value and red blood cells indices. Some records have shown that *Clarias sp.* fishery contributes a pout 17% of over 6.000tonnes of annual fish production from all fisheries sectors (Awachie, and Ezenwaji, 1998).

In the Sudan especially *Oreochromis niloticus* the most interesting popular fish used in culture is Tilapia spp. and is fully described by Trewaves, (1983). It consumes a wide range of foods including higher Plants, diatoms, crustacean, aquatic insect and fish remains but has disadvantage, for example excessive reproduction and resulting

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problem over population and stunting growth are the greatest problem encountered in raising any species of Tilapia where large fishes are preferred for the table in Sudan.

Classical method of preventing over population and stunting growth include separating parents and young immediately upon hatching mono-sex culture stock predator along with the Tilapia and selective breeding for large fish been attempted (Bardach et al., 1972); (Huet, 1986) but no success. The problem of this research is tackling of the level of remain food decomposition and nitrogenous produce excreted by culture fish which can lead to toxic levels of ammonia form and determination of water quality in high stocking levels common in aquaculture practice system. Analysis of blood has been developed and well utilized in assessing the health of man and lifestock (Adeparsusi et al., 2003); (Event and Olusanyo, 1988) reported that fish blood consist of fluid containing suspended cellular constituent that circulate round the body. Svesbodora (1991) reported that Ichthohaemology would be useful in the assessment of suitability of feeds and feed mixture evaluation of substances as well as a diagnosis of disease. Because of the wide application of some hematological indices in evaluating the effect unfavorable environmental factors on the fish organism and state of health, it is essential to determine the normal level of these parameters for given fish species (Tilapia) and according to size and different water quality characteristics current information concerning the level of numerous physiological parameters of fish and only fragmentary, (Andrezie, 1985).

The main objectives of this study is to develop an approach to evaluate the potential environmental impacts on cultured fish *Oreochromis niloticus* and *Clarias* lazera and to determine reference values for hematological indices and leukocyte differential count in cultured Tilapia and Clarias.

MATERIAL AND METHODS

This study was conducted at Sudan University of Science and Technology, College of Science and Animal Production Technology, Fisheries Laboratory.

Thirty samples from *Oreochromis niloticus* weighed between (200 – 350 g) and their total length between (24 – 29cm), and another 30 samples of *Clarias lazera* weighed between (200 – 550g) and their total length between (26 – 45cm) were collected from Fisheries Research Centre at Elshagara.

Collecting of Blood samples:

Blood analyses

Blood samples were collected from caudal vein of the fish in a small plastic tubes containing heparin solution (0.2 ml/ml blood) as anticoagulant. These blood samples were used for determining erythrocyte count using haemocytometers. Haemoglobin (Hb) was estimated where it was converted into red cyanomethaemoglobin under the influence of potassium ferricyanide and potassium cyanide. Haematocrit value (Hct), Mean corpuscular volume (MCV), mean corpuscular aemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated according to Blaxhall and Daisny (1973).

Some other blood samples were collected and left to coagulate for 15–20 min at 4_C prior to centrifugation for 20 min at 3,000 rpm to separate serum. The fresh serum was subjected to biochemical analysis. Serum glucose (mg/l) was determined, using assay kits supplied by (Spectrum Diagnostics, Egypt). Total protein (g/100 ml) content and total lipids (g/l) contents were determined colorimetricallyusing assay kits supplied by Diamond Diagnostics,Egypt. Activities of aspartate aminotransferase (AST, U/I) and alanine aminotransferase (ALT, U/I) were determined colorimetrically using assay kits (Spectrum Diagnostics, Egypt) according to Reitman and Frankel method (1957).

The samples were measured by spectrophotometer (Ultroscopec 3100 Pro).The blood was collected by caudal artery puncture at the caudal peduncle and patronized micro – capillary and EDTA (anti – coagulant) tubes. The blood samples were determination of haematological parameters PCV, Hgb, TEC, TLC and ESR in method described by Blaxhall and Daisley (1973).

RESULT

This study was conducted to determine normal range for chemical and physical blood characteristics for two species *Oreochromis niloticus* and *Clarias lazera.*

Table 1. Chemical and physical characteristics of *Oreochromis niloticus*

Parameters	Mean ± Sd.	Range
T.L	26 – 25 ± 1.45	24 – 30
T.WT	247.7 ± 40.47	200 – 350
T. Protein	39.25 ± 13.98	12.8 – 74.1
Glucose	152.75 ± 56.45	33.3 – 250
Urea	34.5 ± 22.95	20 – 75
PCV	16.3 ± 9.45	5 – 48
HB	5.3 ± 2	2.3 – 9.8
WBCs	80.2 ± 79.7	37.6 – 113.2
RBCs	2.6 ± 1.5	101 – 7.2
MCH	26.9 ± 16.6	5 – 80.4
MCV	74.1 ± 40.6	20 – 214

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Table 2. Chemical and physical characteristics of *Clarias lazera*

Parameters	Means ± Sd.	Range
T.L	36.25 ± 4.88	26 – 45
T. WT	380.5 ± 112.2	200 – 550
T. Protein	157.85 ± 193.35	11 – 638.9
Glucose	91.75 ± 128.35	31.1 – 216.7
Urea	45.45 ± 23.4	10 – 29
PCV	20.15 ± 4.7	12 – 29
HB	9.95 ± 2.8	6 – 16.5
WBCs	119.23 ± 64.63	65.6 – 545
RBCs	2.6 ± 0.59	1.5 – 3.8
MCH	36.25 ± 13.85	20.9 – 93.3
MCV	76.49 ± 24.5	38.2 – 135.3

DISCUSSION

This study aimed to measure the mean of the chemical composition and the physical characteristics of the *Clarias lazera* and *Oreochromis niloticus.* The study showed that the mean of the Tilapia quantity of the compact blood PCV (16.3 ± 9.45), haemoglobin HB (5.3 ± 2), red blood cells RBCs (2.6 ± 1.5), white blood cells WBCs (80.2 ± 79.7), haemoglobin formula rate MCH (26.9 ± 16.6), and mean cell value MCV (74.1 ± 40.6). in addition to that the current study classified that mean value of compact blood PCV in Clarias fish was (20 – 15 ± 4.7), haemoglobin HB (9 – 95 ± 2.8), RBCs (2.67 ± 0.95), WBCs (19.23 ± 64.63), value of haemoglobin (36.25 ± 13.85), and range value of the cell PCV (76.49 ± 24.5).

The current study showed that the mean value of Hb varies between (5.3 ± 2), this result conformed to (Adam, 2004) who showed that mean haemoglobin value of controlled fishes was (7.16 haemoglobin 0.65 g/dl). It contradicted with (Nilza, 2003) who showed that the mean value of haemoglobin is (10.52 HB 3.9 g/dl). Moreover, the current study showed that mean value of blood cells precipitation percentage is (16.3 ± 9.45%), and this conformed with (Adam, 2004) who mentioned that the rate of blood cells precipitation of the controlled fishes is (22.71± 1.94%) and also conformed with Nilza *et al.,* 2003) who stated that mean value of haematocrite PCV is (31.85 ± 8.45%) as well as with (Pernard Zoo, 2000) who reported that the percentage of PCV was (27.37%).

The study also revealed that the mean value rate of red cell varies between (74.1± 40.6 ft), whereas it agreed with (Adam, 2004) who said that the mean size of the red cell of control fish varies between (124.97 ± 10.68 ft) and disagreed with (Nilza, *et al.,* 2003) who clarified that MCV varies between (148.80 ± 153.1 ft), while it confored with (Bernard, 2000) with stated that MCV varies between (115 – 183).

The trail revealed that Hb value rate varies between (26.4 ± 16.6 pg), it is in agree with (Adam, 2004) who clarified that MCH in red cell in control fishes varies between (41.67± 3.66 pg), and disagreed with (Nilza *et al.,* 2003) who mentioned that MCH (40.64 ± 34.19 pg), while it conformed with (Bernard, 2000) who clarified that the range percentage of MCH (28.3 ± 42.3 pg). The current study explained that the mean value of red blood cells RBCs of controlled fish varies between (1.19 ± 2.83× 10ml), and it conformed with (Nilza *et al.,* 2003) who clarified that the percentage of RBCs varies between (6.93 ± 2.8 ×10ml). It also agreed with (Bernard, 2000) who stated that the percentage of RBCs was (1.9 ± 2.83 ×10 ml). Moreover, the result revealed that the range percentage of the white blood cells varies between (21600 ± 154700 ml).

The experiment explained that the mean of Tilapia protein was (39.25n ± 13.98), Glucose (152.75 – 56.45), Urea (34.5 ± 22.95), in addition to that, the result revealed that the mean value of protein in Clarias fish was varies between (157.85 ± 193.35), Glucose (91.75 ± 128.35), Urea (45.45 ± 23.4). The chemical composition of fish varies greatly from one species to anther and within individuals depending on age, sex, environment and season. The variation in chemical composition of fish is closely related to feed intakes, migratory swimming and sexual changes in connection with spawning (Love, 1970).

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