

ABSTRACT

This study was conducted to determine the effect of water quality characteristics on the level of haematological indices and differential leukocytes count of cultured fish, which was most frequently used in the pathophysiological investigations in fish reared in the ponds and tanks culture conditions, compared with the normal healthy fish in natural water.

Four fish (*Oreochromis niloticus*) groups, each consisting of three different weights (20-40, 50-70 and 80-100 grams) were selected from four sites under different culture conditions for this study.

The first group of fish was raised in experimental tanks under different management systems (24 hrs, 48 hrs and 72 hrs served as cleaning intervals time), the second, third and fourth groups of fish were collected from White Nile River (control), Fisheries Research Centre (FRC) ponds, and General Administration Fisheries (GAF) ponds respectively.

The results showed that water quality characteristics of experimental tanks level of NH_4 , NH_3 , NO_3 and NO_2 concentrations, were significantly ($P < 0.01$) increased with interval time of cleaning and changing during experimental period. The concentration levels were peaked when the tanks were left for 72hrs without changing and flushing, while tanks left for 24hrs had lowest concentration levels.

In case of survey study, the concentration levels of NH_4 , NH_3 , NO_3 , and NO_2 were significantly the highest in (GAF) ponds and experimental tanks water, while FRC ponds and White Nile River water were the lowest.

The results clearly revealed a significant increase in NH_4 , NH_3 , NO_3 and NO_2 levels ($P < 0.01$) in GAF and experimental tanks compared to control.

In the case of haematological indices of fish, the effect of cleaning and changing interval time of tanks water (24hrs, 48hrs, and 72hrs), significantly ($P < 0.01$) showed decreased overall mean values of haemoglobin concentration (6.59 ± 0.85 , 6.12 ± 1.20 and 5.61 ± 0.74 g/dl respectively) compared to control value (7.61 ± 0.65 g/dl), packed cell volume (19.69 ± 2.54 , 18.35 ± 5.09 and 16.75 ± 2.21 % respectively) compared to control value (22.71 ± 1.94 %), mean corpuscular volume (79.79 ± 6.04 , 71.97 ± 9.04 and 65.60 ± 9.62 Fl respectively) compared to control value (124.07 ± 10.68) and mean corpuscular haemoglobin (27.76 ± 3.66 , 24.05 ± 3.46 and 22.44 ± 4.41 Pg respectively) compared to control value (41.67 ± 3.66 Pg) of studied fishes.

The overall mean values of leukocytes differential count of White Nile River (control) fish had the lowest significant difference ($P < 0.01$), than the experimental tanks fish.

Weight-related group changes in haematological indices and leukocytes differential count of fish showed no significant difference ($P < 0.05$) within all studied sizes of fish (20-40, 50-70 and 80-100 grams).

There is a negative inverse correlation between haematological indices (Hb., PCV, MCV, and MCH) and water quality parameters (NH_4 , NH_3 , NO_3 , and NO_2) with moderate regression factors. Relationship between RBCs and water quality characteristics was positive and with very low regression factors.

Also, there is high and positive proportional relationship between leukocyte differential count (WBC, lymphocyte and monocyte) and negative relationship between (neutrophil and thrombocyte) with water quality parameters of experimental tanks.

The White Nile River and Fisheries Research Centre ponds fish had the highest overall mean values of haematological parameters; haemoglobin concentration 7.61 ± 0.65 and 7.49 ± 1.06 g/dl, packed cell volume percentage 22.71 ± 1.94 and 22.46 ± 1.94 %, Mean corpuscular volume 124.07 ± 10.68 and 117.30 ± 18.56 Fl and mean corpuscular haemoglobin 41.65 ± 3.66 and 39.13 ± 6.22 Pg respectively.

A slightly smaller increase was noted in red blood cell count among fishes of different water sources, when were compared with White Nile River fishes (control), unless in the case of General Administration of Fisheries pond fishes which had the lowest number of RBC (1.71 ± 0.17 million/ mm^3).

The results showed a significant ($P < 0.01$) decent decrease in the RBC count; 1.71 ± 0.17 , 1.83 ± 0.12 , 1.92 ± 0.16 , and 2.58 ± 0.50 million/ mm^3 of General Administration of Fisheries pond, White Nile River, Fisheries Research Centre pond and experimental tanks fishes respectively.

Also the results showed a significant ($P < 0.01$) variability of white blood cell count among different water source fishes.

The fishes of the experimental tanks had the highest number of WBC ($192.96 \pm 11.95 \times 10^3$) and percentage of Eosinophil (19.78 ± 6.99) compared to control. General Administration of Fisheries pond fishes had the highest percentage of lymphocytes (39.67 ± 3.04 %) and monocyte (15.33 ± 1.66 %), Fisheries Research Centre fish had the highest neutrophils (18.22 ± 2.58 %), compared to control and White Nile River fish had the highest thrombocyte (34.89 ± 5.71 %) among others.

A marked decrease in the mean corpuscular volume (MCV) of fish affected by water quality deterioration in this study is a predisposing factor for fish microcytic anemia and it is suggested that the lower values of blood parameters are complementary elements in diagnosing the stunting phenomenon in cultured tilapia in the Sudan.

