

Study of Some Blood Parameters of *Tilapia Zillii* Collected from Different Environments (Fresh Water and Brackish Water)

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Abstract:

In this study, various hematological indices were evaluated in 60 adult *Tilapia zillii* specimens (mean length 9.66 cm \pm 1.21; mean weight 17.52 g \pm 7.21). Specimens were collected from Alarabia Company for Agricultural Investments (a freshwater fish farm) and Ain El-Majdob Lagoon (a brackish water lake). Blood samples were obtained using heparinized plastic syringes from the heart. Hematological parameters were measured with standardized, approved methods in a medical analysis laboratory. The following mean values \pm SD were recorded: hematocrit (Hct) 11.51 \pm 6.09%; hemoglobin (Hb) 7.31 \pm 2.38 g/dL; white blood cells (WBC) 57.50 \pm 23.23 $\times 10^9$ cells/L; red blood cells (RBC) 0.82 \pm 0.35 $\times 10^9$ cells/L; mean corpuscular hemoglobin concentration (MCHC) 55.11 \pm 17.82 g/dL; mean corpuscular hemoglobin (MCH) 69.60 \pm 16.75 pg; mean corpuscular volume (MCV) 134.55 \pm 32.91 fl; platelets (PLT) 219.92 \pm 206.73 $\times 10^9$ cells/L; granulocytes (GRA) 6.63 \pm 6.03 $\times 10^9$ cells/L; lymphocytes (LYM) 43.05 \pm 19.42 $\times 10^9$ cells/L; and monocytes (MON) 4.81 \pm 3.52 $\times 10^9$ cells/L.

RBC values approached statistical significance, with RBC, Hb, LYM, MON, MCH, and MCHC levels higher in freshwater *Tilapia zillii* compared to those in brackish water. Conversely, Hct, GRA, and MCV values were higher in brackish water specimens than in freshwater ones. In freshwater, WBC, LYM, Hct, and MCV decreased with increasing weight but increased with length. Granulocyte and platelet

counts, however, increased with weight and decreased with length, as assessed through regression analysis. No significant differences were observed for MON, RBC, Hb, MCH, or MCHC between environments.

In brackish water, WBC counts were influenced by the fish's length and weight. Additionally, in freshwater, LYM and MON counts increased with weight but decreased with length. No significant changes were found for RBC, Hb, Hct, MCV, MCH, MCHC, or PLT across environments.

Keywords:

Hematology, fresh water, Brackish water, *Tilapia Zillii*, Benghazi, Libya.

1. Introduction

Blood tissue reflects physical and chemical changes occurring in organisms, therefore detailed information can be obtained on the general metabolism and physiological status of fish in different groups of age and habitat (Orun and Erdemli, 2003). In fishery, it is important to find out illness and parasites as the source of these causes may not be generally detectable in the early period of the infection, however, it is also possible to early diagnosis of illnesses in case of evaluating hematological data, particularly blood parameters (Rimsh and Adamova, 1973).

Fishes generally have less blood volume than other vertebrates, the volume usually ranging between about 2 and 4 ml/100 g in bony fishes.

The blood transports a variety of materials, including inorganic ions and several organic constituents such as hormones, vitamins, and several plasma proteins.

Cellular constituents of the blood are the red blood cells or erythrocytes, and the white blood cells or leucocytes obtain their characteristic color from hemoglobin. Made up of the colorless protein globin, and the red-yellow pigment heme, which contains iron. (Bond, 1979)

According to (Gabriel *et al.*, 2004) hematological parameters are closely related to the response of the animal to the environment, an indication that the environment where fishes live could exert some influence on the hematological characteristics. These indices have been employed in effectively monitoring the responses of fish to the stressors and thus their health status under such adverse conditions. They can provide substantial diagnostic information once reference values are established under standardized conditions.

Hematological tests and analysis of serum constituents have showed useful information in detection and diagnosis of metabolic disturbances and disease in fishes (Aldrin *et al.*, 1982). In hematological analyses, measurement of blood indices in the liquid part of the blood and the morphological composition of the blood is important. To investigate the fish blood factors and their changes, the normal rate of these factors must be initially measured in healthy fish. Hematological determination can provide substantial diagnostic information once reference values are established under standardized conditions. Hematological studies in animal research and in human diseases are well accepted and considered to be routine procedure in diagnoses (Ranzani-Paiva *et al.*, 2001).

Blood hematological measurements can provide valuable physiological indices that may offer critical feedback on transportation and handling stress in aquaculture as haematological measures have been reported (Gbore, *et al.*, 2006) to be useful indicators of sub lethal environmental stress in fish.

2. Materials and Methods

2.1. Fish Samples

Thirty Fish of the *Tilapia Zillii* were collected by hand net (30 cm in diameter) in December 2009, from (Ain Elmajdob Lake), Benghazi city (Fig1), and, thirty Fish were collected from Fish Farm (Alarabia Company for agricultural investments) located in north Benghazi city near Alkuwifiya town (Fig2). Fish were collected and transported immediately in pouches filled with lake water to the laboratory of the Zoology Department, Benghazi University. Fish were divided into four groups each group containing (15) fishes, and kept in laboratory glass aquarium of 200 L capacity were well aerated and provided with external filtration. They were given a minimum period of 72 hours to acclimatize to laboratory conditions.

2.2. Water Quality

The water quality parameters such as pH, temperature, dissolved oxygen, and Salinity were measured for two water systems using a portable meter. (Values are shown in the results section).

2.3 . Blood collection and analysis

Random fish samples of *Tilapia Zillii* were considered as normal based on their external appearance and absence of symptoms of diseases.

The fish sample caught from the containers. After the preliminary investigation of the length, weight and sex (Fig 3, 4), a damp cloth was used to cover the fish head. They placed belly upwards and blood samples obtained from the heart with the aid of a heparinized disposable plastic syringe containing EDTA as an anticoagulant (Fig 5).

Heart puncture was chosen for being easy to perform and excellent for obtaining a large quantity of blood when applied to Tilapia. After obtaining the desired quantity of blood, the use of plastic syringe is a necessary precaution with fish blood because contact with glass results in decreased coagulation time (Smith *et al.*, 1952). Fish wiped dry with tissue paper to aid contamination with mucus it was then pushed gently down until blood started to enter in the needle. Thereafter the needle was withdrawn and the blood gently transferred into heparinized plastic containers, which contained EDTA as an anticoagulant. The samples were then mixed gently.

Then blood samples transported to Saleem laboratory for analysis using (Diatron instrument) after adjusted to animal analysis and measurement of Haematocrit (Hct) or (PCV), hemoglobin concentration (Hb), red blood cell count (RBC), white blood cell count (WBC), Lymphocytes (LYM), Monocytes (MON), Granulocyte (GRA), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and of platelets (PLT).

2.4. Statistical Analysis

Results were analyzed with SPSS for Windows by using (T-test and regression).

3. Result

In this study some parameters of water quality were measured (Table 1); the result shows differences between the water quality parameters for two ecosystems.

Table 1 The water quality parameters

	Ain El-Majdob Lake	Fish Farm
Temperature	21.4°C	19.9°C
pH	7.7	7.9
Dissolved oxygen	3.16mg/l	5.42mg/l
Salinity	6.1 ‰	0.04 ‰

The summary of the mean values of weight, length and hematological parameters for Tilapia Zillii are represented in Table 2, together with the standard deviation and Standard Error.

In present study the white blood cells, Lymphocytes, Haematocrit and Mean corpuscular volume were decreased with increase of weight, and increased with increase the length of *Tilapia Zillii* in fresh water. While Granulocyte and platelets, increased with increase of weight, and decreased with increase the length of *Tilapia Zillii* in fresh water as studied by regression of white blood cells, Lymphocytes, Granulocyte, Haematocrit, Mean corpuscular volume, and platelets on length and weight of *Tilapia Zillii*.

While there is no statistically significance in Monocytes, Red blood cells, Hemoglobin, Mean corpuscular hemoglobin and Mean corpuscular hemoglobin concentration According to regression in this research.

On other hand the white blood cells of *Tilapia Zillii* in brackish water were found depend on length and weight of *Tilapia Zillii* as studied by regression of white blood cells on length and weight of *Tilapia Zillii*. as well as Lymphocytes and Monocytes increased with increase of weight, and decreased with increase of length *Tilapia Zillii* fresh water as studied by regression of Lymphocytes and Monocytes on length and weight of *Tilapia Zillii* ,as shown Table (2).

In this study, the result value of Red blood cells counts of fish in two systems are very closely significant. RBC in fresh water, *Tilapia Zillii* is (0.73 0.35) and RBC in brackish water, *Tilapia Zillii* is(0.91 0.33). as shown in fig (8).

Table2: Hematological parameters for *Tilapia Zillii* in freshwater (FW) and brackish water (BW).

Parameter(Unit)	Mean		Standard Deviation		Standard Error		Sig.
	F W	B W	F W	B W	F W	B W	
length (cm)	9.55	9.76	1.10	1.32	0.20	0.24	0.558
Weight (g)	16.72	18.32	5.46	8.65	0.99	1.57	0.437
Hb (g/dl)	8.50	6.13	2.26	1.87	0.41	0.34	0.000
Hct (%)	9.46	13.56	5.01	6.45	0.91	1.17	0.010
RBC($10^{12}/L$)	0.73	0.91	0.35	0.33	0.06	0.06	0.063
WBC($10^9 /L$)	61.18	53.82	14.76	29.18	2.69	5.32	0.209
MCHC (%)	73.13	42.64	9.35	9.53	2.20	1.87	0.000
MCH (pg)	86.94	63.60	3.44	15.24	1.14	2.99	0.000

MCV(μ^3)	125.46	143.96	33.94	29.51	6.19	5.48	0.033
MON (10^9 /L)	7.14	2.02	2.44	2.41	0.44	0.48	0.000
LYM (10^9 /L)	49.80	34.96	15.21	21.08	2.77	4.21	0.003
GRA (10^9 /L)	4.23	9.52	2.65	7.58	0.48	1.51	0.001
PLT (10^9 /L)	262.7	177.10	247.80	147.47	45.2	26.92	0.122

Table 3: Regression of blood parameters on length and weight of Tilapia Zillii in fresh water and brackish water. Red=sig at 0.05.

Blood parameters	Fresh water		Brackish water	
	Length	weight	Length	weight
WBC	-	+	+	+
LYM	-	+	-	+
MON	+	-	-	+
GRA	+	-	-	+
RBC	-	+	-	+
Hct	-	+	+	-
Hb	-	+	+	-
MCV	-	+	+	-
MCH	-	+	+	-
MCHC	-	-	+	-
PLT	+	-	-	+

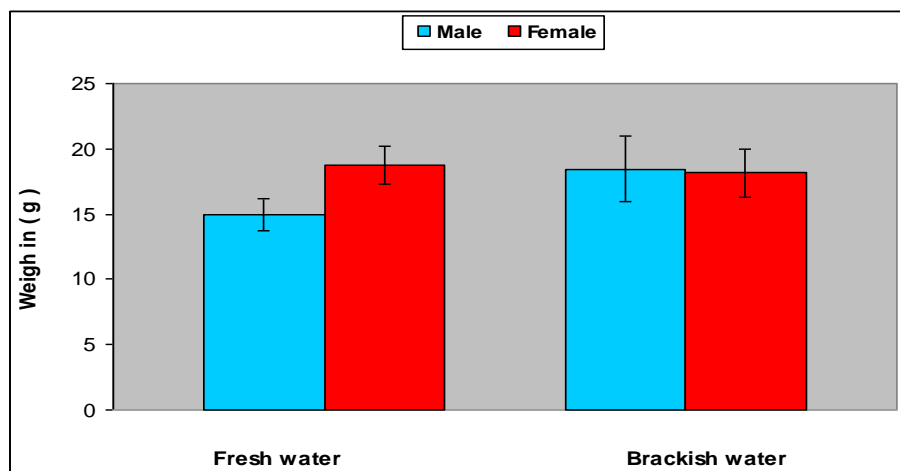


Figure (6): Weight of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

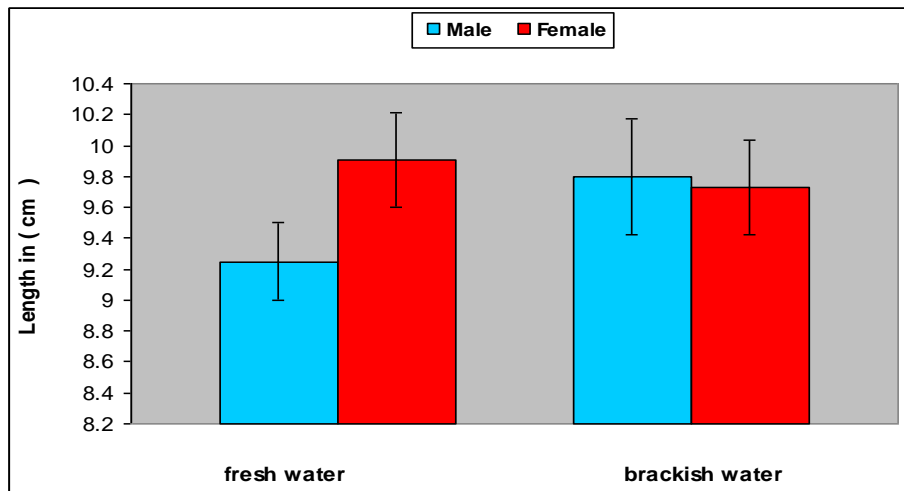


Figure (7): length of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

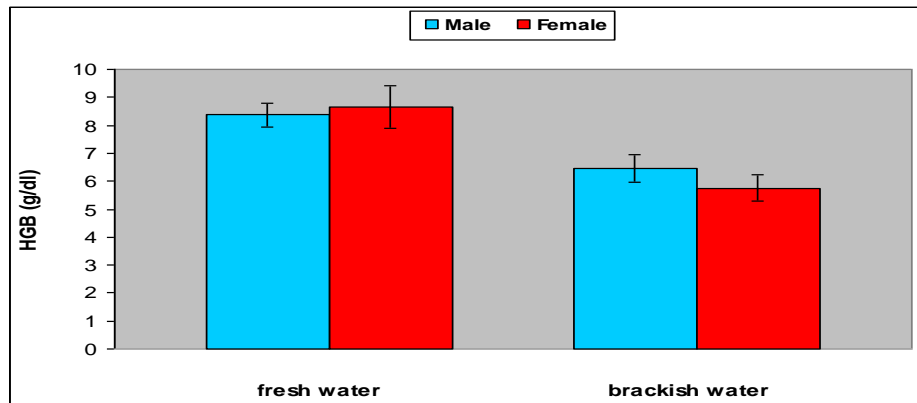


Figure (8): RBC of Tilapia Zillii fishes from Aquaculture and Ain El-Majdob Lake.

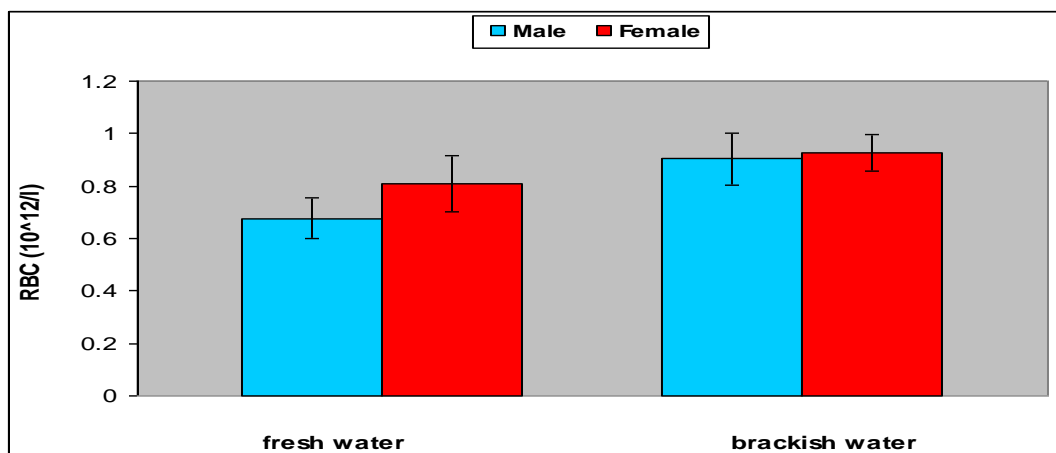


Figure (9): Hb of Tilapia Zillii fishes from Aquaculture and Ain El-Majdob Lake.

The result of hemoglobin concentration (8.50 ± 2.20) in this research for Tilapia Zillii in fresh water was significantly higher than the hemoglobin concentration of Tilapia Zillii in brackish water (6.13 ± 1.87) as shown in Fig (9).

In the present study, The result of the hematocrit value (9.46 ± 5.01) of Tilapia Zillii in fresh water was significantly lower than the hematocrit value in brackish water Tilapia Zillii (13.56 ± 6.45). as shown in Fig (10).

In this study, the lymphocyte (49.80 ± 15.21) in fresh water, Tilapia Zillii was significantly higher than the lymphocyte (34.96 ± 21.08) in brackish water, Tilapia Zillii as shown in Fig (11).

High significant in present result of Monocytes value in two systems. Monocytes value (7.14 ± 2.44) in fresh water Tilapia Zillii were significantly higher than the value in brackish water Tilapia Zillii (2.02 ± 2.44), as shown in Fig (12).

In this study, the value of Granulocytes (4.23 ± 2.65) in fresh water, Tilapia Zillii was significantly lower than the value of Granulocytes (9.52 ± 7.58) in brackish water, Tilapia Zillii .as shown in Fig (13).

In this research, the value of Mean Corpuscular volume 125.46 ± 33.94 in fresh water, Tilapia Zillii was significantly lower than the result of the value of Mean Corpuscular volume (143.96 ± 29.51) in brackish water, Tilapia Zillii. Fig (14).

The results of this work for Mean corpuscular hemoglobin (86.94 ± 3.44), Mean corpuscular hemoglobin concentration (73.13 ± 9.35) in fresh water, Tilapia Zillii were significantly higher than values of Mean corpuscular hemoglobin (63.60 ± 15.24), Mean corpuscular hemoglobin concentration (42.64 ± 9.53) in brackish water, Tilapia Zillii as shown Fig (15, 16).

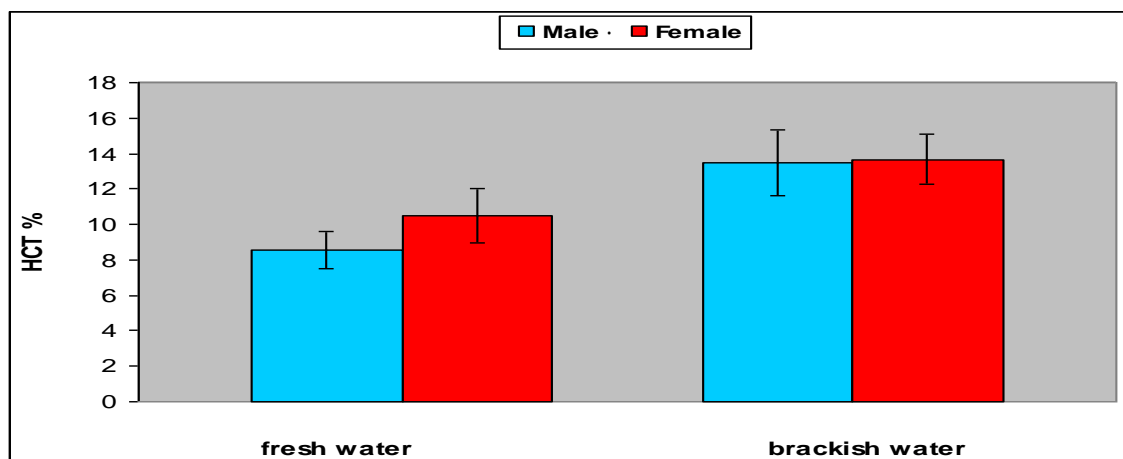


Figure (10): Hct of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake

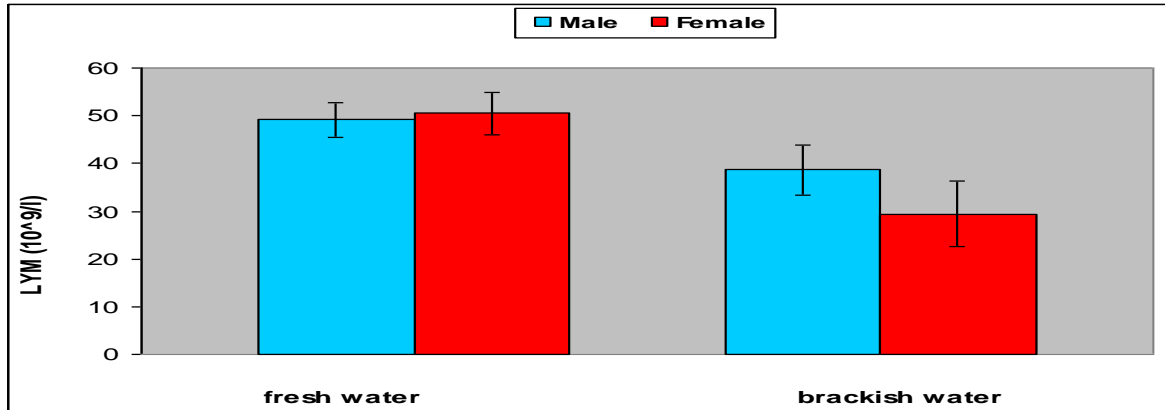


Figure (11): LYM of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

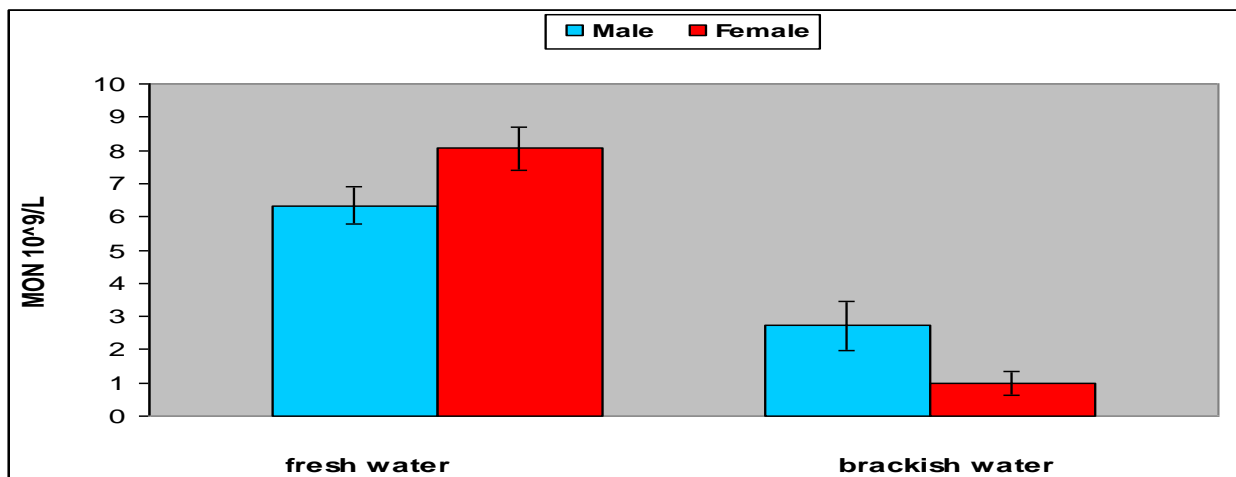


Figure (12): MON of Tilapia Zillii fishes from Fish Farm and Ain Elmajdob Lake

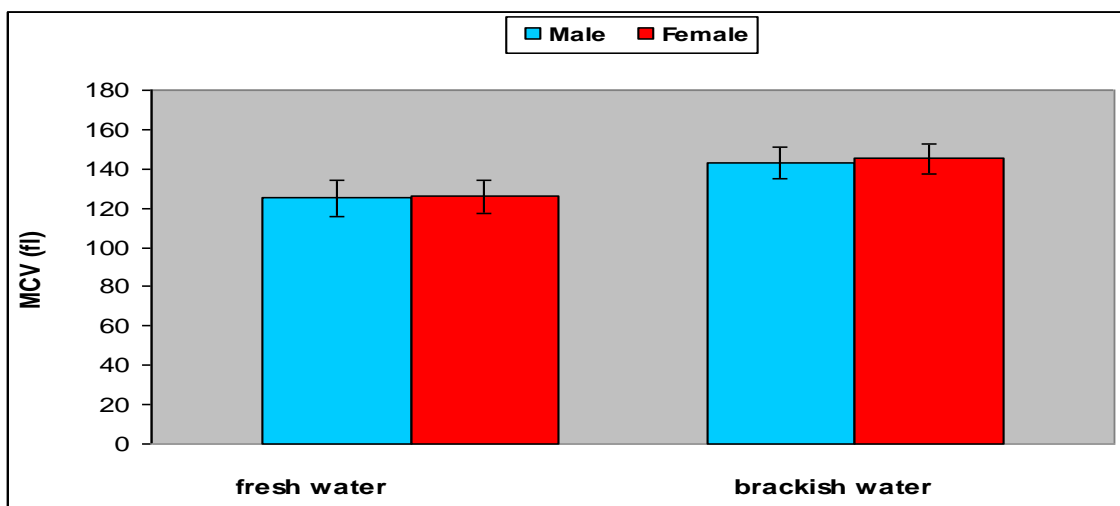


Figure (13): MCV of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

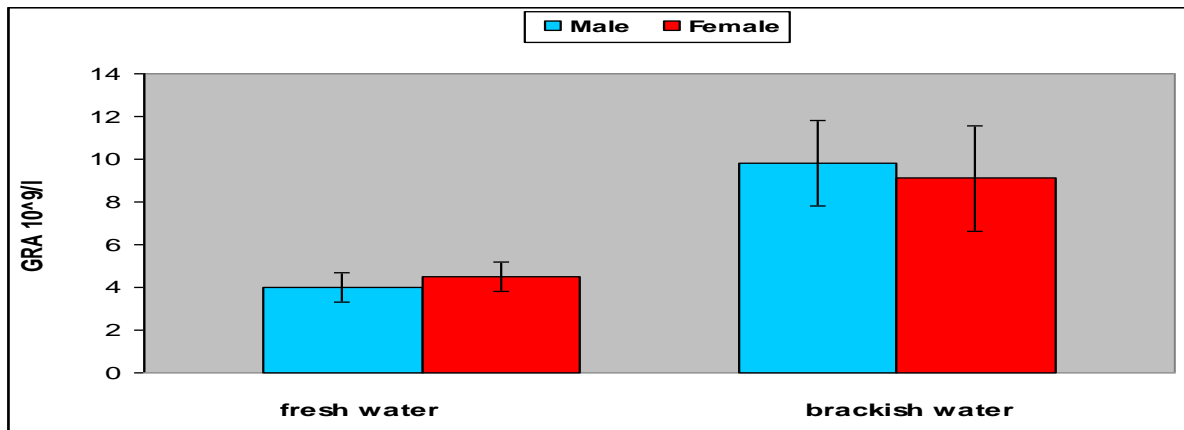


Figure (14): MCH of Tilapia Zillii fishes from Fish Farm and Ain Elmajdob Lake.

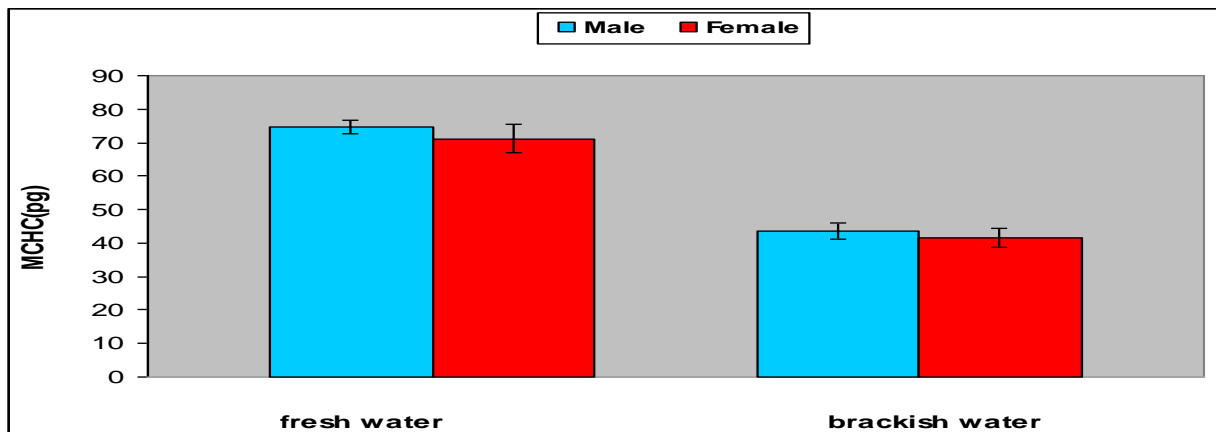


Figure (15): MCHC of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

In this work, There was no significant in the result of the White Blood Cell count, the WBC count of Tilapia Zillii in freshwater was (61.18±14.70), and in brackish water was (53.82±29.18), as shown in Fig(16).

The results of platelet were no significant (262.73±247.8) in freshwater, Tilapia Zillii and platelet in brackish water Tilapia Zillii (177.10 ±147.47) fig (17).

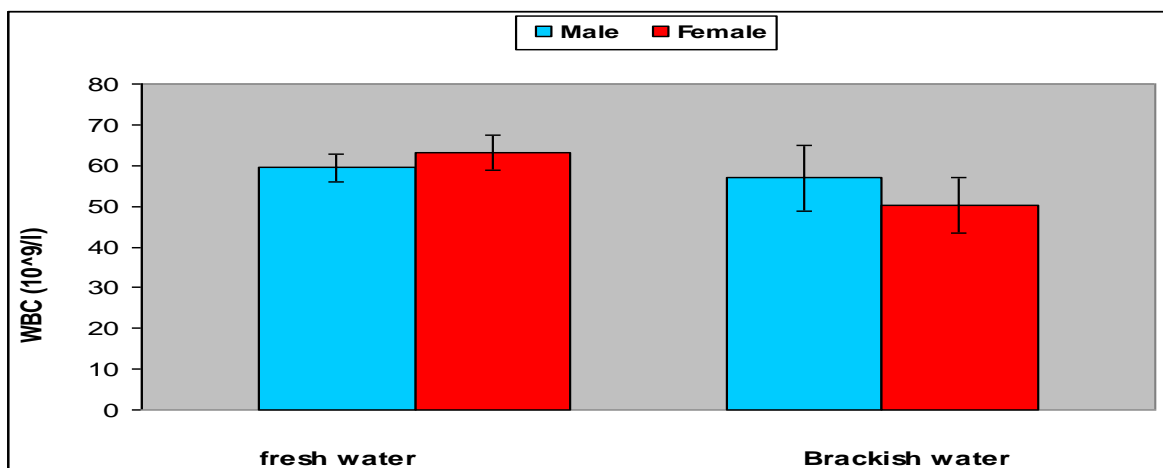


Figure (16): WBC of Tilapia Zillii fishes from Fish Farm and Ain El-Majdob Lake.

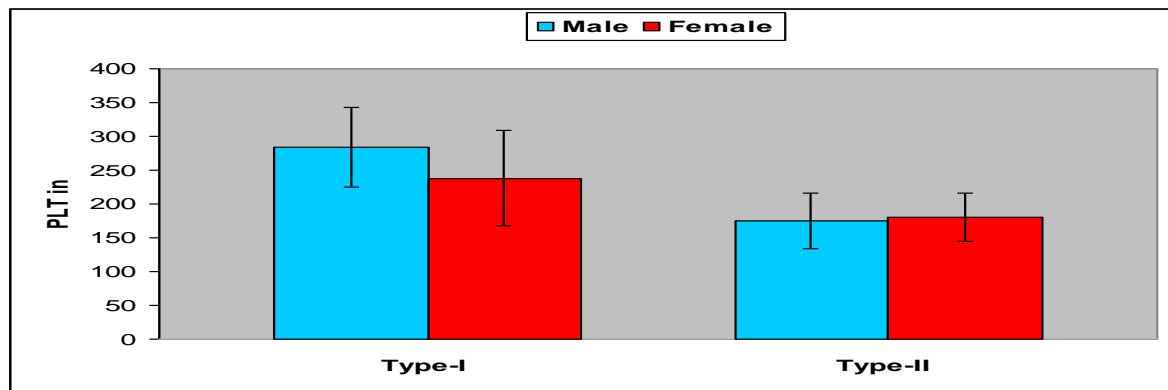


Figure (17): PLT of *Tilapia Zillii* fishes from Fish Farm and Ain El-Majdob Lake.

4. DISCUSSION

In this study, the result shows differences between the two ecosystems, such as water temperature was higher in Ain El-Majdob Lake (21.4C) than in Fish Farm (19.9C), because of the greater requirements for oxygen, food, and the faster growth rate, Water temperature rise when water absorbs energy from the sun. In shallow water, there may be little or no differences between the temperature at the surface and the bottom. In deep water, temperatures vary with the coolest water at the bottom.

Sun *et al*, (1995) concluded that low temperatures have the significant effects of either increasing or decreasing direction on the changes of various blood parameters in tilapias depending on the environmental salinity.

An increase in water temperature increased most of the parameters (Ezzet, 1973)

In this research, the water pH result of Ain El-Majdob Lake was (7.7), and the water pH in Fish Farm was (7.9). pH varies depending on several factors such as pH levels of the pond water change depending on the aquatic life within the pond, Carbon dioxide produced by aquatic organisms respire has an acidic reaction in the water, the pH in ponds rises during the day as phytoplankton and other aquatic plants remove CO₂ from the water during photosynthesis. The pH decreases at night because of respiration and the production of CO₂ by all organisms. The fluctuation of pH levels will depend on algae levels within the pond. (Aquaculture, 2003).

In this study, the Salinity was higher in Ain El-major Lake (6.1) than in Fish Farm (0.04), Salinity is a measure of the amount of salt in water, fresh water has almost no dissolved salt, and brackish water is a mixture of fresh and salt water. Salinity significantly caused the decrease of hemoglobin concentrations at 24C. (Sun *et al*, 1995).

High salinity caused an increase in the concentration of most of the blood characteristics, Temperature and salinity changes produce several variations in the blood characteristics of tilapia Zillii (Ezzat, 1973).

Although the dissolved oxygen was higher in Fish Farm (5.42mg/l) than in Ain El-major Lake (3.16mg/l), because warm water holds less oxygen than cold water does. Dissolved oxygen is probably the most critical water quality variable in freshwater aquaculture ponds. Oxygen levels in pond systems depend on water temperatures, stocking rates of aquaculture species, salinity, the amount of aquatic vegetation, and the number of aquatic animals in the ponds. Dissolved oxygen concentrations will vary throughout the day. Dissolved oxygen in the water is obtained through diffusion from air into water, mechanical aeration by wind or aeration systems, and photosynthesis by aquatic plants (Aquaculture, 2003).

In the present study, statistical analysis (ANOVA) reveals that hematological parameters are not significantly different between male and female fish in the two systems. Although the blood parameters between males and females of Tilapia were different as observed by Akinrotimi *et al.* (2010) in Niger Delta, Nigeria.

The weight and length of Tilapia Zillii in fresh water between males and females were 16 males weight between (10.5 to 28.6 gm) and total length between (7.0 to 11cm); 14 females weight between (10.5 to 31 gm) and total length between (8.3 to 12.2cm). on other hand, in brackish water were between 16 males weight between (9.4 to 41.9 gm) and total length between (7.4 to 13.2cm); 14 females weight between (9.2 to 28.2) gm and total length between (8 to 12 cm).

The effect of length-weight variables on blood parameters such as enhanced formation of lymphocytes were an essential component of immune system in the early stages of growth period (Aldrin *et al.*, 1982). In a research for Nile tilapia *Oreochromis niloticus*, there was an effect of fish size (between small and big fishes) on all the parameters except for MCV (Tran-Duy *et al.*, 2008). In a study on Mugil it was verified that mean values for HCT, Hb, MCV, MCH and MCHC showed a slight increasing tendency as individuals got larger (Ranzani-Paiva, 1995). Also, larger individuals present higher mean values for MCV, MCH and MCHC for dourado *Salminus maxillosus* (Ranzani-Paiva *et al.*, 2001).

Al-Hassan *et al*, (1993) observed the hemoglobin and hematocrit values of *Acanthopagrus latus* were having increased with both body weight and length, but to a certain weight and length group after which a slight fall in their value was observed.

4.1. The Red Blood Cells (RBC):

The Red Blood Cells have the important function of hemoglobin transport, which carries oxygen to all tissues in the body (Hibiya, 1982). The Red Blood Cell count significant decrease may be attributed to the decrease in the erythropoietic activity of the kidney (Santhakumer *et al*, 1999), decreased Red Blood Cell count indicates that the erythrocytes are being affected or destroyed by the infection of fish (Martins,2008),the reduction in the erythrocyte value may be due to destruction of the Red Blood Cells which might have resulted in the liberation of the hemoglobin content of the cells (Gbore,2006).

On the other hand, the increased Red Blood Cell count may be due to stimulation of erythropoietin by elevated demands for oxygen or carbon dioxide transport as a result of increased metabolic activity or destruction of gill membranes causing faulty gaseous exchange (Cyria P *et al*,1989). High Red Blood Cells could be explained by the increase of reproductive activity (Collasozn *et al*, 1998). Changes in metabolism and hormonal activity, triggered by cooler water temperatures and declining photoperiod during fall, may result in anemia (Lane 1979) and reduced erythropoietic production (Lane 1979; Zanuy and Carrillo 1985).

4.2. The hemoglobin concentration (Hb):

The hemoglobin within those erythrocytes is the main transport mechanism for oxygen and carbon dioxide in the blood. Alterations in blood oxygen capacity reflect seasonal adjustment in oxygen transport (Cameron, 1970; Anderson *et al*, 1985). Hemoglobin is the oxygen carrying component in the blood of fish and its concentration can be used as good indicator of anemia (Blaxhall and Daisley, 1971). The hemoglobin can vary with season, temperature and nutritional state and health of the fish (Bond,1979). The increase hemoglobin content could be explained as a process where the body tries to replace the oxidized denatured hemoglobin (Cyria, 1989). Changes in the hemoglobin content of the blood in response to the environment might come about either by a change in the number of erythrocytes or by a change in the hemoglobin concentration of the individual cells (Anthony, 1961).

4.3. The hematocrit value (Hct or PCV):

Hematocrit provides a measurement of red blood cells (erythrocytes) in whole blood. (Cameron, 1970; Anderson *et al*, 1985). The increase in hematocrit value may be attributed to swelling of red blood cells due to increased carbon dioxide in blood, hypoxia or stress of fish (Ellis,1981) and high hematocrit level may be caused by metabolic activities (Collasozn *et al*.,1998). These differences may be due to diverse strains used in previous studies and different environmental and cultured conditions. Low temperature caused the decrease of hematocrit (Sun et al,1995)

4.4. The lymphocyte (LYM):

This work shows a decreased in lymphocytes in Tilapia Zillii fresh water and brackish water contrarily to that observed in Tilapia Zillii; (74.42.13) by Ghazaly, , (1992). However, these values were higher than the values obtained for Nile tilapia (20.59.7) by Martins *et al*,(2008) and values of Tilapia guineensis, (35.46 4.11) by Akinrotimi *et al*,(2010).except lymphocyte in brackish water, Tilapia Zillii in this study are lower than in Tilapia guineensis ;35.46 4.11 (Akinrotimi.,2010).

4.5. Monocytes value (MON):

The result of Monocytes in the present study for freshwater Tilapia Zillii was higher than that reported by Akinrotimi *et al*, (2010) in Tilapia guineensis (3.12 1.01). However, this value was significantly lower than the value obtained for Nile tilapia 14.3 7.7 (Martins *et al*, 2008).

While the result of Monocytes value in brackish water Tilapia Zillii in this research was lower than those studied by Martins *et al*, (2008) in Nile tilapia (14.3 7.7) and Tilapia guineensis, 3.12 1.01 by Akinrotimi *et al*, (2010). High Monocytes could be explained by increase of reproductive activity and defense mechanism of fish (Orun and Erdemli, 2003).

4.6. Granulocytes value (GRA)

The result of Granulocytes in fresh water, Tilapia Zillii in this work is similar to Tilapia Zillii (4.8 1.18) by Ghazaly, (1992).but lower than Nile tilapia 6.5 4.6 (Martins *et al*,2008) and Tilapia guineensis, 20.95 2.21 by Akinrotimi *et al*, (2010).

On the other hand, the result of Granulocytes in fresh water, Tilapia Zillii in this research is lower than the value referred by Akinrotimi *et al* ,(2010) in Tilapia guineensis (20.95 2.21).but higher than the value the value obtained for Nile tilapia 6.5 4.6 by Martins *et al*,(2008) and Tilapia Zillii (4.8 1.18) by Ghazaly, (1992).

Granulocytes are phagocytic, involved in combating disease, and may increase in number when the fish is infected by bacteria. (Bond, 1979).

4.7. Mean Corpuscular volume (MCV):

Lower value of Mean Corpuscular volume was found in the present study in *Tilapia Zillii* in freshwater and brackish water than those referred by Bittencouret *et al*, (2003) in Nile tilapia (148.80153.19) and the result of *Tilapia Zillii* (181.78 A 0.06) by Gbore *et al*,(2006). Nevertheless, the value of Mean Corpuscular volume in the present work *Tilapia Zillii* in fresh water and brackish water was higher than the value obtained in *Tilapia guineensis*; 80.76 2.11 by Akinrotimi *et al*, (2010) and *Tilapia Zillii*; 104.29 13.7 (Ghazaly, 1992).

4.8. Mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC):

Changes in the hemoglobin content of the blood in response to the environment might come about either by a change in the number of erythrocytes or by a change in the hemoglobin concentration of the individual cells (Anthony, 1961 |).

The value of MCH and MCHC in this work were higher than the values MCH ;(23.961.21), MCHC; (29.662.21) that obtained in *Tilapia guineensis* (Akinrotimi *et al*,2010) ., MCH (46.482.49), MCHC ; (33.141.88) in *Tilapia Zillii* by Gbore *et al*,(2006), and values MCH ;(40.7434.19), MCHC ;(35.2414.92) that concluded in Nile tilapia (Bittencouret *et al*,2003) .

The increase of Mean corpuscular hemoglobin concentration may be attributed to swelling of red blood cells due to increased carbon dioxide in blood, hypoxia or stressful (Ellis, 1981).

4.9. White Blood Cells count (WBC):

In this work, were no significant in result of the White Blood Cells count, in fresh water, *Tilapia Zillii* and in brackish water, *Tilapia Zillii*.

The White Blood Cells are known to be involved in the regulation of immunological functions of the body and the animal resistance to some vulnerable diseases. Decrease of white blood cells to protective functions of the body (Santhakumer *et al*, 1998). The White Blood Cells of the blood respond to various stressors including infections and chemical irritants (Mohammed and Sambo, 2008). The significant change in the white blood cells values of *Tilapia Zillii* might be due to the stress of handling and transportation (Gbore *et al*, 2006).

4.10. Platelet or Thrombocytes (PLT):

In this work, the results of platelet were no significant in fresh water, Tilapia Zillii and platelet in brackish water, Tilapia Zillii. These values are higher than the platelet value (40.02 3.14) that studied by Akinrotimi *et al*,(2010) in Tilapia guineensis.

Platelet are involved in blood clotting, they carry chemical that promotes the conversion of prothrombin and thrombin (Bond, 1979). Nowadays, thrombocytes have been found to be an important cell involved in fish defenses (Martins *et al*, 2008). Finally, differences in levels of some hematological parameters could be explained by effects of body size and ecological conditions.

The increase in hematological parameters might have resulted from the difference in water temperature and oxygen concentration (Orun and Erdemli, 2003).

An attempt was made to compare the reference range for hematological values for Tilapia Zillii and the range of the corresponding values for Tilapia Zillii specimens reported by other investigators. A direct comparison was not possible because of the different experimental factors, there is a wide range of physiological variations are influenced by environmental conditions, gender, origin, feeding and age. (Bittencouret *et al*,2003) .

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