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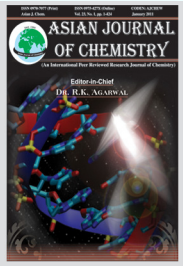

Some Haematological and Biochemical Parameters in Common Carp (*Cyprinus carpio* L., 1758) in Munzur River, Tunceli, Turkey

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Haematological parameters are indicators of the response of the animal to the environment and used as reliable indicators of fish health status to detect physiological changes following different stress conditions. This study was carried out to evaluate some haematological and biochemical parameters of *Cyprinus carpio* caught in Munzur River, Tunceli, Turkey. The values of total red blood cell count (RBC), haematocrit (HCT), haemoglobin concentration (HGB), mean corpuscular volume (MCV), mean cellular haemoglobin content (MCH), mean corpuscular haemoglobin concentration (MCHC), platelet count (PLT), mean platelet volume (MPV), plateletcrit (PCT), platelet distribution width (PDW) were measured. Levels of amylase, high-density lipoprotein cholesterol (HDL-C), cholesterol (CHOL), albumin (ALB), total protein (T-PROT), direct bilirubin (D-BIL), total bilirubin (T-BIL), γ glutamyle tranferas (GGT), urea, creatinine, glucose (GLU), triglycerides (TRIG), uric acid (Uric-A), sodium, potassium, calcium, phosphorus and iron, chlorine were determined as 1.02 10^{12}/L, 17.90 %, 11.72 g/L, 198.00 fL, 166.82 pg, 89.50 g/dL, 112.80 10^{9}/L, 8.06 fL, 0.055 %, 17.59 fL, 87.20 U/L, 220.24 mg/dL, 767.40 mg/dL, 1.60 g/dL, 4.68 g/dL, 1.83 mg/dL, 3.046 mg/dL, 12.00 U/L, 9.20 mg/dL, 0.72 mg/dL, 504.40 mg/dL, 381.00 mg/dL, 2.76 mg/dL, 134.20 mmol/L, 1.90 mmol/L, 13.78 mg/dL, 17.96 mg/dL, 262.60 g/dL, 81.80 mmol/L, respectively. We assume that variation in values of blood indices may be a defensive mechanism against pollution.

Key Words: Biochemical parameters, Common carp, Munzur River.

INTRODUCTION

Water pollution is recognized globally as a potential threat to both human and other animal populations which interact with the aquatic environments[1]. Human population growth and industrial development have been the major causes of coastal contamination around the world during recent years[2]. Discharges of metal effluents into Rivers may cause deleterious effects to the health[3]. Fish contaminants can reach man through the food chain[4].

Haematological indices are important for toxicological research, environmental monitoring and as indicators of disease and stress[5]. Since haematological parameters reflect the poor condition of fish more quickly than other commonly measured parameters and since they respond quickly to changes in environmental conditions[6], they have been widely used for the description of healthy fish[7], for monitoring stress responses[8,9] and for predicting systematic relationships and the physiological adaptations of animals. In addition to the haematological parameters, biochemical variables are of fundamental importance in the physiopathological evaluation of animals. Biochemical parameters were often used when clinical diagnosis of fish physiology was applied to determine the effects of external stressors and toxic substances[10,11].

The cyprinidae is one of the largest families of teleost in the world comprising at least 1700 species and over 200 genera. Natural populations of cyprinids are widely distributed in most freshwater Rivers, lakes and ponds in world[12]. The common carp, *Cyprinus carpio* L., is a dominant species in freshwater fish culture and is believed to have emerged in the middle of the 19th century and was well developed at the beginning of the 20th century[13].

Considering the significance of haematological and serum biochemical parameters as indicators of fish health, the present study aimed at investigating the status of fresh water fish *Cyprinus carpio* from the Munzur Region of Tunceli. For this purpose, certain water quality parameters of the River and some haematological and biochemical parameters of this fish caught from the River were analyzed.

EXPERIMENTAL

The experiment was organized on Aquaculture Department, Fisheries Faculty and Faculty of Engineering, Department of

Environmental Engineering on Tunceli University (Tunceli, Turkey).

Locality: The localities were illustrated in Fig. 1. The fish was caught from River mouth of Munzur River with gill net (20 m length and 10 cm diameter) on April 2010.

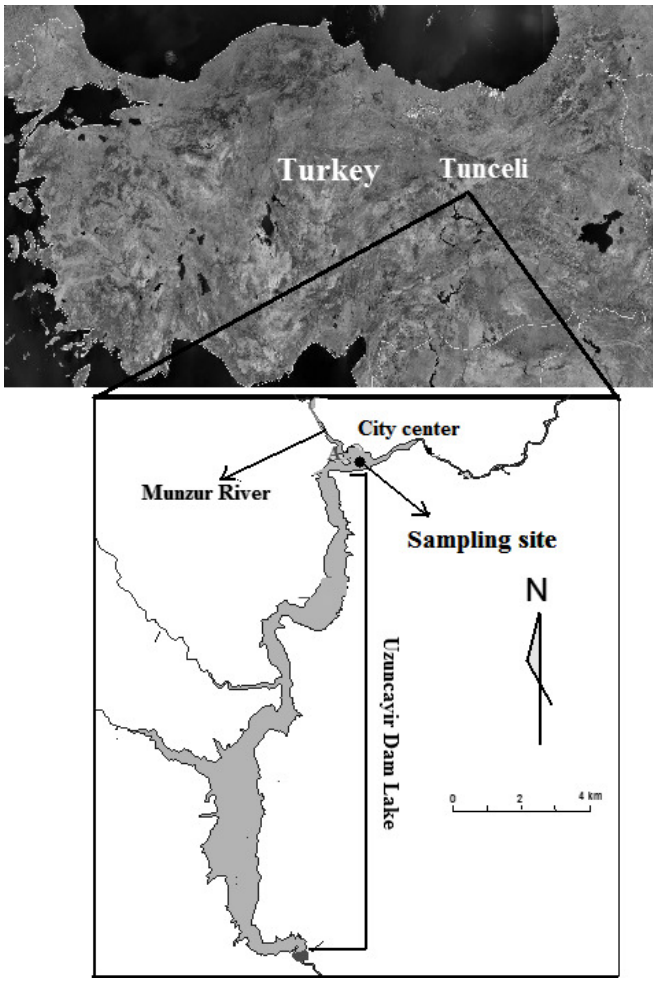

Fig. 1. Map of sampling site on Munzur River, Tunceli, Turkey

Fish: In this study, wild fishes of common carp (*Cyprinus carpio* Linneaus, 1758) were used for investigating the status of fish. The fish (n = 7) was caught from their natural areas in Munzur River (Tunceli, Turkey). These fishes had been anaesthetized immediately 0.7 g/L benzocaine dissolved in ethyl alcohol[14] and observed anesthesia of fish being deep sedation, losing of swimming actions and partial losing of equilibrium[15].

Blood sampling: Blood samples were collected by piercing in the ventro-lateral side of the caudal peduncle with 5 mL disposable syringe and transferred to K3 EDTA tubes (2.5 mL) for haematological analyses and to gelled and vacuumed tubes (5 mL) for biochemical analyses. The tubes were closed and rinsed to prevent haemolysis and stored in cold until analysis[16].

Haematological analyses: Blood parameters (RBC, HGB, HCT, MCV, MCH, MCHC, PLT, MPV, PCT and PDW) were determined by auto haematology analyzer (BC-5500).

Biochemical analyses: The blood sample was centrifuged at 4000 rpm for 20 min (centrifuge; Universal 320 R (Hettich Zentrifugen)) to separate the plasma and analyzed. Na, K, Ca, P, amylase, HDL-C, CHOL, T-PROT, D-BIL, T-BIL, GGT, creatinine, Urea, GLU, ALB, TRIG, Uric-A, Fe and Cl were measured by kits (Lot numbers of kits; E485, E485, F133, F108, E504, HDL100101, E597, E467, F050, F145, F004, E338, E398, F027, E424, E418, E628, E389 and E485, respectively, (purchased Thermo SCIENTIFIC)) using clinical chemistry analyzer (Konelab Prime 60I).

Statistical analysis: SPSS v13.0 statistical software was used for statistical analysis (SPSS Inc., Chicago, IL, USA). Data was statistically analyzed for means ± standard error.

RESULTS AND DISCUSSION

The values of RBC, HCT, HGB, MCV, MCH, MCHC, PLT, MPV, PCT, PDW, Amylase, HDL-C, CHOL, ALB, T-PROT, D-BIL, T-BIL, GGT, urea, creatinine, GLU, TRIG, Uric-A, Na, K, Ca, P, Fe and Cl were shown in Table-1.

TABLE-1
SOME BLOOD BIOCHEMICAL PARAMETERS IN *Cyprinus carpio* CAUGHT FROM SAMPLING SITE ON MUNZUR RIVER

Parameters	Mean ± SE*	Parameters	Means ± SE
Na (mmol/L)	134.20 ± 2.43	Uric-A (mg/dL)	2.76 ± 0.30
K (mmol/L)	1.90 ± 0.53	Fe (mg/dL)	262.60 ± 32.73
Ca (mg/dL)	13.78 ± 0.69	Cl (mmol/L)	81.80 ± 3.63
P (mg/dL)	17.96 ± 0.44	RBC (10^{12}/L)	1.02 ± 0.13
Amylase (U/L)	87.20 ± 14.33	HGB (g/L)	11.72 ± 0.51
HDL-C (g/dL)	220.24 ± 37.33	HCT (%)	17.90 ± 2.18
CHOL (g/dL)	767.40 ± 98.79	MCV (fL)	198.00 ± 9.71
T-PROT (g/dL)	4.68 ± 0.37	MCH (pg)	166.82 ± 3.84
D-BIL (mg/dL)	1.83 ± 0.22	MCHC (g/dL)	89.50 ± 11.98
T-BIL (mg/dL)	3.04 ± 0.35	PLT (10^9/L)	112.80 ± 4.59
GGT (U/L)	12.00 ± 2.21	MPV (fL)	8.66 ± 0.61
Creatine (mg/dL)	0.72 ± 0.05	PCT (%)	0.05 ± 0.01
Urea (mg/dL)	9.20 ± 0.37	PDW (fL)	17.59 ± 0.59
Glu (mg/dL)	4.40 ± 70.85	TRIG (mg/dL)	381.00 ± 36.67
ALB (g/dL)	1.60 ± 0.08		

*SE: Standart error, n = 7.

Fish physiology (haematological and biochemical parameters) are suitable tools for assessing environmental influences and stress effects of anthropogenic origin on the condition and health of aquatic vertebrates[17]. Fishes can adapt themselves to bad environmental conditions by changing their physiological activities. Blood is an indicator of physiological condition of an animal. Blood is known to exhibit pathological changes before the onset of any external symptoms of toxicity. Fish blood is a pathophsiological indicator of the whole body function and therefore qualitative and quantitative variations in haematological parameters including RBC and WBC numbers, cell proportions of leukocyte, the amount of HGB and the size of RBC and WBC are the most significant findings as regards diagnosis[18].

Generally, the erythrocytes not only pump out sodium and pump in potassium against electrochemical gradient but also reduce methaemoglobin to HGB to transport oxygen to the body tissues. The importance of PCV or HCT as an index of anaemia and erythrocyte sedimentation rate (ESR) revealing almost all types of infections is well known in clinical medicine[19]. White blood corpuscles (WBC) play a major role in defense

mechanism and mainly comprise granulocytes, monocytes and lymphocytes. The former two function as phagocytes to salvage debris from injured tissue and the latter produces antibodies[20]. Thrombocytes are involved in coagulation of blood. Therefore, clinical haematology has been widely used as potent bioindicator in aquatic toxicology[21].

In addition to the haematological parameters, biochemical variables are often used to evaluate environmental pollution. A higher serum amlylase than normal concentration, may reflect one of several medical conditions, including acute inflammation of the pancreas. Low albumin (hypoalbuminemia) may be caused by liver disease, nephrotic syndrome, burns, protein-losing enteropathy, malabsorption, malnutrition, late pregnancy, artefact, genetic variations and malignancy. High albumin (hyperalbuminemia) is almost always caused by dehydration[22]. Uric-A may be a marker of oxidative stress[23]. CHOL is a steroid lipid found in the cell membranes of all body tissues and transported in the blood plasma[24].

Elevated levels of serum bilirubin suggest liver damage[25]. Elevated serum GGT activity can be found in diseases of the liver, biliary system and pancreas[26]. The blood GLU level reflected the changes in carbohydrate metabolism under hypoxia and stress conditions. Rise of glucose level indicated the presence of stressful stimuli eliciting rapid secretion of both glucocorticoids and catecholamines from the adrenal tissue and accompanied by cortisol elevation[27]. Triglycerides are used to evaluate nutritional status, lipid metabolism and its high concentrations may occur with nephritic syndrome or glycogen storage disease[28]. The macroelements calcium, magnesium, sodium, potassium and phosphorus are essential to human health[29]. Microelements such as zinc, iron, copper and manganese, which occur in physiological concentrations, play key roles in living processes and either an excess or deficit can disturb biochemical functions in both humans and animals[30].

Ramesh *et al.*[31] investigated haematological and biochemical responses in a freshwater fish *Cyprinus carpio* exposed to chlorpyrifos. They found that haematological parameters like RBC, HGB and TPROT levels decreased insecticide treated group whereas WBC and plasma GLU levels increased. Maheswaran *et al.*[32] investigated the haematological parameters of fresh water fish, *Clarias batrachus* L. exposed to mercuric chloride. They indicated that after 35 days after exposure RBC count and HGB content decreased. The number of WBC increased in mercuric Cl treated fish. Zaki *et al.*[33] assessed the hazardous effect of lead pollution on *Tilipia zilli*, including haematological, biochemical and immunological parameters. They indicated that RBCs, HGB, HCT and MCHC showed significant elevations, the serum GPT and GOT were increased significantly. LDH, glucose and cortisol were elevated, while serum CHOL concentration was reduced significantly when tilapia exposed to height temperature 30 ºC and lead pollution.

As a result of present study, the values of RBC, HCT, HGB, MCV, MCH, MCHC, PLT, MPV, PCT and PDW were measured. Levels of Amylase, HDL-C, CHOL, ALB, T-PROT, D-BIL, T-BIL, GGT, urea, creatinine, GLU, TRIG, Uric-A, Na, K, Ca, P, Fe and Cl were from examined haemetological and biochemical parameters were found as 87.20 U/L; 220.24 mg/dL; 767.40 mg/dL; 1.60 g/dL; 4.68 g/dL; 1.83 mg/dL; 3.046 mg/dL; 12.00 U/L; 9.20 mg/dL; 0.72 mg/dL; 504.40 mg/dL; 381.00 mg/dL; 2.76 mg/dL; 134.20 mmol/L; 1.90 mmol/L; 13.78 mg/dL; 17.96 mg/dL; 262.60 g/dL; 81.80 mmol/L, respectively.

The measuring of haematological and biochemical parameters, which are used in this study, have provided valuable information. The employment of haematological and biochemical techniques has provided valuable knowledge for fishery biologists in the assessment of fish health and in monitoring stress responses. We believe that further researches are needed to protect the aquatic organisms.

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