

## **A COMPARATIVE STUDY OF GRASS CARP (*CTENOPHARYNGODON IDELLA*) WHEN CULTIVATED IN POLLUTED AND NON POLLUTED AQUATIC ENVIRONMENT**

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**Keywords;** grass carp, necrosis

### **ABSTRACT**

Fourty fresh water grass carp fish weighing about ( $35.75 \pm 0.60$ ) g were obtained from fish aquaria by, Marine Science Center, University of Basrah, Iraq. First the. Fish were individually examined for external necrosis and infections. Healthy and see it very active in the study. The physiochemical characteristics of water used for acclimation in control and polluted water that were used for the fish of experiment were daily recorded.

The results of the present study show that the blood parameters ( RBC and WBC counts and Hb content) for fresh water grass carp fish were greater than those values of polluted water grass carp fish and also show increased number of dead fish among polluted grass carp, in reverse of fresh water ones. Physicochemical characteristics of water did not affect the results.

### **INTRODUCTION**

Fish are not only a major ecosystem component, making it important to study their physiological response mechanism when confronted with environmental stress<sup>(1)</sup>. Any environmental disturbance can be considered as a potential source of stress as it promotes a number of responses in the fish to deal with the physiological changes triggered by exterior challenges<sup>(2)</sup>. These responses can be detected in fish in the form of changes in biomarkers, alteration in erythrocytes such as cell volume and enzyme activities<sup>(3,4,5)</sup>. Of among all aquatic fauna, fish is the most susceptible to the effects of heavy metal toxicants in comparison to other aquatic organisms<sup>(6,7)</sup>.. Because of their toxicity,long survival time, circular course in the biosphere and accumulation in nature, heavy metals are of prime importance among stress generators to fish<sup>(8)</sup> Heavy metals cause differences in the physiological and chemical properties of fish blood<sup>(9)</sup>.The bioaccumulation of combined heavy metals occurs in common carp under sublethal levels of metal exposure<sup>(10)</sup>.Exposure of animal to hydrocarbons causes delayed reproduction, reproductive failure, birth defects, skin lesions, tumors, thymic atrophy, liver disorder, teratogenic effects, behavioural changes, histopathological alterations, body weight loss, decreased food consumption , in more sensitive species death occurred<sup>(11,12)</sup>.

### **MATERIALS AND METHODS**

Fourty fresh water grass carp fish weighing about ( $37.85 \pm 0.70$ ) g were acquired from Fresh water aquaria of,,Marine Science Center,University of Basrah,Iraq.. Fish were individually examined for external necrosis, infection and

parasites. Those fish which proved to be free from pathological signs and very active were used for the study, ten fish for control group and three repetitions ,each repetition of ten fish for or polluted water groups. Physiochemical characteristics of water used for acclimation in control and polluted water that were used for cultivation of fish of experiment were daily recorded . The institutional ethical committee guides for the care and use of laboratory animals were followed<sup>(13)</sup>. The fish were taken from a clean water pond in fish breeding farm of: Marine Science Centre, the specimens are quite healthy and they were of the same size and age group.The dissolved oxygen and electrical conductivity (EC) in fresh and polluted water were measured by YSI incorporated apperatus ,556 model.the study lasted two weeks.

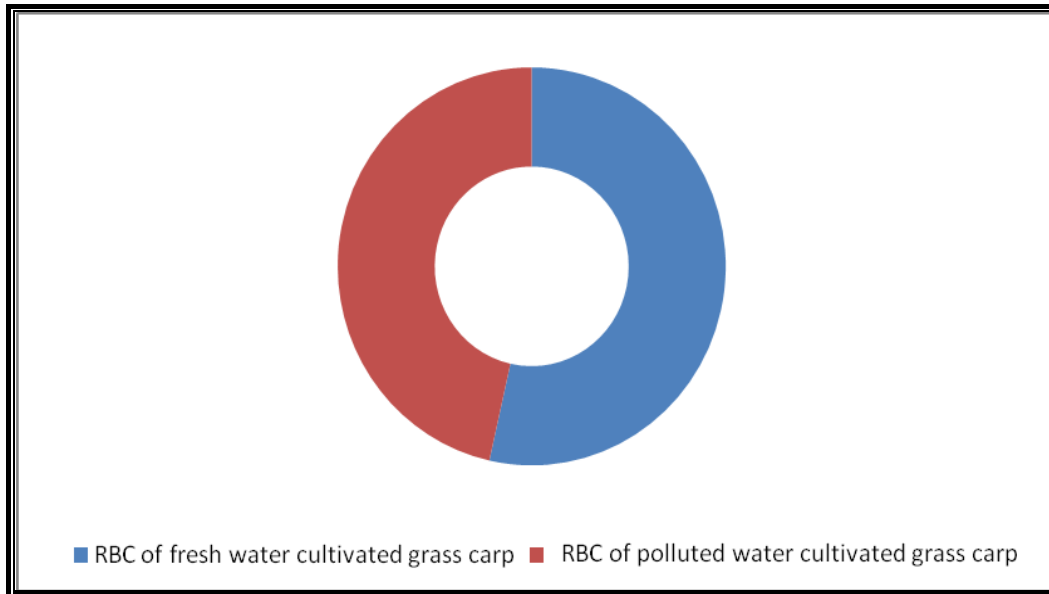
The blood test-samples taken through heart puncture were located in Monovet units with anticoagulant ,EDTA<sup>(14)</sup>. Hemoglobin estimation (g/ 100 ml ) was done by using Sahli apparatus previously treated with EDTA<sup>(15)</sup> . The total red and white blood cells were counted by using Neubaur Improved Haemocytometer and light microscope<sup>(16)</sup> . Fresh and polluted water aquaia during the period of experiment were provided with oxygen by electrical aerators.The statistical analysis SPSS was used to analyze the data and LSD ( least significant difference ) was used to test the significant difference between the treatments (  $P \leq 0.05$  ) .

## RESULTS

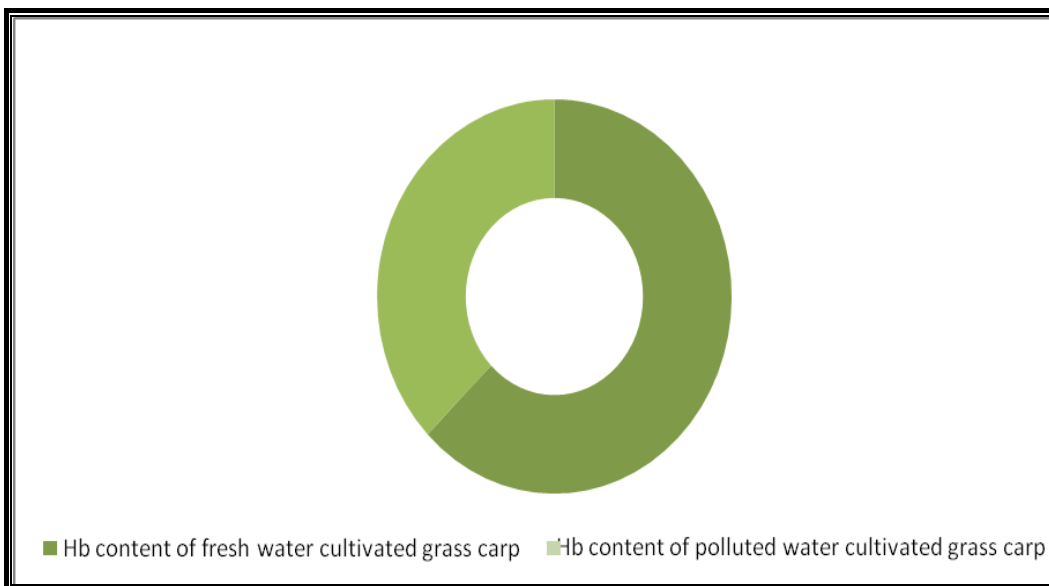
The results of blood parameters are present in table (1) and figures (1,2,3) of carp, grass carp fish that were cultivated in fresh and polluted waters.

**Table ( 1) illustrates the parameters of blood cell(RBC Count, Haemoglobin concentration and WBC count ).**

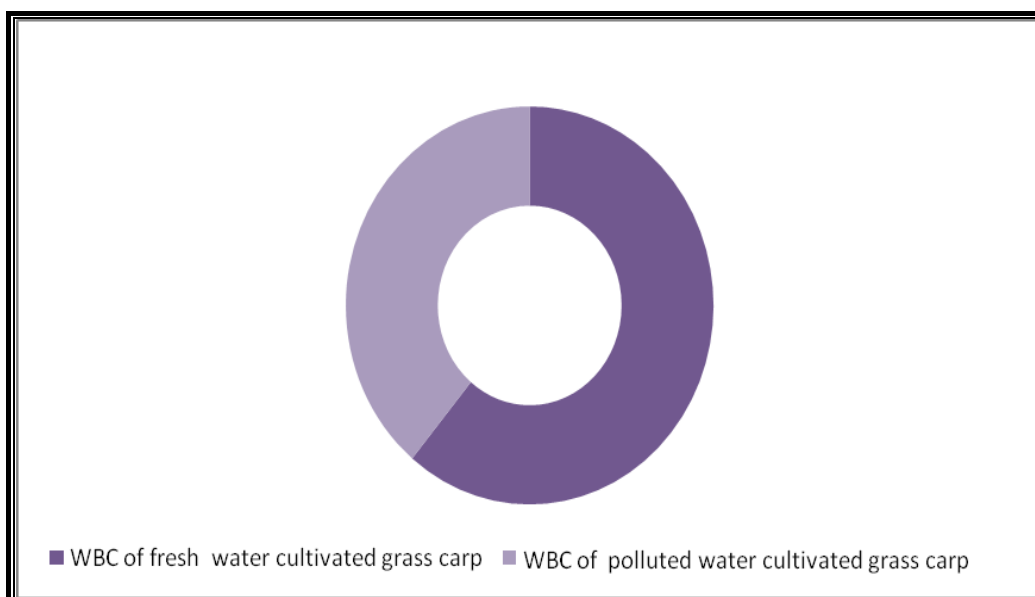
Blood parameters	Grass carp fish Cultivated in Polluted water	Grass carp fish Cultivated in fresh water
Number of RBC Per 1 mm <sup>3</sup> (1x10 <sup>6</sup> mm )	3190000 ±41255 .22	3670000 ±53418 .35
Hb content (gm/dl)	3.25 ±0.125	5.46 ±0.622
Number of WBC Per 1 mm <sup>3</sup> ( 1x10 <sup>3</sup> mm )	4600 ± 275	7200 ±425



**Figure (1) shows the numbers of red blood cells of grass carp that were cultivated in fresh water and in polluted water .**



**Figure (2) illustrates the haemoglobin (Hb) contents of grass carp fish that were cultivated in fresh and polluted waters.**



**Figure (3) illustrates the numbers of white blood cell of grass carp that were cultivated in fresh and polluted waters.**

Table 2 shows the physicochemical parameters for fresh and polluted waters. pH values of the polluted water at the beginning and ending of the experiment, they were sequentially mentioned (7.8 & 8.14), they were greater than those of fresh water ones. Dissolved oxygen values for fresh water at starting and ending of the experiment (8.33, 10.1 mg/L), they were greater than those of polluted ones. While Ec values at starting and ending of the experiment of polluted water were greater than those of fresh water (1.7, 1.87  $\mu$  S / cm units).

**Table ( 2 ) illustrates the normal range of physicochemical parameters that recorded during the experiment period.**

Physiochemical parameters	Experimental period ( two weeks )			
	Starting of experiment		Ending of experiment	
	Control (freshwater)	Polluted water	Control (fresh water)	Polluted water
pH	7.4	7.8	7.8	8.14
Dissolved oxygen (mg/l)	8.33	8.11	10.1	9.01
electrical conductivity ( $\mu$ s/cm)	1.2	1.7	1.33	1.87

**Table ( 3 ) shows the ranges and averages of physicochemical parameters for fresh and polluted waters during the period of experim**

Physiochemical parameters	Range		Average	
	Control (fresh water)	Polluted water	Control (fresh water)	Polluted water
pH	7.4-7.8	7.8-8.14	7.6	7.98
Dissolved oxygen (mg/l)	8.33-10.1	8.11-9.82	9.28	8.54
electrical conductivity (µs/cm)	1.2-1.33	1.7-2.26	1.297	1.937

Table 4 shows the number of dead fish among the polluted water grass carp fish as time of the experiment increased.

**Table( 4) shows the number of survived fish during and after the experiment(n=10,number of fish that were used for each group and time period )**

Period of experiment in Days	Number of survived fish		Number of dead fish	
	In fresh water	In polluted water	In fresh water	In polluted water
10	All live	9	None	1
12	All alive	5	None	4
14	All alive	3	None	7

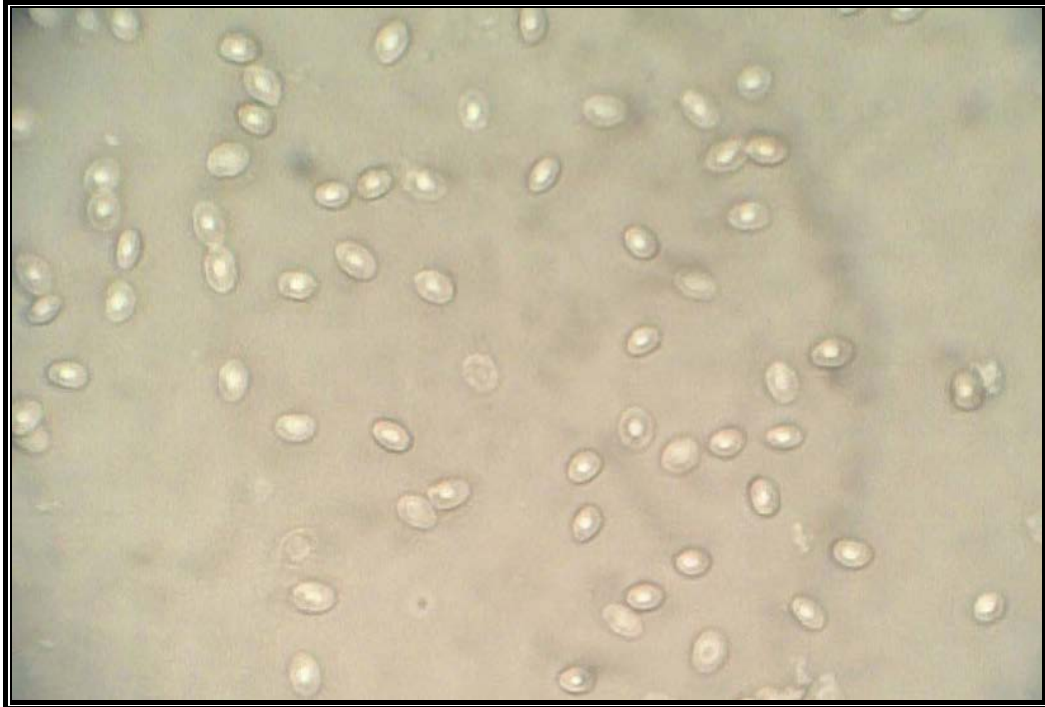


Figure ( 4 ) illustrates the normal blood cells of fresh water grass carp fish under high power ( 40 ) .

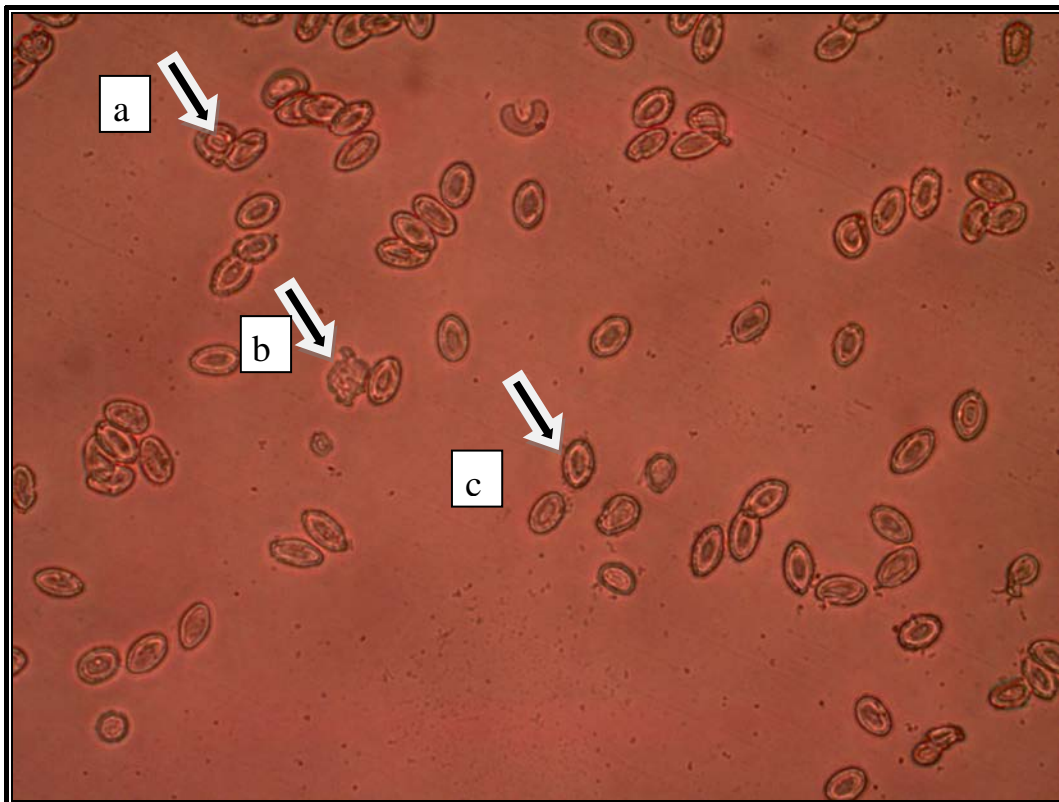


Figure (5) Illustrate the deterioration in blood cells of polluted water grass carp under high power (40X) a&b represent deteriorated RBC while c represents normal cells.

## DISCUSSION

Table 1 shows the parameters of blood cells (RBC and WBC count Hb content ). With respect to RBC count for the blood of grass carp fish that were cultivated in fresh water aquarium showed a number ( 3670000 Cell / 1 mm<sup>3</sup> ) higher than that one of the fish that were exposed to polluted water( 3190000 Cell / 1 mm<sup>3</sup> ).

As to WBC count, fresh water grass carp fish showed also a number (125000 Cell / 1 mm<sup>3</sup> ) was higher than the one of polluted water grass carp fish ( 28525 Cell / 1 mm<sup>3</sup> ). While haemoglobin estimation value for the blood of fresh water grass carp fish ( 5.46 g / 100 ml ) dominated the value of polluted water grass carp fish (3.259 46 g / 100 ml ).

Decreasing of blood parameters ( RBC,WBC and Hb content of polluted water grass carp fish could be due to many reasons. It could be as a result of the impact of heavy metal exposures such as cadmium intoxication<sup>(17,18,19)</sup> mentioned that zinc salts precipitated the mucus on the gills of the fish causing their death from suffocation. If the secreted mucus by the fish was in a large quantity, it could be deposited on the gills, reduces the gas exchange<sup>(18,20)</sup>. Xenobiotics can induce physiological changes that appear at the biochemical level such as in carbohydrate , protein metabolism and in blood parameters<sup>(21)</sup>.

Table 2 and Table 3 illustrate the physicochemical parameters( i.e .pH value, oxygen concentration and electrical conductivity units ) for fresh and polluted waters in which the fish of the experiment were cultivated .Range and average values of the above mentioned physicochemical parameters were within normal range ,so they should be excluded from the reasons of fish death<sup>(22)</sup>.

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Results shows the normal blood cells of fresh water grass carp fish (control sample ) without any deterioration . Where as the deterioration of blood cells of polluted water grass carp fish, such as disruption of cell wall or shape of the cell and their numbers due to the above mentioned reasons. Spring viraemia of carp could also be the cause of decreasing the number of fish during the period of the experiment. Statistical analysis showed that there were significant differences in several rates among the three blood parameters.

### Conclusion

Decreasing of blood parameters ( WBC,RBC and Hb content) for the fish that were cultivated in polluted water of unknown components.

It could be as a result of exposure of these fish to heavy metals or xenobiotic sources.

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## دراسة مقارنة بين معايير الدم لاسماك الكارب العشبي المستزرعة في بيئة مائية ملوثة و اخرى ملوثة.

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### الخلاصة

استخدمت في هذه التجربة اربعون سمكة من اسماك الكارب العشبي ، تزن (  $0.60 \pm 35,75$  غم )  
، حصل عليها من احواض تربية الاسماك التابعة لمركز علوم البحار، جامعة البصرة. اختيرت للدراسة الاسماك  
النشطة جدا بعد فحصها على نحو فردي و التأكد من خلوها من التقرنات الخارجية و الاصابات المرضية.

اخذت القياسات الفيزيوكيميائية يوميا لماء التاقلم و الماء الملوث المستخدمين مع مجاميع اسماك التجربة  
كانت قياسات الدم لعينات الاسماك الضابطة اى اسماك الكارب العشبي غير الملوثة ذات القيم التلية ( خلايا  
الدم الحمراء ) 3670000 خلية/ملم<sup>3</sup> و خلايا الدم البيضاء ( 125000 خلية/ملم<sup>3</sup> ) وتركيز خضاب الدم 5.46  
غم/100 مل. وكانت اعلى من قبيم مقاييس الدم العائدة لاسماك الكارب العشبي المستزرعة في الماء الملوث ( خلايا  
3190000 خلية حمراء / ملم<sup>3</sup> و 28525 خلية دم بيضاء / ملم<sup>3</sup> وتركيز خضاب الدم 3.259 غم/100 مل.  
تزايد اعداد نفوق الاسماك المستزرعة في الماء الملوث بينما بقيت اسماك المياه العذبة ( العينات  
الضابطة) غير متأثرة. لم يظهر تاثير للعوامل الفيزيوكيميائية للمياه الملوثة والعذبة على النتائج.

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