

A comparative study on blood parameters of two species of cyprinid fish

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Abstract

A total of 27 grass carp *Ctenopharyngodon idella* (Val., 1844) and 24 silver carp *Hypophthalmichthys molitrix* (Richardson, 1845) were collected from the Fish farming station of Marine Science Centre-University of Basrah.

Packed cell volume (P.C.V.), haemoglobin concentration (Hb), red blood cells count (R.B.C.) and white blood cells counts (W.B.C.) were estimated. The results show that the silver carp have higher blood parameters than those of grass carp, and there is a strong positive correlation ($r=0.50-0.83$) between the values of P.C.V. and Hb in both fish species.

In general, the male fishes have higher blood parameters than those of females and there are no significant differences between sexes.

Key Words: Cyprinid fish, haematology.

Introduction

Cyprinids are highly important food fish. It is the largest family of fresh-water fish, with about 2,420 species of cyprinids in about 220 genera [36] Grass carp, one of the largest members of the minnow family, is an integral part of fish culture, and fish flesh forms an important source of protein for human consumption [35]. In their native habitat, grass carp typically reach the weights of 30–36 kg, but fish have been reported up to 181 kg. This herbivorous fish currently is licensed to control aquatic vegetation in irrigation canals, reservoirs, lakes and farm ponds [14]. [31] reported that the silver carp have been introduced around the world for aquaculture purposes and also because they can be used to control excessive growths of phytoplankton in natural waters. The ecological and

physiological studies were helpful in understanding the relationship of blood characteristics to the phylogeny, activity, habitat and adaptability of fishes to the environment [33].

In fish, there are many factors that significantly alter their haematological parameters, include age, strain, sex, season, diet, methods of capture, handling, water quality, pollution, specific water flow-through, density, environmental conditions and inflammations [23; 30; 17; 1; 15; 24; 28 and 22]. In Iraq, there are little and scarce studies on fish haematology [18; 34; 20; 12; 21; 6; 10; 9; 5; 4; 3; 11; 8; 2; 27; 26; 25]. For the economical importance of the cyprinid fishes, some of the main blood parameters of two species of this family silver and grass carp were studied.

Materials & Methods

A total of 27 grass carp *Ctenopharyngodon idella* (Val., 1844) and 24 silver carp *Hypophthalmichthys molitrix* (Richardson, 1845) with 12-14 cm in length were collected along three months from January to March 2007, from Fish farming station of Marine science centre-Basrah university.

Water temperature ranges from 17-22 °c, while the air temperature ranges between 14-20 °c.

The fishes were brought to laboratory by using a plastic boxes containing farm water.

The fishes are released at least for 2 to 3 hours for adaptation, then, fishes are handled gently to avoid stress, and then killed by pithing them with a fine needle. After the completion of blood withdrawal, fish total length and sex were measured.

The taxonomy of fishes is done according to [7] and [36].

Blood samples are used in measuring four parameters:

- a- P.C.V. (packed cell volume) is measured according to [13].
- b- Hb (haemoglobin concentration) is detected according to [30].

c- R.B.C. (red blood cells) and W.B.C. (white blood cells) counts are estimated according to [29].

Two replicates of each blood sample are detected. The Statistical Package for Social Science (SPSS) is used to analyze the data.

Results & Discussion

From the data shown in the tables 1, 2 and 3 we can summarize the main results :

1- Males fish for both species have higher values of blood parameters than females, and there are no significant differences between the sexes ($P \leq 0.05$).

2- The blood parameters of silver carp are higher than those of grass carp, since the higher values [75, 50, 3.00 and 20.0] for the Hb, P.C.V., R.B.C. count and W.B.C. count respectively were recording from the males of silver carp, while the lower values [25,

15, 1.5 and 5.0] for the Hb, P.C.V., R.B.C. count and W.B.C. count respectively were recording from the females of grass carp.

3- There are no significant differences ($P \leq 0.05$) between the values for both studied species of fishes.

4- The values of Hb and P.C.V. are positively correlated with each other in both species and sexes and it ranges from $r=0.50$ to 0.83 .

Table 1: The values of the main blood parameters of grass carp (SE±)

Sex	♂		♀	
No of fishes	11		16	
	Range	Mean(SE±)	Range	Mean(SE±)
Hb %	35-60	44.1 ±2.89	25-47	35.35 ±1.92
P.C.V. %	22-47	38.6 ±2.88	15-36	28.50 ±1.51
R.B.C. 6 count * 10	1.99-2.47	2.22 ±0.064	1.5-2.81	2.08 ±0.10
W.B.C. 3 count * 10	5.75-11.2	9.39 ±0.75	5.0-11.5	8.08 ±0.53

($P \leq 0.05$)

Table 2: The values of the main blood parameters of silver carp (SE±)

Sex	♂		♀	
No of fishes	9		15	
	Range	Mean(SE±)	Range	Mean(SE±)
Hb %	40-75	54.57 ±5.27	25-61	42.36 ±3.3
P.C.V. %	34-50	44.0 ±2.03	25-46	36.0 ±2.01
R.B.C. 6 count * 10	2.12-3.0	2.58 ±0.72	1.61-2.66	1.91 ±0.09
W.B.C. 3 count * 10	8.8-20.0	13.03 ±4.38	5.6-13.2	9.03 ±0.8

($P \leq 0.05$)

Table 3: The correlation coefficient values (r) between Hb and P.C.V. values for grass carp and silver carp

Fish sp.	Sex	r
Grass carp	♂	0.67
	♀	0.50
Silver carp	♂	0.83
	♀	0.72

From the data shown in tables 1 and 2, it can be concluded that; the silver carp have higher blood parameters than those of grass carp. This can be related to the increase in the metabolic activity in silver carp in this length group at least [10-14] cm. This result agrees with other studies on other fish species [33 and 26].

The decrease in the blood values of grass carp can be related to the feeding nature of this kind of fish [14] under pond farming conditions, [19] showed that the declining in the values of R.B.C counts and Hb may occur in fish farm due to low food intake and nutritional diseases which affect haematopoietic organs, while [3] notice the relationship between the growth rates and blood parameters.

Higher values of male fishes than those of females to both species of carp with no significant differences agree with many other studies [12; 10 and 8, 26 and 25]. [16] suggest that such differences between sexes may be related to the genetic differences between the sexes, while [32] attribute the differences to the metabolic rates which are higher in males than in females.

The high positively correlation between Hb and P.C.V. (Table 3) in both two species and sexes agree with many other studies [4; 8; 26 and 25]. This correlation led [12] to suggest the possibility of using P.C.V. as a general indicator to know the hematological status and to judge the healthy status.

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دراسة مقارنة لقياسات دم نوعين من أسماك عائلة الشبوطيات

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الخلاصة

تم جمع 27 سمكة كارب عشبي (*Ctenopharyngodon idella* (Val., 1844) و 24 سمكة كارب فضي (*Hypophthalmichthys molitrix* (Richardson, 1845) من محطة لستزراع الأسماك التابعة لمركز علوم البحار-جامعة البصرة.

تمت دراسة كل من مكداس الدم P.C.V., تركيز الهيموغلوبين Hb, عد كريات الدم الحمراء R.B.C.count و عد كريات الدم البيضاء W.B.C.count. أشارت النتائج إلى امتلاك أسماك الكارب الفضي قياسات دم أعلى من مثيلاتها لأسماك الكارب العشبي و أن هناك ارتباط موجب قوي ($r= 0.50-0.83$) بين قيم كل من مكداس الدم و تركيز الهيموغلوبين. عموماً وجد أن ذكور الأسماك و لكلا النوعين تمتلك قياسات دم أعلى من مثيلاتها للإناث و أنه لا توجد فروق معنوية بين الجنسين .