EFFECT OF SOME ENVIRONMENTAL AND PHYSIOLOGICAL FACTORS ON THE BLOOD COUNT OF *MUGIL CAPITO* DURING THE BREEDING SEASON

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Abstract

The blood count was affected by the change in environmental factors. The number of red and white blood corpuscles of *Mugil capito* has been affected by environmental changes of the photoperiod, temperature and salinity. human chorionic gonadotropic hormone (HCG) also resulted in a change of the blood count. The increase of photoperiod resulted in a significant increase in the erythrocyte count and a significant decrease in the leucocyte count. Continuous darkness resulted in a decrease in both erythrocytes and leucocytes. High temperature resulted in an increase in both erythrocytic and leucocytic counts while the low temperature led to a decrease in erythrocytic count of *Mugil capito*. The increase in salinity was accompanied by a significant increase in the erythrocyte count and a decrease in the leucocyte count. The HCG injection resulted in increase in both erythrocyte and leucocyte counts.

Key words: fishes, physiology, cell, temperature, salinity

Introduction

Fish respond immediately even to small changes in their ambient environment. The impact of environmental variables on fish haematological parameters has been studied in many different species. The complete blood picture of *Tilapia zilli* and the effect of environmental and physiological factors on the blood cellular and non-cellular constituents of this economically important fish in Egypt have been investigated (1). Also, the influence of temperature and salinity on the erythrocyte count, leucocyte parameters and plasma constituents of juvenile milkfish, *Chanos chanos* from three different brackish water fish farms has been studied (2). The changes in leucocyte count in smoltifying 1- and 2- year old salmons and 2-year old sea trout, both at ambient water temperature and after acclimation to 10°C, in order to exclude the temperature dependent variation have been investigated (3).

Material and Methods

Fish samples

Grey mullet *Mugil capito* were transported from a fresh water fish farm in Barciek, Behaira Governorate of Egypt to the laboratory in suitable continuously aerated aquaria. (2 x 1.5 x 1.25 m) fiber glass aquaria. The fish were acclimated to the laboratory conditions for 7 days. All the experiments were undertaken during the same period (from mid October to late December), *i.e.* within the breeding season, before the natural resorption of the gonads which starts at January and February (4). Fish used were carefully selected to be healthy and more or less robust. Their body length ranged between 29.1 cm and 36 cm, and their body weight ranged between 280 and 390 g. the age of such population lies within the end of the second year class.

Experiments

1. Effect of photoperiod

Four aquaria beside the control were used in this experiment. All these aquaria were provided with 3.4% salinity water, as it was in the natural habitat "Barceik fish farm" to keep the same salinity. The average of the actual sunshine duration over Alexandria during this period is (6.5L+ 17.5D) as reported by Mosalam (5). So the control group received (6.5L+ 17.5D) during the experiment.

The four tanks which involved photoperiodicity experiment were arranged as follows:

	Tank (1)	Tank (2)	Tank (3)	Tank (4)
Photoperiod	6L+ 18D	18L + 6D	Continuous light (24L)	Continuous darkness (24D)
Temperature	17.5°C	17.5°C	17.5°C	17.5°C
Salinity	3.4%	3.4%	3.4%	3.4%

The illumination in this experiment was done by 3 lamps for each tank, the lamp was 100 watt, produced by Philips company. The tank which represented continuous darkness had a heavy black plastic glued top its sides and to so that absolute darkness was obtained.

2. Effect of temperature

The aquaria used in this experiment were placed directly in the front of windows of the laboratory and thus received identical amounts of day light. The aquaria were arranged as follows:

	Tank (1) : lower temperature	Tank (2) : higher temperature
Photoperiod	6.5L+ 17.5D	6.5L+ 17.5D
Temperature	15°C	20°C
Salinity	3.4%	3.4%

The tank with lower temperature (15°C), the temperature had been lowered by using ice bags. In the tank with higher temperature (20°C), the water temperature was thermostatically controlled by using electric heaters.

3. Effect of salinity change

Four aquarium beside the control were used in this experiment to determine the effect of salinity.

	Tank (1)	Tank (2)	Tank (3)	Tank (4)
Photoperiod	6.5L+ 17.5D	6.5L+ 17.5D	6.5L+ 17.5D	6.5L+ 17.5D
Temperature	17.5°C	17.5°C	17.5°C	17.5°C
Salinity	15%	25%	35%	38% (seawater)

4. effect of Human chorionic gonadotrophic hormone (HCG):

A group of male and female *Mugil capito* was injected three times with human chorionic gonadotropic hormone (HCG) intramuscularly, Each fish received 500 IU each week and thus 1500 IU during the three weeks.

Blood sampling

the blood was obtained from the caudal artery by a syringe previously washed with anticoagulant. In the present work, heparin 5000 IU/ml was used. A small drop of the blood directly from the fish was used to make a blood smear for differential white blood cells analysis.

Results and discussion

The blood composition does not only reflect the physiology of the animal in the normal state, but also reflects all changes which occur due to any stress. There are many stresses that induce physiological changes in the animal. These stresses may be internal or external. In the present investigation, the effect of some important environmental and physiological factors on some haematological parameters of *Mugil capito* has been shown during the breeding season.

The Red blood corpuscles (Erythrocytes)

From our results, it is clear that erythrocyte count of males always exceeds that of females during the period of study (breeding season). This observation confirms sexual differences in erythrocyte count. The red blood count among males is usually greater than in females in fish species. Sexual variation in the erythrocyte count of the mountain whitefish, *Prosopium williamsoni* was reported (6).

The present study also revealed that the number of RBCs tends to increase with increasing photoperiod, while continuous darkness (24D) cause a remarkable decrease in the erythrocyte count. The increase in erythrocyte count at long photoperiod and continuous illumination may be due to the increased feeding regime. It is evident that acclimation of *Mugil capito* to a high temperature (20°C) increases the red cell count to a considerable high value.While, the acclimation to a low temperature (15°C) led to a diminution of the erythrocyte count. The variations of environmental temperature affect the number of erythrocyte count in both high and low temperature conditions (7,1). These studies indicate that haematological variations may in some instances follow thermal acclimation.

The results obtained in the present work are in a good agreement with other authors for other species. An increase in erythrocytic count was observed during warm acclimation of trouts, *Salmo gairdneri* (7), the goldfish, *Carassius auratus* (8), the river shiner, *Notropis blennius* (9) and *Tilapia zilli* (1). The increase in erythrocyte count due to the elevation of water temperature may be due to increase of evaporation