Seasonal Alteration in Blood Parameters in Surface, Column & Bottom Dweller Fishes

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Abstract- ***The present investigation show that seasonal (spring, summer, autumn and winter) changes in haematological parameters in the blood variation cause immunological impairments in Catla catla (surface dweller) Labeo rohita (column dweller) Heteropneustes fossilis (bottom dweller) The significant effect of temperature variation on haemoglobin % is observed in surface dweller (Catla catla) during April, August, December and January Hb % 5.7±0.56, 3.3±0.70, 6.3±0.34, 5.9±0.81, column dweller (L. rohita) 2.3±0.98, 4.1±0.62, 5.8±0.55, 6.2±0.51 and bottom dweller (H. fossilis) 2.70±0.62, 4.50±0.11, 5.40±0.33, 5.70 ± 0.55 respectively, which suggests that the haematological parameters change to counter temperature variation . If the biotic factor viz., temperature reaches extreme limits that result in serve physiological problems, ultimately leading to the death of fish.***

Indexed Terms- ***Temperature, Hb %, Catla catla, Labeo rohita, Heteropneustes fossilis.***

I. INTRODUCTION

Temperature is also important because of its influence on water chemistry. The rate of chemical reactions generally increases at higher temperature, which in turn affects biological activity. An important example of the effects of temperature on water chemistry is its impact on oxygen. Warm water holds less oxygen that cool water, so it may be saturated with oxygen but still not contain enough for survival of aquatic life. Some compounds are also more toxic to aquatic life at higher temperatures. The major source of water for filling and maintaining water levels in ponds are surface runoff from springs affected by rainfall. The availability of water inland aquaculture is closely related to rainfall (Boyd, 2000), and an understanding of local rainfall patterns is of paramount importance in pond management.

II. MATERIALS AND METHODS

Live Surface dweller (*Catla catla*) Column dweller (*Labeo rohita)* and Bottom dweller (*Heteropneustes fossilis*) fish were obtained from *Sagra* taal located in Gonda city (Coordinates: 27°7'48"N 81°57'37"E) . The fishes selected belonged to 1 + age group. At least five healthy fishes of the same age group and of similar size and weight were selected for each set of observations. Studies on seasonal changes in the blood were made from April, August, December (2018) and January (2019) . Rapid and without the need to sacrifice the fish this procedure targets the dorsal aorta (a relatively larger blood vessel) in fish, punctured by inserting a needle directly from the anterior part of the anal fin about 2-5 mm behind the genital papilla, to draw the desired amount of blood. a 21G needle was inserted into the fish at a point anterior to the anal fin, and about 2-5 mm behind the genital papilla. The insertion of the needle into the fish was at a perpendicular angle to the ventral surface (at approximately 90º), until some blood entered into the syringe or when the needle made contact with the vertebral column (hard impenetrable surface). Once the needle touched the vertebral column, it was withdrawn slightly, approximately 1 mm, so that the blood vessel overlying the vertebral column could then be sampled easily and rapidly. This was done by gently pulling on the plunger by maintaining consistent pressure until the desired quantity of blood is drawn into the syringe. Blood was taken under gentle aspiration until 0.5ml. The average values were calculated on this basis.

The details of techniques used are as follows.

i. Erythrocytic and leucocytic counts were made by a standard clinical method (improved Neubaur, ruling haemocytometer) using Shaw's (1930) solution as the diluting fluid. The advantage of this method is that the differentiation between the

erythrocytes and leucocytes is made with the same diluting fluid.

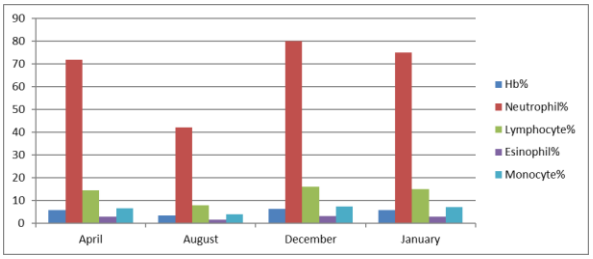
ii. Haemoglobin determination. The haemoglobin content per 100 ml of blood was determined with Fisher's haemophotometer (Model 55).

iii. Haematocrit values were determined by the capillary method.

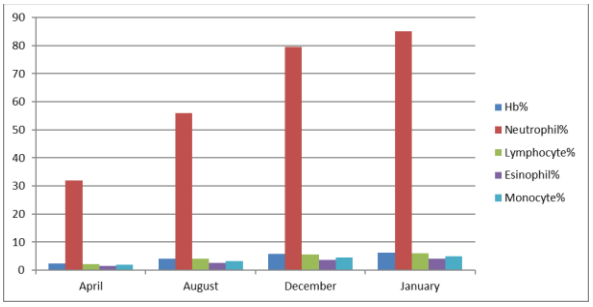
iv. Preparation and staining of blood smears. To differentiate cell types in peripheral blood a new method combining haemoglobin stain with a counterstain of Giemsa was found to be useful and was used throughout this investigation.

III. RESULTS AND DISCUSSION

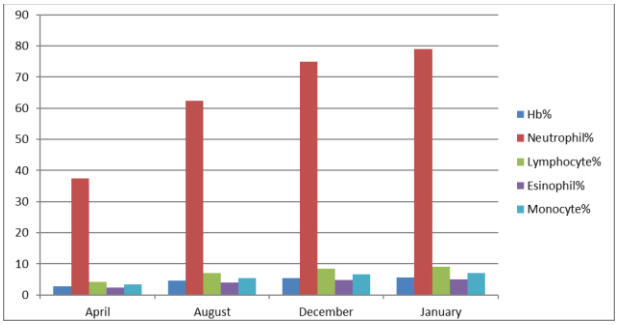
Graph1: Haematological parameters of fish Surface dweller (*Catla catla*)



Graph 2: Haematological parameters of fish_Column dweller (*Labeo rohita*)



Graph 3: Haematological parameters of fish Bottom dweller (*Labeo rohita*)



C. L. Mahajan *et al.* (1979) has a yearlong study based on monthly observations on the haematology of female *Channa punctatus* with respect to haemoglobin, haematocrit values, total erythrocyte and leucocyte numbers together with a differential enumeration of various leucocytes *viz.* thrombocytes small and large lymphocytes, monocytes, neutrophils, eosinophils and basophils is recorded. The study showed that the total erythrocytic number, haemoglobin and haematocrit values decrease during the breeding time i.e., July to September. The thrombocyte number significantly increased while the neutrophilic number showed a decrease. The physiological significance of these changes is discussed with reference to the available literature. RBC count, hematocrit, MCH, percent of monocytes and eosinophils were constant in different temperatures, WBC count, MCHC, hemoglobin, platelets count, the percent of lymphocytes and neutrophils were constant up to 24 hours and then tend to increase with increasing temperature except lymphocytes percent that tend to decrease. MCV decreased with increasing temperature up to 8 hours and then significantly increased (from 83.89 to 87.50 fmol/l, $p < 0.001$). WBC, hematocrit, MCV, platelets count, and neutrophils' percent tend to increase by the time of incubation, but RBC count, MCHC, lymphocytes' percent decreased. Hemoglobin, MCH, and the percent of monocytes and eosinophils were constant. (Mahmoodi M *et al.* 2006)

The results of the present investigation show that the seasonal temperature variation effect the haematological parameters. Surface dweller fish (*Catla catla*) has the haematological parameters season variation during April, August, December& January in Hb% 5.7±0.56, 3.3±.70, 6.3±0.34 and 5.9±0.81 Neutrophil% 72±0.98, 42±1.18, 80±0.73, 75±0.51 Lymphocyte% 14.5±0.63, 8.0±0.62, 16±0.47, 15±0.57 Esinophil% 3.0±0.54, 1.5±0.48, 3.20±0.55, 3.0±0.51and Monocyte% 6.5±0.51, 4.0±0.58, 7.5±0.77 ,7.0±0.51 respectively. Column dweller fish (*Labeo rohita*), also have haematological parameters variation during months April, August, December and January in Hb% 2.3±0.98, 4.1±0.62, 5.8±0.55 and 6.2±0.51 Neutrophil %32±0.58, 56±0.51, 79.5±0.48 and 85±0.34 Lymphocyte%2.2±0.62, 4.0±0.41, 5.5±0.69 and 6.0±0.14. Esinophil% 1.5±0.26, 2.5±0.16, 3.71±0.09 and 4.0±0.49 and Monocyte% 2.0±0.10,3.28±0.25 ,4.5±0.19 and 5.0±0.06

significantly. Bottom dweller fish (*Heteropneustes fossilis*) have haematological variation during months April, August, December and January in Hb% 2.70±0.62, 4.50±0.11, 5.40±.33 and 5.70±.55. Neutrophil% 37.50±.40, 62.32±.55, 75.00±.23 and 79.00±.32 Esinophil% 2.34±.10, 4.00±.15, 4.70±.33 and 5.00±.10 Monocyte% 3.30±.15, 5.50±0.6, 6.58±.18 and 7.00±.60 respectively. María et al . (1998) investigate any seasonal (spring, summer, autumn and winter) changes in haematological parameters in the blood of Tinca tinca measuring the number of red blood cells (RBC), haematocrit, white blood cells, and total plasma proteins. The results show significant changes in RBC and haematocrit in males comparing spring and summer with autumn and winter, whereas in females the RBC remained constant for all 4 seasons but the haematocrit decreased in autumn and winter compared to spring and summer. The white blood cells of male and female animals were significantly lower in spring and winter compared to summer and autumn. In male fish total protein contents significantly decreased in autumn and winter compared to spring and summer, whereas in females protein output significantly decreased in winter compared to the other seasons. the present investigation show that seasonal (spring, summer, autumn and winter) changes in haematological parameters in the blood variation caused immunological impairments in *Catla catla* (Surface dweller fish) *Labeo rohita* (Column dweller fish) , *Heteropneustes fossilis* (bottom dweller fish) which suggests that the haematological parameters change to counter temperature variation but may weaken the immune system if the abiotic factor viz., temperature reaches extreme limits that result in severe physiological problems, ultimately leading to the death of fish.

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