BLOOD PARAMETER STUDIES OF FRESH WATER FISH, *CATLA CATLA*, GROWN IN EARTHEN PONDS OF ADDANKI

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By

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DECLARATION

I declare that this thesis entitled **"BLOOD PARAMETER STUDIES OF FRESH WATER FISH, *CATLA CATLA*, GROWN IN EARTHEN PONDS OF ADDANKI"** is composed by me and has not been published or submitted in part or in full for award of any degree.

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Station: Addanki **(KOMMURI KEERTHI)**

Date : AUGUST 2021

Verified by

CERTIFICATE

This is to certify that the work incorporated in this thesis entitled, **"Blood Parameter Studies of Fresh Water Fish, *Catla catla*, grown in earthen ponds of Addanki"** is the bonafide work carried out by **K.Keerthi** under our supervision.

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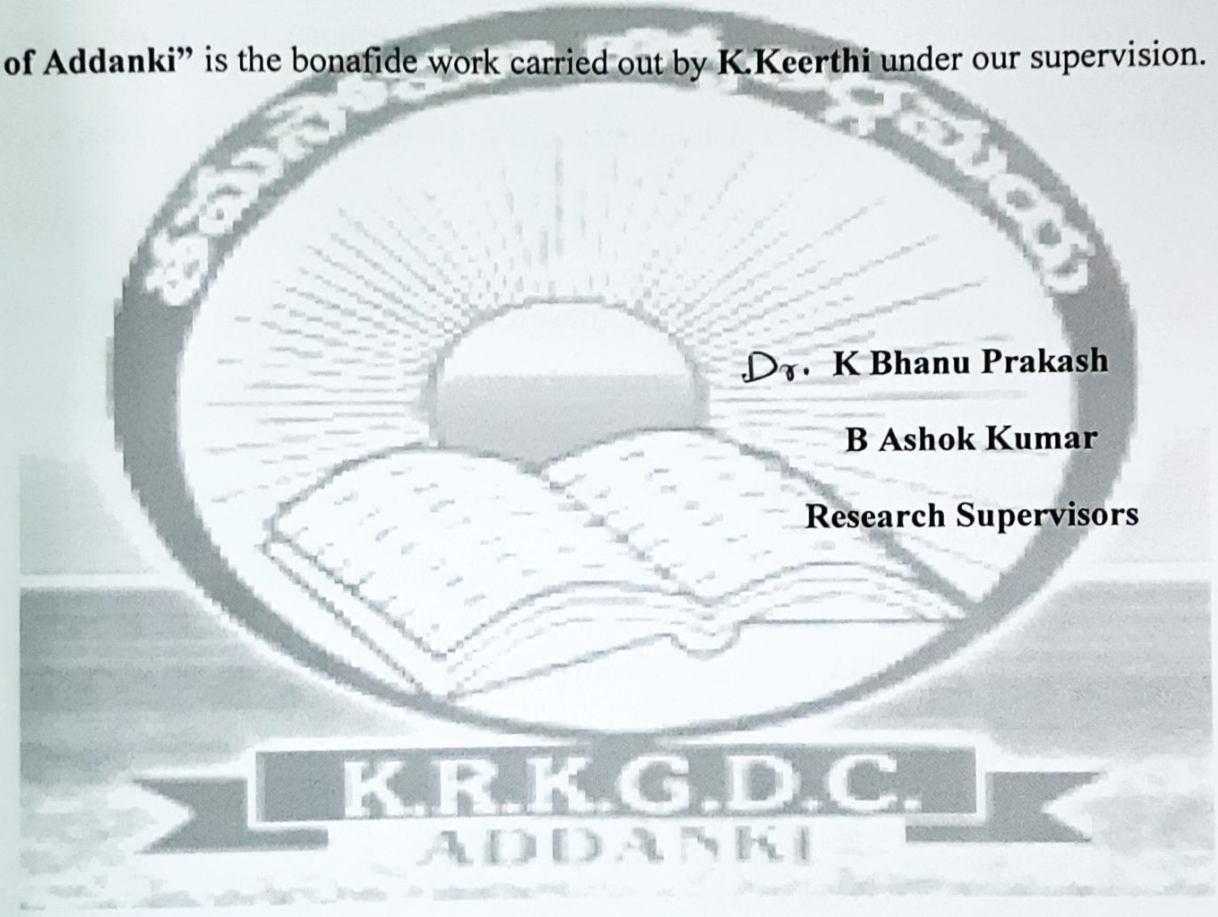

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(KOMMURI KEERTHI)

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INTRODUCTION:

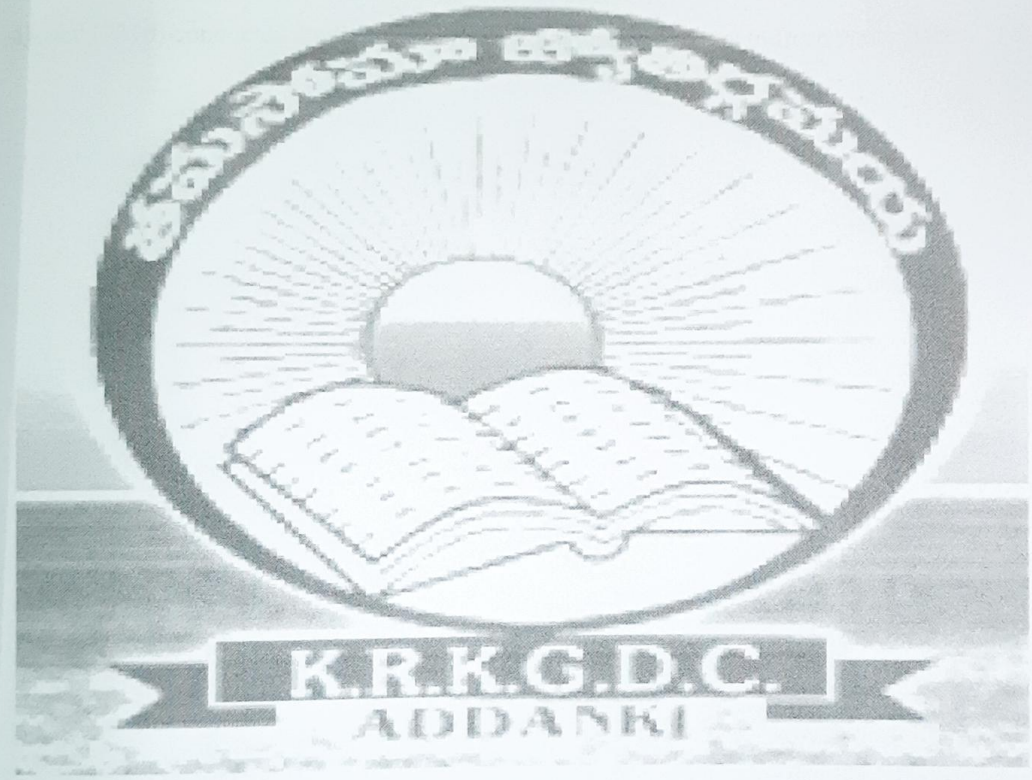
Blood parameters are considered pathophysiological indicators of the whole body and therefore are important in diagnosing the structural and functional status of fish exposed to toxicants (Adhikari et al., 2004). A number of haematological indices such as haematocrit (Hct), hemoglobin (Hb), red blood cells (RBCs) and so on, are used to assess the functional status of the oxygen carrying capacity of the bloodstream and have been used as indicator of metal pollution in the aquatic environment ((Shah and Altindag, 2004a). Variations can be noticed in the blood parameters with respect to the age, sex, season, nutrition, environment, disease etc condition. The differences among haematological values are affected by factors as photoperiod, temperature, reproduction, and feed or by impacts of changes in the combination of these factors, in addition by age, sex, season, capture, collection methods, water quality, and starvation (Tisa et al. 1983).

Haematology that provided the information about habitat of livings is also important to determine the rate of feed intake and the condition of fish stocks in ichthyologic researches. Economic losses can be eliminated when haematological methods are used as aids (early diagnosis etc.) in fish disease diagnostics (Bittencourt et al.2003). Therefore, haematology contains important information to determine the conditions of taxonomical, ecological, physiological and pathological of fish.

The present study was undertaken to see if there is any significant difference with respect to the major haematological parameters in two different seasons - winter & summer – of a year.

OBJECTIVES OF THE STUDY:

1. **To assess if the principal blood parameters of the freshwater fish, *Catla*, are significantly different in two different grow out ponds**
2. **To assess if the principal blood parameters of the freshwater fish, *Catla*, are significantly different in two different seasons.**



REVIEW OF LITERATURE

Adhikari S et al. (2004) and Shah SL and Altindağ A (2005) conducted studies on the effect of heavy metals and pollutants on the haematological parameters of fishes. Bittencourt et al observed the haematological parameters with respect to diagnosis in disease conditions (2003). Qiang, J (2013) carried out studies on the effect of temperature and dietary protein on the haematological parameters. Tisa et al. (1983) and Zubair Ahmad Sheikhand and Imtiaz Ahmed (2016) conducted studies on the haematological parameters in fresh water fishes.

MATERIALS & METHODS

The study area has been chosen at Singarakonda, Addanki. The ponds with fresh water *Catla* were chosen for the study. Two ponds with same stocking density and feeding protocol were chosen. The ponds of the size 1 acre were selected and the water quality parameters and the haematological parameters were observed on monthly basis.

Fish sample were put into buckets filled with pond water and transported to the laboratory on the same day. After overnight acclimatization, blood sample was collected from the caudal vain using a sterile plastic disposable heparinised syringe (2-3ml) having 0.5mm x16 mm microlance needle and transferred into heparinised vial immediately on ice.

Total count of RBC: Total red blood cells (tRBCs) were counted using an improved Neubaur haemocytometer (Shah and Altindağ 2004a). Blood was diluted **1:200** with Hayem's fluid (Mishra et al., 1977).

Total count of WBC: Total white blood cells (WBC) were counted using an improved Neubaur haemocytometer (Shah and Altindağ 2005; Mgbenka et al., 2003). Blood was diluted 1:20 with Turk's diluting fluid and placed in haemocytometer. 4 large (1 sq mm) corner squares of the haemocytometer were counted under the microscope (Olympus) at 640X. The total number of WBC counted ranged from 36000 to 94000.

Estimation of Haemoglobin: Hemoglobin (Hb) was determined with a hemoglobin test kit (DIAGNOVA, Ranbaxy, India) using the cyanmethemoglobin method.

Statistical Analysis: The results relating to the two seasons – winter and summer – were treated with '**paired t test**'.

RESULT & DISCUSSION

Many factors such as sex, age, and size, environmental and physiological conditions are known to effect haematological responses in fish. Erythrocytes are one of the most important in the determining of the erythrocyte characteristics significantly the efficiency of oxygen transport from the respiratory system to tissues, especially changes in their number and volume could influence metabolic performance.

The following results were observed in the parameters of the fish, *Catla catla*

Hemoglobin: The annual mean Haemoglobin concentration was measured as 8.5 mg/dL. Higher concentration of Haemoglobin observed was 8.8 mg/dL in Summer and lower value was measured as 7.9 mg/dL in Winter.

RBC: Erythrocytes were counted in the loaded haemocytometer chamber and total numbers were reported as 1.82 million/mm^3. In our study, we monitored the amount of erythrocyte monthly and the data showed that while erythrocyte amount had the highest values ($1.82x10^6$/mm3) in Summer (May), the lowest value ($1.43x10^6$/mm3) in Winter (November).

Leucocytes: Total Leucocytes were found to be 94,200/mm^3. Among leukocytes, range of count for neutrophils 22.4%, lymphocytes 33.6%, monocytes 38.6% and eosinophils 3.8% and Basophils 1.6% recorded in fish blood. In our study, we monitored the amount of leucocytes monthly and the data showed that while leucocytes amount had the highest values in Summer (May), the lowest value in winter (November).

Table: Haematological Parameters in two different seasons

Haematological Parameter	Winter	Summer
Haemoglobin(mg/dL)	8.8	7.9
RBC/mm^3	$1.43x10^6$/mm3	$1.82x10^6$/mm3
WBC/mm^3	5.4×10^3	9.4×10^3

Fig: Haemoglobin concentration in two seasons of a year

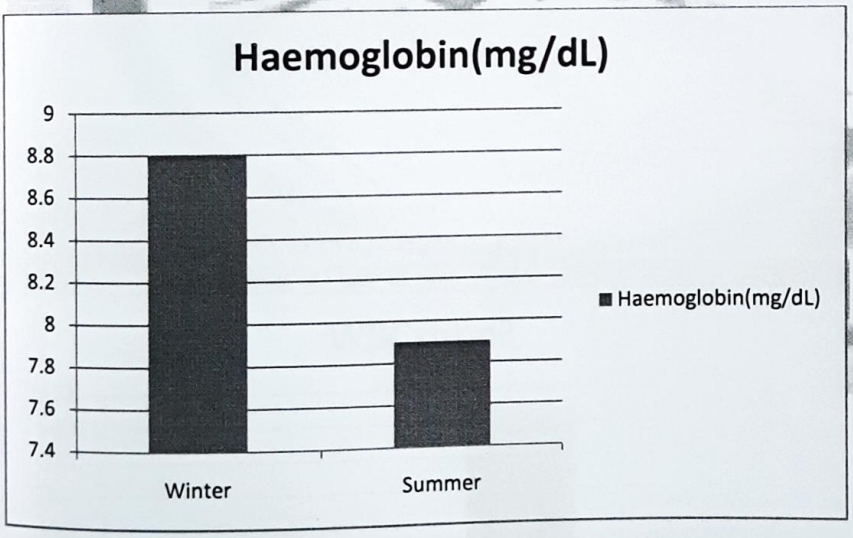


Fig: RBC count in two seasons of a year

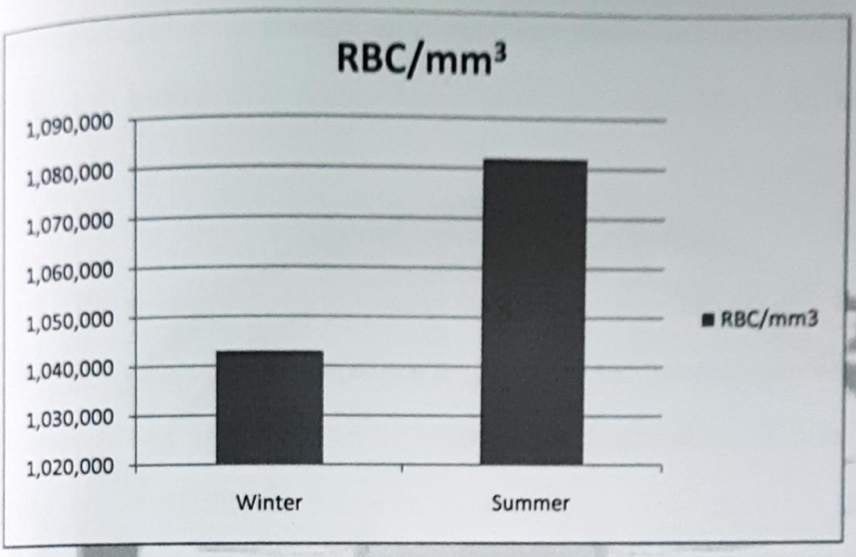
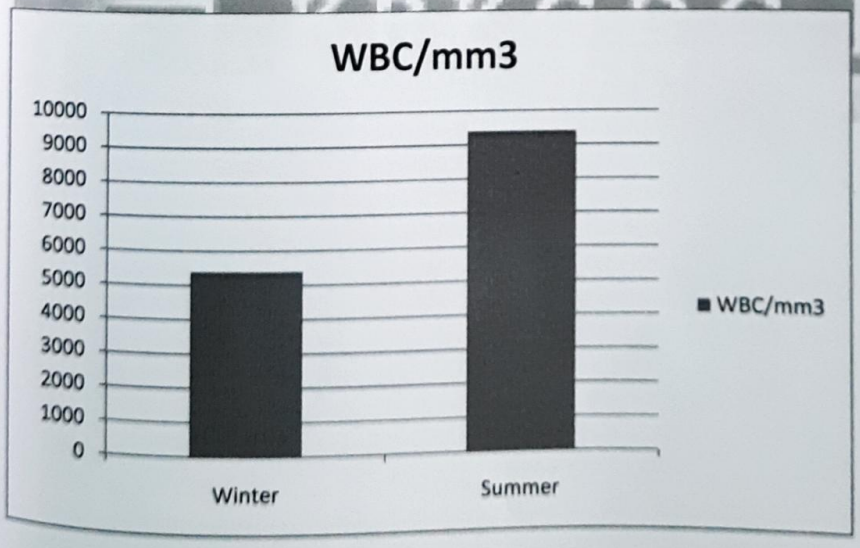


Fig: WBC count in two seasons of a year



Haematological Parameters differ significantly between the two seasons of a year at **'p value' of 0.05** where as the values relating to the same are not significantly different for the two ponds observed. The present study findings on haematological parameters in show statistical difference in seasonal variations. These results are in line with the results obtained in the study carried out by (Zubair Ahmad Sheikh and Imtiaz Ahmed, 2016).

SUMMARY & CONCLUSION

Blood parameters are considered pathophysiological indicators of the whole body and therefore are important in diagnosing the structural and functional status of fish exposed to toxicants. These parameters are influenced by multidimensional factors. One such factor being season which sees change in the temperature. This influences the change in the haematological parameters of the fish. The present study has observed a significant change in the blood parameters of the fresh water fish, *Catla catla.*

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