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Research Article

IMPACT OF HAEMATOLOGICAL CHARACTERISTIC ALTERATION IN TANNERY EFFLUENT TREATED FISH *CHANNA PUNCTATUS*

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ABSTRACT

In the present study the toxicity of tannery effluent on economically important fish, *Channa punctatus.* Bioassays were carried out. Changes were observed after 30 days of exposure, (sublethal concentration). Red blood cells, (RBC) count and Hb content decreased when compared to the control. The number of white blood cells (WBC) increased in textile effluent treated fishes.

Keywords: *Channa punctatus*, Tannery effluent, RBC, WBC, Heamoglobin.

INTRODUCTION

With exploding population and increasing industrialization and urbanization, water pollution by agricultural, municipal and industrial sources has become a major concern for the welfare of humanity. Water soluble toxicants from industrial and municipal wastes, leached soils and the atmosphere have rapidly transferred to natural bodies of water. While some of the pollutants decompose or volatilize, others form insoluble salts, which precipitate and get incorporated into the sediment (Bowen, 1979). Uptake of such toxicants by aquatic organisms like fish may be followed by metabolism of the toxicants into more toxic derivatives (Webb, 1975; Duffus, 1980). Various industrial effluents that affect the quality of water bodies have been characterized by investigators like Varadaraj and Subramanian (Varadaraj and Subramanian, 1991; Baruah *et al.*, 1996; Reddy and Subba Rao, 2001). The tannery industries are one of the water based industries as they use large quantity of water and chemicals in processing the leather. Of all the industrial wastes, the tannery effluent is shown to be a dangerous pollutant (Arora, 1981).

In the past years, the adverse effects of heavy metals, pesticides and paper and pulp mill effluent have been elucidated with reference to hematological alterations in a number of fishes (Singh *et al.*, 2000; Joshi *et al.*, 2002). As studies pertaining to the toxicity of tannery effluent on the blood parameters of fishes are scanty, the present work has been carried out to assess the toxic impact of tannery effluent on some biochemical parameters in the blood of *Channa punctatus.*

MATERIALS AND METHODS

Bioassays were carried out by using tannary effluent collected from one of the local area and locally collected fishes of known weight and size were used in the present study. By adopting the method (Sprague, 1973), the LC_{50} 96 hr value of the effluent to the fishes was found. Then a group of ten fishes were reared in different sublethal concentrations along with appropriate control for 7 days. The total RBC s and WBC s were counted using Haemocytometer and Neubauer counting chamber. The haemoglobin contents were determined using Haemoglobinometer by Sahli's acid haematin method.

RESULTS

The variation in hematological parameters of the fish *Channa punctatus* to chronic toxicity of tannery effluent is presented in Figures 1-3. Significant variation in mean Red Blood Cells (RBC), mean White Blood Cells (WBC) and mean Haemoglobin, was observed in the blood of industrial effluents treated fish when compared to the untreated ones *Channa punctatus* when treated with 1.0, 1.5, 2.0 and 2.5 ml/L concentrations of tannery effluent showed a decreasing trend in the RBC counts compared to control (Figure 1). The mean values of total RBC in the 1.0, 1.5,

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2.0 and 2.5 ml/L concentration of tannery effluent were 1.55, 1.46, 1.31, 1.22 and control value 1.71 (10^6/mm^3) exposures to 7 days respectively. The WBC analysis revealed a significant increase in the tannery effluent exposed fish when to control fish Figure 2. The mean values of total WBC in the 1.0, 1.5, 2.0 and 2.5 ml/L concentration of tannery effluent were 6.19, 6.34, 6.52, 6.90 and control value 5.64 (10^3/mm^3) exposures to 7 days respectively.

The haemoglobin analysis revealed a significant reduction in the tannery effluent toxicity imposed fish concentration compared to control (Figure 3). The total haemoglobin content in the 1.0, 1.5, 2.0 and 2.5 ml/L concentration treated fish recorded from 6.10, 5.55, 4.86, 4.08 and control value 66.10 mg/100 ml after exposure to 7 days respectively.

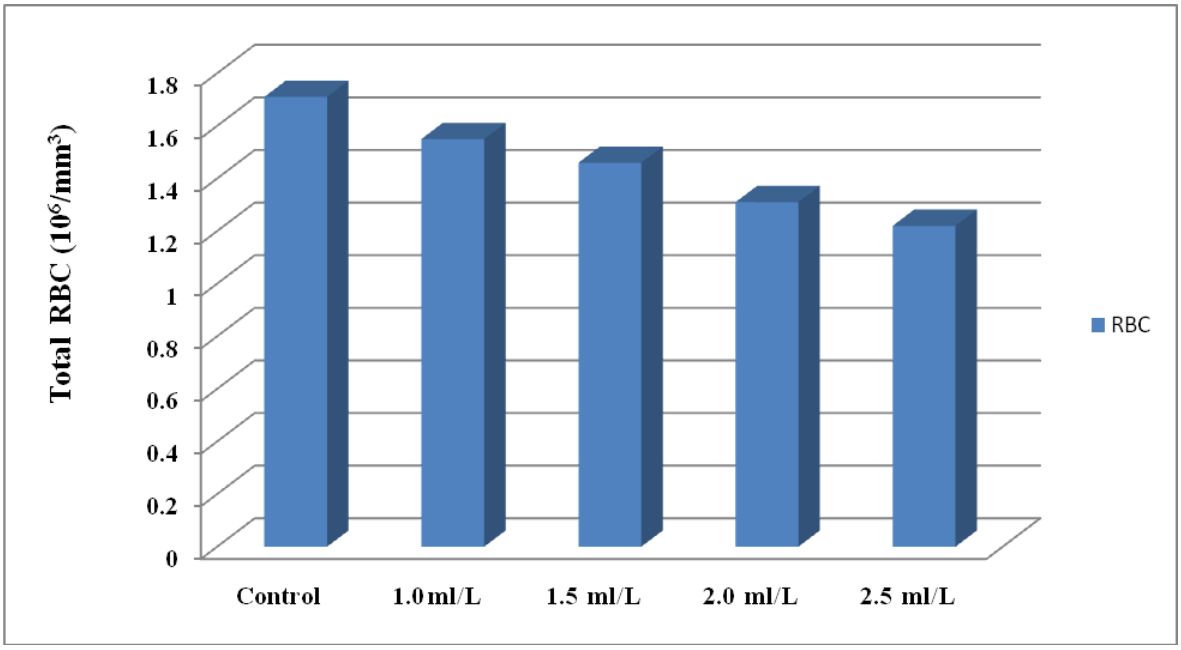

Figure 1. Total RBC of sub lethal concentrations of tannery effluent treated fish *Channa punctatus*

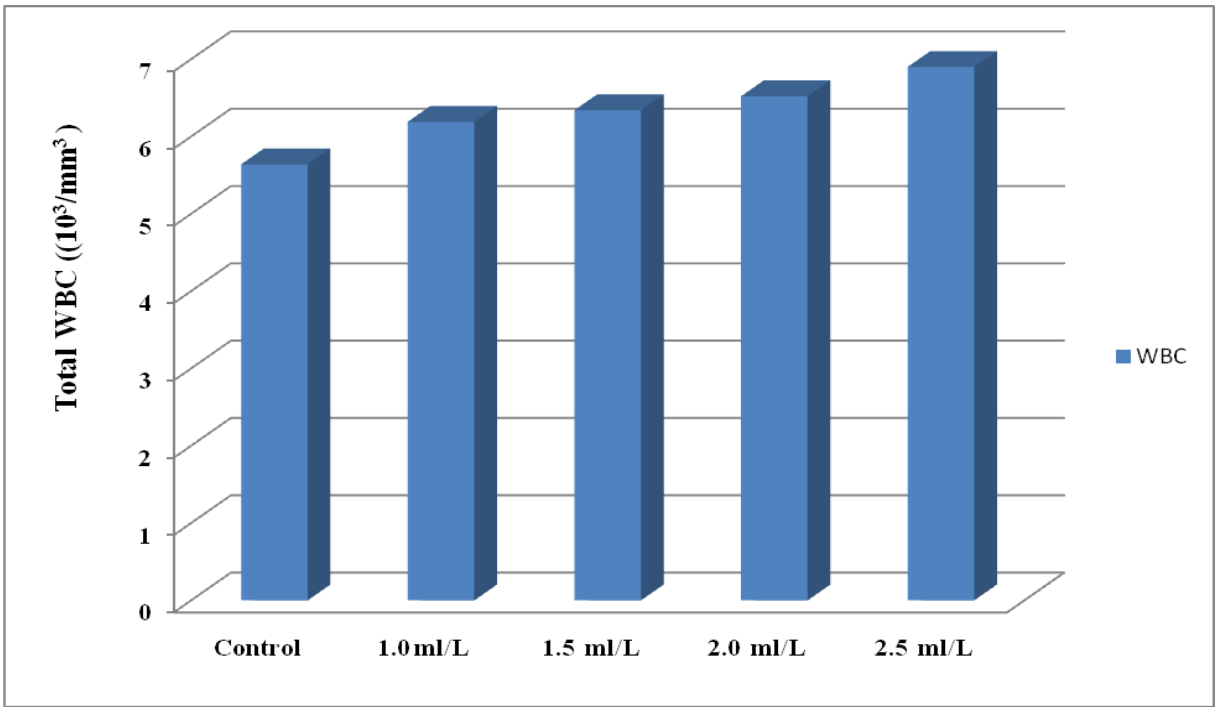

Figure 2. Total WBC of sub lethal concentrations of tannery effluent treated fish *Channa punctatus*

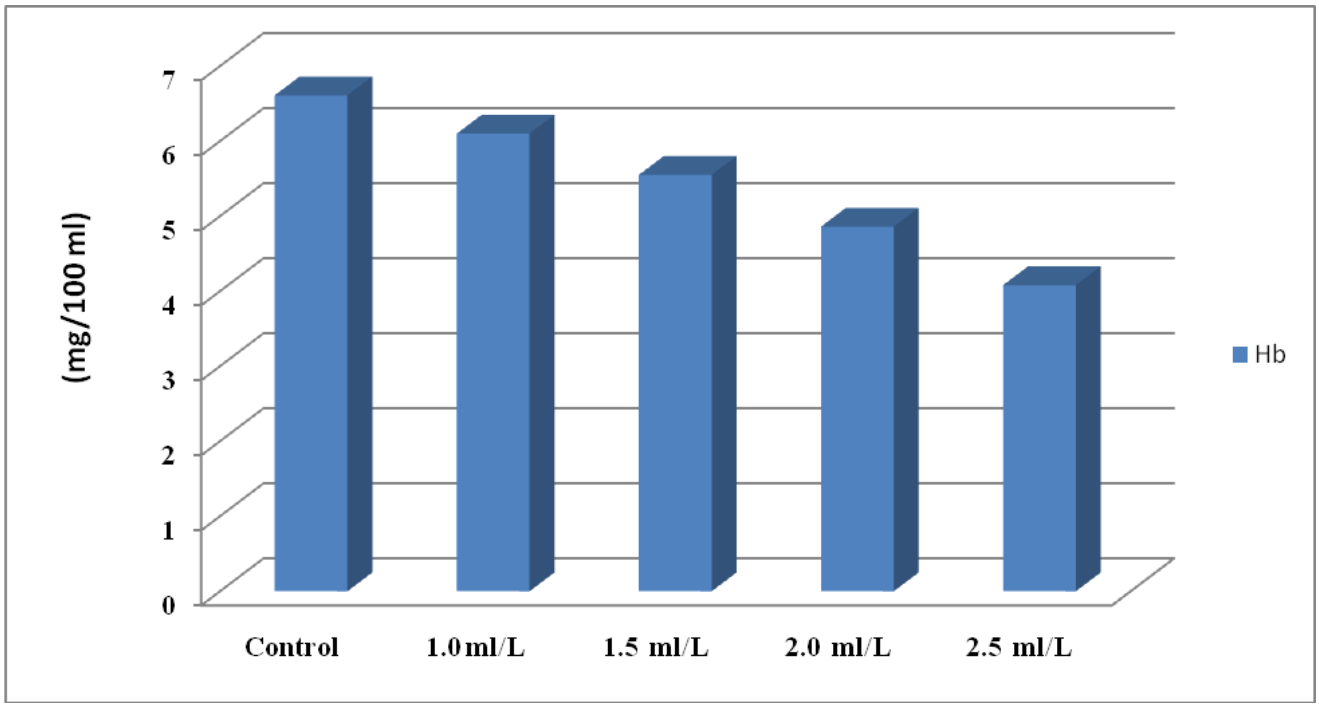

Figure 3. Total Hb of sub lethal concentrations of tannery effluent treated fish *Channa punctatus.*

DISCUSSION

In the present investigation, significant time found reduction in the total Red Blood Cell (RBC) and Hb were noticed, when compared to control fish. The erythrocyte level was found to be decreased in fishes subjected to stressful conditions. An anemic condition is generally indicated by the tendency of lower RBC count, haemoglobin content and haematocrit values, as seen in fishes exposed to environmental pollution stress (Ramesh, 2001). The heavy metal induced significant decrease in RBC, Hb and PCV. The RBC count coupled with low haemoglobin content may be due to destructive action of pollutants on erythrocytes. Our results are in good agreement with the earlier works reported (Karuppasamy, 2000; Bela Zutshi *et al.,* 2010). The decrease in haemoglobin concentration indicates the fish inability to provide sufficient oxygen to the tissues (Nussey *et al.*, 1995).

In the present study, there is a gradual increase in the total WBC count in the fish *Channa punctatus* in exposure to 1.0, 1.5, 2.0 and 2.5 ml/L concentrations of tannery effluent. The gradual excalation was in accordance with the period of exposure. But a drastic reduction was noticed in 7 days exposed fish. WBC plays an important role in immune system. The increase in WBC in the present study has been attributed to several factors like increase in thrombocytes, lymphocytes or squeezing of WBC's in peripheral blood. Increase in WBC count can be correlated with an increase in antibody production which helps in survival and recovery of fishes exposed to toxicant. High WBC counts indicate damage due to infection of body tissues, severe physical stress as well as Leukemia. Similar increase was reported by Banerjee and Banerjee (1988) in *Channa punctatus* due to Copper sulphate and Potassium dichromate induced toxicity in *Channa punctatus* exposed to Copper.

CONCLUSION

The present study reveals that due to the influence of tannery effluent the amount of RBC and Hb have been decreased in blood of fish. But the amount of WBC has been increased as an immunological defense to survive against the toxic substance in the effluent. The discharge of tannery effluent with present condition into water bodies will definitely affect the fish population.

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