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LEATHER DYE POLLUTION AND ITS IMPACT ON WATER FAUNA

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ABSTRACT: *Effect of two leather dyes Bismarck brown and acid leather brown were investigated on fresh water teleost Cirrhinus mrigala (Ham.) on blood parameter (TEC) with different concentrations as 0.6mg/l, 0.7 mg/l, 0.8 mg/l, 8mg/l, 9mg/l and 10mg/l at different time intervals (24hrs, 48hrs, 96hrs, and 1week) decreasing trend in TEC on exposure to Bismarck brown and acid leather brown were observed. However the effect was more with acid leather brown than Bismarck brown, the value of TEC was 2.46± 0.02 10^{12}/l after Bismarck brown treatment and 2.49± 0.08 10^{12}/l after acid leather brown treatment. The reduction in TEC may also be due to haemolytic anaemia which characterised by abnormal destruction of erythrocytes.*

KEYWORDS: Bismarck brown, acid leather brown, toxic effect, TEC, Cirrhinus Mrigala, Reduction.

INTRODUCTION

Raising animals for food and leather requires huge amounts of feed, pastureland, water, and fossil fuels. Animals on factory farms produce 130 times as much excrement as the entire human population, without the benefit of waste treatment plants. The U.S. Environmental Protection Agency (EPA) has even acknowledged that livestock pollution is the greatest threat to our waterways.

Although some leather makers deceptively tout their products as "eco-friendly," turning skin into leather also requires massive amounts of energy and dangerous chemicals, including mineral salts, formaldehyde, coal-tar derivatives, and various oils, dyes, and finishes, some of them cyanide-based. Most leather produced in the U.S. is chrome-tanned; all wastes containing chromium are considered hazardous by the EPA. Tannery effluent contains large amounts of pollutants, such as salt, lime sludge, sulfides, and acids. The process of tanning stabilizes the collagen or protein fibers in skins so that they actually stop biodegrading—otherwise the leather would rot right off your feet. People who work in and live near tanneries suffer too. Many die from cancer possibly caused by exposure to toxic chemicals used to process and dye the leather. The Centers for Disease Control and Prevention found that the incidence of leukemia among residents in an area near one tannery in Kentucky was five times the U.S. average. The dye effluents so generated from these industries and ultimately dumped in natural water. The dye stuff industry in India is a post independent phenomenon after 1952 a few large units were set up mainly as import substitution projects. the Indian leather industry was well set for rapid growth in 1990, since then there are more than 2,500 tanneries located in different urban centres the various types of dyes are used to tan the leather so as to improve its appearance and make it saleable in finished form, these dyes both in solid as well as in liquid form has been considered toxic to the living beings such as dermatitis, irritation in eyes, respiratory problems in the workers of the dye industries. Inland waters from tanneries textile mills and paper mills produce tremendous chemicoazo stress on aquatic organisms including fishes and turtles resulting in their mass mortality.

The dyes have also been reported to precipitate in aquatic organisms leading to haematological changes and histopathological alterations in vital organs of fishes. The dyes effluents so generated from the industries are ultimately dumped in natural waters form one of the major thrust areas of water pollution, severely affecting the fish fauna.

MATERIAL AND METHODS

The fishes *Cirrhinus mrigala* (Ham.) were obtained from Govt. fish form Laramada Agra, the freshly captured fishes were brought to the laboratory and were kept in running tap water for about one hour. Each fish was measured and identified for sex. TEC were counted with the help of improved standard neubaur haemocytometer Dacie and Lewis (1968). All the apparatus were cleaned with sodium citrate and then dried. The sample blood was aspirated in the RBC's pipette up to the 0.5 mark and then Hayem's diluting fluid up to 101 mark (1:200) The blood was thoroughly mixed with diluting fluid by shaking well. The counting chambers was covered with a cover slip and charged with the diluted blood after discarding first few drops, when the RBC's had settled down the counting chamber was examined under the high magnification of a research microscope, the cells were counted in five squares of canters large square four in the corners and one in the centre lined with triplet lines. This means counting was done in 16x5=80 small square, the RBC's lying on lower and right sides of each square on chamber was covered with a cover slip and charged with diluted blood after discarding few drops, when the WBC's had settled down, the counting chamber was examined under the high magnification of a research microscope. The cells were counted in four squares each containing sixteen smaller squares.

Calculation:

$$\text{Total number of WBCs/mm3 of blood} = \frac{\text{total no of WBCs counted x dilution x 10}}{\text{No. of small squares in which counting has been done.}}$$

RESULT AND DISCUSSION

Treatment with Bismarck brown

The treatment was given with different concentrations (0.6 mg/l, 0.7 mg/l and 0.8 mg/l) at different time intervals 24 hrs, 48 hrs, 96 hrs and 1 week as in table 1 and fig A; the value of total erythrocyte count was 2.59 ± 0.09 10^{12} /l in control set while as the value of TEC was 2.46 ± 0.02, 2.49 ± 0.03, 1.79 ± 0.14 and 1.37 ± 0.08 10^{12}/l after 24 hrs, 48 hrs, 96 hrs and 1 week treatment, the increase was significant after 24 hrs, 48 hrs, 96 hrs and 1 week treatment. The value of total erythrocyte count was 2.52 ± 0.08 10^{12}/l in control set after 0.7 mg/l while as the value of TEC was 2.41 ± 0.06, 2.39 ± 0.06, 1.69 ± 0.11 and 1.33 ± 0.07 10^{12}/l after 24 hrs, 48 hrs, 96 hrs and 1 week treatment, the increase was significant after 24 hrs, 48 hrs, 96 hrs and 1 week treatment, after treatment with 0.8mg/l the value of TEC was 2.49 ±0.07 10^{12}/l in control set while as the value of total erythrocyte count was 2.36 ± 0.02, 2.29 ± 0.07, 1.58 ± 0.12 and 1.29 ± 0.05 10^{12}/l**.**

Treatment after acid Leather brown

The treatment was given at three different concentrations as 8 mg/l, 9 mg/l and 10 mg/l at different time intervals (24 hrs, 48 hrs,96 hrs and 1 week) as in table 2 and fig. B The value of total erythrocyte count was 2.59 ± 0.09 1012/L in control set after 8mg/l, while as The value of total erythrocyte count was 2.42 ± 0.03, 1.95± 0.19 and 1.57±0.38 10^{12}/L after 24hrs, 48hrs, 96hrs and 1 week treatment respectively. The increase was significant after 24hrs, 48hrs, 96hrs and 1 week treatment .The value of total erythrocyte count was 2.52±0.08 1012/L in control set after 9mg/l while as the value of total erythrocyte count was 2.48±0.06, 2.49±0.05, 1.74±0.10 and 1.53±0.27 10^{12}/L after 24hrs, 48 hrs, 96 hrs and 1 week treatment. The increase was significant after 24hrs, 48 hrs, 96 hrs and 1 week treatment respectively. The value of total erythrocyte count was 2.49±0.07 10^{12}/L in control set after 10mg/l while as The value of total erythrocyte cont was 2.39±0.32, 2.35±0.09, 1.68±0.42 and 1.59±0.06 10^{12}/L after 24 hrs, 48 hrs, 96 hrs and 1 week treatment the increase was significant after 24 hrs, 48 hrs, 96 hrs and 1 week treatment respectively. In the present investigation decreasing trend in TEC on exposure to Bismarck brown and Acid leather brown was at different time intervals 24 hrs , 48 hrs , 96 hrs and 1 week and at all three concentrations has been observed . However, the effect was more with acid leather brown than Bismarck brown the decrease in the TEC was also reported by Preston (1960) in *Pleuronectes platessau*; Qayamm and Naseem (1967) in *Cirrhinus mrigala* ; Mishra an Shrivastava (1978) in *Colisa fasciatus* after lead an zinc toxicity respectively . Raizada and Singh (1980) in *Channa punctatus* ; Rai and Qayyam (1984) in *Catal catla* due to Hg and Pb intoxication ; Sharma and Joshi (1984) in *Nemachielus rupicola* ; Dhanekar et al ., (1985) in juveniles of *Hetropneustes fossilis* and *Channa punctat* .Thakur and Sahai (1987) in *Channa punctatus* exposed to BHC ; Garg and Tyagi (1989) in *Heteropneustes fossilis* due to manganese toxicity ; Goswami and Dutta (1991) in *Heteropneustes fossilis* due to thallium nitrate toxicity and vit. A deficient diet respectively ; Singh and Shrivastava (1992) in *Heteropneustes fossilis* due to copper sulphate toxicity ; Nath and Banerjee (1995) in *heteropneustes fossilis* due to devithion intoxication ; Singh (1995) in *Channa Punctatus* due to copper sulphate and potassium dichromate poisoning ; Thakur and Bais (2000) in *Heteropnestes fossilis* due to aldrin and fenvalerate poisoning ,Tilak et al., in *Cyperinus carpio* ,The sub lethal exposure of Bismarck brown and acid leather brown results into significant decrease in TEC . Reduction in TEC might be due to toxic of bismarck brown and acid leather brown. Reduction in TEC due to bismarck brown and acid leather brown assigned actue anaemia and leads, to haemorrhage; which in turn induces erythrocytopaenic condition due to the adverse effect of chemicals on the erythopoietic tissue, and the bone marrow. In the present study reduction in TEC may also due to haemolytic anaemia which is characterized by abnormal destruction of erythrocytes. However Dhanekar et al., (1985) reported an increase in the erythrocyte count in the juveniles of *Heteropneustes fossilis* and *channa punctantus* due to zinc toxicity.

Table : 1 fig A;

Total Erythrocyte count (10^{12} /L) in Cirrhinus mrigala (Ham.) after Bismarck brown treatment .

Conc.	Control Mean ± S.Em.)	24 hrs (Mean ± S.Em.)	48 hrs. (Mean ± S.Em)	96 hrs. (Mean ± S.Em.)	1 week. (Mean ± S.Em).
8 mg/L	2.59 ± 0.09	2.46 ± 0.02*	2.49 ± 0.03*	1.79 ± 0.14**	1.37 ± 0.08***
9 mg/L	2.52 ± 0.08	2.41 ± 0.06*	2.39 ± 0.06**	1.69 ± 0.11**	1.33 ± 0.07***
10 mg/L	2.49 ± 0.07	2.36 ± 0.02*	2.29 ± 0.07**	1.58 ± 0.12**	1.29 ± 0.05****

* Non significant (P>0.05).
** Significant (P<0.05).
*** Highly significant (P<0.01).
**** Very highly significant (P<0.001).

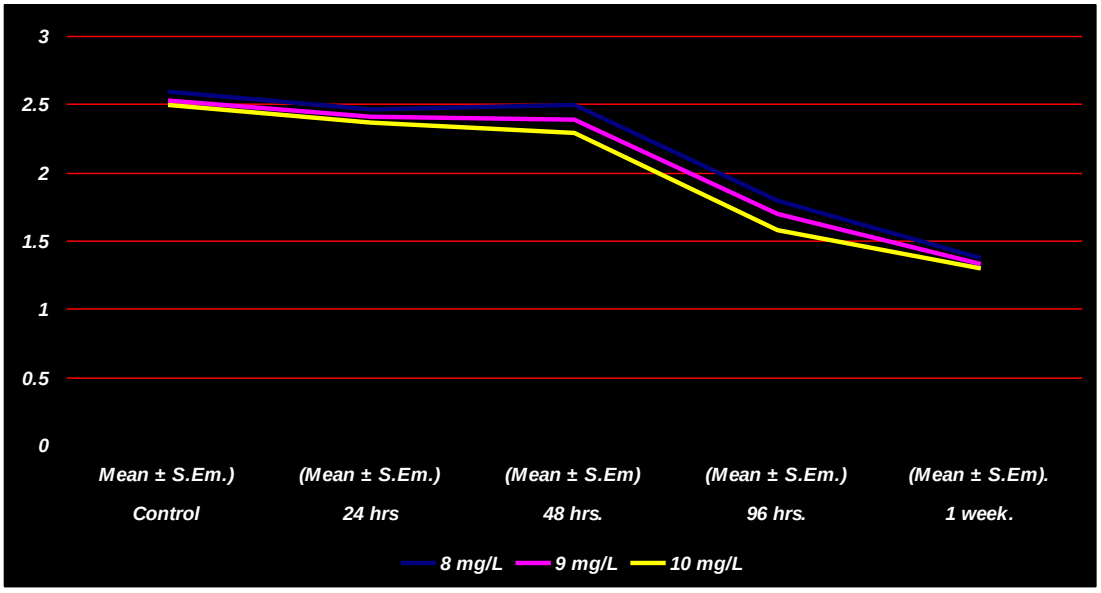
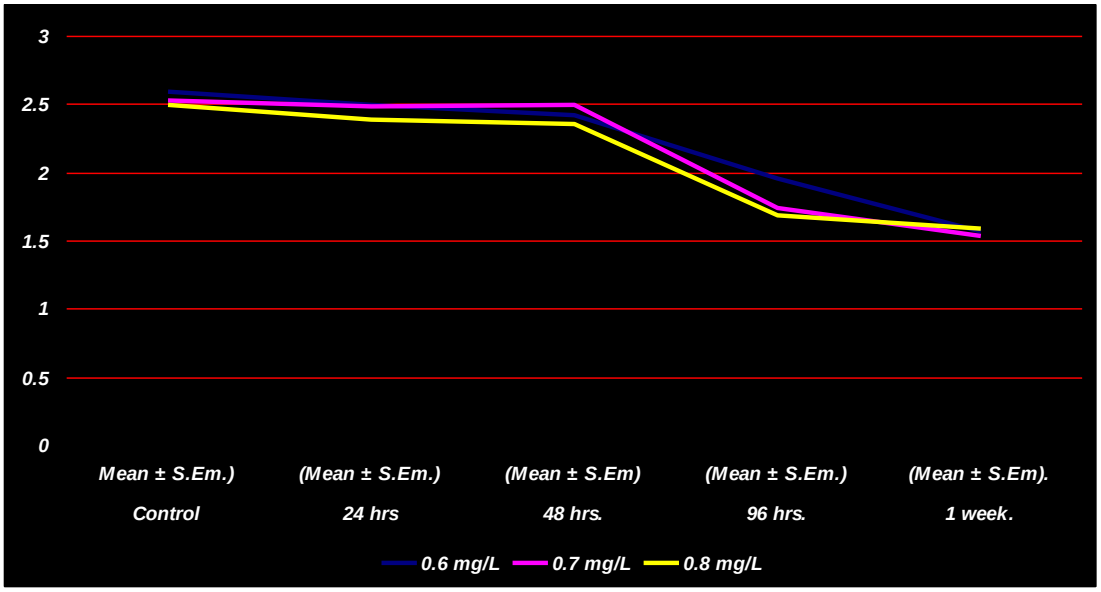


Table: Table 2 Fig. B ;

Total Erythrocyte Count (10^{12} /L) in Cirrhinus mrigala (Ham.) after Acid leather brown treatment.

Conc.	Control Mean ± S.Em.)	24 hrs (Mean ± S.Em.)	48 hrs. (Mean ± S.Em)	96 hrs. (Mean ± S.Em.)	1 week. (Mean ± S.Em).
0.6 mg/L	2.59 ± 0.09	2.49 ± 0.08*	2.42± 0.03*	1.95± 0.19**	1.57 ± 0.38***
0.7 mg/L	2.52 ± 0.08	2.48 ± 0.06*	2.49 ± 0.05*	1.74 ± 0.10**	1.53 ± 0.27***
0.8 mg/L	2.49± 0.07	2.39 ± 0.32*	2.35± 0.09**	1.68 ± 0.42**	1.59 ± 0.06:****

* Non significant (P>0.05).
** Significant (P<0.05).
*** Highly significant (P<0.01).
**** Very highly significant (P<0.001).



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