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TOXIC IMPACT OF PESTICIDES ON THE MORPHOLOGICAL CHARACTERISTICS OF BLOOD CELLS OF FISH *Channa punctatus* (BLOCH)

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ABSTRACT

Pesticide is an agrochemical generally used for controlling the pests of agricultural products but when it get mixed with water resources through agricultural lands, it affects the river water and the organisms as well as the whole river water ecosystem. This affect being an adverse one can change the physiological, behavioral and biochemical properties of aquatic organisms. In the present study an attempt has been made to find out the toxic effect of agrochemical "trichlorofan" on the morphological structure of Blood cells of fish *Channa punctatus* (Bloch). The morphological characteristics were investigated after exposing the fish to a pesticide Trichlorofan, which is generally used for pest control by the farmers. Blood samples were collected from both control i.e. untreated and treated fish after 24,48,72,96,120,148 and 172 hours of exposure and blood films were prepared for morphological study. Significant changes in the morphology of blood cells were obtained between treated groups of fish when compared with the control one.

KEYWORDS: Agrochemical, Blood, Biochemical, Morphology, Pesticide

Environmental pollution is one of the most serious problems facing humanity and other life forms on our planet today. Some of these pollutants are responsible for various acute and chronic diseases, such as skin burns and rashes, bone abnormalities, lung and digestive system disorders in aquatic and surrounding land fauna. (John, 1990). Pesticide is an agrochemical generally used for controlling the pests of agricultural products but when it get mixed with water resources through agricultural lands, it affects the river water and the organisms as well as the whole river water ecosystem. This affect being an adverse one can change the physiological, behavioral and biochemical properties of aquatic organisms. Fishes are aquatic and poikilothermic animals. Hence, their existence and performance is dominated by the quality of their environment. All species of fish perform best under certain optimal conditions, but the amplitude of such conditions is quite narrow. A fish's survival in the face of environmental stress thus, depends up on its ability to adjust its physiological processes so as to maintain relatively constant internal body chemistry. Any stress requiring an adjustment in excess of ability to accommodate will be lethal or will result in disease (Wedemeyer,1970, Wedemeyer and Wood,1974).

Haematological indices are important parameters to evaluate the general physiological status of fishes and may be considered as stress indicators for estimation of the response reactions of the fish to various environmental conditions (Docan et al.,2010).Besides, haematological tests can also provide important information on the erythropoietic condition (Rehulka and Adamec, 2004). it may be considered useful in assessing the health of fish subjected to changing environmental conditions (Blaxhall,1972 and Nair et al, 1984) and have proven useful in monitoring stress responses as bio-indicators (Bridges et al,1976; Soivio & Oikari,1976;Warner & Wiliams,1977; Agarwal and Shrivastava 1980;Folmar,1993;Gill & Epple,1993; Caruso et al ,2005;Remyla et al,2008 and Ramesh and Saravanan,2008,Singh and Tandon,2009).

Several studies have been conducted regarding the reactions and modifications of the haematological indices in response to various stress factors (Gbore et al., 2006). Montero et al. (1999) reported increases in hematocrit value, haemoglobin amount and red blood cell count, upon short term density stress, suggesting a strategy to increase the ability of oxygen transportation in the blood during periods of metabolic breakdown. Significant increases in hematocrit, haemoglobin, and MCHC during high stocking density environment have been reported in *Salmo salar* (Kjartannson et al. 1988), while in *Carassus auratus* both the hematocrit and the amount of haemoglobin depleted with the

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increasing stocking density (Burton and Murray,1979).

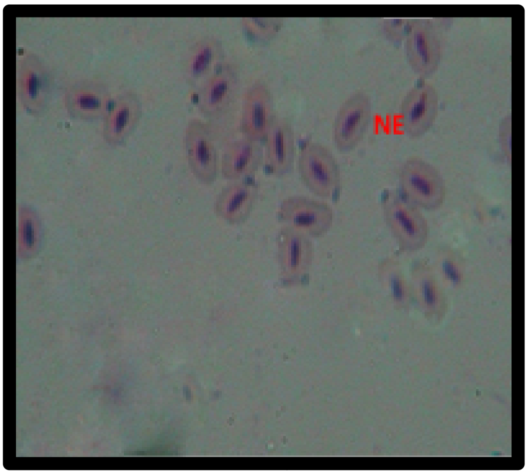
MATERIALS AND METHODS

Collection and Acclimatization of Fishes

Live, healthy *Channa punctatus* in the same size range were collected from local streams and acclimatized under normal laboratory conditions for 15 days. For the exposure of fishes, different concentration ranges (10%,20%, and 30%) were taken after dilution with normal tap water and Normal tap water served as control. The fishes were divided into 5 groups consisting of 20 fishes each. All were individually exposed to Tap water (Control) and low concentrations (10%,20%,and 3s0%) of agrochemical in 20 liters glass aquaria. Feeding of fishes and aeration of the tanks were done uniformly throughout the experiment. Blood samples were collected separately from 4 live fishes from each group at 24,48,72,96,120,144 &168 hours by severing the caudal peduncle. A thin blood film is prepared by spreading a small drop of blood uniformly. After staining with Leshmania stain the blood film is used to determine the cell type characteristics and number.

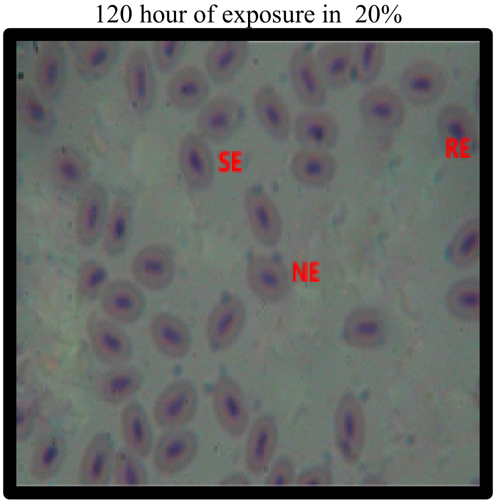
Figure 1to 8 shows the morphological changes in blood cell of fish Channa punctatus (Bloch)

Control



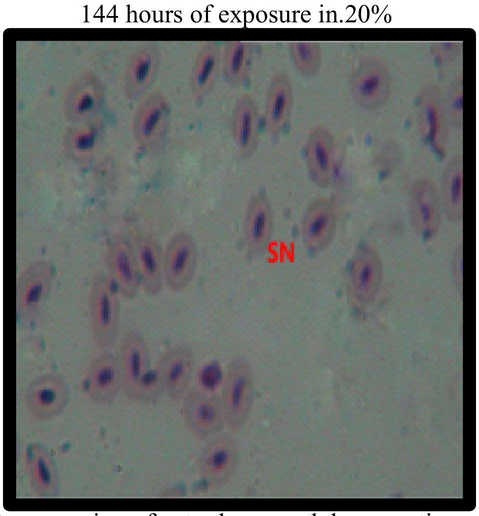
Normal cell shape

120 hour of exposure in 20%



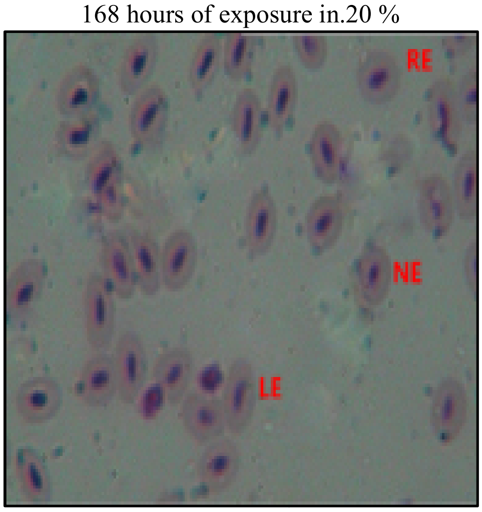
Changes occurred in blood cell

144 hours of exposure in.20%



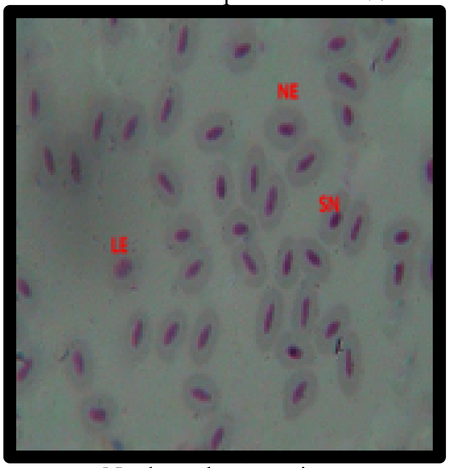
Degeneration of cytoplasm and degeneration of plasma membrane.

168 hours of exposure in.20 %



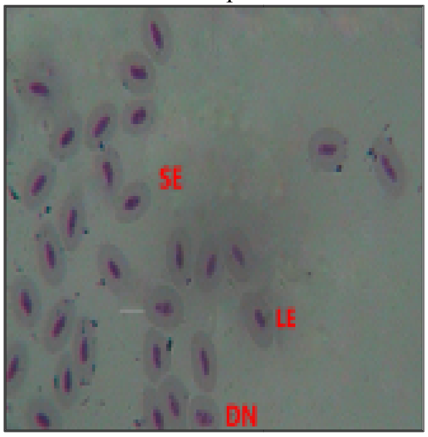
large erythrocytes and shape also change

96 houres of exposure in 30 %



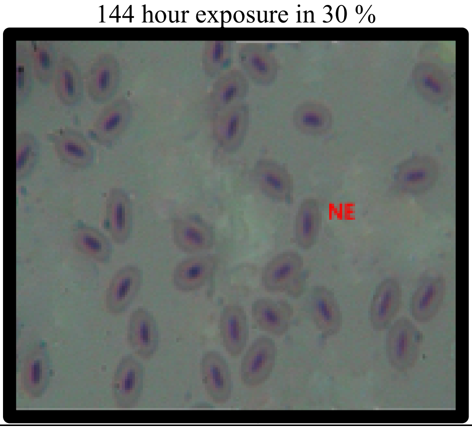
Nuclear degeneration ,

120 houres of exposure in 30%

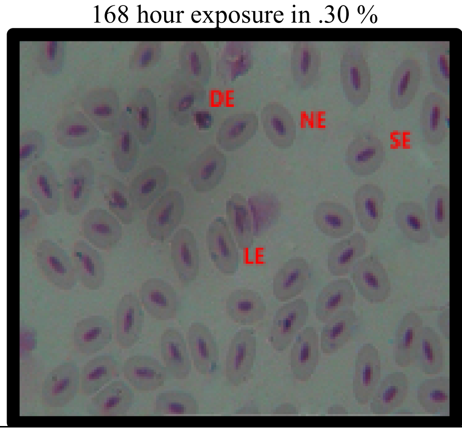


large size of the cell and nuclear degeneration

144 hour exposure in 30 %



168 hour exposure in .30 %



RESULTS

After exposure in different concentration of agrochemical many morphological changes was observed .during this it No any changes were observed in 10% concentration of after the exposure while during the Exposure to 20 % effluent revealed the presence of anisocytosis at 96 hours [plate 1)], damaged erythrocytes at 120 hours [plate 2)], anisocytosis , deformed erythrocytes and large bulged nucleus in some cells at 144 hours [V-3(E)],clumped erythrocytes at 176 hours [plate 3], deformed erythrocytes at 120 hours [plate 4] followed by deformed cells clumped erythrocytes and cell lysis at 144 and 168 hours [plate 5].Exposure to 30 % effluent revealed, anisocytosis and karyorhexis (nuclear degeneration) in the first 72 hours plate 6&2 (G).At 72 hours, the cells looked pale with a large nucleus marking the onset of cellular degeneration [plate 7].This was followed by karyorhexis and cytoplasmic degeneration at 96 hours [plate 8]and large, clumped erythrocytes and cell lysis at 120 to 168 hours [plate 9].

Presence of anisocytosis and poikilocytosis in the present case clearly indicates toxic effects agrochemical on the red cell morphology. Structural defects and changes in surface shapes of erythrocytes have been reported by Koc et al. (2008) from Endosulfan and Malathion exposed rats. Changes in the erythrocyte profile were also noticed in fishes by Benarji and Rajendranath(1990) in presence of Dichlorvos, Tavares et al. (1999) to Trichlorphon, Khattak and Hafeez (1996) to Malathion, Singh and Srivastava (1994) to Formothion and Sampath et al. (1993) Ekolux organophosphorus preparation. Deformations and increase in the cellular size of the red blood cells were also observed in the present case prior to clumping. Similar changes have been observed by Tripathi and Shrivastava (2010) in rats post exposure to Chlorpyrifos. Comelekoglu et al. (2000) stated that some pesticides may provoke the alterations in size and surface shapes of erythrocytes. Nikimma (1992) suggested that toxic materials directly or indirectly damage the membrane structure, ion permeability and cell metabolism of erythrocytes thus may cause morphologically damaged erythrocyte formation .Vives et al. (1999) explained that the expansion of membrane increases the area/volume proportion and could allow the swelling of the cell, thus, reaching the largest volume before the lysis. Swelling of red blood cells as reflected by the increased mean corpuscular volume (MCV) has been attributed to the increase in the activity (Soivio et al. 1974). An increase of erythrocyte size (MCV) has been associated with several factors but it is generally considered as a response to stress(Weber 1982).

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