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IMMUNE RESPONSE DURING DIFFERENT REPRODUCTIVE PHASES OF *Channa Panctatus* (BLOCH) EXPOSED TO SUGAR FACTORY EFFLUENT

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ABSTRACT

The wastewater has becomes the biggest issue and threat to the world. In developing or less developed countries are victim of different diseases by wastewater. The wastewater from sugar industries is one of the complex issues throughout the world. It is also biggest challenge for environmentalist for economic and environment friendly treatment of wastewater. The present study deals the impact of sugar factory effluent on immune response of fresh water snake headed fish, *Canna punctatus.* The haematological parameters like RBC counts, WBC counts and haemoglobin %, were decreased where as lymphocytes increased during stress condition. The fish species is therefore recommended as good bioindicator for the risk assessment of aquatic environmental pollution.

KEYWARDS: Sugar Factory Effluent, *Immune response, Channa punctatus*, Spawning Phases

Environmental pollution has been recognized as one of the major problems of the modern world. The increasing demand for water and dwindling supply has made the treatment and reuse of industrial effluents an attractive option. Sugar factory is one of the most important agro-based industries in India and has significantly contributed to national economy. As India is the largest producer of sugarcane in the world with 550 sugar mills and 220 million tons cane per year and total sugar production 13.5 million tons per year (Elayaraj, 2014). The by-products of sugar factory are also used as raw materials in different industry. However sugar mill have a great environmental impact upon the surrounding environment. Sugar production processing require huge amount of water for a number of steps and released almost equal quantity of effluent which contain toxic material (Kaur *et al*., 2010). The change of water chemistry is the main associated environmental impact of discharging sugar factory's effluent on an open water body.

Sugar factory effluent that has not been treated properly has an unpleasant odor when released into the environment. The effluent discharge from sugar mill consist of a number of organic and heavy metal pollutant in dissolved or suspended form that can bring about changes in the physical, chemical and physiological sphere of the biota (Salequzzaman *et al*., 2008). The effluents are causing odor nuisance during decomposition. Wastewater from sugar mills with its high Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) rapidly deplete available oxygen supply when discharged into water bodies endangering fish and other aquatic life and also creates septic conditions, generating foul-smelling hydrogen sulfide, which in turn can precipitate iron and any dissolved salts, turning the water black and highly toxic for aquatic life. Suspended solids reduce light penetration capability and, as a result, plant production in the receiving water body is diminishing through increasing turbidity that also clog fish gills. Discharge of water with a high Total Dissolved Solids (TDS) level would have an adverse impact on aquatic life, render the receiving water unfit for drinking and domestic purposes, reduce crop yields if used for irrigation, and exacerbate corrosion in water systems and pipe (ETPI, 2001).

The discharged of effluents to receiving waters inhibits photosynthetic activity of aquatic green plants by reducing the penetration of sunlight, besides there direct toxic effects on biota. Indian rivers act as temporary reservoir for drainage of water and industrial effluent and often are highly contaminated with anthropogenic materials. This is also true for Swan River, a tributary of Rapti River, Balrampur.

MATERIALS AND METHODS

For studying the impact of Sugar factory effluent on immune response, *Channa punctatus* (9.0±2.0 cm & 40±10g) were collected in living condition from 300 meters away from the entry point of effluent in up stream (site 1) and at the point of discharge of effluent into river Swan (Site 2) in all the three seasons i.e. spawning phases and were sacrificed for the collection of blood. The blood was collected after severing the caudal peduncle of the living fish by a scissor. haematological parameters, total number of RBCs, Hb%, WBCs and DLC were estimated by following standard methods.

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RESULTS AND DISCUSSION

Table 1 presented the impact of Sugar factory effluent on haematological parameters at different reproductive phases of snake headed fish, *Channa punctatus*.

Table 1: Impact of Sugar Factory effluent on haematological parameters in different seasons (each value represents the average performance of 10 individuals)

Parameters	Pre-Spawning Phase (Summer)		Spawning Phase (Rainy)		Post-Spawning Phase (Winter)	
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
RBC(10^6mm^{-3})	2.97±0.05	1.83±0.08	3.19±0.87	1.97±0.58	3.09±0.31	1.74±0.27
Hb(g 100ml^{-3})	9.9±0.12	7.3±0.33	10.2±0.87	8.4±0.26	11.8±0.53	8.04±0.28
WBC (10^3mm^{-3})	58.8±0.22	54.0±0.22	58.0±0.76	55.21±0.60	52.2±0.32	45.12±0.35
Thrombocyte	45.5±0.78	24.8±0.61	28.3±0.73	27.4±0.82	23.5±0.58	20.4±0.22
Lymphocytes	33.5±0.24	35.62±0.52	27.4±0.31	28.4±0.31	37.2±0.08	42.2±0.04
monocyte	2.1±0.14	2.2±0.12	3.2±0.52	2.4±0.25	1.9±0.36	1.2±0.21
Neutrophils	13.31±0.71	12.22±0.12	14.10±0.27	13.12±0.35	12.3±0.96	10.21±0.72
eosinophils	13.9±0.31	12.9±0.24	15.2±0.4	14.3±0.24	13.71±0.34	10.22±0.15
basophils	12.3±0.36	12.36±0.16	13.5±0.6	12.83±0.57	11.4±0.36	10.13±0.17

The total RBC counts, WBC counts, Haemoglobin content, were found to be reduced with increased WBC counts in the fishes collected from polluted sites from river. The reduction in RBC counts and haemoglobin % was found to cause macrocytic anemia as noticed in fishes by Srivastava *et.al.* (2007). Subramaniam *et al* (1988) observed a decrease in rate of oxygen consumption of fishes due to fall in RBC count and Haemoglobin content. The reduction in the haemoglobin content in the fish could also be attributed to the lysing of erythrocytes (Samprath *et al*, 1993). Thus significant reduction in these parameters is an indication of severe anemia. In *Channa punctatus* the reduction in total WBC count below the normal level (leucopenia) is in line with those recorded in fishes exposed to toxicant. This could cause loss of efficiency in the defense mechanism against infection in the species studied. Decreased number of WBC may also be related to an increased level of corticosteroid hormones, whose secretion is a non-specific response to any environmental stressor (Ellis, 1981).The reduction in leucocytes of the experimental fish that was observed agrees with the report that the release of epinephrine during stress causes the concentration of spleen and a decrease of leucocyte count, which shows the weakening of the immune system. In the differential leucocytes count, a sharp significant increase was observed in the percentage of lymphocytes. This is an agreement with the findings of Samprath *et al.* (1993) when they exposed the Nile tilapia, *O. niloticus* to a toxic environment. This they attributed to stimulation of the immune mechanism of the fish to eliminate the effects of the pollutants. The significant decrease in eosinophils and neutrophils are in agreement with the findings of Srivastava *et al*., (2007) when *Clarias batrachus* were exposed to distillery effluent. This was attributed to tissue damage.

CONCLUSSION

Balrampur Sugar Mill is one of the largest industries among all operating industries of U.P. Though this factory is seeking to increase government revenue and employment opportunities the discharge of semi treated effluents causing severe environmental degradation. The present investigation has been carried out to assess the impact of sugar factory effluent on immune response of fresh water fish. From the result it has been concluded that it does not maintain the desired standard treatment technique before discharging the effluent in Swan River.

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