



Haematopoietic Alterations induced by Carbaryl in *Clarias batrachus* (LINN)

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ABSTRACT: The aim of the study was to assess the effect induced by Sevin a carbamate pesticide on hematological indices of *Clarias batrachus*. The effect was studied based on the results of acute toxicity tests and comparison of control with experimental group. The fish was exposed to varying levels of the toxicant and sub lethal exposure to varying concentrations was used to study the effect on blood cells. LC₅₀ of Sevin for *Clarias batrachus* after 96hr exposure was found to be 15.3mg/l. Examination of hematological indices was performed on 6 control and 9 experimental specimens after 96hr exposure to Sevin in concentration of 12.6mg l⁻¹ and 14.6mg l⁻¹. Reduction in the number of red blood cells, erythrocytes, packed cell volume, Mean corpuscular hemoglobin, mean corpuscular volume decreased indicating Anemia. @JASEM

Pesticides are directly applied to agricultural field mainly to control pests and improve crop yield. These pesticides finally find their way into water bodies and cause harm to aquatic flora and fauna. Some pesticides such as carbamates are known to be cholinesterase inhibitors. The effect have been reported on operculum Beat frequency (Chindah et al 2004), hematological indices (Svoboda et al 2001), Histochemical (Abdelmeguid et al 2002), acetyl cholinesterase (Monserrat et al 2001). This study aims at determining the effect of major maximally used carbamate pesticides against insects on hematological indices of air breathing freshwater fish *Clarias batrachus* (Linn). Pesticide toxicity to fish has been investigated in several studies (e.g. Hamelink and Spacie, 1977; Kumaraguru and Beamish, 1981; Mulla and Mian, 1981; Barry *et al.*, 1995; Steinberg *et al.*, 1995; Moore and Waring, 1996; Waring and Moore, 1997; Moore *et al.*, 1998; Csillik *et al.*, 2000; Moore and Waring, 2001). However, fish are not usually target organisms for pesticides, and knowledge about effects of pesticides in the field is still sparse. However, studies have demonstrated that atrazine concentrations as low as 5 µg/L affect the swimming behavior of zebrafish (*Brachydanio rerio*; Steinberg *et al.*, 1995). As a consequence, the feeding behavior of individuals may change, possibly increasing predatory susceptibility. Fisheries have always played a pivotal role in providing food to the people in India as well as the world over and fresh water aquaculture contributes more than 90% of the total aquaculture production.

India stands seventh in the world in terms of fish production, yet provides only 8 kg of fish per person as against 11-12 kg prescribed by WHO Standards. Marine fisheries in India has reached a plateau in terms of growth, hence the short fall in future has to be met from inland fisheries. Gujarat stands fourth among states in

fish production in India and has the longest coastline of 1640kms with 11 coastal districts, 176 fishing villages and 173 landing centers. The production rate of live fishes is 18000t per annum, which accounts for 15% of the country's total marketable surplus of inland fish. Among the inland fisheries the catfishes and other air breathing fishes are second most important group with regard to their commercial purpose. Catfishes or air breathing fishes as these grow in swamps and marshes can fill up the deficit. India has vast resources of swamps and marshes, which can be utilized for cultivating air-breathing fishes.

MATERIALS AND METHODS

The aim was to assess the effect of Carbaryl on fish. It was tested in the form of Sevin pesticide. The toxic effect was assessed based on the results of acute toxicity tests and hematological examination of freshwater fish *Clarius batrachus* after exposure to the pesticide. The common air breathing fish *Clarias* of Uniform length (11 cms+ 12 cms) and weight (45+ 1.5 gm) were collected from Vadtal pond located in Bakrol Anand (GUJARAT) INDIA with the help of local fisherman. The fishes were acclimatized to laboratory conditions for fourteen days. The fishes were fed once daily with Boiled chicken egg and water was changed every 24 hrs. The experiment was conducted in 20 round 30 liter capacity to which volumes of carbaryl was added to achieve different concentrations of the toxicant. Each container housed one specimen. All experiments were conducted at laboratory temperature and fishes were not fed during the experiment. Observations were recorded every 96 hrs for different concentrations of carbaryl for determining LC₅₀. Twenty fish specimens were used for each concentration to determine LC₅₀. Basic parameters of water used were as follows: pH 7; acidity 27.5 mg/l; Temperature ; dissolved oxygen 4.65 mg/l ; free carbon

dioxide 26.4 mg/l. The LC₅₀ values in the respective time period of 96hr were determined.

Examination of erythrocyte profile was carried out on 6 control and 9 experimental female specimens at the end of 96 hr toxicity test with Sevin in concentration of 12.6 mg l⁻¹ and 14.6 mg l⁻¹ and the control group was examined for hematological indices. The test was

performed for a period of 45 days. The fresh blood from fish was collected by cardiac function. Using 2ml hypodermic syringe into 2ml lithium heparin's tube to determine Erythrocyte count (RBC), haematocrit (PCV), hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC). Results were analyzed statistically.

Table 1 Derived haematological parameters in clarias affected by exposure to Sevin at 12.6mg/l.

Indices	UNIT	Groups	N	Mean	SD	Variance
Haemoglobin	G%	Control	6	8.550	0.235	0.055
		Experiment	9	7.256	0.364	0.133
PCV	%	Control	6	25.683	2.423	5.870
		Experiment	9	19.596	1.628	2.652
MCV	Fl	Control	6	122.552	11.559	133.612
		Experiment	9	101.937	11.511	132.512
MCH	Pg	Control	6	40.840	1.806	3.263
		Experiment	9	37.721	2.774	7.694
MCHC	%	Control	6	33.497	2.863	8.195
		Experiment	9	37.324	4.311	18.584
RBC COUNT	MILL/CMM	Control	6	2.095	0.058	0.003
		Experiment	9	1.930	0.134	0.018

RESULT AND DISCUSSION

As the fish came in contact with pesticide restlessness was observed and supplemented by sudden rapid movement in circles. A neural paralytic effect was observed in fish Poisoned with Sevin. The fish tried hard to swim and swam in half circles Hematological parameter: Significant reduction in erythrocytes and hemoglobin was observed at sub lethal concentrations. The erythrocytes (RBC) values for treated fish indicated decline when compared with the reference fish in Fig. 2 and Table no 1. Decrease in hemoglobin in experimental animals might be due to destruction of (decrease in hemoglobin has been reported by Bhaktavasalam(1991). Erythrocytes and inhibition of erythropoiesis, which is confirmed by decreased MCHC Values. Lowering of Erythrocyte values has been reported by Svoboda et al (2001) in *Cyprinus carpio* due to the effect of diazinon , Prabha et al (1999) have reported the Effect of paper and pulp mill effluent on haemopoietic alterations in *Oreochromis mossambicus*. Effect of sub lethal concentration of propoxur has been reported by Singh et al (1991) with significant decrease in haematocrit value and hemoglobin concentration in *Heteropneustes fossilis* and decrease in hemoglobin has been reported by Bhaktavasalam(1991) in *Anabas testudineus*. Fall in the

number of red blood Cells followed by PCV(Packed cell volume) confirms anemia in *Clarias batrachus*. MCV and MCH values also reduced after exposure to various concentrations. Some of the blood cells became elliptocyte i.e. more cigar like shape and some cells showed variation in size which confirms anisocytosis due to carbaryl effect on blood cells.(Fig 2)

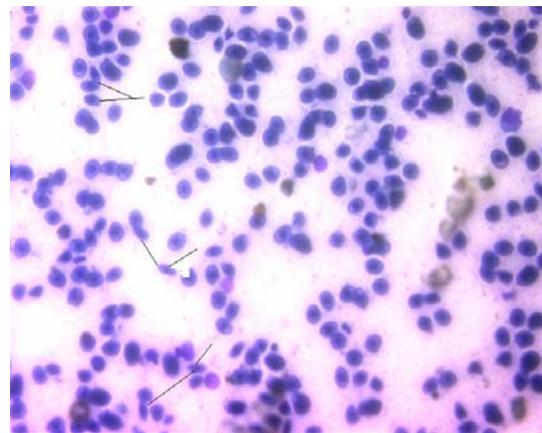


Fig .2 Change in the shape of bloodcells (Anisocytosis) at 12.6mg/l

During the course of 96 hr toxicity test of Sevin based carbamate on *Clarias batrachus* there was no death of fish in control tank. The main hematological response on exposure to Sevin was significant decrease of hemoglobin content, haematocrit value and erythrocyte count. The shape of blood cells also showed changes at concentration of 12.9 mg/l and formed chain like structure at concentration of 14.9 mg/l as is evident from Fig.1. Decrease in erythrocytes has been reported in *Tilapia zillii* due to water Pollution Abdelmeguid et al (2002). Changes in blood cell profile has been reported in *Cyprinus carpio* due to the effect of diazinon by Svoboda et al(2001). Organophosphate effect on hematological indices has been reported by Chindah et al (2004) in *Tilapia guineensis*. Decrease in various indices of blood after exposure to Sevin at different Concentrations indicated that *Clarias batrachus* became anemic(Table no.1). The same Has been reported in *Tilapia guineensis* after exposure to chloropyrifos by Chindah et al(2004). Anisocytosis and crenation of erythrocyte membrane has been reported by Birendra et al (1991).

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