



ORIGINAL ARTICLE

Toxic Stress of Sublethal Doses of Herbicide, 2,4-D on Body Weight and Behavior of *Channa Punctatus* (Bloch.)**Ranjana Chauhan¹ and Bhagya Laxmi Sengar²**¹ Department of Zoology, Kr. R.C.M. Degree College, Mainpuri² Department of Botany, Kr. R.C.M. Degree College, MainpuriEmail: drranjanachauhan1965@gmail.comReceived: 24th Jan. 2017, Revised: 10th March 2017, Accepted: 15th March 2017**ABSTRACT**

In the present findings toxic effect of 2,4-D observed in *Channa punctatus*. The 2,4-D concentrations of 400, 600 and 800 ppm were selected to study their effects on the body weight and behavior of *Channa punctatus*. The average weight showed a decreasing trend with the increase in time exposure and different concentrations of 2,4-D. The decrease in the body weight is statistically non-significant for different concentrations and time exposures. In these observations behavioural response of *Channa punctatus* varied in different test concentrations of 2,4-D.

Key words: Toxic Stress, Sublethal Doses, *Channa Punctatus*, Body Weight

INTRODUCTION

Advancement in the field of agricultural science, latest techniques involving much more effective synthetic pharmaceutical compounds in the form of biocides and a considerable growth of industries has resulted in severe toxication of fresh water bodies. The aquatic ecosystem in known to be highly sensitive to residual toxicity of pesticides as compared to terrestrial ecosystem. The short term effect of pollution on aquatic life is due to the lack of oxygen in water, heavy load of organic matter from sewage and other sources, and The long term due to the gradual accumulation of toxic substances in the body of aquatic fauna specially fish and thereby causing a great problem to mankind for whom these are one of the main sources of food.

In spite of all odds, the use of chemical herbicide is increasing leaps and bounds in recent years, the reason being their utilization as effective weed killers, economic with regard the cost of application, quick availability and nontoxic attitude towards warm blooded animals. Herbicide 2,4-D extremely mobile and acts as a respiratory inhibitor.

Obviously being a poikilotherm, the fish become a target where subsequent transport of weedicides either by general body surface or through respiratory pathway to various tissues of different organ system results in metabolic disorders leading finally to death.

Fish afford an easily assimilable, highly nutritive and a well-balanced diet and their successful intensive rearing is mainly dependent upon the availability of a suitable environment involving favourable water chemistry, absence of pollutants, sufficient oxygen contents. So it is necessary to have judicious and intelligent use of various herbicides.

Therefore in the present investigation an attempt has been made to evaluate the damage caused by the herbicide-2,4-D on the body weight and behavior of a common air breathing fish *Channa punctatus* (Bloch) Similar work has been done by Elia, *et. al.*, (2017) on rainbow trout and Wani *et.al* (2010) on *Channa punctatus* (Bloch)

MATERIAL AND METHODS

The Fresh water air breathing fish *Channa punctatus* ranging from 14 to 20 cm in length and 40 to 100gms in weight were collected from the local fish market and carefully examined for any injury.

Fish were treated with 1% solution of KMNO₄ for few minutes to get rid of any dermal infection, and kept in a large glass aquaria measuring 75cm×37.5cm ×37.5cm. Water of each aquarium was changed every two or three day. Fish were fed on boiled egg each day. In the beginning of experiment LC₅₀ of 2,4-D is determined by using bioassay method (APHA *et.al.* 1981) for this six

aquaria A,B,C,D,E and F were set up and in each aquaria 10 fish were taken. 2000ppm is the highest concentration at which all the fish died within 24 hrs. and 1125 ppm is the lowest concentration at which all the fish survived for 24 hrs, and within this range six concentrations 1750, 1625, 1500, 1375, 1256, 1125 ppm were selected to observe the survival number in each concentration after 24, 48, 72 and 96 hrs and processed statistically (Snedecor, 1961).

To observe the effect of herbicide on fish three sublethal concentrations of 2,4-D 600, 800 and 1000 ppm were selected. The weight of fish was taken after keeping each in a weighed polythene bag and then exposed to 2,4-D. After exposure to the 2,4-D the weight of each fish was also taken after 24,48,72 and 96 hrs. The behavior of fish was also observed both in control and exposure of 2,4-D.

RESULT AND DISCUSSION

The fresh water air breathing fish *Channa punctatus* were exposed to different concentrations of 2,4-D to observe the survival no. for 24,48,72 and 96 hrs Survival no. shows a corresponding decrease with the increase in concentration and time exposure. LC_{50} values recorded are 1687.5, 1437.5, 1250.0 and 1212.5 ppm for 24,48,72 and 96 hrs respectively.

The average body weight of *Channa punctatus* was maximum (69.6 gms) in control and it showed a decreasing trend with the increase in time exposure and different concentrations of 2,4-D, that is minimum (57.2gm) after 96 hrs. at 800 ppm. The decrease in the body weight is statistically non-significant for different concentrations and time exposures. Table 01

Table 1: Body weight of *Channa punctatus* at different concentrations and time intervals with 2,4-D 80% E.C.

S.No.	Concentration (ppm)	Exposure time in hrs			
		24	48	72	96
		Range Mean \pm S.E.	Range Mean \pm S.E.	Range Mean \pm S.E.	Range Mean \pm S.E.
1	Control	60-81 69.6 \pm 3.93	60-81 69.6 \pm 3.93	60-81 69.6 \pm 3.93	60-81 69.6 \pm 3.93
2	400	58-80 68.0 \pm 4.09*	55-76 65.8 \pm 3.86*	53-74 63.6 \pm 4.01*	51-71 61.0 \pm 3.73*
3	600	56-78 66.8 \pm 3.98*	53-74 64.2 \pm 3.85*	51-70 60.8 \pm 3.44*	50-65 58.2 \pm 2.73*
4	800	54-76 64.6 \pm 4.07*	52-73 62.2 \pm 3.92*	50-70 60.0 \pm 3.78*	48-66 57.2 \pm 3.54*

S.E. - Standard error of the mean.

* - Non-significant.

Due to 2,4-D toxicity behavioral response of *Channa punctatus* varied in different concentration in 400 ppm. The fish exhibited less activity, in 600 ppm showed accelerated swimming, excessive mucous secretion, increased opercular activity and frequent excursion to the upper surface of water, and in 800 ppm showed frequent movement, extreme restlessness followed by violent movement of pelvic fins and erratic and jerky swimming.

In *Channa punctatus* the toxicity of 2,4-D is directly correlated with the concentration and time exposure. Similar observation has been made by Naqvi, *et. al.* (1981) due to the toxicity of paraquat and metribuzin herbicides to copepods. The survival percentage of *Channa punctatus* is statistically significant at 5 per cent level for both concentrations and time exposures of 2,4-D which is in accordance with the findings of Verma, *et. al.* (1974 and 1975) due to the toxicity of DDT and lindane to *Calisa fasciatus* and *Notopterus notopterus* respectively.

Toxicity of 2,4-D in *Channa punctatus* results in reduced activity with enormous extrusion of mucous which practically covers the whole body surface before death this may be due to the fact the mucous hinders the exchange of gases resulting in the deficiency of oxygen in blood which in turn affects the general physiology of the body and finally the death.

Almost similar observations have been made in *Channa punctatus* in response to the toxicity of carbamate pesticides, sevin by sastry and Siddiqui (1982), and due to the zinc toxicity by Skidmore (1970), Skidmore and Tovell (1972) and Hughes (1973) in rainbow trout.

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