

Pesticide Toxicity and Behavioural Responses in the Fish *Oreochromis Mossambicus*

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Abstract:

The freshwater teleost fish and the pesticide cypermethrin were used to study the behavioural aspects of the fish in pesticide toxicity. On acute exposure periods at an interval of 24 hours upto 96 hours the fish exhibited a number of abnormal behaviour such as restlessness, fast opercular movement and engulpmnt of air, at initial stages. Later reduced activity, erratic swimming and difficultiy in respiration were evident among the treated fishes. Then there were profuse mucous secretion all over the body with the loss of balance and jerking movements. Finally, the fishes lost equilibrium, became active and lethargic along with body depigmentation and ultimately died. This behavioural responses were shown to serve as sensitive indicators of pollution load in aquatic organisms.

Keywords: *Oreochromis mossambicus*, cypermethrin, behavior, mucuous secretion, depigmentation.

Introduction:

At present, pollution has become a global problem because of population growth, industrilization, urbanization and man's over exploitation of nature. Due to man's greed a large number of pesticides and herbisides are put in use in order to control pests for higher agricultural productivity. On the otherhand this has led to a steady detoriation of the aquatic ecosystems. Of all the pollution types, the aquatic pollution is of greater concern because almost all kind of life is dependent on water. The pollutants also destroy the quality of water bodies and render them unfit for aquatic organisms especially to the fishes Rita and Milton(2006). In addition the effect of pesticides is influenced by a number of environmental factors which mean adversely affect the aquatic organisms.

Several authors have reported the major effects of a number of pollutants such as fertilizers, heavy metals, industrial effluents and pesticides of fishes Oti and chude 1997; Reita and Milton 2006, Rakesh *et al* 2007 RekhaRani *et al* (2008). The fishes are possessing nutritive value and also serve as a better bioindicator of freshwaters. As behavioural alterations form sensitive indicators of chemically induced stress in aquatic organisms, the present work has been planned to study various behavioural aspects in the freshwater teleost fish *Oreochromis mossambicus* on exposure to a pyrethroid pesticide namely cypermethrin.

Materials and methods:

The fishes were collected from the local reservoir and acclimatized to the laboratory conditions for a week in a glass aquaria containing the chlorinated tapwater. A stock solution of cypermethrin of analar grade was prepared by using 0.5% acetone. Various concentrations such as 1%, 2%, 3%, 4% and 5% were made from the stock solution and the group of ten fishes having the same weight and size were introduced in each concentration along with appropriate control. Behavioral responses and mortality of the fishes were recorded at the interval of 24 hours upto 96 hours. The alterations of behavioural characteristics were recorded and discussed.

Results and discussion:

The acute toxicity of cypermethrin as percent mortality in different concentrations is shown in Table 1. It is clear that the mortality of the fish under the toxic stress of pesticide is dose and duration dependent.

As soon as the fish is introduced in the pesticide medium it exhibited an abnormal behaviour to escape from the effect of the pesticide. The fishes were restless showing rapid movement and fast engulfment of air with faster opercular movement along with surfacing activity. The increased opercular movement at 24 hours exposure period could be due to the shock caused by the pesticide stress in order to increase the ventilation of the gills. Similar observations have also been made by Joseph *et al*, (1987) and Lata *et al* (2001), in fishes on exposure to pollutants. According to Sakshena and Parashari (1982), the surfacing activity and gulping of air is to compensate the oxygen deficiency from the medium to extract more oxygen to meet the extra energy to cope up the toxicity. Later (48 hours exposure period) the fishes exhibited reduced activity, erratic swimming and difficulty in respiration. As recorded by Aguilar (2004) and Miron (2005) the erratic swimming movements in the fishes of the present study might be due to the inhibition of AchE by the toxic effect of the cypermethrin. At 72 hours exposure period the fishes exhibited profuse mucous secretion all over the body and gills convulsion with loss of balance and jerking movements. In the opinion of Arillo and Melodia (1990), the mucous secretion in fishes on exposure to pollutants has an ameliorative effect against the toxicants. During the longer duration (96 hrs) of exposures of fishes to the pesticides there was loss of equilibrium, inactiveness and lethargic condition and increased depigmentation of the body surface. A profuse mucous secretion could cause a hardship for aerial

breathing in the medium because the lamellar fusion will reduce the surface area for gaseous exchange. The exudation of mucous and depigmentation of the body could be due to dysfunction of hormones from the pituitary gland under the pesticide stress.

Thus the present study reveals that the pesticide cypermethrin inflicts a number of abnormal behaviour in *O. mossambicus* on dose and duration dependent manner. All these responses could be for the adjustment of the internal homeostatic mechanisms of the fish under the stress caused by the pesticide not able to withstand to adjust the homeostatic within the body, the fishes ultimately die. In this way the present study clearly shows that the behavioural aspects in organisms serve as sensitive indicators of pollution load in aquatic organisms as also recorded by Sharma and Shukla (1990) and Agarwal (1991).

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