

EFFECT OF MALATHION TOXICITY ON THE BEHAVIOUR OF FRESHWATER FISH *HETEROPNEUSTES FOSSILLIS*

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ABSTRACT

An attempt was made to study the acute toxicity of malathion to the freshwater food fish *Heteropneustes fossilis* exposed to this concentration. Behavioral changes (Resting period, opercular movement, air gulping and s-jerks) were observed during acute exposure.

Keywords: Malathion, Toxicity, *Heteropneustes fossilis*, Behavior

INTRODUCTION

Behavior provides a unique perspective linking the physiology and ecology of an organism and its environment: (Little and Brewer 2001). Alterations in fish behavior, particularly in non-migratory species can provide important indices for ecosystem assessment. Any change in the behavior of fish indicates the deterioration of water quality, as fish are the biological indicator and hence index of environmental suitability and the cost of survival (Halappa and David, 2009). Pesticides in sublethal concentrations present in aquatic environment are too low to cause rapid death directly but may affect the functioning of the organisms, disrupt normal behavior and reduce the fitness of natural population (Susan *et al.*, 2010). Malathion is a nonsystematic, wide spectrum organophosphate insecticide. This is used for agricultural and nonagricultural purposes. Once malathion is introduced into the environment, usually from spraying on crops, droplets of malathion in the air fall on soil, plants, water or manmade surfaces. While most of the malathion will stay in the areas where it is applied, some can move to areas away from where it was applied by rain, fog and wind. Malathion may cause serious intimidation to the aquatic organisms and is notorious to cause severe metabolic disturbances in non-target species like fish (USEPA, 2005). Pesticidal impact on the life of aquatic organisms is often acute resulting in mass mortality or chronic changes in behaviour. Such behavioural alterations are very sensitive indicators of stress imposed on fish by the environment. In the present paper an attempt has been made to study the toxic effect of different concentrations of malathion on behavioural parameters of *Heteropneustes fossilis* for 30 days.

MATERIALS AND METHODS

Live specimens of *Heteropneustes fossilis* (10-12 cm in length and 4-6 gm in weight) were collected locally. Fishes were washed with 0.5% KMnO₄ solution for five minutes to remove external infections and then acclimated in dechlorinated tap water under laboratory condition for a period of 15 days prior to experiment. Commercial fish food was given to fishes. Three different concentrations 25 mg/L, 50 mg/L and 75 mg/L were taken for behavioural studies. Resting period and Opercular movement was recorded for one minute and gulping of air calculated for fifteen minutes (Gupta and Dua 2010). S jerk were recorded for 15 mins. All the parameters were recorded for 30 days and the results of the observations are expressed in mean values and standard deviations.

RESULTS AND DISCUSSION

Changes in behavioral responses of fishes started 30mins after dosing. Fishes exposed to malathion showed speedy movements as compared to control. This resulted in decrease in resting period. The normal resting period between each swimming action in control was 252.02±2.88 seconds whereas this period decreased with an increase in pesticide concentrations. The opercular movement per minute showed increasing trend with the increase in concentration of toxicant. Malathion exposure caused hypoxia which was reflected in the number of air gulps per 15 mins. Number of air gulps increased from 1.15±0.36 in control group to 5.76±0.52, 3.61±0.50 and 2.52±0.45 in the group exposed to malathion. Movements like S jerking, threat and burst swimming were increased in the experimental fishes when exposed to malathion. The increase in swimming activity may be due to disruption of shoaling behavior which occurs because of the stress of the toxicant (Venkata *et al.*, 2008). Fast swimming was also observed by Yaji *et al* (2011) in

Oreochromis niloticus treated with Cypermethrin. Under toxic condition the oxygen supply becomes deficient and so the fish breathe rapidly (Susan *et al.*, 2010). Increase in opercular movement has also been reported by Srivastava *et al.*, (2010) in *Heteropneustes fossilis* exposed to Dimethoate respectively. Rapid opercular movement was also confirmed by Wasu *et al.*, (2009) in *Clarias batrachus* treated with Carbaryl and malathion. Gulping of air may help to avoid contact of toxic medium (Katja *et al.*, 2005). S jerk and burst swimming were also observed by Marigoudar *et al* (2009) in *Labeo rohita* exposed to cypermethrin.

Table 1: Effect of Malathion doses on different behavioral parameters of *Heteropneustes fossilis*

PARAMETERS	CONTROL	25 mg/L	50mg/L	75 mg/L
Resting period (second)	252.02±2.88	224.93±2.48	198.15±4.04	184.84±2.15
Opercular movement (1min)	43.51±3.03	46.14±3.99	51.9±2.17	54.84±2.23
Air gulp (15 mins)	1.15±0.36	2.52±0.45	3.61±0.50	5.76±0.52
S-jerk (15 mins)	20.53±1.37	23.05±1.09	31.56±1.77	35.07±2.04

Conclusion

On the basis of the observations made in the above study it is possible to conclude that impact of malathion on fish behavior is dose dependent. As the concentration increases the number of behavioral alterations also increases. The sublethal concentrations of malathion may adversely affect the survivality of the fish in their natural environment. So care should be taken regarding dosage and time of application when malathion is used for pest control in agricultural field or tea gardens surrounding the aquatic bodies.

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