INT. J. BIOL. BIOTECH., 3 (3): 591-593, 2006.

RESIDUAL TOXICITY OF METHAMIDOPHOS AGAINST A COMMON FRESH WATER FISH

Tahir Anwar[1], Seema Tahir[1], Imtiaz Ahmad[2], A. H. Baladi[3] and Omm-e-Hani[3]

[1]*Pesticide Research Institute, Southern-zone Agricultural Research Center, Pakistan Agricultural Research Council (PARC), Karachi University Campus Karachi-75270, Pakistan.*
[2]*Department of zoology, University of Karachi, Karachi- 75270, Pakistan.*
[3]*Institute of Environmental Studies, University of Karachi, Karachi-75270, Pakistan.*

ABSTRACT

The residual toxicity of lethal and sub lethal doses of methamidophos (Organophosphate) were determined against a common carp (*Channa punctata*). The LC_{50s} were calculated to be 8.58 mg/l after 96 hours followed by 16.62 and 25.32 after 72 and 48 h of treatment respectively. The importances of pesticides as the run off from the agricultural fields to aquatic bodies are discussed.

Keywords: Fish, *Channa punctatus*, insecticides, organophosphate, methamidophos

INTRODUCTION

Fish are one of the most important target organisms in any aquatic systems, and are one of the major sources of cheap protein for human beings in Pakistan. A variety of fish species show uptake and accumulation of many contaminants such as pesticides (Heger *et al*., 1995; Grande *et al*. 1994). Pesticides have been found to be highly toxic not only to fish but also to fish food organisms, thus threatening the life of the fish (Grande *et al*., 1994; Shakoori *et al*., 1996; Azmi *et al*., 1999). Pesticides contamination of surface water from agriculture use is a problem of worldwide importance. Once a pesticide is introduced into the environment there is a reasonable chance that it will eventually find its way into water therefore aquatic systems probably represent one of the most important complex environment as far as describing the fate and behavior of pesticides. Bioaccumulation of pesticides in aquatic species is increasing alarmingly, thus posing a threat to aquatic life (Heger *et al*., 1995). In view of the always increasing risk of natural waters being polluted by different pesticides, the study was designed to determine the lethal and sub-lethal toxic effects of organophosphate insecticides, methamidophos that are commonly used on agricultural crops and run off to near by aquatic bodies and cause risk to aquatic fauna including fish.

MATERIALS AND METHODS

Methamidophos was tested against a common fresh water fish (*Channa pucntata*) which were collected from Gharo, Thatta, Sindh. Fish of uniform size (6.5-7.0 cm) were used to expose different doses of insecticides i.e. 2, 10, 20, 30, 40, 60, 80, 100 mg/litre. Fishes were exposed in glass jars of 3 liter containing water of pH 7. The doses were applied with the help of glass pipette and micro syringe for low doses. Ten fishes were transferred in each jar. The jars were then covered with perforated plastic cap with a provision of aeration. The experiment was carried out in triplicate with control batches of untreated fish. The experiment was carried out at 30-32°C. Mortalities were recorded at 48, 72 and 96 hours after treatment. The mortality data was subjected for analysis to calculate the LC_{50} by Finny software (Probit analysis). The residual toxicity of lethal and sub-lethal doses (2, 10, 20< LC_{50} 25.32 mg/l for 48 h<30, 60 and 100) was tested by recording the data until the mortality started in the control batch.

RESULTS AND DISCUSSION

The experiment was conducted to calculate the dose ranges and lethal and sub lethal residual toxicity of methamidophos an organophosphate insecticide against common carp (*C. punctata*). Mortality was recorded at 48, 72, and 96 h after treatment. The LC_{50s} were calculated to be 8.58 mg/l after 96 hours followed by 16.62 and 25.32 after 72 and 48 h of treatment respectively. In this experiment the residual toxicity of methamidophos was tested at sub lethal and lethal doses against the same specie that was exposed to different doses of insecticide (2, 10, 20< LC_{50} 25.32 mg/l for 48 h<30, 60 and 100). After treatment mortality data was recorded up to 13days when the mortality started in control.

There was only 20% mortality at the dose of 2mg/l, which was observed after 4^{th} day of treatment, and then no mortality was observed until the last day of experiment. Whereas 25% mortality was recorded after 24 h of treatment

followed by 40%, 50% and 60% after 2nd, 4th and 6th days of treatment at 10 mg/l dose and then no mortality was observed until the last day of experiment. Similarly, 40% mortality was observed after 24 h of treatment followed by 60% and 100% after 8th and 9th day respectively at the dose of 20 mg/l. The lethal dose 30mg/l was found to be very toxic as 60% mortality was recoded after 24 hours of treatment followed by 80% and 100% after 2nd and 11th days of treatment respectively. The 80-100% mortality was recorded after 48 h of treatment at the lethal dosage when tested 2 and 4 times the $LC_{50.}$ The results of residual toxicity i.e. sub lethal and lethal dosages are given in **Fig. 1**.

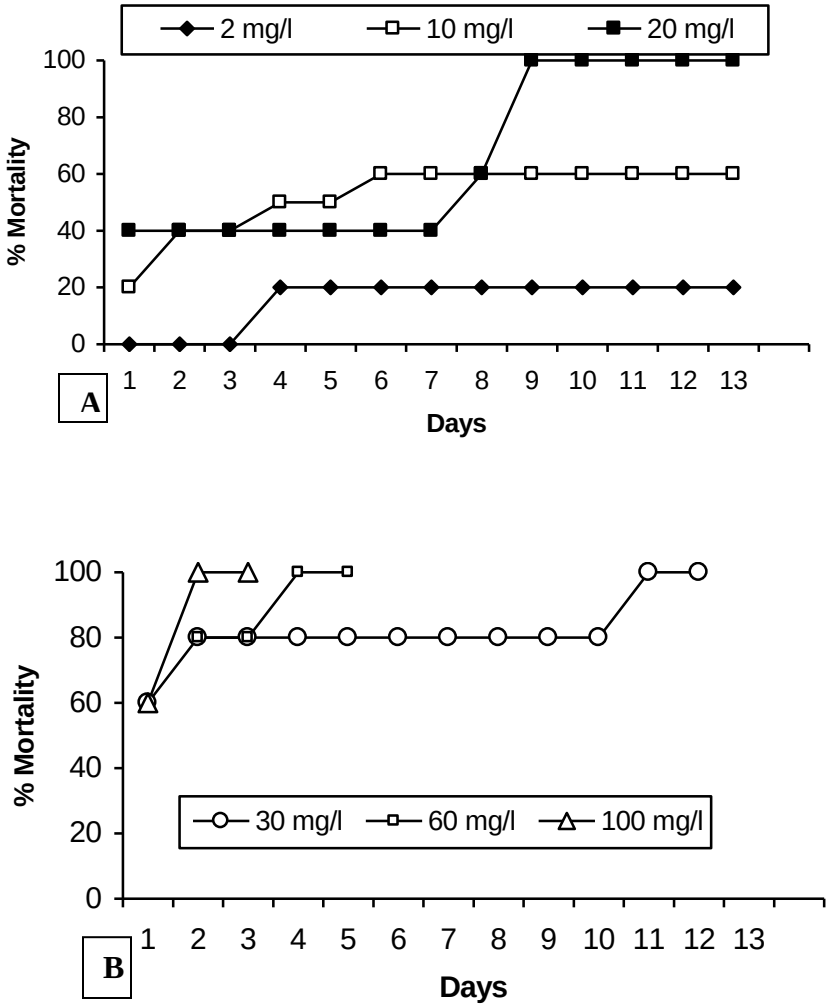

Fig. 1. Residual toxicity of sub lethal (A) and lethal (B) doses of methamidophos against common fresh water fish (Channa punctatus).

In the present experiment 20% mortality at dose of 2 mg/l was observed after the 4th day of treatment but in a similar species (but not the same) at lower doses i.e. 0.62, 1.25, 2.5 and 10 µg/l even after 72 hours of treatment fish remain unaffected (Anwar *et al*., 2005). Methamidophos appears more toxic to common carp (*C. punctata*) in which case LC_{50} of 8.58 mg/l was calculated. Whereas in the case of methyl parathion 21 mg/l LC_{50} was calculated by Anwar *et al*. (2005) in a different species of common carp in Thatta District. The differences in the acute toxicity values of pesticides after time period is due to a great variability in species sensitivity to a particular pesticide, as well as great variation in the toxicity of different pesticides to a species as observed in the case of other marine crustaceans (Randall *et al*., 1979) in aquatic arthropods (Fortun *et al*., 1995) and in fish *Cyprinus carpio* (Malla and Bashamohideen 1988). Additionally, for any species, sensitivity to a given pesticide varies with age, sex, nutritional background, health and stress. A lethal dose of 30 mg/l of methamidophos was found to be highly toxic in the present experiment, so much so that 60% mortality was recorded after 24 h of treatment followed by 80% and 100%

after 2nd and 11 days of treatment. The present study adds to the validity of monitoring residues of persistent pollutants, which can provide basic information concerning the response time of natural ecosystem.

It would be useful to investigate further the effect of individual variables and environmental factor on the uptake and distribution pattern of pesticides. Probably a wide survey is required with a wide range of toxic material as the run off from the agricultural fields of a wide spectrum of pesticides could harm the aquatic fauna in a more severe manner.

ACKNOWLEDGEMENT

Syed M. Hassan Mehdi Naqvi, Scientific Officer, Livestock and Fisheries Research Unit, Southern-Zone Agricultural Research Center (SARC), Jinah Avenue, Malir Halt, Karachi, Pakistan is gratefully acknowledged for identifying the fish species.

REFERENCES

Anwar, T., S. Tahir, I. Ahmad, M.F. Khan, S. M. H. M. Naqvi and S. Akhtar (2005). Acute toxicity and sub lethal effect of selected pesticides on fresh water fish. *J. Exp. Zoo. India*, 8: 417-424.

Azmi, M.A., S. Jahan, S.N.H. Naqvi, R. Tabassum, M.F. Khan and K. Akhtar (1999). Effects of tetranortriter periods (neem product SDS) and deltamethrin (Pyrethroid) on phosphomonoesterases activity in *Cyprinus carpio* (common carp). *Nat. Acad. Sci. Letters*, 22: 7, 130-134.

Fortum, S.S., F.S. Barrera and M.V.B. Gamariz (1995). Acute toxicities of selected insecticides to the aquatic arthropod. *Artenia Saleria*, 54: 76-82.

Grande, M., S. Anderson and S. Berge (1994). Effects of pesticides on fish. *Norw. J. Agric. Sci. Suppl*., 13: 195-209.

Heger, W., S.T. Jung, S. Martin and H. Peter (1995). Acute and prolonged toxicity to aquatic organisms of new and existing chemicals and pesticides. *Chemosphere*, 31: 2702-2726.

Malla Reddy, P. and M.D. Bashamohideen (1988). Toxic impact of fenvalerate on the protein metabolism in the bronchial tissue of a cat fish Cyprinus carpio. *Cens Sci*., 57: 211-212.

Randall, W.F., W.H. Dennis and M.C. Warner (1979). Acute toxicity of dechlornated DDT, chlordane and lindane to blue gill (*Lepnuis maerochinus*) and *Daphgria magra*. *Bull. Environ. Contam. Toxicol*. 21: 849-854.

Shakoori, A.R., A.L. Mughal and M.J. Iqbal (1996). Effects of sub lethal doses of fenvalerate (A synthetic pyrethroid) Administered continuously for four weeks on the blood, liver, and mussels of a fresh water fish, *Ctenopharyngodon idella*. *Bull. Environ. Contam. Toxicol*., 57: 487-494.

(*Accepted for publication July 2006*)