Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 5, Issue, 10, pp. 3244-3247, October, 2013

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

IMPACT OF PESTICIDE MONOCROTOPHOS ON HISTOLOGICAL CHANGES IN THE LIVER OF *MYSTUS VITTATUS*

[1]Sukumaran, M., [1]Manikandan, S. R., [2]Nathiya, N. and [*2]Muthukumaravel, K.

[1]Department of Zoology, Rajah Serfoji Government College, Thanjavur 613 005, Tamilnadu
[2]Department of Zoology, Khadir Mohideen College, Adirampattinam - 614 701, Tamilnadu

ARTICLE INFO

Article History:
Received 29th July, 2013
Received in revised form
09th August, 2013
Accepted 20th September, 2013
Published online 23rd October, 2013

Key words:
Monocrotophos, Toxicity, Liver, Histology and *Mystus vittatus.*

ABSTRACT

Histopathological lesion have been studied in the liver of *Mystus vittatus* under 10, 20 and 30 days of exposure to 10% sub lethal concentration of monocrotophos (96 hr LC_{50} : 0.025 ppm; 10% SLC-0.0025 ppm). In control cat fish, the liver was comprised of polygonal hepatocytes with centrally placed nucleus. Pesticide induced dilation of blood sinusoids, vacuolization and disintegration of cell boundaries were noticed in the 10 and 20 days of exposed fish. The complete damage of hepatocytes and loss of integrity of cell wall were noticed on 30 day of exposure.

INTRODUCTION

Environmental protection has attracted the attention of the wide cross – section of people all over the world, which has now become a global issue amongst scientists and researchers working in this area. Unfortunately, several toxic pollutants, few are even unknown or unidentified to the biota, are being regularly introduced in large quantities into the environment, especially into the aquatic environment. Pollution of water is an important dimension of environmental degradation. The disposal of the industrial and agricultural wastes directly into the aquatic medium burdens the ecosystem and stresses the need to analyze the concentration of these substances in the medium as well as in the organisms. Pesticide pollution constitutes the most dangerous health hazard apart from creating adverse effects on fish production. Pesticides have been reported to make a revolution in the agriculture production in India by controlling pests of various crops (Matsumura, 1985). Pesticides used in pests control programes resulted contaminate the ecosystem and enter food chains causing damaging effects on the ecosystem and non - target species (Ruvio, 1972 and Bakre *et al.*, 1990). Toxicity data for a variety of pesticides such as organophospate, organochlorine, carbamide and pyrethroid pesticides have been reported for number of fish species by various authors (Anees, 1975; Arunachalam and Palanichamy 1982; Arunachalam *et al*., 1980; Baskaran *et al*., 1989; Roy and Dutta Munshi, 1988; Singh *et al*., 1981; Malla Reddy and Basha Mohideen, 1989; Gurusamy and Ramdoss, 2000; Sapna Shrivastava, 2002; Nisar Shaikh and Yeragi, 2004 and Visvanathan *et al*., 2009). In view of this in the present study the effect of sublethal concentration of monocrotophos on the liver biochemistry and histology of a freshwater teleost, *Mystus vittatus*

Corresponding author: Muthukumaravel, K.
Department of Zoology, Khadir Mohideen College, Adirampattinam - 614 701.

MATERIALS AND METHODS

The fish, *Mystus vittatus* weighing approximately 20g were collected from ponds in and around Thanjavur. They were acclimatized for 15 days in large cement tanks (temperature 28 ± 2°C; pH 8.0 ± 0.02 & DO 6.2 ± 0.4) previously washed with 1% potassium permanganate. The water was renewed every 24 hr. Stock solution of monocrotophos was prepared and the toxicity tests were conducted following method of Finney (1964). Based on the acute toxicity studies (96 h), LC_{50} value for test fish was found to be 0.025 ppm. For histological studies, *Mystus vittatus* were reared in 10% sub lethal concentration for a period of 10, 20 and 30days. After treatment, both the control and experimental fishes were sacrificed at the end of 10, 20 and 30days. The liver tissues were removed and fixed in Bouin's fluid and then they processed adapting the usual procedure (Gurr, 1950). The sections (8µm) were stained with Haematoxylin and Eosin.

RESULTS

Histology of fish liver

In untreated, *Mystus vittatus* the liver is made up of continuous mass of hepatocytes arranged in irregular cords. The hepatic

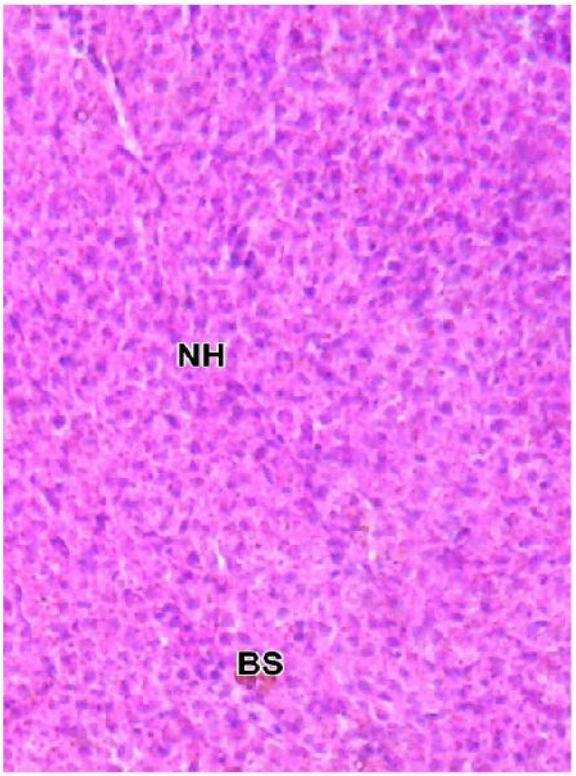

Fig. 1. control liver

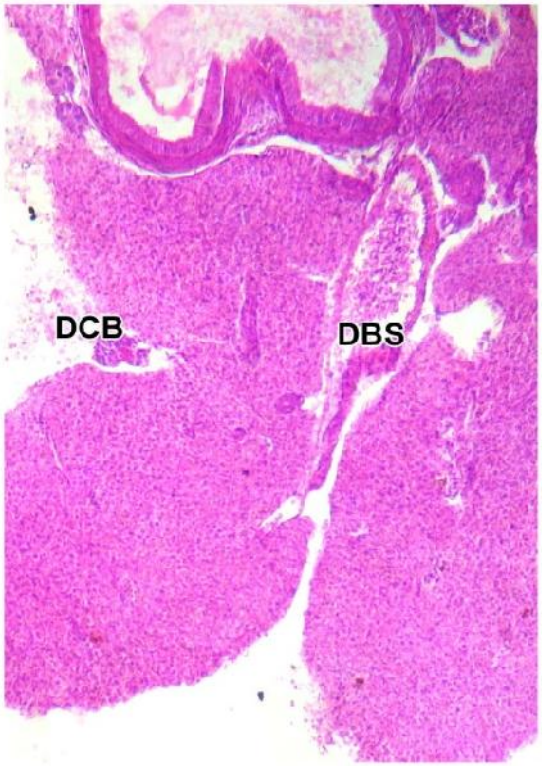

Fig. 2. 10 days treated liver

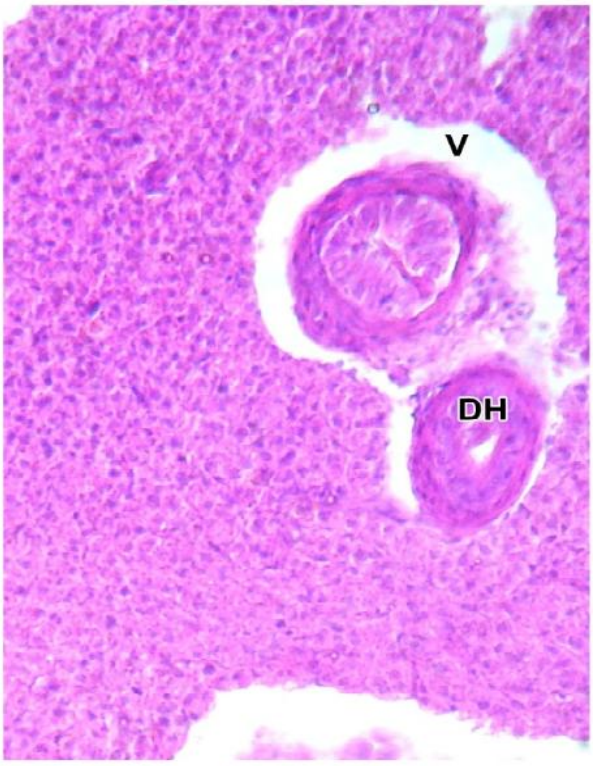

Fig. 3. 20 days treated liver

V - Vacuolization

DH - Degeneraiton of hepatocytes

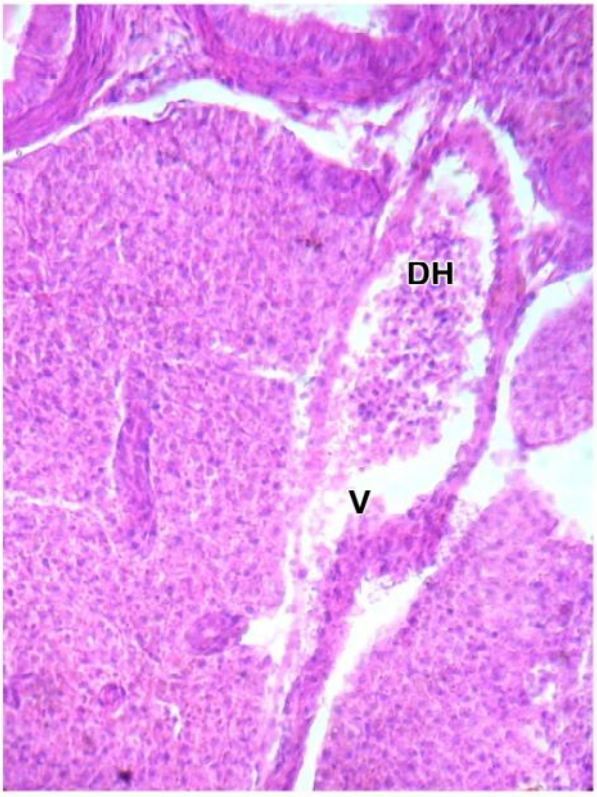

Fig. 4. 30 days treated liver

V - Vacuolization

DH - Degeneraiton of hepatocytes

cells are polygonal in shape with distinct central nuclei. A large number of blood sinusoids was also seen around the hepatocytes (Fig.1).

Pathology of liver tissue under monocrotophos toxicity

Marked toxic effects were observed at the structural and cellular level in the liver. In 10 days exposed fish, disintegration of cell boundaries and slight dilation of blood sinusoid was observed (Fig.2). After 20 days, many hepatic cells were completely damaged. Intracellular vacuolation was also apparent (Fig.3). After 30 days, damage to the hepatocytes was prominent. In most of the hepatic cells the integrity of cell wall was completely lost (Fig.4)

DISCUSSION

Morphological and histological alterations related to pesticide toxicity in the liver of fish have been studied showing that the substances cause severe damage to the liver cells (Ahamed and Srivastava, 1985; Ortiz *et al.*, 2003). Liver is an important organ of detoxification and biotransformation process and due to these reasons the hepatic cells are damaged severely. Several works have reported degenerative changes in hepatic tissue subjected to pollution by various pesticides and insecticides (Kumar and Pant, 1984; Gill *et al.*, 1990; Pandey *et al.*, 1993; Tilak *et al*., 2005; and Sakr and Jamal Al lail, 2005). Dubale and Shah (1979) reported that *Channa punctatus* under malathion toxicity showed the degenerative changes in liver. Radhaiah and Jayantha Rao (1992) reported moderate cytoplasmic degeneration in hepatocytes, formation of vacuoles, repture of blood vessels and picnotic nuclei in the liver of *Tilapia mossambica* exposed to fenvalerate. The liver of pesticide treated fish showed dilation of blood sinusoids, vacuolization, disintegration of cell boundaries and necrosis. The present results are in agreement with those observed by many authors who studied the effects of different pollutants of fish liver (Mohamed, 2001; Ptashynski *et al*., 2002 and Fanta *et al.*, 2003). According to Rodrigues *et al.* (2001) the liver is an organ that frequently undergoes changes when exposed to insecticide at sublethal doses. The changes may be attributed to direct toxic effects of pollutants on hepatic cells, since the liver is the site of detoxification of all types of toxic substances (Soufy *et al*., 2007).

Acknowledgement

The authors are thankful to the Principal and HOD of Zoology, Rajah Serfoji Government College, Thanjavur for providing necessary laboratory facilities.

REFERENCES

Ahmad, G. and G.J. Srivastava., 1985. Histopathologic alterations in the liver and skin of a fresh water teleost, *Heteropneustes fosilis* (Block) exposed chronically to a sublethal concentration of methylene blue. *Pakistan M. Zool*., 17: 229-246.

Anees, M.A., 1975. Acute toxicity of four organophosphorus insecticides to freshwater teleost Channa *punctatus*. *Park. J. Zoo*., 7: 135.

Arunachalam, S. and S. Palanichamy, 1982. Sublethal effects of carboryl on surfacing behaviour and food utilization in the air breathing fish *Macropods cupanus. Physiol. Behav*., 29: 23-27.

Arunachalam, S.K., Jayalakshmi and S. Aboobucker, 1980. Toxic and sublethal effects of carboryl on freshwater catfish *Mystus vittatus*. *Arch. Environ. Contam. Toxicol*., 9: 307-316.

Bakre, P.R., B. Mishra and P.Bhatnagar, 1990. Residues of organochlorine insecticides in fish from Malala water reservoir, Jaipur, India. *Bull. Environ.contam. toxicol*., 5: 394-398.

Baskaran, P., S. Palanichamy and M.P. Balasubramanian, 1989. Effect of pesticides on protein metabolism in *Mystus vittatus. J. Ecobiol*., 1(2): 90-97.

Dubale, M.S. and P. Shah, 1979. Histopathological lesions induced by malathion in the liver of *hanna puctatus*. *Ind. J. Exp. Biol*. 17(7): 693-697.

Fanta, E., F. Rios, S. Romao, A. Vianna and S. Freiberger, 2003. Histopathology of the fish *orydoras paleatus* contaminated with sublethal levels of organophosphorus in water and food. *Ecotoxicol. Environ. Safety*, 54(2): 119-130.

Finney, D.J., 1964. Probit analysis. Cambridge University Press. Cambridge, London. Pp. 333.

Gill,T.S., J.S. Pandey and H. Tewari, 1990: Hepatopathotoxicity of three pesticides in a fresh, *Puntius conchorius* Ham. *J. Environ. Sci. Hlth*., 25A: 653-663.

Gurr. E., 1950. Methods of analytical histology and histochemistry. Leonard Hill Hd. London. pp.45-49.

Gurusamy, K. and V. Ramadoss, 2000. Impact of DDT on oxygen consumption and opercular activity of *Lepidocephalichthys thermalis. J. Ecotoxicol. Environ. Monit*., 10(4): 239-248.

Hartel,, A.R.Helger. and H. Lang, 1969. A method of determination of glucose. *Z. Klin. Chem. Klin. Biochem*. 7, 183.

Kumar, S. and S.C. Pant, 1984. Organal damage caused by aldicarb to a fresh water teleost, *Barbus conchonius* Hamilton. *Bull. Environ.Contam. Toxicol*., 33: 50-55.

Malla Reddy, P. and M.D. Bashamohideen, 1989. Toxic impact of fenvalerate on protein metabolism in the branchial tissue of a fish *Cyprinus carpio. Curr. Sci*., 57: 211-212.

Matsumura., F, 1985. Toxicology of insecticides. Plenum press, New York.

Mohamed, F.A., 2001. Impacts of environmental pollutionin the southern region of Lake Manzalah, Egypt, on the histological structures of the liver and intestine of *Oreochromis niloticus* and *Tilapia zillii*. *J. Egypt. Acad. Soc. Environ. Develop*., 2: 25-42.

Nisar Shaikh and S.G.Yeragi, 2004. Effect of Rogor 30E (Organophosphate) on muscle protein in the fresh water fish *Lepidocephalecthyes thermalis. J. Ecotoxicol. Environ. Morit.*, 14(3): 233-235.

Oritiz, J.B., M.L. Gonzalez de Canales and C. Sarasquete, 2003. Histopathological changes induced by lindane (HCH) in various organs of fishes. *Sci. Mar*., 67(1): 53-61.

Pandey, A.K., K.C. George and M. Peer Mohamed, 1996. Histopathological alterations induced in the liver of an estuarine mullet, *Liza parsia* by mercuric chloride and DDT. *Indian J. Fish*. 43 (3): 277-284.

Ptashynski, M., R. Pedlar, REvan, C.Baron and J. Klaver Kamp, 2002. Toxicology of dietary nickel in lake white fish (*Coregonus clupeaformis*). *Aquat. Toxicol*., 58, 229-247.

Radhaiah, V. and K. Jayantha Rao, 1992. Fenvalerate toxicity to the liver in a freshwater teleost, *Tilapia mossambica* (Peters). *Comp. Physiol.Ecol*. 17(2): 48-53.

Rodrigues, E.D.L., M.J.T. Ranzani-Paiva, F.J. Pacheco and M.I.D. Veiga, 2001. Histopathologic lesions in the liver of *Prochilodus lineatus* (Pisces, Prochilodontodae) exposed to a sublethal concentration of the organophosphate insecticide Dipterex 500 (Trichlorfon). Maringa, 23(2): 5003-505.

Roy, P.K. and J.S. Datta Munshi, 1988. Oxygen consumption and ventilation rate of fresh water major carp, *Cirrhinus mrigala* (Ham). In fresh and Malathion treated waters, *J. Environ. Physiol*., 9(1): 05-13.

Ruvio, M., 1972. Marine pollution and sea life. FAO News Ltd., London.

Sakr, S.A. and S.M. Jamal Al lail, 2005. Fenvalerate induced Histopathological and histochemical changes in the liver of the cat fish *Clarias Gariepinus. J. Applied Sci. Res.*1(3): 263-267.

Sapna shrivasatava, Sudha Singh and Keerty Shrivastava, 2002. Effect of carbaryl on glucose content in the brain of *Heteropneustes fossilis J. Ecotoxicol. Environ. Monit*., 12(3): 205-208.

Seifter, S., S. Dayton, B.Novic and I. Muntwyler, 1950. Estimation of glycogen with Anthrone teagents. *Arch. Biochem*. 25: 191-200.

Singh, D.N., R.K. Tyagi and R.S. Panwar, 1981. Toxicity of some organobiocides to a fish *Cyprinus carpio* var communis. *J. Environ. Physiol*., 2(3): 41-46.

Soufy,H., M.Soliman,E.El-Manakhy and A.Gaafa, 2007. Some biochemical and pathological investigations on monosex tilapia following chronic exposure to carbofuran pesticides. Global Veterinaria, 1: 45-52.

Tilak, K.S., K.Veeraiah and D.Koteswara Rao, 2005. Histopathological changes observed in the gill, liver, brain and kidney of the Indian major carp *Cirrhinus mrigala* (Hamilton) exposed to chlorpyrifos. *Poll. Res*. 24(1): 101-111.

Visvanathan, P., C. Maruthanayagam and M. Govindaraju, 2009. Effect of malathion and endosulfan on biochemical changes in *Channa punctatus. J. Ecotoxicol. Environ. Monit.*, 19(3): 251-257.

****