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Toxicological studies on the fish *Channa punctatus* (Bloch) exposed to sublethal concentration of HILTAKLOR (Butachlor, 50%EC)

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ABSTRACT

The present study was undertaken to evaluate the toxicity and effects of a commercial formulation of the herbicide Hiltaklor on glycogen in the fish ***Channa punctatus (Bloch)*** *The toxicity for 24, 48, 72 and 96 h of Hiltaklor calculated by probit analysis, were determined to be* LC_{50} *values* ***213.9, 208.8 , 205.9 and 195.3*** *ppb, respectively, when treated with Hiltaklor Behaviour changes observed.*

KEYWORDS: Channa punctatus (Bloch), *toxicity, herbicide, Hiltaklor (50% E.C of Butachlor)*

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I. INTRODUCTION

Toxicology is the study of toxic chemicals and environmental impacts. Toxicological investigations are the action of toxic agents through the standard tests, characterizing the toxic properties of agents. Here selected Butachlor (Technical grade) for controlling the herbs, for commercial formulation selected **Hiltaklor (50% EC Butachlor).**

Man has to cross the hurdle of unwanted herbs and pest while achieving green revolution. The loss of food production by pests was estimated to be one third of production in 1950-60 in USA (Brown, 1978)., the chemicals sprayed on crops are surface runoff into the aquatic ecosystem and contaminate the entire system. These sources of contamination of the system are divided into two categories: point sources and non-point sources (Murthy, 1986).Worldwide, Herbicides commonly used as pre-plant and post-plant for controlling several weeds in most major agricultural crops (Worthing and Walker, 1983).

Butachlor is a chloroacetanilide, which is widely used in agricultural crops. **Butachlor** is selective herbicide for paddy selective synergists will suppress resistance in the unwanted herbs without affecting rice (Gressel, 1990). List of chloroacetanilides showed Table No: 1 and The Commercial products of **Butachlor also showed on** Table No: 2

Table No: 1

S.No	Name of the Chemical	Chemical Name
1	Acetochlor	2 chloro-N-(ethoxymethyl)-N-(2-ethyl-6-me

		thyl phenyl) acetanilide
2	Alachlor	2-chloro-2,6-diethyl-N-(methoxymethyl) acetanilide
3	Butachlor	2-chloro-2'6'-diethyl-N-(butoxymethyl) acetanilide
4	Metachlor	2-chloro-N-(2-ethyl-6-methyl pheneyl)-N-(2-methoxy-1-methylethyl) acetanilide
5	Propachlor	2-chloro-N-isopropylacetanilide or N-psopropyl chloro acetanilide

Table No: 2 Commercial products of **Butachlor**

Trade Name	**Company Name**
Machete	Monsanto
Butanex	Makhteshrinagan
Butataf	Rallis
Dhanuchlor	Dhanuka
Farmachlor	Sanonda
Hiltaklor	Hindustan
Rasayanchlor	Krishirasayan
Trapp	RPG
Wiper	Nagarjuna Agrichem
Brute	Modern Insecticides Limited

II. MATERIALS AND METHODS

Fish *Channa punctatus* (Bloch) is called as spotted murrel which belongs to family Channidae, order – Channiformes, was selected for this experiment and the fish easily available in this area.

Experimental set up

Pilot experiments were conducted to choose the mortality concentration at which the fish respond. For each test, five concentrations were chosen with 10 fish in each concentration. acute toxicity test, static test were conducted.

The fish were maintained in the laboratory, for a period of 10 days after collection for acclimatization as per the recommendations of committee on toxicity tests of Aquatic organisms (Anon, 1975; APHA *et al.*, 1998). The water used for maintainance and toxicity testing was one and same.. The fish were fed daily during acclimatization. Such acclimatized fish are only, used for toxicity evaluation.

Experiments were conducted to determine the toxicity of Hiltaklor at different concentrations, in static system for all the five selected fish's batches. The size of the fish was obtained on trail and error basis and toxicity evaluation (Doudoroff *et al.*, 1951) and mortality rate was observed in all concentrations of Hiltaklor after 24, 48, 72 and 96 hours exposure. The value of sub lethal concentration effective to kill 50% of the exposed fish and are considered as LC50.

Preparation of stock solution

The stock solutions for the above were prepared by dissolving the Hiltaklor acetone separately. Finney's probit analysis (Finney, 1971) as reported by Roberts and Boyce (1972) was followed to calculate the LC_{50} values.

III. RESULTS

The observed percentage mortality along with exposure concentrations of the present work on ***Channa punctatus* (Bloch)** when exposed to the Hiltaklor (50% E.C of Butachlor) for a duration of 24, 48, 72 and 96h in static systems were presented in Table No:3 respectively.

Table No 3

24 hours				**48 hours**				**72 hours**				**96 hours**			
Con-centra-tion (ppb)	Mor-tality (%)	Probit Mor-tality	Log 100 x Dose (Log conc.)	Con (ppb)	Mor-tality (%)	Probit Mor-tality	Log 100x Dose (Log conc.)	Concentra-tion (ppb)	Mor-tality (%)	Probit Mor-tality	Log 100 x Dose (Log conc.)	Con-centra-tion (ppb)	Mor-tality %	Probit Mor-tality	Log 100x Dose (Log conc.)
185	20	3.7184	4.26717	180	10	4.1584	4.2552	175	10	4.1584	4.2430	170	20	4.1584	4.2304
200	30	4.4756	4.30103	195	30	4.4756	4.2900	190	30	4.4756	4.2787	185	30	4.4756	4.2671
215	50	5.0000	4.33243	210	50	5	4.3222	205	60	5	4.3117	200	50	4.7467	4.3010
230	70	5.5244	4.36172	225	70	5.5244	4.3521	220	70	5.2533	4.3424	215	60	5.2533	4.3324
245	80	6.2816	4.38916	240	90	5.8416	4.3802	235	80	5.8416	4.3710	230	80	5.5244	4.3617
LC 50 value = 213.9				**LC 50 value =208.8**				**LC 50 value =205.9**				**LC 50 value =195.3**			

IV. DISCUSSION

Butachlor is stable in the fields and water systems. The remnants of the pesticide can enter ground waters used for human consumption and thus can be dangerous for human health (Yu *et al.*, 2003).

The LC_{50} for the acute toxicity of butachlor in fish varies from 0.14 to 0.52 mg/l for 96h and for rainbow trout (Oncorhynchus mykiss) has been reported 0.52 mg/l, showed its high toxicity in rainbow trout (Tomlin 1994).

Butachlor acts as a spindle fibre inhibitor, and lead to liver cells with abnormal sets of chromosomes abreactions (Ateeq *et al.*,2002). Additionally, high concentrations of Butachlor have been showed to cell structure to be destroy (Tilak et al. 2007).

The pathological changes observed after Butachlor expose in the gills of rainbow trout are in agreement with reports in other fish treated with different chemicals (Altinok and Capkin 2007; Velmurugan *et al.*,2009; Ahmed *et al.*,2013). This is perhaps because of the direct contact of gills with the toxinfound that acute exposure to Butachlor induced a marked dysfunction in gills, but not the liver and kidneys of flounder (Paralichthys olivaceus).

Christopher D.N *et al.*,2013 explained that Acute toxicity of Butachlor, a chloroacetanilide herbicide (2-chloro-N-[2, 6-diethylphenyl] acetamide) to Tilapia zillii, was studied in a semi static bioassay. The 24, 48, 72 and 96 h LC_{50} values estimated by probit analysis were 3.13 (2.88 to 4.61), 1.93 (0.63 to 4.41), 1.27 (0.59 to 1.92) and 1.25 (0.60 to1.85) mgl-1, respectively. There were significant differences ($p<0.05$) in the LC_{50} values obtained at different exposure times and the safe levels estimated by different methods varied from 1.25×10-1 to 1.25×10-5 mgl-1. There were dose and time dependent increase in mortality rate due to exposure to the herbicide. Stress signs in form of hyperactivity, erratic swimming, skin discoloration, vigorous jerks of the body followed by exhaustion and death were observed. The 96 h LC_{50} of 1.25 mgl-1 obtained indicate that the herbicide was toxic to T. zillii. Agricultural use of butachlor in the environment, especially, near water bodies, must be restricted to avoid the severe risk associated with the use of the pesticide.

Acute and chronic toxicity tests are widely used to evaluate the toxicity of chemicals on non-target organisms (Santos *et al.*, 2010). The 96 h LC_{50} of 1.25 mgl-1 obtained indicate that the herbicide is toxic to T. zillii. The toxicity is both concentration and time dependent thus, accounting for the differences in the values obtained at different concentrations and exposure times. When T. zillii juveniles were exposed to butachlor, only 20 % died after 96 h, whereas all the fish died after 96 h expose at 3.00 mgl-1 butachlor concentration.

Previously reported LC_{50} values of butachlor in Oreochromis niloticus (Wang et al., 1991), Heteropneustus fossilis (Ateeq *et al.*,2005) and Channa punctatus (Tilak *et al.*, 2007) were 0.880 mgL-1, 2.34 ppm and 247.46 ppb, respectively. Geng *et al.*, (2005) reported that 96 h for LC_{50} of *Rana japonica* was exposed to butachlor while Gobic and Gunasekaran (2010)

V. Summary and Conclusion

The present study was undertaken to assess the effect of Herbicide Hiltaklor (50% E.C of Butachlor) on freshwater fish *Channa punctatus (Bloch)* for the following reasons. Krishna district has been identified as the highest herbicide consuming region in India in agriculture activity herbicides. In recent times herbicides are used extensively in weed control in agricultural crops and their use is increasing phenominally. Herbicides are also carried into aquatic ecosystem through runoff from agricultural lands and cause environmental damage affecting the non-target species.

The percent study Herbicide Hiltaklor (50% E.C of Butachlor) of *Channa punctatus* (Bloch). The 96 h LC_{50} were obtained by taking the mean LC_{50}The results showed that Herbicide Hiltaklor (50% E.C of Butachlor). The LC_{50} values of static system are high toxic effect to the fish. **Though we can avoid the use of herbicides,** measures should be taken for the controlling the herbs by man or machine power.

References

[1] Anon (1975). Committee on methods for toxicity tests with fish macro-invertebrates and amphibians, EPA, Oregon, p.61.

[2] Ahmed MK, Habibullah-Al-Mamun M, Parvin E, Akter MS, Khan MS (2013): Arsenic induced toxicity and histopathological changes in gill and liver tissue of freshwater fish, tilapia (Oreochromis mossambicus). Experimental and Toxicologic Pathology 65, 903–909.

[3] Altinok I, Capkin E (2007): Histopathology of rainbow trout exposed to sublethal concentrations of methiocarb or endosulfan. Toxicologic Pathology 35, 405–410.

[4] Anon (1975). Committee on methods for toxicity tests with fish macro-invertebrates and amphibians, EPA, Oregon, p.61.

[5] APHA [American Public Health Association], American Water Works Association and Water Environment Federation [AWWA] and Water Environment Federation [WEF] (1998). Standard methods for examination of water and wastewater 20 ed. Fd. Lenore SC. Arnold EG and Andrew DE.

[6] Ateeq, B; Abul Farah, M; Ahmad, W. (2005) Detection of DNA damage by alkaline single cell gel electrophoresis in

2,4-dichlorophenoxyacetic-acid-and butachlor-exposed erythrocytes of Clarias batrachus. *Ecotoxicol Environ Saf.* 2005, *62*, 348–54.

[7] Ateeq, B; Abul farah, M; Niamat Ali, M; Ahmad, W (2002). Induction of micronuclei and erythrocyte alterations in the catfish Clarias batrachus by 2,4-dichlorophenoxyacetic acid and butachlor. *Mutat Res* 2002, *518*, 135–44.

[8] Brown, A.W.A. 1978. Insecticides and Fish. in: Ecology of Pesticides, John Wiley and Sons, Inc., New York, USA 525 pp.

[9] Christopher Didigwu Nwanil, Udu Ibiam Ama , Florence Okoh , Uche Obasi Oji , Rebecca Chima Ogbonyealu , Arua Agha, Ibiam and Onyinyechi Udu-Ibiam,(2013): Acute toxicity of the chloroacetanilide herbicide butachlor and its effects on the behavior of the freshwater fish Tilapia zillii,. African Journal of Biotechnology Vol. 12(5), pp. 499-503, 30 January, 2013.

[10] Doudoroff, P., Anderson, B.G., Burdick, G.E., Gattsoff, P.S., Hart, W.B., partrick, R., Strong, E.G., Sunber, E.W. and Vanfforn, W.H. (1951). Bio-assay method for evaluation of acute toxicity of industrial wastes to fish sewage. Indi. Wastes 23: 1830-1391.

[11] Finney, D.J. (1971). Probit Analysis 3rd edition, Cambridge University Press.

[12] Geng BR, Yao D, Huang H, Xue Q, Lian Y, Zheng Z (2005). Acute toxicities and effects of dichlorovos and butachlor to Rana japonica tadpoles and its growth. Herpetol Sinica, 10:127-132.

[13] Gobic M, Gunasekaran P (2010). Effects of butachlor herbicide on earthworm Eisenia fetida- its histological perspicuity. Applied Environ. Soil Sci. DOI:10.1155/2010/850758.

[14] Murthy, A.S. 1986. Toxicity of pesticides to fish, Vol. I, CRC Press, Inc., Boca Raton, Florida.

[15] Roberts, M. and Boyce, C.B.C. (1972). Methods in Microbiology (7-A ed.) Norris J.R. and Ribbows, D.W., Academic Press, New York, 479 pp.

[16] Santos LHMLM, Araujo AN, Fachini A, Pena A, Deleure-Matos C, Montene-gro MCBSM (2010). Ecotogicological aspects related to the presence of pharmaceuticals in the aquatic environment. J. Hazard. Mater. 175:45-95.

[17] Tilak, K.S,k. Veeraiah, P.Bhaskara Thatahji., and M.S.Buchiram . (2007). Toxicity study of Butachlor to the fresh water fish *Channa punctata* (Bloch) J. Environmental Biology28(2),485-487.

[18] Tomlin C (ed.) (1994): The Pesticide Manual. 10th ed. Crop Protection Publications, British Crop Protection Council, Farnham, Surrey, UK. 1341 pp.

[19] Velmurugan B, Selvanayagam M, Cengiz EI, Unlu E (2009): Histopathological changes in the gill and liver tissues of freshwater fish, Cirrhinus mrigala exposed to dichlorvos. Brazilian Archives of Biology and Technology 52, 1291–1296.

[20] Wang, Y. S., Cheng, C.C., Liu, Y.H. and Chiang, H.C. (1991). Residue of three herbicides in paddy water and their danger level to carp. J.Chin Agri. Chem. Soc. 29(2): 195-202.

[21] Worthing, C.R., Walker, S.B. 1983. The Pesticide Manual, the British Crop Protection Council, London 565 pp.

[22] Yu YL, Chen YX, Luo YM, Pan XD, He YF, Wong MH (2003): Rapid degradation of butachlor in wheat rhizosphere soil. Chemosphere 50, 771–774.