

Study of effect of Malathion and Magnesium sulphate induced changes in Erythrocytes count of *Channa striatus*

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Abstract

The present paper described the short term effect of organophosphorus pesticide malathion and magnesium sulphate individually and in combination on the erythrocytes of *Channa striatus*. The result obtained showed that 96 hours exposure of Malathion decreases erythrocytes count up to 75%, while Magnesium sulphate showed no significant change in erythrocytes count. However, Magnesium Sulphate in combination with malathion decreases the malathion toxicity to erythrocytes up to 55.76%. Thus, present findings clearly indicates that magnesium sulphate help in reducing the toxicity of Malathion up to certain limit.

Keywords : *Erythrocytes, Channa striatus, Malathion, Magnesium sulphate*

Introduction

Malathion, an organophosphorous pesticide/insecticide is used to kill insects on agricultural crops, on stored products, on golf course, in home and in garden. It is also used to kill mosquito, med flies, fleas on pets and to treat head lice of human (Hazarica *et al.*, 2003 and ATSDR, 2003), while Magnesium plays an important role in various metabolic processes such as oxidative phosphorylation and cellular enzymatic reactions. It also appears to be important in maintenance of normal blood pressure (McCarren, 1983). Very scanty work has been done on the blood of fishes, because fishes have very little amount of blood. Looking to the importance of blood in fish physiology and pesticides-malathion in agriculture field, the present study was aimed to find out the short term effect of malathion and magnesium sulphate on erythrocytes of *Channa striatus* individually and in combination.

Material and Methods

- 1 **The animal :** *Channa striatus* were collected from the local fish market and acclimatized to the laboratory condition for one week during which they were regularly fed with Prawn powder and Soya meals.
- 2 **Test chemicals :** Following two chemicals were used in present study-
 - a. Malathion (Boss Agro chemical Pithampur, Indore) M.P. 2.9°C
 - b. Magnesium Sulphate (V chem., 274 Sec E Sanwer Road, Indore) M.P. 1125°C
- 2 **Experimental Design** - Total 80 Fishes were used in the present experiments. They were divided into following four groups ;
 - Ist Group-** In this group 20 Fishes were kept in the untreated water for (Control group).
 - IInd Group-** 20 Fishes were kept in 1 ppm malathion solution in a separate aquarium (experimental group).

IIIrd Group- In this group 20 Fishes were kept in 10 ppm MgSO_4 solution in separate aquarium (experimental group).

IVth Group- This Group also includes 20 fishes but in combined solution of 1 ppm malathion and 10 ppm magnesium sulphate (experimental group)

4. **Autopsy-** 5 Fishes of control and treated groups were sacrificed at 24, 48, 72 and 96 hours. The blood was taken from caudal peduncle and stored in EDTA coated vial for further analysis.
5. **Method-** Erythrocytes (RBC) were counted by Hemocytometer following the method described by Sharma *et al.* (2002).

Result

Effect of malathion on RBC of *Channa striatus*

Effect of 1 ppm malathion on RBC was studied for 96 hours. The results obtained showed that malathion alter the values of RBCs after various exposure duration. The RBC count of control fish was 2.60×10^6 / cu. mm, which after exposure of test chemical for 24, 48, 72 and 96 hours reduced into 2.14, 1.22, 1.05 and 0.65×10^6 / cu. mm respectively. The decrease in RBCs count after 24, 48, 72 and 96 hours were 17.6, 53.0, 59.6 and 75 percent respectively. These results showed that effect of Malathion on RBC was duration dependent (Table 1 and Figure 1).

Recovery in malathion treated RBCs of *Channa striatus*

Fishes treated for 96 hrs in malathion (1ppm) were kept in fresh water for further 96 hrs to see the recovery in RBC. After 24, 48, 72 and 96 hours RBCs count increased very slightly and reached up to 0.066, 0.065, 0.069 and 0.73×10^6 / cu. mm. respectively. The increase in RBC count in 24, 48, 72 and 96 hrs were 1.53, 00, 6.15 and 12.30 percent respectively (Table 2 and Figure 2).

Effect of magnesium sulphate on RBC of *Channa striatus*

Effect of 10 ppm magnesium sulphate on RBC was studied for 96 hours. Result obtained showed that magnesium sulphate alter the value of RBC count after various exposure duration (Table 3 and Figure 3) The trend in change were not constant. In 24, 48 and 72 hrs the RBC counts increases 1.15, 0.38 and 0.76 per cent respectively, while in 96 hrs treatments RBC values decreases 0.38 per cent.

Combined effect of magnesium sulphate and malathion on RBC of *Channa striatus*

Effect of 1 ppm malathion and 10 ppm of magnesium sulphate on RBC of *Channa striatus* was studied for 96 hours. Result obtained showed alteration in the values of RBCs, after various exposure durations. The RBC count of control fish was 2.60×10^6 / cu. mm., which after combine exposure of malathion and magnesium sulphate for 24, 48, 72, and 96 hours reduces RBC count to 2.43, 1.96, 1.12, and 1.15×10^6 / cu. mm. respectively. The decrease in 24, 48, 72 and 96 hours were 6.53, 24.61, 56.92 and 55.76 per cent respectively, which was very less in comparison to test chemical malathion's effect (Table 4 and Figure 4).

Discussion

Hematological studies have been carried out in different fishes in normal and experimental conditions. Raizada and Singh (1982) observed average total number of RBC in male (1.85×10^6 /cu. mm) and female (1.08×10^6 /cu. mm) *Cirrhinus mrigala*. In *Trichogaster fasciatus* the mean value of RBC was 1.83×10^6 /cu. mm (Raizada and Gupta, 1982). Sharma and Shandilya (1982) had observed average number of RBC in *Labeo rohita* (2.65×10^6 /cu. mm), in *Clarias batrachus* (4.5×10^6 /cu. mm) and in *Channa punctatus* (1.30×10^6 /cu. mm) in *Oreochromis mossambicus*. While Sharma and Singh (2004) reported RBC count of *Channa punctatus* as 2.60×10^6 /cu. mm. Patro *et al.* (2004) recorded RBC values (2.60×10^6 /cu. mm) In the present investigation too the RBC count was noted as 2.60×10^6 /cu. mm in *Channa straitus*.

Pesticides induced changes in various blood parameters of fishes have been reported by a few workers (Shammi *et al.*, 1978; Qayyum *et al.*, 1982; Qayyum and Shammi, 1983 and Thakur and Sahai, 1986). In *Channa punctatus* Pandey *et al.* (1979) have shown that DDT, metacid and unizeb causes anemia, whereas treatment of endrin, urea and phenol bring about polycythemia. Qayyum *et al.* (1982) reported that in *Clarias batrachus* diptarex intoxication bring about changes in erythrocyte count. In *Saccobranhus fossilis* (Verma *et al.*, 1979) reported that RBC increased with increasing the treatment period. While Thakur and Sahai (1987) described significant decrease in total RBC count of *Garra gotyla gotyla* when it was induced to carbaryl. In the present experimental study RBC count of 96 hrs treated malathion induced *Channa straitus* was 75 per cent less than control value. Similar reduction in RBC count in malathion treated *Channa punctatus* (Pandey *et al.* 1976) and *Clarias batrachus* (Mukhopadhyay *et al.* 1980) were observed.

When the fishes of treated group were placed in separate aquarium without treatment in fresh water to see the recovery status the results obtained showed that the initial value of RBC count (0.65×10^6 /cu. mm) increased and reached up to 0.73×10^6 /cu. mm in 96 hrs. This states that in malathion treated fishes, the recovery in RBC count were very slow. To speed up the recovery it requires some stimulating agent, which can neutralize the effect of malathion.

To see this fact in the present study a separate experiment was setup in which, fishes were treated with combination of malathion and $MgSO_4$ for 96 hours. When fishes were exposed to malathion for 96 hours the reduction in count was 0.65×10^6 /cu. mm in comparison to 2.60×10^6 /cu. mm. While fishes were exposed to $MgSO_4$ alone the RBC count were 2.59×10^6 /cu. mm and were very nearer to the control. However, when fishes were treated in combination with malathion and $MgSO_4$, the RBC count after 96 hour was 1.15×10^6 /cu. mm. This showed that $MgSO_4$ reduced the toxicity of malathion up to 43.47 percent Thus it can be concluded that magnesium sulphate has a role in preventing the malathion toxicity in RBC count up to certain limits.

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References

- ATSDR, M. 2003. Agency for toxic substances and disease registry . Public Health Statement for malathion. **Case 121**: 75-78
- Hazarika, A., Sarkar, S.N., Hajare, S., Kataria, M. and Malik, J.K. 2003. Influence of malathion , pretreatment on the toxicity of anilofos in male rates : a biochemical interaction study . *Toxicology* 185 (2) : 1-8 .
- McCarron ,D.A.1983.Calcium and Magnesium nutrition in human hypertension. *Annals of Internal Medicine* 98 : 800-805 .s
- Mukhopadhyaya, P. K. and Dehadrai, P.V. 1980. Biochemical changes in air breathing catfish, *Clarias batrachus* exposed to Malathion . *Environ . Pollu . Ser . Ae . Cpll . Biol .* 22 , 149- 158.
- Pandey, B.N., Chanchal, A. K. and Singh, M.P.1976. Effect of Malathion on O₂ consumption and blood of *Channa punctatus*. *Indian J. Zoology* .27 : 95-100 .
- Patro Lingaraj, Mishra, Minakshi and Panigrahi ,A.K.2004. Ecotoxicological effects of Cadmium on the hematology of fresh water fish *Oreochromis mossambicus* (Peters) . *National Journal of Life Sciences* 1 (1): 47-55 .
- Qayyum, M.A. , Shammi, Q.J. and Rai, R. 1982. Changes in blood parameters of *Clarias batrachus* (Linn.) due to diptarex intoxication. *Jour. Sci. Res.* ,4(3):175-178.
- Qayyum, M.A. and Shammi, Q.J. 1983. Hematological values of a teleost fish *Catla catla* (Ham.) exposed to aldrin. *Jour. Sci. Res.* 5(3):129-132.
- Raizada ,M.N. and Singh, C.P. 1982. Observation on hematological values of fresh water fish *Cirrhinus mrigala* (HAM). *Comp, Physiol, Ecol.* 7(1), 34-36 .
- Raizada, M.N. and Gupta, Abha 1982. Toxic effect of RH-2161(A systemic fungicides) On total erythrocyte count (RBC) and Hemoglobin content(HB) of *Trichogaster fasciatus*. *Comp. Physiol. Eco.* , 7(1) :29-30.
- Shammi, S., Qiser Jahan and Qayyu, B.A. 1978. Gammexene induced changes in certain blood parameters of *Clarias batrachus* (Linn.). *Ind. J. Zool.* , 7(1) : 54-58.
- Sharma, R.K. and Shandilya, Smita 1982. Observation on the haematological values of some fresh water teleosts. *Comp. Physiol. Ecol.* 7(2) : 124-126
- Sharma, S. and Singh, S. 2004. Effect of roger toxicity of some biochemical parameters in the fish *Channa punctatus* . *Bionotes*. 2:42.
- Sharma, A., Maheshwari, R.S., Prakash, M.M., Batham, A.R., Baijal, N. and Paliwal, P. 2002. *A manual on Haematological tests and experiments*. Dept. of Biotechnology, Govt. Holkar Sci. College, Indore :1-59.
- Sweta Lohia, and Shrivastava, A.K. 2000. Variation in some Hematological values of *Channa punctatus* (Bloch) . *Flora & Fauna* 6 (1) : 13-14 .
- Thakur, N. and Sahai, S. 1986. Carbaryl induces hematological alterations in the teleost *Garra gotyla gotyla* (Gray). *Environment and Ecotoxicology* : 339-344.
- Verma, S.R., Bansal, S.K. , Gupta, A.K. and Dalela, R.C. 1979. Pesticides induced hematological alterations in a fresh water fish *Saccobranchnus fossilis*. *Bull. Environ. Contam. Toxicol.* ,22 : 467-474.

Table 1: Effect of Malathion on RBC of *Channa striatus*

Time in hours	Control value (in 10^6 / cu mm)	Experiment value (in 10^6 / cu mm)	Difference	Per cent alter
24	2.60	2.14	0.46	17.6
48	2.60	1.22	1.38	53.0
72	2.60	1.05	1.55	59.6
96	2.60	0.65	1.95	75

Table 2: Recovery in RBC after 96 hours in Malathion treated fish *Channa striatus*

Time in hours	Control value (in 10^6 / cu mm)	Experiment value (in 10^6 / cu mm)	Difference	Per cent alter
24	0.65	0.66	0.01	1.53
48	0.65	0.66	0.00	00
72	0.65	0.69	0.04	6.15
96	0.65	0.73	0.08	12.30

Table 3: Effect of Magnesium sulphate on RBC of *Channa striatus*

Time in hours	Control value (in 10^6 / cu mm)	Experiment value (in 10^6 / cu mm)	Difference	Per cent alter
24	2.60	2.63	0.03	1.15
48	2.60	2.61	0.01	0.38
72	2.60	2.62	0.02	0.76
96	2.60	2.59	0.01	0.38

Table 4: Combined effect of Malathion and Magnesium sulphate on RBC of *Channa striatus*

Time in hours	Control value (in 10^6 / cu mm)	Experiment value (in 10^6 / cu mm)	Difference	Per cent alter
24	2.60	2.43	0.17	6.51
48	2.60	1.96	0.64	24.61
72	2.60	1.12	1.48	56.92
96	2.60	1.15	1.45	55.67

