Paper ID E81

Effects of Sumithion on hematological parameters in stinging catfish, *Heteropneustes fossilis*

Md. Haider Ali, Samiron Kumer Saha and Harunur Rashid*

Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
Corresponding *e*-mail: rashid@bau.edu.bd

Abstract

The present investigation was conducted to study the effect of sumithion on hematological parameter of stinging catfish (*Heteropneustes fossilis*) (Bloch). The experiment was carried out from October 2013 to June 2014 at the backyard hatchery, Department of Fisheries Management, Bangladesh Agricultural University (BAU), Mymensingh. Male and female stinging catfish were reared in controlled (fresh water) and treatment condition (water treated with sumithion). The investigation included the month-wise study of hematological parameters i.e., glucose; haemoglobin-Hb; red blood cells- RBC and white blood cells- WBC in controlled and in treatment conditions. Blood glucose level was highest (10.36 mmol/l) in treatment condition and lowest (6.0 mmol/l) in controlled condition. Hb level was found highest (10.30 g/dl) in controlled water and lowest (5.30 g/dl) in sumithion treated water. RBC level was found highest ($1.82x10^5$ cells/mm^3) in controlled water whereas it was lowest ($1.14x10^5$ cells/mm^3) in sumithion treated water. WBC level was lowest ($1.04x102$ cells/mm^3) in sumithion treated water and highest ($3.5x10^5$ cells/mm^3) in controlled water. From this result it can be assumed that sumithion has effects in altering hematological parameters of *H. fossilis*.

INTRODUCTION

Pesticides residues from agricultural fields are easily drained out into the adjacent rivers and other natural water bodies (CHINTA, 1992; Rahman and Alam). A few drops of Aldrin or Endrin can kill all the fishes of a certain water body and these compounds persist in the soil for long period (Dasgupta, 2005). There are several instances of mass mortality of fishes have been reported immediately following the massive application of pesticides and results show that mainly chemical contamination affects the habitat in aquatic environment (Bhowmik *et al.*,) It is assumed that indiscriminate use of pesticide in crop fields is one of the vital causes of water pollution. Sumithion, an organophosphate insecticide is one of the widely used insecticides. Kabir and Begum (1978) studied that organphosphorus insecticides have the capacity for histo-pathological changes in the intestine and liver tissue of catfish. It is very important to study the effect of sumithion on hematological parameters of *H. fossilis* as the abundance of this fish is threatened due to habitat degradation due to pollution (IUCN, 2012). Considering all these facts the present study was conducted to identify the effect of sumithion on hematological parameters of stinging catfish during its breeding season.

MATERIALS AND METHODS

A. Collection and rearing of experimental fish

Fingerlings of stinging catfish (*H. fossilis*) having average size 6.31 cm and 2.39 gm were collected from Sharnalata Agro Fisheries Ltd., Radhakanai, Fulbaria, Mymensingh. They were brought to the backyard hatchery of the Faculty of Fisheries, BAU in poly bag with oxygen and reared in three cement cisterns (average size $52.62ft^3$) from October 2013 to May 2014. One cistern was treated as controlled (fresh water) and two were treated as treatment (with sumithion @ 0.24ppm). 300 male 300 female fingerling were stocked in controlled cistern and 300 male and 300 female were stocked in treatment cistern. About 90% water were exchanged every alternate day in all cistern and sumithion were mixed accordingly. Fish were supplied with regular commercial *shing* diet (Protein-39%, Carbohydrate-40%, Calcium-2%, Moisture-11%, Fat-8%, Metabolic energy-3400 kcal/kg). Unutilized feedstuff and fecal wastes were cleaned using siphoning. The fishes were reared about five months before sampling.

B. Sampling

3 male and 3 female from controlled and 3 male and 3 female from treatment were sampled from March' 2014 to May 2014. Blood samples were collected from each sampled fish using 5ml syringe for the study of amount of glucose (mmol/l), hemoglobin (g/dl) and number of white blood cells(cells/mm^3)and number of red blood cells(cells/mm^3).

Amount of blood glucose in mmol/l was measured using a glucometer named "SensoCard-CE0197" . The glucometer was first switched on. Then code of the strips was adjusted with the glucometer. The code card is supplied within the strip box. Then a strip is placed within the glucometer carefully. When the glucometer showed the sign of blood drop then a drop of blood was splitted over the blood sensor zone. After 3-5 seconds the instrument showed the amount of glucose in the form mmol/L. Following this procedure blood glucose of all sampled fish was measured.

To measure haemoglobin "SAHLI's" hemometer was used. At first 90µl 0.1N HCL was taken in an eppendorf tube using micropipette. Then 10 µl blood was added and the tube was shacked thoroughly for proper mixing. After 2-3 minutes the mixture was transferred to the sahli's tube. Then distelled water was added in drops until color was adjusted with colorimeter of sahli's haemometer. When the color was adjusted then the reading was taken upto the level of the mixture specifid on the body of sahlii's tube. To count RBC and WBC 990 µl 2% EDTA was taken in an appendorf tube. Then 10µl blood was added with it. During counting RBC 10 µl solution and small amount of gimsa stain was taken on haemocytometer. After covering by a cover slip it was observed under microscope. During counting 5 large square units (each large square contains 16 small square units) were selected randomly. Numbers of RBC within a large square unit not touching any line were counted. Using this procedure number of RBC was counted from randomly selected 5 large square units. Then using the following formula total number of RBC was counted.

$$\text{Number of red blood cell} = \left(\frac{sumof\ RBC * 4000 * 100}{5 * 16}\right) \text{cells/mm}^3$$

In case of RBC, total number of RBC found within large squares of four corners were counted. Then using following formula total number of WBC was counted.

$$\text{Number of white blood cell} = \left(\frac{(sumtoalof\ WBC/4) * 100}{0.4}\right) \text{cells/mm}^3$$

RESULTS

A. Blood glucose level (mmol/l)

Month wise blood glucose level in controlled female ranged from 7.2 to 10.9 mmol/l and in treatment female from 8.36 to 10.36 mmol/l. In controlled male ranged from 6.0 to 11.2 mmol/l and in treatment from 6.7 to 12.2 mmol/l. (Fig. 1.0 & 2.0).

B. Haemoglobin level (gm/dl)

Month wise haemoglobin level in controlled female from 6.4 to 10.3 g/dl in whereas it ranged from 5.4 to 9.16g/dl in treatment. In male it ranged 6.6 to 7.9 g/dl in controlled and 5.3 to 6.9 g/dl in treatment. Haemoglobin in controlled male & female were high. (Fig. 3.0 & 4.0).

C. Red Blood Cell Count (RBC) (cells/mm^3)

Month wise RBC count in controlled female ranged from $1.36x0^5$ to $1.76x10^5$ cells/mm^3 whereas it ranged from $1.14x10^5$

to $1.53x10^5$ cells/mm^3 in treatment. In controlled male it ranged $1.23x10^5$ to $1.82x10^5$ cells/mm^3 and in treatment ranged from $1.21x10^5$ to $1.59x10^5$ cells/mm^3. RBC in treatment male and female was low. (Fig. 5.0 & 6.0)

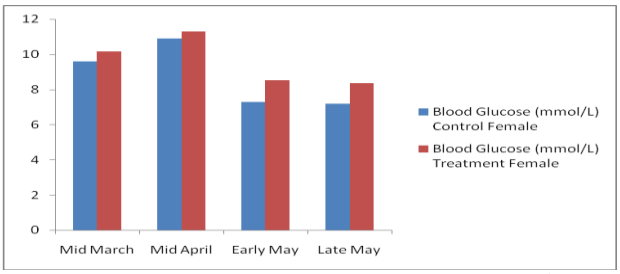

Fig. 1. Month wise blood glucose in controlled and treatment female

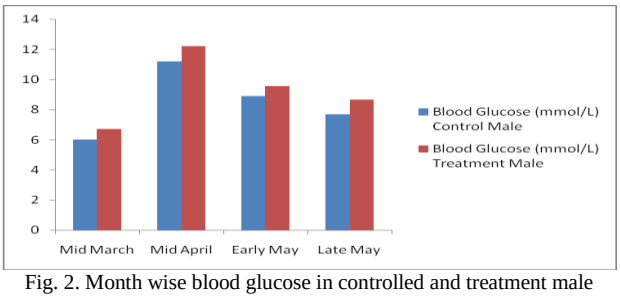

Fig. 2. Month wise blood glucose in controlled and treatment male

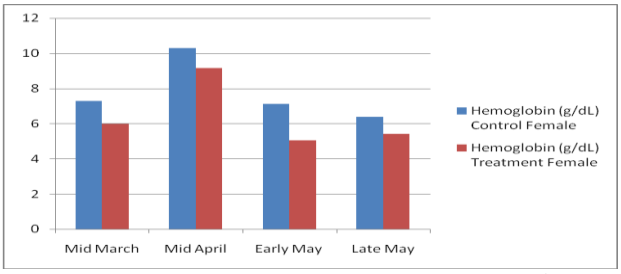

Fig. 3. Month wise haemoglobin in controlled and treatment female

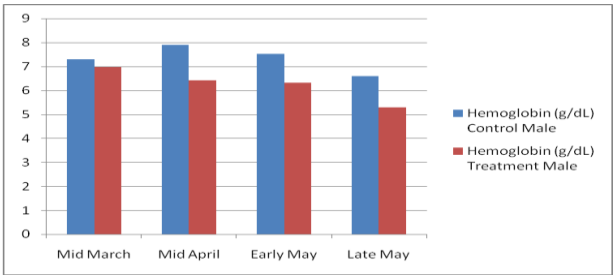

Fig. 4. Month wise haemoglobin in controlled and treatment male

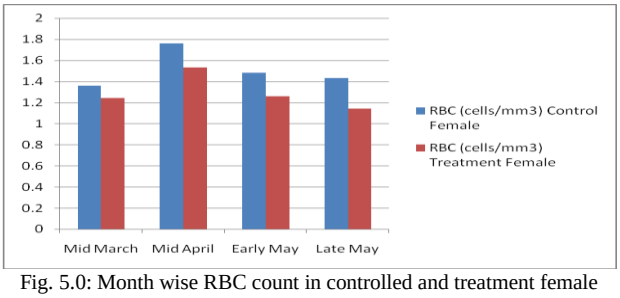

Fig. 5.0: Month wise RBC count in controlled and treatment female

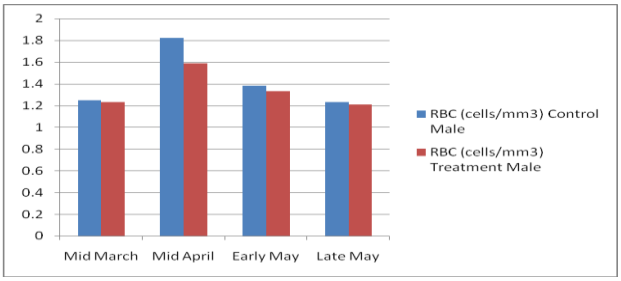

Fig. 6.0: Month wise RBC count in controlled and treatment male

D. White Blood Cell Count (WBC) (cells/mm^3)

Month wise WBC count in controlled female ranged from $2.08x10^2$ to $2.9x10^2$ cells/mm^3 whereas it ranged from $1.45x10^2$ to $2.08x10^2$ cells/mm^3 in treatment. The result shows that the WBC in treatment male & female were low. (Fig. 7.0 & 8.0)

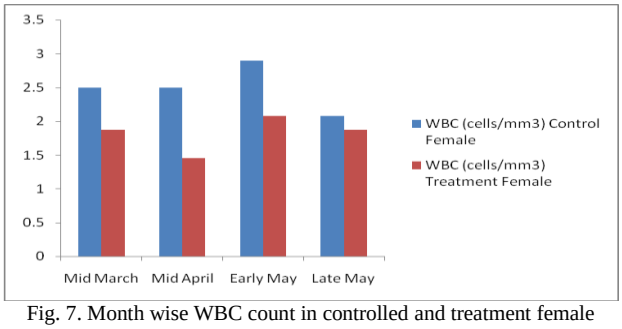

Fig. 7. Month wise WBC count in controlled and treatment female

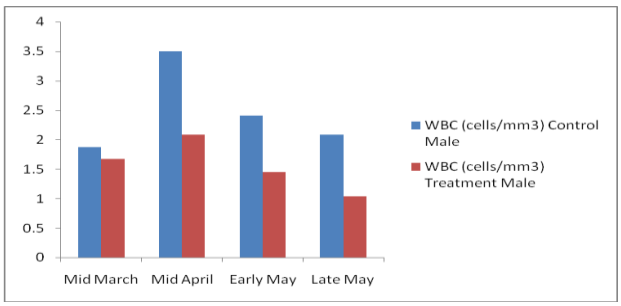

Fig. 8. Month wise WBC count in controlled and treatment male

DICUSSION

After analyzing the hematological parameters in both controlled and in treatment conditions and in both male and female of *H. fossilis.* It was found that blood glucose level was high in treatment than the controlled. Mamta (2012) observed that organophosphate pesticide have effect on blood glucose level of *H. fossilis*. Hb, RBC and WBC were found highest in controlled and lowest in treatment fish. Christopher *et al.* studied the effects of diazinon on behaviour and some haematological parameters of African catfish *Calrias garriepinus* and found diazinon have different effects on haematological constituents like reduction of RBC and WBC. Ahmed (2011) studied the effect of diazinon on carp species and found significant decreases of WBC. Change in haematological indices of Tench (*Tinca tinca*) during the reproduction period has been reported by Svobodova et al. (2001). They reported that there is a drop in values of hematological indices particularly in erythrocyte count (RBC), haemoglobin content (Hb), and haematocrit value in the reproduction period of brood tench in lakes; an expressive decrease of values was found in females. Similar changes in haematological values (RBC, Hb, and Hct) were noticed after artificial reproduction in tench females and males by Svobodova *et al.* (2001) also. Kocaman *et al.* (2005) related difference in glucose concentration in the rainbow trout (*Oncorhynchus mykiss*) prior to the reproduction. They also reported that serum glucose levels elevated until early spawning than rapid fall was observed in associated with reproduction. The findings of this current study about hematological parameters of *H. fossilis* are in agreement with Svobodova *et al.* (2008) and Kocaman *et al.* (2005).

CONCLUSION

All the haematological parameters studied under this investigation viz. glucose, haemoglobin, number of white blood cells and number of red blood cells proved the effects of sumithion in altering blood environment of aquatic animal like *H. fossilis*. It can be assumed that varieties of pesticide chemicals that are used in crop cultivation may effect haematology of aquatic animals similarly.

REFERENCES

[1] Ahmed, O. 20122. Acute and Haematological changes in common carp (*Cyprinus carpio*) caused by diazinon exposer. African Journal of Biotechnology 10, 63: 13852-9.

[2] Bhowmik, L.R., H. Rashid and M.F. Kabir 2012. Toxicity in embryonic and larval stages of stinging catfish Heteropneustes fossilis. Proceedings of the 5th Fisheries Conference and Research Fair 2012, Dhaka, Bangladesh. p.48.

[3] CHINTA. 1992. The increase Use of Fertilizer and Pesticides and the Effect of Increasing Higher Price in Bangladesh; In Bengali; January 31, 1992, Dhaka, Bangladesh.

[4] Dasgupa. S, C. Meisner, M. Huq 2005. Health effects and pesticides perception as determinants of pesticides use: evidence from Bangladesh. Policy Research Working Papers No.3776, The World Bank, Washington D.C.

[5] IUCN, 2012. IUCN Red List of Threatened Species. Version 2012.1. IUCN 2012. IUCN Red list of Threatened Species . Downloaded in September 2013.

[6] Kabir, . M. and Begum, R. 1978. Toxicity of three organophosphorus insecticides to *H. fossilis*. *Dhaka Univ. Stud. B.* 26(1): 115-122.

[7] Kocaman E. M., Telat Yanik, Orhan Erdogan and Abdul Kadir (2005): Alterations in Cholesterol, Glucoseand Triglyceride levels in Reproduction of rainbow trout (*Oncorhynhcus mykiss*) *J.Anim.Vet.Adv.*, 4(9), 801-804.

[8] Kumari, M. 2012. Effects of Organophosphate Pesticide Abate on the Overy of the cat fish, *Heteropneustes fossilis* (Bloch). Bangladesh J. Zoolgy. 40 (2): 207-212.

[9] Nwani., C.D., Okeke, O.C., Onyishi, G., Atama, C., Chinekwa, U., and Eneje, L.O. 2012. Zoology and Ecology. 1-8, iFirst Article.

[10] Rashid, H., L.R. Bhowmik, M. F. Kabir, K. Taslima, M. R. Ali, M.J. Alam, U.K. Rokeya and S.P. Paul. 2012. Toxicity of Diazinon on Embryonic and Larval Development of Stinging Catfish, *Heteropneustes fossilis*. *Proceedings of the 3rd International Conference on Environmental Aspects of Bangladesh*, Fukuoka, Japan. pp 47-50.

[11] Svoboda, M., Kouril, J., Hamackova, J., Kalab, P., Savina, L., Svobodova´, Z. and Vykusova´, B. (2001). Biochemical profile of blood plasma of tench (*Tinca tinca* L.) during pre- and postspawning period. *Acta Veterinaria Brno* 70, 259–268.

[12] Svobodova Z, Kroupova H, Modra H, Flajshans M, Randak T, Savina LV, Gela D (2008) Haematological profile of common carp spawners of various breeds. *J App Ichthyol* 24:55–59.