



SEMIARID JOURNAL OF ACADEMIC RESEARCH AND DEVELOPMENT (SJARD)

Haematological and Behavioural Response of *Clarias Gariepinus* Fingerlings Exposed to Urea

Sambo, M.U¹., Farida, S¹., Idris, S¹., Ahmad, A.¹ and Adamu, M².

¹Department of fisheries, Binyaminu Usman Polytechnic, Hadejia Jigawa state

²Department of Wildlife & Eotourism mgt., Audu Bako College of Agriculture, Kano state

ABSTRACT

Chemical fertilizers have been used globally for centuries for improve agricultural yield and overall increased food production. This research is aimed at establishing the hematological and behavioral response of *Clarias gariepinus* fingerlings exposed to Urea. The experiments were performed with one control and three treatments in duplicate. The test organisms were exposed to 1.0g/l (trmt 1), 1.5g/l (trmt 2) and 2.0g/l (trmt 3) of urea respectively. The results of the hematological analysis carried out after exposure showed that packed cell volume (PCV) decrease as the concentration of the Urea increased it was 30.00 for trmt1 and 23.0 for trmt3. Haemoglobin counts (Hb), Red blood cells counts (RBC) and White blood cells counts (WBC) also decreases as the concentration of the Urea increases. The observation on the behavioral pattern after exposure include attempt to jump out, air gulping at the surface, loss of reflex, erratic swimming, loss of response to stimuli and finally death. Although chemical fertilizers are highly essential in enhancing agricultural productivity, their deleterious and devastating effect on aquatic biota and the general aquatic environment far outweigh the benefits. The use of chemical fertilizers should therefore be discouraged.

Keywords: Haematological, Behavioural Response, *Clarias Gariepinus* Fingerlings, Urea

Introduction

Chemical fertilizers have been used globally for centuries for improve agricultural yield and overall increased food production. The

use of fertilizers in agriculture is highly indispensable and is widely accepted by an ever increasing number of farmers. However, fertilizers have been known to have

devastating effect on aquatic biota generally. Furthermore, chemical fertilizers have severe deleterious effect on fish populations, manifesting in several physiological and biochemical defects in fishes. These fertilizers are introduced allochthonously in to the aquatic ecosystem through precipitation and surface runoffs resulting in eutrophication and aquatic pollution when in excess amounts. Water bodies have been used over the years as repositories for a wide variety of xenobiotics, which cause biochemical and hispathological alterations in fishes. Reddy and Rawat (2013) reported histo-cytopathological alteration in gills and liver of fish while Aboud (2010) reported impact of heavy metal pollution on immune response of *Oreochromis niloticus*. Toxicity test are necessary in water pollution evaluation because chemical and physical test alone are not sufficient to asses potential effects on aquatic biota (APHA, 2005). Pollution occurs whenever potentially harmful substances are released in to the environment and is caused mainly by human induced perturbation though, sometimes it can be by natural process (Burchart *et al.*, 2010). The extreme effect of pollution could lead to extinction of species through mass mortality, low fecundity and reproductive potential and migration to more favorable areas culminating in gross reduction in population size. (Barnosky,2012). Chemical pollution is hazardous as it prevents the diffusion of dissolved oxygen in to the water thus hindering biological processes resulting in

offensive ammonia odor and overall lowering of water quality (Gibbs et al., 2009); Aboud, 2010).

Haematological parameters are employed to describe health status of organism with circulatory system, it is considered by Blaxhall (2002) as best tool to for assessing the health of fish. Haematology is an effective and sensitive index to monitor physiological and pathological changes in fish. It contributes to a greater understanding of factors such as phyllogenetic position, ecological habitat, food selection and mode of life. It can also be used as a clinical tool for the investigation of biochemical and physiological disturbances in fish caused by pollution, disease and other stress factors. Haematological studies on fish have assumed greater significance due to the increasing emphasis on aquaculture. Fish have been the most popular test organism because they are presumed to be the best understood, one of the most important organisms in the aquatic environment and perceived as most valuable by the majority of researchers for the assessment of aquatic pollution. To carry out effects of toxins on aquatic system, fish is more reliable as a bio-indicator.

Materials and methods

Two hundred fingerlings of *Clarias gariepinus* were obtained from a private fish farm and were transported in jerry can to the Binyaminu Usman polytechnic fish laboratory. Health status examination was carried out on the fish and healthy samples were introduced in to the plastic tank to acclimatize for one week.

Acclimatize fish were taken and transferred in to the experimental tank; ten fishes each were placed in plastic tank of 10litres capacity prepared by filling each tank with 5 litres of water. The experiments were performed with one control and three treatments in duplicate. The test organisms were exposed to 1.0g/l (trmt 1), 1.5g/l (trmt 2) and 2.0g/l (trmt 3) of urea respectively.

Behavioral Examination:

The behavioral pattern of exposed fish were observed, timed and noted immediately after the addition of urea to stocked experimental tanks; fish that were already lying on the floor of the tank were removed without delay for blood collection before death.

Collection and analysis of blood:

The fish were caught individually with dip net and were made to lie flat on a laboratory work table, blood was withdrawn by heart puncture into syringe containing a drop of 10% EDTA solution. The blood collected was 1ml each and then the blood was analyzed for the packed cell volume, haemoglobin content, leucocytes, count and erythrocyte count according to procedure described by Blaxhall and Daisley (1973).

Results and Discussions

The results Hematological and behavioral responses of *Clarias gariepinus* fingerlings exposed to Urea in a 96hours static bioassay are given in table 1and figure 1.

Table 1: Results of Hematological parameters of *Clarias gariepinus* exposed to Urea

Parameters	Control	Treatment 1	Treatment 2	Treatment 3
PCV (%)	31.00	30.00	25.0	23.0
HB (g/dl)	10.3	10.06	8.3	7.3
WBC (x 10 ³ µl)	6.2	6.1	3.5	2.8
RBC(x 10 ³ µl)	3.2	3.1	2.3	2.1

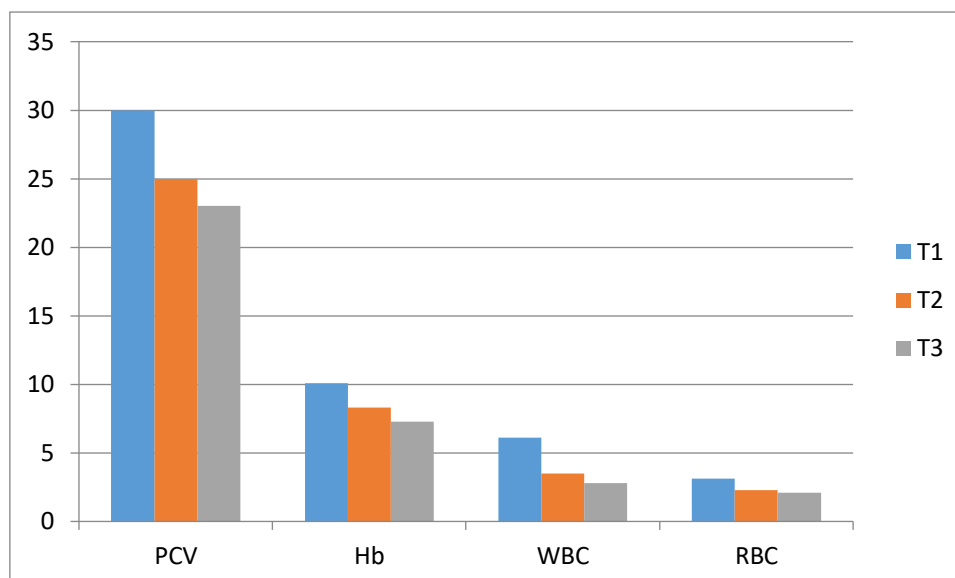


Figure 1: Variation in Haematological parameters of *Clarias gariepinus* exposed Urea

Observed behavioral response include attempt to jump out, air gulping at the surface, loss of reflex, erratic swimming, loss of response to stimuli and finally death. Physical examinations showed gills and fins discolorations. The differences in behavioral responses to toxicants are attributed to a number of factors ranging from nature of the chemical and its concentration, the species and size or age of the fish, to the ambient environmental conditions (FAO, 1981).

The abnormal behaviors tend to suggest some nervous disorder and insufficient oxygen supply (chung-min *et al.*, 2003).

The results of haematological analysis shows that, the higher the concentrations of Urea the higher the reduction of Park cell volume, Haemoglobin, White blood cell and Red blood cell. The primary consequence of changes in white blood cells count(WBC) in the stressed fish samples is the suppression of the immune system and increased susceptibility to disease as observed by Wedermeyer *et al.*, (1977).

Decrease in red blood cell count(RBC) could be as a result of damage to haemopoetic organs; osmoregulations was impaired once the gill were damage causing haemodilution leading to decrease in number of RBC through haemolysis. The decrease in RBC and Hb concentration are often accompanied by decrease in haematocrit value; this demonstrated the physiological dysfunction of the haemopoeitic system. In this study, Hb decreased in all treatment tanks; this can be a good indicator of anemia.

Conclusions

Decline in blood cells and haemoglobin content indicated the haemotoxicity of chemical fertilizers. The toxins may eventually accumulate in body tissues of consumers of such fish reared in chemically fertilized waters. Although chemical fertilizers are highly essential in enhancing agricultural productivity, their deleterious and devastating effect on aquatic biota and the general aquatic environment far out-weigh the benefits. The

use of chemical fertilizers should therefore be discouraged.

References

Abound, O.A.S.A. (2010). Impact of pollution with lead, mercury and cadmium on the immune response of *Oreochromis niloticus*. Newyork science journal, 3 (9):12-16

www.sciencepub.net/newyork.

Adeyemo A.O. and Ayere S.O. (2015) Hematological and behavioral responses of *Oreochromis niloticus* exposed to crude Extracts of *Raphia hookeri*. Proceedings of 30th FISON annual conference, 17 -20

APHA (2005). Standard methods of examination of water and waste water. 18th Edition of the American public health association, 15th street, NW. Washington D.C. 1422p.

Barnosky, A.D. (2012). Approaching a state shift in earth biosphere. *Nature*, 486(7401):52-58.

Burchat, S.H.M., Wapole, M., Collen, B. and Scharlemann, J.P.W. (2010). Global biodiversity: indicators of recent declines. *Science*, 328:1164 -1168.

Blaxhall, P.C. (2002). The haematological assessment of health of freshwater fish. A review of selected literature, *Journal of fish biology*, 4:593 -604.

Chung-Min, I., Bo-Chang, C, Shar, S., Ming-Chaalin, Chen-Wuing, L. Bor-Cheng, H. (2003). Acute toxicity and bioaccumulation of arsenic in tilapia (*Oreochromis niloticus*) from a blackfoot disease area of Taiwan. *Environmental toxicology*., 18 (4): 252 – 259.

FAO (1981). Toxicological evaluation of certain food additives. WHO food additive series. No.15

Gibbs, K.E., Mackey R.L., Currie D.J. (2009). Human land use, agriculture, pesticides and losses of imperiled species. *Divers Distrib.*, 15(2):242-253.

Reddy, P.B. and Rawat, S, S. (2013). Assessment of aquatic pollution using histopathology in fish as a protocol. *Int. Research Journ. of Environ. Science*, 2 (8): 79-82

Wedemeyer, G.A., Wood, F.E. and Yusatake, W.T. (1977). Clinical methods for assessment for the effect of environmental stress on fish health. United states fish and wildlife services. Technical paper, 89:1 -18.