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Biochemical alterations due to carbaryl exposure in glucose content of liver and alimentary canal of *Clarias batrachus*

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ABSTRACT

Pesticides provide useful tools to agriculturists and hygienist for crop protection and disease control. The use of pesticides has undoubtedly increased the agricultural output, but on the other hand, they have also poisoned the aquatic environment. Present study indicates that carbaryl is highly toxic to fish. It produces severe damage to the organs: alimentary canal and liver, concerned with the digestion and absorption of glucose. Due to this, glucose metabolism was significantly affected throughout the exposure period. Carbaryl intoxication reduced glucose content both in liver and alimentary canal after an initial increase, generally more energy is needed to mitigate any stress conditions. This may be obtained from glucose which is one of the most available sources of energy. All these changes in glucose content may be due to cumulative effect of enzymes, hormones, and metabolic disturbance caused by the pesticide.

KEY WORDS: HYGIENIST, TOXIC, MITIGATE, BIOCHEMICAL, HEALTH

INTRODUCTION

Pesticides provide useful tools to agriculturists and hygienists for crop protection and disease control (occupational Environmental Health 1997). The use of pesticides has undoubtedly increased the agricultural output, but on the hand they have also poisoned the aquatic environment. Carabmates are comparatively of recent development in the field of pesticides. Carbaryl, which was introduced in 1956 under the trade name “Sevin” is the most widely, used carbamate today (Oluah and Agatha 2014). The influence of pesticides on the inhabitants of the water systems may manifest itself. Both direct toxification (acute chronic toxicity) and indirectly (diminishing of the content of oxygen dissolved in water, a change in the chemical composition of the water) (Singh

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Table 1. Effect of Carbaryl (0.04 PPM) on glucose content in liver of Clarias batrachus

S. No.	Time	Amount of glucose		% Age change (increase/decrease)	't' value	Probability
		Control (mg)	Treated (mg)			
1	7	5.068 ± 0.2051	7.282 ± 0.4090	43.685879	4.3276	≤ 0.01
2	15	5.192 ± 0.2514	4.854 ± 0.3529	18.4024	2.3212	≤ 0.02
3	30	5.212 ± 0.3457	3.254 ± 0.1959	37.5671	4.4164	≤ 0.01

Value expressed as mg/100mg wet-weight of tissue
Each value is the mean ± standard error of 5 individual observations.

and Singh 2010). When pesticides pass over from water into other links of biological chain, their content grows hundreds and thousands of times. Besides observed by filtering organisms, persistent poisonous chemicals may be deposited in the tissues and then get into the organism of a fish in the interconnected links of food chains, the action of the pesticides, being cumulative is amplified several times, (Omoniyi 2018).

The main stream of the earlier toxicological studies on the pesticides on fishes was confined to histopathological field. The effect of pollutants on tissue systems of fish have shown to produce gross structural changes such as atrophy, hyper trophy, necrosis, haemorrhage, liquification, cytoplasmic vacuolation and degeneration of blood vessels, (Mekkawy et al. 2016). Histological changes and histopathological studies pressurized scientists to go in for biochemical changes. Several scientists have paid significant contribution in the histochemical and biochemical field (Ahmad et al. 2015). The present attempt has been made to investigate the biological change in the *Clarias batrachus* induced by sublethal dose of carbaryl. The alimentary canals and liver were selected for the present study because digestion, absorption and metabolism are cumulatively responsible for energy production.

The amount of glucose in alimentary canal and liver of *Clarias batrachus* was measured by Anthrone method (Nicholas et al. 1956). About 100mg of tissue sample was homogenized in 5 mL of chilled de-ionized water. Then centrifuged at 5000rpm for 10min the final volume of supernatant was noted. Soon after the supernatant collection, 1mL of 0.01% Sodium fluoride solution was added to supernatant to stop the conversion of glucose to lactic acid. From the supernatant, 0.01mL was taken as test sample. The volume in the test tube was made up to 1mL with DDW. Then de-proteinization was done by mixing 0.5mL of 1% H_2SO_4 to 1mL of test sample. Then 4mL of anthrone reagent was added slowly with constant stirring. The tubes were dipped in chilled water during the mixing of anthrone reagent. The mixture was kept in boiling water bath for 4min and then cooled. Development of green color indicated the presence of glucose in the supernatant. The intensity of the color was read at on 540nm on spectrophotometer. Each experiment was repeated 5times and the mean value with standard error were calculated.

Carbohydrate, protein, lipid, enzymes and vitamins are important component of the body and play a vital role in the body construction, metabolism and detoxification. Therefore, in present investigation biochemical changes in glucose content have been studied in liver and alimentary canal of control and intoxicated *Clarias batrachus* on interval of 7-15-30 days. In the present investigation an initial increase in glucose was observed, which may be due to the greater absorption of glucose by the intestine, under created stress conditions and acceleration of glycogenolysis and gluconeogenesis, which is similar to the findings of Sharma et al. (2012). These process synthesize glucose which is the major fuel for energy production and energy demand of animal increase to face the toxicity stress. Similar observations were also made by (Singh and Singh 2017).

Besides glucose, they also observed increase of lactate dehydrogenase (LDH) activity which elevates the amount of lactic acid. These findings are supported by Michael (2018), as they have also reported an increase LDH activity. Ahmad et al 2015 also reported the significant increased value in blood glucose and significant decrease value in serum total protein level. Mekkawy et al. (2016) also observed a decrease in LDH activity which indicates pyruvate not dehydrogenated to yield acetyl CoA and converted into lactic acid due to the ele-

Table 2. Effect of Carbaryl (0.04PPM) on glucose content in alimentary canal of *Clarias batrachus*

S. No.	Time	Amount of glucose		% Age change (increase/decrease)	't' value	Probability
		Control (mg)	Treated (mg)			
1	7	0.392± 0.032	0.541 ± 0.0448	37.500	-2.41921	≤ 0.05
2	15	0.408 ± 0.0511	0.322 ± 0.026	-21.0784	1.2837	≤0.10
3	30	0.411 ± 0.051	0.286 ± 0.0308	-28.713861	1.7247	≤ 0.10

vation of LDH activity. The other cause of initial elevation in glucose level in alimentary canal may be due to immediate increase of some digestive enzyme activity which is responsible for the carbohydrate digestion. The decrease in glucose level after 15th and 13th day of exposure is probably due to the lesser secretions of hormones, enzymes and inhibition of enzyme activity, which are responsible for the carbohydrate digestion that's why the absorption of glucose is also decreased because deficiency of glucose content occur in the intestine. Present findings get confirmed with the findings of Mahmoud et al. (2013) as they have also observed depletion in glucose content in the intestine of fish *Clarias gariepinus*, after the exposure to mercury chloride. Effects of pesticidal intoxication in intestine of different fishes were also reported by workers like Siakpere et al. (2011); Kumar et al. (2011) and Ajani et al. (2018).

They have reported necrosis, vacuolation in mucosa, complete degeneration in the serosa, muscularias submucosa and broken vili in the intestines. These changes possibly deteriorate the secretion of enzyme in the gut and absorption is also decreased due to damaged vili of intestine. This is also supported by the finding of Adewoyeso (2010); Kumar and Banerjee (2016) as they have observed depletion in glucose content in the fish *Clarias garipinus*.

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