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EFFECT OF MALATHION AND TEMPERATURE COMBINATION ON BLOOD GLUCOSE AND UREA LEVELS OF GOBIID *FISH GLOSSOGOBIUS GIURIS(HAM)*

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ABSTRACT

Exposure to sub-lethal concentrations of malathion (0.05,0.25 and O.5 ppm) for 24, 48, 72 and 96 hrs at laboratory temperature (27 ± 1 °C) the blood glucose level has gradually declined after 96 hrs exposure of 0.5 ppm malathion. The blood urea level was significantly elevated after treatment with high concentration (0.5 ppm) for longer duration (96 hrs). In malathion temperature (20 °C and 30 °C) combinations show a significant decrease of blood glucose level prominently at 30 °C after exposure to 0.5 ppm for 72 and 96 hrs than in 20 °C. Increase blood urea levels were conspicuous at 30 °C for 24 to 96 hrs at high concentration (0.5 ppm) of malathion than in 20 °C.

INTRODUCTION

Temperature is one of the physical parameters which is directly related to the chemical reaction in water and biochemical reactions in the living organism. Measurement of temperature determines the solubility of oxygen from atmosphere. At higher temperature, solubility of oxygen decreases while metabolic activity of organism increases. Dissolved oxygen reflects the physical and biological process prevailing in the waters Shivanikar *et al*., (1999).

Fish is considered as an important tool in the aquatic toxicology and the toxic pollutants significantly alter certain physiological and biochemical processes when they enter into the body. The acute and chronic toxicity of pesticides in the aquatic organisms have also been reported by Anees (1978) and Basak and Konar (1978).

Biochemical changes of blood in relation to different toxic substances are reported in various teleost (Saxena and Chouhan, 1993 and Sahai, 1994). Blood glucose and blood urea variations in response to pesticides and industrial effluents have been reported by Bhattacharya (1989) and Narendra *et al.,* (1993) on *Channa punctatus* and *Heteropnestes fossilis* respectively. Blood glucose and glycogen level in *Tilapia mossambicus* has been studied after treatment with sodium arsenite (Shobha Rani *et al.*$_t$ 2000). The information about effect of pesticides in relation to varies of temperature is neglected. Hence, in the present investigation an attempt has been made to study the blood glucose and urea level in response to malathion, malathion-temperature combination.

MATERIALS AND METHODS

The freshwater gobiid fish, *Glossogobius giuris* were collected from Kelaverapalli Dam (located near Bangalore) by using cast and gill nets (mesh : 10 mm), brought alive to the laboratory and were acclimatized for 15 days in 15 liters glass aquarium (60" x 30" x 20") containing aerated tap water prior to use for experiments. They were maintained at 27 °C ± 1 °C temperature and were fed daily with earthworms. Sexually mature fishes were selected for the study.

The pesticide malathion [0,0- dimethyl, S(l, 2 dicarbethoxyethyl) phodophorodithioate] was dissolved in acetone and added to the test water to obtain the desired concentrations. The stock solution, 1mg /L was prepared separately and desired concentrations were made by adapting the dilution techniques as outlined in APHA AWWA WPCF (1985).

The acclimatised fish were divided into four experimental groups of eight fish each. The first three groups of fish were placed in sublethal concentrations (0.05, 0.25 and 0.5ppm) of malathion and the fourth group in freshwater to serve as control. The second set was divided into four groups and were subjected to different concentrations of malathion (0.05, 0.25 and 0.5 ppm) and temperature variation (20 °C and 30 °C). Eight fish were used for each concentration in 15 liters glass trough in all experiments. The acclimated fish were starved for 24 hrs prior to their use in the experiment and were not fed during the course of experiments (Dalela *et al.,* 1978). The tap water was changed on alternate days and the concentration of pesticide was maintained. In the experimental and control fish, the blood was collected by severing the caudal peduncle, causing minimum stress to the fish, and blood was drawn with the help of 1 ml graduated syringe fitted with 2.4 Gxl" needle coated with sodium citrate as anticoagulant.

The blood was collected from both treated and control fish in the intervals of 24, 48, 72 and 96 hrs into heparinated tubes by caudal incision using sodium citrate solution as an anticoagulant. From each heparin tube 0.1 ml of blood was drawn with a fine 1 ml of micro syringe and the glucose content in the blood samples was determined by the colorimetric micro method as described by (Hawk *et al* 1954). The blood urea level was determined following urease nesslerization method described by King and Wooton (1951). The glucose and urea level were expressed as mg per 100 ml of blood.

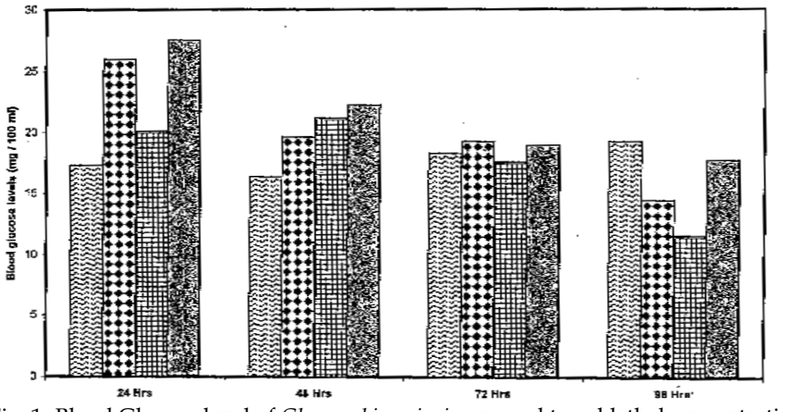

Fig. 1- Blood Glucose level of *Glossogobius giuris* exposed to sublethal concentrations of malathion.

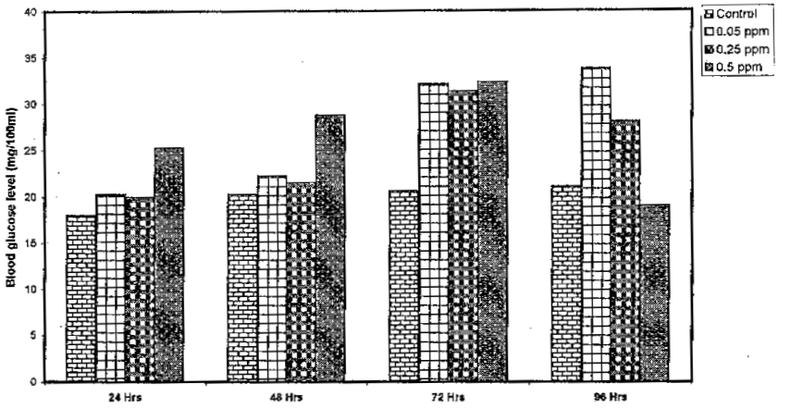

Fig. 2- Blood Glucose level of *Glossogobius giuris* exposed to sublethal concentrations of malathion at 20 ^{0}C.

Fig. 3- Blood Glucose level of *Glossogobius giuris* exposed to sublethal concentrations of malathion at 30 ^{0}C.

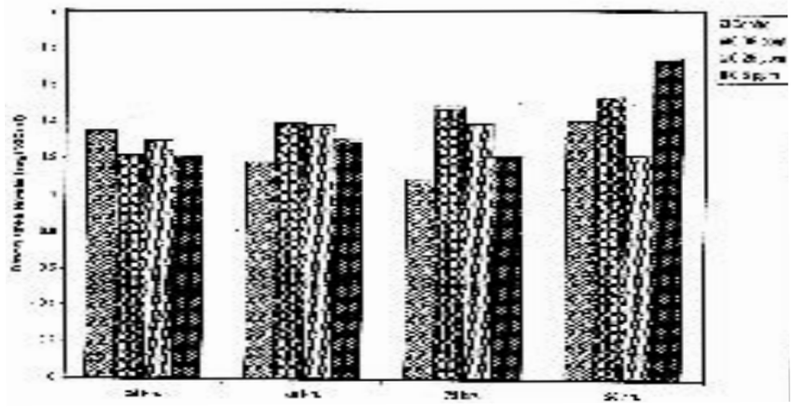

Fig. 4 - Blood Urea level of *Glossogobius giuris* exposed to sublethal concentrations of malathion.

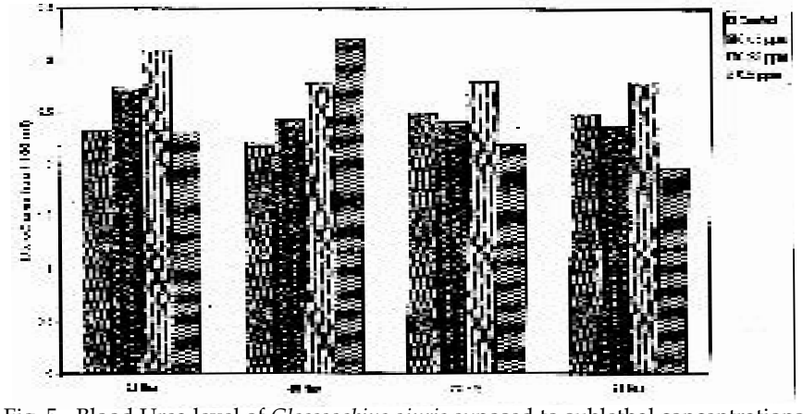

Fig. 5 - Blood Urea level of *Glossogobius giuris* exposed to sublethal concentrations of malathion 20 ^{0}C.

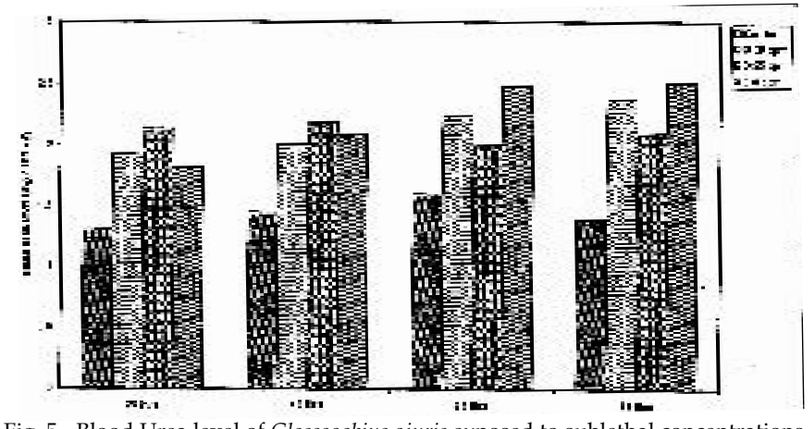

Fig. 5 - Blood Urea level of *Glossogobius giuris* exposed to sublethal concentrations of malathion 30 ^{0}C.

RESULTS

Blood glucose level

The blood glucose level in different concentrations of malathion during different duration are illustrated in Fig. 1.The results indicate the blood glucose level increased during 24 and 48 hrs of exposure period at 0.05 and 0.5 ppm (25.96 ± 2.00, 27.50 ± 3.10 and 19.61 ± 2.24, 22.19 ± 2.60 mg/l00ml). Thereafter it slightly increased (19.23 ± 2.12 and 18.94 ± *2.92* mg/ml in 0.05 and 0.5 ppm malathion for 72 hrs) than controls (Fig. 1). However, the blood glucose level at 96 hrs of exposure showed slight decrease (18.90 ± 3.80 mg/ l00ml) in comparision with controls (19.23 ± 0.93mg/100ml).

The results obtained on blood glucose level of *G. giuris* after treatment with sublethal concentrations (0.05, 0.25 and 0.5 ppm)of malathion and temperature (20 °C and 30 °C) for 24, 48, 72 and 96 hrs are illustrated in Fig, 2 and 3. In treated fish remarkable increase in blood glucose level was found on 24, 48 and 72 hrs in 0.5 ppm of malathion at 20 °C (Fig. 2).

Significant increase in blood glucose level at 20°C over the control was evident after 96 hrs of 0.05 ppm malathion exposure respectively. On the other hand fish transferred from freshwater to 30 °C the blood glucose level decreased gradually after 24 and 48 hrs of exposure in higher concentration (0.5 ppm) of malathion. However, the fish treated with higher concentration (0.5 ppm) of malathion for 96 hrs at 30 °C brought about a significant decline in blood glucose level (14.39 ± 0.55 mg /100 ml) when compared to control (20.34 ± 0.46 mg /100 ml) (Fig. 3).

Blood urea level

The results of blood urea levels with the exposure of different sublethal concentrations (0.05, 0.25 and 0.5 ppm) are illustrated in Fig,4. It was observed that the level of urea significantly decreased in fish blood when exposed to 0.05 to 0.5 ppm at 24 hrs. But it increased at 48 and 72 hrs of exposure (Fig.4). However, during the subsequent exposure period (96 hrs) the increase of urea levels was more conspicuous in 0.5 ppm of malathion (1.74 ± 0.61) than the control (L40 ± 0.96 mg/l00ml).

In test fish G. *giuris* the blood urea level significantly increased after 24 and 48 hrs of treatment with 0.05 and 0.5 ppm of malathion (Fig. 5). Substantial decrease occurred in higher concentration of malathion treated for 72 and 96 hrs test fish at 20 °C (control value 2.51 ± 0.31 and 2.48 ± 0.21 to 0.5 ppm 2.22 ± 0.27 and 2.02 ± 0.11 mg / 100ml). Similarly in G. *giuris* the blood urea level increased depending on time of exposures (Fig.6) at 30 °C. At the end of 96 hrs. a marked elevation in blood urea level wasnoticed from the value of 2.50 ± 0.20 mg / 100 ml in 0.5 ppm of malathion at30 °C.

DISCUSSION

In teleosts, the blood glucose and urea showed seasonal changes correlated with the temperature, gonadocycle, metabolic activities, feeding intensity etc.,

(Chandra, 1980 and Raizada and Singh. 1982). Nace *e1 al,* (1964) opined that seasonal variation in blood glucose level is mainly due to thermal variations and gonadal cycle. Silver and Shenk (1968) and Tandon and Joshi (1974) have observed that lowering of temperature resulted in hypcrglycemia in *Opsanus tale* and *Clarias batrachts.* In the present study, when the fish were exposed to the malathion (0.05 to 0.5 ppm) at 20 °C the glucose level in the blood were found to have increased. Similar results have been made in few teleosts by David and Philips (1992) on *Labio rohita* and Tandon and Joshi (1974) on *C. batrachus* after treating with fenvelarate toxicity and decrease of temperature, In G. *giuris* the hyperglycemic condition was observed after treating them with low temperature and malathion toxicity.

In G. *giuris* changes in the glucose level in the blood was found to have increased due to temperature and malathion toxic stress suggesting an imbalance in the pancreatic hormones involved carbohydrate metabolism as pointed by David and Philips (1992) on L-rohita. Similar observation has been made by Diwan *et al.,* (1979) *onMystilus edulis* after exposing them to industrial effluents.

In G. *giuris* the glucose level in the blood gradually increased in all concentrations of malathion for 24 and 48 hrs. However, the low values in the blood glucose was found at 0.5 ppm during 72 and 96 hrs at 30 °C. The reduction in glucose might be due to increased oxidation of glucose to meet the higher energy demands warranted during chronic exposure. Similar findings have been suggested by Bashamohideen and Parvathes wara Rao, (1972) on *T. mossambicus;* Shanawaz and Bashamohideen (1985) on *L. rohita* \ Sreenivasulu Reddy *et* al., (1986) on *Oziotelphsa senex senex* and Venkateswara Prasad *et al*$_t$ (1987) on *Mus booduga* after exposing to different temperature, malathion. methyl parathion and hexchlorophene treatment.

Ammonia is a toxic substance cannot be retain in the body for longer period and could be converted into non toxic substance like urea (Sambasiva Rao *et al,* 1984). In the present study an elevation of blood urea was found to be more in higher concentrations of malathion (0.5 ppm) and temperature combination for 72 to 96 hrs. The higher of urea in the blood subjected to malathion and higher temperature combination was found to be increased over the control suggesting an effective conversion of the toxic ammonia into non toxic urea. Similar observation have been made by Vellas and Serfaty (1974) on *Cyprinus carpio* \ Mackay and Beatty (1968) have reported that urine flow of *Catostomus commersonii* increased with raising the temperature. The present study also suggests that high temperature and malatliion combination has led to an increase in the metabolic activities resulting into high level of urea in the blood. However, after long term stress in 0.5 ppm of malathion there was rapid decrease in the level of blood urea at 20 °C. Raizada and Singh (1982) reported that the fish, *Cirrhina mrigala* collected during monsoon and winter, the urea level of blood significantly reduced due to the decrease of temperature. The low values in the blood urea in both malatliion and temperature combination treated fish were found due to the decrease of temperature (20 ^{0}C malathion concentrations and time of exposure. These changes in the urea level of treated fish indicate possible alterations in their metabolic activities.

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