ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 6, Issue 3, pp: (324-327), Month: July - September 2018, Available at: www.researchpublish.com

SERUM GLUCOSE CONCENTRATION IN HETEROPNEUSTES FOSSILIS EXPOSED TO ORGANOPHOSPHATE PESTICIDE WITH REFERENCE TO SEASON AND SEX

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Abstract: **In the present experiment effect of sublethal (LC_0) and semilethal (LC_{50}) concentration of pesticide lead nitrate on the serum glucose concentration of Heteropneustes fossilis, Heteropneustes fossilis with reference to season and sex was studied. Significant increase in the serum glucose concentration is observed in sublethal (LC_0) and semilethal (LC50) concentration of pesticide. High glucose concentration is observed in breeding period as compared to pre-breeding and post-breeding period.**

Keywords: **Heteropneustes fossilis, lead nitrate, serum glucose.**

1. INTRODUCTION

Fish and aquatic biota may be harmed by pesticide-contaminated water. Pesticide surface run off into rivers and streams. These pesticides causes harmful effects to the aquatic life. Bioaccumulation of these pesticides in fish and subsequently in human through food chain causes great risk, sometimes even lethal.

Further, more, this contaminations may also be transferred to fish by Phytoplanktons (Das and Mukherjee, 2003).

2. MATERIAL AND METHODS

For conducting the experiment live specimens of Heteropneustes fossilis were collected from local fish market. They were acclimatized to the laboratory conditions. The acclimatized fishes were exposed to sublethal (LC_0) and semilethal (LC50) concentration of lead nitrate for 48-h. In the present study, commercial grade of lead nitrate has been used. All tests were done at room temperature.

3. RESULT AND DISCUSSION

The sublethal (LC_0) and semilethal (LC_{50}) 48-h concentration of lead nitrate for Prebreeding, Breeding and postbreeding periods of Heteropneustes fossilis are shown in Table 1.

Table 1: Showing lethal concentration of lead nitrate for Heteropneustes fossilis during different reproductive periods. All values are expressed in ml/litre lethal concentrations.

Reproductive Periods	LC_0	LC_{50}	LC100
Prebreeding	0.002	0.003	0.005
Breeding	0.004	0.005	0.007
Postbreeding	0.001	0.002	0.004

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LC_0= The highest concentration of pesticide that causes no death.

LC_{50}= The concentration of pesticide that kills 50% of exposed organisms in a specific time of observation.

LC_{100} = The concentration of pesticide that kills 100% of exposed organisms in a specific time of observation.

The variation in the serum glucose concentration during different reproductive periods in sublethal and semilethal concentration of lead nitrate in Heteropneustes fossilis are shown in Table 2,3 and 4. The mean serum Glucose level in male and female Heteropneustes fossilis during prebreeding period in control, Sublethal (LC0) and semilethal (LC50) conditions are 42.4 mg/100 ml and 44.6mg/100 ml, 50.6 mg/100ml and 53.2 mg/100 ml, 58.2 mg/100 ml and 59.8 mg/100 ml respectively. The mean serum glucose level during breeding period in control, sublethal (LC0) and semilethal (LC50) conditions in male and female during similar reproductive periods are 47.2 m g/100ml and 49.0 mg/100 ml, 55.4 mg/100 ml and 57.4 mg/ 100 ml, 63.4 mg/100 ml and 65.4 mg/100 ml respectively. The mean serum glucose level in male and female during postbreeding period.

Table 2: Showing effect of sublethal and semilethal (LC_{50}) 48-h concentrations of lead nitrate on the serum glucose (SG) in both sexes of Heteropneusters fossil is during different reproductive stages.

All Values are expressed in one/100ml of blood ± standard deviation (SD) Number of observations in each case = 10; Range in parenthesis.

Reproductive stages	sec	Experimental conditions					
		control		Sublethal		Semilethal	
		SG ± SD	t	SG ± SD	t	SG ± SD	t
Prebreeding	Male	42.4 ± 2.28304 (38.2 - 46.8)	0.025	53.4 ± 2.922057 (48.14 - 56.32)	* 2.541	56.4 ± 2.767683 (51.12 - 60.18)	*** 4.885
	Female	44.6 ± 2.25684 (40.0 - 48.8)		56.22 ± 2.805507 (50.26 - 60.12)		63.61 ± 2.803015 (52.18 - 67.24)	
Breeding	Male	47.22 ± 2.62469 (42.4 - 51.2)	0.244	58.24 ± 4.184782 (48.24 - 62.28)	1.353	64.32 ± 3.590534 (58.18 - 70.72)	2.116
	Female	49.02 ± 3.07542 (42.4 - 54.2)		60.04 ± 2.450651 (56.84 - 64.36)		67.48 ± 2.693516 (62.28 - 71.36)	
Post breeding	Male	35.66 ± 2.260998 (31.2 - 39.6)	1.673	48.46 ± 3.485188 (42.68 - 54.62)	2.129	55.68 ± 2.823246 (50.62 - 60.34)	1.969
	Female	38.42 ± 1.578888 (36.4 - 40.6)		51.48 ± 2.272464 (47.28 - 55.18)		57.46 ± 2.314662 (54.26 - 60.56)	

*** P < 0.05; ** = P < 0.01 ; *** = P < 0.001 (Students 't' = test)**

The increase in serum glucose level is found period; in semilethal condition (P < 0.01) during the significant in sublethal condition (P < 0.05) during post breeding period. Prebreeding period and (P < 0.01) during Post breeding.

The results reveal that higher glucose level is found in breeding period followed by prebreeding and post breeding periods. It is perhaps due to high metabolic activity of fish during breeding period. (Gruber and Mumm 1988; Hank et. al., 1983) This may also be the reason for higher glucose value in female than male counterparts. It also appears that serum glucose content in fish run parallel to gonadial cycle.

The result further reveals that serum glucose level in higher in semilethal condition followed by the sublethal and control conditions.

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Table 3: Variation of 't'- test values of serum glucose (SG) in similar sex among different experimental condition during different reproductive stages of Heteropneustes fossilis treated with lead nitrate.

Experimental conditions	sesc	Reproductive stage		
		Prebreeding	Breeding	Postbreeding
Control Vs sublethal (LCo)	Male	5.627***	7.414***	8.291***
	Female	6.762***	5.496***	9.113***
Sublethal (LCo) Vs Semilethal (LC_{50})	Male	6.285***	7.723***	6.124***
	Female	5.835***	7.331***	5.300***
Control Vs Semilethal (LC_{50})	Male	7.151***	7.141***	7.667***
	Female	6.354***	8.797***	5.898***

Number of observations in each case = 10; Range in parenthesis

*P < 0.05; ** = P < 0.01 ; *** = P < 0.001 (Students 't' = test)

The difference in the serum glucose level is found to be significant in both the sexes (P > 0.001) during all the three reproductive periods when different experimental conditions were compared among one another.

Table 4: Variation of 't' - test values of serum glucose (SG) in similar sexes among reproductive stages of Heteropneustes fossilis in different experimental conditions, treated with lead nitrate.

Reproductive stages	sex	Experimental conditions		
		Control	Sublethal	LC_{50}
Prebreeding Vs Breeding	Male	0.347	3.856**	1.750
	Female	0.896	2.796*	2.064
Breeding Vs Postbreeding	Male	2.052	6.124***	5.334***
	Female	1.021	7.564***	4.453**
Prebreeding Vs Postbreeding	Male	0.733	5.285***	3.804**
	Female	1.293	6.704***	5.971***

Number of observations in each case = 10; Range in parenthesis

*P < 0.05; ** = P < 0.01 ; *** = P < 0.001 (Students 't' = test)

So, far as seasonal variation is concerned in sublethal condition the difference is found significant in both the sexes (Male P < 0.01 and female P < 0.05) in Breeding period, compared to prebreeding period, compared to Breeding and prebreeding period. During semilethal condition the difference is found significant in both the sexes (male P < 0.001 and female P < 0.001) in postbreeding period, compared to Breeding period, and in both the sexes (Male P< 0.01 and female P

There has been marked increase in the serum glucose level in sublethal and semilathal experimental conditions in both the sexes of Heteropneustes fossilis during all the three phases of the annual reproductive cycle.

Philip et al. 1995 has reported increase in serum glucose level in Heteropneustes fossilis when treated with cypermetherin. Similar findings of hyperglycemia have been reported by Szegletes et al. 1995 and Dravid et. al. 2004 in cyprinus carpio treated with Deltamethrin. Ceron et al. (1997) reported that 96-h treatment with diazinon significantly increase the glucose level in common. It seems that glucose increase is a general response of fish to the effects of pollutants (Svobodova, 1971; Srivastav a, 1981; Sancho ety al. 1997) and is likely to be a sign of stress associated with increase in cortisol level. Contrary to above findings fall in the blood glucose level in response to stress have also been reported in fish by various workers viz. Soengas et. al. 1991; Krumschnable and Lackner, 1993; Hodmark et. al. 2002.

4. CONCLUSION

In the present experiment effect of sublethal (LC_0) and semilethal (LC_{50}) concentration of pesticide lead nitrate on the serum glucose concentration of Heteropneustes fossilis, Heteropneustes fossilis with reference to season and sex was

studied. Significant increase in the serum glucose concentration is observed in sublethal (LC_0) and semilethal (LC50) concentration of pesticide. High glucose concentration is observed in breeding period as compared to pre-breeding and post-breeding period. Fish and aquatic biota may be harmed by pesticide-contaminated water. Pesticide surface run off into rivers and streams. These pesticides causes harmful effects to the aquatic life. Bioaccumulation of these pesticides in fish and subsequently in human through food chain causes great risk, sometimes even lethal. The results reveal that higher glucose level is found in breeding period followed by prebreeding and post breeding periods. The result further reveals that serum glucose level in higher in semilethal condition followed by the sublethal and control conditions.

ACKNOWLEDGEMENT

The authors are thankful to Dr.Gajendra Prasad Singh, Associate Professor,Jagdam College, Chapra (Saran),University, Department of Zoology, Jai Prakash University, Chapra (Saran) Bihar for constant support and encouragement.

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