Volume : 4 | Issue : 5 | May 2015 • ISSN No 2277 - 8179

Research Paper

Impact of Sago Factory Effluent on Biochemical Constituents of Ovary in The Larvae of Dragonfly, Bradinopyga Geminata (Rambur) (Anisoptera: Libellulidae)

Zoology

KEYWORDS : Sago factory effluent, ovary, biochemical constituents, larvae

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ABSTRACT

The final instar female larvae of B. geminate were treated with various sublethal concentrations of sago factory effluent. Under the effluent stress, various biochemical constituents were found to decrease in the ovary indicating the occurrence of physio-metabolic dysfunction. The effluent may act as a chemosterilent.

Introduction

Odonates are ecofriendly beneficial insects and are used as the biological agents in the pest eradication program. But in recent period, such a valuable group of insects faces an alarming threat towards extinction due to, indiscriminate discharge of wastes into water bodies. Among the industries, Sago factory are one of the wet processing industries which discharge toxic substances into the water bodies[1].

Many investigators have made studies on female sex proteins, storage proteins, carbohydrates and lipids in various tissues of insect group[2,8] . Attempts have also been made to show the effect of industrial pollutants on the growth of ovary[4]. Although oogenesis and vitellogenesis have been studied extensively in the dragonflies, *Orthetrum chrysis* [5,8] and *Tramea Virginia* [9], no substantial, much work has, however, been made in relation to the impact of industrial effluents on gonadal tissue in the larval dragonflies.

The present investigation was therefore, carried out to evaluate the impact of sago factory effluent on the biochemical constituents of the ovary in the larvae of dragonfly, *Bradinopyga geminata.*

Material and Methods

The female larvae of *B. geminata* were manually collected from their natural habitat and were acclimatized to laboratory conditions. The composite tannery effluent was collected from the local sago industry. Static bioassays were carried out by the method of Square*10.* The $LC_{,,}$ 96 hr value of the effluent to the final instar female larvae was found to be 7%. Various sublethal concentrations of the effluent namely, 0.2%, 0.4%, 0.6% and 0.8% were prepared. In each concentration and a group of 10 animals were introduced with appropriate controls. At the end of experimental period (21 days) the ovary was dissected out from the test animals and various biochemical constituents such as total free aminoacids, total proteins, total free sugars, reducing sugars, glycogen, total lipids, triacylglycerol and cholesterol were estimated by using the standard methods. The data were statistically analyzed and given in the Table 1.

Table 1 : Biochemical constituents (mg/10Gmg) in the ovarian tissue of control and treated larvae of *B.geminata* (Each value is the mean ± SD of 5 observations)

Biochemical constituents		Effluent Concentrations (%) Treated larvae			
	Control	0.2	0.4	0.6	0.8
Total free		3.15+0.21 *	2.52±0.14 *	1.68±0.07*	1.68±0.07*
amino acids	4.20±0.28	(-21.00;	(-40.00;	(-60.00;	(-60.00;
		r = 0.893)	r = 0.94)	r= 0.816)	r = 0.918)
Total		4.45±0.25 *	4.45±0.25 *	4.08±0.26 *	2.97±0.13 *
Proteins	5.20+0.35	(-14.42;	(-14.42;	(-21.54;	(-42.88;
		r = 0.938)	r« 0.993)	r = 0.973)	r = 0.990)
Total free		2.46±0.13*	2.03+0.15*	1.74±0.07*	1.45±0.08 *
sugars	2.92±0.07	(45.75;	(-30.48;	(-40.41;	(-50.34;
		r = 0.753)	r = 0.876)	r = 0.964)	r = 0.993)
Glycogen		18.89+1.14	17.44±1.12	14.53±0.89	12.35±0.76
content	21.80±1.33	*	*	*	*
		(-13.62;	(-20.00;	(-33.35;	(-43.35;
		r = 0.883)	r = 0.983)	r = 0.993)	r = 0.989)
Non-		0.66±0.03 *	0.60±0.04 *	0.57±0.03 *	0.48±0.03 *
reducing	0.72±0.05	(-08.33;	(-16.66;	(-20.83;	(-33.33;
sugars		r = 0.971)	r = 0.996)	r = 0.853)	r = 0.971)
		2.30±0.14*	1.80+.0.07*	1.60±0.07*	1.60±0.07*
Total Lipids	3.07±0.19	(-25.08;	(-41.36;	(-47.88;	(-47.88;
		r = 0.972)	r = 0.972)	r = 0.769)	r = 0.800)
Triacyl		0.54±0.03 *	0.40±0.20 *	0.37±0.02 *	0.33±0.02 *
glycerol	0.61±0.04	(-11.47;	(-34.43;	(-39.34;	(-42.62;
		r = 0.976)	r = 0.996)	r = 0.911)	r = 0.987)
		0.20±0.01 *	0.18+0.01 *	0.12+0.01 *	0.11±0.01 *
Cholesterol	0.24+0.01	(-16.66;	(-25.00;	(-50.00;	(-54.16;
		r = 0.900)	r = 0.800)	r = 0.800)	r = 0.600)

*p <0.05; - indicates percent decrease from control

Volume : 4 | Issue : 5 | May 2015 • ISSN No 2277 - 8179

Results and Discussion

It is evident that the parameters studied are found to be reduced in the ovary of dragonfly larvae under the sago factory effluent toxicity (Table-1). The female insects depend entirely on stored amino acid reserve or dietary amino acids for the synthesis of oogenesis and yolk synthesis[11] Proteins are the major components in modulating female reproductive activity in insects[12]. According to Rockstein[13], the carbohydrates are necessary for vitellogenesis and for the formation of vitelline membrane and chorion in the adult female insects. Investigators[14,15] opined that the yolk material is lipo-phospho-glyco-protein (vitellogenin) and it is derived from the fat body transported through haemolymph in the terminal oocytes. It is well evident that in the dragonflies, the oogenesis upto transformation of primary oocytes occurs in larvae and further development, *viz*., steroidogenesis, vitellogenesis, coriogenesis and oviposition occur at the adult stage[5-11].

In the present investigation, the sago factory effluent is found to bring out an overall reduction of biochemical substances in the ovary in larva causing a physio-metabolic dysfunction[16,17]. The metabolic stress caused by the sago factory effluent seems to alter the development of oocytes or oogenesis in the female dragonflies. Therefore, the possibility of reduced fecundity in the adult dragonflies developed from the sago factory effluent treated larvae cannot be ruled out. Many toxic substances are reported to affect the fecundity in a large number of insect species ' .The sago factory effluent may act as a chemosterilent similar to other toxic substances which would cause adversely on the development of eggs (oogenesis). The process of vitellogenesis in dragonflies, however occurs in the adult stage after imaginal emergence and extension of present studies up to adult stage leading to oviposition, is therefore very essential.

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