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Effect of Acute Toxicity of Organochlorine Pesticide on Respiration in Lamellibranch Mollusc *Lamellidens corrianus* During Winter Season

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Abstract: Study of effect of acute toxicity of organochlorine pesticide thiodan (Endosulfan 35 EC) was carried out during winter season for 96 hr. The rate of oxygen consumption was recorded after 0, 24, 48, 72 and 96 hr in freshwater lamellibranch mollusc *L. corrianus*. The observations indicate that the rate of oxygen consumption was found to be decreased in freshwater lamellibranch mollusc *L. corrianus* found near Sangola, Dist. Solapur (MS) India.

Key words: *Lamellidens corrianus* · Oxygen Consumption · Acute Toxicity · Thiodan · Endosulfan

INTRODUCTION

The pesticides are spreading over agricultural crops, throughout the year with different concentrations, frequencies, different formulations and with different modes affect aquatic inhabitants. It is very difficult for assessment of implications to non-target aquatic organisms due to insecticides. The industrialization, urbanization, advancement in technology and human activities are causing rapid degradation of water quality affecting the vast freshwater sources. The direct discharge of industrial effluents and runoff comprising versatile chemicals exert their toxic effect on the living beings, depleting the dissolved oxygen altering pH, changing the CO_2 content and finally affecting the life cycle of the animals [1]. Study of impact of Endosulfan and cythion-malathion on respiration of gastropod, *Thiara lineata* observed reduction in oxygen consumption from experimental group and decreases in oxygen consumption were due to changed metabolic activity, accumulation of pesticide and damage to internal cellular architecture [2].

MATERIALS AND METHODS

The experiment for oxygen consumption were performed in a specially designed respiratory glass jar of one liter capacity fitted with rubber cork having inlet and outlet connected with rubber tube. Each bivalve from individual group was marked on the shell. The marked bivalve molluscs were weighted by using digital single pan balance and kept one in each jar and the tap water was allowed to flow for 2-3 min through inlet and immediately the tube was pinched tightly without leaving air bubble. Soon after opening the valve the time was counted till one hr. After one hour, from each respiratory jar the water was carefully siphoned out in stopper reagent bottle and oxygen was estimated.

For the determination of oxygen consumption the bivalve mollusc from control, LC_{10} and LC_{50} groups of pesticide acute toxicity experiments individually marked species were used for each season. The marked individuals were separately used throughout experimental period for determination of oxygen consumption. The rate of oxygen consumption of bivalve mollusc, *Lamellidens corrianus* from control, LC_{10} and LC_{50} groups for both the pesticides toxicity experiments was determined at 24 hr interval starting from 0 hr to period of 96 hr. The rate of oxygen consumption was determined by modified method of Winker's method [3]. All the values were subjected to statistical analysis for confirmation. The difference of oxygen content of the water prior to the experiment and after one hour was taken as mg of oxygen consumed/l/hr/g body weight of bivalve mollusc,

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Lamellidnes corrianus. Comparing the results with control, the changes in the rate of oxygen consumption from LC_{10} and LC_{50} group were statistically analyzed and were calculated for each pesticide. By using student 't' test [4]. The experiments were repeated for three times for confirmation for each season.

RESULTS

The rate of respiration in bivalve mollusc, *Lamellidens corrianus* exposed to organochlorine pesticide Thiodan (Endosulfan 35 % EC) in winter season showed by the control group at 0 hr it was 0.130±0.002, at 24 hr was 0.128±0.004 mg/hr/g, at 48 hr it was 0.127±0.005 mg/hr/g, at 72 hr it was 0.123±0.004 mg/hr/g and at 96 hr it was 0.122±0.006 mg/hr/g. Upon exposure to LC_{10} concentration of Thiodan, (Endosulfan 35 EC), the rate of oxygen consumption, at 0 hr it was 0.128±0.002, after 24 hr was 0.089±0.004 mg/hr/g, after 48 hr it was 0.074±0.003 mg/hr/g, after 72 hr it was 0.42.27±0.004 mg/hr/g and after 96 hr it was 0.052±0.004 mg/hr/g. When exposed to LC_{50} concentration of the rate of oxygen consumption, at 0 hr it was 0.127±0.002, after 24 hr was 0.073±0.004 mg/hr/g, after 48 hr it was 0.068±0.005mg/hr/g, after 72 hr it was 0.058±0.004 mg/hr/g, after 96 hr it was 0.052±0.004 mg/hr/g.

When compared with control values after 24 hr of exposure in LC_{10} concentration of Thiodan, (Endosulfan 35 % EC) there was non-significant decrease in the rate of oxygen consumption was 30.46 % (NS). After 48 hr of exposure to LC_{10} concentration the oxygen consumption decreased to 41.73 % ($P<0.001$). After 72 hr of exposure to LC_{10} concentration the oxygen consumption decreased to 42.27 % ($P<0.001$). At 96 hr of exposure to LC_{10} concentration, there was decrease in the rate of oxygen consumption to 44.26 % ($P<0.001$). Similarly, when compared with control values after 24 hr of exposure to LC_{50} concentration, there was significant decrease in the rate 42.96 % ($P<0.001$) and after 48 hr of exposure to LC_{50} concentration the rate was decreased to 46.45 % ($P<0.01$). After 72 hr of exposure to LC_{50} concentration the rate of oxygen consumption was decreased to 52.84 % ($P<0.001$) and after 96 hr of exposure the rate was decreased to 57.37 % ($P<0.001$). When compared with LC_{10} and LC_{50} concentration exposure after 24 hr, the rate was significantly decreased to 17.97% ($P<0.05$), after 48 hr it decreased non-significantly to 8.10 %(NS), after 72 hr oxygen significant decrease consumption was 18.31 %($P<0.05$) and after 96 hr it increased to 23.52 % ($P<0.05$).

DISCUSSION

Respiration is the important aspect of life and rate of oxygen consumption ultimately reflect the metabolic activity of living animals. Therefore, the metabolic responses of organisms due to the changes in the surrounding environment are an indicator of the adjustment capacity of the organism. Increased population induced environmental pollution results in the depletion of available oxygen from aquatic media. Respiration and pesticide intake via gill will be rapid in aquatic animal at high temperature; this is because oxygen demand is being increased during reduction in solubility [5]. After treatment of Falithion and Lebaycid during the study of effect of pesticides on, the rate of oxygen consumption from freshwater gastropod, *Viviparous bengalensis* (Lamarck) during all the three seasons showed decreased oxygen intake. The decrease in oxygen consumption was comparatively more in LC_{50} concentration than in LC_0 during monsoon and winter than in summer. This was more severing in Lebaycid exposed snails than in Falithion. The gastropods exposed to different concentrations did not accept new state of metabolism to adjust the continual insecticidal stress [6]. The effect of sublethal concentration of Zinc on oxygen consumption of the freshwater fish, *Nemacheilus botia* and *Gambusia affinis,* a reduction in oxygen consumption from experimental groups of both the fishes was observed [7].

Due to exposure to mercuric chloride and arsenic chloride on oxygen consumption found decreased with increasing the exposure period from freshwater fish, *Amblypharyngodon mola*. The decrease in respiratory metabolism was due to the gill damage, formation of mucous film over the gill and reduction in efficiency of oxygen up take of the animal [8]. Similar might be the case for present investigation in which reduction in oxygen consumption in the all experimental groups due to acute toxicity.

In the present study, from winter seasons, in the freshwater lamellibranch mollusc, *Lamellidens corrianus* due to pesticidal stress of Thiodan reflected differential behavioral pattern along with variation in rate of oxygen consumption. It can be stated that, penetration of pesticides in to the body of bivalves might have affected the gill architecture and could have alter the rate of oxygen consumption. It is also further stated that, due to pesticidal toxicity *Lamellidens corrianus* did not adjust themselves with new state of metabolism to counteract to the continued pesticidal stress.

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