

Effect of endosulfan on oxygen consumption and succinate and lactate dehydrogenase activities in freshwater crab *Barytelphusa cunicularis*

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Abstract: Endosulfan (an organochlorine insecticide) is used in agricultural crops to control pests. As a consequence, it enters into the aquatic ecosystem via agricultural runoff where it causes a serious threat to non-target organisms. The freshwater crab *Barytelphusa cunicularis* (West wood), inhabiting freshwater environment and serves as food for man, is frequently exposed to endosulfan. The present investigation was undertaken to determine the short-term (lethal) and long-term (sublethal) effects of endosulfan on oxygen consumption and both succinate dehydrogenase (SDH) and lactate dehydrogenase (LDH) activities of the tissues of this crab. The crabs were collected from the Bhadra River and surroundings, and then acclimatized to the laboratory conditions for about 10–12 days. From the acclimatized stock, healthy and active crabs were selected for the experiments. The experimental crabs were divided into three groups, each of 10 crabs. The first group served as control, the second group was exposed to endosulfan 2.22 µg/L lethal concentration (LC₅₀ of 96 h) for four days, and the third group was exposed to 0.37 µg/L sublethal concentration (1/6th of LC₅₀ of 96 h) for 21 days. The oxygen consumption of the crabs and tissue SDH and LDH activities were determined. The results showed that the exposure to both endosulfan concentrations caused a decrease in the oxygen consumption. SDH activity was noticed in all the tissues over the control, whereas the LDH activity level was increased in all the tissues samples (viz. gills, muscles, hepatopancreas, testes and ovaries), the values being found statistically significant. Based on the above results it has been proved that endosulfan has an adverse effect on crab oxygen consumption and its associated oxidative metabolism.

Key words: crab, endosulfan, oxygen consumption, succinate dehydrogenase, lactate dehydrogenase.

Abbreviations: SDH, succinate dehydrogenase; LDH, lactate dehydrogenase; LC, lethal concentration; TCA, tricarboxylic acid cycle.

Introduction

Aquatic animals pass large quantities of water over their respiratory surfaces and are subjected to relatively greater exposure to toxic substances (BHAGYALAKSMI & RAMAMURTHI, 1981). The rate of oxygen consumption is influenced by many factors, such as animal activity, their body size, stage in life cycle, nutrition, temperature of their habitat, season and time of the day as well as previous oxygen experience and genetic background (PROSSER, 1965). The effect of pollutants on the respiration of fishes and invertebrates have received a widely spread attention (MASON, 1996). The measurement of oxygen consumption is thus taken as a bioindicator of pollution (VENKATESHWARLU & VENKATACHARI, 1995).

Many researchers have reported alterations in oxy-

gen consumption and associated oxidative metabolism in aquatic organisms exposed to different organochlorine compounds, such as the effect of endosulfan on *Oziotelphusa senex senex* (RAJENDRAPRASAD NAIDU, 1985; SUBHADRA DEVI, 1985; RAJENDRAPRASAD NAIDU & PADMANABHANIDU, 1989), effect of DDT on portinid crab *Ozius rugulosus* (SAROJINI et al., 1989), and the effect of monocrotophos on *Paratetphusa hydrodromus* (BHARATHI et al., 2002) and *Lepidocephalichthys thermalis* (GURUSWAMY & RAMADAS, 2000). Alterations in the several enzymes and physiological mechanism due to pesticides have been reported (GERALDINE et al., 1999; BHAVAN & GERALDINE, 2000; 2001; 2002). The succinate dehydrogenase (SDH) enzyme is involved in the Krebs' cycle in mitochondria. Any disturbance in its activities is bound to affect the tricarboxylic acid cycle (TCA) operation

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