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Biochemical Modulations in *Duttaphrynus melanostictus* Tadpoles, Following Exposure to Commercial Formulations of Cypermethrin: An Overlooked Impact of Extensive Cypermethrin use

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ABSTRACT

Extensive application of pesticides in agricultural and domestic zones has contributed to environmental contamination globally. With aquatic bodies being ultimate recipients of pesticide residues, the inhabiting fauna are known to be largely affected due to their proximity and inevitable exposure. The present investigation was aimed to examine the effect of sublethal (1.11 µg/L) concentration of cypermethrin on biochemical cluster of tadpoles of *Duttaphrynus melanostictus*. Significant changes were observed in total, soluble and structural protein fractions following cypermethrin exposure to subacute (1, 2, 4 and 6 days) durations in whole animal biochemical composition of *Duttaphrynus melanostictus*. Marked elevation in free amino acid level was observed at all the exposure tenures. Generation of reactive oxygen species with endpoint induction of oxidative stress were evidenced by decrease in activity of catalase, glutathione-S-transferase and increased levels of hydrogen peroxide, reduced glutathione and malodialdehyde levels. The outcome clearly suggests the increased susceptibility of *Duttaphrynus melanostictus* tadpoles to sublethal concentrations of cypermethrin, thus implicating the toxicant to possess detrimental health effects on *Duttaphrynus melanostictus* species. The study may contribute in environmental monitoring and assessment of water bodies with possible cypermethrin contamination.

1. INTRODUCTION

Worldwide decline in amphibian population has become a major issue of global concern [1]. Annual global use of agricultural sprays is estimated to be 11.2 billion kg [2]. With this range of indiscriminate pesticide use, has resulted in inevitable consequence of compromised health status of aquatic fauna with partial contribution to drastic decline in amphibian population as well [3, 4]. According to the first global assessment of the status of amphibian species, more than 40% of the world's 5743 amphibian species have experienced recent declines, a situation far worse than that reported for mammals or birds [5]. With aquatic systems often being contaminated with pesticides [6], the amphibian susceptibility have been known to reach alarming levels [7, 8]. While pesticides have the potential to affect many non-target aquatic taxa [9], the inexorable conditions of amphibians begs the intervention to counter the excessive pesticide use. The increased permeability of skin and eggs in anurans is known to be one of the crucial cause for facilitating the immediate absorption of wide range of environmental xenobiotics [10, 11]. In addition, amphibians are known to complete a phase of their life cycle in shallow ponds and other freshwater aquatic bodies that may be the recipient of pesticidal residues adjacent to agriculture fields, where the possibilities of pesticidal exposure from agriculture outputs could be certain [12]. Cypermethrin (CY) is a synthetic pyrethroid, and is more suitable for agricultural use because of its improved potency and stability as well as low mammalian toxicity [13]. CY is known to act by disrupting sodium ion channels of the nerve membrane [14] and hence considered a reliable compound for controlling insect pests that could damage crop at large-scale [15].

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