

RESEARCH ARTICLE

## Effect of diazinon on survival and growth rate of *Bufo melanostictus* and *Polypedates cruciger* gill stage larvae

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**Abstract:** Amphibian populations are declining globally at an alarming rate and a growing body of evidence suggests that pesticides may be a major cause. The present study is aimed at providing empirical evidence for the potential impact of pesticides on amphibian populations. The effects of diazinon, a widely used organophosphate pesticide, on the survival and growth of larvae of two amphibians, the common toad *Bufo melanostictus* and the Sri Lankan endemic common hourglass frog *Polypedates cruciger* are investigated.

Larvae were laboratory bred from six egg clutches, three from each species, collected from ponds and wells located in home gardens in Delgoda and Malabe in the two districts of Gampaha and Colombo. Two separate trials were conducted using gill stage hatchlings (Gosner stages 20-22) of each species. The larvae were held in glass tanks and repeatedly exposed to 4 ug/L, 400 ug/L and 10 mg/L of diazinon for seven days. Larval mortality was recorded daily, whilst the body length and activity levels were measured at the end of the experiment.

Results showed that exposure to 10 mg/L of diazinon caused significant elevations ( $p < 0.05$ ) in larval mortality in both *B. melanostictus* and *P. cruciger* as compared to the controls. On the other hand, no significant increases in mortality were noted at 4 and 400 ug/L. The trends in mortality were significant and positive for both species. Growth retardation was also noted at the highest dose of 10 mg/L, these larvae being significantly smaller than those in the controls ( $p < 0.05$ ). Larval activity was also seriously impaired at the highest dose. This study is one of the initial studies that have provided empirical evidence of the harmful effects of pesticides on larval mortality, growth and activity of native amphibian species in Sri Lanka. In view of these findings, we suggest that pesticides may facilitate the decline of many amphibian populations in Sri Lanka.

**Keywords:** *Bufo melanostictus*, diazinon, mortality, organophosphate pesticide, *Polypedates cruciger*, tadpoles

### INTRODUCTION

The widespread application of pesticides has attracted the attention of ecologists due to the impacts of these chemicals on natural communities. A diversity of pesticides and their residues are present in a variety of aquatic habitats<sup>1</sup>. While pesticides have the potential to affect many types of aquatic organisms, amphibian larvae are especially sensitive because of their permeable skin and gills<sup>2</sup>. Not surprisingly, pesticides have been identified as one of the major causes of amphibian declines worldwide<sup>3-6</sup>.

Sri Lanka, with about 2% of the world's amphibian fauna, has been recognized as a global amphibian hotspot. The island supports more than a hundred species, of which 88 are found nowhere else in the world<sup>7</sup>. The majority of these amphibians, especially the endemics, are restricted to the southwestern rainforests that are mostly surrounded by agricultural plantations. Although no data are yet available on population trends of Sri Lankan amphibians, it is clear that many species have undergone range reductions or population declines in the last decade. It is of significance that about 70 % of the island's amphibians are currently facing the threat of extinction<sup>7</sup>. The expansion of agriculture, horticultural industries in the country and the accompanying increase in the use of pesticides<sup>8</sup> have been implicated as probable causes for the threatened status of many of these amphibian species<sup>7</sup>. Despite the widely held belief that pesticides are responsible for amphibian declines in Sri Lanka, there is a dearth of empirical evidence to justify these claims.

To understand the effect of pesticides on amphibian decline it is necessary to first understand their direct

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