TOXICITY OF INSECTICIDES TO *MACROBRACHIUM LAMARREI* (H. MILNE EDWARDS) (DECAPODA, PALAEMONIDAE)

BY

OMKAR and G. S. SHUKLA
Pollution Relevant Research Laboratory, Department of Zoology, University of Gorakhpur, Gorakhpur-273001, India

INTRODUCTION

Pesticides are economic chemicals employed to regulate the impact of noxious plants and animals upon our life and economy. The effect of vast majority are relatively non-selective and usage therefore may result in undesirable even unanticipated side-effects.

Use of pesticides had undoubtedly contributed to increase the crop-yield and human health, but has also produced a number of adverse effects including wide-spread pollution of natural environment, with damage to shell fisheries, inland fisheries, beneficial insects, and occasional with overt poisoning of human beings.

Among various types of pesticides, organophosphate and carbamate insecticides are now being increasingly used in place of organochlorines, due to their biodegradable nature and lesser degree of persistency in the environment. After their use, these pesticides drain into rivers, ponds and tanks from the crop fields.

A survey of literature reveals that, as regards side effects, most of the work on the toxicity of pesticides has been done on various kinds of insects and fishes. Comparatively little work has been done on crustaceans (Eisler, 1969; Sanders, 1969; McLeese, 1976; Khorram & Knight, 1977; Sundaram & Szeto, 1979; McLeese et al., 1980; Abdel, 1980; Woodward & Mauck, 1980; Sanders et al., 1981; Stephenson, 1982). But, no work seems to has been done on freshwater prawn except by Shukla & Omkar (1984, in press). Freshwater prawns are abundantly available in local water sources and they are a cheap and protein-rich source of food for human beings. The scarcity of literature on the toxicity of pesticides to freshwater prawn has initiated the present study. The insecticides selected for the present investigation are being commonly used in various parts of India.

In the present study an attempt has been made to investigate the acute (short-term) toxicity of three organophosphates (quinalphos, dichlorvos and monocrotophos) and one carbamate insecticide (carbaryl) to a freshwater prawn, *Macrobrachium lamarrei* (H. Milne Edwards).
MATERIALS AND METHODS

Specimens of *M. lamarrei* were collected from Ramgarh lake, brought immediately to the laboratory and acclimated for three days to the laboratory conditions. During this period specimens were fed on dried prawn powder and diatoms. Feeding was stopped 24 hours before the beginning of the experiments and no food was given during experiments, to avoid contamination by excrements in the test solution. Three organophosphate insecticides namely quinalphos (Ekalux, 25 E.C.), dichlorvos (Nuvan, DDVP, 76 E.C.) and monocrotophos (Nuvacron, 36 E.C.) and one carbamate insecticide carbaryl (Sevin, 99.9%) were used as toxicant. The stock solutions of these toxicants were prepared by dissolving a weighed quantity of 100% active ingredients of insecticides in 1.0 ml acetone and further diluted by adding distilled water. Plastic containers of fifteen litre capacity were used as test container. A series of six concentrations (toxic range determined by exploratory tests) of each insecticide were prepared by adding a calculated volume of stock in ten litre dechlorinated tap water (pH, 7.5 ± 0.2; dissolved oxygen, 7.6 ± 0.3 mg/l; total hardness as CaCO₃, 113.5 ± 1.5 mg/l and temperature, 26 ± 2°C). One container was used for control having 1.0 ml acetone in ten litre dechlorinated tap water. Ten healthy specimens of average size (length, 64 ± 2 mm and 1.2 ± 0.2 g in weight) were transferred carefully from the acclimatization tank to the test solution and bioassays were carried out. The bioassay methods were similar to standard methods (APHA et al., 1971). The whole set was aerated continuously with compressed air using stone diffusers (2.5 cm³) to fulfil the O₂ requirement of the prawns during acclimation and test periods. The test solutions were replaced by fresh solutions of respective concentrations after every 24 hours to maintain constant concentration of insecticides in the test solution. Each experiment was replicated three times. The different reactions in response to insecticidal stress were observed carefully, concomitant mortality was recorded after 24, 48, 72 and 96 hours exposure and dead animals were removed regularly from the test solutions. The animals were considered dead when they did not respond to gently touching with a glass rod and when their colour turned white. The obtained data were statistically analysed (Goulden, 1959) to calculate the values of LC₂₅, LC₅₀, LC₇₅ and 95% confidence limits of LC₅₀.

RESULTS

Prawns are active animals, so the symptoms of insecticide intoxication are easily detectable. They became restless in the test solutions of each insecticide, but earlier so in high concentrations than in lower ones. The first indication of insecticide poisoning was irritability, during this phase they became excited, showed erratic swimming and tried to jump out of the containers with test solutions. The irritability was followed by impaired locomotion, restriction of ap-