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Toxicity of Phosphamidon to the Common South Indian Earthworm *Lampeto mauritii*

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Earthworms which are of considerable importance in improving soil aeration, drainage and fertility are of great value as indicator species representing the terrestrial environment of the biosphere. Extensive use of organophosphorus compounds has resulted in[a]widespread distribution in the environment. The increasing demand for organic pesticides in public health and agriculture practices (Hayes 1964; Long 1971) resulted in the production of numerous formulations (Macdonald and Deichmann 1970) which form a group of poisonous chemicals (Datta and Dikshith 1973) resulting in an imbalance in the ecosystem (Mrak 1969). There is an increasing concern over their toxic hazards due to their indiscriminate use in the environment (Matsumara et al. 1972). Several attempts have been made to evaluate these hazards on biota (Majumdar and Solomon 1971; Robert et al 1975). The non-target organisms are affected by pesticides either directly through toxicity and/or indirectly through changes in the environment. Hence, an attempt is made in the present study on the toxicity of phosphamidon to Lampeto mauritii besides calculating the 24, 48, 72, and 96 hrs LC_{50} values using renewal technique (EPA 1975).

MATERIALS AND METHODS

Lampeto mauritii were dug out from the kitchen gardens of residential localities in Visakhapatnam and were acclimated to laboratory conditions with pond water medium (temperature 30 ± 1° C). The

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TABLE 1. Toxicity of Phosphamidon to L.mauritii

Duration of experiment (hrs)	LC_{50} (ppm)		95% Fiducial limits	
	Water medium	Vermiculite medium	Water medium	Vermiculite medium
24	16.53	26.95	14.14-19.33	26.30-27.61
48	14.04	25.79	12.08-16.30	24.91-26.70
72	12.20	24.11	9.83-15.14	23.11-25.16
96	10.34	22.51	8.63-12.39	21.52-23.55

toxicity tests were conducted employing renewal technique as recommended (EPA 1975). The physiological responses to pesticide impact were studied in the earthworms fed with pulp made of blotting paper which has no nutritive value and these animals were treated as 'controls'. Healthy and nearly equal sized worms (12-15 cm) were selected for experimentation. Standard solution of 1 mg/ml (W/V) of technical grade phosphamidon was prepared in acetone. Worms in batches of 10 each were used for each concentration with water, as well as vermiculite (to simulate the soil habitat for the worms) and the experiment was repeated 4 or 5 times till the percentage mortality in each of the experiments was constant. Pilot experiments were conducted to choose concentrations which resulted in mortality range of 5 to 95 per cent. To maintain uniform conditions throughout the experiment 200 ml of water together with 100 gm of vermiculite per animal were provided in water and vermiculite milieu respectively. The data were pooled for calculating the LC_{50} value. LC_{50} values were calculated by using the unweighted regression method of probit analysis (Finney 1971).

RESULTS AND DISCUSSION

The results are presented in Table 1. The difference between observed and calculated values was tested for significance using Chi-square test which showed that the difference was not significant at p=0.05 level at concentrations of 16.53, 14.04, 12.20, and 10.34 ppm respectively. The worms were also exposed to the pesticide in vermiculite. The LC_{50} values for 24, 48, 72, and 96 hrs are 26.95, 25.79, 24.11, and 22.51 mg/kg of vermiculite respectively. The results indicate that the worms showed higher mortality rate, even at lower concentrations of phosphamidon in water medium than in vermiculite. High mortality rate in water may be due to two reasons. The pesticide in a medium of water diffuses into body easily through the body wall. As there is no food supply, naturally the animals will starve. At higher concentrations swellings appeared on the body of the worms and the worms looked weak. Either recovery of the worm or its death occurred after one or two days. Stenersen et al (1973) reported that the carbamate insectisides carbaryl and carbofuran are highly toxic to the earthworm Lumbricus terrestris producing characteristic sores and tumor-like swellings. Very few

insecticides have been tested with earthworms in the laboratory and majority of the work was done in the field. The LC_{50} value (375 ppm; 30 days) of the earthworm Pontoscolex corethrurus to Sevin® under soil exposure was found to be very high (Kale and Krishnamoorthy 1979). The herbicide atrazine (Edwards 1970) and insecticides carbaryl, aldicarb, carbofuran (Kring 1969; Thompson 1970; Edwards 1973; Tomlin and Gore 1974; Stenersen et al. 1973) affect the earthworm populations either by reducing immobility of worms or causing heavy mortality. The hyperactivity of the individuals at lower pesticide contamination and the lethargy developed at higher concentrations in the survivors may have great influence on the population dynamics of earthworms (Kale and Krishnamoorthy 1979). Based on laboratory studies Richards and Cutkomp (1946) and Martin and Wiggans (1959) showed that the earthworms immersed in various concentrations of DDT in water could survive amounts of at least 1:10,000. In the present study L.mauritii showed that the toxicity increased with exposure period. This suggests that the toxicity is associated with accumulation of phosphamidon in excess amounts that may be metabolised and prove injurious to the earthworms.

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