

## Phenthoate Toxicity in Prawns, *Penaeus indicus* H. Milne Edwards & *Metapenaeus monoceros* (Fabricius)

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*P. indicus* and *M. monoceros* exhibited differential response towards phenthoate toxicity when exposed to different concentrations under 24 and 48 h exposure.

Of the many pollutants that the estuaries and coastal waters receive, pesticides occupy a pivotal place<sup>1-3</sup>. The effect of pollutants will be more severe in estuaries since they are retained for long periods in these regions due to tidal influence, which may not only result in mass mortality of nursing prawns and fishes but also in hazards to human health. The present report is an evaluation of toxicity of phenthoate in 2 species of prawns, *Penaeus indicus* and *Metapenaeus monoceros*.

*P. indicus* and *M. monoceros* of  $60 \pm 10$  mm length and  $1.8 \pm 0.5$  g wet weight were collected from the Upputeru estuary near Kavali (14° 50' E and 80° 5' N). They were kept separately in plastic containers and acclimatized to laboratory conditions for a week in seawater with continuous aeration. The prawns were fed on rice bran and oil cake. Water was changed daily to remove scattered food particles and excreta.

Technical grade phenthoate, *o.o*-dimethyl, S-(ethoxycarbonyl benzyl) phosphorothiolothionate, of 98% w/w purity was used. A stock solution of 1000 ppm was prepared by dissolving phenthoate in acetone. The quantity of acetone used in the present study (0.5 ml) is very low and hence nontoxic<sup>4</sup>. However, acetone controls were also maintained to study its effects, if any.

Dosage-mortality studies were conducted at water temperature  $27 \pm 1^\circ\text{C}$  under static medium by adopting the bioassay procedure<sup>5</sup> for 24 and 48 h

exposure periods. Salinity of the seawater used was  $25 \pm 2 \times 10^{-3}$  and pH was  $7.8 \pm 0.2$ , the same as the salinity and pH of the habitat. The prawns were sorted into batches of 12 in such a way that they follow the biomass theory ( $1 \text{ g wet wt. l}^{-1}$ ).

The stock solution was added to the test animal containers to yield final concentrations ranging from 0.005 to 0.04 ppm. About 50 to 60 individuals were used for each experimentation. During LC<sub>50</sub> determination, the control and the experimental prawns were aerated twice a day for about 30 min to prevent hypoxia in the medium<sup>6</sup>.

The data were subjected to probit analysis wherein the probit mortality was obtained from percent mortality. LC<sub>50</sub> value, its standard error, 95% confidence limits and slope value of the probit line were calculated<sup>7</sup> for both 24 and 48 h exposure. Mortality of prawns at different concentrations of phenthoate are given in Table 1. LC<sub>50</sub> values obtained by plotting the percent kill against log concentration were almost the same (Table 2). The differences in LC<sub>50</sub> values of phenthoate between the 2 species suggests the differential toxicity in relation to species specificity.

In lower concentrations of phenthoate, prawns exhibited very mild and sluggish movements while in higher concentrations jerky movements followed by fast swimming along the sides of the trough were

Table 1—Mortality of *P. indicus* and *M. monoceros* at Different Concentrations of Phenthoate

(For each concentration 12 animals were used. Each value is an average of 5 individual observations)

| Conc.<br>ppm | <i>P. indicus</i> |      |             |      | <i>M. monoceros</i> |      |             |      |
|--------------|-------------------|------|-------------|------|---------------------|------|-------------|------|
|              | Percent kill      |      | Probit kill |      | Percent kill        |      | Probit kill |      |
|              | 24 h              | 48 h | 24 h        | 48 h | 24 h                | 48 h | 24 h        | 48 h |
| 0.005        | 0                 | 0    | 3           | 3    | 0                   | 0    | 3.0         | 3.0  |
| 0.01         | 25                | 25   | 4.33        | 4.33 | 8.3                 | 33.3 | 3.59        | 4.56 |
| 0.02         | 67                | 83.3 | 5.44        | 5.95 | 33.3                | 83.3 | 4.56        | 5.95 |
| 0.03         | 91.7              | 100  | 6.41        | 8.09 | 75.0                | 100  | 5.67        | 8.09 |
| 0.04         | 100               | 100  | 8.09        | 8.09 | 100.0               | 100  | 8.09        | 8.09 |

Table 2—The 24 and 48 h LC<sub>50</sub> Values, Slope and 95% Confidence Limits of Phenthoate Toxicity to *P. indicus* and *M. monoceros*

| Exposure (h)        | LC <sub>50</sub> ppm | SE      | Slope  | 95% confidence limits (ppm) |             |
|---------------------|----------------------|---------|--------|-----------------------------|-------------|
|                     |                      |         |        | Lower limit                 | Upper limit |
| <i>P. indicus</i>   |                      |         |        |                             |             |
| 24                  | 0.0146               | ±0.0025 | 3.6877 | 0.0101                      | 0.0191      |
| 48                  | 0.0127               | ±0.0016 | 5.3820 | 0.0096                      | 0.0159      |
| <i>M. monoceros</i> |                      |         |        |                             |             |
| 24                  | 0.0222               | ±0.0020 | 6.3032 | 0.0183                      | 0.0261      |
| 48                  | 0.0129               | ±0.0018 | 4.6179 | 0.0093                      | 0.0164      |

observed immediately after exposure. In many cases, the individuals of *P. indicus* have even shed their exoskeleton within 12 h of exposure. However, such behaviour has not been exhibited by *M. monoceros*. Both the species, interestingly, showed differential response towards phenthoate toxicity as against the period of exposure. *M. monoceros* which showed

homogenous response towards phenthoate toxicity at 24 h exposure period became heterogenous in response at 48 h, and the response was vice versa in case of *P. indicus* with reference to slope values and confidence limits (Table 2).

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