

Estimation of LC_{50} Values for *Puntius Ticto* and *Rasbora Daniconius* with Dimethoate Pesticide

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Abstract:

The experiments were conducted to estimate LC_{50} values for *Barbus ticto* and *Rasbora daniconius* exposed to dimethoate pesticide. Well acclimatized healthy fishes were selected for acute toxicity test for dimethoate pesticide. Different numbers of concentrations were prepared and batch five fishes of *P. ticto* and *Rasbora daniconius* were exposed to each concentration. Observations were made after every 24 hrs upto 96 hrs, dead fishes during experimental period were removed and recorded. LC_{50} values were estimated using graphical method. Dimethoate was found to be more toxic to Rasbora and Puntius, as the LC_{50} values were 3.936 ppm and 5.070 ppm respectively.

Key words: Dimethoate, Pesticide, *Puntius ticto*. *Rasbora daniconius*.

Introduction:

Pesticides, herbicides and industrial wastes find their way in the freshwater resources and contaminate it. These toxicants indirectly cause considerable damage to aquatic life including economically important species of fishes. Exposure to pollutants creates many molecular and biochemical changes in fish which precedes cellular disfunctions. Thus early warning signs of distress can be detected by monitoring appropriate parameters.

The toxic effects of large number of chemicals, heavy metals and pesticides in fishes have been studied by Ketz (1969), Brown *et al.* (1967), Joshi *et al.* (1981), Alam *et al.* (1995), Shanthakumar *et al.* (2000). Dimethoate is an organophosphorus pesticide, widely used against vegetable and fruit sucking aphids and mites. The present work was undertaken to observe the effects of dimethoate on mortality and survival of *P. ticto* and *R. daniconius*.

Material and Methods:

The test fishes *P.ticto* and *R.daniconius* were selected for the present investigation because of their easy availability, moderate sensitivity and easy maintenance in the laboratory. Fishes were collected from the nearby freshwater resources around Aurangabad. Adult healthy specimens preferably females of *Puntius* (5-7cm, 3.5-5.5gm) and *Rasbora* (06-09 cm, 3.5-4.5 gm) and allowed to acclimatize to the laboratory conditions for four weeks.

The standard methods for preparation of pesticide formulation and for detection of physicochemical characteristics of test water, APHA (1995) were followed (Table No. 1). The pilot tests were performed for the selection of test concentrations. The range of concentrations selected was varied from 0 to 100 percent mortality.

On the basis of pilot and five healthy females of same size and weight of *P. ticto* and *R. daniconius* were exposed to various concentrations. The bioassays were started in the morning and animal mortality was recorded after every 24 hrs. The mortality and survival of fish was recorded after 24, 48, 72 and 96 hrs. The dead specimens were removed immediately from the test aquarium.

Results and Discussion:

The LC_{50} values for different durations were calculated and estimated by regression analysis (Ghosh, 1962). The LC_{50} values for dimethoate to *P. ticto* and *R. daniconius* for 96 hrs were 5.070 ppm and 3.936 ppm respectively (Table No. 2). These values indicated that dimethoate was more toxic to *P. ticto* than *R. daniconius*.

The fishes exposed to lethal concentration of toxicant for short term were studied in relation to their mortality and survival. The *P. ticto* and *R. daniconius* were exposed to dimethoate showed rapid movements in *R. daniconius* than *P. ticto*. Similar results were obtained by Peshine *et al.* (2000) in *Lebistes reticulatus* with toxicants zinc sulphate and mercuric chloride.

Tilak *et al.* (1980) studied toxicity of carbaryl and 1-napthal to fish *Labeo rohita* of two size groups and reported LC_{50} values for 96 hrs. The 96 hrs LC_{50} values for carbaryl ranges from 1.2-4.6 ppm. The values show the relationship between size group of the test fish and dose.

Bengeri *et al.* (1986) determined 96 hrs LC₅₀ value for copper sulphate to the test fish *Lepidocephalichthyes guntea* weight 0.334 gm and 1.2 gm as 2.0mg/l and 3.77mg/l respectively.

Alam and Shafi (1990) determined the LC₅₀ values for ekalux to the test fish fingerling of a carp *Catla catla* at 3.0 ppm.

Peshine and Kurve (2000) determined LC50 values for *Lebistes reticulatus* with toxicants zinc sulphate and mercuric chloride which are 22.35 mg/l and 2.44 mg/l for 96 hrs respectively.

Srivastava *et al.* (1997) estimated LC50 values of detamethrin on a freshwater fish *Heteropneustus fossilis* which are 3.10, 2.30, 2.10 and 1.86 µg/lit at 24, 48, 72 and 96 hrs respectively.

Toxicity depends upon size of animals and time duration exposure (Bengeri *et al.* 1986; Tilak *et al.* 1980). During present investigation toxicity of dimethoate is more in *Rasbora* than *Puntius*.

In present study the survival rate of *P. ticto* decreases with increase in the concentration of dimethoate. Further the mortality rate was found to be linked to duration of exposure, it was higher in fishes exposed 96 hrs compared to those exposed for 48 hrs. The exact cause of death is ill defined as there are number of channels. The death may be the result of severe physiological stress as cellular as well as organism level. The exact cause of death is explained by Abel and Skidmore (1975), the severe physiological stress responsible for the death of fishes.

Table No. 1. Physicochemical characteristics of test water

| | |
|------------------|---------------------|
| Temperature | 26°C (24-28°C) |
| Conductivity | 0.73 mMHO |
| Acidity | 3.6 (3.2-4.3) ppm |
| Alkalinity | 29 (27-31) ppm |
| Total hardness | 71 (68-79) ppm |
| Dissolved oxygen | 6.6 (6.2-6.9) |
| pH | 7.4 (7.2-7.7) |
| Weight of fish | 4325 (3925-4625) mg |
| Length of fish | 63 (59-67) mm. |

Table No. 2.

LC₅₀ values for dimethoate to *Puntius ticto* and *Rasbora daniconius* for 96 hrs.

| Sr. No. | Conc. In ppm. | Survival and Mortality | | | | | | | |
|---------|---------------|------------------------|-----|-------|-----|--------|-----|--------|-----|
| | | 24 hrs | | 48hrs | | 72 hrs | | 96 hrs | |
| 1. | 3.60 | 100 | 00 | 100 | 00 | 100 | 00 | 100 | 00 |
| 2. | 4.20 | 100 | 00 | 100 | 00 | 80 | 20 | 80 | 20 |
| 3. | 4.80 | 80 | 20 | 80 | 20 | 60 | 40 | 60 | 4-0 |
| 4. | 5.40 | 80 | 20 | 60 | 40 | 40 | 60 | 40 | 60 |
| 5. | 6.00 | 60 | 40 | 40 | 60 | 40 | 60 | 20 | 80 |
| 6. | 6.60 | 60 | 40 | 40 | 60 | 40 | 60 | 20 | 80 |
| 7. | 7.20 | 40 | 60 | 40 | 60 | 20 | 80 | 00 | 100 |
| 8. | 7.80 | 20 | 80 | 20 | 80 | 00 | 100 | - | - |
| 9. | 8.40 | 20 | 80 | 00 | 100 | - | - | - | - |
| 10. | 9.00 | 20 | 80 | 00 | 100 | - | - | - | - |
| 11. | 9.60 | 20 | 100 | - | - | - | - | - | - |

LC₅₀ 96 hrs = 5.012

S = Survival

LC₅₀ 72 hrs = 5.070

M = Mortality.

LC₅₀ 48 hrs = 5.555

LC₅₀ 24 hrs = 6.839

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