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The Effects of Plants Toxin from Fruit Extract of *Sapindus laurifolius* on Mortality of Fresh Water Snail, *Bellamya bengalensis* (Lamark)

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ABSTRACT : In order to elucidate the effects of toxin form the fruit extract of *Sapindus laurifolius* on the mortality of fresh water snail, *Bellamya bengalensis*, the present investigation was undertaken. The LC_{50} values of this toxin were determined for the 24 hrs., 48 hrs., 72 hrs. and 96 hrs. by using Probit analysis method (Finney, 1971). The LC_{50} value was found to be 376.6, 215.3, 163.1 and 136.9 ppm for 24 hrs., 48 hrs., 72 hrs. and 96 hrs., respectively. The results indicated that the mortality of *Bellamya bengalensis* when exposed to the above mention plant toxin was dose and time dependent. As the concentration of the toxin was increased, the time to kill 5o per cent snails was decreased and vice-versa. Similarly, if the exposure period increased in the particular concentration of the toxin the rate of mortality was also increased with advancing the exposure period. Such dose and time dependent mortality responses of the snail are interpreted in relation to the toxicity of active principles in the fruit extract of *Sapindus laurifolius*.

Keywords : *Bellamya bengalensis*, fruit extract of *Sapindus laurifolius*, mortality.

INTRODUCTION

Mortality is nothing but the death of an organism at a particular time. Recently, the death rate of an organism is increased tremendously mainly due to fluctuations in environmental conditions (temperature, pH, salinity, humidity, etc.) and also due to pollution. Polluted environment is less suitable for existing life forms (Menzel, 1977).

The indiscriminate use of chemical fertilizers and pesticides created a problem of pollution. In agricultural practices farmers in order to get more yields used herbicides, molluscicides, etc., to control the pests. These substances may affect the behavior of animal, different organ systems like respiration, reproduction, etc. Animals cannot sustain the high toxicity of pollutants, they may die. These substances produce cumulative deleterious effect not only on fishes but also on food web organisms inhabiting the environment.

Mortality plays an important role in toxicity study. To calculate the sub lethal (LC_{50}) and lethal (LC_{100}) dose of toxin for particular animal, it is necessary to know the per cent mortality of that animal for particular period, *i.e.* it is the concentration that theoretically kills 50% or 100% of the total population of test animals within a fixed period of time (Buikema and Benfield, 1982; Sivaramakrishna *et. al.*, 1991; Schmitt *et. al.*, 1999). The concentrations are generally expressed in parts per million (ppm) or parts per billion (ppb) to assess the toxicity of a toxin.

The toxicity of particular pollutants depends on many factors such as animal weight (Pickering *et. al.*, 1962), its developmental stages (Kamaldeep and Toor, 1975), period of exposure, temperature (Macek *et. al.*, 1969), pH, hardness of water and dissolved oxygen contents of medium. The change in oxygen consumption can be considered as a tool in evaluation of toxicity by many workers in different aquatic animals (Mane *et. al.*, 1983; Muley *et. al.*, 1987; Chaudhari *et. al.*, 1988).

Snails are also important in agricultural practices as these are harmful pests of paddy and vegetables. They damage the root caps, vegetables mostly they damage the roots of paddy and hence so called 'Paddy root weevil'. Hence, in the present investigation it was aimed to study the mortality responses induced due to application of fruit extract of *Sapindus laurifolius* to freshwater snail, *Bellamya bengalensis*.

MATERIAL AND METHODS

For present investigation freshwater snail, *Bellamya bengalensis* was selected as experimental animal and fruit extract from plant *Sapindus laurifolius* was selected for treatment.

Experimental design

Snails were collected from Rajaram tank, near Shivaji University, Kolhapur and brought to laboratory. They were kept in plastic troughs for acclimatization. They were daily provided with proper food and ventilation. For experiment, large size snails, on an average weight and length (3.5-4.5 gm and 1.5-2.5 cm) were selected and experiments were carried in plastic troughs having capacity of 5 liters. Six troughs were taken with 10 snails each and provided with 5 liter. water. One trough was considered as control and other five for different concentrations *i.e.* 100, 200, 300, 400 and 500 ppm concentration of fruit extract of *Sapindus*

laurifolius for the different time interval *i.e.* 24 hrs., 48 hrs., 72 hrs. and 96 hrs. of exposure period.

The number of dead snails from each trough was recorded after intoxication period of 24 hrs., 48 hrs., 72 hrs, and 96 hrs. to study the mortality responses of exposed snails. The dead snails were removed immediately. The experiments were repeated 3 times for avoiding the error.

The observations were made on the snail mortality (mori bond snail was also considered as dead one). Per cent mortality rates were recorded at 24 hrs. of time intervals upto 96 hrs. The values above 0.5 were rounded off to next higher number while values less than 0.5 were rounded off to the lower numbers. Final data was subjected to Probit analysis (Finney, 1971) to find out the 50% concentration (LC_{50}) after each 24 hrs. time interval.

RESULT

The freshwater snail, *Bellamya bengalensis* when exposed to different concentrations of fruit extract from Sapindus laurifolius showed mortality. There was no mortality observed in the control set, where as mortality was observed in intoxicated snails. It must be noticed that all environmental factors like temperature, hardness, salinity and pH and dissolved oxygen of water in the control and experimental troughs were normal even after addition of the toxin. This clearly indicated that no factor other than plant toxin was responsible for the mortality of snails. The per cent mortality is recorded in Table 1. By using percent mortality data the Probit (*Y*), *LnX*, LnX^2 and *LnXY* values were determined. The regression equations and LC_{50} values were determined by using values of '*b*' and '*a*'. The "*b*' and '*a*' values and regression equations for fruit extract of *Sapindus laurifolius* when snails were exposed for 24 hrs., 48 hrs., 72 hrs. and 96 hrs. are recorded in Table 2. The graphs of Probit (*Y*) against Log concentration (*LnX*) were plotted for different concentrations and from these graphs LC_{50} values were estimated by using Probit as five.

The LC_{50} values for fruit extract from Sapindus laurifolius were found to be 376.6 ppm for 24 hrs. of exposure, 215.3 ppm for 48 hrs. of exposure, 163.1 ppm for 72 hrs. of exposure and 136.9 ppm for 96 hrs. of exposure (by calculations). The mortality responses of snails were found altered in different concentrations at different time interval. The LC_{50} values for fruit extract from *Sapindus laurifolius* were found to be 377.6 ppm for 24 hrs. of exposure, 215.1 ppm for 48 hrs. of exposure, 163.1 ppm for 72 hrs. of exposure and 136.8 ppm for 96 hrs. of exposure (by graph). The LC50 values determined by both calculations and graphical methods coincide with each other but have negligible difference.

From the data, it was clear that the per cent mortality was increased with increase in concentration of plant toxin. It was also noticed that per cent mortality was increased with increase in exposure period. Hence the per cent mortality was found associated with the concentration of plant toxin.

DISCUSSION

The study of mortality responses is an important criterion in toxicological analysis of any chemicals. Mortality is one of the most noticeable effects of toxicity. The mortality responses also plays key role in the toxicological studies. It is most essential to decide LC50 and LC100 doses of any toxin for particular animal. It will help to study toxicity of that toxin in a specific animal. In present investigation, freshwater snail, *Bellamya bengalensis* were exposed to fruit extract from *Sapindus laurifolius* to study the mortality responses.

These observations coincide with the observations of many other workers, Kulkarni *et. al.* (1989) studied effects of endocel on Paphia *laterisulca*, Rajeswara *et. al.* (1983) observed effects of phenthoate on *Pila globosa*, Muley and Mane (1989) on mercury salts to V. bengalensis and on copper sulphate toxicity to *Thiara turberculata* (Mule and Lomte, 1992).

The present study revealed that, gill tissue gets damaged due to toxic effect of *molluscicides*. The thick film of mucus was secreted by gills and foot to overcome the toxic effects. This might be the reason for death of the snails. Similar results were found by Rao *et. al.* (1990) when exposed *Thiara lineata* to cythion, malathion and endosulfan. Radhakrishnaiah (1988) on *Lamellidens marginalis* after exposure to cadmium. This may be one of cause of mortality because due to cellular damage of gill tissue, this directly affects the rate of respiration and ultimately leads to death.

Table 1: Mortality responses of freshwater snail, *Bellamya bengalensis* to fruit extract from *Sapindus laurifolius.*

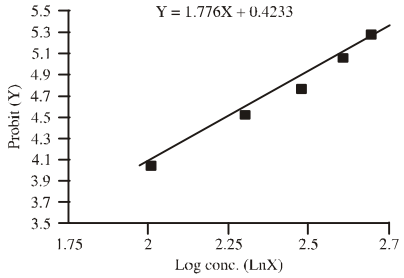
Per cent mortality for freshwater snail, Bellamya bengalensis when exposed to fruit extract from Sapindus laurifolius (%).

Concentration in ppm	*24 hrs.*	*48 hrs.*	*72 hrs.*	*96 hrs.*
Control	0.0	0.0	0.0	0.0
100	16	32	33	40
200	30	43	57	63
300	40	63	70	77
400	53	73	80	83
500	60	77	87	93

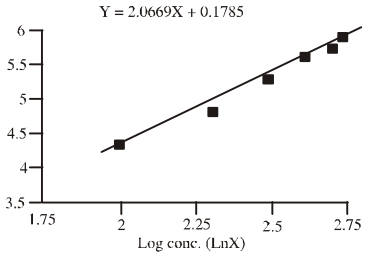
Table 2: Numerical data of '*b*' and '*a*' for the calculation of LC_{50} values and Regression equations for determination of toxicity of fruit extract from *Sapindus laurifolius*.

Values of 'b' and 'a' for calculation of LC_{50}			
Time of exposure in hrs.	***'b'***	***'a'***	***Regression equation***
24	1.7760	0.4233	Y = 0.4233 + 1.7760X
48	2.0669	0.1785	Y = 0.1785 + 2.0669X
72	2.201	0.1305	Y = 0.1305 + 2.2010X
96	2.3211	0.0423	Y = 0.0423 + 2.3211X

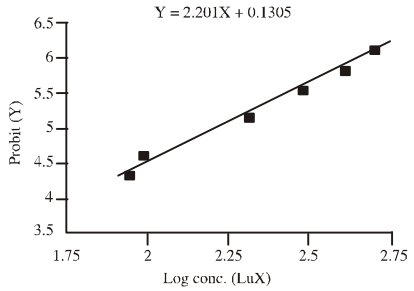
Graph 1. LC_{50} value and regression equation of fruit extract of *Sapindus laurifolius* for freshwater snail, *Bellamya bengalensis* at 24 hrs. of exposure.



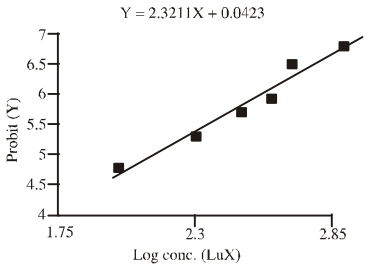
Graph 2. LC_{50} value and regression equation of fruit extract of *Sapindus laurifolius* for freshwater snail, *Bellamya bengalensis* at 48 hrs. of exposure.



Graph 3. LC_{50} value and regression equation of fruit extract of *Sapindus laurifolius* for freshwater snail, *Bellamya bengalens*is at 72 hrs. of exposure.



Graph 4. LC_{50} value and regression equation of fruit extract of *Sapindus laurifolius* for freshwater snail, *Bellamya bengalensis* at 96 hrs. of exposure.



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