

Toxicity of *Datura stramonium* to Three Cyprinid Fish of Kashmir

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ABSTRACT

In the present study toxicity of seed extract of *Datura stramonium* was tested against three fish species of Dal Lake, Kashmir. Mortality rate after 24hrs, 48hrs, 72hrs and after 5 days was recorded. The order of tolerance of the fish to different concentrations of oil and aqueous extracts of *Datura* seeds was *Cyprinus carpio* > *Crossocheilus diplochilus* > *Puntius conchonius*.

Keywords: *Datura*, seed extract, fish toxicity.

INTRODUCTION

In culture fisheries many a times uneconomical fish species find their way into ponds and compete for food with the cultivable species. Their eradication poses problems to the farmers. Although there are a number of chemical poisons available, the use of poisons of plant origin is environmentally more suitable. Several studies have been made to find out the impact of natural plant toxins on the various animals (Mahajan, 1994; Hussein, 1999; Oberndorfer *et al*, 2002; Sasaki *et al*, 2002) and to try these toxins for the elimination of unwanted plants and animals from aquaculture units. It is in this context that the response of three cyprinid fish species occurring in Kashmir to *Datura* extract was investigated during 2002. *Datura stramonium* (Family Solanaceae), a 4 - 5ft tall toxic annual herbaceous plant, grows naturally in Kashmir Himalayas (Dhar and Kachroo, 1983). The plant is distributed widely in cultivated fields, overgrazed pastures and on the banks of rivers, lakes and fertile lands. Of the three fish species, *Cyprinus carpio* is economically most important and is being cultured as well. *Crossocheilus diplochilus* contributes to the commercial fish catches from lakes but is not suited for fish culture. *Puntius conchonius* is a trash fish occurring together with other fish in lacustrine habitats of the valley. The data obtained regarding the response of these fish to *Datura* seed extracts in the laboratory are described in the present article.

MATERIAL AND METHODS

Ripe seeds collected from the plants growing in Kashmir University campus were dried under shade, powdered and soxhlet extracted with graded solvents. The extracts were concentrated on thin film evaporator and made free from solvent to afford a semisolid residue. Fish collected from the Dal Lake, Kashmir, by cast net, were acclimatized to the laboratory conditions prior to experimentation. 10 individuals per set of each species were used for experimental purpose. Control groups were run concurrently in de-chlorinated water. After acclimatization the fish were exposed to 10ppm and 20ppm concentrations of pet-ether and aqueous extracts of *Datura* seed in glass troughs. Mortality was recorded after 24hrs, 48hrs, 72hrs and at the end of 5 days. Physico-chemical characters of the de-chlorinated tap water used in the experiments were analysed as per the methods given in CSIR (1974), EPA(1976) and Eaton *et al* (1995).

RESULTS AND DISCUSSION

Physical and chemical characters of the water used in fish aquaria are given in the Table 1. The data show that all these environmental variables were within the normal range for the fish in the aquatic habitats of the region (Yousuf, 1996).

Table 1: Physico-chemical parameters of the de-chlorinated tap water used in aquaria.

Parameter	Value	Parameter	Value
Water temperature	5 °C	pH	8.14
Free CO ₂	4 mg/l	Dissolved Oxygen	6.4 mg/l
Conductivity	220 µS	Total alkalinity	73 mg/l
Total Hardness	80 mg/l	Chloride	12 mg/l
NO ₃ - N	220 µg/l	NH ₃ - N	40 µg/l

Toxicity of *Datura stramonium*

The data obtained regarding the rate of mortality in the three fishes exposed to the different concentrations of the *Datura* seed extract are presented in Table 2. When the fish were exposed to 10 ppm pet-ether extract of *Datura* seed, *Puntius conchonius* showed no

mortality for the first 24hrs, but 40%, 70% and 100% mortality was observed in this fish after 48hrs, 72hrs and 5days respectively. In case of *Crossocheilus diplochilus* 20% fish died after 24 hours of exposure, while after 48 hours the rate increased to 30%, and after 72 hrs and 120 hrs of exposure, the mortality increased to 60% and 100% respectively. *Cyprinus carpio* did not show any mortality for the first two days, but on the third day 10% mortality was recorded and after five days 50% of the fish died. When exposed to 20ppm pet-ether extract, *Puntius conchonius* recorded 30% mortality after one day of exposure. At the end of second day mortality increased to 70% and by the end of third day all the ten specimens died. In case of *Crossocheilus diplochilus*, the mortality was 30% after 24hrs, which increased to 60% by the end of second day. After 72hrs only 20% fish survived but these also died by the fifth day. *Cyprinus carpio* recorded the least mortality. Only 10% fish died after 24hrs and by the end of 48hrs mortality increased to 20%. By the end of 72hrs 50% of the fish were dead. Thereafter no further mortality was recorded in this species till the end of the experiment.

On exposure to 10ppm aqueous extract no mortality was recorded in all the three species for the first day. However, from the second day of the experiment the response varied in the three fish. In *Puntius conchonius* 30% mortality was recorded after 48hrs. By the end of the third day only 30% of fish survived and by the end of fifth day all the individuals died. By the end of 48hrs 30% of *Crossocheilus diplochilus* were dead. However, there was no further mortality during the next two days in this species. But at the end of fifth day all the individuals were dead. *Cyprinus carpio* recorded the least mortality. There was no mortality for the first day but by the end of the second day 20% fish died. There was no mortality during the next two days. However, by the end of five days the mortality increased to 50%.

Exposure to 20ppm aqueous extract also revealed varied response in the fish. However, one thing was common here. Mortality was recorded in all the three species on the first day itself. While *Puntius conchonius* and *Cyprinus carpio* recorded 20% mortality after 24hrs, *Crossocheilus diplochilus* recorded 30%. After 48hrs mortality increased to 50% in *Puntius conchonius*, 40% in *Crossocheilus diplochilus* and 30% in *Cyprinus carpio*. At the end of 72hrs the mortality rose to 70%, 80%, 50% in the three species respectively. While 100% mortality was recorded in *Puntius conchonius* and *Crossocheilus diplochilus* after fifth day, *Cyprinus carpio* did not show any mortality after the third day of the experiment.

Table 2: Extent of mortality (%) in three cyprinid fishes exposed to *Datura* seed.
(Note: There was no mortality in the fish kept as control)

Fish species	Water Extract							
	Concentration							
	10 ppm				20 ppm			
	% Mortality (after hours)							
	24	48	72	120	24	48	72	120
i. <i>Puntius conchonius</i>	0	30	70	100	20	50	70	100
ii. <i>Crossocheilus diplocheilus</i>	0	30	60	100	30	40	80	100
iii. <i>Cyprinus carpio</i>	0	0	20	50	20	30	50	50
Fish species	Pet – ether Extract							
	Concentration							
	10 ppm				20 ppm			
	% Mortality (after hours)							
	24	48	72	120	24	48	72	120
i. <i>Puntius conchonius</i>	0	40	70	100	30	70	100	X
ii. <i>Crossocheilus diplocheilus</i>	20	30	60	100	30	60	80	100
iii. <i>Cyprinus carpio</i>	0	0	10	50	10	20	50	50

Hussein (1999) pointed out that oil extract treatment of *Datura stramonium* to *Culex pipiens* caused drastic changes by showing reduced vitellogenesis, reduced synthesis of protein, carbohydrate, lipid contents and also reduced DNA and RNA materials. *D. stramonium* produced anisocoria in dog by simple contact with the eye (Hansen and Clerc, 2002). Ayuba and Ofojekwu (2002) pointed out that fingerlings of *Clarias gariepinus* exposed to *D. innoxia* exhibited loss of balance, respiratory distress and swam erratically just before death. In the present fish, activities similar to those reported by Ayuba and

Ofojekwu (op. c.) were observed. Both pet-ether and aqueous extracts showed high toxicity to the fish. *Puntius conchoniis* was the worst affected, followed by *Crossocheilus diplochilus* whereas *Cyprinus carpio* showed the least mortality rate. Our data indicate that *Datura* seed extract can be used as a piscicide for the elimination of unwanted predatory or uneconomical species and also for checking overcrowding of the fish in aquaculture units. However, further experiments are needed in this direction to reach final conclusion.

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