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Impact of Aquathol on blood urea level of *Heteropneustes fossilis*: an Indian freshwater cat-fish

Rupam Kumari and Raj Kumar

Abstract
The present work was undertaken to assess the impact of sublethal concentrations of Aquathol, a weedicide on blood urea level of *Heterpneustes fossilis.* Fishes exposed to various sublethal concentrations of aquathol (0.5 ppm, 1.0 ppm, 1.5 ppm and 2.0 ppm) exerted a marked significant increase in the level of blood urea with the increase of concentrations as well as the increasing time intervals, i.e. from 24 hrs upto 96 hrs. It might be due to its damaging effects on the renal tubules. Thus, urea estimation is mainly useful for the diagnosis of renal damage.

Keywords: Aquathol, blood urea, sublethal concentration, *Heterpneustes fossilis,* weedicide

Introduction
There is an increasing world concern over the indiscriminate use of weedicides / herbicides that result in environmental pollution and toxicity risk to non-target organisms (Valisek *et al*., 2009). These weedicides can enter aquatic ecosystems due to intensive usage causing harmful effects on fish population, cellular functions, growth and behaviour of aquatic organisms (Hanazato, 2001; Zou, 2003; Relyea, 2005) [3, 10, 7]. Blood is considered as the most important fluid in animals reflecting the physiological conditions. Hence, haematological study is widely used to identify the toxic impact of pollutants (Lakshmanan *et al*., 2013) [4].

Materials and Method
The present work was undertaken to assess the impact of Aquathol, a weedicide on blood urea level of *Heterpneustes fossilis* - an Indian cat-fish. Aquathol effectively eliminates a wide variety of submerged weeds. It begins working on contact to inhibit protein synthesis while breaking down cellular structure or submerged weeds and curly-leaf pond weed. It is quite effective against Hydrilla – a very common weed of Indian ponds. The fish was exposed to various sub-lethal concentrations of aquathol *viz*., 0.5 ppm, 1.0 ppm, 1.5 ppm and 2.0 ppm for different periods – 24 hours, 48 hours, 72 hours and 96 hours. The maximum concentration of aquathol selected here is 2.0 ppm which is sub-lethal concentration and below the maximum recommended dose (3 to 5 ppm) for the eradication of rooted weeds.
Fish of average length 18 ± 2 cm and weight 62 ± 2g were procured from fresh water sources and local fish market.
Fishes were treated with 0.1 % $KMNO_4$ to avoid any dermal infection. The fish stock was acclimatized in 100 L glass aquaria containing dechlorinated tap-water for 14 days. The physico –chemical characteristics of the tap water were analysed following the methods mentioned in APHA (1998) [1]. The water of aquarium was changed once every two days. The fish were fed with commercial fish food pellets during acclimatization.
Blood was taken from the lumen of cauda – dorsalis through a syringe rinsed with 3.8 % solution of sodium-citrate (an anticoagulant). In the present investigation blood Urea was estimated using Diacetyl – monoxime method as described by Natelson (1957) [6].

Result and Discussion
Fishes were exposed to various sublethal concentrations of Aquathol i.e. 0.5 ppm, 1.0 ppm, 1.5 ppm and 2.0 ppm for different time periods *viz*., 24 hrs, 48 hrs, 72 hrs and 96 hrs. Table 1 showed record of blood urea (in mg/100 ml of blood) of *Heteropneustes fossilis* subjected to

different concentrations for different durations of treatment of Aquathol. Aquathol treatment exerted a marked increase in the level of blood urea as explained below:

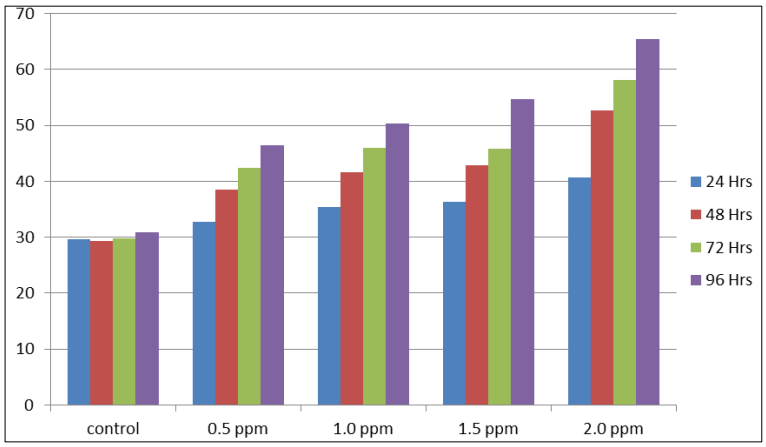
1. At 0.5 ppm the increase in its value at 72 hrs and 96 hrs of observation was highly significant ($P < 0.01$) from those of controlled condition and 24 hrs of observation.
2. At 1.0 ppm a statistically significant rise in the level of blood urea occurred from the controlled condition at and beyond 24 hrs.
3. At 1.5 ppm and 2.0 ppm a significant rise in the level of blood urea took place from the controlled condition upto 96 hrs.

In the present investigation a rise in the level of blood urea upto 96 hrs of the treatment of Aquathol (at all concentrations) might be due to its damaging effects on the renal tubules (Mathur, 1962) [5]. Common cause for increase in blood urea is inadequate excretion usually due to kidney damage and urinary obstruction (Goel, 1996) [2]. Sivaramakrishna and Radhakrishnayya (1998) [8] opined that an increase in urea level is due to conversion of part of excess ammonia into less toxic urea in the liver during active operation of ornithine cycle. Thus, urea estimation is mainly useful for the diagnosis of renal damage.

Table 1: Showing impact of various concentrations of Aquathol on Blood Urea level (in mg/100 ml of blood) of *Heteropneustes fossilis* at different hours of exposure (n = 10 animals in each group ±SE)

Parameter	Treatment Group (ppm)	Duration of Exposure (in Hrs.)			
		24 hrs.	48 hrs.	72 hrs.	96 hrs.
Blood Urea (mg/100ml blood)	0	29.69±0.23	29.32 ±0.21	29.77±0.31	30.95 ±0.44
	0.5	30.80±1.12	38.52± 1.41	42.38±1.32*	46.46±1.22*
	1.0	35.39±1.35*	41.60±1.31*	45.99±1.24*	50.41±1.24*
	1.5	36.27±1.41*	42.90±1.39*	45.78±1.33*	54.70±1.43*
	2.0	40.67±1.07*	52.69±1.47*	58.09±1.41*	65.37±1.38*

$P < 0.01$



Graph 1: Showing impact of various concentrations of Aquathol on Blood Urea level (in mg/100 ml of blood) of *Heteropneustes fossilis* at different hours of exposure (n = 10 animals in each group ±SE)

Conclusion

The present work suggests that a progressive increase in blood urea level is due to protein degradation or biochemical transformation of protein nitrogen into other nitrogenous products and renal malfunction. Thus aquathol exerts toxic effect on fish.

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