

Short – term toxicity of copper of two species of snails in Shatt – Arab estuary

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Abstract

The copper sensitivity of two species of snails in Shatt Al – Arab estuary (*Lymnae auricularia* (Linneus) and *Theodoxus jordani* (Sowerby)) were evaluated . The snails were subjected to different concentrations of copper for 24 and 48 hours . The experimental tests were carried out in laboratory using renewal toxicity system . The medium lethal concentration (LC₅₀) values indicated that the snail *L . auricularia* was more sensitive to copper than *T . jordani* .

Introduction

Water discharged into freshwater ecosystem from industrial effluents using copper may adversely effect aquatic biota . Depending on the sensitivity of the organism , copper may cause mortality or sublethal stress that reduces the ability of organism to compete effectively in its habitat .

The adverse effects of copper on molluscs are well documented (Eister etal . , 1978 ; Pesch etal . , 1979) . However , most of the researches have been conducted on marine species , primarily because of concern about the possible destruction of seafood resources . Information on the toxic effects of copper on freshwater molluscs were limited , and there were no toxicological studies on toxic effects of copper to molluscs from Shatt Al – Arab estuary .

Shatt Al-Arab estuary is received the contamination by copper from different industries such as oil refinery plants , power stations , paper mill and fertilizers industry as well as from a agriculture operations and domestic sewage (Abaychi and Doubul , 1985) . Thus , this study was conducted to determine the acute toxicity of copper to two common species (*Lymnae auriculata* (Linneus) and *Theodoxus jordani* (Sowerby)) of snails in Shatt Al – Arab estuary . This snails are well distributed mollusca in the intertidal and subtidal zones of the Shatt Al - Arab estuary and considered as an important part of food web in the stream . Data on toxicity will be useful in evaluating the potential impact on snails from copper released in industrial discharges .

Materials and Methods

Specimens of uniform size of adult snails *L . auriculata* and *T . jordani* were collected during 2004 from Garmat Ali region Figure (1) . The specimens were transferred into an aquarium for acclimation period of one week prior to start of the experiments , under laboratory temperature of 20±2°C with photo regim of 12 hours light and 12 hours dark under aerated conditions .

Stock solution of the copper was prepared by dissolving 3.801 g of Cu (NO₃)₂ . 3H₂O in distilled water and the volume was completed to 1000 ml in volumetric flask . A graded doeses of the stock solution of copper was added to volumetric flasks containing about 150 ml of water collected from the Shatt Al-Arab estuary (which was filtered and boiled before used) to prepare the test solutions . The resulting mixture was then mixed for about 15 minutes by using shaker at temperature of 20±2°C . After shaking , the volumes were brought to one liter with filtered and boiled river water . The solutions were allowed to equilibrate before the adding of animals for exposure . The pH , sanility and DO of test solutions were about (7.1 – 7.8) , (1.6) ppt and (5.0 – 5.1) mg / l respectively.

Renewal toxicity tests were conducted by exposing the snails to different concentrations for definite exposure time , after which the organisms were transferred to normal river water , ten individuals were placed in glass - jar (10 x 7 x 20 cm³ in size) , containing the test solution . The jar was covered by glass lid to reduce evaporation of water . The snails were left without

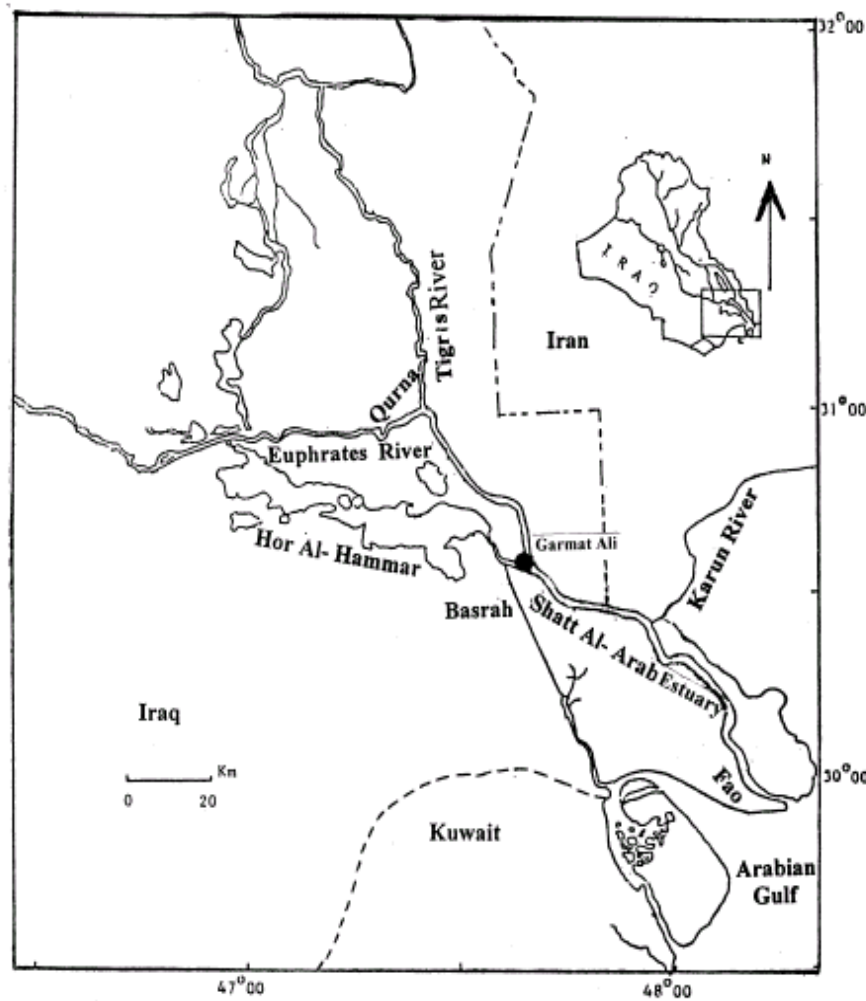
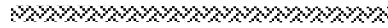


Figure (2) : Map of sampling location

Figure (1):Map of sampling location

food during the exposure experiment . Mortality of animal was recorded as being dead if no dissection movements , after 48 hours a recovery in clean river water was made . In all case , the test solutions changed daily. The test was set up in three replica along with three control (untreat) . 30 individuals were used for each replicate and for exposure time of 24 and 48 hours , the test was carried out using concentrations of 1 , 5 , 10 , 20 , 25 , 30 and 50 mg of copper / l of river water .

Some acute effects of copper on the snails were observed by monitoring the animals closely during exposure periods which will be discussion .

The LC₅₀ values and their upper and lower 95 % confidence limits were calculated by the methods described in UNEP (1989) .

Results and Discussion

Mortality occurred as a result of the toxicity tests and expressed in percentage and LC₅₀ values and their upper and lower confidence limit at two time intervals of the snails *L . auricularia* and *T . jordani* are shown in Table (1) . It appeared that survival of the snails generally decreased with increasing concentration and exposure time of copper . It is clear

. Sliver revealed a proportional higher increase with decreasing salinities in the soft – shell clam (Suter , 1993) . There is a “ normal ” increase in oxygen consumption at decreasing salinities because of the additional “ work ” to maintain the proper osmotic balance , and silver adds additional stress to an already stressful situation . Calabrese and Nelson (1974) studied the effects of salts of mercury , silver , zinc , copper , and lead on eggs , embryos , and larvae of the hard clam . The trend of toxicity was mercury > copper > silver > zinc > lead . The developed larvae were generally more tolerant to higher concentrations than the eggs and embryos .

In the present study , the total acute effects of copper on the snails *L . auricularia* and *T . jordani* are : restriction of normal activities , necrosis and anesthesia , loss of ability to react to the external cue , rupture of tissues and finally death . Those above effects are due to the toxic effects of copper on the snails which associated with their tissues in a sufficient amount to produce the abnormal activities and death . Gueniche *et al .* (1994) reported a more toxic effects of heavy metals on aquatic organisms including the neurophysiological effects , the influence on enzyme activity , the effect on vigor of organisms , endocrin - activity , parasitology and disease , the teratogenic , carcinogenic and mutagenic effects , as well as the other impacts of metals at the cellular level . A similar toxic effects of heavy metals on other species of aquatic organisms were also reported by (Abdul – Hussan *et al .* , 1989 ; Nebeker *et al .* , 1986 ; Daigham , 1989 ; Al – Mansoori , 1999) .

In conclusion , the studied organisms are vary varied in their sensitivity to copper . The species *L . auricularia* is more sensitive to copper than the species *T . jordani* .

Finally , we recommend further studies to test the acute and chronic toxicity of heavy metals in aquatic environment . This will help to predict their effects on living organisms and ecology and to determine permissible effluent discharge rates into the aquatic environment and monitoring their levels in aquatic environment with respect to water quality standards .

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