ACUTE TOXICITY OF BENZENE ON TWO SNAILS FOUND IN SHATT AL - ARAB RIVER [+]

السمية الحادة للبنزين اتجاه قوقعين من نهر شط العرب

Wisam A. Farid [*] Wasen A. Farid *

Abstract:

The acute toxicity effect of benzene on the survival of two Shatt Al - Arab river snails species (Lymnaea auricularia and Theodoxus jordani) was tested . The two species were subjected to several concentrations of benzene . The tests were performed for 48 and 96 hours , into renewal toxicity test system , under the laboratory conditions . The median lethal concentration (LC_{50}) values indicated that the snail L . auricularia was more sensitive to benzene than the snail T . jordani .

المستخلص:

تم اختبار التأثير السمي الحاد للبنزين على بقاء نوعين من القواقع المتواجدة في نهر شط العرب Lymneaa auricularia و Theodoxus jordani . إذ عرض القوقعان إلى عدة تراكيز من البنزين لمدة 48 و 96 ساعة في نظام متجدد للاختبار تحت الظروف المختبرية . قيم متوسط التركيز المميت اشارة إلى ان القوقع L . auricularia اكثر حساسية إلى البنزين من القوقع T . jordani .

Introduction:

The effects of oil spills on the aquatic environmental has received increasing attention over the past decades . A major portion of the research on these effects has followed a holistic approach of subjecting organisms to crude oil . Although these studies have contributed considerably to understanding of the problem , oil is a complex mixture of several components , varying in toxicity . It is difficult to ascertain specific effects on the survival and physiology of aquatic organisms using whole crude oil . While some studies have focused on the effect of tar [1 , 2] , less attention has been given to those compounds in crude oil though most toxic to aquatic organisms , i.e. , the low boiling point , water - soluble aromatic hydrocarbons .

Benzene is among the most abundant of the aromatic components , comprising at least 20 % of the total aromatic hydrocarbons in crude oil . Benzene is relatively soluble in water (up to 2000 ppm in freshwater) , and is among the most toxic of all oil components .

Mollusca are important group of organisms habiting the Shatt Al - Arab river water . They are as any organisms in the river continuously exposed to pollution by oils discharges . Because few studies of effects of oil components have been performed on these organisms , the present experiments have been conducted to test the acute effect of benzene on *L . auricularia* and *T . jordani* . These snails are abundant and distribution mollusca species in intertedial zone of Shatt Al – Arab river .

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[*] Assistant Lecture -Technical College - Basrah

Materials and Methods:

Specimens of the mollusca species *L . auricularia* and *T . jordani* were collected during the low tide from Shatt Al - Arab river . All samples were taken from Abu – Al – Khassib region Figure (1) The specimens were kept in aquarium for an acclimation period of one week prior to start of the test , under laboratory temperature of 20 ± 2°C with light / dark cycle (12 : 12) under aerated conditions .

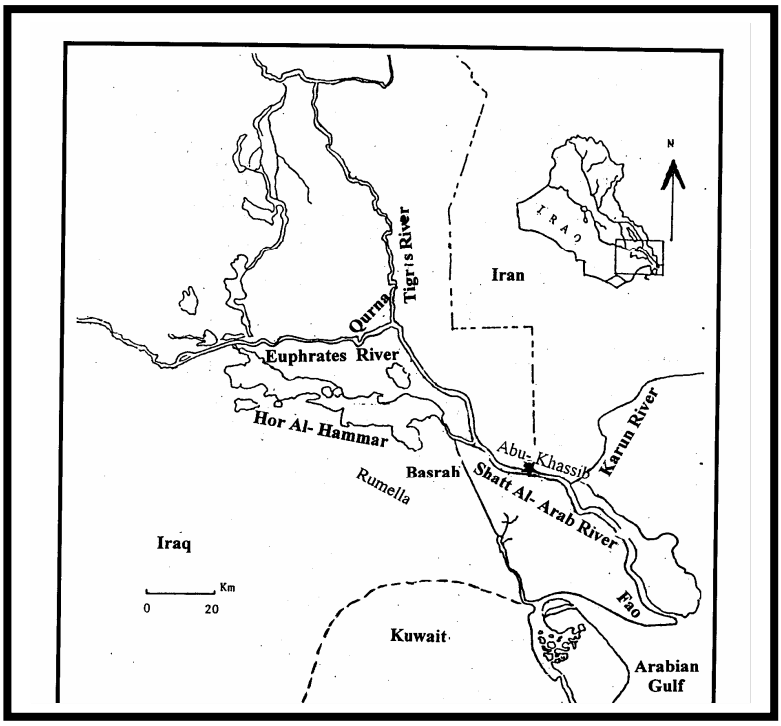

Figure (1) : Map of sampling location .

Test solutions were prepared freshly by adding a graded dose of benzene to volumetric flask containing about 150 ml of freshwater collected from Shatt Al - Arab river , which was filtered and boiled before use . The resulting mixture was then mixed for about 15 minutes by a shaker at temperature of 20 ± 2 °C . After shaking , the volume was brought up to one liter filtered and boiled river water . The solutions were allowed to equilibrate before the animals were added to them . The pH , salinity and dissolved oxygen (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 organisms to different concentrations for a definite exposure times , after which the organisms were transferred to clean river water , 10 individuals were placed in glass jar , containing of test solution . The jar was covered by glass tide to reduce evaporation of benzene . Mortalities in snails species were taken as the number of animals still immobile and remaining in the clean river water after 2 hours . In all cases , test solution was changed daily . The test was set up in three replicates together with three control (untreated) . Thirty individuals were used for each replicate and for an exposure time 48 and 96 hours . The test was carried out using concentration of 2 , 5 , 10 , 20 , 25 , 30 , 40 and 45 ml / l .

To compute the LC_{50} values and their upper and lower 95% confidence limits , the method described by UNEP [3] was used .

Results and Discussion:

Toxicity data and the results of analysis of that data of the snails *L . auricularia* and *T . jordani* subjected to serious concentrations of benzene for 48 and 96 hours are summarized in Table (1) . The survival of the snails generally decreased with increasing concentration and exposure time of benzene . It is clear that the 48 and 96 hours LC_{50} values of the snail *L . auricularia* are lower than the 48 and 96 hours LC_{50} values of the snail *T . jordani* comparsion with the same exposure time . This is indicated that the snails *L . auricularia* are more sensitive to benzene than *T . Jordani* .

Table (1) : Percentage mortality of snails L. auricularia and T. jordani exposed to different concentrations of benzene and LC_{50} values and their upper and lower 95 % confidence limits at two different time intervals .

Concentration mg / l	Percentage of mortality			
	L . auricularia		*T . jordani*	
	48 h .	96 h .	48 h .	96 h .
2	30.0	36.3	26.6	30.0
5	56.6	66.6	50.0	63.3
10	80.0	86.6	73.3	80.0
20	90.0	96.6	86.6	90.0
25	96.6	100	90.0	96.6
30	100	100	100	100
40	100	100	100	100
45	100	100	100	100
Control	0	0	10	0
LC_{50}	4.2	3.1	5.1	4.0
Upper 95 % confidence limit of LC_{50}	11.2	8.7	16.3	16.4
Lower 95 % confidence limit of LC_{50}	1.5	1.0	1.5	0.9

There are no toxicological studies on immediate lethal effects of benzene to organisms from the Shatt Al-Arab river . Most pervious studies reported the acute effect on the river organisms of crude oil or its products . Farid [4] studied the acute toxicity of Basrah regular crude oil to four species of mollusca habiting Shatt Al - Arab river . It is found that the species *Melanopsis nodosa* was the most sensitive to crude oil followed by the species *T . Jordani* , *Melanoides tuberculata* , and *Corbicula fluminalis* respectively . Al – Aabbaway [5] tested the acute effect of three oil products (kerosene , gas oil , and lubrication oil) to the snails *T . jordani* , and *M . nodosa* . It is found that the snail *M . nodosa* was more sensitive to the three oil products than the snail *T . Jordani* .

In the present study , the total acute effects of benzene on the snails are : restriction of normal activities , prevention of adhering ability to test vessels walls , narcosis and anesthesia , loss of ability to react to the external cue , rapture of tissues , leaving the shells death . Those above effects are due to the chemical toxic effect of benzene on the snails . Aromatics and other water soluble hydrocarbons associated with lipids and other tissues of

organisms in sufficient amount to produce the abnormal activities and die [6] . A similar to the acute effects of benzene on other species of aquatic organisms were also reported by [7] .

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

The applied benefit of this research is obvious in view of the increasing possibility of oil spills , blowout , effluents , and ballast dumping in the future .

Finally , we recommend further studies to test the acute and chronic toxicity of oils and that oil products and oil fractions in Shatt Al – Arab river environment , in order to predict the effects of oil pollution on living organisms and ecology , to determine permissible effluent discharge rates into the aquatic environment in Shatt Al – Arab river , and to monitoring levels of oil pollution in steam with respect to water quality standards .

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