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Research Article

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Effect of Crude Oil on the Oxygen Dissolved, and Some Biochemical Changes of Fresh Water Fish *Barabus luteus (H)* and *Liza Abu (L)*

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ABSTRACT

The current study is to investigate the influence, concentrations crude of oil on the oxygen dissolved of the fresh water fish Barabus luteus and Liza Abu in different concentrations (2,5,10,15 and 20ml/L) and (6, 24 and 72 hours) periods of exposure. Found that the concentrations of crude oil had varied values with different values of oxygen dissolved. It was also observed that the Liza Abu fish more sensitive and affected by the fish Barabus luteus, Relationship between crude oil concentrations, and the oxygen dissolved where the, 15 and 20 ml/l of crude oil concentration recorded severe reduction in oxygen dissolved. The amounts of oxygen dissolved was observed to decrease in 6-hours period at 15 ml (2.7 mg/L and 20 ml/(2.3 mg/l)). Extermination of some biochemical composition showed that value of liver and muscle glycogen content significant decrease and revealed a negative correlation combined with the highest oil concentrations. As well, values of blood glucose show significant increase with all concentrations of crude oil the 72 hours recorded increased (35.07 ± 2.18 mg/l for juveniles Liza Abu and 47.64 ± 3.04 mg/l in the blood glucose of juveniles Barabus luteus and positive correlation.

Keywords: *Liza Abu;* Oil; Pollution; Oxygen; Concentrations of crude oil

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INTRODUCTION

The study of oil pollution arising from spillage of crude oil as a result of accidents, impact of oil tankers and explosion of the pipelines is of great importance, as one of the problems that attacked the attention of many scientists and researchers who have dealt with studies of hazards of this pollution on many aquatic organisms [1,2]. As for the oil form a wide range of chemical hydrocarbons, this is one of the factors causing change in nature of structure of aquatic system through the effect of the animals including fishes and plant and also noted the effects of short term and the impact of severe, sudden death and other effects under long-term effects on physiological, biochemical, reproduction and accumulation in tissues of fishes [3-5]. The degree of damage caused by oil spill event depends primarily upon the quality of oil spill, the chemical properties of the oil and the sensitivity of the biological resources impacted [6]. A variety of pollutants including crude oil and its product are known to induce

stress condition, which impair the health of fish [7]. The oil spill at the beginning of a floating layer on the surface of water lead to decrease of oxygen dissolve and light together, with effect on process of gas exchange and oxygen dissolve which is due to change behavior and low density of population of fishes [8]. This research focuses on the effects, the influence of the crude oil concentration on the oxygen dissolved for the freshwater fish *Barabus luteus* and *Liza Abu* in different concentrations under periods of exposure. To show that the concentrations of crude oil had varied values with different values of oxygen dissolved ion.

MATERIALS AND METHODS

Test animals

Fish samples were collected from the bank of Shatt al Arab in the north of the Basra city. The samples were transferred to the basin for 15 days to acclimation under laboratory conditions at a temperature 22 ± 2°c and also provided feed with dry protein diet. After that, they measured the average weight as 9 ± 2 gm. and 11 ± 3 cm length Juvenile fish *Liza Abu*, 11 ± 2 gm. and 8 ± 2 cm length of length Juvenile fish *Barabus luteus*, after acclimation period samples are divided with three replicates in with 5 samples of fish in each replicate for each oil concentration.

Preparation of solution

The crude oils were obtained from Iraqi South Oil Company-Rumelia Oilfield, and transferred to the laboratory by dark bottles and stored in (18 ± 2) ascertain volumes of crude oil [9] procedure for the preparation of Water Soluble Fraction (WSFs) was adopted. 250 ml of crude oil was gently mixed with 750 ml of water and was shaken by and mixed by magnetic shaking device at speed (800 rpm) for two (2) hours and crude petroleum oil was introduced into ten plastic containers filled with 3 liters of water experiment then put 5 juveniles, fish each at concentration of 0, 5, 10, 15 ,and 20 ml/l respectively exposure and for time periods (6 ,24, and 72 hrs).

Oxygen dissolved test

Winkler method [10] is used to measure the dissolved oxygen after the end of each period exposure.

Biochemical tests

Juvenile fish *Liza Abu* and *Barabus luteus* were tested to determine glycogen content in muscle and liver by taking small pieces of muscle and liver which were freezer dried and then used in the method [11] and also calculated the blood glucose by small sample of blood and then estimated with method [12].

Statistical analyses

Statistical analyses were done by SPSS software. The results of hematological profile were presented as the mean ± S.D. comparing between untreated control and treatment groups using One-way analysis of (ANOVA with values $P \leq 0.05$ were regarded as statistically significant.

RESULTS AND DISCUSSIONS

The results of the current study on oxygen dissolved amount by the juvenile fish *Barabus luteus*, influence the different concentrations. Figure 1 shows the relationship between the oil concentration and oxygen demand during periods of time estimated 6,24.72 hours, respectively. Figure 1 shows the amounts of oxygen dissolved and was observed to decrease in 6-hours period at 15 ml (3.0 mg/L and 20 ml/ (2.7 mg/l) while in 24 hours, the decrease in the amounts of oxygen dissolved was (2.4mg//l) a period 72 hours, is very effective the values of oxygen dissolved

are (2.0mg/L at 15 ml/L of crude oil and in 20ml/L the dissolve oxygen was (1.5mg/l) in comparison with the reference group (5.6mg/l) (Tabes 1 and 2).

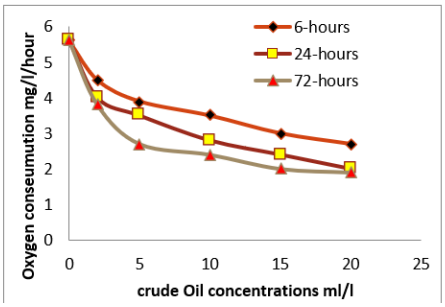

Figure 1. Ehe amount of oxygen dissolved mg/I/hour for juvenile *Barabus Luteus* fish after three periods of exposure.

Table 1. Coefficient coloration factor for dissolve oxygen for *Barabus Luteus* fish after exposure to three period of time.

Time Period hours	R value	R^2 value	Equation
6	0.9478	0.8674	Y=0.1271x+4.968
24	0.9129	0.8334	Y=0.1531x+4.7257
72	0.8404	0.7064	Y=0.1529x+4.391

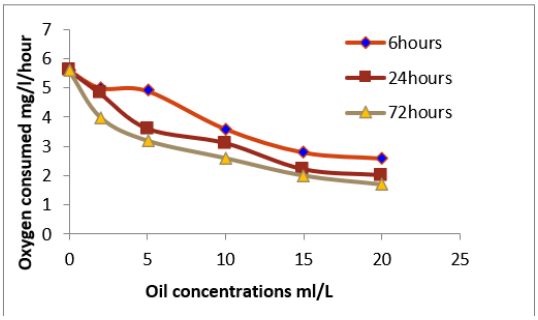

Figure 2. The amount of oxygen dissolved mg/I/hour for juvenile fish *Lisa Abu* after three period.

Figure 2 shows the relationship between the oil concentration and oxygen dissolved during periods of time estimated 6,24.72 hours respectively, the results obtained from testing on the rate of oxygen dissolved for juvenile fish *Liza Abu* after 6 hours of exposure as following (4.5, 3.9, 3.5, 3.0 and 2.7 mg/l) and after 24 hours were (4.0, 3.5, 2.8, 2.4 and 2.0 mg/l) while in 72 hours period was more severe (3.8, 2.7, 2.4 , 2.0 and 1.9 mg/l) comparison with the control (5.6mg/l) comparison with the reference group (5.6mg/ l).

Table 2. The coefficient coloration factor for dissolve oxygen for *Liza Abu* fish after exposure to three period of time.

Time Period hours	R value	R^2 value	Equation
6	0.9764	0.9465	Y=0.1577x+4.459
24	0.9528	0.90803	Y=0.1747 x+4.063
72	0.9143	0.8379	Y=0.1699 x+4.655

Statistical analysis indicated the existence of relationship between the time period and the amount of dissolved oxygen, as it was found that the shortest period of time is the most abundant in the availability of oxygen to other periods, where the correlation coefficient was for juvenile fish *Barabus luteus* (0.9478 r) and *Liza Abu* (0.9764 r) as it is evident in (Tables 1 and 2). The process of breathing fish dissolved oxygen and its very sensitive to changes in

aquatic environment, whether it is oil spill, organic pollutants or chemicals materials, where the presence of dissolved oxygen is an efficient factor and indicator of the vitality of the water system. The gills are the first important organ that have direct contact with water and are affected by oxygen. So, any decrease in the oxygen is reflected by its effect on metabolic activities [13]. It was found in the present study, the crude oil concentrations of water basin have obstruction arrival and permeability of oxygen lead to less proportion and shortness of breath [14]. The results of the present study on the oxygen dissolved by freshwater fishes *Barabus* and *L. Abu* under the influence of different concentrations (2, 5, 10, 15 and 20 ml/L) of the crude oil which is an obstacle to oxygen permeability) as well as there is found decrease in operculum function because of this low oxygen require for their respiratory. Similar observation by Pandit et al. [15] and according to Prasad MS [16] the reduction in dissolved oxygen is caused by effect of crude oil and period of exposure, perhaps reduces the abundance of soluble amounts of oxygen this leads to like hypoxia condition [17]. These toxic concentrations are from crude oil. It has caused changes in the structure of gills tissue, resulting in damage to the respiratory lamella due to its low effectiveness and lack of ability to cause oxygen to circulate in it and indicated that the abnormal mechanical mechanism leads the fish to death. It forms a mucous layer that prevents the delivery of oxygen. The results of the current study also showed that the correlation coefficient between the time of exposure and the amount of dissolved oxygen was found that the time period of 6 hours more abundant in the presence of dissolved oxygen from the rest of the other periods, where the correlation rate was (0.9478 r) in *Barabus luteus* while in a fish *Liza Abu*, the correlation factor was (0.9764 r) and this confirms that the exposure period has a large role in the lack of the presence of the quantity of dissolved oxygen with the presence of dissolved crude oil concentrations in the water.

Effect on muscle and liver glycogen

The results of this study indicated that the changes in juveniles of freshwater fish *Liza Abu* and *Barabus luteus* treated to crude oil concentrations (10,15 and 20 ml/L) for 24 and in a period of 72 hours. Figures 3 and 4 show a gradual reduction in the values of liver tissues glycogen content for juvenile *Liza Abu* and *Barabus luteus*. Therefore, the decrease in the level of juvenile *Liza Abu* glycogen was (4.08, 2.97, 1.32 mg/l) compared to the control (5.98mg/l) and of juvenile *Barabus luteus* liver glycogen was recorded within a period of 24 hours as follows (4.72, 3.28, 2.05 mg/l) compared to the control (5.88mg/l).

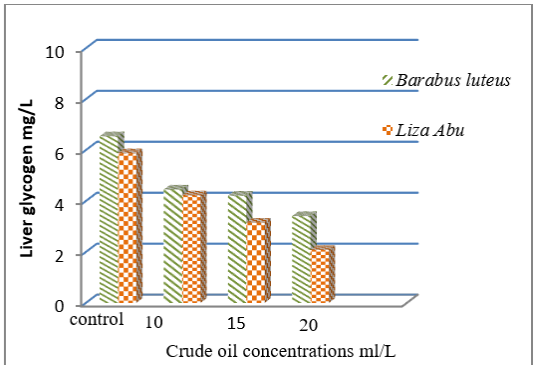

Figure 3. Effect of 24 hours exposure to different crude concentration on liver glycogen content for juvenile *Barabus luteus* and *Lisa abu* *(p<0.05).*

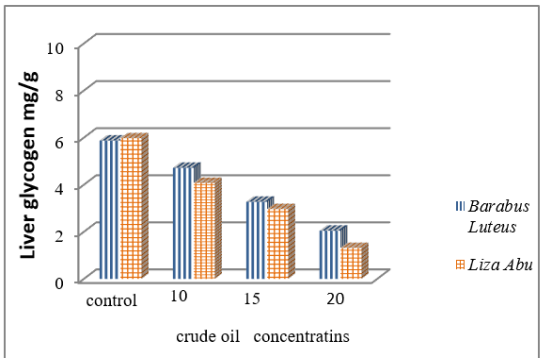

Figure 4. Effect of 72 hours exposure to different crude concentrations on liver glycogen content for juvenile *Barabus luteus* and *Lisa abu* fishes *(p<0.05).*

As for the 72-hour period of exposure, where the sharp decline was evident, especially in the 20 ml/L, the juvenile *Liza Abu* were recorded (2.08mg/l) compared with control (mg/l). Also, the figure showed that the period of exposure 72 hours was more reduced. It was observed that these decrease of different values scattered with the concentrations crude oil, where the characteristic of juvenile *Barabus luteus* was recorded as follows (3.41mg/l) compared to control (6.54mg/l) (Figures 5 and 6).

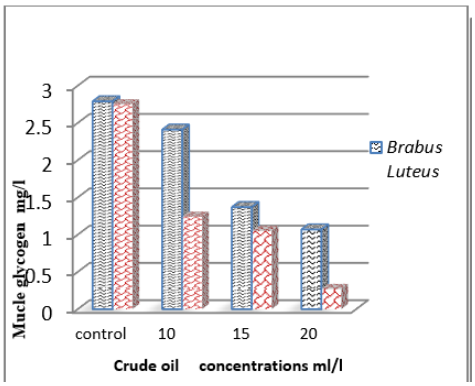

Figure 5. Effect of 24 hours of different crude oil concentrations on muscle glycogen for juvenile *Barabus luteus* and *Lisa abu (p<0.05).*

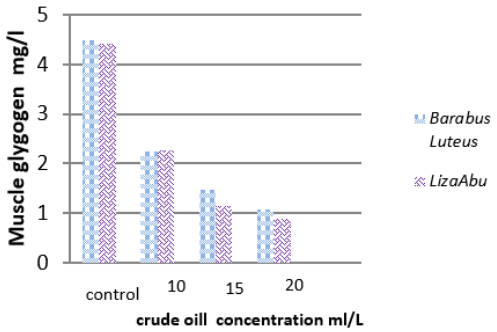

Figure 6. Effect of 72 hours exposure to different crude oil concentrations on muscle glycogen content for juvenile *Barabus luteus* and *Lisas abu (p<0.05).*

From the above figures 5 and 6, it is indicated that a decrease in the muscle glycogen values for the juveniles *Liza Abu b*y and the *Barabus luteus*, was found that the decrease was with different values during 24 hours of exposure. Also, it showed that the period of exposure of 72 hours was more reduced. It was observed that these decreases of

different concentrations of crude, where the significant decline in the muscle glycogen of *Liza Abu* juveniles fish was recorded as follows (2.28,1.14.0.88 mg/l comparing with reference group (4.41mg/l). In the glycogen of *Barabus luteus* juvenile fish, the decrease (2.25.1.48, 1.07mg/l) was compared with control (4.49mg/l). This reduction in glycogen content which is affected by toxicity of crude oil and low gas exchange leading to reflect on metabolic vital process. Results of exposure fish to different crude oil concentrations and exposure periods causes depletion in glycogen levels in liver and muscles, this attribute may be happened with increase in glucose level thus the increase of glycolysis operation lead to glucose level. This agreement who reported significant reduction in liver and muscle glycogen of fish exposed to WSF crude oil [18]. The depletion in liver and muscle glycogen by inhibition in enzymatic activities cause and this led to reduction in glycogen storage. Previous studies have shown the readily depleted as a result of angry production and my typical stress response confirming the prevalence of hypoxia condition at the tissues and also decrease in glycogen due to utilization by anaerobic glycolysis [19], and induce marked changes in carbohydrate energy reverse of fish. This study that showed the reduction in glycogen content combined with increase crude concentrations, which emphasized about the sings of crude oil poisoning and it is agreement with the findings of Salahuddin et al. [20]. As a result of the impact, this crude concentration is appeared that *Liza Abu* is more sensitive than *Barabus Luteus.* In this study, it is shown the levels of blood TG were significantly increased in the juvenile of *Liza Abu* and *Barabus Letuse* due to response to a stressor by eliciting a generalized physiological response, similar to this is reported by Pazhanisamy et al. [21]. The present study (Table 3) showed gradual increase of blood glucose level of the treated fish after 24, 72 hours to the crude concentrations. This increase is due to glycolysis of stored glycogen in liver, this took place as a response to stress and transformation to glucose for energy requirements, by animals [22], this result is in line with the result of Abdulla et al. [23]. During the study on freshwater fish, exposure to water pollutants including pesticides and heavy metals similarly resulted in elevated plasma glucose in fish [24] attributed the increase in blood glucose in Nile tilapia *Oreochromis niloticus* to intensive glycogenolysis. Glucose level is an important indicator of stress and [25,26] showed that increasing of glucose levels due to the secretion of hormones like catechol amines, glucocorticoids and that increasing of glycolysis and this led to high glucose in blood. Water soluble fraction of crude oil is an environmental stress, or which leads to abnormal changes in dissolved oxygen and biochemical parameters in fishes. The alteration in the amount of dissolved oxygen and some biochemical parameters is an indication.

Effect on blood glucose

When measuring blood glucose, it is observed in table 3 the high value present, it is accompanied by an increase in the exposure period and the crude oil of its oil concentrations as shown in 20 ml/L (42.44 mg/l in juveniles *Barabus luteus* and 31.2 ± 1.21 mg/l in juveniles *Liza Abu* during 24 hours of exposure, while in the 72 hours the same layer recorded increased (35.07 ± 2.18 mg/l for juveniles *Liza Abu* and 47.64 ± 3.04 mg/ in the blood glucose of juveniles *Barabus luteus* compared with control (23.7 ± 2.02 mg/l), while in the lower l oil concentrations was the increase in blood glucose values as shown in table 3.

Table 3. The changes in blood glucose in two fishes after exposure to different crude concentrations.

Control	10 ml/l	15 ml/L	20 ml/L	Time of period	Type of fish
23.3 ± 231	26.27 ± 2.04	28.19 ± 2.76	31.2 ± 1.21	24 hours	*Liza Abu*
24.86 ± 2.07	30.15 ± 1.27	34.11 ± 3.09	42.44 ± 2.08	24 hours	*Barabus Luteus*

23.7 ± 2.02	28.14 ± 2.14	31.1.2 ± 1.73	35.07 ± 2.18	72 hours	*Liza Abu*
24.66 ± 2.04	33.74 ± 3.01	37.05 ± 2.96	47.64 ± 3.04	72 hours	*Barabus luteus*

CONCLUSION

The entry of pollutants, especially crude oil, causes effects and damage to the aquatic environment and aquatic organisms. Therefore, in the current study there is a severe decrease in quantities of oxygen dissolved due to presence of contaminated water, which the organisms cannot take what it needs from the dissolved oxygen in water. This in turn affects the energy release system in bodies of animals, including fish.

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