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Research Article

Estimation of hydrocarbon compounds concentrations in water and sediments in tigris river near amara city center in Missan province/Iraq

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Abstract

Samples were collected from four distributed along Tigris river near Amara city center in Missan province to estimate the hydrocarbon concentration compounds in water and sediment samples. By using spectrofluoro meter the concentrations of total petroleum hydrocarbons (TPHs)were measured. Results of the present study revealed that the concentrations of total petroleum hydrocarbons in water samples were (1.25, 2.35, 3.47 and 2.92 µg/l) in first, second, third and fourth stations respectively, whereas for sediments samples were (2.83, 3.83, 12.3 and 6.25 µg/g dry weight) in first, second, third and fourth stations, respectively. The highest concentrations of total petroleum hydrocarbons recorded in sediment samples, also the results of this study showed that there were spatial variations in TPHs levels among stations. Elevated their levels of TPHs in third station compared with other stations especially first station may be attributed to reception of high amounts of organic matter like industrial and domestic wastes from Amara City Center which have high population density. Whereas the first station (control station) is far away from the eminent anthropogenic pollution sources.

Keywords: Tigris river, Missan province, hydrocarbon, spectrofluoro meter.

Introduction

Pollution of the rivers water in Iraq considered from the important problems that must treat and control it, so not become complicated in future such as what occurred in other industrial countries which have Ahigh population density **[1**]. Hydrocarbons have been identified as important pollutants that can appear in high concentration **[2]**. Because of the growing industrialization, the need for oil exploration and transportation were increased so the risks of oil spill accidents became high. A major oil spill can cause long term and irrecoverable damages to the aquatic environment **[3]**. The control of such pollution problems in the aquatic environment is very difficult because of the large number of input sources and their geographic dispersions. Contrary to popular views, evidences were accumulated to buttress the fact that petroleum hydrocarbon mixes with water and penetrates to the underlying sediments **[4]**, also impaired growth of aquatic organisms which depend basically on the quantity and quality of the primary production of phytoplankton such as fishes, crustaceans and molluscs which acquire objectionable odor or flavor, thereby causing a reduction in their marketability and acceptance as food **[5,6]**. The chemical composition of petroleum products vary significantly, and can have diverse effects on different organisms within the same ecosystem **[7]**. These differences in toxic effects are due to qualitative compositional differences in the various products, as well as concentration differences of the chemical constituents **[8,9]**. This study aim to provides a necessary information on the pollution of this river with hydrocarbon compounds in water and sediments.

Materials and Methods

Collection of Samples:

Samples were collected from four distributed along Tigris river near Amara City Center. The water samples were collected by dark glass bottles with 5 liters capacity on deep one meter from surface water ,while the sediment samples were taken using Van veen grab sampler and stored in aluminum foil and then placed in ice- packed and transferred to the laboratory then kept in the refrigerator before analysis.

Extraction of Hydrocarbon compounds from water samples:

The hydrocarbons were extracted from water following the procedure of **[10]** by added 50 ml from Carbon Tetra Chloride (CCl_4) to the sample water then the mixture was vigorously shaken to disperse the CCl_4 thoroughly throughout the water sample by using electrical shaker for period 30 minutes, the mixture leave for some time until stability, then this layer from water placed in separating funnel and leaved for 5 minutes until stability, then the extract was passed through column chromatography filled with glass wool at the bottom then placed a small amount of anhydrous sodium sulphate to remove excess water and the CCL_4 extracts were collected in clean beaker and leave until evaporate. Then added 50 ml of n-hexane to the clean beaker which contain sample and passed through column chromatography filled with glass wool at the bottom then placed silica gel (100–200 mesh) and 8 g from alumina (100–200 mesh) is placed at the top to isolate the aliphatic fraction, then added 50 ml of benzene to isolate the aromatic fraction. These fractions were reduced to a suitable volume prior to analysis.

Extraction of Hydrocarbon compounds from sediment samples:

20 gm dry sediments were placed in a pre-extracted cellulose thimble and soxhlet extracted with 150 ml methanol : benzene (1:1 ratio) for 24-36 hours following a method of **[11]**. At the end of this period, the extracted was saponified for 2- hours with a solution of (4 N) KOH. for some time until stability forming two layers, the unsaponified layer which contain hydrocarbons taking and passing through chromatographic column provided with glass wool at the bottom then placed layer from silica gel (100-200 mesh) and layer from alumina (100-200 mesh) is placed at the top then placed layer from anhydrous Na_2So_4 to isolate the aliphatic fraction, then added 50 ml of benzene to isolate the aromatic fraction. These fractions were reduced to a suitable volume prior to analysis. Spectroflurometershimadzo RF-540 equipped with recorder type Shimadzu RF–540 was used to determine total petroleum hydrocarbons in water and sediments, the basis quantitative measurements were made by measuring emission intensity at 360 nm with excitation set at 310 nm, in Laboratories of Marine Science Center, University of Basrah.

Results and Discussion

Concentrations and distribution of petroleum hydrocarbons are a good indicator for the situation of the river. It can indicate the source of the pollutant that deserve special emphasis or needs more control **[12].** Results of the present study was revealed that concentrations of total petroleum hydrocarbons in water (µg/l) in water samples were (1.25, 2.35, 3.47 and 2.92) in first, second, third and fourth stations, respectively (Fig. 1), whereas for sediments samples (µg/g dry weight) were (2.83, 3.83, 12.3 and 6.25) in first, second, third and fourth stations, respectively (Fig. 2). The highest concentrations of total petroleum hydrocarbons recorded in sediment samples, while the lowest concentrations in water samples this may be due to the tendency of these compounds to adsorb onto suspended particulate matters in water column, so through this mechanism these compounds will be removed from water **[13]**. Hydrocarbons compounds have low solubility and therefore, their concentrations and distribution in water are very low also as a consequence of their hydrophobic nature. Petroleum hydrocarbons in aquatic ecosystems tend rabidly to become associated with the particulate matter ending in sediment, therefore sediments represent the most important reservoir of these compounds, for that reasons, TPHs accumulated in sediments is both due to anthropogenic and natural emissions **[14,15]**, also decrease the levels of hydrocarbon compounds hydrocarbon compounds in the water column compared with their levels in sediments samples perhaps attributed to probably degrade rapidly for these compounds through photo-oxidation **[16]** and degrade most rapidly at elevated temperatures, dissolved oxygen and at higher incidences of solar

radiation **[17]**. The same conclusions reached other researchers **[18,19,20,21,22]**, in studies on sediments of Shatt Al-Arab River, Arabian Gulf , Iraqi marine waters, southern marshes of Iraq (Hor Al-Hammar and Al-Howaiza) and Euphrates River.

The results of this study showed that there were spatial variations in TPHs levels among stations. Elevated their levels of TPHs in third station compared with other stations especially first station may be attributed to reception of high amounts of organic matter like industrial and domestic wastes from Amara city center which have high population density. Whereas decrease their levels in first station attributed to it is location which is far away from the eminent anthropogenic pollution sources because this station lies in the start of the river before entering to Amara City Center (control station) **[19,21]**.

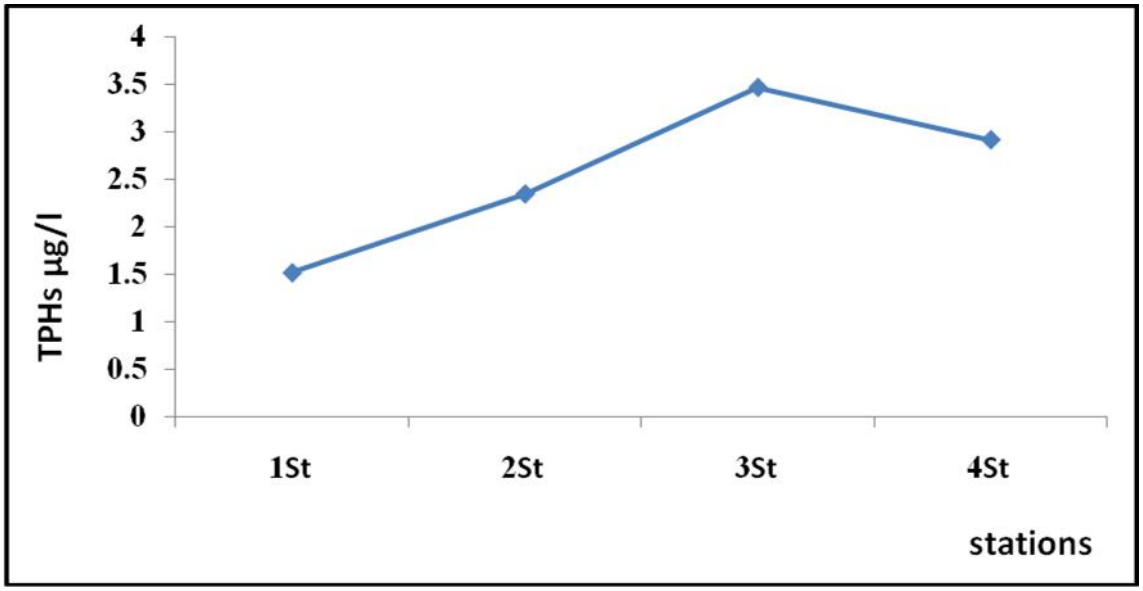

Fig. 1: Concentrations of TPHs in water samples.

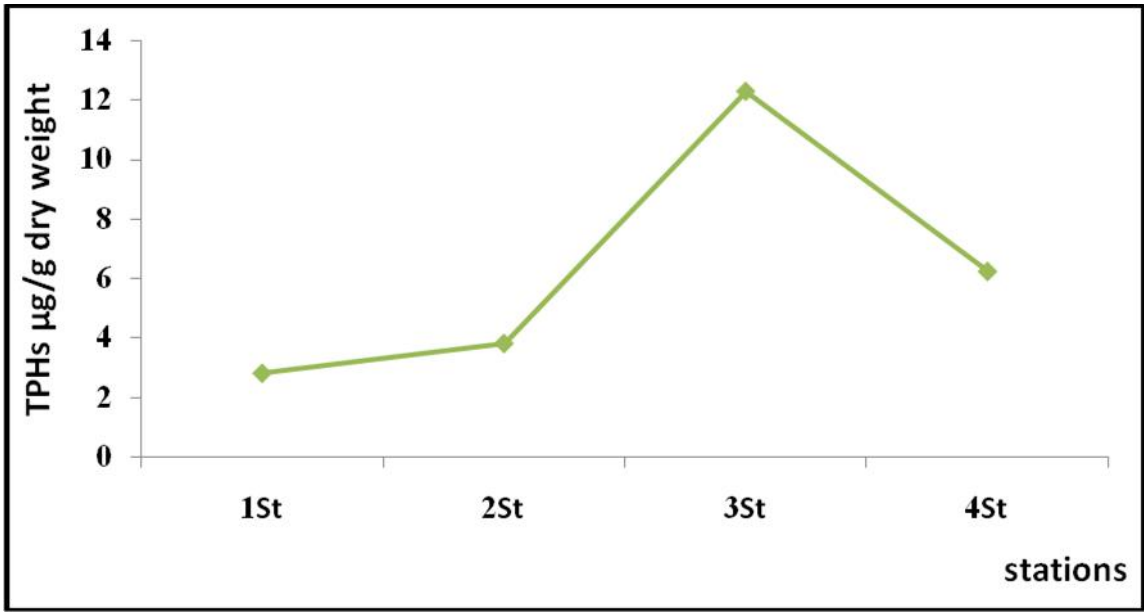

Fig. 2: Concentrations of TPHs in sediment samples.

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