

Spatial variations of hydrocarbon compounds levels in water and sediments of some rivers in Misan province / Iraq

Salih Hassan Jazza

College of Science/ University of Misan

Abstract

The present study was performed to have knowledge of spatial variations of hydrocarbon compounds levels in water and sediment samples from some rivers in Misan province .The samples were collected from seven different locations during December 2017, three from them in Tigris river (Ali Al-grbi, maamal alzuyut and Qulat Salih),whereas another four station distributed on the following rivers Al-Kahlaa , Al-Musharah , Al-Mijer and Al- Batiruh . By using spectrofluorometer the concentrations of total petroleum hydrocarbons (TPHs)were measured. Results of the present study revealed that there are spatial variations of TPHs concentrations in water and sediment samples . Concentrations of TPHs in water samples ranged from 0.038 to 0.074 $\mu\text{g/L}$ in Al-Musharah and Al-Kahlaa river respectively, whereas in sediments ranged from 31.35 to 96.13 $\mu\text{g/ gm}$.dry weight the highest levels in Ali Al-grbi station ,while the lowest in Al- Batiruh river .Also results of this study showed that TPHs levels in water was lower than in sediments in all locations.

Introduction:

Petroleum hydrocarbon compounds and their derivatives are one of the notable organic pollutants found in the environment which enter the aquatic ecosystem from

various routes either by natural seepage or anthropogenic origins such as oil spills from refineries ,shipping ,tanker operation , burning of fossil fuels ,industrial and municipal wastes) Gao *et al*; 2007 ,. Zrafi *et al*;2013 ,. Farid *et al*.(2014 ,.Also these compounds can be synthesized by higher plants , algae and bacteria) Magi *et al* ,. (2002Aromatic and aliphatic hydrocarbon compounds cause many environmental problems and have impacts on human health and many organisms attributed to their mutagenicity, teratogenicity and carcinogenicity especially polycyclic aromatic hydrocarbons (PAHs (that tendency to bio accumulate in the tissues of aquatic biota such as mammals, fish ,birds , molluscs and mussels that are unable to efficiently eliminate them from their bodies) Bakhtiari *et al*; 2009 , Ahmed *et al*.(2014 ,. PAHs are characterized by persistent pollutants ,great toxicity and more lipophilic , so they are bioaccumulation in food webs and then to human through water and food consumption) Ramesh *et al*; 2007 ,. Taioli *et al*.(2007 ,.These impacts depending on concentrations of petroleum products after release to the environment and the biota species that is exposed) Adewuyi *et al* .(2011 ,. PAHs in aquatic ecosystem rapidly tend to become associated to the suspended matter in water column ending in sedimentation and absorbed to sediments and perhaps release back into the water column through chemical processes , thus the sediments represent the most important reservoir of these compounds in aquatic environment) Qiu *et al*; 2009 ,. Zhang *et al* .(2012 ,.The aims this study are to determine the levels of hydrocarbon compounds in water and sediments samples in various locations from some rivers in Misan province and to identify the main sources of hydrocarbons compounds in water and sediments samples to give database for future works.

Materials and methods

Water samples were collected during December 2017 from seven stations in different rivers located in Misan province three of them in Tigris river distributed in Ali Al-grbi district center , near maamal alzuyut and Qulat Salih district center ,whereas another

station distributed in Al-Musharah river , Al-Kahlaa river near treatment plant , Al-Batiruh river in Al-Maymona district and Al-Mijer river in center district .Water samples were collected from the rivers by using dark glass bottles at least 50 cm under the water surface . Samples were not taken when it was raining . Simultaneously sediment samples were collected at a depth of 5–10 cm of sediment surface from the idem locations .Hydrocarbon compounds in water samples were extracted according to (UNEP ,1989).Whereas in sediment samples were extracted according to (Goutx and Saliot , 1980). Spectrofluorometer instrument type Shimadzu was used at 360 nm emission intensity and 310 nm excitation to detected the TPHs concentrations in the extracted water and sediment samples at marine science center / Basrah university .

Results and discussion

a– TPHs in water samples.

TPHs levels obtained for water samples in the different locations are summarized in fig (1) . Generally the results ranged from 0.038 to 0.074 $\mu\text{g/L}$ in Al-Musharah and Al-Kahlaa river respectively .Results of this study exhibited that there were a spatial variations of TPHs in water samples ,the highest concentrations of TPHs were recorded in Al-Kahlaa river near treatment plant attributed to the reception of great amounts of domestic wastes and industrial effluents which contain on high organic compounds that come from industrial quarter in Amara city, whereas the lowest concentrations of TPHs in Al-Musharah , Al-Batiruh and Al-Mijer , this may be attributed to the fact that these rivers are small branches from Tigris river except Al-Kahlaa river , in addition to that density difference people lead to contributions in discharging wastes into water bodies will differences among these rivers ,thus will differences in the severity of effect (Uzoekwe and Oghosanine , 2011 ; Jazza ,2015). On other hand the variations in the levels of TPHs in water samples attributed to many reasons mainly uncontrolled releases from treatment plants, the discharging of

hydrocarbons materials to the aquatic system from agricultural activities , weathering processes such as (photo-oxidation ,evaporation ,biodegradation and sedimentation etc), adsorption and absorption by particulate matters in addition to that these compounds synthesized by some aquatic biota (Al-Saad 1995 ; Jazza *et al* ., 2016).

b- TPHs in sediment samples .

Levels of TPHs in the sediment samples varied from 31.35 to 96.13 $\mu\text{g/gm}$.dry weight (table ,2) , generally in decreasing order of magnitude locations Ali Al-grbi > Qulat Salih > maemal alzuyut > Al-Kahlaa > Al-Musharah > Al-Mijer > Al- Batiruh ,thus indicating variations in the severity of impact which may be depend on amount of diesel wastes which commonly used in fishing boat ,domestic and industrial effluents or because Tigris river passing through many cities thus these pollutants will increase in locations which located on Tigris river compared other branches or due to other factors that have the highest impacts on the hydrocarbon compounds in sediments like turbid domestic wastes that precipitated high levels of hydrocarbons through water column and settle to the bottom sediments or release these hydrocarbons to the sediments from aquatic biota specially plants and the benthic algae (Jazza ,2015 ; Jazza *et al* ., 2016) .

Also results of the present study revealed that TPHs levels in water was lower than in sediments in all locations this could be due to many processes such as the evaporation, photochemical decomposition, and microbial breakdown that occurred through the water column ,therefore only a small portion from these compound eventually remains in water column while heavier fractions of hydrocarbon compounds typically pass during the water column and settle to the bottom sediments through coagulation ,flocculation and sedimentation ,so that sediment remains the potential sink for hydrocarbon pollutants which represent a very high health hazard for most aquatic biota that reside in such an environments (Hanson *et al* .,2003 ; Ali *et al* ., 2015 ; Adeniji *et al* ., 2017).

Fig(1): Spatial variations of TPHs in water samples.

Fig(2): Spatial variations of TPHs in sediment samples.

References

- Adeniji , A. O ; Okoh ,O. O .and Okoh ,A. I.(2017). Petroleum hydrocarbon profiles of water and sediment of Algoa Bay, Eastern Cape, South Africa., Int. J. Environ. Res. Public Health, 14, 1263: 1-21 .
- Adewuyi ,G .O ; Etchie ,O . T. and Ademulegun, O. T.(2011). Determination of total petroleum hydrocarbons and heavy metals in surface water and sediment of Ubeji River, Warri, Nigeria” .Bioremediation, Biodiversity and Bioavailability .5 (1) :46-51.
- Ahmed, O.E; Ali, N.A ; Mahmoud, S.A ; Doheim, M.M.(2014). Environmental assessment of contamination by petroleum hydrocarbons in the aquatic species of Suez Gulf. Int. J. Mod. Org. Chem. 3, 1-17.
- Ali, S.A.M.; Payus, C. and Ali, M.M. (2015). Surface sediment analysis on petroleum hydrocarbon and total organic carbon from coastal area of Papar to Tuaran, Sabah. Malays. J. Anal. Sci., 19, 318-324.
- Al-Saad , H. T. (1995). Distribution and sources of hydrocarbons in Shatt Al-Arab estuary and NW Arabian Gulf. Ph. D. thesis , Basrah University , 186 pp.

- Bakhtiari ,A.R ; Zakaria ,M.P ; Yaziz ,M.I;Lajis, M .N .H and Bi ,X. (2009).Polycyclic Aromatic Hydrocarbons and n-alkanes in Suspended Particulate Matter and sediments from the Langat river ,peninsular Malaysia .environment Asia .2:1-10
- Farid , W.A ; Al-Eed , A. A ; Shihab , L.A and Al-Saad , H.T. (2014). Distribution , sources , and seasonal variations of hydrocarbons in Shat Al-Arab river water . J. Inter. Acadi. Rese. Multi. , 2(2): 729-739.
- Gao, X; Chen, S; Xie, X; Long, A. and Ma, F.(2007) . Non-aromatic hydrocarbons in surface sediments near the Pearl River estuary in the South China Sea. Environ. Pollut. 148, 40 - 47.
- Goutx, M. and Saliot , A. (1980). Relationship between dissolved and particulate fatty acid and hydrocarbons , chlorophyll (a) and zooplankton biomass in Ville Franche Bay , Mediterranean Sea" .Mar. Chem., 8: 299-318.
- Hanson, J ; Helvey ,M. and Strach, R.(2003).Non-fishing impacts to essential fish habitat and recommended conservation measures. Long Beach (CA): National Marine Fisheries Service (NOAA Fisheries) Southwest Region ., Version 1:1-75.
- Jazza, S.H. (2015). The Status of Hydrocarbon Compounds Pollution of Water, Sediments and Some Aquatic Biota in Al-Kahlaa River-Missan Province /Iraq .Ph.D, thesis. Basrah: College of Science, University of Basrah; 137pp.
- Jazza,S.H ; Al-Saad,H.T ; Salih ,S .M and Khwadem ,A .A (2016). Estimation of Hydrocarbon Compounds in Drinking Water in Misan Governorate / Iraq . Journal of Pharmaceutical, Chemical and Biological Sciences ., 4(2):291-298.
- Magi, E; Bianco, R; Ianni, C ,D and Carro, M.,(2002). Distribution of polycyclic aromatic hydrocarbons in the sediments of the Adriatic Sea. Environ. Pollut. 119 (1): 91-98.
- Qiu, Y.W; G. Zhang, G.Q; Liu, L.L; Guo, X.D. and Wai ,O. (2009). Polycyclic aromatic hydrocarbons (PAHs) in the water column and sediment core of Deep Bay, South China. Estuarine, Coastal and Shelf Sci.83: 60 - 66.

- Ramesh, A; Walker, S.A; Hood, D.B; Guillén, M.D ;Schneider, K. and Weyand, E.H. (2004). Bioavailability and Risk Assessment of Orally Ingested Polycyclic Aromatic Hydrocarbons. International Journal of Toxicology.23 (5): 301–333.
- Taioli, E;Sram,R.J ;Garte, S ; Kalina, I. T; Popov, A and Farmer, P.B.(2007). Effects of Polycyclic Aromatic Hydrocarbons (PAHs) in Environmental Pollution on Exogenous and Oxidative DNA Damage (EXPAH Project): Description of the Population under Study. Mutation Research. 620 (1–2): 1–6.
- UNEP: United Nation Environmental Program (1989). Comparative toxicity test of water accommodated fraction of oils and oil dispersant's to marine organisms. Reference methods for marine pollution .No. 45, 21pp.
- Uzoekwe, S.A. and Oghosanine , F.F.(2011). The effect of refinery and petrochemical effluent on water quality of Ubeji Creek, Warri, Southern Nigeria, Ethiopian .Journal of Environmental Studies and Management .4(2)107– 116.
- Zhang, Y; Guo, C.S; Xu, J; Tian, Y.Z; Shi, G.L ;Feng, Y.C., (2012). Potential source contributions and risk assessment of PAHs in sediments from Taihu Lake, China: Comparison of three receptor models. Water Res. 46, 3065–3073.
- Zrafi, I; Hizem, L; Chalhmi, H; Ghrabi, A; Rouabhia, M; Saidane–Mosbahi, D.(2013).Aliphatic and aromatic biomarkers for petroleum hydrocarbon investigation in marine sediment. J. Pet. Sci. Res. 2, 145–155.

**التغيرات المكانية لمستويات المركبات الهيدروكربونية في مياه ورواسب بعض الانهار في محافظة ميسان /
العراق**

صالح حسن جازع

كلية العلوم / جامعة ميسان

الخلاصة :

انجزت الدراسة الحالية لمعرفة التغيرات المكانية لمستويات المركبات الهيدروكربونية النفطية في عينات المياه والرواسب من بعض الانهار في محافظة ميسان .جمعت عينات المياه والرواسب من سبعة مواقع مختلفة خلال شهر كانون الاول 2017 ثلاثة منها في نهر دجلة (علي الغربي ، معمل الزيوت ، قلعة صالح)، واربعة موزعه على الانهار التالية الكحلاء ، والمشرح ،والمجر ، والبتيه . قدرت تراكيز المركبات الهيدروكربونية النفطية الكلية (باستخدام جهاز الفلوره. أظهرت نتائج الدراسة الحالية وجود اختلافات مكانية في تراكيز المركبات TPHs في عينات المياه والرواسب وقد تراوحت تراكيزها في المياه من 0,038 إلى TPHs الهيدروكربونية النفطية الكلية 0,074 مايكروغرام/ لتر في نهر المشرح والكحلاء على التوالي ، بينما تراوحت تراكيزها في الرواسب من 31,35 إلى 96,13 مايكرو غرام/غرام وزن جاف اذ سجلت اعلاها في محطة على الغربي بينما ادناها في نهر البتيه .كما أظهرت نتائج هذه الدراسة بأن مستويات المركبات الهيدروكربونية النفطية الكلية في عينات المياه اقل منها في عينات الرواسب في كافة المواقع المدروسة.

