Marina Mesopotamica, 9(2): 313-321 (1994)

DISTRIBUTION OF PETROLEUM HYDROCARBONS IN AQUATIC PLANTS OF HOR AL-HAMMAR MARSH, IRAQ

Hamid T.Al-saad
Marine Science Centre-University of Basrah
Basrah-Iraq

ABSTRACT

This paper present the result of a survey undertaken to obtain preliminary data on the level of petroleum hydrocarbon in aquatic plants in Hor Al-Hammer marsh.

Eleven species of aquatic plants were collected from different localities in the Hor Al-Hammar march southern iraq during 1987-1988. These plants were extracted and concentration of petroleum hydrocarbons were determined spectrofluorometrically Total hydrocarbons concentration range from 0.59 ug/g in Namphoides indica to 0.06 ug/g in Potamogeton prefoliatus expressed in terms of Kuwait crude oil equivalents, also high correlation between petroleum hydrocarbons and fat content of these plants have been observed.

INTRODUCTION

In species years detailed analysis of fresh-sea water as well as aquatic species ranging from micro-organisms to vertebrates, have demonstrated the presence of hydrocarbons, both aliphatic and aromatic,which are simillar in nature to components of petroleum and petroleum products. Also present, however are other hydrocarbons that are characteristic of living organisms.

In the open water concentrations of hydrocarbons are generally low and the origin of these compounds is not always easily determined. By constrast, in area affected by massive contamination the hydrocarbons may present in high

concentrations and can be directly releated to the particulate source of pollution (Lockwood 1976).

The analysis of micropollutant in natural organisms has been shown to be sutibale methods for pollution monitoring. Aquatic plants, clearly reflect regional differences in deposition levels because of their high accumulation rates for anumber of pollutants such as hydrocarbons (Thomas 1983).

Aquatic vascular plants (Macrophytes) are important components of any ecosystem. They are more productive per unit area than phytoplankton communities under comparaple condition, and useful for the enrichment of water with oxygen and production of organic matter to the food web and turnover for essential nutrient. they provide shelter and breeding sites for fauna, they serve as a substrate for epiphytic organisms. The high uptake capacity of mineral elements by several aquatic plants have stimulated some proposal for using higher aquatic plants in tertiary waste treatment for nutrient and waste removal from domestic waste water or industrial efflunt (Al-Saadi and Al-Mousawi 1984). However, littel is Known of plant ecology of the marshes in Iraq (Al-Hilli 1977,Al-Mayah 1978, Al-Saadi and Al-Mousawi 1988) and there is nostudy of hydrocarbons pollution on aquatic plants in the marshes, so the present study represent the first investigation on the distibution of petroleum hydrocarbons on the aquatic plants of Hor Al-Hammar marshes.

MATERLALS AND METHODS

Samples were collected during 1987-1988 from seven stations (Fig.1) to provide, representative coverage of Hor Al-Hammer marsh southern Iraq. Entire plants were collected at several points along the population at each sampling site, thus minimizing sampling errors due to the colonal variation. Plants were washed several times with marsh water at the collection station to remove as much epiphytic material as possible, squeezed gently and placed in aluminum foil. Upon reaching laboratory, leaves from plants were rinsed throughly with deionized-distilled water, dried at 50C to ground with agite morter, seiving through 1mm metal seive. A replicate of five grams of dried plants were placed in pre-extracted cellulose thimble and soxhlet extracted with methylene chloride. The extraction and fractionation procedure employed in the present study was based upon that of Risebrough et.al(1983). Fat content determined by weighting. The determination of petroleum residuse was carried out using

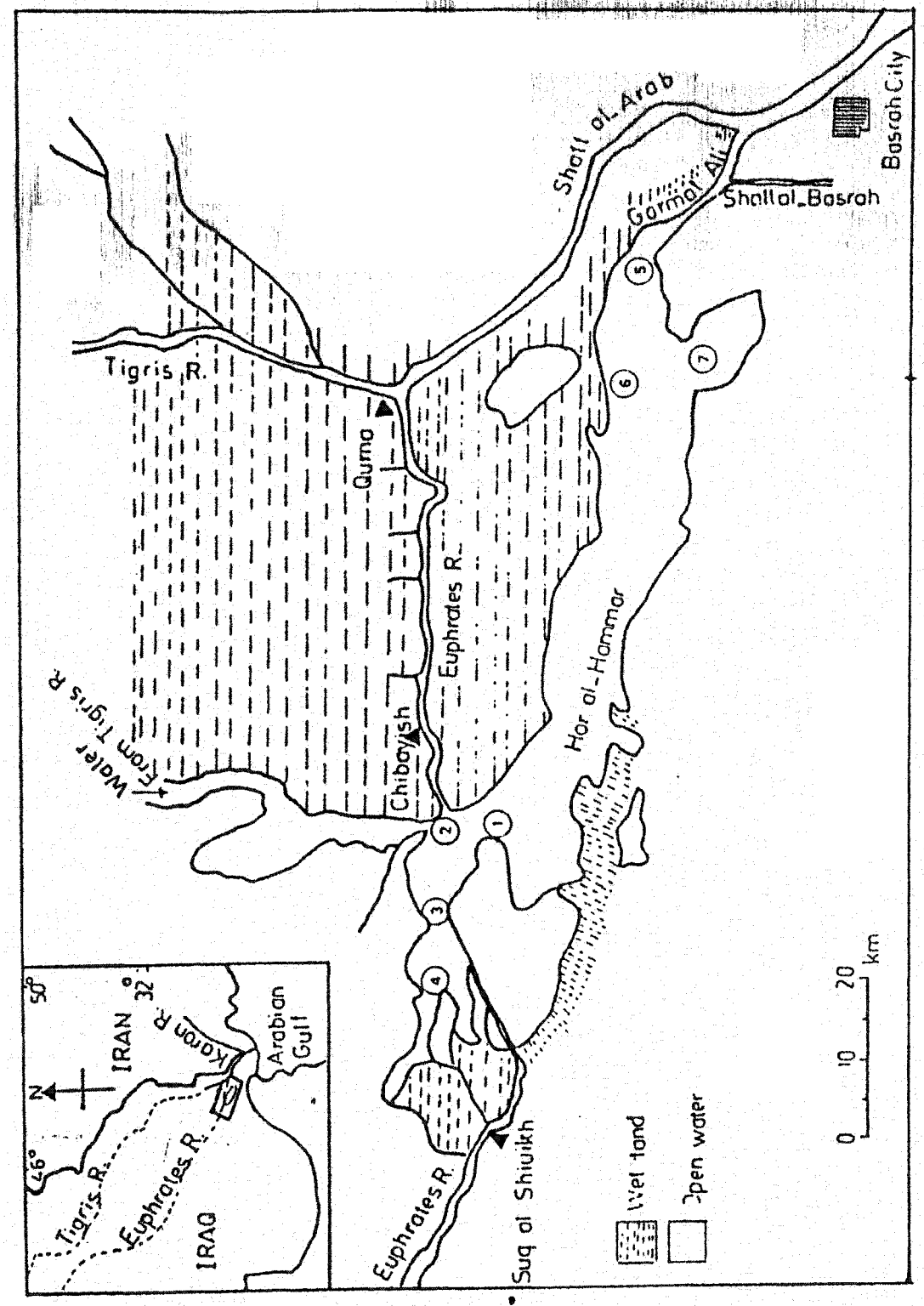

Fig.1 Map of the marshes of Iraq showing the position of stations.

SHIMADZU RF 540 Spectroflurometer. Emission spectra (exciatation 310nm) were recorded for each sample, and flouresecence intensities were measured at (360nm). Blank determination were achieved for each sample. Kuwaite crude oil, supplied by American Petroleum Institute (API), was chosen as an arbitary standard for comparsion. Chrysen standrad were employed to calibrate the Spectroflurometer, and to check quantification of the analytical result for the characterizing the extracted hydrocabons (Saliot et.al 1981), some of the samples were also analyzed by gas chromatography. For this purpose, a Perkin-Elmer Sigma 300 capillary gas chromatography with Flame Ionization Detectr (FID) was used, in this case a well coated open tubular (WCOT) fused silica capillary column (50x0.25mm.i.d.) with 0.22u film thickness coated with SE 30 was used. Helium used as a carrier gas, Splitless injection, temperature programmed from 70°C for 4min to 300°C for 30min at rate 4°C/min was employed.

RESULTS AND DISCUSSION

The concentration ranges and means of hydrocarbons in plants sampled with fat% are presented in Table.1.

The mean concentration of total hydrocarbons range from 0.59 ug/g in Namphoides indica to 0.06 ug/g in Potamogeton prefoliatus expressed in term of Kuwait crude oil equivalents.

The analysis of plant samples reveal its abitity to contain hydrocarbons in their lipid pool, in the basis of differents hydrocarbons concentration observed in plant along the marsh it is observed that a direct relationship exsist between hydrocarbons and Fat%. It can seen from Table.1 and Fig.2. that there are noticable variations illustrates the capacity of these plants to accumulate certain hydrocarbons, hence their significant as potential monitors, However consideration should be made to the fact that fifferent species of plant have different abilities to accumulate or eliminate certain pollutant from the environment (Thomas et al 1984). This may explain the rather high concentration in some plants than others.

Hydrocarbons concentration observed in the plant marshes reflect the combined effect of input and removal processes due to the water flows associated with agricultural activity, and the marshes receive water from both Tigris and Euphrates river whom carry tremendons amount of suspended particulate matter to which organic matter are sorbed. These material are mostly deposited in the entrance of the marshes i.e station.4,Fig.1.as the water current of Tigris-Euphrates rivers Drop appreciably (Al-Saad and Al-Timari 1989). Also

Table-1-
Distribution of petrolum hydrocarbons in aquatic plants of the marshes of Iraq (µg/g dry weight) with fat contants.

SPECIES	HYDROCARBONS range	HYDROCARBONS mean	FAT%
Nymphoides indica	0.58-0.60	0.59	2.1
Ceratophillum demersum	0.03-0.06	0.04	0.3
Potamogeton lucens	0.05-0.07	0.06	0.4
Potamogeton crispus	0.24-0.32	0.28	1.1
Potamogeton perfoliatus	0.03-0.09	0.06	0.2
Vallisneria spiralis	0.26-0.08	0.53	2
Najus marinum	0.07-0.10	0.08	0.7
Polygonum sp.	0.18-0.10	0.19	1.1
Ranunculus sp.	0.26-0.30	0.28	0.6
Salvinia natans	0.05-0.09	0.07	0.6
Bacopa monniera	0.16-0.22	0.19	0.7

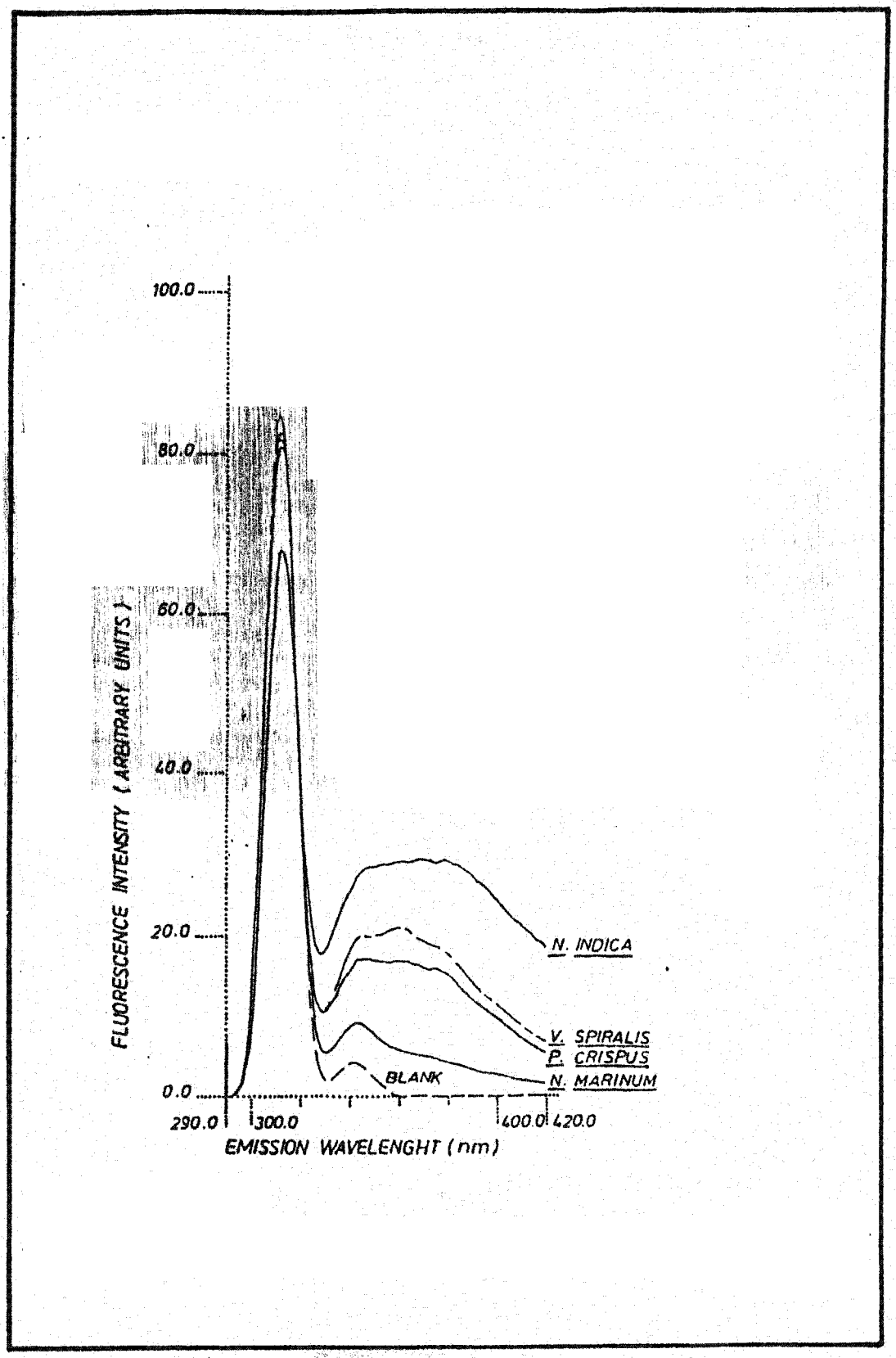

Fig.2 Synchronous flourescence emission spectra of hydrocarbons extract of plant samples

hydrocarbons present in these plants may be due to numerous number of small fishing boats moving in Hor-Hammar, As acnosequence the environment here is constantly subjected to samall spillage of fuel oil as well as direct discharge of engine exhaust (Al-Saad and Al-Timari 1989).

Result of the gas chromatographic analyses of n-alkanes are depicted in Fig.3. for some of these plants, ingeneral, plants have ahigh proportion of odd carbon number n-alkanes relative to even carbon number n-alkanes such as C25,C27 and C29 (Johnson and Calder 1978), while abundance of C15,C17,C19 n-alkanes is repoted to derived frome zooplankton,bacteria, fungi (Farringhton et.al 1983) and phytoplankton which were observed growing on the base of some of these plants, inasmuch as algae is generally have very high concentration of hydrocarbons (Saliot 1981).

Also plant samples contain isoprenoids n-alkanes which occure commonly in plant kingdoms as a side chain of chlorophylls, found mainly in photosynthetic organisms, which are widely distributed in the Hor Al-Hammar marsh, and must be attributed to them (Simone et.al 1987).

As aconclusion all plant samples in Hor-Hammer marsh contain hydrocarbons either biogenically and from plant itself or contaminated anthropogenically.

REFERENCE

Al-Hilli, N.R. 1977. Studies on the plant ecology of Ahwar region in southern-Iraq. Ph.D thesis, Cairo University. Egypt.

Al-Mayah, A.R. 1978. Common water and marsh angiosperms of southern Iraq. J.Bang.Acad. Sci. 2: 47-54.

Al-Saad, H.T. and Al-Timari, A.AK. 1989. Distribution of Polycyclic Aromatic Hydrocarbons (PAHS) in marsh sediment Iraq. Bull.Environ.Contam.Toxicol, 43: 864-869.

Al-Saadi, H.A and Al-Mousawi, A.H.A 1988. Some notes on the ecology of aquatic plants in the Al-Hammar marsh,Iraq. Vegetatio 75: 131-133.

Al-Assdi, H.A and Al-Mousawi, A.H.A 1984. On the chemical composition of aquatic plants in Shatt Al-Arab near Basrah, Iraq. Bang.J Bota. 13: 137-146.

Farringhton, J.W, Goldberg, E.D, Risebrough, R.W, Martin, J.H and Brown, V.T 1983. U.S.Mussel watch 1976-1978; an overview of the trace metal, DDE,PCB, Hydrocarbon and artificial radionuclide data. Environmental Science and Technology, 17: 490-496.

Johnson, R.W and Calder, J.A 1978. Early diagenesis of fatty

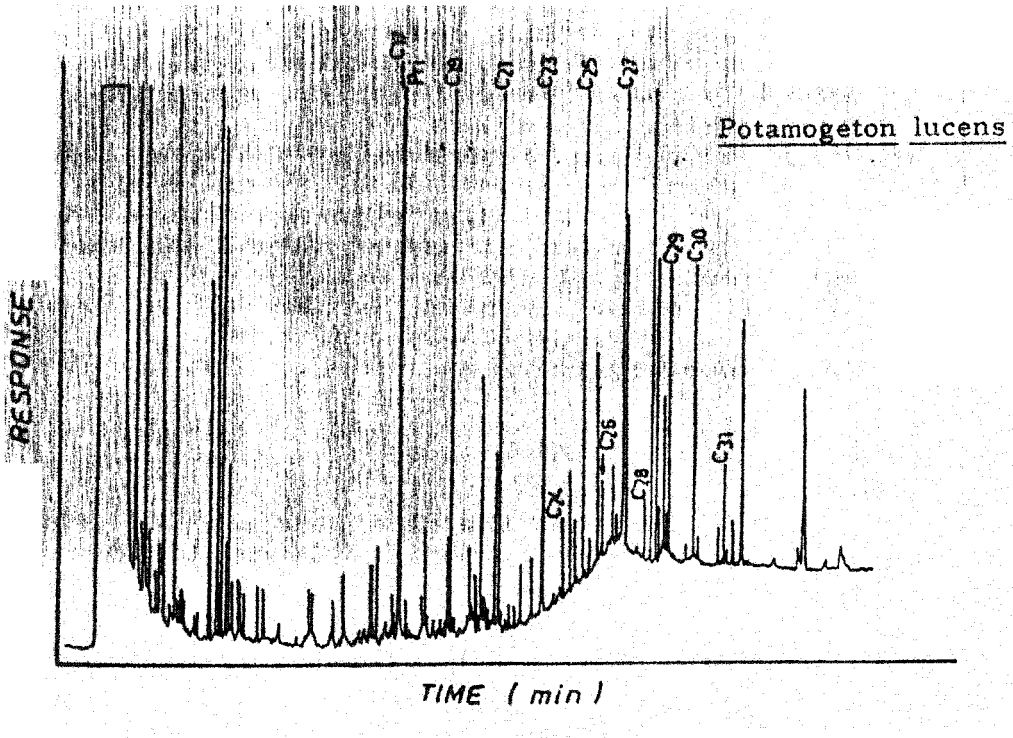

Fig.3 Chromatograms of n-alkanes in plant sample.

acids and hydrocarbons in a salt marsh environment. Geochemica et Cosmochemica Acta 37: 1943-1955.
Lockwood, A.P.M. 1976. Effects of pollutants on Aquatic organisms. Cambridge Press. U.K.
Risebrough, R.W, Delape, B.W: WAlker, W.W.II, Simoneit, B.R.T, Grimalt, J., Albaiges, J , Regueiro, J.A.G, Nolla, A.B.I and Femandez, M.M 1983. Application of the mussel wath concept in the studies of the distribution of hydrocarbons in the coastal zone of the Ebro delta. Marine Pollution Bulletin 14: 181-187.
Saliot, A. 1981. Natural hydrocarbons in sea water in: Marine organic chemistry (edit) Dursma, E.K and Dawson, Amesrdam: 327-374.
Thomas, W. 1983. Uber die verwendurng van pflanzen zur analyse raumlicher spurensubatanz-immissionsmuster. Staub-Reinhalt. Luft. 43: 141-148.
Thomas, W, Ruhling, A. and Simon, H. 1984. Accumulation of Ariborne pollutants (PAH,Chlorinated hydrocarbons, Heavy metals) in various plant species and humus. Environmental Pollution 36: 295-310.

توزيع الهدروكاربونات النفطيه في النباتات المائيه لهور الحمار العراق

حامد طالب السعد
مركز علوم البحار، جامعة البصره، العراق

المستخلص

يتضمن هذا البحث دراسه اوليه حول تراكيز الهايدروكاربونات النفطيه للنباتات المائيه المتواجده في هور الحمار جنوب العراق. جمعت احدى عشر نوعا من النباتات المائيه لمناطق مختلفه في هور الحمار خلال الفتره ١٩٨٧ - ١٩٨٨ واستخلص منها الهايدروكاربونات النفطيه وقيست بجهاز الغلوره .تراوحت التراكيز الكليه للهايدروكاربونات من ٠,٥٩ مايكروغرام/غم في Namphoides indica الى ٠,٠٦ مايكروغرام / غم في Potamogeton prefoliatus مكافئه بنفط خام الكويت. بينت الدراسه وجود علاقه بين تراكيز الهايدروكاربونات النفطيه وكمية الدهن في هذه النباتات.