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GROWTH OF SOME MARINE DIATOMS IN SEA WATER POLLUTED WITH CERTAIN PETROLEUM PRODUCTS

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Abstract

In this investigation five diatom species were grown in sea water polluted with Kerosine and Mazot.The results indicated that the diatoms which tolerated petroleum pollution were the bentho-planktonic taxa *Melosira moniliformis* (O.Mull.) Ag. and *Grammatophora marina* (Lyngb.) Kutz.in comparing with the planktonic species *Chaetoceros curvisetus* Cl., *Coscinodiscus granii* Gough. and *Ditylum brightwellii* (West) Grun.. This latter species was the highly susceptible one. The effect of the two petroleum products on the growth of the investigated diatoms varied greatly. Whereas, the number of cells of the tested diatoms decreased under the influence of Kerosine, certain doses of Mazot had stimulatory effect on the growth of some studied diatoms .

Introduction

A rapidly increasing population, a more effluent society and a more widespread use of oil have resulted in great increase in the world production of crude oils. Intensive exploration is now in progress throughout the world in an effort to locate new sources of petroleum.There is an increascing amount of offshore exploration on the Continental Shelf. All these trends have offered more opportunities for accidental spillages. The serious oil pollution recorded not only arround the coasts but also in open seas, land water habitats and soils (Crapp , 1971 ; Johnston , 1976 ; Chindah and Amadi , 1993 ; Megharaj *et al.* , 2000 and wiley , 2001).

Little research effort was directed to the problem of the effects of oil and oil cleaning agents on marine life and life dependent upon the marine environment (Cowell , 1976 ; Nyan & Price, 1980 and Pudo & Fubara, 1988).

In relation to this, there is an offer interest to study the growth of diatoms , which compose the main part in the phytoplankton of seas and oceans , in sea water polluted with petroleum products .

Materials and Methods

The investigated diatoms were isolated from Egyptian coast of Mediterrenean Sea and Suez canal , and cultured on an artificial medium after Mclachlan (1964) under specific illumination (4000 lux) and temperature (25±1)C° . These species are *Melosira moniliforemis* (O.Mull.) Ag., *Coscinodiscus granii* Gough. , *Chaetoceros curvisetus* Cl. , *Ditylum brightwellii* (West) Grun.and *Grammatophora marina* (Lyngb.) Kutz..

Two of the slowly volatile petroleum products were chosen. These are Mazot and Kerosine which boil at 150 C° or more and therefore, present for a long time in sea water after pollution .

The concentrations of these petroleum products were ranged from 0.001 ml. to 10 ml./litre of sea water. Clean dry dishes each contain 10 ml. of sterilized sea water were

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used. Sea water was sterilized by heating to 70 C° and then cooling three times. Treated and control dishes were inoculated each with 100 algal cells per 10 ml.of sea water. After 24 , 72 and 120 hours incubation, ten replicate dishes were used for the determination of population growth of each of the investigated diatoms in each concentration. Mathematical analysis of the results was occurred.

Results and Discuission

The results in Tables 1 & 2 indicated that the growth of investigated diatoms in sea water polluted with petroleum products varied greatly. Thus , the most tolerated diatoms to the petroleum pollution were the bentho-planktonic taxa *Melosira moniliformis* (O. Mull.) Ag. and *Grammatophora marina* (Lyngb.) Kutz. if compared with the planktonic species *Chaetoceros curvisetus* Cl. , *Coscinodiscus granii* Gough. and *Ditylum brightwellii* (West) Grun. The two former species can grow under the high concentrations of Kerosine and Mazot in sea water (1.0 ml./ L and 10.0 ml./L), while the three latter species were perished under the doses of these petroleum products in ten and hundred times lesser (see Tables 1 & 2). The highly susceptible diatom to the petroleum pollution was *Ditylum brightwellii* (West) Grun. , the cells of which were completely killed under 0.001 ml./L and 0.01 ml./L of petroleum products in sea water (Tables 1 & 2).

Table 1: Growth of certain diatoms under different concentrations of Kerosine (in % to the initial number of cells).

Algae	Time hours	Concentrations of Kerosine ml/L					Control
		0.001	0.01	0.1	1.0	10	
Ditylum brightwellii (West) Grun.	0	100	100	100	100	100	100
	24	148±1	.....	.....	.....	.....	135±1
	72	.....	.....	.....	.....	.....	206±1
	120	.....	.....	.....	.....	.....	268±7
Coscinodiscus granii Grough.	0	100	100	100	100	100	100
	24	200±1	170±2	113±1	.....	.....	220±9
	72	605±7	625±6	.....	.....	.....	1025±7
	120	1500±4	1640±1	.....	.....	.....	2100±1
Melosira moniliformis (O. Mull.) Ag.	0	100	100	100	100	100	100
	24	116±1	125±7	98±3	102±6	109±5	118±1
	72	157±9	214±1	130±1	102±6	115±1	170±1
	120	210±7	250±2	131±1	102±6	110±6	216±1
Grammatophora marina (Lyngb.) Kutz.	0	100	100	100	100	100	100
	24	131±1	111±1	130±3	135±1	105±7	146±1
	72	330±3	290±2	238±1	180±2	110±8	336±2
	120	505±4	510±3	326±3	284±3	110±1	552±7
Chaetoceros curvisetus Cl.	0	100	100	100	100	100	100
	24	140±1	130±1	100±1	100±2	100	112±2
	72	240±2	230±2	.....	.....	.....	288±2
	120	450±6	540±6	.....	.....	.....	645±9

Table 2: Growth of certain diatoms under different concentrations of Mazot (in % to the initial number of cells).

Algae	Time hours	Concentrations of Mazot ml/L					Control
		0.001	0.01	0.1	1.0	10	
Ditylum brightwellii (West) Grun.	0	100	100	100	100	100	100
	24	150±1	54±2	.....	.....	.....	123±6
	72	330±4	88±1	.....	.....	.....	255±1
	120	513±2	88±1	.....	.....	.....	328±2
Coscinodiscus granii Grough.	0	100	100	100	100	100	100
	24	225±2	230±2	100	100	.....	220±9
	72	440±6	353±4	.....	.....	.....	1025±7
	120	440±6	.....	.....	.....	.....	2080±1
Melosira moniliformis (O. Mull.) Ag.	0	100	100	100	100	100	100
	24	135±1	162±2	105±7	112±1	100	130±1
	72	254±4	333±4	154±1	97±1	100	333±31
	120	437±8	514±5	209±2	45±1	.....	514±1
Grammatophora marina (Lyngb.) Kutz.	0	100	100	100	100	100	100
	24	133±8	140±1	121±6	106±2	120±1	124±1
	72	463±3	314±3	290±2	62±3	130±1	232±4
	120	885±6	876±1	419±3	62±3	.....	411±9
Chaetoceros curvisetus Cl.	0	100	100	100	100	100	100
	24	230±1	210±3	150±9	.....	.....	210±2
	72	480±6	365±6	550±4	.....	.....	413±6
	120	944±1	572±6	.....	.....	.....	822±1

Various petroleum fractions had different effects on the growth of the studied diatoms. *Ditylum brightwellii* (West) Grun. perished afrter 24 hours under a concentration 0.001 ml.|L of Kerosine in sea water , while under the same concentration of Mazot this species of diatoms grew normally and sometimes more better than the control.

The results in Table 2 indicated that the initial lethal dose of Mazot was 0.01 ml./L and under this concentration during 15 days much more than 50% of the cells of the investigated diatoms lived and grew .

The most tolerated species of the investigated diatoms to the petroleum pollution was *Grammatophora marina* (Lyngb.) Kutz.. Thus, under concentrations 0.001 ml.|L and 0.1 ml.|L of Mazot a significant increase in the number of cells of this alga was if observed compared with that of control. This species grew more or less like control under concentrations 0.001 ml.|L and 0.01 ml.|L of Kerosine, but under 0.1 ml.|L of this pollutant in sea water it should be observed its evidently oppression .

Conclusions

From the previous results we can conclude that each of the investigated diatoms has a different perceptibility to grow in sea water polluted with the selective petroleum products , and that the toxicity of Kerosine on the growth of these diatoms was higher than that of Mazot. In conformity with this conclusion Crafts and Reiber (1948), Havis (1950), Leonartd and Harris (1952), Ukeles (1962)), Baker (1971), Ottway (1971 and 1975), Chindah and Amadi (1993)and Maloveryan *et al.* (2001) stated that the sensitivity of marine biota to petroleum oil pollution varies with species and the toxicity of different

fraction of crude oil could be inversely correlated with the series of hydrocarbon i.e. the smaller molecules are more toxic than the larger .

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نمو بعض الدياتومات البحرية في مياه بحر ملوثة ببعض منتجات البترول

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في هذا البحث تمت متابعة نمو خمسة أنواع من الدياتومات (ميلوزيرا مونيليفورمس،كوسينوديسكس جرني ، كيتوسيرس كورفيزيتس ، ديتيلوم بريتفيلي وجراماتوفورا مارينا) في مياه بحر ملوثة بالكيروسين والمازوت. هذا ولقد أوضحت النتائج أن أكثر الدياتومات تحملا للتلوث البترول هي الأنواع القاعية- الهائمة ميلوزيرا مونيليفورمس وجراماتوفورا مارينا وذلك بالمقارنة بالأنواع الهائمة كيتوسيرس كورفيزيتس ، كوسينوديسكس جراني ديتيلوم بريتفيلي .هذا النوع الأخير كان أكثر أنواع الدياتومات المستعملة حساسية للتلوث البترولي .

هذا ولقد أوضحت النتائج أيضا أن تأثير منتجي البترول علي نمو الدياتومات المدروسة غير ثابت .فرغم أن عدد خلايا الدياتومات المختبرة قد نقص تحت تأثير أي تركيز من تركيزات الكيروسين الا أن وجود بعض الجرعات من المازوت قد نشط نمو بعض الدياتومات المدروسة