

PRELIMINARY INVESTIGATIONS INTO THE PHYSIOLOGICAL ACTIVITY OF
MARINE SEDIMENTS MICROFLORA

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The paper reports first pieces of information obtained on the activity of marine sediments microflora which degrades phenol and uses it as the only source of carbon. Sediments were taken from 30-450 m depth. Tests were carried out at phenol concentrations of 50, 125, 250 and 500 mg/l, at temperature 20°C and after 7 and 14 days of incubation respectively.

Dans cet communication on expose les premières résultats d'activité de microflore des sédiments marins provenant de profondeur de 30-450 m. Cette activité se manifeste dans la démolition et utilisation des phenol comme seule source de carbon. La testation est fait d'après les concentrations de phenol de 50, 125, 250 et 500 mg/l, près de T de 20°C pendant 7 et 14 jours d'incubation.

Sediments collected from the depths of 30-450 m were subjected to analyses of total phenol concentrations and of qualitative-quantitative composition of microflora, whose degradation activity upon phenol was examined under experimental conditions. The sediments analysed were of fine sandy or muddy constitution.

Sediments analyses for total phenol presence gave, as a rule, positive results. In 85% of the samples analysed the total phenol concentration varied between the traces and 4 mg/kg of sediment. These concentrations were higher in only 15% of the samples. The absolute maximum of phenol concentration, 211.2 mg/kg, was obtained for the sample taken from 100 m. However, phenol concentrations were noted to be related neither to depth nor to sediments structure.

The number of bacterial cells per 1 g of sediment varied with depth the sediments were taken from. The sediments taken at smaller depths contained more numerous microflora than those taken at higher depths, as shown by the analyses. Regression coefficient of bacterial cells number in relation to depth of the sediments was $b = -2853$. The number of bacterial cells in relation to the material as a whole varied within the limits of the order of magnitude $10^4 - 10^6$. Dominant bacteria recorded from the medium of nutrient salt agar, after 48 hours incubation at 20°C were B. mycoides, B. proteus, than follow various staphylococci and Klebsiella, and of

moulds various species of genus Aspergillus.

The results on the activity of marine sediments microflora in the biodegradation of phenol which is the only source of carbon, are presented in table 1. Results refer to standard solution of 50, 125, 250 and 500 mg of pure phenol per litre of distilled water

Tab. 1.

Station	Depth (m)	Initial concentration	% of biodegradation		Station	Depth (m)	Initial concentration	% of biodegradation	
			7 days	14 days				7 days	14 days
1	20-	500	∅	99.0	6	115	500	∅	11.0
	30	250	99.0	100.0		250	8.9	74.0	
		125	99.0	100.0		125	91.0	99.9	
		50	...	...		50	99.9	100.0
2	50-	500	81.0	99.9	7	128-	500	∅	37.6
	60	250	99.9	100.0		130	250	38.7	80.1
		125	99.9	100.0		125	83.0	99.0	
		50	...	...		50	99.9	100.0
3	60-	500	12.0	98.5	8	143	500	∅	8.0
	70	250	99.0	100.0		250	8.3	79.0	
		125	96.0	100.0		125	46.0	96.4	
		50	...	...		50	99.9	100.0
4	64	500	∅	56.0	9	270	500
		250	37.0	99.9		250	∅	19.3	
		125	81.0	99.9		125	∅	93.8	
		50	99.0	100.0		50	...	...
5	115	500	∅	42.6	10	450	500
		250	∅	54.0		250	∅	6.9	
		125	15.1	85.0		125	∅	90.6	
		50	79.2	99.9		50	...	...

with 4 g NaCl and 1 g $(NH_4)_2HPO_4$ added. 2 g of sediment were suspended in the 100 ml of this solution, then incubated at 20°C. The biodegradation was controlled after a week and after a fortnight.

These data together with the earlier ones (Ristanović, *et al.*, 1975; Munjko & Mandić, 1975) show that microflora of marine sediments is able to degrade biologically the phenol in concentrations considerably higher than those in which phenol ordinarily occurs in the sea (Jardas & Munjko, 1974; Pavletić *et al.*, 1975). After a period of adjustment microflora uses phenol as the only source of carbon. The more pronounced biodegradation activity of microflora was recorded for the sediments taken from the smaller depths, what can be accounted for by the more numerous microflora.

References

- Jardas, I. & I. Munjko, 1974. Sinteza dosadašnjih rezultata u istraživanju ulja i fenola u moru uz istočnu obalu Jadrana, Pomorski zbornik, 12: 423-451.
- Munjko, I. & M. Mandić, 1975. Neka određivanja ulja i fenola u priobalnom moru te biološka razgradnja fenola pomoću mikroflora morskih sedimenata. Zaštita '75, 59-64.
- Pavletić, Z., I. Munjko, I. Jardas & I. Matonićkin, 1974. Quelques observations sur lapollution verticale de la mer par les huiles minérales et les phenols dans l'Adriatique centrale et méridionale faites à l'automne 1971-1972. Journées Stud. Pollutions, Monaco, C.I.E.S.M., 47-51.
- Ristamović, B., M. Nuntanjola-Cvetković & I. Munjko, 1975. Phenol-degrading fungi from south Adriatic Sea and lake Skadar. European J. Appl. Microbiol., 1: 313-322.

