

THE EFFECTS OF PHC AND DISPERSANT COMBINATIONS ON
PALAEMON ELEGANS RATHKE FOUND IN THE BAY OF IZMIR

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ABSTRACT

Experiments have been conducted using Palaemon elegans of the Izmir Bay to investigate the effects of Crude oil from the Aliğa refinery and it's combination with Dispersants Corexit 9527, Atlantic-Pacific and Corexit 7664. It has been seen that concentrate dispersant Corexit 9527 and Atlantic Pacific enhance the toxicity of crude oil (WSF) and it's derivative Toluene, whereas Corexit 7664 a conventional dispersant decreases it's toxicity on P.elegans, a benthic species.

The 9-day LC₅₀ value with the water soluble fraction of crude oil was found to be 0.39% whereas it was found to be 0.07% when the dispersant Corexit 9527 was applied. Likewise the toxicity of Toluene increased when the dispersant Atlantic-Pacific was applied from an LC₅₀ of 0.009 to 0.006%, in a 96-hour period. This indicated that concentrate dispersants had a tendency to increase the toxicity of PHC's at least as far as benthic species were concerned.

INTRODUCTION

It has been a general belief that dispersants lower the toxicity of petroleum hydrocarbons. However in our experiments with concentrate dispersants, Corexit 9527 and Atlantic-Pacific (super concentrate), it has been seen that they rather increase the toxicity of petroleum hydrocarbons as also observed by Doe and Wells (1978), Richard (1979) and Norton (1980). Our experiments conducted with Palaemon elegans Rathke, obtained from the Urla shore (Izmir, Turkey) has had the intention to guide us in dispersant application.

MATERIALS and METHODS

A series of experiments have been conducted using a set of PHC's or derivatives of dispersants and PHC+dispersant combinations. The test animal Palaemon elegans have been collected from the URLA shore. The water has been collected from the same shore, the water having a salinity of ‰36.5 and an average pH of 7.5 The test temperature has been 20°C as suggested by other reseach workers. The test has been conducted in a semi-static form in 4 L capacity containers with low aeration. The solution has been periodically checked to see that there was no DO depletion. The animals were acclimated for at least 48 hours. The animals were juveniles weighing 0.25 grs and 2 cms. in length.

The toxicants used were Crude oil from the Aliaga refinery Toluene, Atlantic-Pacific Oil dispersants. Corexit 9527 and Corexit 7664 (a conventional dispersant).

RESULTS AND DISCUSSION

Toluene has been found to be very toxic, being an aromatic with a-CH₃ group. It's 96 hour-LC₅₀ value has been found to be 0.009% whereas when the dispersant Atlantic-Pacific was applied it's toxic effect increased as can be seen from it's LC₅₀ value of 0.006%. When the WSF of crude oil was applied the 9-day LC₅₀ Value was 0.39%, whereas with the application of Corexit 9527 the toxicity increased. When the 3 dispersants were compared between themselves, it was seen that Atlantic-Pacific was the most toxic with a 48-hour LC₅₀ of 0.1%, next came Corexit 9527 with an LC₅₀ of 0.3% and Corexit 7664 (conventional) was the least toxic.

This made us conclude that concentrate dispersants enhanced the toxicity of PHC's as supported by Doe and Wells (1978), Richard (1979) and Norton (1980).

Canevari (1975) suggests that the increase in toxicity may be due to smaller droplet size (1/10) produced by concentrates, which make them easily available due to smaller droplet size. Smaller droplet size make their consumption easier for benthic organisms as well as other forms. Another reason for the application of concentrate dispersants to increase toxicity may be the formation of more toxic isomers.

This of course shows that there is need for further investigation in the chemical aspects of reactions taking place in dispersant application.

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