

Oil Spill Dispersant Toxicity on Fish and Mollusc

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ملخص

يحتوي هذا العدد على قياسات علمية لصفة التسمم الناتج عن استعمال المنتج المشتت للبترو (Dispolène 32S) إزاء ثلث من أنواع السمك (*Aphanius fasciatus*) (*Atherina hepsetus*, *Mugil ramada*) ونوعين من المحار (*Mytilus galloprovincialis*).

إن تقييم CL - 10 ، CL - 50 و CL - 90 التي ترمز كل منها على الكمية القاتلة لـ 10 % ، 50 % و 90 % من الكائنات المختبرة خلال مدة 24 ساعة ، مكنتنا من التعرف على حدة صفة التسمم لمشتت البترول حتى ولو استعمل بكمية ضئيلة ثم من تحديد مدة الانفعال إزاء هذا المنتج إذ هي تختلف من كائن الى آخر . فقد أظهرت *Atherina* و *Mugil* أكثر حساسية من *Aphanius* ، أما المحار فهي أكثر الكائنات قدرة لتحمل Dispolene 32 S على الإطلاق . . . فهي تحبس نفسها في قوقعتها .

RESUME

Cet article rapporte les mesures faites sur la toxicité d'un produit dispersant anti-petrole, le dispolene 32S, vis-à-vis de 3 espèces de poisson (*Mugil ramada*, *Atherina hepsetus*, *Aphanius fasciatus*) et 2 espèces de Mollus que (*Mytilus galloprovincialis* et *Tapes decussatus*).

La détermination des CL-10, CL-50 et CL-90, qui correspondent respectivement à la concentration lethale tuant 10%, 50% et 90% des organismes testes pendant une durée de 24 heures, montre que le dispolene 32S est très toxique même à faible dose.

Le temps de reaction differe d'un organisme à un autre et montre que *Mugil* et *Atherina* sont plus sensibles que *Aphanius*, et les Mollusques sont les espèces les plus résistantes... elles se renferment dans leur Coquille.

ABSTRACT

The present article is dealing with test toxicity of dispolene 32S (oil spill dispersant) on three kinds of fishes (*Mugil ramada*, *Atherina hepsetus*, *Aphanius fasciatus*) and two kinds of Molluscs (*Mytilus galloprovincialis* and *Tapes decussatus*).

Determination of LC-10, LC-50 and LC-90, respectively the lethal concentration which kills 10%, 50% and 90% of test organisms in 24 heures, shows that the dispolene 32S is very toxic and can be considered as a harmful product even when used at low level. Time reaction differs from one test organism to another ; it shows that *Mugil* and *Atherina* are more sensible than *Aphanius* and that Molluscs are the most resistant ones... it withdraws into oneself.

INTRODUCTION

When oil spill occurs, the major concern to prevent its impact on any shoreline is to use an oil spill dispersant, which can greatly aid in the handling of floating oil at sea.

This oil spill dispersant can be of extremely high toxicity to marine life when used in undesirable concentration.

This study is dealing with the toxicity test of such oil dispersant (Dispolene 32S) using different test organisms : three kinds of fishes (*Mugil ramada*, *Atherina hepsetus*, *Aphanius fasciatus*) and two molluscs (*Mytilus galloprovincialis*, *Tapes decussatus*).

Material

— Oil spill dispersant, dispolene 32S ;

— Test organisms : *Mugil ramada* (mean length, 4.6 cm), *Aphanius fasciatus* (mean length, 3.0 cm), *Atherina hepsetus* (mean length, 4.8 cm), *Mytilus galloprovincialis* (mean length, 3.8 cm) and *Tapes decussatus* (mean length, 3.5 cm) ;

— Dilution sea water : after aeration and sterilisation for 24 heures, the dilution water has a pH of 7.9, a salinity of 37.6 ppt and a temperature of 23°C.

Procedure

All stages of procedure described below took place in an atmosphere free of dust and toxic vapors.

The test is carried out in graduated and 2000 ml capacity pyrex cylinders at a temperature of 23°C and gently aerated.

Series of dilution of toxicant are prepared with filtered sea water as following 100 ppm (0.1 ml/l), 1000 ppm (1 ml/l), 2000 ppm (2 ml/l), 5000 ppm (5 ml/l) and 10 000 ppm (10 ml/l).

For each series using one test organism we prepare a control with no toxicant. The percentage of mortality between 5 and 95% are calculated from the average number of dead test organisms per concentration and plotted on log-probit paper. A straight line is drawn through the points ; the intersection of the line with

10%, 50% and 90% mortality horizontal line, determines the LC-10, LC-50 and LC-90 for 24 and 48 heures ; these lethal concentrations are calculated from graphical interpolation according to Doudoroff and Hal. (1951), Stora (1972) and Vanhaecke and al. (1981).

Results

Results and observations are reported in tables n° : 1, 2, 3, 4, 5, 6 and at figure I ; it shows that dispolene 32S is very toxic even at Low concentrations and remind the study related to that subject and done by Darmoul (1981).

The test organismes even the most resistant one, show a total mortality in a few minutes when dispolene is used at concentrations between 5 000 and 10 000 ppm and can only survive for a few heures at concentrations between 1000 and 2000 ppm. The effect of dispolene 32S is almost the same and differs very little considering the fish or the mollusc when taken specy by specy.

At concentrations between 2000 and 10 000 ppm Mugil ramada is the most sensitif and bivalves are less resistant then *Atherina* and *Aphanius* ; but at dispolene concentrations between 50 and 100 ppm, bivalves are the most resistant then fishes ; it seems that in the second case, the molluscs can support very big concentration of dispolene, and this by withdrawing into themselves in that case its death is catastrophic and its body is quickly destroyed ; In the first case, the molluscs keep its test open and show a normal biological activity or a short period after which it dies ; it seems that dispolene when used at small concentration inhibits some physiological mecanism and causes the death of animals.

The time molluscs reaction to the dispolene is higher when compared to the time fish reaction ; dispolene 32S can kill 50% of fish and molluscs in less then 24 heures, when used at concentrations between 100 and 3000 ppm. This LC-50, for 24 heures, is on to four times bigger, when compared to LC-50, for less then 48 heures (fig. 1).

Mussel is a little more sensitif then *Tapes decussatus* ; the LC-10, LC-50 and LC-90, for 24 heures, are two to five times higher then those killing the same bivalves in 48 heures.

On account of its high density, when mixed with sea water, dispolene 32S, by decanting from the surface to the bottom, can kill all marine organismes within the water column. ...All the reason, such oil spill dispersant is dangerous on both plankton and benthos.

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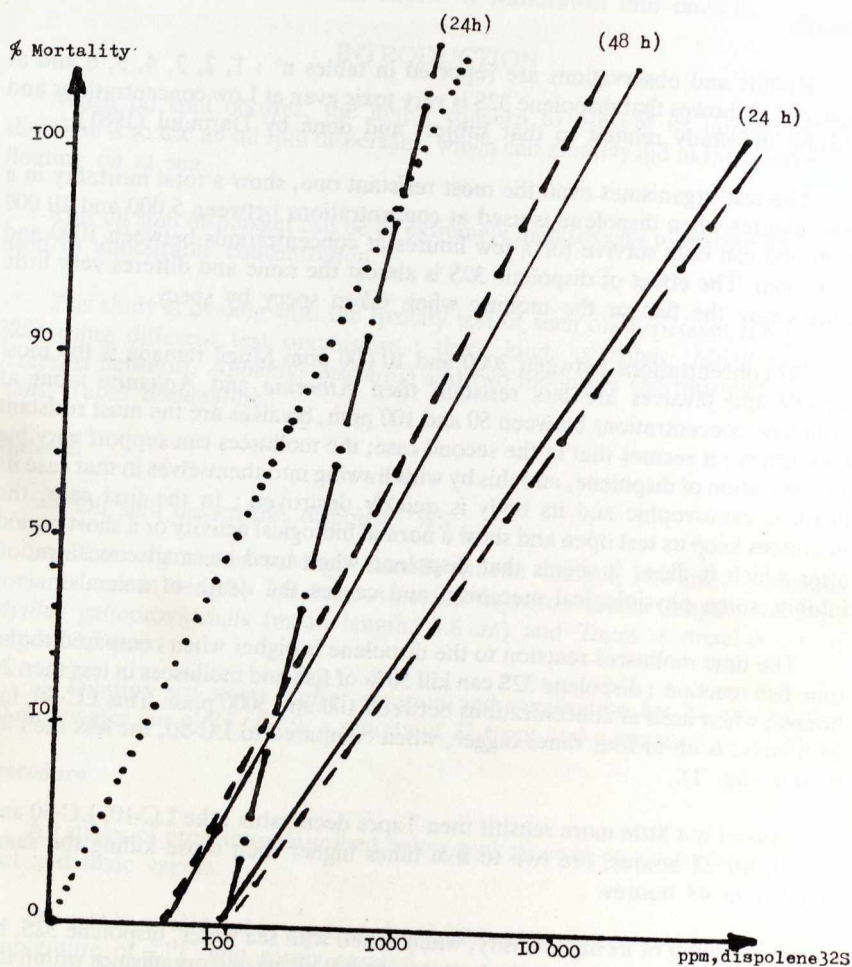


Fig.I. Determination of lethal concentration values which kill 10 %, 50 % and 90 % of Mugil Ramada (....), Atherina (---.), of Mytilus (____) and Tapes (---) during a periode of 24 and 48 heures.

Percentage mortality related to different concentrations
of dispolene 32 s, of the following organisms

Table 1 : *Mugil remada*

Time (heures)/ concentrations (ppm)	0	100	1000	2000	5000	10 000
000,00	0	0	0	0	0	0
0,08	0	0	27	100	100	100
0,19	0	0	73			
0,30	0	0	100			
20,40	0	60				
47,20	0	80				
143,50	0	100				

Table 2 : *Atherina hepsetus*

000,00	0	0	0	0	0	0
0,01	0	0	0	0	100	100
20,40	0	0	100	100		
143,50	0	0				

Table 3 : *Aphanius fasciatus*

000,00	0	0	0	0	0	0
0,20	0	0	0	0	33	100
0,30	0	0	0	0	67	
0,40	0	0	0	0	100	
20,40	0	0	100	100		
47,50	0	10				
119,50	0	20				
143,50	0	25				

Table 4 : *Mytilus galloprovincialis*

000,00	0	0	0	0	0	0
24,00	0	0	9	45	68	86
44,30	0	5	48	85	100	100
72,30	0	11	100	100		
144,40	0	76				
168,00	0	100				

Table 5 : *Tapes decussatus*

000,00	0	0	0	0	0	0
24,00	0	0	10	47	70	80
44,30	0	5	60	84	100	100
72,30	0	5	100	100		
144,40	0	50				
168,00	0	100				

TABLE 6
Lethal concentrations of dispolene 32 S using, as test organismes,
fishes and molluscs, during 24 and 48 heures

Test organismes	CL - 10	24 heures		48 heures		
		CL - 50	CL - 90	CL - 10	CL - 50	CL - 90
Mugil ramada	40	100	300	20	60	200
Atherina hepsetus	200	300	600	CL is between 100 and 1000		
Aphanius fasciatus	200	300	600	90	200	400
Mytilus galloprovincialis	600	3000	10000	200	700	3000
Tapes decussatus	600	3000	10000	200	600	2000

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