

# Using *Daphnia carinata* KING on Toxicity Test Pre and Post Phytoremediation of Oily Sludge

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## ABSTRACT

The performance of a bioremediation of oily sludge process can be determined by measuring the reduction of contaminant concentrations and by assessing the treatment's ability to lower toxicity. Land treatment of polycyclic aromatic hydrocarbon (PAH)-contaminated soil from oily sludge. Acute toxicity, as measured by the *Daphnia* survival assay, testing bioremediation medium is very necessary for the health of the soil and water from the pollutants. Bioremediation of oily sludge using bacteria (pre) and post phytoremediation decline in levels of TPH. Although toxic levels decreased, urgent toxicity tests on organisms to determine of bioremediation are safe for the environment. The aim of this research is to observe acute toxicity level  $LC_{50}$ -48 hours medium of oily sludge composted by bacteria, post phytoremediation and influence to reproduction of *Daphnia carinata* King. To get  $LC_{50}$ -48 hours value, used static bioassay according to standard of APHA (1995) counted with Minitab Probit Analysis. For chronic toxicity test medium of oily sludge prae and post phytoremediation to reproduction of *D. carinata* King, counted the total of neonates *D. carinata* King during 21 days. The result showed that  $LC_{50}$ -48 hour's value of medium of oily sludge prae phytoremediation is amount 1043,69 ppm and post phytoremediation is amount 4728, 7 ppm. For chronic toxicity test, total of neonates *Daphnia carinata* King in medium of oily sludge pre phytoremediation is amount 34 neonates with frequency of brood 4-6 times and the size 0,75 mm. While post phytoremediation is amount 37 neonates of brood are 5-7 times and the size 0,77 mm

**Keywords:** *Daphnia carinata*, phytoremediation, oily sludge

## INTRODUCTION

Oily sludge is the residual oil distilled from crude oil processing companies, including hazardous and toxic waste, if referring to the rules of the Ministry of Environment Ministerial No. 18 and Ministerial No. 33 in 2009. This regulation stated that any activities that generate waste should be processed should be better management as not to pollute the surrounding environment. One of the efforts of petroleum waste management and soil contaminated with oily sludge that cause pollution are with the management of biologically means of bioremediation and Phytoremediation. The process of oily sludge decomposition as biological by utilizing microorganisms and plants (Kep-Men KLH No. 128/2003; Salt *et al.*, 1998).

Toxicity test on prae and post phytoremediation of oily sludge medium is urgent for the health of the soil and water from the pollutants. Using *Daphnia* are the right way for bioassays. *Daphnia* are small crustaceans, a genus belonging to the class Branchiopod, includes at least fifty species and has a worldwide distribution. *Daphniids* have been used widely as experimental animal, not only in bioassay research, but also in studies dealing with population growth and interspecific competition. *Daphnia* have been used as standard freshwater invertebrate organisms in toxicity test and formally endorsed as such by international organizations such as the USEPA (United States Environmental Protection Agency), the EEC (European Economic Community) and the OECD (Organization for Economic Cooperation and Development) (Persoone and Janssen, 1993; Herbert, 1978; Winner *et al.*, 1977 in Dhahiyat 1977).

## METHODOLOGY

### Critical test range limits

Acute bioassay using static bioassay, to determine the critical threshold for *Daphnia*.

### Acute toxicity test (LC50-48 hours)

Media in mind the critical limit, and then determine the concentration based on a logarithmic re medium and post phytoremediation with 7 aining 150 ml of the test medium, 10 neonate



ages of 24 hours with a length of more than 1 mm (OECD, 1996) inserted into it and observed LC50 after 24 and 48 hours. Toxicity criteria referred by Swan (1994).

Table 1 : Criteria toxicity test (Swan, 1994)

Toxicity rating	Lc50 (ppm)
Very Toxic	<1
Toxic	1-100
Moderately Toxic	100-1000
Slightly toxic	1000-10.000
Almost non toxic	10.000-100.000
Non Toxic	100.000

### Chronic toxicity test (Lc50-48jam)

Tests carried out for 21 days, a 24-hour-old test animals introduced into 50 ml test solution without aeration, the observed number of neonate, production time and size of Daphnia

## RESULT AND DISCUSSION

### Acute Toxicity Test (Lc50-48 jam)

The results showed that among the oily sludge that has been composted with bacteria and post phytoremediation also show differences in toxicity criteria, as in Table 2

Table 2: Toxicity test LC<sub>50</sub> Pre and post phytoremediation of oily sludge

No.	Sample	Value Lc <sub>50</sub> -48 jam
1.	Oily sludge	37 ppm
2.	Composted by bacteria Prae phytoremediation	1043,69 ppm
3.	Post phytoremediation	4728,7 ppm

In the table above shows that the lower the LC50 value of the toxicant is a toxicant is more toxic, compare to oily sludge, medium pre phytoremediation are toxic waste. While toxicity test criteria on the medium post phytoremediation of oily sludge are slightly toxic. Looking at the above data suggest that phytoremediation efforts to reduce toxicity compounds such as polyaromatic hydrocarbons.

### Chronic Toxicity Test on Prae and Post Phytoremediation Of Oily Sludges

The results showed that the concentration of 37-220 ppm oily sludge (Pre and post phytoremediation) to Daphnia reproduction normally runs both a good number, size of the neonate and the frequency of brood as in Table 3 and 4.

Table 3: Neonate production, size and frequency of brood on pre phytoremediation of oily sludge

Oily sludge Concentration(ppm)	Neonate production on pre phytoremediation	Size of neonate (mm)	Frequency of brood (times)
37	41	0,69	6
56	33	0,76	5
75	24	0,78	4
100	29	0,76	6
140	43	0,71	6
Water	111	0,82	7
Water+Tween	94	0,82	8

Table 4 : Neonate production, size and frequency of brood on post phytoremediation of oily sludge

Concentration(ppm)	Neonate production on post phytoremediation	Size of neonate (mm)	Frequency of brood (times)
100	45	0,74	6
140	55	0,77	7
160	35	0,74	5
190	32	0,79	5
220	18	0,81	5
		0,82	7
		0,82	8

## CONCLUSION

An increase in the value of acute toxicity LC50-48 hours of medium oily sludge pre and post phytoremediation to *Daphnia carinata* King in the amount of 37ppm, 1043,69 ppm (toxic criteria) and 4728 ppm (slightly toxic). Chronic toxicity test, total of neonates *Daphnia carinata* King in medium of oily sludge pre phytoremediation is amount 34 neonates with frequency of brood 4-6 times and the size 0,75 mm. While post phytoremediation is amount 37 neonates of brood are 5-7 times and the size 0,77 mm.

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