

# Dieldrin (Organochlorine) effect on reproduction of Earthworm at different toxication periods

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## ABSTRACT

In the present work we establish that the lowest dose concentration of dieldrin from 4mg/kg soil to 8mg/kg soil showed non-significant impact on the reproduction of earthworm in all treated periods, but the result value produced near to significant on the replication of the crawler. It was also found that the 12mg/kg soil to 16mg/kg soil concentration of dieldrin showed non-significant difference in the breeding of the earthworm till 40, 50 and 60 days of toxication periods as compared to control. But same toxicant at highest concentrations dose at 16mg/kg and 20mg/kg soil of dieldrin produced a significant effect on the replication of the earthworm as compared to control.

**Key word:** - Earthworm, dieldrin, reproduction, cocoon, soil.

## INTRODUCTION

The crawler is the usual epithet for the greatest number of Oligochaeta in the phylum annelid. Red worms are common soil organism in most environments and act as an important role in structure and fertility of soil ecosystems (Bartlett, *et al.*, 2010). Most toxicity tests for cypermethrin on earthworms had been conducted using full blown earthworms (Alshawish, 2004). However, some upshot areas showed that juveniles are practically more confidential to EDCs than adults (Booth and O'Halloran, 2001). Earthworms are universal in a wide Cordilleran belt of soils and may stand for appropriate 80% of the every one soil biomass. The species acclimate with a liberal hand to laboratory final notice and it's an arm and leg sensitivity to its circumventions makes them single of the virtually congruous bio-indicator for soil chemicals (Spurgeon, *et al.*, 2004).

Earthworms play a substantial role in decomposing litter material and in structuring soils. By burrowing they create holes and pores in the land and stabilize these structures with their slime see for an overview (Edwards, 2004). As a sound indicator of land quality, earthworms were used as testing organisms by OECD in early 1980's for the registration of industrial fertilizers and pesticides before implementing them into

the soil. More than forty of them are currently registered, although all operate the risk of acute and sub acute toxicity. Organophosphates are used in husbandry, in the home lawn, in gardens and in veterinary practice, etc. All apparently share a common mechanism of cholinesterase inhibition and can cause similar symptoms of toxicity since they share this line of action, exposure to the same organophosphate by multiple paths can run to serious additive toxicity or synergistic effect (Savage, *et al.*, 1988).

## MATERIALS AND METHODS

### Experimental animal

Earthworm, *Eisenia foetida* (Savigny, 1826) is a recommended earthworm test species by Organization for Economic Co-operation and Development (OECD, 1984a) and European Economic Community (EEC, 1985).

### Animal collection

Earthworm, *Eisenia foetida* brought from commercial suppliers, Nursery Department of Forest, Wadali, Amravati and adopted as the test species, recommended by (OECD, 1984) guideline for testing of chemicals no. 207, earthworm, and acute toxicity tests.

### Chronic test for reproduction

This test was similar to the described above, the difference in the reproductive test were cocoon production juvenile survive rate. The cocoon was assessed after 28 days by wet sieving the soil and collecting all cocoons at different time intervals and different pesticides concentrations and the rate of hatchling and the rate of survival of juvenile was also assessed. The number of cocoon and juvenile were counted and compared at the end of reproductive test.

### Statistical analysis

Mortality and LC<sub>50</sub> were observed and calculated. Probability analysis was used for the result of filter paper contact test method and for standardization artificial soil test mortality was assayed according to Buchatsky (*et al.*, 2007). Correlation analysis and two way ANOVA significance tests ( $p < 0.05$ ) were used for the assessment of selected pesticide on survival, biomass, growth and reproduction of earthworm. For the filter paper contact test for cythion and dieldrine, based on the resulting 48h LC<sub>50</sub> values, the fertilizers were classified as super toxic ( $< 1 \text{ mg/cm}^2$ ), extremely toxic ( $0.8\text{--}0.9 \text{ mg/cm}^2$ ), very toxic ( $0.6\text{--}0.7 \text{ mg/cm}^2$ ), relatively nontoxic ( $> 0.5 \text{ mg/cm}^2$ ).

## RESULTS AND DISCUSSION

This test was similar to the growth, but the test endpoints were a cocoon production after 30 days to 60 days and the number of hatchlings, and their development after 60 days. The worms were hand-sorted after 30 days; the numbers of cocoons produced were counted and returned for further incubation. The juveniles were weighed after 60 days and their maturity was determined from the presence of a fully developed clitellum. Chronic test was conducted to analyze the impact of selected pesticide on (cocoon) reproduction of the earthworm. It was a long duration test. The duration of time intervals were 10, 20, 30, 40, 50 and 60 days for both the pesticides and dose of different concentrations for dieldrin 4, 8, 12, 16 and 20mg/kg soil. After 30, 40, 50 days of intoxication, number of cocoons deferred than the control in all treatment groups. The earthworms are a farmer's friend and it is widely used for preserving the richness of the land. Cocoon engenderment in earthworm exposed to dieldrin for 60 days were lower than that for 30 days at concentrations.

**Table 1:** Impact on the reproduction (cocoon) of earthworm exposed to dieldrin at different toxication periods.

Toxicated periods (day) and concentration (mg/kg)	10	20	30	40	50	60
Control	0	0	0	8±2.8	12±3.4	19±4.3
4mg	0	0	0	0	5±2.2*	8±2.8*
8mg	0	0	0	0	3±1.8*	6±2.6*
12mg	0	0	0	0	2±1.4*	6±2.4*
16mg	0	0	0	0	2±1.4*	7±2.6*
20mg	0	0	0	0	9±3*	6±2.4*

\* Significant differences ( $P < 0.05$ ) were found between treatment and control group were found 0.01.

It is evident from (table and figure) dieldrine intoxicated earthworm showed significant decreased the rate of cocoon production in treating earthworm than the untreated earthworm. The reduction was found in rate of cocoon production due to toxic effect of dieldrine on earthworm. Estimation of the rate of production of cocoon in intoxicated earthworm determines that the duration and dose dependant effect. At the present dose of dieldrine, rate of cocoon production was found to be significantly decreased as compared to control reproductive earthworm. The significant result was observed in the rate of cocoon production during all periods of toxication. It is evident from (table and figure) that the earthworm intoxicated with dieldrine determined decrease in the production of cocoon as compared to control. From (table) the reduction in the rate of cocoon production in all treated earthworms and the result was significantly in dose and duration of days. During the chronic test it was found that the result was significantly different as compared to control and also observe that the delay in duration of cocoon production than control reproductive earthworm. (Booth and O'Halloran, 2001) reported Chlorpyrifos had adverse effect on fecundity in earthworm exposed to 5 mg/kg chlorpyrifos after 8 weeks reported. (Xiao, *et al.*, 2006) noted the field application rate (5-10 mg/kg) of acetochlor had no long term effect on the reproduction of *Eisenia fetida* but at higher concentration (20-80 mg/Kg) produced toxicity to *Eisenia fetida*. Espinoza-Navarro and Bustos-Obreg stated treated *Eisenia fetida* with organophosphate insecticide Malathion and found that Malathion decreased the spermatocytic viability in spermatheca, altering the cell proliferation and modifying the DNA structure of spermatogonia (Espinoza-Navarro and Bustos-Obreg, 2004). Sperm count also seems to be a very sensitive marker (Savage, *et al.*, 1988 and Neuhauser and Callahan, 1990). Malathion could affect the sperm count, but in addition, its metabolites could affect sperm quality (Espinoza-Navarro and E. Bustos-Obreg, 2004.).

## CONCLUSION

Different parameters were analyzed concern to toxic effect of two selected pesticides dieldrine (organochlorine) on earthworm. Different doses of dieldrine ranging from 4, 8, 12, 16 and 20mg/kg soil for duration of 10, 20, 30, 40, 50 and 60 days as chronic test for reproduction. Reproductions (cocoon)

were decreased till the end of the experiment for both duration periods and for selected toxicants. The decreased in the different parameter of earthworm may be due to the change in the biochemical and physiological function of earthworm. Experimental data showed that earthworm was more sensitive dieldrine. It also determined that decreased in the morphological parameters as period of toxication increased means that the toxicity of pesticide is directly proportional to the experimental periods.

**Conflicts of interest:** The authors stated that no conflicts of interest.

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