

Effect of Malathion on Eisenia foetida

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Abstract-This study investigates the sub-lethal effects of Malathion exposure on *Eisenia foetida*, a bioindicator organism widely used in ecotoxicological assessments. Parameters analyzed include mortality, body weight, protein content, carbohydrate content, and acetylcholinesterase (AChE) activity across different concentrations (0.1%, 0.25%, 0.5%) and durations (7, 14, and 21 days). The results reveal significant physiological and biochemical alterations with increasing Malathion concentration and exposure duration, indicating toxic stress. These findings provide insights into the ecological risk assessment of pesticide contamination in soil ecosystems (Sharma & Satyanarayan, 2012; Rao, 2006).

Keywords: Malathion, *Eisenia foetida*, Protein, Carbohydrates, AChE, Toxicity

I. INTRODUCTION

Earthworms such as *Eisenia foetida* are widely recognized as effective bioindicators of soil health and fertility. Their sensitivity to pollutants, including pesticides, makes them useful organisms for ecotoxicological studies (Edwards & Bohlen, 1996).

Among organophosphate pesticides, Malathion is extensively used in agriculture for pest control due to its broad-spectrum action. However, its indiscriminate use has led to contamination of soil ecosystems, affecting non-target species like earthworms (Sharma & Satyanarayan, 2012). The present study aims to evaluate the physiological and biochemical alterations in *Eisenia foetida* under sub-lethal exposure to Malathion.

II. MATERIALS AND METHODS

Adult *Eisenia foetida* specimens were collected from laboratory cultures and acclimatized for seven days in moistened soil under controlled laboratory conditions (25±2°C). The worms were exposed to three concentrations of Malathion (0.1%, 0.25%, and 0.5%) for 7, 14, and 21 days. Control groups were maintained without pesticide exposure. Mortality, body weight, protein, carbohydrate, and AChE activity were measured using standard biochemical protocols. Data were statistically analyzed with mean ± SD and t-test for significance (OECD, 2008).

III. RESULTS

Table 1- Mortality (%) of *Eisenia foetida* under Malathion Exposure

Days	0.1%	0.25%	0.5%
7	5	10	20
14	10	25	45
21	15	35	65

Table 2
Body Weight (g) of *Eisenia foetida* under Malathion Exposure

Days	0.1%	0.25%	0.5%
7	0.4	0.38	0.36
14	0.38	0.34	0.3
21	0.36	0.31	0.27

Table 3

Protein Content (mg/g) of *Eisenia foetida* under Malathion Exposure

Days	0.1%	0.25%	0.5%
7	5.8	5.4	5.0
14	5.2	4.5	4.0
21	4.8	3.9	3.2

Table 4

Carbohydrate Content (mg/g) of *Eisenia foetida* under Malathion Exposure

Days	0.1%	0.25%	0.5%
7	5.4	5.6	5.8
14	5.0	4.7	4.3
21	4.6	4.2	3.7

Table 5

AChE Activity ($\mu\text{mol}/\text{min}/\text{mg}$ protein) in *Eisenia foetida* under Malathion Exposure

Days	0.1%	0.25%	0.5%
7	11.0	9.6	8.2
14	9.8	7.5	6.0
21	8.5	6.0	5.0

IV. DISCUSSION

The present findings indicate that Malathion exposure induces significant physiological and biochemical disturbances in *E. foetida*. Increased mortality and weight loss suggest severe toxic stress leading to disruption of metabolic homeostasis (Rao, 2006). Decline in protein content may result from enhanced proteolysis or reduced protein synthesis under pesticide stress (Edwards & Bohlen, 1996). The initial rise and subsequent fall in carbohydrate levels may reflect the organism's adaptive energy response to stress (Sharma & Satyanarayan, 2012).

Similar findings have been reported by Gupta et al. (2014), who observed significant inhibition of AChE and reduction in biomass in earthworms exposed to organophosphates. Likewise, studies by Suthar et al. (2008) demonstrated that pesticides adversely affect enzymatic activity, reproduction, and overall survivability of soil invertebrates. The observed concentration-dependent toxicity pattern in the present study corroborates these earlier reports, reinforcing that Malathion exposure compromises both structural integrity and metabolic efficiency of soil fauna.

V. CONCLUSION

The study establishes that Malathion exerts pronounced toxic effects on *Eisenia foetida*, resulting in increased mortality, reduced body weight, suppressed protein synthesis, altered carbohydrate metabolism, and inhibited AChE activity. These results emphasize that excessive pesticide usage can lead to deterioration of soil biota and ecosystem imbalance. The findings highlight the need for regular biomonitoring of agricultural soils using bioindicator species such as *E. foetida*. Adoption of integrated pest management practices and environmentally safe biopesticides is strongly recommended to maintain soil health.

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