

Research on the toxicological impact of cypermethrin, chlorpyrifos, and the mixture of them on the function of acetyl in *Eudrilus eugeniae*, a soil worm.

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Abstract

The fauna and flora of the soil ecosystem are negatively impacted by the growing use of pesticides in farming areas. Since they greatly improve the quality and fertility of soil, earthworms play a well-known function in agricultural activities. Thus, it serves as a bioindicator for the ecotoxicological evaluation of soil pollution caused by pesticides. Thus, the goal of the current study was to investigate how the pyrethroid cypermethrin and the organophosphate chlorpyrifos affect *Eudrilus eugeniae*, the earthworm. Through the use of the paper contact toxicity method, *E. eugeniae* were exposed to varying pesticide concentrations for 48 hours. The results showed that the LC50 values for cypermethrin and commercial grade chlorpyrifos were 0.020 $\mu\text{g}/\text{cm}^2$ and 0.165 $\mu\text{g}/\text{cm}^2$, respectively. For 48 hours, *E. eugeniae* were treated to 5% and 10% of the LC50 chlorpyrifos and cypermethrin, respectively, in order to evaluate the sub-lethal effect of these pesticides. After exposure, earthworms showed altered morpho-behavioural patterns, including coiling, clitellar enlargement, mucus secretion, bleeding, and body fragmentation. The assay of acetylcholinesterase (AChE) activity was conducted in several body segments. The results indicate a noteworthy ($p < 0.05$) reduction in AChE activity, mainly in the pre-clitellar region, which is followed by the clitellar and post-clitellar regions, and in

relation to the entire body. The effect at the neuronal level, which is evident from the behavioural alterations, is indicated by the decreased AChE activity with increasing pesticide concentration.

Thus, it can be inferred from the current research that prolonged exposure to these pesticides may have detrimental effects on the metabolic processes of earthworms that are irreversible. Although chromium is one of the main contaminants in soil, little is known about how harmful it is to soil organisms. Therefore, copper, chromium, and lead were selected to be employed in this study from among the several metals that pollute terrestrial ecosystems. There is not as much research on chromium's toxicity in soil organisms. Even less is affected by the insecticide and heavy metal combination on the soil fauna.

A well-researched model for heavy metal toxicity is the earthworm. Numerous academic works have addressed the uptake and accumulation of metals in earthworms. Many of them measured the density of worms, growth, and metal content. Pizl rate of accumulation Vijver and excretion rate Lock.

REFERENCES

1. M.K. Swarczewicz, A. Gregorczyk, The effects of pesticide mixtures on degradation of pendimethalin in soils, *Environ. Monit. Assess.*, 184 (2012), pp. 3077-3084
2. S. Hussain, T. Siddique, M. Saleem, M. Arshad, A. Khalid, Impact of pesticides on soil microbial diversity, enzymes, and biochemical reactions, *Adv. Agron.*, 102 (2009), pp. 159-200.
3. M.R. Narra, G. Begum, K. Rajender, J.V. Rao, Toxic impact of two organophosphate insecticides on biochemical parameters of a food fish and assessment of recovery response, *Toxicol. Ind. Health*, 28 (2011), pp. 343-352

4. R.K. Tiwari, S. Singh, R.S. Pandey, Assessment of the acute toxicity of chlorpyrifos and cypermethrin to *Heteropneustes fossilis* and their impact on acetylcholinesterase activity, *Drug Chem. Toxicol.*, 20 (2017), pp. 1-8
5. C.A.M. VAN GESTEL, J.E. KOOLHAAS, T. HAMERS, M. VAN HOPPE, M. VAN ROOVERT, C. KORSMAN, S.A. REINECKE, EFFECTS OF METAL POLLUTION ON EARTHWORM COMMUNITIES IN A CONTAMINATED FLOODPLAIN AREA: LINKING BIOMARKER, COMMUNITY AND FUNCTIONAL RESPONSES, *ENVIRON. POLLUT.*, 157 (2009), PP. 895-903.