# Toxicogenetic Assessment of Widely used in Kazakhstan Agro-Pesticide on Test Objects

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## Abstract

The study presents a comprehensive toxicogenetic evaluation of agro-pesticides commonly used in Kazakhstan, focusing on their dose-dependent effects across different biological levels. Using a multi-object approach, the research investigated the influence of organophosphate-based pesticides on aquatic plants (*Spirodela polyrhiza*), fish (*Danio rerio*), and laboratory mammals (*BALB/c* mice). Experimental analyses included toxicological, embryological, histological, and cytogenetic methods. Results demonstrated pronounced toxic, embryotoxic, and genotoxic effects even at environmentally relevant concentrations. Observed outcomes included growth inhibition in plants, dose-dependent embryo mortality and teratogenic deformities in Danio rerio, as well as histopathological and chromosomal abnormalities in mammalian tissues. The findings emphasize the ecological hazards of agro-pesticide contamination, highlighting oxidative stress and DNA damage as key mechanisms of toxicity. These results support the use of selected test organisms as effective bioindicators for environmental pollution monitoring. The study contributes to the understanding of pesticide-induced genotoxicity and offers data essential for improving regulatory standards and minimizing ecological and health risks in agricultural regions.

## Keywords

Ecotoxicology, toxicogenetics, agro-pesticides, bioindicators.

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