

Toxicity assessment of powdered laundry detergents: an in vivo approach with a plant-based bioassay

Nimmi Apsara Jayalal (Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Kelaniya, 11600, Sri Lanka)

Mangala Yatawara (Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Kelaniya, 11600, Sri Lanka)

Journal – Environmental Science and Pollution Research

Online ISSN: 1614-7499

Article publication date: 28 September 2024

Abstract

Powdered laundry detergents, encompassing a diverse blend of organic and inorganic compounds, are crucial in efficiently removing dirt in household cleaning. This study investigated the cytotoxic and genotoxic potential of commonly used powdered laundry detergents in Sri Lanka using the *Allium cepa* bioassay. Five detergents (four branded A, B, C, and D, and one non-branded E) were selected for assessment. Toxicity evaluations were conducted across a range of predetermined aqueous detergent concentrations (0–2500 mg/L) using the *A. cepa* bioassay, with all experiments being triplicated and following standard protocols. Exposure to detergent concentrations up to 500 mg/L resulted in mitosis suppression, nuclear aberrations, and chromosomal abnormalities in *A. cepa*, indicating concentration-dependent cytotoxicity and genotoxicity. Condensed nuclei were notably prevalent among nuclear abnormalities, while vagrant chromosomes and chromosomal adherence were the most frequent chromosomal aberrations observed. At higher concentrations (> 500 mg/L), the selected detergents induced necrotic cell death in *A. cepa* root meristematic cells. This study warns to avoid the unnecessary use of detergents as they cause significant ecological risks and advocates for further research to comprehensively assess detergent toxicity across diverse organisms within ecosystems to safeguard ecosystem health effectively.

Citation

Jayalal, N.A., Yatawara, M. Toxicity assessment of powdered laundry detergents: an in vivo approach with a plant-based bioassay. *Environ Sci Pollut Res* 31, 59166–59178 (2024).
<https://doi.org/10.1007/s11356-024-35158-w>

Publisher

Springer Nature