

Phytotoxicity and apoptotic impact assessment of an over-the-counter drug (paracetamol) residue using *Allium cepa* as a bioindicator

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Abstract

Pharmaceutical compounds (PCs) present in the environment can induce adverse toxic consequences on exposed biotic features. Some PCs have been reported to exert fatal impacts on aquatic fauna. However, information on their toxic actions on plants, which are critically essential to ecosystems' health and balance, is scarce and scanty. This study investigated the adverse phytotoxic and apoptotic impacts of a common over-the-counter drug (paracetamol) residue at environmental levels of 0.01 and 0.1 mg/L, using *Allium cepa* (*A. cepa*) as a bioindicator. The inhibition of the germination rate of *A. cepa* root tip was employed as indices (after a 4-day exposure) for assessing paracetamol's phytotoxicity, while deoxyribonucleic acid (DNA) fragmentation assay was used in the apoptotic investigation of paracetamol. It was observed that 0.1 mg/L paracetamol had a phytotoxic impact on the germination rate of *A. cepa* root tips relative to the control ($p < 0.05$), while there was no phytotoxic impact exerted by 0.01 mg/L paracetamol. Furthermore, microscopic examination showed irregular prophase in the onion cells. The DNA fragmentation assay revealed the induction of apoptosis by 0.1 mg/L paracetamol, while no apoptosis was induced by 0.01 mg/L paracetamol. Based on the findings from this study, paracetamol can be said to be phytotoxic and bring about DNA damage when exposed to plants at environmental levels. It is therefore recommended that policies be put in place to remediate the environment as regards the removal of paracetamol residues.