

Antioxidant, Cytotoxic and Genotoxic Properties of Aqueous, Ethanol and Pet Ether Fractions of Eichhornia Crassipes Modulate MCF-7 Cells via the Apoptotic Pathway

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Abstract

Background: Eichhornia crassipes also known as water hyacinth, spread rapidly in fresh water and it is generally regarded as the most troublesome aquatic plant, but not without any usefulness. This study aimed to evaluate the antioxidant activity, cytotoxicity and genotoxicity of the aqueous (ECA), ethanol (ECE) and pet ether (ECP) fractions of Eichhornia crassipes in MCF-7 breast cancer cell lines.

Methods: The qualitative, quantitative and antioxidant screening were assessed using standard laboratory methods. The preliminary cytotoxicity screening was monitored using brine shrimp lethality and MTT assays, while the genotoxic effect was examined using comet and DNA fragmentation assays.

Results: The qualitative screening revealed the presence of phenols, phlobatannins, alkaloids, saponins, tannin, flavonoids, steroids and terpenoids in all the fractions, but alkaloids and phenols were absent in the ECP fraction. Phenols ($45.59 \pm 0.44 \text{ mg/100g}$), phlobatannin (12.87 ± 0.52), alkaloid (25.87 ± 0.31), and Saponin ($107.10 \pm 2.79 \text{ mg/100g}$) were highest in ECE fraction as compared to others while tannin ($20.41 \pm 0.28 \text{ mg/100g}$), flavonoids ($25.93 \pm 0.71 \text{ mg/100g}$), steroids ($24.53 \pm 0.33 \text{ mg/100g}$) and terpenoids ($26.68 \pm 0.47 \text{ mg/100g}$) were also highest in ECP fractions as compared to other fractions. The ECE elicited the highest DPPH (2,2-diphenyl-1-picrylhydrazyl) ($\text{IC}_{50} - 24.04 \mu\text{g/ml}$), nitric oxide scavenging ($\text{IC}_{50} - 27.22 \mu\text{g/ml}$) and reducing power activity ($\text{IC}_{50} - 30.9 \mu\text{g/ml}$). The ECP fraction was highly toxic to brine shrimp with LD_{50} of $34.57 \mu\text{g/ml}$ followed by ECE ($63.33 \mu\text{g/ml}$) while the ECA fraction had an LD_{50} of $166.81 \mu\text{g/ml}$. The results showed that treatment of MCF-7 cells with all three extracts of E. crassipes caused cytotoxicity in a dose-dependent manner. The most cytotoxic and genotoxic effects were observed with $700 \mu\text{g/ml}$ ECP fractions. DNA fragments and comets were also observed in MCF-7 cells treated with the fractions suggesting the involvement of apoptosis. GC-MS analysis revealed the presence of myriads of bioactive compounds.

Conclusion: The findings of this study indicate moderate cytotoxicity and genotoxicity of $\text{ECP} > \text{ECE} > \text{ECA}$ against MCF-7 cells via the apoptotic pathway.

Keywords

Eichhornia crassipes, MCF-7 cells, antioxidants, cytotoxicity, genotoxicity.