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Effects of Galium aparine extract on the cell viability, cell cycle and cell death in breast cancer cell lines

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Abstract

Ethnopharmacological relevance: Galium species have been traditionally used for its anti-cancer, antioxidant, anti-inflammatory, antimicrobial and cardioprotective effects in the folk medicine. Galium aparine (GA) is a typical climbing plant growing widespread in Anatolia.

Aim of the study: To investigate the potential anti-proliferative and apoptotic effect of GA methanol (MeOH) extract on MCF-7 and MDA-MB-231 human breast cancer cells and MCF-10A untransformed breast epithelial cells.

Materials and methods: First, the extract was characterized by both liquid chromatography/quadrupole time-of-flight mass spectrometry (LC/Q-TOF/MS) and gas chromatography-mass spectrometry (GC-MS) analyses. Then, cell viability and cell cycle distribution were investigated by XTT assay and PI staining by flow cytometry, respectively. Cell death was determined by Annexin V FITC/7-AAD staining.

Results: A total of 14 major phytochemicals were identified by LC/Q-TOF/MS and 34 volatile compounds were determined by GC-MS. The extract was cytotoxic in both breast cancer cell lines in a concentration and time dependent manner and showed G1 block after 72h extract treatment. However, it was not cytotoxic to MCF-10A breast epithelial cells. Flow cytometry analyses revealed that apoptosis was induced in MDA-MB-231 cells; however, necrosis was induced in MCF-7 cells.

Conclusion: Our study suggests that GA MeOH extract may have potential anti-cancer effects against breast cancer cells without impairing normal breast epithelial cells. Ability to induction of non-apoptotic cell death besides apoptotic cell death by this complex plant-derived mixture may enable the killing of apoptosis resistant breast cancer cells but further studies should be conducted to investigate the bioavailability and metabolism of it in vivo.

Keywords: Apoptosis; Breast cancer cells; Cytotoxicity; GC-MS; Galium aparine; LC/Q-TOF/MS; Necrosis.

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