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## Antiproliferative activity of ionic liquid-graviola fruit extract against human breast cancer (MCF-7) cell lines using flow cytometry techniques

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### Abstract

Ethnopharmacological relevance: Medicinal plants have been used for ages by indigenous communities around the world to help humankind sustain its health. Graviola (*Annona muricata*), also called soursop, is a member of the Annonaceae family and is an evergreen plant that is generally distributed in tropical and subtropical areas of the world. Graviola tree has a long history of traditional use due to its therapeutic potential including anti-inflammatory, antimicrobial, antioxidant, insecticide and cytotoxic to tumor cells.

Aim of the study: This study aimed to investigate the in vitro antiproliferative effects and apoptotic events of the ionic liquid extract of Graviola fruit (IL-GFE) on MCF-7 breast cancer cells and their cytokinetics behaviour to observe their potential as a therapeutic alternative in cancer treatment.

Materials and methods: The cell viability assay of the extract was measured using tetrazolium bromide (MTT assay) to observe the effects of Graviola fruit extract. Then the cytokinetics behaviour of MCF-7 cells treated with IL-GFE is observed by plotting the growth curve of the cells. Additionally, the cell cycle distribution and apoptosis mechanism of IL-GFE action on MCF-7 cancer cells were observed by flow cytometry.

Results: IL-GFE exhibited anti-proliferative activity on MCF-7 with the IC50 value of 4.75  $\mu$ g/mL, compared to Taxol with an IC50 value of 0.99  $\mu$ g/mL. IL-GFE also reduced the number of cell generations from 3.71 to 1.67 generations compared to 2.18 generations when treated with Taxol. Furthermore, the anti-proliferative activities were verified when the growth rate was decreased dynamically from 0.0077 h to 1 to 0.0035 h<sup>-1</sup>. Observation of the IL-GFE-treated MCF-7 under microscope demonstrated detachment of cells and loss of density. The growth inhibition of the cells by extracts was associated with cell cycle arrest at the G0/G1 phase, and phosphatidylserine externalisation confirms the anti-proliferation through apoptosis.

Conclusions: ionic liquid Graviola fruit extract affect the cytokinetics behaviour of MCF-7 cells by reducing cell viability, induce apoptosis and cell cycle arrest at the G0/G1 phase.

### Keywords

**Author Keywords:** Breast cancer; Graviola; Ionic liquid; Flow cytometry; Apoptosis

**KeyWords Plus:** ANNONA-MURICATA; IN-VITRO; CYCLE ARREST; APOPTOSIS; ACETOGENINS; VIVO


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