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A Study on Cytotoxicity and Apoptotic Potential of Different Fractions of *Gracillaria edulis* (Gmelin) Silva against Human Breast Adenocarcinoma (MCF-7) Cells

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Marine seaweeds are a rich source of bioactive metabolites that can be used as an alternative source for the development of the anti-cancer drug. The present study was aimed to evaluate the cytotoxicity and apoptotic activity of different fractions of *G.edulis* against the human breast adenocarcinoma (MCF-7) cell line. De-polysaccharide polyphenol-rich methanol extract of *G.edulis* was sequentially partitioned with hexane, chloroform, and ethyl acetate to determine the cytotoxic and apoptotic effects. The cytotoxic activity was assessed by MTT and neutral red assays while apoptotic activity was examined by cellular morphology, DNA fragmentation, and Caspase 3/7 assays. The results of the cytotoxicity assay showed that the decrease in the percentage of cell viability in a dose-dependent manner as signified by cell death. Among them, the hexane (HF) and chloroform fractions (CF) showed potent cytotoxic activity as determined by MTT ($IC_{50Hexane}: 29.84 \pm 0.65 \mu\text{g/ml}$, $IC_{50Chloroform}: 78.62 \pm 3.86 \mu\text{g/ml}$) and neutral red assay ($IC_{50Hexane}: 33.19 \pm 0.44 \mu\text{g/ml}$, $IC_{50Chloroform}: 72.28 \pm 3.51 \mu\text{g/ml}$) compared to the standard cycloheximide ($IC_{50MTT}: 28.76 \pm 0.55 \mu\text{g/ml}$, $IC_{50NEUTRAL RED}: 27.84 \pm 0.33 \mu\text{g/ml}$). Further, the morphological assessment of apoptosis was confirmed using Hoechst 33342 staining and crystal violet staining. The low activation of Caspase 3/7 was observed in the MCF-7 cells treated with all fractions of *G.edulis* together with the standard staurosporine and cycloheximide. Among them, Caspase 3/7 was activated to a moderate extent in both HF and CF after 3 hours of the treatments. Besides, the typical DNA ladder pattern was observed in both HF and standard cycloheximide-treated MCF-7 cells. It can be concluded that the HF of *G.edulis* has the ability to suppress cellular proliferation and induce apoptosis-mediated cell death in the MCF-7 cell line. Thus, the HF of *G.edulis* can be a potent candidate to isolate the new anti-cancer compounds.

Keywords: *G.edulis*; Anti-cancer; MCF-7

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