

## Gene Expression Analysis of Human Breast Adenocarcinoma (MCF-7) Cells Treated with a Sri Lankan Red Seaweed *Gracilaria edulis* (Gmelin) Silva

MDTL Gunathilaka<sup>1</sup>, KW Samarakoon<sup>2</sup>, P Ranasinghe<sup>3</sup> and LCD Peiris<sup>1#</sup>

<sup>1</sup>*Department of Zoology (Centre for Biotechnology), Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*

<sup>2</sup>*Institute for Combinatorial Advanced Research and Education (KDU-CARE), General Sir John Kotelawala Defence University*

<sup>3</sup>*Industrial Technology Institute, Halbarawa Gardens, Malabe, Sri Lanka*

#dinithi@sci.sjp.ac.lk

Marine seaweeds are a rich source of bioactive metabolites that can be used as an alternative source for the development of anti-cancer drugs. Therefore, the present study was aimed to analyse the apoptosis-related gene expression of hexane fraction of *G. edulis* treated human breast adenocarcinoma (MCF-7) cells. De-polysaccharide polyphenol-rich methanol extract of *G. edulis* was sequentially partitioned with hexane, chloroform, and ethyl acetate to determine the cytotoxic potential. The hexane fraction of *G. edulis* (IC<sub>50</sub>: 29.84±0.65 µg/ml) exhibited the potent cytotoxic activity compared to the standard cycloheximide (IC<sub>50</sub>: 28.76±0.55 µg/ml). Apoptotic morphological alterations were observed in MCF-7 cells treated with hexane fraction of *G. edulis*. Based on the cytotoxic and apoptotic activity, hexane fraction of *G. edulis* has been selected further to analyze the apoptosis-related *p53*, *p21*, *Bax* and *Bcl2* genes expression in MCF-7 cells. Based on the results, the mRNA expression of apoptosis-related genes *p53*, *p21*, *Bax* and *Bcl2* was increased following treatment of *G. edulis* hexane fraction in a dose-dependent manner. Further, 30 µg/mL of hexane fraction of *G. edulis* treated MCF-7 cells upregulated the *p53* (5.4) gene more prominently compared to the *p21* (1.58) and *Bax* (0.829) genes. Similarly, standard cycloheximide (30 µg/mL) treated MCF-7 cells up-regulated the *p21* (0.96) gene more prominently compared to the *p53* (0.74) and *Bax* (0.753) genes. The expression of the anti-apoptotic *Bcl2* gene is comparatively lower in the hexane fraction of *G. edulis* (15 and 30 µg/mL) treated MCF-7 cells than the standard cycloheximide. Further, a higher expression ratio of *Bax/Bcl2* has been observed in 30 µg/mL of hexane fraction treated MCF-7 (29.69) cells which determines the cells' susceptibility to apoptosis compared to the standard cycloheximide treated cells. Therefore, this study demonstrated that the hexane fraction of *G. edulis* is a promising source to influence apoptosis prominently in MCF-7 cells compared to the standard cycloheximide. Thus, the hexane fraction of *G. edulis* is a potential source of natural compounds that can be utilized for the development of a new drug or a supplement to treat patients suffering from breast adenocarcinoma.

**Keywords:** MCF-7 cells, *Gracilaria edulis*, genes, marine seaweeds