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Role of mitochondrial apoptotic pathway in mediating the abrogation of cytotoxicity by GMG-ITC in neurodegenerative diseases model cells

Mohammed Sani Jaafaru
Kaduna State University, Main Campus, PMB 2339, Kaduna, Nigeria.

The antioxidant and neuroprotective activity of Glucomoringin isothiocyanate (GMG-ITC) have been reported in in vivo and in vitro models of neurodegenerative diseases. However, its neuroprotective role via mitochondrial dependent pathway in a noxious environment remains unknown. The main objective of the present study was to unveil the mitochondrial apoptotic genes' profile and prospectively link it with neuroprotective activity of GMG-ITC through its ROS scavenging activity. GMG-ITC was isolated from Moringa oleifera Lam seeds, purified and characterised using high performance liquid chromatography and nuclear magnetic resonance techniques. The molecular mass of the compound was confirmed using liquid chromatography mass spectroscopy prior to its bio-activation by myrosinase. The results showed that pre-treatment of differentiated SH-SY5Y cells with 1.25 µg/mL purified isolated GMG-ITC, significantly reduced reactive oxygen species (ROS) production level, compared to H2O2 control group, as evidenced by flow cytometry-based evaluation of ROS generation. Presence of GMG-ITC prior to development of oxidative stress condition, downregulated the expression of cyt-c, p53, Apaf-1, Bax, CASP3, CASP8 and CASP9 genes with concurrent upregulation of Bcl-2 gene in mitochondrial apoptotic signalling pathway. Protein Multiplex results revealed significant decreased in cyt-c, p53, Apaf-1, Bax, CASP8 and CASP9 due to GMG-ITC pre-treatment in oxidative stress condition. The present findings speculated that pre-treatment of neuronal cells with GMG-ITC may alleviate oxidative stress condition in neuronal cells by reducing ROS production level and protect the cells against apoptosis, which leads to neurodegenerative disease development.

Keywords: Apoptosis; Glucomoringin-isothiocyanate; Mitochondria; Neurodegenerative diseases; Neuroprotection; Oxidative stress

Jaafaru Sani Mohammed has completed his PhD (Medical Biotechnology) in the year 2019 from Uniersiti Putra Malaysia (UPM) in the area of Neurochemistry. He is currently a faculty member, Kaduna State University. He has published more than 10 papers in reputed journals and has been serving as a reviewer of repute

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