



MAURITIUS RESEARCH COUNCIL

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MRC UNSOLICITED RESEARCH GRANT SCHEME:

Molecular mechanisms of antioxidant protection in health and disease : potential of application and characterisation of antioxidant actions of endemic Mauritian plant extracts

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There is an emerging interest for the evaluation of natural antioxidants from food and plant sources as possible prophylactic agents in the management of several clinical disorders. In this line of research, the phenolic constituents of Mauritian endemic plants from the Celastraceae, Erythroxylaceae, Ebenaceae, Rubiaceae, Sterculaceae, Myrtaceae family were assessed and correlated to their *in vitro* antioxidant propensities. A multi-antioxidant assay approach (8 independent assays) was employed to evaluate the antioxidant capacity of the plant extracts. The data indicate that *Eugenia pollicina*, *E. orbiculata*, *S. commersonii*, *S. glomeratum*, *S. mauritianum* from the Myrtaceae family and *Diospyros* species from the Ebenaceae family had important levels of phenolics and were potent antioxidants. Levels of total phenol ranged from 1 to 103 mg gallic acid equivalent/g fresh weight while the flavonoid content was estimated between 1 to 16 mg quercetin equivalent/g fresh weight. HPLC analyses indicated the presence of significant amounts of catechins and their derivatives, procyanidin dimers and flavonol aglycones. Since plant-derived natural phytochemicals have shown great potential in the fight against cancer, this research work has been geared towards the evaluation of the chemopreventive potential of the Mauritian endemic plant extracts against human cancer cell lines. Leaf extract of *Monimiastrum globosum* at low concentrations (98 and 195 µg FW/ml) protected benzo[a]pyrene-dependent DNA damage in human hepatoma cells, thus exhibiting anti-genotoxic effects. In the same vein, plant extracts from the genus *Eugenia*, *Syzygium* and *Myonima* (concentration range of 0.05-4 mg FW/ml) showed promising anti-proliferative activities against MDAMB 231 and MCF-7 human breast cancer cell lines. The mechanisms of action of the phytochemicals in chemoprevention include the upregulation of cytoprotective genes that encode for carcinogen detoxifying enzymes and antioxidant enzymes, induction of cell cycle arrest and apoptosis or by modulation of specific signal transduction pathways such as those leading to aberrant gap junction intercellular communication (GJIC), abnormal

cyclooxygenase-2 (COX-2), activator protein-1 (AP-1) or nuclear factor-kappaB (NF- κ B) expression. Apoptosis has been proposed as a potential target in chemoprevention and in this study *E. pollicina* (concentration of 0.5 mg FW/ml) induced apoptosis of MCF-7 breast cancer cells and further mechanistic studies will provide insight on their potential application as chemopreventive agents. In addition plant extracts from the Celastraceae and Myrtaceae family restored gap junction intercellular communication (GJIC), an interesting target of chemoprevention. The rising incidence of cancer worldwide suggests an imperative need to develop alternative approach to manage the disease progression and delineating the mechanism underlying the anti-proliferative effect of Mauritian endemic plants will provide further data on their chemopreventive nature. It can be envisaged that Mauritian endemic plant extracts with their high levels of phenolic antioxidants can offer a realistic promise to reduce the incidence of cancer and other oxidative stress mediated disorders including cardiovascular disorders and neurological diseases.