

Nanomedicine using *Quercus infectoria* Extract for the treatment of Breast Cancer

Wan Nur Suzilla 1, Syed Mahmood 1,2, and Rajaletchumy Veloo Kutty 1,2*

1 Faculty of Engineering Technology, Universiti Malaysia Pahang, 26300 Kuantan, Pahang.

2 Center of Excellence for Advanced Research in Fluid Flow, University Malaysia Pahang, 26300, Kuantan, Pahang, Malaysia

*Corresponding author: vrajaletchumy@ump.edu.my

Abstract:

Drug resistance and metastasis appears to be a continuous challenging issue in spite of the evolvement that have been made in surgery, radiotherapy and targeted therapy. The recognition of natural product and their effect against the cancer treatment is continuously under exploration. *Quercus infectoria* (QI) galls is a special natural products formed through the interactions between plant hormones and insects. It has been used as a source of drugs for the treatment of cancerous diseases in traditional and folk medicines for centuries. However, the information on the phytochemical content and the cytotoxicity against breast cancer cells are not well established. Therefore in this study, QI galls is chosen for its evaluation for phytochemical constituents and cytotoxic activity against breast cancer cells (MDA-MB-231 and MCF-7). The QI galls extract was extracted by maceration extraction using 70% aqueous-ethanol. The yield of extract obtained is 47.54%. Then, the crude extract was screened for their total phenolic content (TPC), total flavanoid content (TFC) and antioxidant assay. From the result, it was showed that the TPC is 672.22 $\mu\text{g}/\text{mg}$ GA equivalent while the TFC is 4.8 $\mu\text{g}/\text{mg}$ Rutin equivalent. The antioxidant assay was determined and the IC₅₀ obtained for the QI galls extract is 44.5 $\mu\text{g}/\text{ml}$. QI galls extract also quantified for gallic and tannic acid via liquid chromatography and content in extract was found to be 76.22 mg/g and 1794.18 mg/g respectively. Finally, the QI galls extract was screened for cytotoxic activity against breast cancer cells. From the result it was showed a promising result as the IC₅₀ obtained for MCF-7 was 0.961 $\mu\text{g}/\text{ml}$ and for MDA-MB-231 was 9.61 $\mu\text{g}/\text{ml}$. For MCF7 cell line, it was showed that the IC₅₀ value obtained was significantly higher ($p < 0.05$), than the docetaxel (5.67 $\mu\text{g}/\text{ml}$). The cytotoxic activity of the gallic acid (GA), tannic acid (TA) and combination of gallic and tannic acid (TA/GA) against MCF-7 and MDA-MB-231 cells also been determined. It was showed that, for MCF-7, the IC₅₀ of GA was 4.03 $\mu\text{g}/\text{ml}$, TA was 9.61 $\mu\text{g}/\text{ml}$ and combination of TA/GA was 2.81 $\mu\text{g}/\text{ml}$. For MDA-MB-231 the IC₅₀ of GA was 43.33 $\mu\text{g}/\text{ml}$, TA was 74.25 $\mu\text{g}/\text{ml}$ and combination of TA/GA was 37.5 $\mu\text{g}/\text{ml}$. From this study, it was also showed that the QI galls extract inhibit the MCF-7 and MDA-MB-231 cell lines through the induction of apoptosis. The percentage of early apoptosis for the MCF-7 and MDA-MB-231 cell line after 72 hours treatment were 49.7% and 48.6% respectively. Interestingly, it was revealed that QI galls extract can be a potential source of natural antioxidants as well as a potent anticancer agent against breast cancer cells.

Keywords: Natural Plant; Antioxidant; Flavonoids; Phenolics; Pharmaceutical

Acknowledgment

This study was supported by internal grant of Universiti Malaysia Pahang (UMP) (RDU 150379 and RDU1803181), Fundamental Research Grant Scheme (FRGS Ref: FRGS/1/2017/TK05/UMP//1 and RDU 170130). We also would like to thank Faculty of Engineering Technology (FTeK) and Centre of Excellence for Advanced Research in Fluid Flow (CARIFF) for providing the equipments and facilities used in the project.