EXTRACTION OF ANTIOXIDANTS FROM GUM ARABIC AND ITS APPLICATIONS FOR ANTICANCER AND ANTI-INFLAMMATORY AGENTS

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ABSTRACT

Gum Arabic from Acacia complex group of gum (ACGG) is a dry exudate rich in dietary fibres and polyphenolics compounds, that can support healthy living due to the antioxidant activity (AA). Despite its rich AA and medical benefits, the research on ACGG antioxidant (and bioactive compounds) extraction has not received the attention it deserves, from researchers and government. The focus of this research is thus to produce an optimized extraction conditions to enhance the antioxidant activity and active components of raw ACGG samples and to further investigate the effectiveness of the active fractions of the extracts toward human breast adenocarcinoma (MCF-7), colon adenocarcinoma (HCT-116), and prostate cancer (PC3) cell lines properties. Six samples of raw ACGG were obtained from two different locations: a non-commercial hand-picked sample from Acacia complex group of gum (ACGG) and two commercial samples consisting of Prebio-M and Prebio-T (PBMT). The first experiment was conducted to extract ACGG active compounds using methanolic crude extraction (MCE) method and to determine the physiochemical properties of the extracts, e.g. flavonoids, phenolic compounds, moisture content, pH, metal profile, amino acid profile. The second experiment was conducted to optimize the methods and extraction conditions to improve AA. The third experiment was conducted to study the antioxidant materials regarding crude extract and its active sub-fractions using the optimized conditions. The last experiment was carried out to investigate the anti-inflammatory of the ACGG methanolic crude extracts and active fractions (MF and AF) on Albino rats(in-vivo) and the antiproliferative activity against breast adenocarcinoma (MCF-7), colon adenocarcinoma (HCT-116), and prostate cancer (PC3) cell lines using in-vitro assay. Results from the extraction indicated a significant number of flavonoid compounds and phenolic compounds (amongst others) in both ACGG (6540±3.46µg/100g) and PBMT from (2560±3.49µg/100g) to (2710±4.04µg/100g), using HPLC analysis. The individual flavonoid detected was quercetin. For phenolic acids, the active compounds identified in both ACGG and Prebio-T were caffeic acid and ρ-coumaric, p-hydroxybenzoic, and ferulic acid with caffeic acid being the most predominant phenolic compounds in the ACGG (lateritic soil sample: 401770±3.52µg/100g; clay soil samples: 77580±5.20 µg/100g). The optimization result showed that the maximum AA and yield of extract (predicted by design expert software 7.00) was 11.10% and 15.56% for *Acacia seyal* gum (ASG) and Prebio-T (PTC), respectively, using the ultrasonic extraction; and methanol at experimental temperature conditions of 43°C, power of 40 kHz, for 3hrs. Furthermore, the GC-MS/MS results of MCE, MF and AF of both ASG and PTC confirm the presence of a total of 57 bioactive compounds (BCs). Compared to the amounts of the same BCs were almost doubled in PTC methanol crude extract (MCE). The In-vivo results (i.e. acute inflammatory test) under control conditions in the laboratory at 150 mg/kg dosage of both MCE of ASG and PTC developed a mean and maximum percentage inhibition of 23.63% and 23.54% respectively, during the 24 hrs observation. Using in-vitro methodology, the MCE of PTC resulted in strong cytotoxic activity against MCF7 cell lines with an IC_{50} value of 8.792 µg/ml. Compared to ASG, against MCF7, PC3, and HTC116 cell lines, showed IC_{50} values of 9.56, 11.53 and 13.36µg/ml, respectively. Furthermore, the both MF and AF of PTC were found to possess the most efficient CA against PC3 cell lines that were stronger than the MF and AF of ASG with IC_{50} values of 9.56µg/mL and 9.63µg/mL, respectively. Gum arabic is a promising natural products for treating cancer as well as acute inflammation.