

A New Insight Into the Anti Proliferative and Apoptotic Effects of Fulvic and Humic Acids as Bio Product of Humus on Breast Cancer Cells, Optimized by Response Surface Methodology

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Abstract

Today, plant compounds and substances of natural origin as bio products are strongly recommended for the prevention and treatment of cancer. In the field of biomedicine anti-viral, anti-inflammatory, anti-oxidant properties among the most known activities of Humus and the products obtained from humus. In this study, the effect of humic and fulvic acids (HA, FA), bio product of humus, on breast cancer cells (MCF7), the most common cancer among women, was investigated. To achieve optimum cytotoxic time and determine the effect of the different parameters the Response Surface Methodology (RSM) was applied. The main parameters influencing the cytotoxic performance in the MTT assay, such as time and concentrations were regarded. The cell viability was measured using different concentrations of HA and FA including 10, 50, 100, and 200 µg/mL for 14, 24, and 48 h, respectively. Apoptosis, cell cycle, mechanical properties and survivin gene expression of MCF7 cells treated with HA and FA were analyzed after 14 h. Our results showed that HA and FA induced apoptosis, reduced cell viability and gene expression in the cured MCF7 cells. We have seen a dose-dependent behavior of HA in increasing the cell population in phase Sub-G1. The results of AFM showed that the increasing behavior of elastic modulus value and cell–cell adhesion forces were dose-dependent in cells treated with HA and FA. The golden result of this study was the matching of laboratory and statistical results which confirms the success of the RSM model in biological researches.