Original Article

Synthesis of Kaempferol-Cr (III) Complex and study its Effect on Bax and Bcl-2 Genes Expression in SW480 Cell Lines

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ABSTRACT

Objective: Impact of a kaempferol-Cr(III) complex on the expression of Bax and Bcl-2 genes in the SW480 after 24 hours of treatment and to highlight the complex's potential role in promotion.

Study Design: Experimental study

Place and Duration of Study: This study was conducted at the Department of Pharmacognosy and Medicinal Plants, College of Pharmacy, University of Basrah, Iraq from 1st June 2022 to 30th November 2022.

Methods: Kaempferol and its Cr(III) complex were successfully synthesized and examined through FT-IR, UV-Vis spectroscopy, EI-MS, and HPLC analyses. Their anti-proliferative effects were tested using the MTT assay on SW480 and normal HDFn, with IC50 values calculated to determine cytotoxic activity.

Results: Treatment with the kaempferol–Cr(III) complex significantly suppressed the viability of SW480 colorectal cancer cells more effectively than kaempferol alone, with negligible impact on healthy cells. Gene expression profiling via real-time PCR demonstrated an elevation in Bax levels alongside a reduction in Bcl-2 expression after 24 hours, indicating the induction of apoptosis. These findings point to the complex's ability to trigger programmed cell death through modulation of apoptotic gene expression, supporting its potential as a promising chemotherapeutic agent

Conclusion: Kaempferol-Cr(III) complex exhibits anticancer properties. When compared to ligand alone, this compound has demonstrated a noticeably greater lethal effect in experiments using the SW480 cancer cell line.

Key Words: Kaempferol-Cr(III) complex, Apoptosis, Bax, Bcl-2, SW480 cell line

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INTRODUCTION

Theorists are particularly interested in the development of novel materials. Day by day, the percentage of deaths attributable to cancer illnesses rises.[1] Since the first metal-based chemotherapy medication, cisplatin, was discovered, metal complexes have been employed as antitumor agents.[2] With the development of a multitude of platinum relatives, cisplatin or its derivatives, such as carboplatin or oxaliplatin, are utilized for treating nearly fifty percent of all people with cancer receiving chemotherapy.[3] Flavonoids are secondary metabolites composed of a benzopyrone ring with polyphenolic groups.[4]

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Their poor absorption and low water solubility have limited biological evaluation for drug development.[5] However, their hydroxyl and carbonyl groups allow interaction with biomolecules and chelation of metal ions, enabling the formation of metal complexes with improved and distinct biological properties.[6]

Kaempferol is a member of the tetrahydroxy flavonoid group because it has four hydroxy groups at positions 3, 5, 7, and 4′.[7] New research has focused on its possible application in cancer treatment since higher consumption was shown to reduce the risk of several cancers, including skin, ovarian, and stomach cancer.[8] Several investigations have shown that kaempferol play a significant part in the apoptosis of carcinoma of the breast.[9] Bcl-2 gene promotes survival of cancer cells by inhibiting apoptosis. On the other hand, cancer cells undergo apoptosis and die when the Bax gene is expressed.[10] Diantini et al[11] found that Kaempferol-3-O-rhamnoside induces death in MCF-7 breast cancer cells by activating the caspase cascade involving caspase-9, caspase-3, and PARP, along with reduced Bcl-2 expression. Nandi et al[12] demonstrated that kaempferol may be effective in treating in vitro triple-negative breast cancer cells. The present study aims to synthesize the kaempferol–Cr(III) complex and evaluate its effect on SW480 cancer cell inactivation by