

# Design, synthesis and molecular docking study of coumarin pyrazoline derivatives against MCF-7 breast cancer cell line

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## Abstract

A new eight series of 3-(2-oxo-2H-chromen-3-yl)-5-(substituted phenyl)-1H-pyrazole-1-carbaldehyde derivatives (9–16) were designed and created from coumarin-chalcone derivatives (1–8). The structures of the derivatives were established by using melting point, mass spectrum, IR, <sup>1</sup>H NMR, and <sup>13</sup>C NMR spectroscopic methods. In vitro antiproliferative activities were evaluated against MCF-7 breast cancer cell line using Microculture Tetrazolium (MTT) assay. The results showed that the compounds 9, 12–14 has a moderate activity against MCF-7 breast cancer cell line with IC<sub>50</sub> 61.44, 70.11, 22.6 and 25.99 µg/mL respectively, while the compounds 10, 11, 15 and 16 were found to be inactive against studied cell line within IC<sub>50</sub> > 100 µg/mL. The possible binding interaction between studied compounds (9–16) and human ER-α (PDB ID: 1ERR) were studied by molecular docking. The results revealed that only the compounds 11 and 16 form π-H interaction with ER-α (PDB ID: 1ERR) within the highest negative values of binding affinity -7.04260 and -7.17308 kcal/mol<sup>-1</sup> respectively than the other compounds, while Raloxifene used here as a positive control form a strong ionic bonding with Asp 351 within the binding affinity -9.61928 kcal/mol which is more negative value than the studied compounds.

## Keywords

coumarin, pyrazoline, molecular docking, MCF-7, MTT assay

## Introduction

Breast cancer is the most common cancer in women following melanoma as well as the 2<sup>nd</sup> largest source of cancer deaths in women before lung cancer (Patel et al. 2012). According to the World Health Organization's tumor database for 2021 at website: (<https://www.who.int/cancer>), more than two million women are diagnosed with breast cancer yearly (Amernic 2013). Since many anticancer drugs have been developed for treating a wide variety of

the malignancies, including Cisplatin, Vinblastine and Mercaptopurine, they all have severe side effects on the hematopoietic system, bone marrow, gastro intestinal epithelium, and hair follicles. Moreover, multi drug resistance (MDR) is a serious issue with chemotherapeutic agents (Akkol et al. 2020).

In recent times, coumarin, Fig. 1 has shown promising use in treating cancer, it may help mitigate the adverse reactions of radiation (Sandhu et al. 2014). Incorporating coumarin into hybridization structures leads to