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Research article

Synthesis, molecular docking study and anticancer activity of novel 1,3,4-oxadiazole derivatives as potential tubulin inhibitors

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ABSTRACT

The current study reports on the synthesis and anticancer efficacy of novel oxadiazole derivatives (8a-f) as tubulin polymerization inhibitors. NMR, mass, and elemental studies were used to confirm the newly produced compounds. In contrast to the conventional medicine colchicine, compounds 8e and 8f demonstrated stronger sensitivity and improved IC_{50} values in the range of 3.19–8.21 μM against breast MCF-7, colorectal HCT116, and liver HepG2 cancer cell lines. The target compounds were tested for enzymatic activity against the tubulin enzyme. Compounds 8e and 8f were shown to have the most effective inhibitory action among the new compounds, with IC_{50} values of 7.95 and 9.81 nM, respectively. As compared to the reference drug, molecular docking investigations of the developed compounds revealed the crucial hydrogen bonding in addition to the hydrophobic interaction at the binding site, assisting in the prediction of the structural requirements for the found anticancer activity. These findings indicate that the 1,3,4-oxadizole scaffold has the potential for future research into new anticancer medicines.

1. Introduction

Cancer is a category of disorders defined by uncontrolled cell growth with the ability to expand into or invade neighboring tissues in a process known as metastasis, which is the leading cause of mortality from cancer [1]. Cancer is currently considered a severe health issue on a global scale. Without appropriate treatments, the number of cancer-related fatalities among cancer patients is predicted to

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