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Chemo-Biological Evaluation and *In Vitro* Anticancer Effects of *Euphorbia hirta* on Lung Cancer Cells via *TP53*-Mediated Cell-Cycle and Proliferation Control

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KEYWORDS *Euphorbia hirta*. Lung Cancer. Tumour Protein p53. Cell Cycle. Molecular Docking. Expression Analysis

ABSTRACT *Euphorbia hirta*, a medicinal plant rich in bioactive phytochemicals, was investigated for anti-lung cancer potential using integrated chemo-biological and in vitro assays in A549 cells. Phytochemicals from SuperTCM and IMPPAT were linked to lung cancer targets via SuperPred and GeneCards, and PPI analysis (STRING/Cytoscape) identified TP53, SRC, and EGFR as key hub genes enriched in MAPK, Akt, and HIF-1 pathways. Four major compounds (pinocembrin, naringenin, catechin, pelargonidin) collectively targeted 82 overlapping genes, while GEPIA2 confirmed elevated TP53 and EGFR expression in LUSC. *E. hirta* ethanolic extract showed dose-dependent cytotoxicity (IC50 = 35 µM), marked G0/G1 arrest, and significant TP53 downregulation by qRT-PCR at higher concentrations. Molecular docking revealed strong TP53 binding by naringenin. Overall, *E. hirta* demonstrates promising anti-lung cancer activity through TP53 modulation and oncogenic pathway inhibition, warranting further in vivo validation for therapeutic development.