Assessment of Cytotoxic Effects of Selected Medicinal Plants on Human Cervical, Breast and Lung Cancer Cell lines

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Certification

This is to certify that Oluwaseun Akinyemi, ADEDEJI with Matriculation Number LCU/PG/001398 carried out this research work titled "Assessment of Cytotoxic Effects of Selected Medicinal Plants on Human Cervical, Breast and Lung Cancer Cell lines" in the Department of Chemical Sciences (Biochemistry Unit), Faculty of Natural and Applied Sciences, Lead City University, Ibadan, Oyo State, for the award of Master Degree (M.Sc.) in Biochemistry and that this has not been previously submitted.

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Dedication

This research work is dedicated to the Almighty God through Jesus, the Wisdom of God.

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Even though the above-mentioned institution and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any found in the work.

Abstract

Cancer remains a leading cause of death globally. Reports of severe adverse effects of anticancer drugs call for newer therapies from natural products. This study aims to investigate the cytotoxic effects of six medicinal plant extracts on human cervical (HeLa), breast (MCF-7) and lung (A549) cancer cell lines. The plant extracts were assayed for cytotoxicity using MTT assay method. The selectivity index was determined with the use of non-tumorigenic cell line (KMST-6). The most active plant was evaluated for its apoptotic effects and its effects on oxidative stress markers of the selected cell lines. Phytochemical composition of the most active plant extract was determined by GC-MS analysis. The leaf extract of *Ficus benjamina* has the highest cytotoxic effects on the cancer cell lines with IC_{50} values of 17.56, 33.35 and 33.57 µg/ml on HeLa, MCF-7, and A549 cell lines respectively. Other plant extracts exhibited low cytotoxic effects with IC_{50} >100µg/ml. The leaf extract of *Ficus benjamina* possesses a selectivity index (SI) of 2.2 in the HeLa cell line. At $p \leq 0.05$, Bax protein level was significantly higher in MCF-7, while caspase-9 and 3 were significantly higher in HeLa cell line. Activities of SOD increases in all the cell lines but significantly in MCF-7 ($p \leq 0.05$). The activities of GST and the levels of GSH were significantly reduced in MCF-7 and A549. LPO and NO were lowered significantly in all cancer cell lines ($p \leq 0.05$). The GC-MS analysis revealed the presence of phenolic compounds (Phytol and Tocopherols) and terpenoids (Eicosyne and Eicosane). The extract of *F. benjamina* induces apoptosis in HeLa and MCF-7. The analysis of bioactive compounds showed that the extract posseses antioxidant and antiflammatory properties. This study suggests that the leaf of *F. benjamina* could be a source of potential and safe anticancer drug against cervical cancer

Keywords: Medicinal plants, Cancer cell lines, Cytotoxicity, Selectivity index.

Word Count: 293

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List of Abbreviations

Abbreviation	Meaning
ATP	Adenosine Triphosphate
CPE	Cytopathic Effect
DMSO	Dimethylsulfoxide
EDTA	Ethylenediaminetetraacetic acid
ELISA	Enzyme-linked Immunosorbent Assay
GST	Glutathione-S-Transferase

GSH	Reduced Glutathione
HRP	Horseradish Peroxidase
IC_{50}	Half maximal Inhibitory Concentration
LPO	Lipid Peroxidation
MTT	3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
NADH	Nicotinamide Adenine Dinucleotide Hydrogenase
NO	Nitric Oxide
OD	Optical Density
ROS	Reactive Oxygen Species
SI	Selectivity Index
SOD	Superoxidismutase