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# Induction of Apoptosis in MCF-7, MDA-MB-468 Human Breast Cancer Cell Lines by Alkaloid Leaf Extract of *Alangium Salvifolium*

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**Abstract:** ***Background:*** ***The objective of this study was to investigate the anti proliferative activities of methanolic extract of of Alangium Salvifolium leaves against MCF-7, MDA-MB-468 breast cancer cells.***

**Keywords:** Alangium Salvifolium leaves, Anti-proliferative activities, Breast cancer cells, Apoptosis, Methanolic extract

## 1. Introduction

**Cancer**

One of the most prevalent causes of disease-related deaths worldwide is cancer, known as the abnormal division, proliferation and accumulation of cells in an organism. It can affect a single organ as well as spread to distant organs. Because cell division and growth are controlled by genes, cancer is basically a gene-associated illness. Although DNA repair systems in the event of damage can improve the function of the gene, they cannot always be successful. Under normal conditions, they grow, divide and proliferate when cells receive signals from the outer membrane.

The cells stop growing and dividing in the event of damage to one of the DNA or cell elements, in order to move to a stage called the G0 phase that provides repair. However, if a cell is damaged beyond repair, apoptosis is initiated, leading to the cell's death. Cancer cells are not genetically/ epigenetically stable and can avoid apoptosis (figure 1.1)

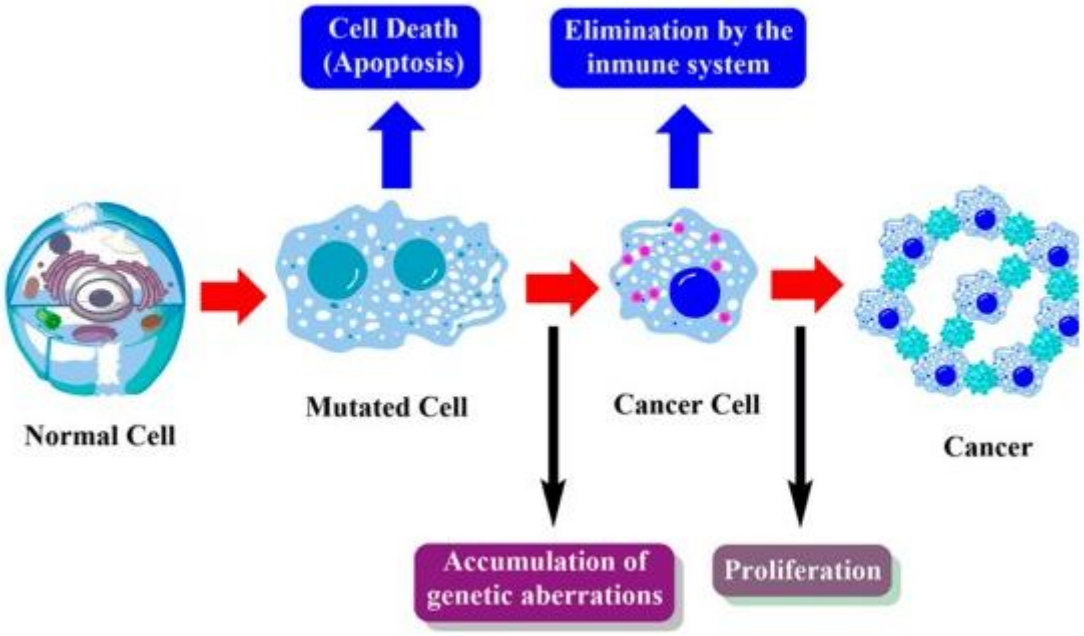



**Figure 1.1:** Basic mechanism of carcinogenesis

The most common type of cancer that causes death in both men and women is lung cancer. Prostate cancer in men and breast cancer in women are in second place.

## 2. Cancer Treatment

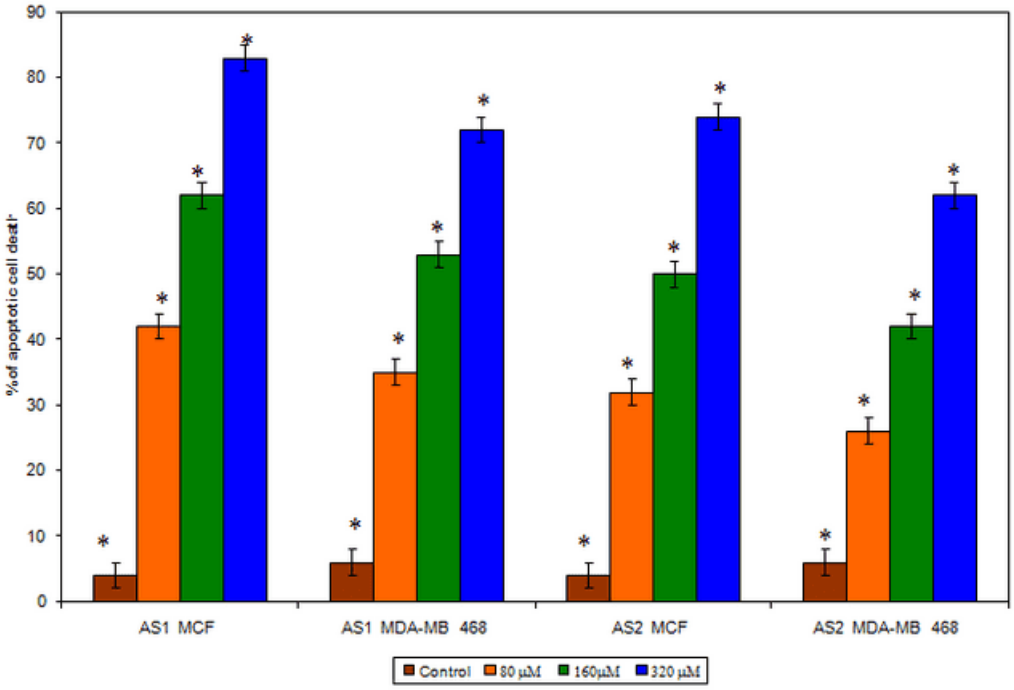
Although some cancer therapy standards have been established, different approaches and treatments are used specifically for each type of cancer. In cancer therapy alone or in combination, biological therapies such as radiotherapy, chemotherapy, surgery, immunotherapy, hormone therapy, targeted therapies and gene therapy may be used . However, there are advantages as well as disadvantages to these methods, known as the gold standard. Despite the discovery of many chemotherapeutic drugs (Adriamycin, Cisplatin, Campotins, Vinblastin, Mercaptopurine, etc.) that inhibit the uncontrolled process of cell division for the treatment of various types of cancer, the serious side effects of these drugs on the hematopoietic system, bone marrow, gastrointestinal epithelial cells and hair follicles are a significant disadvantage. In addition, multi-drug resistance (MDR) is another important problem in anticancer treatment.

Previous studies have shown that many compounds obtained

from natural resources may be used in cancer therapy as preventive and therapeutic agents. When used in combination with chemotherapy or alone in different cancer types, these compounds have been shown to increase the efficacy and tolerance of chemotherapy agents.

Alangium *salviifolium* that grows in the alangium family is a plant species that were chosen. The study's plant species were chosen. Two types of human breast cancer cells, MCF-7 and MDA-MB-468, were treated with different concentrations of *A. salvifolium* compounds AS1 and AS2 to investigate their anti-cancer potential. The apoptotic cell death induced by *A. salvifolium* compound AS1 and AS2 was identified by typical nuclear condensation visualized with DAPI staining after a 24-hour treatment (Figure 1.1 and Graph 1.1, Table1.1).

Apoptosis, also known as programmed cell death, is defined as a pattern of morphological, biochemical, and molecular changes that occur in a cell.




**Graph 1.1:** Induced apoptosis of *A. salviifolium* compounds AS1 and AS2 on Human Breast Cancer Cell MCF-7 and MDA-MB-468

Induced apoptosis of *A. salviifolium* compounds treated cells were compared with that of the control the single (*) indicates a very significant difference from the Control ($P < 0.05$), one way ANOVA Dunnett C Test. Results are mean values ± standard deviation of independent experiments performed intriplicate.

**Table 1.1:** Analysis of variance for ability of A. salvifolium Compounds to induced apoptosis

| ANOVA | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| AS1MCF7 | Between Groups | 723.589 | 3 | 241.196 | 470.627 | .000 |
| | Within Groups | 4.100 | 8 | .512 | | |
| | Total | 727.689 | 11 | | | |
| AS1MDAM B | Between Groups | 351.049 | 3 | 117.016 | 298.131 | .000 |
| | Within Groups | 3.140 | 8 | .392 | | |
| | Total | 354.189 | 11 | | | |
| AS2MCF7 | Between Groups | 460.597 | 3 | 153.532 | 602.087 | .000 |
| | Within Groups | 2.040 | 8 | .255 | | |
| | Total | 462.637 | 11 | | | |
| AS2MDAM B | Between Groups | 222.269 | 3 | 74.090 | 519.928 | .000 |
| | Within Groups | 1.140 | 8 | .143 | | |
| | Total | 223.409 | 11 | | | |

REPORT

| | | AS1MCF7 | AS1MDAM B | AS2MCF7 | AS2MDAMB |
|---|---|---|---|---|---|
| Control | Mean | 4.6667 | 6 | 4.8978 | 6 |
| | Std. Deviation | 0.5774 | 1 | 0.5774 | 1 |
| | Std. Error of Mean | 0.3333 | 0.5774 | 0.4532 | 0.5774 |
| 80 | Mean | 42.6667 | 35 | 32.3333 | 26.6667 |
| | Std. Deviation | 1.5275 | 1 | 1.5275 | 1.5275 |

| | | | | | |
|---|---|---|---|---|---|
| | Std. Error of Mean | 0.8819 | 0.5774 | 0.8819 | 0.8819 |
| 160 | Mean | 62 | 53.6667 | 50 | 42 |
| | Std. Deviation | 2 | 1.5275 | 1 | 1 |
| | Std. Error of Mean | 1.1547 | 0.8819 | 0.5774 | 0.5774 |
| 320 | Mean | 83.3333 | 72 | 74 | 62 |
| | Std. Deviation | 1.5275 | 1 | 1.31 | 1.1 |
| | Std. Error of Mean | 0.8819 | 0.8774 | 0.8774 | 0.6571 |
| Total | Mean | 48.1667 | 41.6667 | 40.25 | 34.1667 |
| | Std. Deviation | 30.256 | 25.4999 | 26.4545 | 21.4639 |
| | Std. Error of Mean | 8.7341 | 7.3612 | 7.6368 | 6.1961 |

## 3. Result

The results showed that the *A. salvifolium* compounds As1 and As2 induced apoptotic cell death in two cancer cell lines in a dose-dependent pattern. Untreated MCF-7 and MDA – MB-468 cells had 4 0.57 percent and 6 1.0 percent apoptosis, respectively. After treatment with 80,160,320 M concentrations of *A. salvifolium* compounds. As1 and As2 in MCF-7 and MDA-MB -468 320 M the concentration *A. salviifolium* compounds exhibited maximum apoptotic cells of 83 1.5 percent, 72 1.07 percent, 74 1.3 percent, and 62 1.1 percent in MCF-7 and MDA-MB -468. At 320 M concentration *A. salvifolium* compounds exhibited maximum apoptotic cells.

The *A. salvifolium* compounds AS1 and AS2 were found to induce apoptosis. As a result, *A. salvifolium* compounds AS1- Deoxytubulosine and AS2 - carboline Hermaline have the potential to control Breast Cancer Cells.

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