PHARMACOLOGICAL IMPLICATION OF *CASSIA ALLATA* LINN. PLANT WITHIN MIZORAM, INDIA TO SUPRESS CANCER ACTIVITY.

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Abstract

Nature has long been a valuable source of medicinal compounds, with many modern drugs originating from natural sources and traditionally used in healing systems. Herbal medicines, with their rich historical background, are often considered safer alternatives to synthetic drugs. Notably, a significant proportion of modern clinical drugs are derived from natural products, highlighting their vital role in pharmaceutical research and development.This review focuses on the distribution, botanical characteristics, medicinal properties, and pharmacological activities of *Cassia alata* and *Cassia auriculata*. These plants are recognized for their diverse active compounds with therapeutic value and their proven biological activity against various diseases.

Keywords: Pharmacological effects, *Cassia alata*, *Cassia auriculata*, therapeutic

INTRODUCTION

Cassia alata Linn., a plant species utilized in traditional Asian medicine, has been extensively studied for its secondary metabolite compounds. Various bioactive molecules have been isolated from its leaves, seeds, stems, and flowers, exhibiting a range of biological activities. Research has confirmed the plant's pharmacological potential, highlighting its therapeutic applications [1]. *Cassia alata* Linn. has been found to possess a broad spectrum of pharmacological properties, including antibacterial, anti-inflammatory, antioxidant, anthelmintic and antifungal properties [2]. The methanol extract of *Cassia alata* flower exhibits anti-tumorigenic properties which suggests potential therapeutic applications in cancer treatment by suppressing oxidative stress-induced signalling pathways, inhibiting protumorigenic and inflammatory responses, arresting mitochondrial oxidative stress and enhancing antioxidant capacity in HT-115 human colon cancer cells [3]. The ethanolic leaf extract of *Cassia alata* demonstrates anticancer activity, effective against breast cancer cells (IC50 < 100 µg/mL) and non-toxic to normal cell lines [4]. *Cassia alata* leaf methanolic extract exhibits anti-lung cancer effects in mice, reducing lung index, inflammation, and cell proliferation while restoring normal lung histoarchitecture [5]. The cytotoxic effects of hexane extract of the *C. alata* plant leaves was studied in A549 lung cancer cells [6]. *Cassia alata* Linn. leaf chloroform fraction exhibits potent cytotoxicity against HepG2 cells, suggesting potential as a promising anticancer agent with low toxicity to non-cancer cells [7]. The extensive uses of C. *alata* has led to the study of pharmaceutically significant compounds in traditional medicine in several research studies [8]. This study aimed to evaluate the

therapeutic potential of *Cassia alata* Linn. in cancer patients of Mizoram, India, focusing on assessing the plant's ability to inhibit cancer cell growth, evaluating the impact on patient survival, quality of life, and tumor response, and monitoring adverse effects and interactions with conventional cancer therapies. The study's findings may provide the potential benefits and limitations of *Cassia alata* Linn. as a complementary or adjuvant therapy for cancer treatment.

MATERIALS AND METHODS

Cell lines and Culture medium

HeLa (Human cervical cancer), HepG2 (Human liver cancer) and MCF-7 (Human breast cancer) cell lines were procured from National Centre for Cell Sciences (NCCS), Pune, India. Stock cells were cultured in DMEM supplemented with 10% inactivated Fetal Bovine Serum (FBS), penicillin (100 IU/ml), streptomycin (100 µg/ml), and amphotericin B (5 µg/ml) in a humidified atmosphere of 5% CO2 at 37°C until confluent. The cells were dissociated with trypsin solution (0.2% trypsin, 0.02% EDTA, 0.05% glucose in PBS). The stock cultures were grown in twenty-five cm^2 culture flasks, and all experiments were carried out in ninety-six microtitre plates (Tarsons India Pvt. Ltd., Kolkata, India).

Cell viabilities

The cell viability of sample A and B were investigated using the MTT (Sigma, USA) on HeLa, HepG2 and MCF-7 cell lines. The cells were seeded in 96-well plates at a density of 1 X 10^4 cells per well. After incubation for 20–24 h, the cells with 70–80% Confluency were treated with polymers at different percentage of A and B (10, 25, 50, 75 and 100 respectively) and incubated for 72 h. Then, twenty µL of MTT (5mg/mL) solution was added to cells per well, and the plate was moved to a cell incubator for another 4 h. The medium was removed, and 150 mL of DMSO was added to the cells. The plate was gently shaken for 15 min to dissolve the formazan crystals generated by live cells, and the measurement was performed using a Spectramax M2 Microplate Reader (Molecular Diagnostic, Inc.) at a wavelength of 550 nm. Percentage cell viabilities of HeLa, HepG2 and MCF-7 cell lines were calculated using untreated cells as control. The results are expressed as mean values (±SEM) of three repeats.

Percentage of sample A	% Cell Viability		
	HeLa	HepG2	MCF-7
10	74.32	81.73	83.55
25	69.92	79.96	73.68
50	67.25	64.97	71.79
75	61.56	62.73	69.99
100	60.82	62.375	66.84
IC 50 (%/ml)	487	229	421

Table-1 Cytotoxic activity of sample-A in different percentage on HeLa, HepG2 and MCF-7 cell lines. Values are presented as mean ± SEM

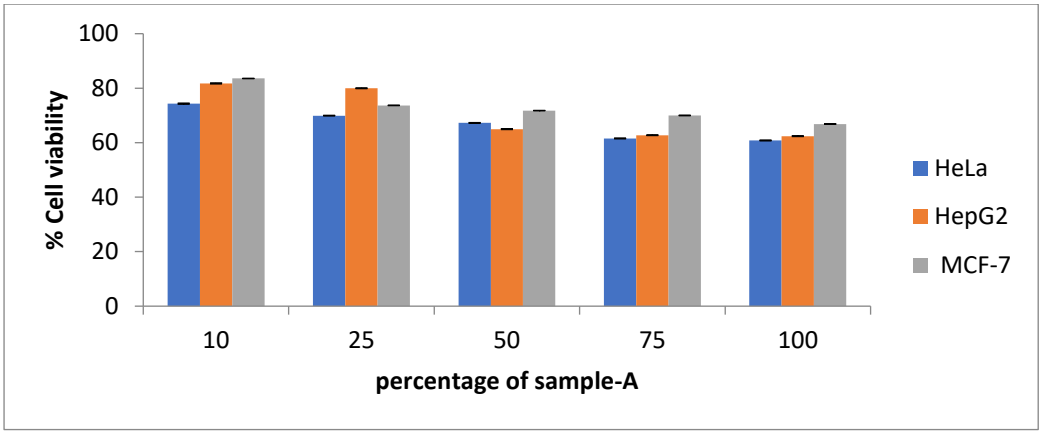

Fig-1 Graphical representation of cytotoxic activity of sample-A in different percentage on HeLa, HepG2 and MCF-7 cell lines. Values are presented as mean ± SEM

Percentage of sample B	% Cell Viability		
	HeLa	HepG2	MCF-7
10	95.43	99.98	95.67
25	94.55	90.40	94.67
50	87.55	90.36	88.72
75	77.97	69.17	85.95
100	64.88	68.50	70.73
IC 50 (%/ml)	147	158	187

Table-2 Cytotoxic activity of sample-A in different percentage on HeLa, HepG2 and MCF-7 cell lines. Values are presented as mean ± SEM

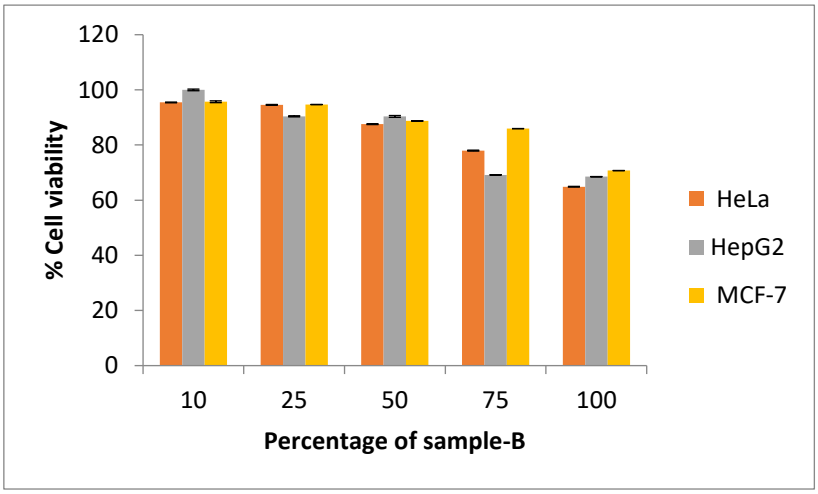

Fig-2 Graphical representation of cytotoxic activity of sample-A in different percentage on HeLa, HepG2 and MCF-7 cell lines. Values are presented as mean ± SEM

RESULTS AND DISCUSSION

The MTT assay was performed to evaluate the cytotoxicity of Sample A, collected on a dry day, and Sample B, collected on a wet day on HeLa, HepG2 and MCF-7 cell lines. Among sample A and B, In sample A showed more cytotoxicity (% inhibition of cell viability based on IC 50) in HepG2 cells, when compared with HeLa and MCF-7 (HepG2>HeLa>MCF-7) (Table-1, Fig-1) and the cell viability of 60% when the concentration reached up to 100 percent of sample A in all the cell lines. In sample B exhibited more cytotoxicity (% inhibition of cell viability based on IC 50) in HeLa cells, when compared with HepG2 and MCF-7 (HeLa>HepG2>MCF-7) (Table-2, Fig-2) and the cell viability of 60% when the concentration reached up to 100 percent of sample A in all the cell lines.

Conclusion:

Even at 100% concentration, the sample exhibited limited cytotoxicity, as more than 60% of the cells remained viable and less than 40% were inactive. While the cytotoxic activity is not strong, the findings suggest the presence of therapeutic compounds in the plant. Interestingly, when the plant extract was administered to local cancer patients, over 60% showed signs of recovery.

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