

POTENTIAL ANTI PROLIFERATIVE EFFECT OF LANTANA CAMARA LINN FLORAL EXTRACT AGAINST HUMAN BREAST CANCER (MCF-7) CELLS

Astalakshmi N^{1*}, Deepa S², Mayilvel S³, Praveenkumar S⁴, Sakthivel S⁵, Sona S.P⁶, Surendra Kumar M⁷

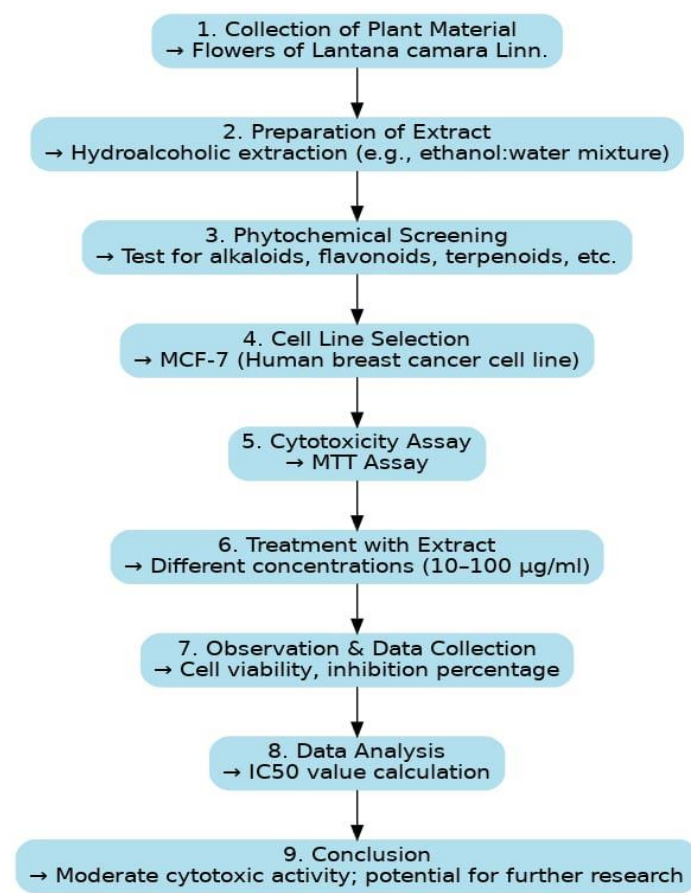
^{1,2,3,4,5,6,7} Senghundhar College of Pharmacy, Kumaramangalam, Tiruchengode-637 205, Namakkal

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Abstract: A research investigation on *Lantana camara* Linn. focused on evaluating its phytochemical profile, therapeutic properties, and potential industrial uses. We evaluated various extract types to identify bioactive constituents like alkaloids, flavonoids, and terpenoids. Traditionally, the plant has been employed in the treatment of ailments like respiratory issues, skin conditions, and digestive disorders. To determine the effects of the hydroalcoholic flower extract of *L. camara* Linn on cell viability and proliferation, we performed the MTT assay. Exhibited a concentration-dependent suppression of cell growth within the 10–100 µg/ml range. Higher extract concentrations were associated with stronger inhibition, and the calculated IC₅₀ value suggested moderate cytotoxic potential.



Keywords : *Lantana camara*, Cytotoxicity, MTT assay, MCF-7, Hydro alcoholic extract.

I. INTRODUCTION

Cancer, characterized by uncontrolled cell growth, remains a primary global cause of sickness and death. [1]. More than 200 different types of cancer have been discovered and are categorized according to the cells or tissues in which they initially originate. [2].

Recent statistics show that in 2019, In 112 out of 183 countries, cancer was among the top two causes of death for individuals under 70. Cancer survival rates indicate that 70% of survivors live for at least 5 years after diagnosis, with 11% surpassing 25 years since diagnosis. Globally, female breast cancer was the most frequently diagnosed type of cancer, with 2.3 million new cases, representing 11.7% of all cancer diagnoses.

High-income (transitioned) countries experience cancer incidence rates that are two to three times higher than those observed in low- and middle-income (transitioning) nations [3].

Tobacco use accounts for roughly 22% of cancer related deaths, while obesity, unhealthy diets, physical inactivity, and excessive alcohol consumption contribute to another 10%. Worldwide, approximately 16–18% of cancer cases are attributed to infections caused by viruses, bacteria, and parasites [4].

Approximately 1 in every 1,000 pregnant women may also develop cancer, The cancer types seen in pregnant women of childbearing age are typically consistent with those found in non-pregnant women within the same age group. These include breast, cervical, leukemia, lymphoma, melanoma, ovarian, and colorectal cancers [5].

A diet rich in fat, red meat, salty and pickled foods, and processed items combined with a low intake of fresh vegetables and fruits is considered a major risk factor for breast cancer [16].

Cervical cancer and its precancerous lesions are primarily caused by persistent infections with high-risk HPV types. [6].

Chemotherapy-induced peripheral neuropathy (CIPN) is a nerve-damaging condition resulting from chemotherapy treatment, resulting from specific chemotherapy medications, leading to various sensory, motor, and autonomic symptoms. Notably, some of the typical chemotherapy drugs known to cause CIPN include platinum compounds such as cisplatin and oxaliplatin [7].

Many chemotherapy drugs are losing their Effectiveness because of growing drug resistance. Traditionally, they damage healthy cells, causing significant side effects for patients [17]. Therefore, there is an urgent need to create new anticancer drug that are not only powerful but also specifically target tumour cells. This issue is drawing heightened interest from researchers [8].

Natural medicines can be compared to allopathic medicines, as they tend to cause fewer side effects and lower toxicity [10]. Common side effects of allopathic treatments such as hair loss, mouth ulcers, constipation, memory and concentration issues, and anemia are generally not associated with natural remedies [9].

Among its genus, *Lantana camara* L., also known as wild or red sage, has the widest distribution [13]. *Lantana camara*, often referred to as *Camara vulgaris* Benth., is an ornamental flowering plant that belongs to the Verbenaceae family. It is commonly found thriving across various Asian countries [11].

Lantana camara provides multiple benefits, especially in traditional medicine, where it has been utilized to manage ailments like fever, colds, and skin infections. However, modern scientific research has uncovered its potential as a versatile medicinal plant, Exhibiting properties that include antimicrobial, wound-healing, anti-inflammatory, and anticancer effects [12].

Lantana is a genus that includes around 150 species of perennial flowering plants [14]. Its flowers can be Zygomorphic, actinomorphic, or hermaphroditic, typically taking on a funnel or tubular shape. The fruit is typically either a drupe or a capsule, while the leaves are generally positioned in opposite pairs or arranged in whorls along the stem [15].



Fig No. 1: Flower of Lantana Camara Linn

II. MATERIALS AND METHODS

1) Collection and authentication of the Flower specimen:

The Flower specimen was collected from the forest of kill hills in Namakkal, Tamil Nada and the same was authenticated.

2) The flower material:



Fig No. 2: Flower of Lantana Camara Linn

Lantana camara Linn was collected and kept in a clean and hygienic place to prevent contamination. Since mould produces aflatoxins, caution was taken to prevent mould growth. All unwanted materials, such as stones, dust, dirt, and sand, in the flowers of Lantana camara Linn were completely removed.

III. THE EXTRAXT

1) Extraction:

The collected flowers were extracted by using a suitable solvent, and by adhering to a standard extraction technique [18], Compounds such as terpenes, alkaloids, flavonoids, saponins, steroids, and glycosides can be extracted from inactive or inert material [19].

Table No. 1: Summary of Qualitative Phytochemical test

Phytochemical	Test Used
Alkaloids	Wagner's Test, Dragendorff's Test
Flavonoids	Ferric Chloride Test
Glycosides	Keller-Kiliani Test
Phenols	Ferric Chloride Test
Saponins	Foam Test
Tannins	Gelatin Test
Terpenoids	Salkowski Test
Steroids	Salkowski Test

2) **PRE-EXTRACTION FLOWER SAMPLE PREPARATION:**

In medicinal plant research, preparing flower samples before extraction is the first crucial step to preserve the plant's biomolecules. Examples of plant material that can be obtained from dried fresh plant material are leaves, bark, roots, fruits and flowers. The shelf life of phytochemicals in final goods is impacted by further pre-treatments of plant products, such as drying and grinding [20].

- Maceration of *Lantana camara* Linn Flowers, coarsely powdered *Lantana camara* flowers were placed in a container. Enough solvent (menstruum) was added to fully cover the flower powder. The container was sealed and left to sit for at least seven days [21]. The mixture was periodically stirred or shaken during this time to aid in the extraction process. After a week, the liquid (micelle) was filtered to separate it from the remaining plant material (mare). The micelle was then dried in an oven to remove the solvent and collect the extracted substances [22].
- Infusion of *Lantana camara* Linn Flower: Initially, the flowers were finely ground into a powder and stored in a clean, sterile container. A solvent was poured over the powder until it was completely covered [23]. The mixture was left to soak for a short period to extract the easily soluble compounds. This method is simple and effective for making a fresh extract quickly. A solvent-to-sample ratio of 4:1 or 16:1 was chosen according to the procedure's objectives [24].
- Ultrasound-Assisted Extraction: High-frequency sound waves (exceeding 20 kHz) are utilized in this method to rupture flower cells and enlarge the plant material's surface area, allowing the solvent to absorb more compounds. After drying, grinding, and sieving the plant material, the resultant powder was combined with an appropriate solvent and introduced into an ultrasonic extractor. The sound waves helped release the plant's active compounds, especially the secondary metabolites, into the solvent and collect the extract [25].
- Microwave-assisted extraction (MAE) is considered one of the cutting-edge techniques for processing medicinal plants. This method operates based on the dipole rotation mechanism and ionic transfer, which involves moving the charged ions found in the drug material and solvent. This method extracts flavonoids using electromagnetic radiation (300 MHz - 300 GHz, 1 cm - 1 m wavelength) [26].

IV. **PHARMACOLOGICAL STUDIES:**

In vitro studies:

1) Cytotoxicity evaluation of *Lantana Camara* (L.) Hydroalcoholic extract on normal and cancer cell lines:

Loss of control over the cell cycle is the root cause of many diseases, including cancer and Uncontrolled, rapid cell proliferation is a hallmark of cancer. Cancer develops due to a combination of internal factors including inherited mutations, hormonal and immune system conditions, and metabolic-related mutations and external influences such as tobacco use, chemical exposure, radiation, and infections. Cancer is a major global health issue primarily because there are insufficient, extensive, and timely detection techniques, the correspondingly bad prognosis of individuals identified at later stages of the illness, and its rising worldwide incidence. Without a doubt, combating cancer stands as one of the most significant challenges facing humanity today [27].

2) Cell lines:

Cell lines were sourced from the National Centre for Cell Science (NCCS), Pune. Cancer cells are extensively used in research and have proven to be valuable tools in genetic engineering, with properties that make them the best models for cancer studies [28]. Studying cancer cells has improved our knowledge of the genes and signalling pathways disrupted in this disease. Cell models are also fundamental to the development and testing of current antibiotics, the development of new treatments, and other methods of turning animal cells into antibiotics [29].

Table N0. 2: Cancer cell lines with different types of cell types origin:

Cancer cell line	Species	Cell name	Morphology
HeLa	Homo sapiens	Cervix adenocarcinoma	Epithelial
MCF-7	Homo sapiens	Breast adenocarcinoma	Epithelial
U87MG	Homo sapiens	Glioblastoma Astrocytoma	Epithelial
HT-29	Homo sapiens	Colon adenocarcinoma	Epithelial
A549	Homo sapiens	Lung carcinoma	Epithelial
HEP-G2	Homo sapiens	Hepatocellular Carcinoma	Epithelial

3) Determination of cell viability by MTT Assay:

spectrophotometric conversion of MTT, MTT converts to formazan via mitochondrial dehydrogenase in live cells. Initially, cells were cultured in DMEM with FBS and antibiotics at 37°C, 5% CO₂. Cells were trypsinized, counted, and plated in 96-well plates at optimal density.. After 24 hours of incubation for adherence, test samples are prepared in appropriate solvents or media, diluted, and added to the wells containing cells. Controls (untreated and treated with cytotoxic agents) are included. Following treatment, cells are incubated with the samples for 24 to 72 hours. Each well receives 5 mg/mL MTT and is incubated for 2–4 h to allow formazan crystal formation. Crystals are dissolved in DMSO, and absorbance is measured at 570 nm. Cell viability is calculated by comparing The MTT assay assesses cell viability and cytotoxicity. This assay measures cell viability by detecting the treated and control absorbance values.[30].

Cell viability (%) = (Absorbance of treated cells / Absorbance at control cells) × 100.

V. RESULTS AND DISCUSSIONS:

1) Authentication of plant specimen:

The collected specimen was authenticated as *Lantana camara* (L.) by Dr. M. U. SHARIEF SCIENTIST E. & HEAD OF OFFICE, botanical survey of India.

Southern regional Centre Coimbatore-641003

Authentication no: BSI/SRC/5/23/2024-25/Tech/455.

2) The plant material extract:



Fig. No. 3: Lantana camera Linn flower extract

VI. PHARMACOLOGICAL STUDIES:

In vitro cytotoxicity studies:

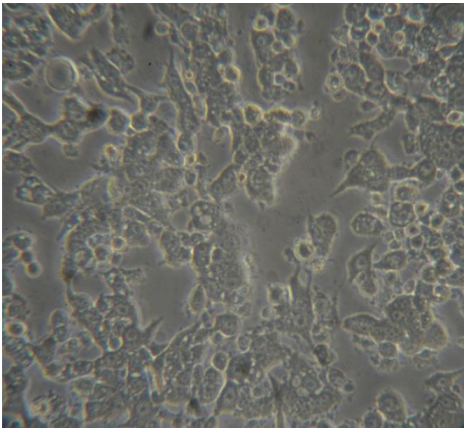
Table No. 4: Anticancer effect of hydro alcoholic extract of Lantana camera (L) flower against MCF-7:

CONCENTRATION	B2400308-1 Solid: Hydroalcoholic extract			
	Cytotoxicity (%)	Cell viability (%)	Cytotoxicity Reactivity	With IC50 Value
10	9	91	Slight	78.1
20	16	84	Slight	
30	22	78	Mild	
40	26	74	Mild	
50	30	70	Mild	
60	36	64	Mild	

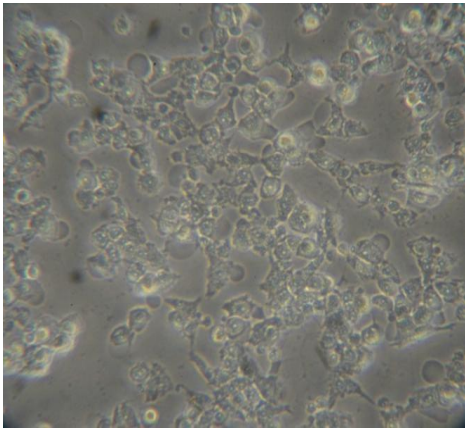
Journal of Xidian University	43	https://doi.org/10.5281/Zenodo.16784874	Mild	ISSN No:1001-2400
80	53	47	Moderate	
90	60	40	Moderate	
100	63	37	Moderate	

The hydroalcoholic extract of *Lantana camara* Linn demonstrated a dose-dependent inhibition of cells across concentrations ranging from 10 to 100µg/ml. An increase in extract concentration resulted in a greater suppression of cell growth. The IC50 for this hydroalcoholic plant extract was also estimated

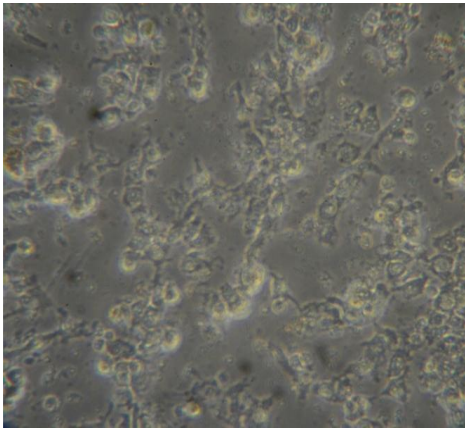
Anti-Cancer Activity with IC50 - MTT method Cell line: MCF-7Sample particulars: Hydroalcoholic Extract



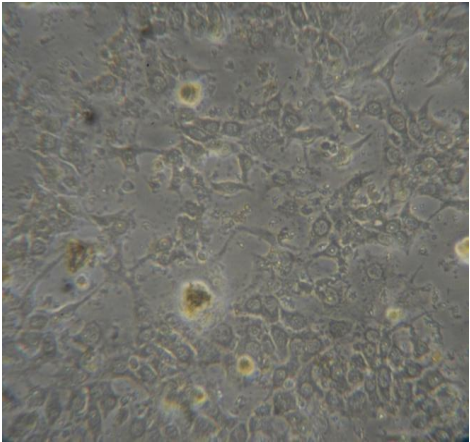
Control



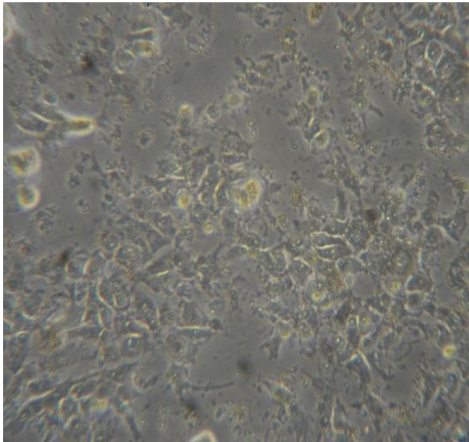
10µL



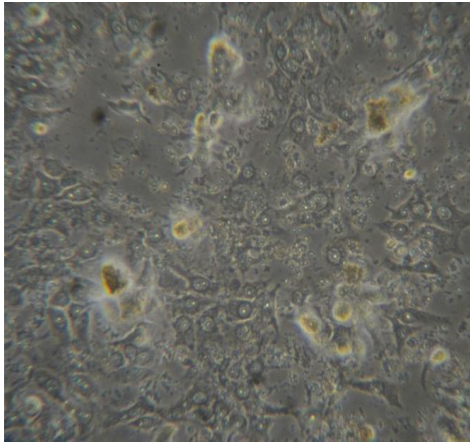
20µL



30µL

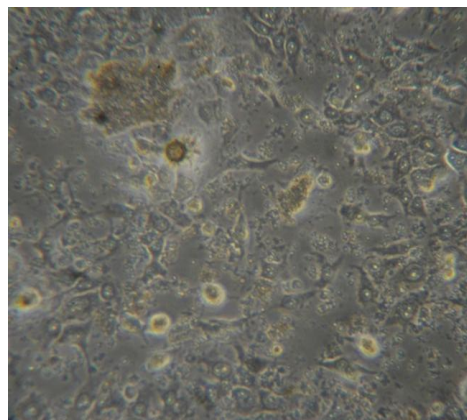


40µL

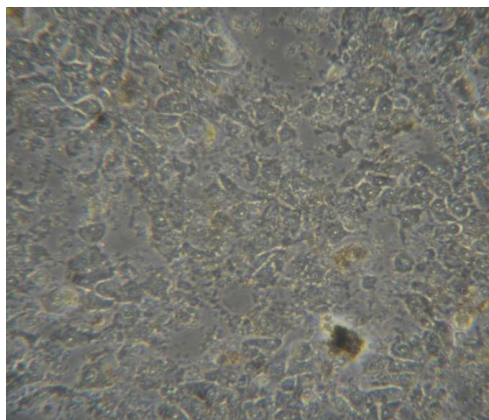


50µL

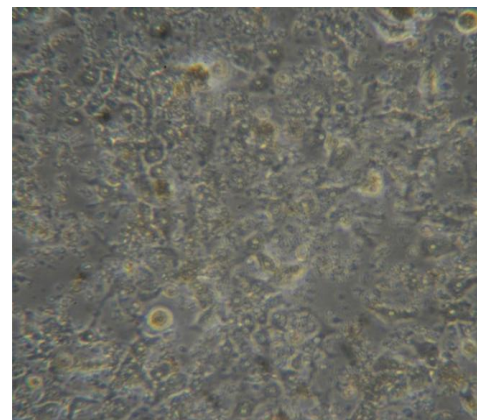
Anti-Cancer Activity with IC₅₀ - MTT method Cell line: MCF-7 Sample particulars: Hydroalcoholic Extract



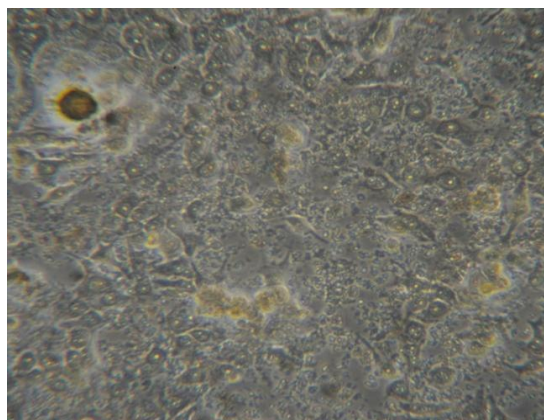
60μL



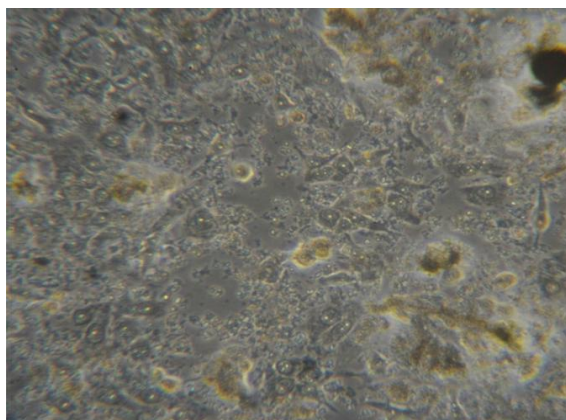
70μL



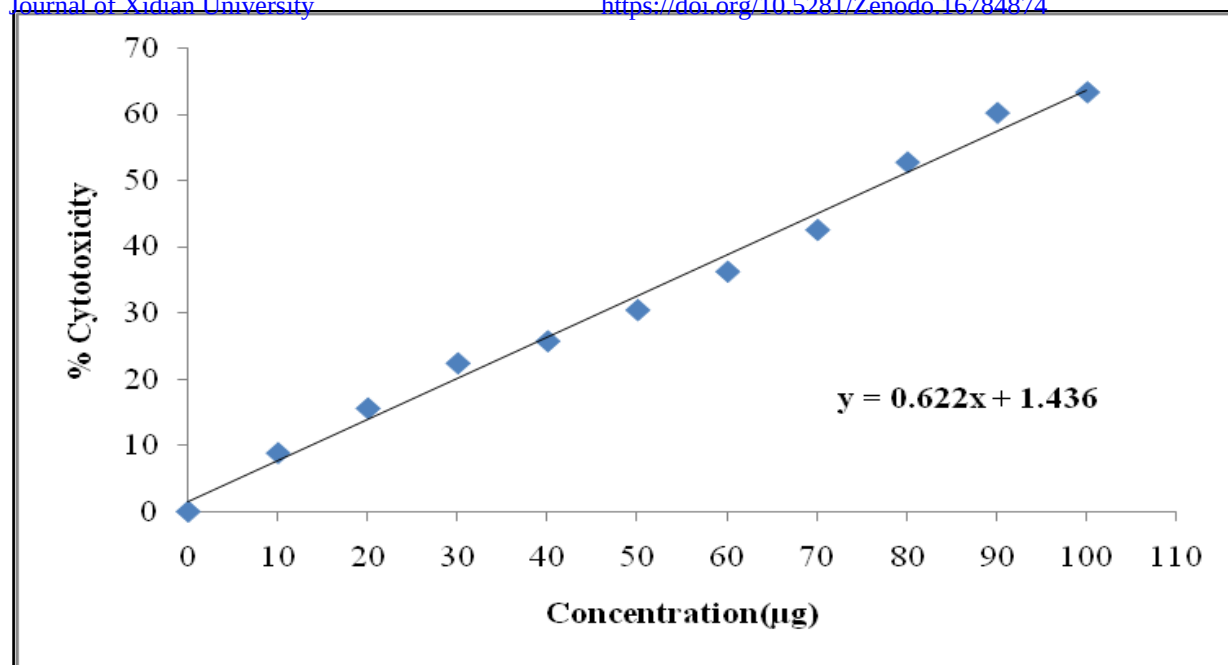
80μL



90 μL



100μL



m	0.622
C	1.436
IC50	(50-C)/m
	48.564
IC50	78.1

The anticancer potential of the hydroalcoholic extract of *Lantana camara* Linn was evaluated on MCF-7 breast cancer cells through the MTT assay. Microscopic observations revealed a progressive reduction in cell density with increasing extract concentrations (10 µL to 100 µL), indicating a dose-dependent cytotoxic effect. Quantitative analysis showed a linear increase in % cytotoxicity with concentration, and the IC₅₀ value was calculated to be approximately 78.1 µg, suggesting significant anticancer potential of the extract.

VII. SUMMARY AND CONCLUSION:

- The collected specimen was authenticated a *Lantana camara* (2) by **Dr. M. SHARIEF SCIENTIST F. & HEAD OF OFFICE**, botanical survey of India. Southern regional Centre Coimbatore-641001 Authentication no, **BSI/SRC/5/23/2024-25/Tech/455**,
- The dried plant materials were extracted using hydro alcohol ethanol, and aqueous solvent by maceration technique

Hydroalcoholic extract:	8%
Ethanollic extract	:8.2%
Aqueous extract	:10%
- Current research indicates that plants containing *lantana camara* (L.) have a moderate cytotoxic effect on MCF7 cells when extracted hydro alcoholically. The hydroalcoholic extract of the *Lantana camara* (L.) plant has moderate anticancer activity, according to the findings of in-vitro studies conducted using MCF7 cell lines. The hydroalcoholic extract of *Lantana camara* at 10,20,30,40,50,60,70,80,90, And 100 µg/ml had shown a dose-dependent inhibition of cells. As The concentration increases, there is an increase in cell growth inhibition. The estimated IC₅₀ of an hydroalcoholic extract of the plant was 78.1µg/ml. The conclusion of this work motivates the continuation of research on the additional cell lines and the necessity of in vivo cytotoxicity tests to detect anticancer activity.

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