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AN OVERVIEW OF MEDICINAL PLANTS IN THE TREATMENT OF CANCER

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ABSTRACT

Cancer is a life-threatening disease that poses a significant challenge in both developing and wealthy countries. The demand for novel ways to avoid the disease is increasing. Plants have always been a foundation for medical systems, and they have offered humans with treatments for thousands of years. Since prehistoric times, medicinal plants have been used as a source of medicine. In today's developing countries, ensuring the safety, quality, and utility of medical plants and herbal products has become a major concern. Medicinal plants have been used to flavor and protect food for many years, as well as to treat health problems and prevent diseases such as epidemics. The knowledge of their medicinal abilities has been passed down through the generations. Plants have been a valuable source of natural goods for sustaining human health for a long time, particularly in the recent decade, with more extensive investigations for natural remedies. Herbal medicine, in comparison to current Western medicine, is a very safe and successful technique. The biological capabilities of plant species utilized all over the world for diverse purposes, including the treatment of infectious diseases, are mainly attributed to active chemicals created during secondary metabolism.

Keywords: Cancer, Medicinal plants, Herbal medicine

HISTORY

Surgery was the major treatment for early stages of cancer in the eighteenth century, and patients experienced numerous relapses **[1]**. Radiation therapy was discovered in 1895, but it produced minimal results **[2]**. Several incidences of cancer regression with bacterial infection were recorded at the time **[3]**. Following an erysipelas

infection, a patient with soft tissue sarcoma went into remission in 1868, although the remission was only temporary **[3]**. Following an erysipelas infection, a patient with soft tissue sarcoma went into remission in 1868, although the remission was only temporary **[3]**. Nitrogen mustard was first utilized in the treatment of lymphoma patients in 1943 **[4]**. In 1948, folic acid antagonists caused a brief remission in infantile leukemia **[5]**. In animal models, viruses were discovered to be useful in suppressing cancers and in people in 1956 **[6]**. Adenoviruses, in particular, have been investigated in humans more extensively, leading to the creation of gene therapy **[7]**.

Immunotherapy was used for the first time in treating cancer patients in 1987, and the FDA subsequently approved rituximab antibodies for treatment of lymphoma patients **[8]**. In 1990, the FDA approved the first gene therapy trial in the United States for a patient suffering from serious combined immunodeficiency disease **[9]**. Since then, numerous clinical trials for cancer patients have been undertaken, using different gene therapy methodlogies, with positive result in patients with chronic lymphocytic leukemia, acute lymphocytic leukemia, brain tumors and other illnesses **[10]**.

INTRODUCTION

Cancer is a term used in medicine to describe uncontrolled cell development. Cancer cells proliferate in an unregulated way, resulting in malignant tumours that target other regions of the body. Metastasis is the process by which a malignant cell spreads to different parts of the body via the lymphatic or bloodstream **[11]**. The tumours aren't all cancerous; some of them are benign, meaning they don't infect neighboring tissue and don't spread to other regions of the body. There are about 200 different varieties of cancer that can affect a person's body **[12]**. Obesity, smoking, lack of physical activity, radiation exposure, oxidative stress and environmental contaminants are just a few of the factors that have been linked to an increased risk of cancer. Cancer causes mutations, which can lead to the development of other diseases **[13]**. The hereditary contribution in cancer has been estimated to be between 5 and 10%. Medical imaging and biochemical screening tests can both be used to diagnose cancer. Radiation therapy, Chemotherapy and surgery are all common techniques used to treat cancer **[14]**.

Genes that cause cancer and their action

Oncogenes (OG): Under normal circumstances, ontogenesis genes are a factor in inducing the cells to begin separating. They increase the rate of cell

proliferation when oncogenes are activated. When one of the oncogenes is impaired, cancer starts developing. It functions as an accelerator, piling down the cell with daughter cells and instructing the cell to divide indefinitely.

Suicide genes (SG): Apoptosis, often known as cell death, is a very complex and crucial process. Normally, cells have the potential to commit suicide if something goes wrong in order to protect their neighbours from harm. A number of SGs have been linked to cancer. When SG is damaged, a defective cell can continue to divide and become malignant.

Tumor suppressor genes (TSG): These were found in 1979 by David Lane, a UK scientist. TSG creates proteins with a utility that is the polar reverse of ontogenesis. P53 is considered to be one of the most essential tumour suppressor genes in cancer.

DNA repair genes (DRG): DNA, which is found in every cell in the body, is constantly under attack from a variety of sources.

Anticancer Activity of Medicinal Plants

Aronia melanocarpa

It is high in polyphenols and anthocyanin, which can help to increase circulation, protect the urinary tract, and improve cardiac function. *A. melanocarpa*'s therapeutic efficacy in the treatment of cancer, eye inflammation, and liver failure. Recent research has proven that the anticancer activity of *A. melanocarpa* is mostly due to its bioactive components, which include chlorogenic acids, certain cyanidin glycosides, and quercetin derivatives. Thani *et al*. (2014) investigated the effect of *A. melanocarpa* extract alone or in conjunction with gemcitabine on the AsPC-1 cell line's proliferation **[15]**.

Bersama abyssinica

Bersama abyssinica is a species belonging to Melianthaceae family that has traditionally been used to treat tumours by chewing stem peelings. To cure various types of tumours, the fresh roots were mashed and juices, as well as an infusion made from the bark. It was discovered that a substance isolated from *B. abyssinica*, bufadienolides-cardiac glycosides, has anticancer action. Lignin and hallebergenin-3-acetate have been isolated and demonstrated to suppress tumour and a specific type of cancer, respectively **[16]**.

Catharanthus roseus

It is also known as Madagascar periwinkle or rosyperiwinkle and belongs to the Apocynaceae family. Its major component is alkaloids, which are used to cure circulatory illnesses and relieve natural cerebral blood blockage. Vinblastin and vincristine are two well-known chemicals that have a considerable anti-cancer impact in humans. Vinblastin sulphate inhibits mitosis and is used to treat acute leukaemia in children. It is also used to treat

lymphosarcoma, neuroblastoma, choriocarcinoma, and carcinomas of the breast, lung, and other organs **[17]**.

Cassia tora

Using human cervical cancer cells, methanolic leaf extract of *Cassia tora* (Fabaceae) (CTME) was tested for antiproliferative efficacy in combination with Cisplatin (HeLa). In HeLa cells, the plant extract caused a concentration-dependent reduction of proliferation, decreased DNA content, and apoptosis. Antiproliferative action is attributed to phenolic chemicals **[18]**.

Cola nitida

On human breast cancer cell lines MCF-7, the possible anti-carcinogenic action of cola nut methanol extract was examined. Compared to DMSO-treated reference cells, MCF7 cells treated with 70-80 g/ml cola nut extract revealed a rise of 8 % in the population of apoptotic cells and a concurrent decrease in the percentage of cells in the S and G2/M phases of the cell cycle **[19]**.

Curcuma longa

It is a member of the Zingiberaceae family of plants. Curcumin, a polyphenol generated from the rhizome, is the active element in this plant, which is utilised for both cancer prevention and therapy. Curcumin promotes apoptosis, interferes with cell cycle progression, and suppresses proliferation, according to numerous studies **[20]**. Curcumin has also been shown to prevent colon and stomach cancer in animals. Curcumin protects against tumour formation by reducing the growth of angiogenesis associates and tumor-associated genes. Curcumin has anticancer properties because it inhibits tumour cell proliferation. Curcumin inhibits cell proliferation by inhibiting the production of several genes, including nitric oxidase synthase, activator protein 1, cycloxygenase 2, NF-kappa B, and tumour necrosis factor **[21]**.

Dracocephalum tanguticum

The entire plant of *Dracocephalum tanguticum* was established to comprise a great amount of saponin in a chloroform extract (53 %). On T98G glioblastomas cells, a 80 g/ml dose of CEDT was active in anticancer activity by inducing cell death via the Caspase-3 and Bax pathways, as well as inhibiting p21 [22].

Plumbago zeylanica

Plumbaginaceae is the family name for this plant. Phytocompounds such as coumarins, saponins, isoorientin, plumbagin, steroids, and psoralen have been discovered in this plant in several investigations. Plumbagin is a napthoquinone derived from the roots of this plant that has anti-tumor properties via regulating hormone refractory cells invasive prostate cancer. The inhibitory action of plumbagin on different molecular targets (STAT-3, AKT, and PI-3K) inhibits

prostate cancer development and invasion. Plumbagin induces death in cancer cells while simultaneously inhibiting their proliferation **[23]**.

Heracleum persicum

Petroleum ether and Methanol extracts from the fruits and root of the plant *Heracleum persicum* (Apiaceae) displayed anti-tumor action and inhibited *Agrobacterium tumefaciens*, which caused crown gall tumours on potato discs. *H. persicum* essential oils also had anticancer activity, with an IC_{50} value of 2.24 mg/mL **[24]**.

Ophiorrhiza mungos

The anti-carcinogenic budding of the phytocompounds Luteolin-7- O-glucoside (LUT7G) and camptothecin, which were insulated from the methanolic extract of the leaves and roots of *Ophiorrhiza mungos* (Rubiaceae), was tested in contradiction ofsarcoma cell lines (MCF-7 and A549) as well as the normal VERO cell line. The dose of 20 mg/kg is effective in inhibiting cell tumour activity **[25]**.

Ocimum sanctum

This belongs to lamiaceae family. The effects of an aqueous and ethanolic extract of *Ocimum sanctum* leaves on human fibrosarcoma cells (HFS cells) and a substantialdecrease in tumour size in mice with Sarcoma-180 solid tumours have been studied. Steroids, terpenoids and phenolic chemicals found in this plant extract play a chemo-preventive function in cancer due to their properties on cell signalling and proliferation **[26]**.

Piper longum

It is a spice that belongs to the Peparaceae family. It's made out of longumine and is used to cure coughs. The growth of human lung cancer (HCC-827 cell line) was inhibited by Piper longum extract, which was measured in terms of feasible cell count reduction related to the control value, and the suppression was dosage dependent. It's also used to treat scorpion and snake bites as an antidote **[27]**.

Prunus africana

The Rosaceae family includes *Prunus africana*, an evergreen tree. The root of *P. africana* has long been used to cure a variety of ailments, including cancer. Furthermore to its traditional therapeutic use tenuifolin and ferulic acid, which were extracted from *P. africana* roots and leaves, have been shown to have anticancer activities **[28]**.

Withania somenifera

It is anassociate of the Solanaceae family of shrubs. It is a traditional Ethiopian plant used to treat a variety of diseases, including tumours and edoema. The crude extract, as well as chemicals (withanolides and withaferin A) derived from *W. somnifera*, have been demonstrated to have anticancer activities in animal and cell culture models **[29]**.

Vitis vinifera

The antitumor and antioxidant efficacy of an ethanolic extract of *Vitisvinifera* L. leaves was tested in Swiss albino mice with Ehrlich ascites carcinoma (EAC). The anticancer impacts as well as the antioxidant role were discovered by estimating tumour size, packed cell volume, and tumour volume LPO and antioxidant enzymes like SOD and CAT are found in the liver. At doses of 200 and 400 mg/kg, extract treatment amplified mean existence time, lowered LPO levels, and enhanced superoxide dismutase, catalase levels. In EAC tumor-bearing mice, the data indicated that an ethanolic extract of *Vitis vinifera* had a substantial anticancer and antioxidant effect **[30]**.

FUTURE PERSPECTIVE

The treatment of acute disease is prioritized in current research and health-care delivery, rather than the shield and conservation of general health. Acute, episodic therapy is inefficient, costly, and challenging for patients. Inhibiting cancer is the best and most commercial way to reduce cancer incidence, mortality, and productivity costs. There is a bright future for medicinal plants, as there are over half a million plants on the planet, most of which have not yet been examined for their medical properties, and their hidden medical potential could be crucial in the treatment of current and future studies. It's the time for scientists and governments to identify and embrace cancer inhibition as one of the most essential objectives of forthcoming cancer research.

CONCLUSION

Many traditional medicinal plants/herbs have therapeutic potential and could be employed as anticancer treatments in the future, according to this review. In addition to in vitro testing, more research in vivo and in clinical trials is needed to better understand its anticancer potential for future application. Furthermore, in order to build logical phototherapeutic treatments, improved information and skills on the mechanism of action are required. As a result, conventional medicine expertise should be applied to find new cancer therapy leads. Despite the fact that numerous plants are utilised for therapeutic purposes, scientific proof for several of these species is lacking. As a result, it's critical to test these plants/poly herbal formulations in preclinical and clinical research. Furthermore, current biotech-nological technologies such as nanotechnology based drug delivery systems will help to advance medicinal plant research to its full potential while also reducing the negative effects of medications developed from these plants. Because herbal medication treatment is less expensive, it may be advised to rural and

impoverished individuals to treat cancer efficiently. Screening medicinal plants for anti-cancer activity opens up a lot of possibilities for developing powerful anti-cancer drugs.

Conflict of Interest

The authors declare no conflict of interest.

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