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Review Article

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## Role of Medicinal Plants in Cancer Treatment- A Review

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### ABSTRACT

India is a peninsula of herbal hub, in which Siddha system of medicine has flourished as an enlightenment in the field of Medicine. Currently medicinal plants have become the paramount source of drug discovery in research for treating diverse form of diseases including Cancer. Currently medicinal plants have become the paramount source of drug discovery in research for treating diverse form of diseases including Cancer. This article reveals a detailed review of ethno medicinally important plants in cancer from Indian medicinal plants which will be useful to treat various types of cancer. It will be helpful to explore the medicinal value of the plants and for the new drug discovery from them for the researchers and scientists around the globe.

**Keywords:** Cancer, Medicinal plants, bioactive compounds, Anticancer

### ARTICLE INFO

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### 1. Introduction

Human use of plants as medicinal agents predates recorded history. Ethnomedical plant-use data in many forms has been heavily utilized in the development of formularies and pharmacopoeias, providing a major focus in global health International Journal of Medicine and Pharmaceutical Research

care, as well as contributing substantially to the drug development process. A huge reservoir of bioactive compounds exists in many species of plants of Earth, only a small percentage of which have been examined and

continued to be an important source of anticancer agents. Worldwide effects are ongoing to identify new anticancer compounds from plants. With the current decline in the number of new molecular entities from the pharmaceutical industry, novel anticancer agents are being sought from traditional medicines. Cell growth and cell multiply process is known as cell division. It must be extremely controlled that all the cells in the body should grow at the right place and for all the organs and tissues to function properly. When the cells divide too quickly, consequences can be disastrous. When a cell divides, it first makes an exact copy of its DNA via a process called DNA replication, before splitting into half, to form two 'daughter' cells, that are genetically identical. Hundreds of proteins involve in Cell division. Some proteins inform the cell when or when not to divide. Others were responsible for making sure that the DNA is copied accurately. Yet more were involved physically by pulling the duplicated chromosomes apart as the cell to split into two. Uncontrolled cell division may have many causes, to form any type of cell. But usually results from defects or damage from one or more of the genes involved in cell division. When those genes were damaged (mutated) on some way, for instance on exposure to cigarette smoke or ultraviolet radiation, the cell may start dividing uncontrollably [1]. Those defective cells might multiply to form a lump of abnormal tissue called a tumor.

The term neoplasm denotes a mass of tissue formed as a result of abnormal, excessive, uncoordinated, autonomous and purposeless proliferation of cells. The most common cause of cancer is due to genetic factors where the incidence is higher among patients with positive family history. Next common cause is exposure to radiations in which nearly all tissues are susceptible to tumour induction with variable sensitivity. The principle carcinogenic agent in our environment is inhaled tobacco smoke in which the incidence of lung cancer is tenfold higher in smokers than nonsmokers. Furthermore it can induce cancer in oral cavity, oesophagus, kidney, bladder and pancreas. Unfortunately occupational exposure is a dreadful cause of inducing cancer in working sectors. Although there has been extensive research on viral oncogenesis, there are number of situations in which viruses are linked to the occurrence of specific cancers with high incidence like Hepatitis B infection and are correlated with hepato-cellular carcinoma.[2]

## 2. Aim of Cancer therapy

The primary aim of cancer therapy is to act at cellular level which includes inhibiting cancer cells proliferation, promoting apoptosis of cancer cells, enforcing the necrosis of tumour and blocking its metastasis. The secondary aim is to maintain the haemopoietic functions to remain normal and to promote the reverse transformation from tumour cells to normal cells. Thereby to alleviate the symptoms of anorexia, insomnia, pain and to make the patient feel comfortable.[2]

### Cancer-causing genes:

There are four main types of gene involved in cell division. Most tumours have faulty copies of more than one of the

genes viz., Oncogenes - Ontogenesis were the genes, under normal circumstances, that play a role tell the cells to start dividing. When oncogenes are activated, they speed up a cell's growth rate. When one of them becomes damaged, causing cancer, it is like the accelerator is becoming stuck down - the cell, and all its daughter cells, are permanently instructed to divide. Tumor suppressor genes- This gene was co-discovered in 1979 by the scientist Professor Sir David Lane Cancer Research UK. These genes make proteins whose normal function is the opposite to that of ontogenesis. One of the most important tumor suppressor genes is called p53. Suicide genes - Apoptosis or cell suicide, which was a highly complex and hugely important process. DNA-repair genes - The DNA in every cell in the body is under constant assault from a variety of directions. But cells contain many different proteins whose job is to repair the damaged DNA. Thanks to those, scientists think that the vast majority of DNA damage is repaired immediately, with no ill effects. But if the DNA damage occurs to a gene that makes a DNA repair protein, a cell's ability to repair itself will be reduced, and that can allow errors to accumulate in other genes over time.

Causes of cancer as follows:1) Viruses such as Epstein-Barr-Virus (EBV), Hepatitis-B-Virus (HBV), Human Papilloma Virus (HPV), 2)Environmental and occupational exposure such as ionizing, UV radiation, exposure to chemicals including vinyl chloride, benzene and asbestos.3) Life style factors such as high-fat, low fiber diets, tobacco, ethanol etc. 4) Medication such as alkylating agents and immunosuppressant's. Genetic factors such as inherited mutations, cancer causing genes, defective tumor suppressor genes.

## 3. Free radicals and cancer

A free radical is nothing more than a molecular structure which contains an unpaired electron. Electrons tend to stay in pairs. Electron pairs make up the chemical bonds which keep molecules from flying apart. An unpaired electron, driven by a potent chemical force which compels it to find a mate. Thus molecular instinct that merges with another electron was so powerful that the searching molecule behaves erratically, moving about much like a weapon within cellular structures. Its random and wild molecular movements within cellular material can create cellular damage, which can eventually result in degeneration or mutation. A free radical can destroy a protein, an enzyme or even a complete cell. To make matters worse, free radicals can multiply through a chain reaction mechanism resulting in the release of thousands of the cellular oxidants. When it happens, cells can become so badly damaged that DNA codes can be altered and immunity can be compromised. Contact with a free radical or oxidant on the scale can create cellular deterioration, resulting in diseases like cancer. Tissue breakdown from the oxidative stress can also occur, which contributes to aging, arthritis and a whole host of other degenerative conditions. Our constant bombardment with free radicals had been likened to being irradiated at low levels all the time. Unfortunately, because of the damage free radicals cause within our cellular

structures, the sad fact was that many of us will die prematurely from one of a wide variety of degenerative diseases. Free radical damage has been associated with over 60 known diseases and disorders. An important fact to remember that the act of breathing oxygen activates those reactive chemical structures known as free radicals. To make matters worse, as because in our generation more than any other had been exposed to a number of potentially harmful environmental substances, free radical formation can reach what has been referred to as epidemic proportions. Some of the more dangerous free radical producing substances include: cigarette smoke, herbicides, high fats, pesticides, smog car exhaust, certain prescription drugs, diagnostic and therapeutic x-rays, ultra-violet light, gamma radiation, rancid foods, certain fats, alcohol some of our food and water supplies, stress, poor diets etc. Even exercising, as beneficial as it is, can initiate the release of free radicals within our cellular systems.

Aerobic exercising produces damaging oxidation by-products. Many of these are not completely neutralized by internal safety mechanisms and an overload can occur. Supplementing the diet with effective antioxidant compounds. Numerous research studies support the fact that many cancers, in particular breast cancer-diet related. Moreover, the risks of certain kinds of cancer could be significantly reduced with dietary changes. While most of us are aware of the wonders of a low-fat diet, a tremendous amount of data conceding other cancer preventative nutrients never reaches the average consumer. For instance, recent studies suggested that just reducing dietary fat may not be enough to prevent certain cancers. Perhaps more and more research suggested that, lack of certain protective nutrients appeared to originate from dietary sources that increase risk of cancer and other degenerative diseases. The role of certain bioflavonoid compounds were the exceptional free radical scavengers that just begin to emerge and the protective potential of those flavonoids was impressive, to say the least.[3,4]

#### 4. Cancer - Indian scenario

Every year about 8,50,000 new cancer cases being diagnosed, India resulting about 5,80,000 cancer related death every year. India had the highest number of the oral and throat cancer cases in the world. Every third oral cancer patient in the world is from India. In males Oral, Lungs and Stomach cancers was the three most common causes of cancer incidence and death whereas In females Cervical, Breast and Oral cancers were the three main causes of cancer related illnesses and death. Overall cervical cancer was the number one cause of cancer death in India. That was really unfortunate as cervical cancer can be easily prevented and also relatively easy to diagnose and treat at an early stage. Compared to developed countries overall there were less cancer cases in India but that could be due to under diagnosis and under reporting. At the same time regional, ethnic, dietary and socio-economic factors might also results in difference in the cancer susceptibilities and the incidence. Also cancer was mainly a disease of old ages. Worldwide median age at diagnosis was about 60

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years. Average life span was about 58 yrs. in India compared to 75 yrs. in the developed world.

#### Plant phytochemicals on cancer –an overview

Plant derived phytochemicals possessing anticancer activities have received considerable attention in recent years due to the adverse effects produced by chemotherapy and radiation therapy. Phytochemicals derived from traditional medicinal plants have been found to possess anticancer and chemo protective effects. They are safer for long-term use in cancer patients. They provide nutrition and reduce the side effects of conventional cancer therapy due to effective antioxidant activity. An intensive survey of plants, microorganism and marine animals for antitumor activity began in the later 1950s mainly because the United States National Cancer Institute (NCI) instigated and fund a major screening programme. Random selection screening programme was adopted, since novel compounds may be found anywhere from plant or animal kingdom. Soybean phytochemicals such as genistein (4, 5, 7-trihydroxy isoflavone) inhibit the growth of transplantable human prostate carcinoma.[4] Epidemiological studies have consistently shown that regular consumption of fruits and vegetables strongly associated with reduced risk of developing chronic diseases such as cancer as the phytochemical extracts from it exhibit strong antioxidant activity.[5]

Andrographolide the potential cancer therapeutic agent isolated from *Andrographis paniculata*. [6] *Morinda citrifolia* showed of cancer preventive effective on both clinical practice and laboratory animal models.[7] An alcoholic extract of *Biorhythms sensitivum* for antitumor activity could inhibit the solid tumor deve ascites (DLA) cells and increase the life span of mice bearing Ehrlich ascites carcinoma (EAC) tumors.[8] Edible fruits and berries served the source for novel anticancer agents, given that extracts of those foods have demonstrated cytotoxic activity against tumor cell lines.[9] Nimbolide, a triterpenoid extract from the flowers of the neem tree was found to have antiproliferative activity against some cancer cell lines.[10] *Semecarpus anacardium* Linn nut milk extract exerts its anticancer effect through quenching - reactive oxygen species.[11] The cytotoxic activities of two medicinal herbs *Linum persicum* and *Euphorbia cheradania* that are native to Iran showed cytotoxic activity on tumor cell lines.[12] The Pomegranate extracts inhibits the growth of breast cancer cells.[13] Brassinosteroids, steroid plant hormones are promising leads for potential anticancer drugs.[14] The *Careya arborea* bark significantly reduced the solid tumor volume induced by DLA cells.[15]

The methanol extract of *Bauhinia racemosa* stem bark exhibited antitumor effect in EAC bearing mice.[16] The antitumor activity of the ethanol extract of *Indigofera aspalathoides* was established [16]. Phytoconstituents extracted from a large number of plants belonging to the genus *Hypericum* are known to possess potent anticancer nature[17] cytotoxic activity of *Sarris cernuss* extract on human colon and breast carcinoma cultures was proved.[18] The natural antioxidant gallic acid (GA) isolated from the

fruits of an Indonesian medicinal Plant, Phaleria Macrocarpa was proved to be a potent anticancer compound.[19] The rhizome Zingiber Officinalis, one of the most widely used species of the ginger family is a common condiment for various foods and beverages. The pungent vallinoids i.e., 6-gingerol and 6-paradol, shogaolsand zingerone attributed to the anticancer properties of ginger.[20] The antineoplastic activity of methanolic extracts of five medicinal plants that are native to Iran including Galium mite, Ferula Angulata, Stachys obtuscrena, Grsium bracteosum and Echinophora Cinerea was investigated and proved to have antitumor activity.[21] Panax ginseng and its extracts have long been used for medical purposes and there increasing interest in developing ginseng products as cancer preventive agents.[22] Purified bioactive compounds derived from medicinal mushrooms were potentially important for new source of anticancer agents. [23]

## 5. Conclusion

From the present review, it can be concluded that cancer is the leading cause of death in developing countries like

India. As there is an enormous increase in the population day by day, the alternative therapy in the market is getting its glimpse. The cheap herbal drug treatment may highly be recommended to the rural and poor people to treat effectively the cancers of various type is an ideal choice. Based on that the herbal plant extract are coming up in combination with metals and other essential supplements to improve the immune status of the cancer patients in India. The above survey reveals the role of Indian medicinal plants and the various phytochemicals may be treated effectively for cancer. In an attempt of screening the traditional medicinal plants for anticancer activity the presence of several compounds such as flavonoids, polyphenols, saponins, etc. with specific anticancer activity against particular type of cancer. The available literature finds to be very impressive which may give an indication for the therapeutic usefulness. Only few of the plants listed here and there are hundreds of plants unexplored need much detailed survey. The isolation, identification of active principles and pharmacological studies of the active phytoconstituents may be considered and studied elaborately to treat effectively for various types of cancer.

**Table 1:** Indian Medicinal plants having anticancer activity

S.No.	Name of the plant	Family	Parts used
1.	Cajanus cajan	Fabaceae	Leaves
2.	Butea monosperma	Fabaceae	Bark
3.	Asparagus racemosus	Liliaceae	Root
4.	Azadirachta indica	Meliaceae	Bark
5.	Bauhinia variegata	Caesalpinaceae	Root
6.	Bacopa monnieri	Scropulariaceae	Whole plant
7.	Calotrophis gigantean	Asclepiadaceae	Whole plant
8.	Aphanamixis polystachya	Meliaceae	Bark
9.	Aloe barbadensis	Liliaceae	Leaf juice
10.	Alium cepa	Liliaceae	Bulb
11.	Acorus calamus	Araceae	Rhizome
12.	Cassia absus	Caesalpinaceae	Leaves
13.	Cassia auriculata	Caesalpinaceae	Root
14.	Cassia senna	Caesalpinaceae	Leaves
15.	Catunaregum spinosa	Rubiaceae	Bark/Fruit
16.	Citrullus colocynthis	Cucurbitaceae	Root
17.	Citrus medica	Rutaceae	Root
18.	Cissus quadrangularis	Vitaceae	Whole plant
19.	Clerodendrum serratum	Verbanaceae	Root
20.	Clerodendrum viscosum	Verbanaceae	Leaves
21.	Crinum asiaticum	Amaryllidaceae	Bulb
22.	Daucus carota	Apiaceae	Root
23.	Embelia ribes	Myrsinaceae	Fruit
24.	Flacourtia jangomos	Flacourtiaceae	Bark/Leaf
25.	Jatropha curcas	Euphorbiaceae	Leaves, seed, oils
26.	Kaempferia galangal	Zingiberaceae	Rhizome
27.	Kaempferia rotunda	Zingiberaceae	Tubers
28.	Lanata camara	Verbanaceae	Whole plant

29.	Lens culinaris	medikus Fabaceae	Seed
30.	Limonia acidissima	Rutaceae	Fruit
31.	Macrotyloma uniflorum	Fabaceae	Seed
32.	Mimosa pudica	Mimosaceae	Whole plant
33.	Nicotiana tabacum	Solanaceae	Leaves
34.	Operculina turpethum	Convolvulaceae	Root
35.	Rhinacanthus nasuta	Acanthaceae	Whole plant
36.	Salvadora persica	Salvadoraceae	Bark, Leaf, Shoot, Fruit
37.	Symplocos cochinchinensis	Symplocaceae	Bark
38.	Tylopora indica	Asclepiadaceae	Root, Leaf
39.	Vernonia cinerea	Asteraceae	Whole plant
40.	Vitex trifolia	Verbanaceae	Leaf
41.	Zanthoxylum armatum	Rutaceae	Bark, Fruit
42.	Xanthium strumarium	Compositae	Root
43.	Alstonia scholaris	Apocynaceae	Leaf
44.	Echites yucatanensis	Apocynaceae	Latex (leaf)
45.	Aristolochia mollissima	Apocynaceae	Entire plant
46.	Alnus japonica	Betulaceae	Wood
47.	Alnus japonica	Betulaceae	Wood
48.	Bombax brevisuspe Sprague	Bombacaceae	Root
49.	Echium arenarium Guss.	Boraginaceae	Leaf
50.	Celastrus orbiculatus	Celastraceae	Entire plant
51.	Bacopa monnieri	Scropularaciae	Entire plant

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