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# A Review on Anti-Cancer Activity of Medicinal Plants

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## ABSTRACT:

India is widely recognized as one of the richest sources of medicinal plants and is often described as the "Botanical Garden of the World." These plants are valuable not only for their natural therapeutic properties used to treat many diseases but also for their role in providing food resources, agricultural materials, and livelihood opportunities for many people. In recent years, considerable scientific attention has been given to the potential of medicinal plants in cancer treatment. Cancer is a serious disease characterized by the uncontrolled growth and division of abnormal cells in the body, which can ultimately result in death. The global incidence of cancer is increasing rapidly, making it a major health concern worldwide. Although various pharmaceutical drugs are available for treating different types of cancer, many of them still present limitations related to safety, side effects, and effectiveness.

Herbal medicine has emerged as a promising alternative for both the prevention and management of cancer. Advances in molecular biology and improvements in compound isolation and structural characterization techniques have enabled researchers to identify several plants with significant anticancer properties. These medicinal plants exert their effects through multiple biological mechanisms, including blocking enzymes and hormones that promote cancer development, enhancing DNA repair systems, stimulating the production of protective enzymes, providing antioxidant activity, and strengthening the body's immune response. Interestingly, more than half of the drugs currently used in modern clinical practice are derived from natural sources. Therefore, the present review focuses on exploring medicinal plants that have been traditionally and scientifically investigated for their potential role in cancer treatment.

## KEYWORDS:

Cancer, Medicinal plants, Anticancer properties, Phytochemical

## INTRODUCTION:

From the centuries, natural goods, particularly plants, have been utilized to heal numerous ailments. Ancient civilizations such as Egypt, China, India, and Greece relied on terrestrial plants for medicinal purposes, and contemporary pharmaceuticals have been derived The Sumerians and Acadians created the first written records on plant therapeutic usage around 2600 BC (1). The World Health Organization reports that 80% of rural populations rely on medicinal plants for primary healthcare. The expense of synthetic anticancer therapies is prohibitively high for the average person. Herbal medications play an important role in cancer prevention and therapy, and they are widely available and cost-effective. Pharmaceutical research in advanced countries such as the United States, Germany, France, Japan, and China has significantly increased the quality of herbal medications used to treat cancer. Herbs can help with detoxification and prevent cancer. Herbal response modifiers can suppress cancer growth by regulating hormone and enzyme function. Certain plants can lessen

the hazardous side effects of chemotherapy and radiotherapy. Scientists worldwide are focusing on herbal medications to strengthen the immune system and combat cancer. Understanding the synergistic interaction of anticancer herbs allows for the development of formulations that target malignant cells without hurting healthy cells.[1,2]

## CANCER:

Cancer is a general term used to describe a group of malignant disorders that can develop in different tissues and organs of the body. These diseases are characterized by the uncontrolled division and rapid multiplication of abnormal cells. Such cells may accumulate to form tumors or spread to other parts of the body through a process known as metastasis, leading to abnormal growth in distant tissues. If this progression is not controlled, it can ultimately result in the death of the affected individual.

The primary treatment strategies for advanced cancer in humans include surgical removal of tumors, radiation therapy, and the use of chemotherapeutic drugs. Chemotherapy can help relieve symptoms, prolong survival, and in some cases lead to complete remission, although this outcome is relatively uncommon. In recent years, there has been a growing interest in developing new and more effective anticancer agents. Although many chemical derivatives of existing chemotherapeutic drugs have been synthesized, these treatments are often associated with significant adverse effects.

An ideal anticancer drug should be capable of selectively targeting and destroying cancerous cells while causing minimal damage to normal, healthy tissues. However, achieving this level of selectivity remains a major challenge in cancer therapy, which is why patients frequently experience severe side effects during treatment. Despite extensive efforts in synthetic drug development, improvements over earlier chemotherapy drugs have been relatively limited. Consequently, there is a continuous demand for new molecular frameworks and lead compounds that can support the discovery of more effective anticancer therapies. Natural products, particularly those obtained from plants, have become an important source of such lead molecules. Recent investigations into plant-derived compounds with tumor-inhibiting properties have revealed a large number of promising chemical structures with potential applications in cancer treatment[3-4]

## Ayurvedic Theory of Cancer:

In Ayurvedic medicine, cancer is referred to as "granthi" and "arbuda" in Charaka and Susruta Samhita "Granthi" and "Arbuda" may cause inflammation or not, depending on the doshas involved. Ayurvedic medicine defines health as the equilibrium of three doshas (Vata, Pitta, and Kapha) in the body, mind, and consciousness. Tridoshacarbudas are typically cancerous when all three primary body humors lose coordination, leading to a diseased state. In Ayurveda, neoplasms are classed based on clinical symptoms related to the tridoshas.[6]

### Group I:

diseases that can be named as clear malignancies, including arbuda and granthi, such as mamasarbuda (sarcomas) and raktarbuda (leukaemia), mukharbuda (oral cancer) and asadhya vrana (incurable or malignant cancer)

### Group II:

diseases like growths and ulcers that are not cancers but may be considered as lik ely malignancies. These include tridosaja gulmas, asadhya udara roga, (abdominal tumours such as stomach and liver carcinomas or lymphomas), mamsaja oshtharoga (growing of lips), and asadhya galganda (incurable thyroid tumour).

## Group III:

Malignancy-prone conditions such visarpa, asadhya kamala (incurable jaundice), and asadhya pradara (untreatable sinusitis)

## CANCER

- **TYPES OF CANCERS:**

**1) Cancers of Blood and Lymphatic Systems**:

a) Hodgkin's disease b) Leukemia's c) Lymphomas d) Multiple myeloma

e) Waldenstrom's disease

**2) Skin Cancer**

a) malignant melanoma

**3) cancer of digestive system**

a) Esophageal cancer b) Stomach cancer c) Liver cancer d) colon and rectal cancer e) anal cancer

**4) Cancer of Urinary system**

a) Kidney cancer b) Bladder cancer c) Testis cancer d) Prostate cancer

**5) Cancer in women**

a) Breast cancer b) Ovarian cancer c) Gynecologicaly cancer d) Choriocarcinoma

**6) Miscellaneous cancer:**

a) brain cancer b) Bone cancer c) Characinoid cancer d) nasopharyngeal cancer

e) Retroperitoneal cancer f) Soft tissue cancer g) Thyroid cancer

## Causes of Cancer:

Morden medicine attributes most cases of cancer. Cancer is primarily caused by DNA alterations that disrupt normal cellular growth, maturation, and cell death. Individuals with certain genetic backgrounds, as well as those infected with chronic viruses, are more likely to experience these changes. For example, (viral hepatitis can lead to liver cancer and HIV can cause lymphoma).

Cancer is primarily caused by exposure to carcinogenic chemicals, radiation, and a failure of the immune system to eliminate cancer cells early in their multiplication, regardless of genetics or viruses. Immunological insufficiency may develop years after exposure to toxins or radiation. Tobacco smoking, alcohol drinking, excessive caffeine and drug usage, exposure to sunlight, infections with oncogenic viruses (e.g., cervical papilloma viruses, adenoviruses, Karposis sarcoma), and asbestos exposure are also potential risk factors. These are known to cause cancer in mammalian.

However, a big population is frequently exposed to such chemicals. Cancer cells can divide even without a chemical transduction signal, unlike normal cells. Tumour cells reject stop signals from adjacent tissues. Cancer cells are immortal even in vitro, but normal cells stop dividing after 50-70 generations and undergo apoptosis. Cancer cells spread to other sections of the body as they continue to develop and invade surrounding tissues. Metastasis is the most dangerous part of carcinogenesis.

Scientists consider environmental factors such as smoking, diet, infectious diseases, chemicals, radiation, and trace quantities of contaminants in food, water, and air. Tobacco use, unhealthy food, and lack of physical activity are all risk factors. However, the level of danger from pollutants varies based on concentration, intensity, and exposure. Exposure to ionizing radiation, cancer-causing chemicals, metals, and other pollutants, even at low levels, significantly increases the risk of developing cancer. Passive tobacco smoke poses a risk to a broad population who do not smoke but are exposed to smokers' exhalations.[3]

## Treatment Available for Cancer:

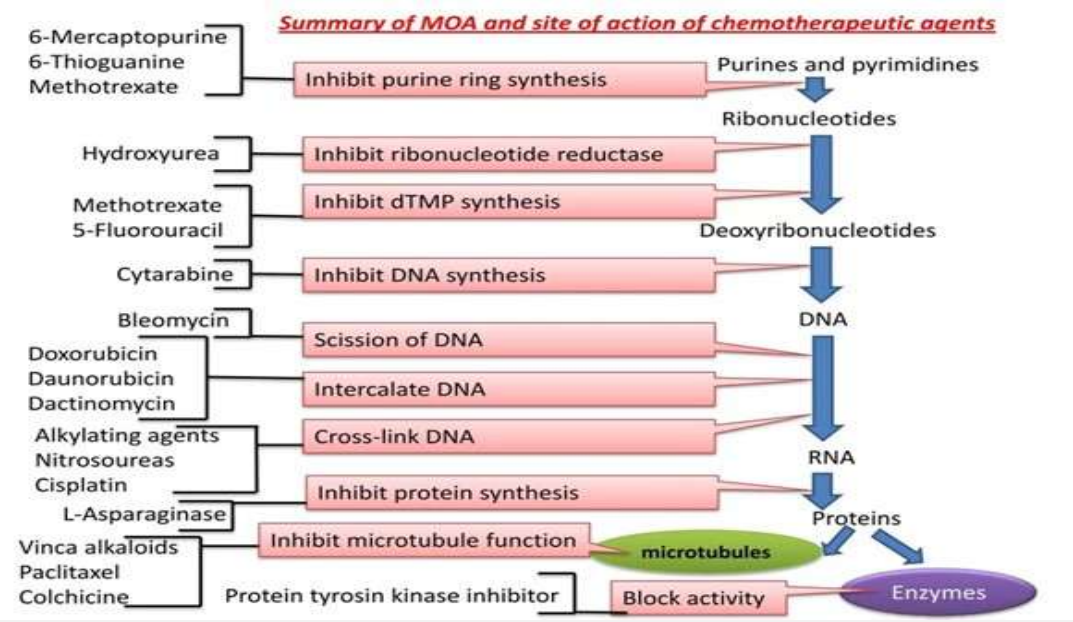
### 1) Allopathic treatment:

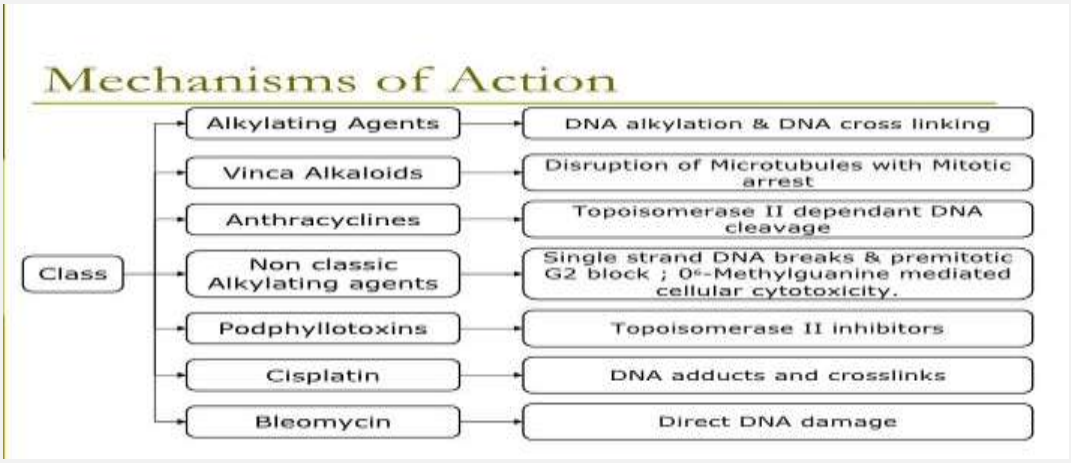
- - **Surgery**: Removing tumors or affected tissue
- - **Chemotherapy**: Using medications to kill cancer cells
- - **Radiation therapy**: Targeting cancer cells with high-energy radiation
- - **Targeted therapy**: Using medications that target specific cancer cell mechanisms
- - **Immunotherapy**: Boosting the immune system to fight cancer
- - **Hormone therapy**: Blocking hormones that fuel certain cancers

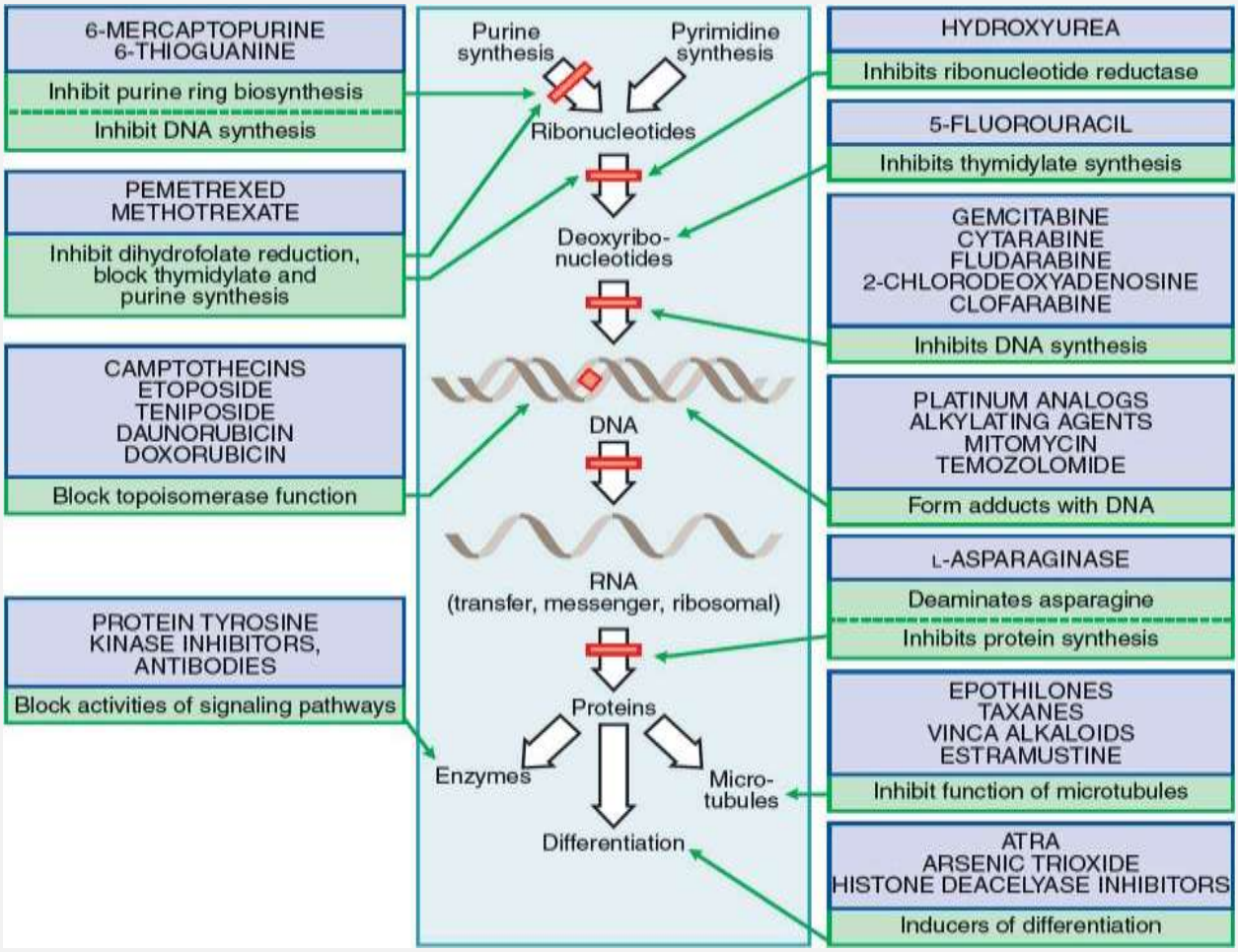
### 2) Herbal treatment:

- Support conventional therapies
- Manage symptoms
- Potentially inhibit cancer cell growth

## Principle of cancer Therapy






## Importance of Medicinal Plant:

Plant-derived medications are ideal for anticancer treatment since they are natural, easily accessible, and can be ingested as a dietary supplement. Naturally generated substances are less harmful and more suitable for human cells. Exceptions include cyanogenetic glycosides, lectins, saponins, lignans, and several taxanes. Plant-derived medicines that exhibit selectivity, non-toxicity to normal cell lines, and cytotoxicity to cancer cell lines may advance to clinical trials for further therapeutic development.

| Sr. No. | Scientific name | Common name | Family | Part(s) used | Important compound | Mechanism | Types of cancer treated |
|---|---|---|---|---|---|---|---|
| 1 | Apis mellifera | European honeybee | Apideae | Not applicable | Protein | Stimulate tumor necrosis factor-alpha (TNF-a) inhibit of cell proliferation. Induce apoptosis | Renal, lung, prostate, bladder, osteosarcoma lymphoid cancer[7] |
| 2 | Zinger officinale | Ginger | Zingiberaceae | Rhizome | Flavonoids - kaempferol, catechin, quercetin, fisetin | Induction of apoptosis | Ovary, cervix, colon, liver and urinary cancer (in vitro & in vivo)[9], prostate[8,] breast cancer |
| 3 | Curcuma Longa | Turmeric | Zingiberaceae | Rhizome | Curcumin | Inhibition of cancer cell proliferation, | Leukaemia, glioblastoma, colon cancer (in vitro)[10], breast cancer[12,] lungs[11-12], breast, prostate, cervax |
| 4 | Glycyrrhiza glabra | Liquorice | Fabaceae | Root | Glycyrrhizin | Inhibition of cancer cell proliferation (bcl-2 phosphorylation) morphological change in cancer cell and lead to apoptosis | Prostate, breast, lung, stomach cancer[13] |
| 5 | Vinca rosea | Madagascar periwinkle | Apocynaceae | shoot | Vincristine, vindoline, vinblastin, catharantin. | Antioxidant effect; inhibition of cancer cell proliferation, | Breast and Larynx cancer[14] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Allium sativum | Garlic | Amaryllidaceae | Fruit | Allicin, ajoene | Cell cycle arrest, induction of apoptosis | Lymphoma, cervix (invitro)[15] breast[16-17], prostate[18], colon[19], |
| 7 | Camellia sinensis | Tea plant | Theaceae | leaf | Epicatechin, epigallocatechin, epigallocatechingallate, epigallocatechine3-gallate | Inhibition of cancer cell proliferation, by inhibit of 5-a reductase enzyme | Lung, bladder, skin, prostate and breast cancer (in vitro and in vivo)[20] |
| 8 | Trigonella foenumgraceum L | Fenugreek | Fabaceae | shoot | Flavonoids and alkaloids (gingerol, cedrene, zingerone, vanillin, and eugenol) | Antioxidant effect induction of apoptosis | Breast cancer[21] |
| 9 | Aloe vera | Aloe | Asphodelaceae | Leaf | Aloe-emodin | Activates the macrophages, enhances activity of the immune cell against cancer[22]. Inhabit metastases[23], | Leukemia, stomach cancer (in vivo)[24] |
| 10 | Astragalus membranaceus | Astragalus | Fabaceae | Root | Swainsonine | Prevent metastases | Liver cancer, gastrointestinal cancer[25] |
| 11 | Artemisia absinthium L | Wormwood | Asteraceae | Root, shoot | Artemisinin, quercetin, limonene, artesunate isorhamnetin, linalool, | Inhibition of cancer cell proliferation (inhibit the nuclear receptors activity) inhibition of angiogenesis and cell migration. | Colon[26], leukaemia[27] |
| 12 | Taxus baccata L | Yew | Taxaceae | Leaf | Taxol, cabazitaxellarotaxel | Cell cycle arrest | prostate cancer (in vitro)[28], breast & bladder. pancreatic cancer (in vivo)[29], blood cell cancer[30] |

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|---|---|---|---|---|---|---|---|
| 13 | Coriandrum sativum | Coriander | Apiaceae | Root, Leaves | Beta-carotene, quercetin, rutin, | Help to remove free radical, antiproliferative activity and inhibition of metastasis[31]. | Breast adenocarcinoma[31], colon cancer[32] |
| 14 | Cannabis sativa | Marijuana | Cannabaceae | Leaf | Cannabinoids, stereo isomer ofcannabitriol, | Anti-tumor activity by modulating key cell-signaling pathway[33]. | Breast cancer, brain tumor, lung, pancreas, prostate & colorectal cancer (in vitro & in vivo)[34]. |
| 15 | Ferula assafoetida | Asafoetida – devil`s Dung | Apiaceae | Shoot, resin | Coumarin compound (sequicoumarins, sulfur - containing compound, | Inhibition of mutagenesis, DNA destruction cancer cell proliferation | Liver cancer[35] |

## Conclusion:

The current analysis suggests that herbal medicinal plants and their derivatives are effective against a variety of malignancies, including lymphomas, breast, ovarian, lung, liver, stomach, prostate, and testicular cancers. Affordable herbal medicine treatment may be highly advised to rural and impoverished people in order to properly treat many types of malignancies. This review found that herbs utilized in Ayurveda, such as Terminalia chebula, Moringa oleifera, and Tinospora cordifolia, had potential anticancer properties. The preceding investigation highlights the role of Indian medicinal plants and how various phytochemicals can be used to cure cancer successfully. Screening traditional medicinal herbs for anticancer potential revealed the existence of bioactive chemicals such flavonoids and polyphenols Saponins, for example, have specialized anticancer action against specific types of cancer, hence there is a large opportunity for the development of potent anticancer medicines from plant compounds.

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