

A Review on Herbal Drugs Used in Anticancer Agent

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Abstract: *Plant-derived inhibitors of cancer cell lines are highly sought after due to their effectiveness. A significant cancer epidemic affects both developed and developing countries. Cancer is the second leading cause of death in the world, after cardiovascular disease. Cancer is an abnormal development of cells in the body that can cause death. The secondary metabolites produced by the plant kingdom are naturally occurring and are currently being studied for their potential anticancer properties, which will eventually lead to the creation of novel therapeutic medications. This study discusses the desire for naturally occurring substances produced from medicinal plants. Plants have been used for treating diseases since time immemorial. More than 50% of modern drugs in clinical use are of natural products. In the present review, an attempt has been made to study the plants that have been used in the treatment of cancer*

Keywords: Epigenetics, cytotoxicity, polyphenols, antitumor, anticancer, and medicinal plants

I. INTRODUCTION

For thousands of years, natural products, particularly those derived from plants, have been utilized to cure a wide range of illnesses. From ancient times, terrestrial plants have been utilized as medicines in Egypt, China, India, and Greece. An astounding number of contemporary medications have been derived from these plants. The first documented accounts of the therapeutic applications of plants date back to the Acadians and Sumerians, circa 2600 BC. 80% of rural residents, according to the World Health Organization, rely mostly on herbal remedies for medical needs. The cost of synthetic anticancer therapies keeps them out of the grasp of the average person. Herbal remedies have a significant function in the prevention and treatment of cancer and medicinal herbs are commonly available and fairly affordable. The quality of herbal medications used to treat cancer has significantly increased as a result of extensive pharmaceutical research conducted in technologically advanced nations including the United States, Germany, France, Japan, and China. Certain herbs can prevent cancer by strengthening the body's detoxification processes. Herbal remedies have a significant function in the prevention and treatment of cancer and medicinal herbs are commonly available and fairly affordable. The quality of herbal medications used to treat cancer has significantly increased as a result of extensive pharmaceutical research conducted in technologically advanced nations including the United States, Germany, France, Japan, and China. Certain herbs can prevent cancer by strengthening the body's detoxification processes.

Cancer

What is it? In medicine, cancer is referred to as malignant neoplasm. Uncontrolled cell development is a part of it. When a person has cancer, their cells proliferate uncontrollably, forming dangerous tumors that spread to surrounding body areas. Usually, the lymphatic system or blood stream are how cancer spreads. Depending on the organ they affect, cancer can take many different forms.

They share the following common qualities:

1. Unusual cell proliferation
2. Ability to infiltrate additional tissues
3. The ability to travel by blood or lymph to distant organs.

Cancer is the result of unchecked cellular growth within the body. The potential anticancer effects of common plants, herbs, and meals are up for debate. The National Cancer Institute (NCI) has looked at some 35,000 plant species for their potent anticancer qualities. 1. Anyone who believes that plants and herbs can weaken or even kill cancer cells is the only one who will accept the benefits of chemotherapy. Though more research is needed in this area, the following

list of herbs and medicinal plants has been the focus of studies and has demonstrated promise in the battle against cancer.

Types of Cancer:

1. Carcinoma (solid tumors): Breast, lung, colon, prostate
2. Leukemia (blood cancer): Lymphoma, myeloma
3. Sarcoma (connective tissue cancer): Bone, soft tissue
4. Lymphoma (immune system cancer)
5. Melanoma (skin cancer)
6. Brain and spinal cord tumors
7. Gynecologic cancers (cervical, ovarian, uterine)
8. Genitourinary cancers (prostate, bladder, kidney)

Causes of Cancer:

1. Genetics (5-10%)
2. Environmental factors (30-40%):
 - Tobacco (15-20%)
 - Radiation (UV, ionizing)
 - Chemicals (pesticides, heavy metals)
 - Viruses (HPV, HIV)
3. Lifestyle factors (20-30%):
 - Diet (low fiber, high fat)
 - Physical inactivity
 - Obesity
 - Alcohol consumption
4. Aging (50-60%)

Symptoms of Cancer :

1. Unexplained weight loss
2. Fatigue
3. Pain
4. Changes in skin or breast tissue
5. Difficulty swallowing or breathing
6. Abnormal bleeding or discharge
7. Persistent cough or hoarseness
8. Changes in bowel or bladder habits

Stages of Cancer:

Stages of Cancer	
Stage	Definition
Stage 0	Carcinoma in situ (literally means: "cancer in place"). The cancer cells have not yet invaded into surrounding tissues; without invasion the tumor can't spread and the cure rate is 100%
Stage I	The primary tumor is small but invasive into surrounding tissues and has not spread.
Stage II	The primary tumor is larger, but there is still no clinical evidence of spread
Stage III	The tumor has spread to lymph glands (also called lymph nodes) in that region of the body
Stage IV	The cancer has spread beyond the region where it initiated to a distant tissue or organ

1. Stage I: Localized cancer
2. Stage II: Regional spread
3. Stage III: Advanced regional spread
4. Stage IV: Distant metastasis

Treatment Options :

1. Surgery
2. Chemotherapy
3. Radiation therapy
4. Immunotherapy
5. Targeted therapy
6. Hormone therapy
7. Stem cell transplantation
8. Precision medicine

Cancer Diagnosis :

1. Biopsy
2. Imaging tests (X-ray, CT, MRI, PET)
3. Blood tests (tumor markers)
4. Genetic testing

Cancer Prevention :

1. Healthy lifestyle choices (diet, exercise)
2. Avoiding risk factors (tobacco, UV radiation)
3. Screening tests (mammograms, colonoscopies)

4. Vaccinations (HPV, Hepatitis B)
5. Genetic testing

Cancer Statistics :

1. Worldwide: 18.1 million new cases, 9.6 million deaths (2020)
2. USA: 1.8 million new cases, 599,000 deaths (2020)
3. Most common cancers: breast, lung, colon, prostate

Current Research :

1. Personalized medicine
2. Immunotherapy
3. Targeted therapies
4. Cancer stem cell research
5. Nanotechnology
6. Epigenetics
7. Gene editing (CRISPR)

Notable Cancer Organizations :

1. American Cancer Society (ACS)
2. National Cancer Institute (NCI)
3. World Health Organization (WHO)
4. Cancer Research UK
5. International Agency for Research on Cancer (IARC)

The Mechanism on Cancer Therapy:

1. Directly preventing the growth of cancer cells by promoting the phagocytosis of macrophages and raising the activity of natural killer cells.
2. Encouraging the death of cancer cells by raising blood serum levels of complement, interleukin-2, interferon, and immunoglobulin
3. By obstructing the tumor's blood supply, forcing the tumor to necrotize and preventing its translocation and dissemination.
4. Stimulating hemopoietic function to increase leukocyte and platelet counts.
5. Encouraging the conversion of cancer cells back into healthy cells.
6. Increasing metabolism and halting the development of cancer in healthy cells.
7. Increasing appetite, enhancing sleep quality, reducing pain, and generally enhancing the health of the patient.

Two gene groups are in charge of regulating the development of cancer: oncogenes and tumor suppressor genes. The first class of genes, known as oncogenes, are involved in a variety of cellular processes, including cell division. On the other hand, an overexpression of these genes causes a normal cell to become cancerous. However, through distinct methods, the second collection of genes, known as tumor suppressor genes, prevents the creation of cancer cells. Oncogenes are overexpressed in cancer cells, whereas tumour suppressor genes are underexpressed. 23. summarizes the key tumor suppressor genes and oncogenes, as well as how they contribute to the emergence of cancer. For cancer treatment, oncogenes and their byproducts make excellent targets. Additional targets include cell division-related enzymes such as topoisomerases, which unravel DNA during replication.

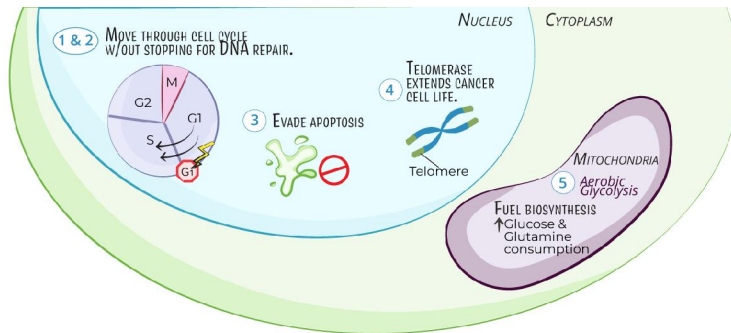
Pathophysiology of cancer :

CANCER PATHOPHYSIOLOGY: OVERVIEW

+ Cancer Hallmarks

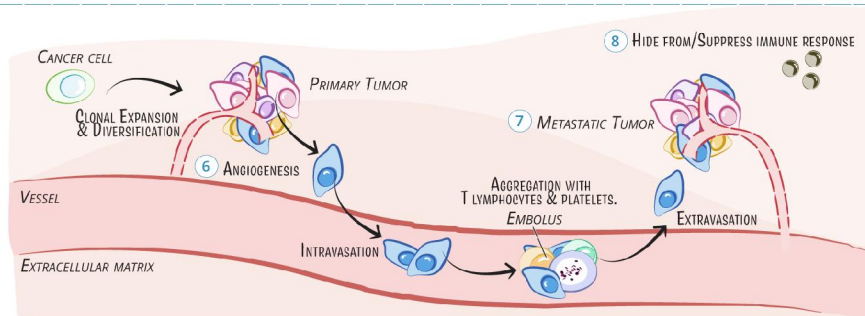
INTRACELLULAR

1. **SELF-SUFFICIENCY**
— Promotes self replication.
2. **IGNORE GROWTH SUPPRESSORS**
— No time for DNA repair.
3. **EVADE APOPTOSIS**
— Survives DNA damage.
4. **IMMORTALITY**
— Perpetuates DNA damage.
5. **ALTERED METABOLISM**
— Supports metabolic needs.



EXTRACELLULAR

6. **ANGIOGENESIS**
— Support nutritional needs.
7. **INVASION & METASTASIS**
— Cross anatomical boundaries.
8. **EVASION OF IMMUNE SYSTEM**
— Ensure self survival.



Herbal Plants with Potent Anti-Cancer Properties :

Herbal remedies are becoming more frequently accepted as complementary and alternative therapies for the treatment of cancer due to growing scientific data from clinical trials and biological research. There is a long history of using herbal medicines to make anti-cancer pharmaceuticals, some of which have been used in clinical settings in place of more conventional anti-cancer medications. In actuality, research on herbal medicines has contributed in the creation of anti-cancer medications. Research on signals from the traditional use of herbal remedies has recently been continuously focused on producing novel anti-cancer treatments in single pure molecules.

Plant compounds with anticancer properties:

The main types of bioactive substances from medicinal plants that have anticancer action include polyphenols, flavonoids, alkaloids, saponins, triterpenes, tannins, and quinones. These bioactive substances exhibited antiproliferative, cytotoxic, cytostatic, antimetastatic, apoptotic, and antioxidative effects.

Medicinal plants used in anti-cancer treatment:

1 Morus alba:



Common name – White mulberry

Genus – Morus

Species – M. alba

Order – Rosales

Family – Moraceae

Kingdom - Plantae

M. alba, commonly referred to as white mulberry, is indigenous to India, Japan, and China. It is grown anywhere silkworms are farmed, including the United States. Their leaves serve as the main source of nutrition for silkworms. M. alba has been linked to the following conditions: cough, edoema, insomnia, bronchitis, asthma, nosebleeds, wound healing, eye infections, and diabetes.

In the past, extracts were utilized as treatments. A lectin that was extracted from M. alba's leaves showed antiproliferative effects on the human breast cell line MCF-7 at a dose of 8.5 g/mL. At an inhibitory level of 16 g/mL, this compound also caused cell cycle arrest and cytotoxicity in a human colorectal cell line (HCT-15). It was demonstrated that caspase-3 activation and release induced apoptosis, which was subsequently linked to the inhibition of cancer cell lines.

2. Coriandrum sativum:



Common name – Cilantro
 Genus – Coriandrum
 Species - C. sativum
 Order – Apiales
 Family – Apiaceae
 Kingdom – Plantae

A particular focus was placed on the roots while assessing Coriandrum sativum's anticancer qualities, such as its effect on cancer cell motility and defense against DNA damage. At 7.8 and 62.5 g/ml (MICs), the methanol extract of Coriandrum sativum (seed and leaf) produced 40 and 31% cytotoxicity, respectively. Additionally, at concentrations of 7.8–125 g/ml, respectively, Coriandrum sativum leaf aqueous extract significantly (P0.01) increased the lymphoproliferation of splenic cells by 14–45 percent. At the examined doses, extracts from the leaves of Coriandrum sativum in methanol significantly (P 0.01) boosted lymphoproliferation by 43 to 59 percent.

3. Red clover :



Synonyms: Purple Clover, Trifolium Pratense
 Biological source : It is a herbaceous species of flowering plant of Trifolium Pratense
 Family : Fabaceae
 Chemical Constituents : Calcium, Chromium ,Magnesium, Manganese, Iron, Niacin, Phosphorus, Potassium, Protein, Riboflavin, Selenium, Silica, Thiamine, Vitamin A, Vitamin C, Zinc, Coumarins, Saponins, Isoflavones.
 Uses : The University of Maryland Medical Center found that Red clover help to prevent breast cancer, other use as Bowel Regulatory, Immune System

4. Dudhpatra



Synonyms: Milk-Thistle-Flower, Marian Thistle, Mary Thistle, Cardus marianus.

Biological Source : It is obtained from the plant of *Silybum marianum*

Family :Asteraceae

Chemical Constituents :Approximately 4-6 % silymarin (flavonolignan complex) 20-30% fatty acids silymarin is a complex mixture of polyphenolic molecule, including 7 closely related flavonolignans (silybin A , silybin B, isosilybin A, isosilybin B , silychristin, Isosilychristine , silydianin) and one flavonoid (taxifolin)¹⁷

Uses : Cirrhosis, jaundice, hepatitis, gallbladder disorders, other potential health benefits including protecting heart health by lowering cholesterol level and helping people manage Type 2 diabetes. The extract of seed coating of milk thistle has anti-cancer effect.

5. Digitalis :



Synonyms :*Digitalis purpurea* , Foxglove-Flower

Biological Source : It is obtained from the herbaceous plant of *Digitalis purpurea*.

Family :Scrophulariaceae

Chemical Constituents :Contains three important primary glycosides namely *Purpurea glycoside A*, *Purpurea glycoside B*, and *Purpurea glycoside C*, which upon hydrolysis gives rise to digitoxini, gitoxin, and gitalin, respectively. Gitoxigenin and gitaligenin, tannins, gallic, formic, acetic, succinic and benzoic acids, fatty acids and enzyme digipuridase solely responsible for hydrolysis of *purpurea glycosides*. ¹¹

User: Strong antitumor possibilities. A study performed in Spain in 2003 look at the cytotoxic activity from the leaves of the strain *purpurea* against human cancer cells.

6. Turmeric :



Synonyms :*Curcuma longa*, Haldi, Haridrai

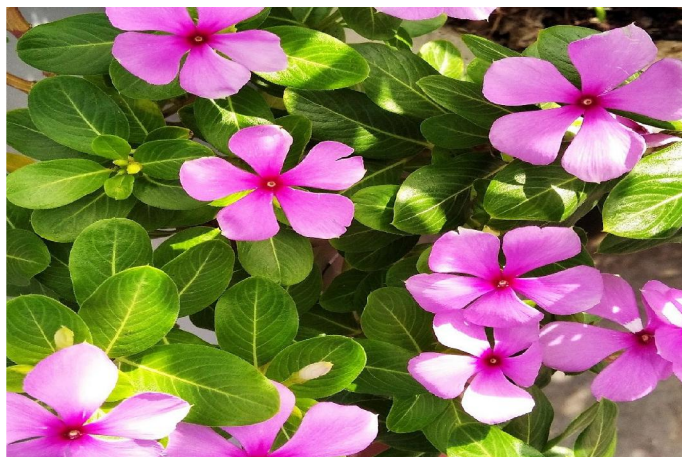
Biological Source :It is a dried root obtained from the perennial plant of *Curcuma longa*

Family : Zingiberaceae

Chemical Constituents :Three gold-colored alkaloids called curcuminoids—Curcumin, Dimethoxy-curcumin, and Bisdemethoxy-curcumin—are found in turmeric. Roughly 95% of curcuminoids are present (just 3–5% are present in turmeric). 70% carbs, 7% protein, 4% minerals, and at least 4% essential oils make up the rhizome. In addition, it contains vitamins, various alkaloids, and roughly 1% resin. (16)(17)Antibiotic molecules number at least twenty

USE : There are 14 chemicals that are known to prevent cancer. There are 12 anti-tumor compounds. There are 12 anti-inflammatory compounds.

7.Vinca



1) Synonyms:- Sarpagandha, Chandrika, chootachand

2) Biological source:- The biological source of vinca is the dried of *Catharanthus roseus*, also known as the Madagascar periwinkle:

3) Family: Apocynaceae

4) Chemical Constituents:- *Vinca* (*Catharanthus roseus*) contains many chemical constituents, including alkaloids, monoterpenes, sesquiterpenes, and indole and indoline glycosides

5) Uses: The plant is grown as an ornamental and medicinal plant. The dried plant is used to produce vinca alkaloids, which are used to treat cancer, diabetes, and high blood pressure.

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