



THE STUDY OF DIFFERENT HERBS USED IN CANCER TREATMENT

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ABSTRACT :

In the present study , elaborate the various types of cancers and its treatment by using various herbal anticancer drugs . As per literature review it is assumed that most of the naturally occurring anticancer agents prevents the cancerous (tumour) cell replication. The herbs like vinca ,taxol, ashwagandha exists major anticancer phytoconstituents .

KEYWORDS :

Cancer, Herbs, Treatment.

INTRODUCTION:

Cancer, a complex metabolic disease, is projected to reach 21 million cases by 2030, presenting distinct genetic profiles and treatment approaches including surgery, chemotherapy, and immunotherapy. Chemotherapy targets rapidly dividing cells but often results in side effects and multidrug resistance (MDR). Small molecule targeted therapy (SMTT) offers specificity, yet also carries risks of drug resistance and adverse effects. Amidst these challenges, herbal medicine is gaining traction, especially in developing nations, due to its lower side effects. Medicinal plants such as olive, saffron, and curcumin show anticancer properties through mechanisms like apoptosis induction. Herbal chemotherapy agents like vinca alkaloids and paclitaxel have proven effective. Renewed interest in biomolecular science highlights the efficacy of traditional remedies, aligning with the WHO's acknowledgment of widespread reliance on herbal treatments globally.

HUMAN CARCINOGENS CAN BE CATEGORIZED INTO FOUR TYPES:

1. ****Chemical carcinogens**** (e.g., arsenic, nickel, aflatoxins),
2. ****Physical carcinogens**** (e.g., ionizing radiation, ultraviolet light),
3. ****Biological carcinogens**** (e.g., specific viruses), and
4. ****Endogenous processes**** (e.g., DNA replication).

Cancer can also develop from genetic alterations; mutations in various genes are linked to different types of cancer, categorized into proto-oncogenes, tumor suppressor genes, and genes involved in DNA repair. Proto-oncogenes promote normal cell growth but may become cancerous if modified; tumor suppressor genes

regulate growth, and DNA repair genes fix DNA damage. Cancer traits include heightened cell proliferation, inadequate apoptosis, modified differentiation, genomic instability, and metastasis. Cancer classification is carried out according to the site of origin, histological type, and stage of the disease. Cancer can begin in various tissues, including adenocarcinoma (glandular tissue), blastoma (fetal tissues), carcinoma (epithelial), leukemia (blood-producing tissues), lymphoma, myeloma (bone marrow), and sarcoma (connective tissue). Tumor grades, indicating levels of malignancy, vary from G0 (normal) to G4 (severely abnormal)

TYPES OF CANCER :

1. Carcinomas

- Originate in epithelial cells (lining of organs ,glands ,skin).
- Most common type of cancer.
- Examples :
 - lung cancer
 - Breast cancer
 - prostate cancer
 - colon cancer
 - skin cancer

2.Sarcomas :

- Begin in connective and supportive tissues (bone ,cartilage ,fat,muscle,blood vessels).
- less common type but often aggressive
- Examples :
 - osteosarcoma (bone)
 - liposarcoma (fat)
 - leiomyosarcoma (smooth muscle)

3.Leukemias :

- cancers of the blood and bone marrow .
- Do not form solid tumors.
- Examples :
 - Acute lymphoblastic leukemia
 - Chronic myeloid leukemia

4. Lymphomas :

- Start in lymphocytes (a type of white blood cell) in the lymphatic system .
- Examples :
 - Hodgkin lymphoma
 - Non- Hodgkin lymphoma

5. Myelomas :

- Begin in plasma cells (antibody – producing white bold cells in bone marrow).
- Examples :

- Multiple myeloma

6. Central Nervous System (CNS)cancers :

-Develop in the brain or spinal cord.

-Examples :

-Glioma

-Astrocytoma

- Medulloblastoma

7. Germ cell tumors :

-Arise from reproductive cells (testes or ovaries).

-Can also appear outside gonads .

-Examples :

-Testicular cancer

-ovarian germ cell tumor

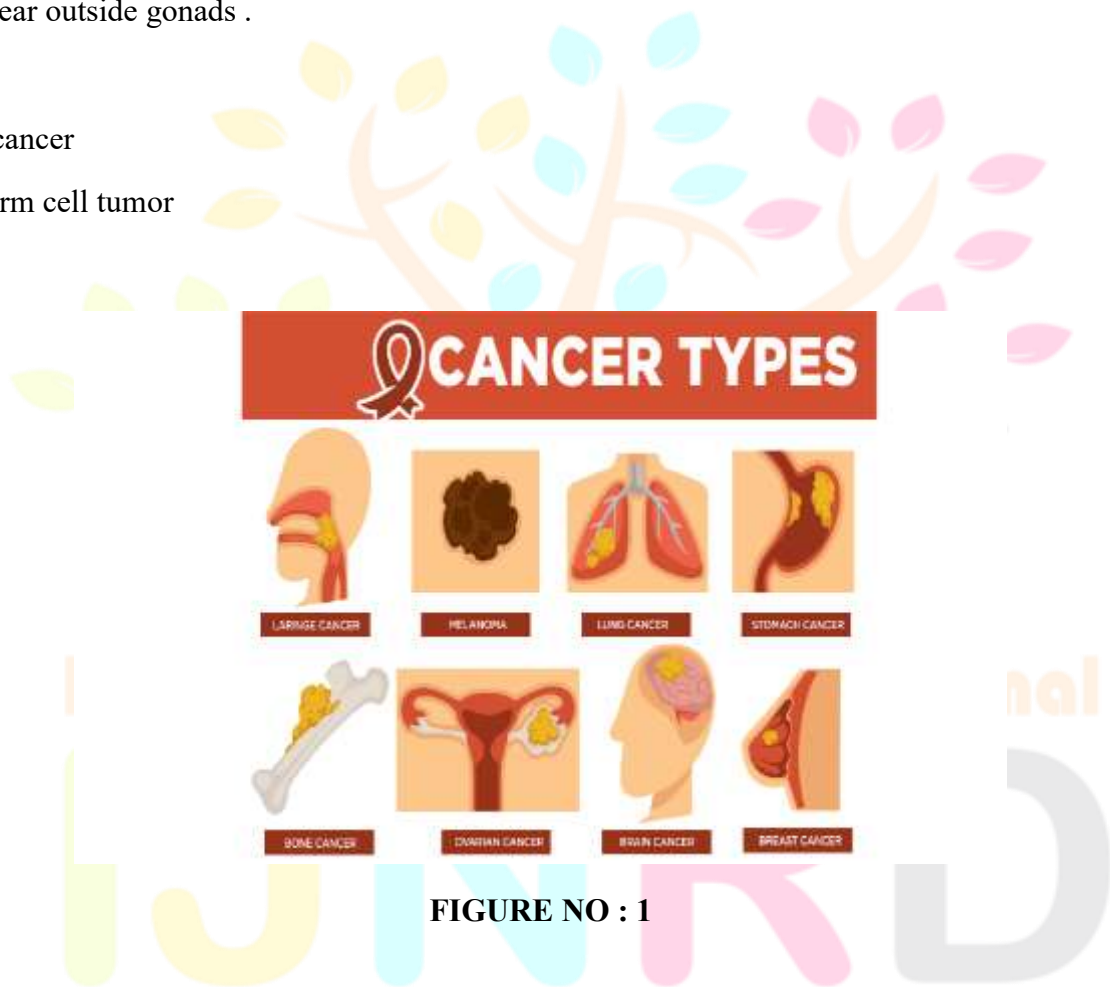


FIGURE NO : 1

• KEY FEATURES OF CANCER :

- 1.Uncontrolled cell growth
- 2.Ability to invade surrounding tissues
- 3.potential to metastasize (spread to other organs)
- 4.Avoidance of natural cell death (Apoptosis)
- 5.Ability to stimulate new blood vessel formation (Angiogenesis)

LITERATURE REVIEW:**1 .Vinca :**

Paper Title	Journal & Year	ISSN details
Vinca alkaloids as a potential cancer therapeutics: recent update and future challenges by A Banyal,S Tiwari,A Sharma ,et al.(2023)	3 Biotech 13 (6):211,2023	Print ISSN :2190-572X; E-ISSN: 2190-5738
pharmacological potential of bioactive compounds in catharanthus roseus by KC Mendonce ,et al .(2025)	Frontiers in pharmacology (or similar –check)	ISSN for Frontiers in pharmacology: 1663-9812

2 . Taxus :

Paper Title	Journal & Year	ISSN details
Paclitaxel and its semi-synthetic derivatives : comprehensive insights into chemical structure ,mechanisms of action ,and anticancer properties by P Sati, E Sharma ,P Dhyan ,et al.(2024)	European journal of medical research	ISSN :2047-783X
Paclitaxels mechanistic and clinical effects on breast cancer : A review (2019)by TMA samaan et al .	Breast cancer : targets and therapy(or similar)	

3.Curcuma longa :

Paper Title	Journal & Year	ISSN details
A review and curcumin and its derivatives as anticancer agents by Mhd Anas Tomeh,Roja Hadianamrei , Xiubo Zhao (2019)	International journal of molecular sciences ,vol.20 (5) :1033	ISSN :1422-0067
A comprehensive review on the therapeutic potential of curcumin (2022) by S Fuloria , et al .	Molecules (or similar checks)	

4.Ashwagandha :

Paper Title	Journal & review	ISSN details
Ashwagandha (withania somnifera)research on the health –promoting activities : A narrative review by P Mikulska, M Malinowska ,M Ignacyk , et al.(2023)	Pharmaceutics ,15 (4) :1057	E-ISSN : 1999-4923
Withania somnifera supplementation : effect on	(various journals)	

PHARMACOGNOSY OF HERBS :

Plant (common name)	Family	Active constituents	Mechanism of action	Uses
Catharanthus roseus(vinca/periwinkle)	Apocynaceae	Vincristine Vinblastine	-act by inhibiting microtubule formation ,leading to mitotic arrest in the metaphase ,which prevents cell division	-Hodgkin's lymphoma -leukemia's -cancer
Paclitaxel(taxus)	Taxaceae	Taxol	Stabilizes microtubules prevents depolymerization inhibits cell division.	-ovarian cancer -breast cancer -lung cancer
Curcuma longa (turmeric / haldi)	zingiberaceae	Curcumin	Antioxidants ,anti-inflammatory ,induces apoptosis ,inhibits angiogenesis	-colon, breast, prostate cancer
Withania somnifera (ashwagandha /Indian ginseng)	Solanaceae	withanolides	Induces apoptosis ,antioxidants, immunomodulator, reduces oxidative stress	-supportive role in breast ,colon cancers ,reduces chemo side effects

TABLE NO : 1**BIOACTIVE COMPOUNDS IN HEALING HERBS**

Medicinal plants contain a wealth of bioactive compounds that exhibit various pharmacological effects, such as anti-cancer properties. These substances can be classified into several primary categories, including flavonoids, alkaloids, terpenoids, and polyphenolic compounds. Flavonoids, for example, are a varied category of phytonutrients present in nearly all fruits and vegetables. They are recognized for their antioxidant effects, which assist in safeguarding cells from harm inflicted by free radicals. Certain flavonoids have demonstrated the ability to impede cancer cell proliferation and lessen inflammation, positioning them as hopeful options. candidates for the prevention and treatment of cancer. Alkaloids represent another important category of bioactive substances discovered in therapeutic flora. They feature nitrogen-containing structures and demonstrate diverse pharmacological activities, such as analgesic, anti-malarial, and anti-cancer properties. Several recognized alkaloids, such as Vincristine and vinblastine, which originate from the Madagascar periwinkle, are currently utilized in clinical environments due to their powerful effectiveness. cancer-fighting characteristics. Terpenoids, or isoprenoids, represent the largest and most varied category of plant secondary metabolic products. They are essential for plant growth and development while also possessing numerous medicinal properties. Terpenes like taxol, derived from the bark of the Pacific yew tree, have been extensively utilized in cancer chemotherapy because of their capacity to hinder cell division in cancerous cells. Polyphenols consist of a category of compounds noted for the existence of several phenol groups. They are recognized for their anti-inflammatory and antioxidant abilities. Polyphenolic compounds like Resveratrol, present in grapes

and red wine, has been researched for its ability to prevent and treat cancer by regulating diverse signaling pathways associated with cellular growth and programmed cell death. To summarize, the bioactive substances found in therapeutic plants, such as flavonoids, alkaloids, terpenoids, and polyphenols, provide.

FLAVONOIDS

Flavonoids represent a category of polyphenolic substances typically present in plants. They contain a fundamental framework made up of two aromatic rings linked by a three-carbon link. Flavonoids can be additionally categorized into subgroups like flavonols, flavones, flavanones, isoflavones, and anthocyanidins. Flavonoids exist in numerous fruits, vegetables, cereals, seeds, and drinks like coffee and juice. Significant sources comprise citrus fruits, berries, onions, soybeans, and greens. Tea Flavonoids have demonstrated anti-cancer properties through various mechanisms, such as triggering apoptosis and blocking cell.

ALKALOIDS

small, requiring careful monitoring of dosages. The intricacy of their frameworks frequently results in the creation Alkaloids represent a varied category of nitrogen-based compounds defined by the presence of a heterocyclic ring structure. They are recognized for their powerful biological properties and are often utilized as therapeutic agents. Alkaloids occur in different families of plants, including Solanaceae (for example, tobacco, tomato), Papaveraceae (for instance, opium poppy) and Ranunculaceae (for example, buttercup). Many alkaloids exhibit potential anticancer properties by blocking topoisomerase enzymes, triggering apoptosis and altering microtubule behavior. For instance, camptothecin, which is derived from the Chinese tree *Camptotheca Acuminata* and its derivatives are strong inhibitors of topoisomerase I utilized in cancer treatment. This step stops cancer cells from mending DNA, thereby stopping their growth. In the same way, taxanes and vinca alkaloids interfere with microtubule functions, dynamics, crucial for cell division, resulting in apoptosis or programmed cell death in tumor cells. Outside of oncology, Alkaloids such as morphine act as strong pain relievers, whereas quinine has been crucial in treating malaria. Sure! Please provide the text you'd like me to paraphrase. the therapeutic use of alkaloids, nonetheless, needs to be handled with caution because of their possible toxicity; the boundary between The range between a therapeutic dose and a toxic dose can be very of semi-synthetic variants to enhance their therapeutic advantages while reducing negative impacts. Investigation into alkaloids persists in revealing novel compounds and improving current ones, augmenting their effectiveness in addressing illnesses, especially cancer, where new modes of action are essential for defeating resistance.

TERPENOIDS

Terpenoids, or isoprenoids, represent a vast and varied category of natural substances made up of isoprene units, consisting of five carbon atoms. They can be classified based on the quantity of isoprene units, for instance, monoterpenes, sesquiterpenes and triterpenes. Terpenoids occur in different plant materials, such as essential oils, resins, and latex. Examples consist of limonene sourced from citrus fruits, artemisinin derived from *Artemisia annua*, and paclitaxel obtained from the Pacific yew. Terpenoids exhibit anticancer effects by promoting apoptosis, reducing cell proliferation, and inhibiting angiogenesis and regulating signaling pathways. For instance, paclitaxel, a type of diterpenoid, serves as a chemotherapeutic drug that interferes with microtubule dynamics, resulting in cell cycle halting and apoptosis. The medicinal promise of terpenoids in Cancer therapy is extensive, with paclitaxel serving as a key example, commonly utilized in chemotherapy for different types of cancers. because of its effect on stabilizing microtubules. Nonetheless, the therapeutic application of terpenoids presents difficulties like guaranteeing sufficient bioavailability, controlling potential toxicity, and navigating the challenges related to their natural synthesis or removal. Investigations persist in examining these compounds for innovative drug creation, concentrating on structure.

POLYPHENOLIC COMPOUNDS

Polyphenols represent a varied set of substances defined by multiple phenolic rings. They are able to be categorized into subcategories like phenolic acids, stilbenes, and lignans. Polyphenols are plentiful in plants, especially in produce, greens, cereals, and drinks such as tea and wine. Major sources consist of grapes, berries, nuts, and greens tea. These substances have shown anticancer effects via multiple mechanisms, including antioxidant action, alteration of signaling pathways, triggering of apoptosis, and suppression of angiogenesis.

For instance, Resveratrol, a stilbene present in grapes, has been demonstrated to block cell growth and trigger apoptosis in various tumor cell cultures. The bioactive substances obtained from medicinal plants display a diverse array of chemical structures and action mechanisms, positioning them as strong contenders for creating new anticancer treatments. Nonetheless, additional studies are essential to completely grasp their possibilities and enhance their medical uses.

VINCA (CATHARANTHUS ROSEUS – MADAGASCAR PERIWINKLE)



FIGURE NO : 2

1.Procedure : Collection & Drying Mature leaves are gathered (highest in alkaloids). Leaves are dried at a controlled temperature (40–50°C) to maintain alkaloids.

2.Extraction : Powdered leaves undergo solvent extraction (ethanol/methanol or chloroform). An acid-base extraction is conducted to isolate alkaloids (dissolve in acid → then neutralize → alkaloids precipitate).

3. Isolation of Active Compounds: Purified using chromatographic techniques (column chromatography, HPLC). Primary alkaloids: Vincristine, Vinblastine.

4. Formulation: Transformed into sterile injectable formulations. Administered via intravenous route.

5. Mechanism of Action: Inhibits microtubule polymerization → obstructs spindle formation. Cell cycle arrest occurs at metaphase → leading to apoptosis.

6. Clinical Use :Applicable for leukemia, Hodgkin's lymphoma, breast & testicular cancer.

TAXUS (TAXUS BREVIFOLIA – PACIFIC YEW TREE)

FIGURE NO : 3

1. Procedure / Method : Collection Bark of *Taxus brevifolia* (the original source of Paclitaxel). To minimize tree destruction, a semi-synthetic method is employed from 10-deacetylbaccatin III (derived from *Taxus baccata* leaves/needles).

2. Extraction: Bark/needles are dried and ground into powder. Solvent extraction is performed using methanol or dichloromethane.

3. Isolation : Paclitaxel is purified through liquid-liquid extraction, column chromatography, and crystallization.

4. Formulation: Insoluble in water → formulated with Cremophor EL + ethanol (for IV injection). Now also available as nanoparticle albumin-bound paclitaxel (nab-paclitaxel) to mitigate toxicity.

5. Mechanism of Action: Stabilizes microtubules → prevents their depolymerization. Blocks anaphase → results in cell cycle arrest in G2/M phase. Induces apoptosis.

6. Clinical Use : Used for ovarian cancer, breast cancer, non-small cell lung cancer, and Kaposi's sarcoma.

Ashwagandha (*Withania somnifera* – Indian Ginseng)

FIGURE NO: 4

1.Procedure / Method: Collection Roots (main source) and leaves are harvested. Dried under shade to preserve bioactive compounds.

2. Extraction: Powdered root/leaf is extracted using ethanol or methanol. Withanolides (e.g., Withaferin A) are concentrated using solvent partitioning.

3. Isolation : Purification by chromatography (HPLC, TLC, column chromatography).

4. Formulation : Crude extracts used in capsules, tablets, tonics in Ayurvedic medicine.

For cancer research → isolated Withaferin A tested in preclinical and clinical trials.

5. Mechanism of Action : Induces apoptosis (via ROS generation, mitochondrial damage). Inhibits NF- κ B pathway → reduces proliferation & angiogenesis. Enhances chemosensitivity & radiosensitivity.

6. Clinical Use: Not yet mainstream anticancer drug. Used as adjuvant/supportive therapy in integrative oncology.

CURCUMA (CURCUMA LONGA – TURMERIC)



FIGURE NO :5

1.Procedure / Method: Collection Rhizomes are harvested, boiled, dried, and powdered.

2. Extraction: Powdered rhizomes subjected to solvent extraction (ethanol/acetone). Oleoresin is obtained; curcumin is separated.

3. Isolation:Curcumin purified using chromatography (HPLC). Further recrystallization yields pure curcumin.

4. Formulation : Curcumin has low bioavailability → enhanced by: Piperine (black pepper extract)

5. Mechanism of Action: Inhibits NF- κ B, STAT3, COX-2, TNF- α signaling pathways. Anti-proliferative, anti-angiogenic, pro-apoptotic. Prevents metastasis.

6. Clinical Use : Used as dietary supplement and adjuvant. Clinical trials ongoing in colorectal, breast, pancreatic cancers.

CONCLUSION :

Herbal remedies are important in the treatment of cancer. Plants like *Taxus*, *Withania somnifera* (Ashwagandha), *Curcuma longa* (Turmeric), and *Vinca rosea* possess bioactive compounds that can slow down cancer cell proliferation, trigger programmed cell death, and boost the immune system. In contrast to traditional treatments, herbal remedies may help mitigate adverse effects and offer additional support. Nevertheless, it is crucial to conduct proper scientific research, ensure standardized dosages, and carry out safety assessments. Therefore, herbs have significant potential as complementary and supportive treatments in cancer therapy. Cancer is one of the major problem in both developing and developed countries . chemotherapy and radiation therapy causes side effects therefore there is requirement of an alternative medicine to treat cancer .medicinal plant contains various secondary metabolites which shows their potential activities against various diseases. Anti-cancer agents derived from the plants source have largely contributed to the development of new drugs. So it can be concluded that herbal medicinal plants and its derivatives are active against different types of cancer herbal drug treatment may be recommended to the rural and poor people to treat effectively the cancers as it is cheaper.

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