

A Review on the Potential of herbal plants as an anticancer drugs

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ABSTRACT

Cancer is a major public health burden in both developed and developing countries. Plant-derived agents are being used for the treatment of cancer. Several anticancer agents including taxol, vinblastine, vincristine, the camptothecin derivatives, topotecan and irinotecan, and etoposide derived from epipodophyllotoxin are in clinical use all over the world. A number of promising agents such as flavopiridol, roscovitine, combretastatin A-4, betulinic acid, and salvestrols are in clinical or preclinical development. This paper focuses the herbs that have the potential of anticancer agent and can be use in treating cancer. Nanoparticles for nanomedicines are a novel technology that aims to improve the anticancer effects of compounds produced from plants by managing the compound's release and researching alternative administration techniques. This review talks about the demand for naturally occurring substances derived from medicinal plants and their characteristics that make them possible targets for cancer treatments.

I. INTRODUCTION

Right present, one of the most serious diseases and a major public health concern in both industrialised and developing nations is cancer. [1]. Blood cancer, lung cancer, breast cancer, prostate cancer, cervix cancer, bone cancer, ascites cancer is thought to be most occurring cancer around the globe and all these cancers can cause death [2]. It is a set of illnesses brought on by a loss of control over the cell cycle, which results in aberrant and unchecked cell growth. [3]. Cancer development is associated with the alteration of oncogenes, tumour suppressor genes, and DNA repair genes [4]. Both external factors such as tobacco, chemicals, radiation, and infectious organisms and internal factors such as inherited mutations, hormones immune conditions are considered to be responsible or the risk factors for causation of cancer [5].

The public health burden of cancer is significant, and the processes for treating and curing it remain technically difficult [6]. Chemotherapy, radiation therapy, hormone

replacement therapy, and surgery are the traditional methods of cancer treatment. But each of these conventional treatment modules has severe side effects [7]. The main drivers behind the hunt for new, more potent medications with fewer side effects were the rising death rate and the unfavorable consequences of anticancer medications [8]. Due to these restrictions, researchers are always looking for natural substances that could potentially treat cancer [9].

Many natural compounds such as terpenoids, phenolic acids, lignans, tannins, flavonoids, quinones, coumarins, and alkaloids were discovered from plant sources that contain significant antioxidant activities and play an important role in cancer treatment [10]. The antioxidant chemicals have been shown in several investigations to have anti-inflammatory, antitumor, antimutagenic, and anticarcinogenic properties [11]. Direct cell growth inhibition and immune system stimulation are both possible with natural substances with antioxidant action [12].

In recent year, the drug industries largely depend on natural compounds as a source of medicine. The statistics showed that over 60% of the recently used anticancer drugs are related to herbal origin [13]. Herbal products are worldwide accepted as a source of complementary and alternative medicine in [14] various diseases especially in cancer [15]. They give us therapeutic alternatives that are comparatively safe, efficient, and affordable, especially when it comes to cancer, a disease whose long-term care comes at an exorbitant price [16].

Due to the favourable climatic condition, Indian subcontinent is the home of wide range of plant species with medicinal properties. They give us therapeutic alternatives that are comparatively safe, efficient, and affordable, especially when it comes to cancer, a disease whose long-term care comes at an exorbitant price [16]. [17]. This treatment system comes out based on the plant's materials and is running smoothly from the very ancient time till today. The history of Ayurveda reported that it gains an excellent achievement in the world medicine. Despite the modern medicine

achieves a remarkable consequence through physical, chemical, and natural sciences, the Ayurvedic medicine shows a fruitful contribution to remission of human suffering [18]. Therefore, the present focus is on finding numerous bioactive chemicals with anticancer potential. The anti-tumor properties of cis-dichlorodiammineplatinum(II), first described by ROSENBERG et al. [1] in tests on mice bearing the sarcoma 180, have been confirmed and extended by a large number of authors [2-4]. The mechanism of action of the compound is unknown although it has a wide variety of biological effects [9-11]. Many of its properties are reminiscent of alkylating agents, in particular its selective inhibition of DNA synthesis [12] and its ability to cross-link complementary strands of DNA [1a]. Similarity to alkylating agents is further seen in cross-resistance studies on Walker carcinoma with acquired resistance to the alkylating agent melphalan. The tumor line is not only cross-resistant to other alkylating agents but also to the platinum compound [2]. This similarity to alkylating agents is not a particularly favorable property since it implies that any clinically useful platinum compound might suffer from the same limiting toxicity as the alkylating agents, and therefore not represent a new class of compound that might be used in combination with present-day agents. However, the preliminary results of Phase I clinical trial of the National Cancer Institute are encouraging and indicate that, in man, the tumor growth inhibitory platinum compound may have properties quite different from the alkylating agents [4]. Chem.-Biol. Interactions, 5 (1972)415-424 416 T.A. CONNORS et al. A number of complexes of platinum and related heavy metals have now been synthesized and tested for their anti-tumor activity. This paper describes the preparation of a number of platinum compounds related to the tumor growth inhibitory cis-dichlorodiammineplatinum(II) and their testing for anti-tumor activity in laboratory animals bearing the PC6 plasma cell tumor. Some highly active compounds have been obtained and it has been confirmed that a specific molecular configuration is necessary for anti-tumor activity, slight changes in structure leading to wide variations in biological properties.

II. LITERATURE REVIEW

Shalini Gupta et.al (2009) Performed anticancer activities of a Chinese herb, *Oldenlandia diffusa* (Bai Hua She She Cao). They used water extract from the raw herb *Oldenlandia diffusa* was used in this study. The in

vitro anti-proliferative activities of the extract were tested against eight cancer cell lines and one normal cell line. Microscopic examination and DNA ladder analysis were carried out to determine the pro-apoptotic effect of the extract. In vivo, studies were carried out to examine the anticancer activities of the extract using C57BL/6j mice bearing B16-F10 lung metastasis. *Oldenlandia diffusa* extract was given at the dose level of 5 g raw material/kg on Days 3-12 by oral gavage and the extent of lung metastases was examined on Day Results showed that the extract exhibited a strong antiproliferative activity against all cancer cell lines tested. The concentrations of growth inhibition at 50% (IC₅₀) ranged from 7 to 25 mg raw material/ml after 48-hour treatment. The extract had very limited cytotoxicity (10% inhibition) on the normal pancreatic cells even at the concentration of 50 mg/mL. Apoptosis in B16-F10 cells after treatment with the extract was observed by microscopic examination and DNA ladder assays. Oral administration of the herbal extract effectively reduced B16-F10 cell growth in the lungs of C57BL/j mice with a 70% reduction in lung metastases (p < 0.001). The present study concludes that *Oldenlandia diffusa* extract effectively inhibited the growth of all eight cancer cell lines and induced a significant increase of apoptosis. The extract exhibited a minimum toxic effect on normal pancreatic cells. Furthermore, there was a significant inhibition of lung metastases in the animal model with no noticeable adverse effects. The herb extract could be a potential anticancer agent [1].

Xin vu et.al (2013) Suggested that *Hemsleya amabilis* extract is derived from the medicinal herb *Hemsleya amabilis*, which has long been used to treat cancer and many other conditions. The underlying mechanism is not clear. To investigate *Hemsleya amabilis*'s anticancer activity, we have treated different types of cancer cells including human astrocytoma U87 cells, breast cancer cells MDA-MB-231 and Jurkat cells with *Hemsleya amabilis* extract. This agent significantly inhibited tumor cell growth and colony formation at various concentrations. When astrocytoma cells were seeded in the presence of *Hemsleya amabilis* extract at very low concentrations, cell spreading was greatly inhibited. *Hemsleya amabilis* extract also promoted tumor cell death in all the tested cell lines, but with varied sensitivities. Apoptotic assays with Annexin V staining demonstrated that *Hemsleya amabilis*

extract induced astrocytoma cell apoptosis at different concentrations(2).

Md. Shihabul Islam et al (2018) Suggested that *B. alba* is a fast-grown leafy vegetable plant with high medicinal values that is cultivated worldwide [19]. It contains fiber, ash, calcium, vitamins, thiamine, riboflavin, niacin, etc., and is traditionally used as an antidote, aperients, astringent, demulcent, diuretic, febrifuge, laxative, and rubefacient [20, 21]. It also works well in the treatment of inflammation, atherosclerosis, stroke, heart disease, diabetes mellitus, multiple sclerosis, Parkinson's disease, Alzheimer's disease, etc. [22]. Moreover, leaves of the plant exhibited its potentiality of recovering male infertility [23]. Therefore, present study was designed to investigate the anticancer potential of leaf and seed extracts of *B. alba* through in vivo mouse model. This current experimental plant *B. alba* showed various activity as anticancer agent which was proved by different bioassay like antioxidant activity, hemagglutination activity, cytotoxic activity, and cell growth inhibition assay. Our molecular studies also suggest that the leaf and seed extracts of *B. alba* can inhibit EAC cell growth.

Yashika Bhalla et al (2013) Suggested that essential oil constituents from aromatic herbs and dietary plants include monoterpenes, sesquiterpenes, oxygenated monoterpenes, oxygenated sesquiterpenes and phenolics among others. Various mechanisms such antioxidant, antimutagenic and antiproliferative, enhancement of immune function and surveillance, enzyme induction and enhancing detoxification, modulation of multidrug resistance and synergistic mechanism of volatile constituents are responsible for their chemopreventive properties. This review covers the most recent literature to summarize structural categories and molecular anticancer mechanisms of constituents from aromatic herbs and dietary plants.

Subash Chandra Gupta et al (2018) Suggested that because of safety, affordability, ready availability, and limited toxicity, agents derived from Mother Nature possess a potential for the prevention and treatment of cancer. Emodin (EM), an anthraquinone derived from shrubs, herbs, flowering plants, and spices, is one such agent that exhibits activities against hepatocellular carcinoma, pancreatic cancer, breast cancer, non-small-cell lung cancer, ovarian cancer, and prostate cancer. The anthraquinone can sensitize resistant tumor cells to chemotherapeutic

agents such as TNF-related apoptosis inducing ligand

(TRAIL), oxaliplatin, gemcitabine, adriamycin, cisplatin, capecitabine, paclitaxel, abiraterone, doxorubicin, and 5-fluorouracil. The anthraquinone can modulate multiple cancer-related cell signaling pathways such as AKT8 virus oncogene cellular homolog (AKT), extracellular signal-regulated kinase (ERK)1/2, Janus-associated kinase (JAK)2, C-X-C chemokine receptor type 4 (CXCR4), signal transducers and activators of transcription 3 (STAT3), nuclear factor kappa B (NF- κ B), activator protein-1 (AP-1), cyclooxygenase-2 (COX-2), and many other pathways. The modulation of these cell signaling pathways by the anthraquinone might contribute to its anticancer and chemosensitization activities. The anticancer properties of EM have been reported both by in vitro and rodent studies. However, EM has still not been tested in humans for its anticancer activities. The focus of this chapter is to discuss the anticancer and chemosensitizing activities of EM. The underlying mechanisms for EM anticancer activities are discussed.

Dae-Hee Lee et al (2008) Suggested that Glioblastoma multiforme (GBM) is the most lethal and aggressive astrocytoma of primary brain tumors in adults. Although there are many clinical trials to induce the cell death of glioblastoma cells, most glioblastoma cells have been reported to be resistant to TRAIL-induced apoptosis. Here, we showed that gingerol as a major component of ginger can induce TRAIL-mediated apoptosis of glioblastoma. Gingerol increased death receptor (DR) 5 levels in a p53-dependent manner. Furthermore, gingerol decreased the expression level of anti-apoptotic proteins (survivin, c-FLIP, Bcl-2, and XIAP) and increased pro-apoptotic protein, Bax and truncate Bid, by generating reactive oxygen species (ROS). We also found that the sensitizing effects of gingerol in TRAIL-induced cell death were blocked by scavenging ROS or overexpressing anti-apoptotic protein (Bcl-2). Therefore, we showed the functions of gingerol as a sensitizing agent to induce cell death of TRAIL-resistant glioblastoma cells. This study gives rise to the possibility of applying gingerol as an anti-tumor agent that can be used for the purpose of combination treatment with TRAIL in TRAIL-resistant glioblastoma tumor therapy.

Bobbi Hamilton et al (2005) Performed an experiment on Aqueous extracts of 12 Chinese medicinal herbs, *Anemarrhena asphodeloides*, *Artem*

isiaargyi, Commiphoramyrtha, Duchesnea indica, Gleditsia sinensis, Ligustrum lucidum, Rheumpalmatum, Rubia cordifolia, Salvia chinensis, Scutellariabarabata, Uncariarhychophylla and Vaccariasegetalis were evaluated for their antiproliferative activity on eight cancer cell lines as well as on normal human mammary epithelial cells. Five human and three murine cancer cell lines representing different tissues (breast, lung, pancreas and prostate) were used. All the crude aqueous extracts demonstrated growth inhibitory activity on some or all of the cancer cell lines, but only two showed activity against the normal mammary epithelial cells. Overall, the murine cell lines tended to be more sensitive to most of the extracts compared with the human cell lines. Among the human cell lines, cell type specificity was observed for two extracts. These results indicate the potential use of traditional Chinese medicinal herbs as antineoplastic agents and suggest that further studies evaluating their mechanism(s) of action and the isolation of active antitumor compounds are warranted.

Wissman Aidi Wannas et.al (2017) Suggested that the use of the medicinal plants in cancer prevention and management is frequent in Africa, especially in Tunisia, and it is transmitted from generation to generation within cultures. Many previous studies showed that a wide range of Tunisian medicinal plants exerted cytotoxic and anticancer activity. A comprehensive review was conducted to collect information from scientific journal articles, including indigenous knowledge researches, about Tunisian medicinal plants used for the prevention and management of cancer. The aim of this review article is to provide the reader with information concerning the importance of Tunisian medicinal plants in the prevention and management of cancer and to open the door for the health professionals and scientists working in the field of pharmacology and therapeutics to produce new drug formulations to treat different types of cancer.

Meyer et , al (2021) Suggested that The chemistry and pharmacology of the important Vinca alkaloids such as vinblastine and vincristine used in anticancer therapy are still investigated widely. Several new derivatives, e.g., vinflunine, vinorelbine, and vindesine, have been synthesized and become successful medicines in anti-cancer therapy. In 2012, we published a paper that reviewed the Vinca derivatives. Nevertheless, the interest in the preparation of new modified

structures is not decreasing either in recent years. In this review, the vinblastine-type molecules with several substituents, e.g., amide, nitrile, hydrazide, substituted side chains, etc. in different positions of catharanthine and/or vindoline cores are presented. An important part of the review is the derivatization of the monomer alkaloid vindoline, which possesses no antitumor effect. Additionally, new hybrid molecules of these alkaloids are also discussed in this mini-review.

Xuan he et , al (2021) Suggested that Efficacy and safety of docetaxel for advanced non-small-cell lung cancer: a meta-analysis of Phase III randomized controlled trial. Several clinical trials have performed risk-benefit analyses comparing docetaxel and pemetrexed or docetaxel and vinca alkaloid, but the efficacy and safety remain uncertain. The aim was to conduct a meta-analysis to compare the efficacy and safety of docetaxel and pemetrexed or docetaxel and vinca alkaloid for non-small-cell lung cancer.

Symptoms

Anti-cancer" is a general phrase that can be used to describe a variety of therapies, drugs, or treatments that are used to treat cancer. It is not a particular ailment or illness in and of itself. However, there may be side effects from cancer therapies such chemotherapy, radiation therapy, targeted therapy, immunotherapy, and others. Depending on the particular medication and how the patient reacts to it, these side effects can change. Here are a few typical signs or negative effects linked to specific cancer treatments:

Fatigue: One common adverse effect of cancer therapy is feeling weak, weary, or exhausted.

Many cancer treatments can result in nausea and vomiting, which can range in severity from moderate to severe.

Hair loss: Hair loss from the scalp and other body hair is a side effect of chemotherapy in particular.

Appetite changes: Cancer therapies may impact your appetite, causing you to feel less hungry or to modify the way food tastes.

Constipation or diarrhoea: Some therapies may result in gastrointestinal problems that induce constipation or diarrhoea.

Pain: Cancer therapies may result in pain, either directly as a side effect or indirectly as a result of the illness itself.

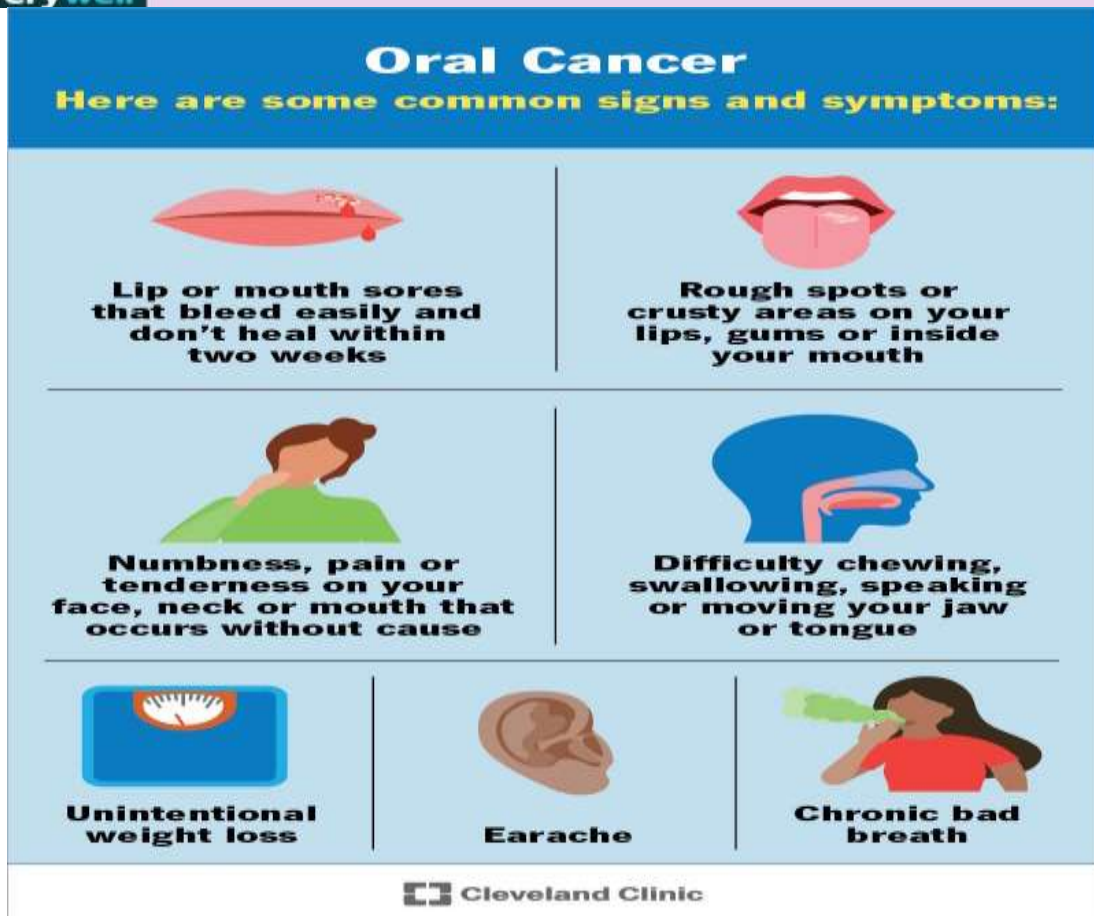
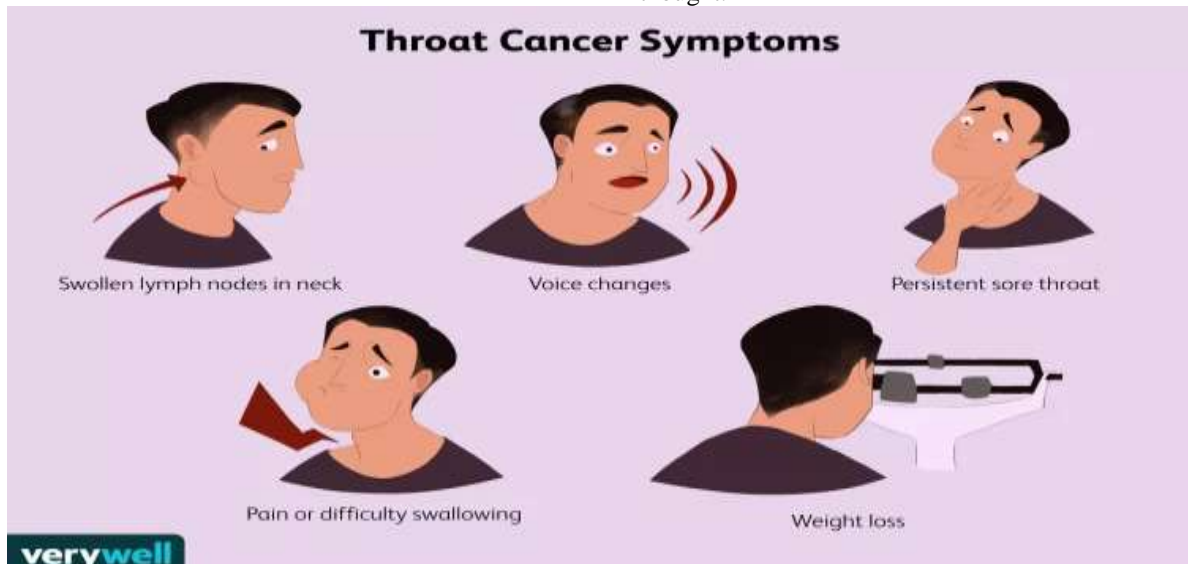
Immune system weakness: Some medical procedures, such as chemotherapy, might depress

the immune system, leaving you more vulnerable to infections.

Skin changes: Some cancer therapies might result in skin issues like dryness, redness, or increased sun sensitivity.

Mood changes: Cancer therapies may occasionally cause you to feel anxious, depressed, or irritable.

Cognitive alterations can result from cancer therapies, which are sometimes referred to as "chemo brain," and can impair memory, focus, and thought.



Treatment of Anti herbal cancer drugs

Depending on the exact drug and the type of cancer being treated, the therapy of anti-herbal drugs and cancer drugs may differ. It's critical to understand the difference between "anti-herbal drugs" and "anti-cancer drugs."

Anti-Herbal Drugs: Anti-herbal drugs are pharmaceuticals used to mitigate the negative effects or toxicity of herbal treatments or conventional therapies. These medications are frequently utilised when using herbal remedies and experiencing negative effects. Treatment options include.

Supportive care: This includecontrolling signs and symptoms like nauseousness, vomiting, or allergic responses. As part of supportive care, medication may be given to treat these symptoms.

monitoring and keeping an eye on: To maintain their wellbeing and to deal with any potential difficulties, the person's vital signs and general health must be closely monitored.

Anti-Cancer Drugs: Cancer is treated with anti-cancer treatments, sometimes referred to as chemotherapy or targeted therapy, which either target and kill cancer cells or stop them from proliferating. The type and stage of the cancer determine the specific treatment plan.

Chemotherapy: The process of using cytotoxic medications to destroy rapidly proliferating cancer cells all over the body.

Drugs that directly target genetic or molecular alterations in cancer cells to prevent their development and survival are known as targeted therapies.

Immunotherapy: Using the immune system to identify and eliminate cancer cells in the body.

Hormone therapy: Used to prevent the effects of hormones or lower their synthesis in malignancies that are hormone-sensitive.

High-energy radiation is used in radiation therapy to kill cancer cells and reduce tumour size.



Causes of Anti herbal cancer drugs

You appear to be inquiring about the rationale for the creation of anti-herbal cancer treatments, or medications used to treat cancer but not derived from plants. While conventional anti-

cancer medications have been developed despite the fact that herbal treatments have been used for millennia to treat a variety of illnesses, including cancer. As a primary cancer treatment strategy,

herbal therapies may not be selected for the following reasons:

Scientific backing and regulation: There is frequently a dearth of robust scientific research to back up the efficacy and safety of herbal treatments for treating cancer. Contrarily, to assure their efficacy and safety, pharmaceutical medications undergo intensive clinical trials and regulatory procedures.

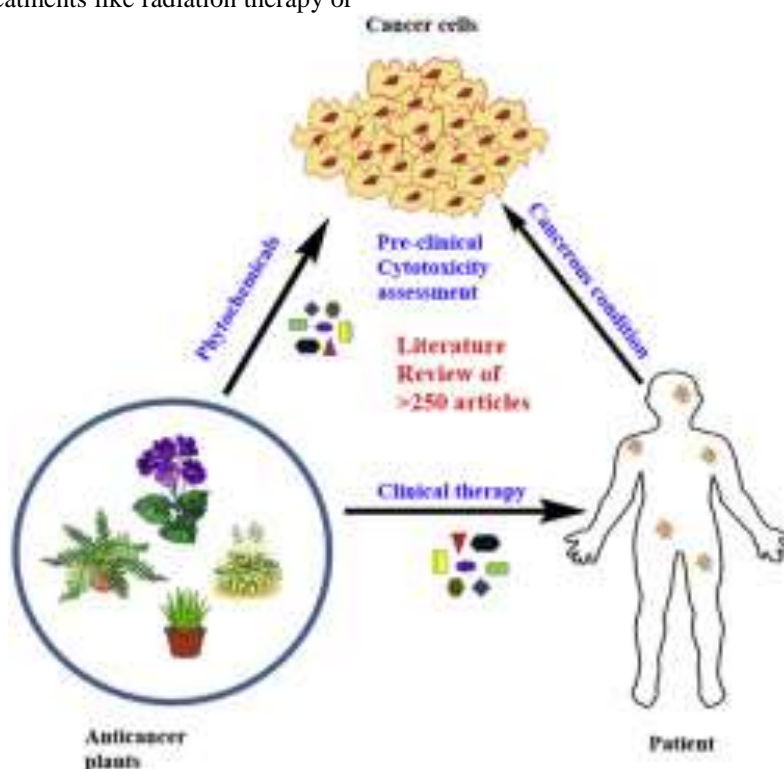
Standardization and quality assurance: Due to variables including plant species, growing environments, harvesting techniques, and manufacturing procedures, herbal treatments can differ significantly in their content, potency, and quality. Pharmaceutical medications, in contrast, are subject to stringent quality control procedures to guarantee uniformity in their composition, dose, and purity.

Drug interactions: Herbal medicines may have negative effects or affect the effectiveness of common cancer treatments like radiation therapy or

chemotherapy drugs. It is frequently difficult to predict how herbal treatments and other pharmaceuticals may interact with one another.

Targeted therapies: Unlike herbal medicines, many anti-cancer medications are made to directly target one or more of the cellular processes or genetic alterations that contribute to the growth of the disease. Pharmaceutical companies devote a lot of money to creating medicines that can selectively suppress or obstruct particular cancer-related targets.

Pharmacokinetics and bioavailability: Individual differences in the absorption, distribution, metabolism, and elimination of herbal medicines can have a significant impact on their bioavailability and overall efficacy. The predictable pharmacokinetics of conventional anti-cancer medications enable precise dosing and optimal drug levels in the body.



III. CONCLUSION AND PRESPECTIVE

The present study suggest that molecular imprinted technology can play a great role in separation and extraction of variety of plant based active compounds like alkaloids, glycosides ,tannins , saponins, flavonoids. These variety of active compounds have vast variety of physicochemical properties that can be very useful

in industries like pharmaceutical industries for treating cancer like diseases. This study have provided sufficient evidence that using these herbal plants not only treat the cancer but also improve quality life of patients .The present study can be use by future researchers as a significant strategy for cancer therapy.

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