



ISSN 2349-7750

INDO AMERICAN JOURNAL OF  
**PHARMACEUTICAL SCIENCES**

Available online at: <http://www.iajps.com>

Review Article

## A REVIEW ON: ANTICANCER PLANTS

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### ABSTRACT

*Cancer is major health problem in both developed and developing countries. Cancer after cardiovascular disease is the second leading cause of death. Cancer is the abnormal growth of cells in our bodies that can lead to death. Because of high death rate associated with cancer and because of serious side effects of chemotherapy and radiation therapy, many cancer patients seek alternative complementary methods of treatment. Medicinal herbs play an important role in primary health care system among rural population since synthetic anti-cancer remedies are beyond the reach of common man because of the cost factor. The herbal medicines have a vital role in the prevention and treatment of cancer which execute their therapeutic effect by inhibiting cancer activating enzymes and hormones, stimulating DNA repair mechanism, promoting production of protective enzymes inducing anti-oxidant action and enhancing immunity*

**Key Words:** Medicinal Herb, Chemotherapy, Complementary Methods.

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## INTRODUCTION

Cancer is a general term applied of series of malignant diseases that may affect different parts of body. These diseases are characterized by a rapid and uncontrolled formation of abnormal cells, which may mass together to form a growth or tumor, or proliferate throughout the body, initiating abnormal growth at other sites. If the process is not arrested, it may progress until it causes the death of the organism[1,2]. The main forms of treatment for cancer in humans are surgery, radiation and drugs (cancer chemotherapeutic agents). Cancer chemotherapeutic agents can often provide temporary relief of symptoms, prolongation of life, and occasionally cures. In recent years, a lot of effort has been applied to the synthesis of potential anticancer drugs. Many hundreds of chemical variants of known class of cancer chemotherapeutic agents have been synthesized but have a more side effects. A successful anticancer drug should kill or incapacitate cancer cells without causing excessive damage to normal cells[3,4]. This ideal is difficult, or perhaps impossible, to attain and is why cancer patients frequently suffer unpleasant side effects when undergoing treatment. However, a waste amount of synthetic work has given relatively small improvements over the prototype drugs. There is a continued need for new prototype-new templates to use in the design of potential chemotherapeutic agents: natural products are providing such templates. Recent studies of tumor-inhibiting compound of plant origin have yielded an impressive array of novel structures[5,6,7].

### The Mechanism on Cancer Therapy

1. Inhibiting cancer cell proliferation directly by stimulating macrophage phagocytosis, enhancing natural killer cell activity.
2. Promoting apoptosis of cancer cells by increasing production of interferon-I,interleukin2,immunoglobulin and complement in blood serum.
3. Enforcing the necrosis of tumor and inhibiting its translocation and spread by blocking the blood source of tumor tissue.
- 4.Enhancing the number of leukocytes and platelets by stimulating the haemopoietic function.

5.Promoting the reverse transformation from tumor cells into normal cells.

6.Promoting metabolism and preventing carcinogenesis of normal cells.

7.Stimulating appetite, improving quality of sleep, relieving pain, thus benefiting patients health.

### Anticancer plants:

#### *Arctium lappa*

It contains potent anticancer factors that prevent mutations in the oncogenes. It has been used in the treatment of malignant melanoma, lymphoma and cancers of the pancreas, breast, ovary, oesophagus, bladder, bile duct and the bone. A study revealed that it reduces the size of tumour, relieves the pain and prolongs the survival period.

#### *Betula utilis*

contains betulin that can be easily converted into betulinic acid. Studies have revealed that betulinic acid inhibits growth of malignant melanoma and cancers of the liver and the lung.

#### *forskholii Coleus:*

It is useful in the treatment of cancer, congestive heart failure . The active principle of Coleus forskohlii, forskolin, increase of cyclic AMP levels in the culture medium of human prostatic cancer cells thereby cellular growth of the cancer found inhibited. This will be a possible new, safe approach to prostatic carcinoma therapy.

#### *Dysoxylum binectariferum:*

It is an ayurvedic plant used for rheumatoid arthritis. Rohitukine was isolated as the constituent responsible for anti-inflammatory and immunomodulatory activity Flavopridol, was found to possess tyrosine kinase activity and potent growth inhibitory activity against a series of breast and lung carcinoma cell lines. It also showed broad spectrum in vivo activity against human tumor xenografts in mice, either alone or in combination with other anti-cancer agents, against a broad range of tumors, including leukemia, lymphomas and solid tumors

***Rosa roxburghii tratt***

*Rosa roxburghii* Tratt and *Fagopyrum cymosum* are two examples of plants which have beneficial effects in improving immune responses, enhancing digestive ability and demonstrating anti-aging effects. Some evidence shows that herbal medicine soups containing extracts of these two medicinal plants i.e *Rosa roxburghii* Tratt and *Fagopyrum cymosum* have efficacy in treating malignant tumors. The study was therefore undertaken to evaluate anticancer effects against three carcinoma cell lines (human esophageal squamous carcinoma CaEs-17, human gastric carcinoma SGC-7901 and pulmonary carcinoma A549) by MTT assay and flow cytometry. IC<sub>50</sub> of *Rosa roxburghii* Tratt and *Fagopyrum cymosum* were obtained by MTT assay. Combination of *Rosa roxburghii* Tratt and *Fagopyrum cymosum* showed significant inhibition of cell growth and increase in apoptosis; the mRNA and protein expression levels of Ki-67 and Bcl-2 in *Rosa roxburghii* Tratt and *Fagopyrum cymosum* group were all greatly decreased, while the expression of Bax was markedly increased[8,9]. These results therefore show that the synergistic antitumor effects of combination of *Rosa roxburghii* Tratt and *Fagopyrum cymosum* are related to inhibition of proliferation and induction of apoptosis[10].

***Goniothalamus macrophyllus***

*Goniothalamus* is a medicinal plant belonging to the Annonaceae family; contains substances which possess anticancer properties towards several tumor cell lines. Goniothalamine, a natural compound extracted from *Goniothalamus* sp. Apoptosis induction by goniothalamine in the HeLa cervical cancer cell line was observed by MTT assay method. The IC<sub>50</sub> value of goniothalamine was 3.2±0.72 µg/ml. It was concluded that morphological changes and biochemical processes associated with apoptosis were evident on phase contrast microscopy and fluorescence microscopy. DNA damage, DNA fragmentation, caspase-9 activation and a large increase in the sub-G1 and S cell cycle phases confirm the happening of apoptosis in a time-dependent manner[11,12,13]. The study there showed that goniothalamine possesses a promising cytotoxicity effect against cervical cancer cells (HeLa) and the cell death mode induced by goniothalamine was apoptosis.

***Curcuma longa***

Anticancer potential of the rhizomes of turmeric (*Curcuma longa*) was evaluated in vitro using tissue culture methods and in vivo in mice using Dalton's lymphoma cells grown as ascites form. *C. longa* extract inhibited the cell growth in Chinese Hamster Ovary (CHO) cells at a concentration of 0.4 mg/ml and was cytotoxic to lymphocytes and Dalton's lymphoma cells at the same concentration. Cytotoxic effect was happened within 30 min at room temperature (30°C). Curcumin was found to be the active constituents of *C. longa* which showed cytotoxicity to lymphocytes and Dalton's lymphoma cells at a concentration of 4 mg/ml. Initial experiments indicated that *C. longa* extract and curcumin reduced the growth of animal tumours[14].

***Cynara syriaca and Cynara cardunculus:***

Apoptotic and cytotoxic activity of plant extracts obtained from *Cynara syriaca* in and *Cynara cardunculus* against DLD1 colorectal cancer cells was determined. This paper was the first report, concerning with, positive effects of plant extracts obtained from two different artichoke species against to colorectal cancer cell line. In this study, their results demonstrated that artichoke extracts had inhibitory effects on the proliferation of human colorectal cancer DLD1 cells[15,16]. Extracts not only hold back cell proliferation but also induce apoptotic pathway on DLD1 cells.

***Melissa officinalis***

*Melissa officinalis* L. commonly known as lemon balm is one of the most used medicinal plants in Europe and the Mediterranean region, as a herbal tea for its aromatic, digestive and antispasmodic properties in nervous disturbance of sleep and functional gastrointestinal disorders[17,18,19]. *Melissa officinalis* showed cytotoxicity against three cancer cell lines, inducing increase in Annexin-positive cells. Furthermore, study showed that mean tumor volume inhibition ratio in *Melissa officinalis* treated group was 40% compared with the untreated rats. This study confirmed that *Melissa officinalis* extracts have antitumoral potential against breast cancer.

### *Camellia sinensis*

Green tea is an aqueous infusion of dried unfermented leaves of *Camellia sinensis* (Family Theaceae) possesses numerous biological activities including antimutagenic, antibacterial, hypocholesterolemic, antioxidant, antitumor and cancer preventive activities. It has been reported that green tea leaves contains six compounds (+)-galliccatechin (GC), (-)-epicatechin (EC), (-)-epigallocatechin (EGC), (-)-epicatechin gallate (ECG), (-)-epigallocatechin gallate (EGCG) and caffeine. These compounds were tested against four human tumor cells lines such as (MCF-7 breast carcinoma, HT-29 colon carcinoma, A-427 lung carcinoma and UACC-375 melanoma). EGCG, GC and EGC found to be most potent against all four tumor cell lines. In view of these extensive in vitro studies, it would be of considerable interest to evaluate all three of these components in animal tumor model systems before final decisions are made concerning which of these potential chemopreventive agent should be taken into broad clinical[20].

### *Allium sativum*

*Allium sativum* L. garlic is among the oldest of all cultivated plants being used as a food, having a unique taste and odor along with some medicinal qualities. Modern scientific research has revealed that the wide variety of dietary and medicinal functions of garlic can be because of the sulfur compounds present in it. The compound allicin, methyl allyl trisulfide, and diallyl trisulfide have antibacterial, antithrombotic, and anticancer activities respectively. It is a remarkable plant, which has multiple beneficial health effects such as hypolipidemic, antiarthritic, antimicrobial, antithrombotic, hypoglycemic and antitumor activities. Different garlic preparations including fresh garlic extract, aged garlic, garlic oil

and a number of organo sulfur compounds derived from garlic shown to have chemopreventive activity. The chemopreventive activity has been attributed to the presence of organo sulfur compounds in garlic. The two major compounds in aged garlic, S-allylcysteine and S-allylmercapto-L-cysteine possess the highest radical scavenging activity. In addition, S-allylcysteine has been found to reduce the growth of chemically induced and transplantable tumors in animal models. Therefore, the use of garlic may provide some kind of protection from cancer development[21]. The seed of *Strychnos nux-vomica* (Loganiaceae) has been used in traditional Oriental medicine as a folk remedy for the treatment of cancer. This study proved that the water extract of *Strychni Semen* (ESS) treatment would affect the growth of AGS human gastric carcinoma cells. ESS was found to inhibit the growth of AGS cells in a concentration-dependent manner. Cell cycle analysis showed G2/M phase arrest and apoptosis in AGS cells following ESS treatment[22,23]. ESS-mediated G2/M arrest was found to be associated with up-regulation of cyclin A, Cdc2, tumor suppressor p53 and cyclin dependent kinase(Cdk) inhibitor p21(WAF1/CIP1), whereas the expressions of other G2/M regulatory proteins, including cyclin B1 and Cdk2, were down-regulated compared with the control. The induction of apoptotic cell death by ESS was associated with down-regulation of anti-apoptotic Bcl-2 and up-regulation of pro-apoptotic Bax expression. Further results indicate that caspase-3, caspase-8 and caspase-9 are all activated by ESS, together with cleavage of downstream caspase-3 target proteins. Taken together, the results of this study suggest the involvement of multiple signaling pathways targeted by ESS in mediating G2/M cell cycle arrest and apoptosis in AGS cells[24].

**Table 1: List of plants has Anti-Cancer activity**

S. No.	Common name	Botanical Name	Part Used	Family	Uses
1.	Arjuna Bark	<i>Terminalia arjuna</i>	Bark	Combretaceae	Anticancer
2.	Kalmegh	<i>Andrographis paniculata</i>	Dried leaves	Acanthaceae	Anticancer
3.	Vinca	<i>Catharanthus roseus</i>	Whole plant	Apocynaceae	Anticancer
4.	Ochrosia	<i>Ochrosia elliptica</i>	Trunk Bark	Apocynaceae	Anticancer
5.	May Apple	<i>Podophyllum peltatum</i>	Dried Rhizome	Berberidaceae	Anticancer
6.	Ginger	<i>Zingiber officinalis</i>	Rhizome	Zingiberaceae	Anticancer
7.	Turmeric	<i>Curcuma longa</i>	Rhizome	Zingiberaceae	Anticancer
8.	Deerberry	<i>Vaccinium stamineum</i>	Fruit	Ericaceae	Anticancer
9.	Indian mulberry	<i>Morinda citrifolia</i>	Fruit	Rubiaceae	Anticancer
10.	Bhilwa	<i>Semecarpus anacardium</i>	Fruit	Anacardiaceae	Anticancer
11.	Madar	<i>Calotrophis gigantea</i>	Whole plant	Asclepiadaceae	Anticancer
12.	Arhar Dal	<i>Cajanus cajan</i>	Leaves	Fabaceae	Anticancer
13.	Palash Butea	<i>monosperma</i>	Bark	Fabaceae	Anticancer
14.	Orchid Tree	<i>Bauhinia variegata</i>	Root	Caesalpinaceae	Anticancer
15.	Onion	<i>Alium cepa</i>	Bulb	Liliaceae	Anticancer
16.	Indian Aloe	<i>Aloe barbadensis</i>	Leaves	Liliaceae	Anticancer
17.	Tarwar	<i>Cassia auriculata</i>	Root	Caesalpinaceae	Anticancer
18.	Senna	<i>Cassia senna</i>	Leaves	Caesalpinaceae	Anticancer
19.	Lemon	<i>Citrus medica</i>	Root	Rutaceae	Anticancer
20.	Carrot	<i>Daucus carota</i>	Root	Apiaceae	Anticancer
21.	Danti	<i>Jatropha curcas</i>	Leaves,seed,oils	Euphorbiaceae	Anticancer
22.	Mint	<i>Mimosa pudica</i>	Whole plant	Mimosaceae	Anticancer
23.	Tobacco	<i>Nicotiana tabacum</i>	Leaves	Solanaceae	Anticancer
24.	Indian Ipecac	<i>Tylopora indica</i>	Root, Leaf	Asclepiadaceae	Anticancer

## CONCLUSION

Medicinal plants maintain the health and vitality of individual and also cure various diseases including cancer without causing toxicity. Natural products discovered from medicinal plants have played an important role in treatment of cancer. In this review some anti cancer plants have been presented. These plants possess good immune modulatory and antioxidant properties leading to anticancer activity. Plant extracts and their bioactive compounds present in them which are responsible for anticancer activity have to be screened for their valuable information. This review had given some of the plants possessing anticancer activity for various types of cancer. This review can help others to explore herbs to further extent and its use in various other disease and toxicity studies along with clinical trials

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