

**NATURAL SOURCE WITH POWER FOR TREATMENT OF CANCER: A RECENT REVIEW**

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ABSTRACT

Cancer is a major public health burden in both developed and developing countries. Studies have estimated that genetic factors cause only 5–10% of all human cancers, while the remaining percentage is caused by lifestyle. Plants have been used as a major source of remedies from the ancient time. The modern drug discovery and development is also dependent of medicinal plants. More than 70% of the FDA approved anticancer drugs can be traced back to their origin in plant-derived natural products, which were traditionally used as ancient remedies for various ailments. Medicinal plants can reduce or minimize the toxic side effect of chemotherapy and radiation treatment by reinforcing their cancer killing action. An attempt has been made to review some medicinal plants used for the prevention and treatment of cancer.

Key words: Cancer, Medicinal Plants, Turmeric, Side effect

INTRODUCTION:

More than 30% of cancer could be prevented by modifying or avoiding key risk factors, including: tobacco use, being overweight or obese, low fruit and vegetable intake, physical inactivity, alcohol use, sexually transmitted HPV-infection, urban air pollution, indoor smoke from household use of solid fuels¹⁻³.

Herbs and spices not only reduce the risks of developing cancer, but also act as efficient treatments for cancer. Herbs and spices are traditional cancer treatments of radiotherapy and chemotherapy enhancers, reducing the negative side effects of these therapies. Edible vegetables, fruits, spices and whole grains contain significant amounts of bioactive phytochemicals, which are warranted health benefits beyond basic nutrition to reduce the risk of chronic disease and the process of carcinogenesis⁴.

The important role of plant derived compounds is undeniable. Paclitaxel, camptothecin, combrestatin, epipodophyllotoxin and Vinca alkaloids (vinblastine, vincristine) are some examples of herbal originated cancer treatments. These are also many other plant-derived compounds that are in clinical trials for cancers^{5,6}.

MEDICINAL HERBS USED IN CANCER TREATMENT:***Curcuma longa* (Turmeric):**

Curcumin is a hydrophobic polyphenol derived from turmeric: the rhizome of the herb *Curcuma longa*. Chemically, it is a bis- α,β -unsaturated bdiketone (commonly called diferuloylmethane) that exhibits keto-enol tautomerism, having a predominant keto form in acidic and neutral solutions and a stable enol form in alkaline media. Commercial curcumin is a mixture of curcuminoids, containing approximately 77% diferuloylmethane, 18% demethoxycurcumin, and 5% bisdemethoxycurcumin. Traditionally, turmeric and other curcuminoids have been used in therapeutic preparations for various ailments in different parts of the world. Numerous therapeutic effects of curcumin/turmeric have been confirmed by modern scientific research. Herein, we present a systematic review of the clinical and experimental data on the use of curcumin in the treatment of cancer⁷.



Figure 1: Turmeric (*Curcuma longa*)⁸

***Withania somnifera* (Ashwagandha):**

Studies on *Withania somnifera* suggests that it reduces tumor cell proliferation and enhances the effectiveness of radiation therapy while potentially mitigating undesirable side effects. The two main components Withaferin A and Withanolide E of

Ashwagandha inhibit the growth of tumor showing a strong immune suppressive effect by stopping cancerous cells division. It is evident that foods rich in anti-oxidants play an important role in the prevention of cancer, cardiovascular and neurogenerative diseases⁹.



Figure 2: *Withania somnifera* (Ashwagandha)¹⁰

***Phyllanthus Emblica* L. (Amla):**

Preliminary research on *Phyllanthus emblica* in vitro demonstrates antiviral and antimicrobial properties. There is also evidence that its extracts induce apoptosis and modify gene expression in addition *Phyllanthus emblica* leaves, bark or fruit have shown potential efficacy against laboratory models of disease, such as for inflammation, cancer, age-related renal disease, and diabetes. The

potential anticancer effects of aqueous fruit extract of *P. emblica* was tested in several different human cancer cell lines such as A549 (lung), HepG2 (liver), HeLa (cervical), MDA-MB-231 (breast), SKOV3 (ovarian) and SW620 (Colorectal). *P. emblica* extract significantly inhibited the growth of several human cancer cell lines at doses of 50-100 µg/ml^{11,12}.



Figure 3: *Phyllanthus Emblica L. (Amla)*¹³

***Azadirachta indica* (Neem):**

Azadirachta indica, popularly known as neem, is abundant in India and other Asian nations. Each part of the neem tree has some medicinal property and is thus known as “wonder plant”. During the last five decades, the chemistry of the neem compounds, its pharmacological actions, clinical studies and plausible medicinal applications has been studied. Studies conducted in Malaysia, Thailand and India show that neem helps to boost antioxidant levels and thus protects against liver damage and carcinogens. All parts of the neem tree can be used such as the fruit, seeds, bark, oil, roots, and leaves. This feature highlights its potent effects on cancers. An important mechanism that has been discovered is programmed cell death, in which

cancer cells are directly killed. Research has shown that neem produces glutathione, which is a carcinogen-detoxifying enzyme and is one of the antioxidants that neem produces. Studies on neem indicate that it increases the positive effects and at the same time reduces the side effects of some traditional cancer treatments. Neem has been used and tested on quite a few cancers. These include lung, cancer, stomach, skin, prostate, breast cancer, etc. Neem based creams are used to treat skin cancer and neem based products are also taken internally to test its effect on lymphocytic cancer. Researchers are still going on to evaluate the effects of neem as an alternative treatment that can be taken alongside conventional cancer treatment¹⁴.



Figure 4: *Azadirachta indica* (Neem)¹⁵

Allium Sativum L. (Garlic):

The effects of garlic on health, with its possible preventive effects on the development of cancer in humans have been mentioned in previous reviews. In addition *A. sativum* have free radical scavenging activity, immune system modulation and direct cytotoxic effect on cancer cells. Now a day's numerous epidemiological,

clinical and laboratory studies have demonstrated the role of garlic in cancer prevention especially in relation to digestive tract cancers, including esophageal and stomach cancers. There is also promising research evaluating the use of garlic in leukemic, melanoma and neuroblastoma cell lines^{16,17}.



Figure 5: *Allium Sativum L. (Garlic)*¹⁸

Ocimum sanctum (Tulsi):

Tulsi plants have secondary metabolites with cancer protective activity through decrease of excess amounts of nitric oxide. In India Tulsi is taken as the most sacred plant. The use of *Ocimum sanctum* (Tulsi) as an aromatic plant has been well documented in Ayurveda. Several recent investigations using these extracts have indicated that *Ocimum sanctum* poses significant anti-inflammatory antioxidant, and immuno- modulatory properties. Various studies have been performed with *Ocimum sanctum* for its antibacterial, antioxidant, antiulceric, antimalarial,

antidiabetic, anti-inflammatory, antilipidemic, anticancer and immunomodulatory properties. The active components of *O. sanctum* consist of phenols and flavones that have been shown to have significant antioxidant and anti-inflammatory activity both in vivo and in vitro conditions. Overall, Tulsi is a premier adaptogen, helping the body and mind to adapt and cope with a wide range of physical, emotional, chemical and infectious stresses, and restore disturbed physiological and psychological functions to a normal healthy state^{19,20}.



Figure 6: *Ocimum sanctum (Tulsi)*²⁰

Carum Carvi L. (Caraway):

The phytochemical estimation oil of *C. carvi* collected from various countries has been widely studied. Many data indicated the essential oil is useful as an antimicrobial, antifungal, molluscidal, nematocidal, antioxidant and anti-aflatoxigenic activities, as well a potential drug used as a cancer preventing agent. In addition it is most commonly used in cases of gastric problems, flatulence and indigestion. It has been very efficient in relief of flatulent colic in infants. It is also known to boost the immune system and possesses antibacterial, antiulcerogenic, antitumor, antiproliferative and antihyperglycemic^{21, 22}.

Terminalia arjuna (Arjuna):

Terminalia arjuna (Combretaceae) is a good hypocholesteremic, hypolipidemic, anticoagulant, antihypertensive, antithrombotic, antiviral, antifungal and antibacterial agent. Many useful phytoconstituents have been isolated from *T. arjuna* which includes, triterpenoids for cardiovascular properties, tannins and flavonoids for its anticancer properties¹⁴.

Brassicaceae Mustard (B. Nigra):

Brassica vegetables are highly regarded for their nutritional value and it is a good medicinal source for many diseases. In addition phytochemicals investigation indicate oleic acid, phenolics, carotenoids, selenium, glucosinolates and vitamin C present in brassicaceae mustard seed, and offer broad-spectrum support for caring against the ubiquitous cancer. Mustard leaves have been reported to possess many bioactive substances and antioxidant properties. Earlier reviews appeared dealing with bio-cidal, bio-herbicidal, anti oxidant, anti cancer activities of glucosinolates and their products from Brassicaceae^{23, 24}.

AYURVEDIC MEDICINE FOR THE TREATMENT OF CANCER:

Paclitaxel is significantly active against ovarian cancer, advanced breast cancer, small and non-small cell lung cancer. Camptothecin, isolated from the Chinese ornamental tree *Camptotheca acuminata* Decne (Nyssaceae), was advanced to clinical trials by NCI in the 1970s but was dropped because of severe bladder toxicity. Topotecan and irinotecan are semi-synthetic derivatives of camptothecin and are used for the treatment of ovarian and small cell lung cancers, and colo-rectal cancers, respectively. Epipodophyllotoxin is an isomer of podophyllotoxin which was isolated as the active anti-tumor agent from the roots of *Podophyllum* species, *Podophyllum peltatum* Linnaeus and *Podophyllum emodi* Wallich (Berberidaceae). Etoposide and teniposide are two semi-synthetic derivatives of epipodophyllotoxin and are used in the treatment of lymphomas and bronchial and testicular cancers. Homoharringtonine isolated from the

Chinese tree *Cephalotaxus harringtonia* var. *drupacea* (Cephalotaxaceae), is another plant-derived agent in clinical use. A racemic mixture of harringtonine and homoharringtonine has been used successfully in China for the treatment of acute myelogenous leukemia and chronic myelogenous leukemia. Ellipticine a derivative of ellipticine, isolated from a Fijian medicinal plant *Bleekeria vitensis* A.C. Sm., is marketed in France for the treatment of breast cancer²⁵.

CONCLUSION:

Plant extracts and their bioactive compounds present in them which are responsible for anticancer activity have to be screened for their valuable information. 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. 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. A number of promising agents such as flavopiridol, roscovitine, combretastatin A-4, betulinic acid and silvestrol are in clinical or preclinical development. With the rapid identification of new proteins having significant regulatory effects on tumor cell cycle progression, and their conversion into targets for high throughput screening, molecules isolated from plants and other natural organisms are proving to be an important source of novel inhibitors of the action of these key proteins, and have the potential for development into selective anti-cancer agents.

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