

A REVIEW: HERBS USED AS ANTICANCER AGENTS

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ABSTRACT

Herbs are the plants which will have desirable odour, taste and other medical uses. Anti-cancer agents are effective in cancer treatment. Here an attempt has been made to review some herbs used for the prevention and treatment of cancer. These herbs were found for posses anticancer, cytotoxic or antioxidant activity in various pre-clinical or clinical studies. Cancer is a disease in which body cells become abnormal and divide without control. Cancer cell may invade nearby tissues and they may spread through the blood stream & lymphatic system to other parts of the body. The search for anticancer agents from the plant sources alkaloids in earnest in the 1950s such as Vincristine, Vinblastine and the isolation of cytotoxic Podophyllotoxins will reduce white blood cell count and caused bone marrow depression in rats. Roots, leaves, stem, root, bark and fruity of the plant herbs are used in the treatment of cancer. The dietary antioxidants having anti carcinogenic property are in demand. Identification and characterization of these anti-carcinogens in the diet can be used for reducing the risk of human cancer. Tea (*Camellia thea*) an evergreen plant contains antioxidants which prevent and repair cellular damage caused by reactive free radicals. Supervitamin drinks containing a combination of *Hordeum vulgare*, *Medicago sativa* and Spirulina enhances the activity of immune cells against cancer. Mentha species containing antioxidants prevent reoccurrence of cancer.

KEYWORDS: Anticancer, Cytotoxic, Antioxidant.

INTRODUCTION

Plants have a long history of use in the treatment of cancer. In many instances, however, the “cancer” is undefined, or reference is made to conditions such as “hard swellings”, abscesses, calluses, corns, warts, polyps, or tumors, to name a few. While in past years, cancer has been regarded mainly as a group of diseases afflicting the more developed countries, the incidence of various forms of cancer is now rapidly rising worldwide.

A number of promising agents such as flavopiridol, roscovitine, combretastatin A-4, betulinic acid and silvestrol are in clinical or pre-clinical development. Numerous types of bioactive compounds have been isolated from plant sources. Several of them are currently in clinical trials or pre-clinical trials or undergoing further investigation. Combretastatins were isolated from the bark of the South African tree *Combretum caffrum* Kuntze (Combretaceae). Combretastatin A-4 is active against colon, lung and leukemia cancers and it is expected that this molecule is the most cytotoxic phyto-molecule isolated so far¹.

ANTI-CANCER HERBS

Vinca Alkaloids: The Vinca alkaloids i.e. Vinblastine (VLB) and Vincristine (VCR) isolated from the *Madagaskar periwinkle*, *Catharanthus roseus* belongs to the family “*Apocyanaceae*”. Extracts reduces the WBC count & caused bone marrow depression in rates & it was found that the treatment of mice bearing transplantable lymphocytic leukemia caused significant life extension. This led to the isolation of

VLB & VCR as the active agents. More recent semi-synthetic analogues of these agents are Vinorelbine (VRLB) and Vindesine (VDS), which will primarily used in combination with other cancer chemotherapeutic drugs for the treatment of variety of cancers. Vinblastine is used in treatment of leukemia, lymphomas, and advanced testicular cancer, breast & lung cancer. Vincristine is used in addition to the treatment of lymphomas also shows efficiency against leukemia, particularly acute lymphocytic leukemia in child hood. Vinorelbine have the activity against non-small-cell lung cancer & advanced breast cancer¹.

Podophyllotoxins: The two clinically active agent's etoposide (VM26) and teniposide (VP16-213) which are semi synthetic derivates of natural product epidophyllotoxin may be considered as being more closely linked to a plant originally used for the treatment of cancer. It will increase the cleavage of DNA. The podophyllum species (Podophyllaceae) like *Podophyllum peltatum* which is known as 'American mandrake' or 'May apple'. In India *Podophyllum emodi* used as in the treatment of skin cancers and warts. The major active constituent podophyllotoxin was first isolated in 1880¹.

Berberine: It is natural product form Chinese herbs. It will show Anti-proliferative and Anti-cancer properties. Berberine is a proto berberine alkaloid widely distributed in medical plants used in traditional Chinese prescriptions. Recent advances show that berberine exerts anticancer activities both *in vitro* and *in vivo* through different mechanisms. It shows inhibitory effects on the proliferation and reproduction of certain tumorigenic micro organisms and viruses such as Helicobacter pylori & Hepatitis B viruses. Transcriptional regulation of some oncogene & carcinogenesis related gene-expression & interaction with both DNA and RNA are also well documented. These actions together with the regulation of reactive oxygen species production, mitochondrial transmembrane potential and unclear factor Kappa B activation might underlie its Anti-proliferative & Proapoptotic effects².

Lemons Gross Soap Essential Oil - Anticancer Agents: A grass obtained from the plant *Cymbopogon citrates* belongs to the family citronella, lemon grass as an herb has been used for centuries for its positive health effects. The fresh grass is used in Indigenous medicine systems around the world. Recently the essential oil has been the subject of scientific studies regarding its effects on cancer cells. Lemon grass appears to be effective as forms of Chemotherapy causing cell death to occur. The research indicates that the oil has a promising anticancer activity and causes loss in tumor cell viability by activating the apoptotic process. The studies indicate that lemon grass essential oil with its low toxicity has the potential of being an inexpensive, alternative treatment in the future^{3,4}.

HERBS USED AS ANTI-CANCER AGENTS IN CHINA

The aqueous extracts of the plant herbs were evaluated for their Anti-proliferative activity on eight cancer cell lines as well as on normal human mammary epithelial cells are, *Anemarrhena asphodeloides*, *Duchesnea indica*, *Gleditsia sinensis*, *Ligustrum lucidum*, *Rheum palmatum*, *Rubia cordifolia*, *Scutellaria barbata*, *Uncaria rhynchophylla*, *Vaccaria segetalis*. Most of these types of herbs show inhibitory effect on growth and only two show activity against normal mammary epithelial cells. Among human cell lines, cell type specificity was observed indicates potential use of traditional Chinese medical herbs as Anti-neoplastic agents⁵.

Flavonoids:

More than 4000 distinct flavonoids have been identified in fruits, vegetables & other plant food and have been linked to reducing the risk of cancer and other major chronic diseases. Chemo preventive agents show their effects by delaying or reversing the process of carcinogenesis at various points. The Mechanism is divided into 1) Blocking effect 2) Suppressing effect. Flavonoids will also inhibit the enzymes which are responsible for cancer like DNA topoisomerase-I, COX-I & COX-II⁶.

Camptothecin: It is isolated from Chinese tree, *Camptotheca acuminata* which will undergo continual structure modification aimed to develop more useful chemotherapeutic agent, used in treatment of gastric, rectal, colon & bladder cancers. The naturally obtained Camptothecin and their synthetic derivatives of 9-amino Camptothecin, topotecan. & irinotecan showed potent antitumor and DNA topoisomerase - I inhibitory action⁶.

ANTI- CANCER PLANTS

Wheat Grass: It is known as wholesome food and the king of alkaloid foods as it is high in alkalinity that helps to fight off acidic body. It contains chlorophyll which is having similar structure of hemoglobin, known as Green blood. It increases production of hemoglobin that Kills cancer by getting more oxygen. Selenium, superoxide dismutase (SOD) and abscisic acid are other anticancer agents present in this. Since an acidic body is a magnet of chronic diseases, taking wheat grass helps to prevent cancer by balancing the P^H and bring it to the desired alkalinity level in our body⁷.

Sea-Buckthorn: It acts by enhancing immune system which contains very high amounts of antioxidant called carotenoids. Sea-buckthorn prevents the growth of cancer cells and also preventing free radical oxidation. Seeds are in rich of unsaturated fatty acids which is good for vascular system. Fruits pulp has high vitamin E responsible for the potent anticancer properties.

Lingzhi: Used in Japan, it is a fungus known as Herb of deathlessness, Herb of longevity and Celestial herb. It has been praised for its promoted vitality and longevity. Lingzhi (*Ganoderma lucidum*) is a mushroom i.e. rich in beta- D- glucose (using water- alkali extract) that have a antitumor activities which currently used as an adjunctive in treatment of reducing side effects of chemotherapeutic agents⁸.

Amalkai: It is an Ayurvedic plant, known as a mother of Healing system. It contains vitamin C and superoxide dismutase (SOD) and other anti-oxidants that fight off damaging free radicals to prevent cancer. It is also rich in polyphenols, tannin, Bio-flavonoids and amino acids⁹.

Garlic: It has anticancer compound called dually sulfide. Raw- uncooked garlic i.e. chopped has much more potent anticancer effect than garlic supplements¹⁰.

Ginger: Zingiber officinale belonging to family Zingiberaceae contains pungent ingredients in which gingerol and pardol have shown antitumor promotional and Anti-proliferative effects.

Aloe: *Aloe Vera* and other species of aloe contain aloe emodin which activates the macrophages to fight cancer. *Aloe vera* also contains acemannan which enhances the activity of immune cells against cancer.

CONCLUSION

The present review summarises plant-derived botanical and dietary supplements which are widely prescribed world wise and are considered natural, safe, and beneficial. Interest has revived recently in the investigation of medicinal plants to identify novel active phytochemicals that might lead to drug development as anticancer drugs derived from research on plant antitumor agents. Induction of apoptosis is commonly reported among emodin and aloe-emodin, which involve disruption of mitochondria membrane potential, cytochrome c release, and activation of caspase 3. Emodin and aloe-emodin were also able to induce cell-cycle arrest, involving an increase in p53 expression level and accompanied by upregulation of p21.

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Table 1: Phytopharmaceuticals and their natural sources

Phytopharmaceuticals	Natural sources
Bryostatin	Macrolide from bryozoans
Rhizoxin	Fungal metabolite
Camptothecin	Dried stem wood of <i>Camptotheca acuminata</i> decne (Nyssaceae)
Podophyllotoxins (etoposide, tonoposide)	Dried rhizomes and roots of <i>Podophyllum hexandrum</i> emodi (Berberidaceae)
Colchicine	Dried ripe seeds of <i>Colchicum luteum</i> (Litiase)
Vincristine & Vinblastine	Dried whole plant Apocyanaceae families
Lemon grass oil	Leaves and arial parts of the <i>Cymbopogon flexuosus</i> <i>Cymbopogon citrates</i> (Gramigne)
Taxol	<i>Taxus baccata</i> - leaves, roots and bark of the plant, <i>Taxus brevifolia</i> - stem bark, <i>Taxus Canadensis</i> - leaves & roots, <i>Taxus cuspidate</i> – leaves.
Turmeric / Curamin	Dried as well as fresh rhizomes of the plant <i>Curcuma wenyujin</i> <i>taxily</i> , <i>Zingiberaceae</i> .
Gloriosa	Dried rhizome & root of <i>Gloriosa superba</i> (Liliaceae)

Table 2: Herbs used as Anti Cancer agents in Chhattisgarh

S. No.	Name of the plant & Family	Parts used	How to use
1	<i>Abrus precatorius</i>	Roots and leaves	Leaves decoction, flowers internally and aqueous extract of roots used in treatment of blood cancer.
2	<i>Acacia nilotica</i>	Stem and root barks	Decoction stem and root barks is used
3	<i>Alangium salvifolium</i>	Roots, bark and fruits	Fruits - lung cancer. Bark decoction / boil the fresh bark in base oil to prepare special oil is considered beneficial for the cancerous wound.
4	<i>Curcuma species</i>	Rhizome	Both internally and externally for cancer treatment
5	<i>Mangifera indica</i>	Leaves & Bark	The leave of Aursa (<i>Adhatoda vasica</i>) Kukurmutter (<i>Blumea lacera</i>) and chirchita (<i>Achyranthes aspera</i>) are mixed in equal proportion. The leaves are taken in double amount of this combination & mixed thoroughly. The combination is burnt & the patients are advised to inhale the fumes for lung cancer.
6	<i>Wrightia tinctoria</i>	Bark, leaves, flowers	Bark in form of decoction flowers for breast cancer.

Table 3: Phytochemical used as Anti cancer agents and their mechanism of action

S. No	Compound	Mechanism of action
1	Cytarabine	Inhibition of DNA synthesis
2	Bryostatin 4	Activation of PKC
3	Dolastatin 10	Inhibition of Micro tubules and tubules dependent GTP hydrolysis & pro apoptotic process
4	Ectein ascidine 743	Alkylation of DNA
5	Aplidine	Inhibition of Cell- Cycle progression
6	Halichondrin. B	Interaction with tubulin
7	Discodermolide	Stabilization with tubulin
8	Cryptophycin	Hyper phosphorylation of BCI-2
9	Auristatin	Auristatin PES have action in blocking blood supply to tumor vasculature