

Some Important Anticancer Herbs: A Review

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Abstract:

With an increasing number of cancer patients seeking an improved quality life, complementary and alternative therapies are becoming more common ways to achieve such improvements. India is the largest producer of medicinal plant and is rightly called the “Biotechnical Garden of the world”. In recent years many herbal drugs are developed which having less side effects than allopathic drugs. In this review article we have discuss some of the herbs and their active constituents having anticancer and other activities. Therefore, this study aimed to collect the result of herbal drug studies relating to concurrent use of the drugs and their active ingredients in the therapies.

Keywords:Cancer, biotechnical garden, herbal drugs, anticancer activities

Introduction:

Cancer is a major public health disease in both developed and developing countries. It is an abnormal growth of cells in body that can cause death. Cancer is the leading death causing diseases reported by United States of America. Deaths due to various types of cancer were mentioned in the World cancer report 2016. Major deaths causing cancer were reported due to lung, liver, stomach, colorectal and breast. It has reported that more than 1 million deaths due to lung cancer, 745,000 deaths in liver cancer, 723,000 deaths in stomach cancer, 694,000 and 521,000 deaths were occurred due to colorectal and breast cancer, respectively [1]. The process in cancer involves irregular cellular growth, by the development of a network of new blood capillaries, in other words, angiogenesis, and triggered by various signals from cancer tissues which include hypoxia, acidic pH, hypoglycemia, mechanical stress, inflammatory responses and mutations. Because of complexity in genetic and phenotypic levels, cancer exhibit a diverse clinical mechanism and drug. [2] A large number of medicinal plants act as anticancer herbs in experimental and/or clinical cancers/tumours of various organs. Some of those cancers are sarcoma, leukaemia, lymphoma and carcinoma. [3-4] Since ancient time, herbal remedies and natural products are being used to cure the diseases. As compared to allopathic system, the herbal remedies have thousands of constituents that all work concurrently against the diseases. [5]

Anti-cancer herbs:

1. Aegelmarmelos:



Common name: Bel

Family: Rutaceae

Lupeol, isolated from pulp and seeds of *A. marmelos*, show strong anticancer activity against breast cancer, malignant lymphoma, malignant melanoma, malignant ascites and leukaemia. *A. marmelos* also show significant antioxidant activity and minimize side effects of chemotherapy and radiotherapy.

Other than anti-cancer it also shows antidiabetic activity, anti-hyperlipidaemic activity, and anti-oxidant activity.

The extract of aegel marmelos possesses anti-proliferative activity on MCF7 and MDA-MB-231 breast cancer cell lines. (14)

2. *allium cepa* linn:



Common name: Onion

Family: Liliaceae/ Alliaceae

Diallyl disulphide, quercetin flavonoid, allicin, allin and vitamins (C, E), isolated from bulb of *A. cepa*, detoxify carcinogen, inhibit *Helicobacter pylori* and arrest cell cycle from S to G2M phase. Diallyl disulphide inhibits stomach cancer, coma and quercetin may cure lung and other cancer. (6) It also shows antifertility activity. (7)

Gathering evidence indicates that individuals who consume copious amounts of onion, their susceptibility to cancer at various organ sites is depleted. Polyphenolics such as flavonoids found in onion are partially responsible for this beneficial effect. In addition, organosulfur compounds (e.g., cysteine, S-methyl cysteine, diallyl disulfide and diallyl trisulfide) content of onion play a vital role in cancer chemoprevention as several studies are showing preventive effects of these compounds against liver, stomach, colorectal and breast cancers. Moreover, onion, due to high-selenium content, can prevent some cancer occurrence without resulting in an excessive accumulation of tissue selenium, a concern associated with standard selenium compounds. (15)

3. *allium sativum* linn



Common Name: Garlic

Family: Liliaceae/ Alliaceae

Sulphur compounds (diallyl sulphide, diallyl disulphide, allyl propyl disulphide) and allicin have been isolated from *A. sativum* bulb. Allicin suppressed growth of stomach, liver, colon, breast and endometrium cancers; while sulphur compounds inhibit the cancer cells. It also shows other activity such as antifungal activity, antiviral activity, antibacterial activity, anti-inflammatory activity, anti-helminthics activity, antihyperglycemic activity, etc. (8)

4. *Barbadensis* mill



Common Name: Indian Aloe

Family: Liliaceae

Acemannan (a polysaccharide) secluded from root, pulp, leaves or aerial parts of *A. vera* stimulates immune system and possesses significant anticancer activity. Emodin and lectins secluded from this herb exhibit strong anticancer and immunoenhancing activities. Aloe- emodin inhibits growth and spread of stomach cancer and various sarcomas by inducing apoptosis. Aloe- emodin has particular anticancer activity against neuroectodermal tumours. Alexin B isolated from *A. vera* possesses strong anticancer activity against leukaemia. Its polysaccharides have strong immunoenhancing and anticancer properties. *A. vera* contains "super carbohydrates" that defend against many cancers, particularly the liver cancer. This herb prevents genesis of cancer, regresses growth of cancer and prevents metastasis of cancer. *A. vera* stimulates immune system response of the body by activating macrophages and releasing cytokines such as interferon, interleukin and tumour necrosis factor. *A. vera* has an extraordinary antioxidant profile and reduces side effects of chemotherapy and radiotherapy. Its leaves contain glycosides-anthracene derivatives hydroxyanthraquinone derivatives or hydroxyanthraquinone derivatives. It also possesses antimicrobial activity. (9)

The flavonoids isolated from the plants *Aloe vera*, *Mimosa pudica* and *Phyllanthus niruri* were tested for their in vitro cytotoxicity against MCF-7, Human breast cancer cell line. (16)

5. *Alpinia Galanga*



Common Name: Barakulanjan

Family: Zingiberaceae

Acetoxy-chavicol-acetate, isolated from *A. galanga*, shows noticeable anticancer activity against cancers of breast, lung, stomach, colon and prostate, multiple myeloma, and leukaemia. Pinocembrin isolated from this herb inhibits growth and spread of colon cancer by arresting cell proliferation and inducing apoptosis. Galangin, a flavonoid isolated from *A. galanga*, possesses strong anticancer, antioxidant, antimutagenic and anti-inflammatory properties. Galangin protects against breast and prostate cancers. It also possesses activity such as antifungal, anti-inflammatory, antidiabetic, hepatotoxicity, anti-oxidant activity and anti-ulcer property.(10)

6. *Aphanamixis polystachya*



Common Name: Harinhara/ Amoora

Family: Meliaceae

Amooranin (a triterpene acid), isolated from *A. polystachya* stem bark, inhibits growth and spread of breast and cervical cancers by arresting G2/M phase of the cell cycle and by inducing apoptosis. Amooranin and its derivatives are efficacious in both chemotherapy-sensitive and chemotherapy-resistant cancers. Amooranin has the ability to overcome (reverse) or multidrug-resistance in breast cancer, colon cancer and leukaemia. (11)

7. *Azadirachta indica*



Common Name: Neem

Family: Meliaceae

Stem bark, leaf and flower of *A. indica* contains about 40 different active principles, known as liminoids, which exhibit immunoenhancing, antioxidant, antimutagenic, anticancer and antimetastatic, anti-inflammatory, hepatoprotective, antiulcer, antifungal and antiviral activities. Liminoids regress growth and spread of various cancers, e.g., cancers of breast, lung, liver, stomach, prostate and skin. Nimbolide, a natural triterpenoid, isolated from *A. indica* leaves and flowers suppressed growth and spread of various cancers, including colon cancer, malignant lymphoma, malignant melanoma and leukaemia by persuade apoptosis (programmed cell death), a process that directs the body's immune cells to identify and destroy cancer cells. Nimbolide also avoid metastasis of cancer. Ethanolic extract of *A. indica* suppressed growth and spread of prostate cancer by persuade apoptosis and its antiandrogenic effect. This herb reduces side effect of chemotherapy and radiotherapy. *A. Indica* also contains polyphenolic myoinositol, dexamethasone, tannin, β sitosterol, nimbin, quercetin and carotene.

During the last 20 years, researchers in India and abroad have collected convenient data to suggest that the onset of cancerous phenotype due to certain mutagens and pro-carcinogens may be treated effectively by extracts obtained from several parts of the neem tree. (17)

8. Curcumina Longa



Common Name: Haldi/ Turmeric

Family: Zingiberaceae

Curcumin (Diferuloyl methane) and curcuminoids, isolated from *C. longa* rhizome (tuber) suppress cancer at every step, i.e., initiation, growth and metastasis. Curcumin (pigment colour of haldi) arrests the cancer cells proliferation in G2/S phase and induces apoptosis (programmed cell death). Curcumin has shown anti-inflammatory, antitumour and antioxidant properties. It suppressed angiogenesis, an influential step in the growth and metastasis of cancer. Curcumin and genistein (isolated from Glycine max) act synergistically to inhibit growth and spread of oestrogen-positive breast cancer. Curcumin acts even in multidrug-resistant breast cancers. Curcumin suppresses adhesion of cancer cells, thus avoid metastasis. It inhibits growth and spread of various cancers, including that of breast, lung, oesophagus, liver, colon, prostate, head, neck and skin. (11)

Curcumin suppressed breast cancer cell proliferation by the following mechanisms: i) Inducing cell cycle arrest and p53-dependent apoptosis; ii) altering expression of signalling proteins, including Ras, phosphatidylinositol-3-kinase (PI3K), protein kinase B (Akt), mammalian target of rapamycin (mTOR) and Wnt/ β -catenin; iii) downregulating transcription factors; and iv) inhibiting tumour growth and angiogenesis. (18)

9. *Berberis vulgaris*

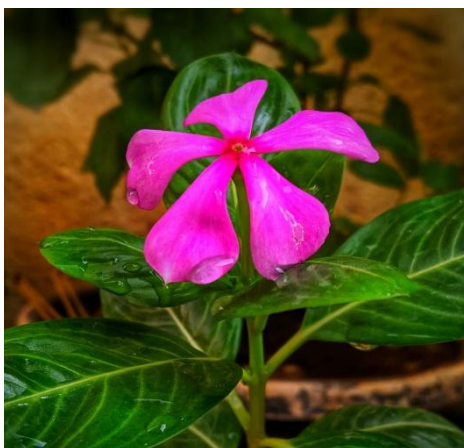


Common Name: Kashmal

Family: Berberidaceae

B. vulgaris root bark contains berberine, berbamine, chelidonic acid, citric acid, columbamine, hydrastine, isotetrandrine, jacaranone, magno florine, oxycanthine and palmatine. Berberine (an isoquinoline alkaloid) possesses anticancer, immunoenhancing, antioxidant and anti-inflammatory properties. Berberine arrests cancer cell cycle in G1-phase and induces apoptosis, and hence it possesses strong anticancer activity against prostate cancer, liver cancer and leukaemia. Berberine interferes with P-glycoprotein in chemotherapy-resistant cancers. It also increases the penetration of some chemotherapy drugs through the blood-brain barrier, thereby enhancing their effect on intracranial tumours. *B. vulgaris* root bark contains three phenolic compounds, viz., tyramine, cannabisin-G and lyoniresinol. Cannabisin-G and lyoniresinol exhibit strong antioxidant activity. Cannabisin-G protects against breast cancer. *B. vulgaris* also suppressed growth of stomach and oral cavity cancers. It also possesses Central nervous system effects, cardiovascular effect, immune system effect, and endocrine effect.(12)

10. *Catharanthus roseus*



Common Name: Sadabahar

Family: Apocynaceae

roseus whole plant contains more than 70 alkaloids, known as vinca alkaloids such as vinblastine, vincristine and their derivatives. Vinca alkaloids arrest cancer cell proliferation by binding to tubulin in the mitotic spindle, i.e., they inhibit microtubule formation and arrests mitosis in metaphase Vinca alkaloids also induce apoptosis (programmed cell death) and inhibit angiogenesis (formation of new blood vessels). These alkaloids inhibit growth and spread of various cancers, including breast, ovary, cervix, lung, colon, rectum, kidney and testis cancers, neuroblastoma, Hodgkin's disease, malignant lymphoma, multiple myeloma, various sarcomas, rhabdomyosarcoma, and leukaemia. It also

possesses antioxidant enzyme activities, anthelmintic activity, antihyperglycemic activity, antidiabetic activity, in vivo antiarrhythmic activity and antimicrobial activity.(13)

Vinca alkaloids also called as mitotic spindle poisons they inhibit assembly of the spindle forms from microtubules, there by inhibiting mitosis in cell cycle. Vinca alkaloids hence successfully prevent cancer cells from dividing. Different Vinca alkaloids have their own unique properties. (19)

Conclusion:

This review highlights the understanding of important herbal drugs and their constituents in cancer therapy. Several Studies have shown the great potential of herbal product as adjuvant therapy to enhance synergy, reduce chemotherapy- induced toxicity, suppress drug resistance, provides quick drug action and enhance quality life of patient.

The aim of herbal treatment is usually to produce persisting improvement in wellbeing. Anticancer agents derive from the plant source have largely contributed to the development of new drug. Screening of medicinal plants for anticancer activity provides a huge space for development of strong anticancer agents. This review provides the information about medicinal plants with their secondary metabolites that show anticancer activity. So, it can be concluded that herbal medicinal plant and its derivative are active against different type of cancers.

Abbreviations:

A. Marmelos = Aegel Marmelos

MCF7 = Michigan Cancer Foundation-7

A. Ceba = Allium Ceba

A. Sativum = Allium Sativum

A. Vera = Aloe Vera

A. Galanga = Alpinia Galanga

A. Polystachya = Aphanamixis Polystachya

A. Indica = Azardirachta Indica

C.Longa = Curcumina Longa

B. vulgaris = Berberis Vulgaris

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Author Contribution:

Ms. Manisha Gayake conceived the idea outline the content; Ms. Ashwini Nalavade and Mr. Sanket Mandlik collected information, review the literature and develop the manuscript; Ms. Shivani Nage and Ms. Bhumika Kudale edited the manuscript. All authors read and approved the final manuscript for submission.

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Availability of data and materials

The datasets used for the current study were collected from the journals, by using Google Scholar, Science Direct, PubMed, Springer link, JSTOR, etc. Conference papers, books were also used in this study.

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