

COMPLEMENTARY AND ALTERNATIVE APPROACH TO HEAL CANCER: A REVIEW

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Abstract: Cancer is the dreadful and life-threatening disease characterized by irregular proliferation of cells and it is considering the main health issue of equally developed and developing states. After cardiovascular disease, cancer is one of the second foremost diseases of mortality. In view of high death rate related with malignant growth and on account of adverse and toxic reactions of its chemotherapy and radiation treatment, people have a preference to use natural plant products for treatment of cancer. Plants were being utilized for treating diseases since the beginning of human civilization. Herbs have played a key role in the prevention and treatment of cancer. The phytochemical investigation of the medicinal plants has contributed to some extent in the discovery of new anticancer drugs. This article has been made to evaluate some therapeutic plants utilized for the treatment of cancer and also gives the information about medicinal plants with anticancer property, which are utilized by people everywhere throughout the world. This review can help the researchers to investigate herbs to additional level and its use in different more diseases and toxicity studies along with clinical trials.

Keywords: Anti-cancer activity, medicinal plants, efficacy, literature review

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INTRODUCTION

Cancer is the dreadful disease caused by abnormal proliferation of cells in our bodies that usually invades in the adjacent tissues and destroys these tissues (1). These cells are appearing because of certain variation in the body and by correcting this variation, the cancer must be healed. Billions of people every year are detected with cancer and it is the subsequent foremost cause of mortality in America (2). Hence, about 3500 million people annually all over the world killed by cancer (3). In both developing and developed countries, cancer is one of the most serious medical issues. Along with the most recognized (breast, stomach, lung, liver, colorectal) cancers categories, lung cancer is the most well-known cancer recognized in men and breast cancer is the mainly well-known cancer recognized in women. In 2008, round about 12.7 million people were diagnosed with cancer and 7.6 million people deceased from the cancer during the same year. Stomach, breast,

lung and colorectal cancers represented for two-fifths of the cancers total cases recognized throughout the world. It is estimated that more than 70% of all deaths caused by cancer happened in low- and middle-income countries. Mortality rate because of cancer is constantly increase. It has been proposed that in the year 2030, there will be 11.5 million deaths and 27 million new cancer cases and 17.5 million cancer deaths are expected to happen in the world by 2050 (4).Cancers more than 30% are caused by change environmental and behavioural risk factors, including dietary factors, obesity, alcohol and tobacco, physical inactivity, lacking standard use of fruit and vegetable, occupational risks including exposure to ionizing and non- ionizing radiation and chronic infections from HBV, HCV, Helicobacter pylori, and some types of human papilloma virus. Conservative cancer treatments include *radiotherapy*, chemo-therapy, psychosocial support and

surgery. At present, the mainly usually utilize cancer chemotherapy comprises antimetabolites, antitumor, alkylating agents, antibiotics, natural anticancer agents and platinum analogy. Though, because of the rising rate of death related with cancer and harmful effects of cancer radiation therapy and chemotherapy (5) an alternative solution of allopathic medicine is the medicinal plant preparations use to control the subtle disease nature. In clinical trials, many medicinal plants have been evaluated and are currently being studied phytochemically to identify their antitumour effects against different type of cancers. Thus, patients of cancer who just got weakened with this disease, who are more loaded by lethal effects of chemotherapy, have now turned to look for help from the complementary and alternative medicine in suspense for a better cure (6).

MEDICINAL PLANTS USED TO TREAT CANCER

For thousands of years, plants have been used for the treatment of various diseases. Terrestrial plants have been utilized for therapeutic purpose in China, Egypt, Greece and India from ancient times and large numbers of current drugs were derived from those. From the Sumerians and Akkaidians, the first written documents on the medicinal plants uses come into sighted in about 2600 BC (7). In the last decade, plant-based medicine has developed into a subject of global importance, creating an influence on both world health and international trade. In maintaining the health system of large proportions of the world's population, medicinal plants continue to play a central role predominantly in developing countries where natural medicine has an extensive and constant history of use (8). Constant utilization of plant-based medicine by a huge part of the population in the developing countries is because of the high expenditure of Western Pharmaceuticals and Healthcare (9). Within the human diseases healed with herbal medicines is

cancer, which is presumably the mainly significant genetic disease, chief cause of death in a majority of the cases (8). Because of high mortality rate due to cancer and harmful effects of chemotherapy and radiation therapy, several cancer patients look for alternative or complementary methods of treatment (8). Plants have been used for treating several diseases of human and animals since dawn of civilization. They maintain the health of persons, and alleviate diseases, including cancer without causing toxic effects. In clinical use, more than 50% of all modern drugs are of plant derivative and several of which have the capability to control cancer cells (10). A recent survey report shows that more than 60% of cancer patients use vitamins or herbs as therapy (8). In this review, attempt has been made to compile several of the plants containing anticancer activity for different cancer types. This review can help the researchers to investigate herbs to advance level and its utilization in different other disease and toxicity studies along with clinical trials.

MEDICINAL PLANTS HAVING ANTICANCER ACTIVITY

1. *Camellia sinensis*

Family: Theaceae. Parts used: Leaves. Chemical constituents: It possesses caffeine, linoleic glyceride, oleic glyceride, naringenin and catechins. Medicinal uses: It is beneficial in rheumatoid arthritis treatment. Pharmacological activity: It is anticancer, gastroprotective and immunomodulant. Study: Ravindranath et al (2006) reported that epicatechins refined from *Camellia sinensis* differentially restrain gender dependent human cancer cell lines growth (11).

2. *Aegle marmelos*

Family: Rutaceae, Parts used: Roots, fruit, stem and leaves. Chemical constituents: It contains lignan-glucosides, coumarin, marmin, umbelliferone, skimmianine tannin, phlobotanninsaegeline, ordinal and ethyl cinnamamide. Medicinal uses: It is

beneficial in jaundice and cancer treatment. Pharmacological activity: It is anti-inflammatory, laxative, diuretic, stomachic, digestive and anticancer. Study: Vijaya et al reported the antiproliferative and antioxidant activity of *Aegle marmelos*(Linn.) leaves in Dalton's lymphoma ascites transplanted mice (12)

3. *Boswellia serrata*

Family: Burseraceae, Parts used: Gum. Chemical constituents: It possesses glycyrrhetic acid, oleanolic acid and boswellic acid. Medicinal uses: It is beneficial in osteoarthritis and other inflammatory diseases of joints. Pharmacological activity: It has adhesive, anti-inflammatory and anticancer properties. Study: Yadav et al reported that Boswellic acid inhibits growth and metastasis of human colorectal cancer in orthotopic mouse model by down regulating inflammatory, proliferative, invasive and angiogenic biomarkers (13).

4. *Curcuma longa*

Family: Zingiberaceae. Parts used: Rhizome. Chemical constituents: It contains zerumbone, cineole, alpha zingiberene, alpha curcumene and germacrene. Medicinal uses: It is used in arthritis. Pharmacological activity: It is aromatic, anti-inflammatory and antiseptic. Study: Kuttan et al reported the potential anticancer property of *Curcuma longa* (14). Park et al reported the cancer chemoprotective effects of *Curcuma longa* (15).

5. *Alternanthera philoxeroides*

Family: Amaranthaceae. Parts used: Aerial parts. Chemical constituents: It contains phytol, cycloeucalenol, 24-methylenecycloartanol, alpha spinasterol, beta sitosterol, oleanolic acid and pheophytin. Medicinal uses: It is beneficial in cancer treatment. Pharmacological activity: It has anti-tumor, febrifuge and antioxidant properties. Study: Fang et al reported the antitumor constituents from *Alternanthera philoxeroides* (16).

6. *Solanum pseudocapsicum* L.

Family: Solanaceae. Local name: Golemirchi. Parts used: Leaves and roots. Chemical constituents: It has aldehydes, terpenoids, fatty acids, beta and delta elemene and hexadecanoic acid. Medicinal uses: It is beneficial in cancer treatment. Pharmacological activity: It is antitumor. Study: Alcoholic extract of roots and stem of the lint possess antibacterial activity. Badami et al reported that total alkaloid fraction of *Solanum pseudocapsicum* leaves has antitumor property (17).

7. *Fumaria indica*

Family: Fumariaceae. Local name: Papra. Parts used: Leaves and flowers. Chemical constituents: It possesses sterol, tannins, saponins, flavonoids, alkaloids and carbohydrates. Medicinal uses: It is beneficial in anxiety, liver diseases, cancer and inflammation. Pharmacological activity: It is diuretic, sedative, stomachic, cholagogue, laxative, diaphoretic, diuretic, anthelmintic, aperients and diaphoretic. Study: Hussain et al reported the chemopreventive activity of *Fumaria indica* against N-nitrosodiethylamine and CCl₄induced hepatocellular carcinoma in Wistar rats (18).

8. *Stinging nettle*

Family: Urticaceae. Parts used: Seeds and herb. Chemical constituents: It possesses linoleic acid, lignin, kaempferol, formic acid, choline, histamine, caffeic acid, acetophenone and agglutinin. Medicinal uses: It is beneficial in lumbago and osteoarthritis. Pharmacological activity: It is anti-inflammatory, antirheumatic and immunosuppressant. Study: Konrad et al described the antiproliferative effect on human prostate cancer cells by a stinging nettle root *Urticadioica* extract (19).

9. *Zingiber officinale*

Family: Zingiberaceae. Parts used: Rhizome. Chemical constituents: It possesses zingiberene, zingiberol and shagaol. Medicinal uses: It is beneficial in rheumatoid arthritis, cancer, migraine, gout and inflammatory diseases.

Pharmacological activity: It is analgesic and anti-inflammatory. Study: Haniadka et al described the efficacy of *Zingiber officinale* as an anti-emetic in cancer chemotherapy (20).

10. *Cynodon dactylon*

Family: Poaceae. Local name: Khabal, Dub. Parts used: Leaves and stem. Medicinal uses: It is beneficial in piles, wounds, hysteria, epilepsy, chronic diarrhea and dysentery treatment. Pharmacological activity: It has astringent and antiseptic properties. Study: Albert et al reported the chemopreventive activity of *Cynodon dactylon* (L.) Pers. extract against DMH-induced colon carcinogenesis in experimental animals (21).

11. *Juglans regia* L.

Family: Juglandiaceae. Local name: Akhor, Akhori. Parts used: Bark. Medicinal uses: It is beneficial in cancer, cardiovascular disorders and inflammation. Pharmacological activity: It is anthelmintic. Study: Kaur et al reported the antimutagenic and antiproliferative activities of *Juglans regia* L (22).

12. *Mallotus philippensis*

Family: Euporbiaceae. Local name: Kamila. Parts used: Stem bark. Medicinal uses: It is beneficial in intestinal worms. Pharmacological activity: It is an antheromatic, cathartic and styptic. Study: Tanaka et al reported the potential antitumor-promoting activity of 3 α -hydroxyD:A-friedooleanan-2-one from the stem bark of *Mallotus philippensis* (23).

13. *Bryophyllum pinnatum* Lam

Family: Crassulaceae. Parts used: Leaves. Chemical constituents: It possesses quercetin, diabinoside, kaempferol, glucoside, ferulic, coumaric and fatty acids. Medicinal uses: It is applied in wound, boils, edema and arthritis. Pharmacological activity: It is antineoplastic and antibacterial. Study: Mahata et al reported the anticancer property of *Bryophyllum pinnatum* (Lam.) Oken leaf on human cervical cancer cells. This investigation

explains its use as herbal drug in cancerous diseases (24).

14. *Catharanthus roseus*

Family: Aponaceae. Parts used: Whole plant. Chemical constituents: It contains coronaridine, methoxytabersonine, tetrahydroalstinine, ajmalicine, vindorosine, catharanthine, mitraphylline, vindoline, vincristine, vinblastine, urosolic acid, leurosine, isoleurosine and previne. Medicinal uses: It is prescribed to treat cancerous diseases. Pharmacological activity: It is antihyperglycemic and anticancer. Study: Asano et al reported the anti-tumordimericindole alkaloids in *Catharanthus roseus* (25).

15. *Clerodendrum inerme*

Family: Verbenaceae. Parts used: Leaves and roots. Chemical constituents: It possesses resins, gums, sterols and triterpenoids. Medicinal uses: It is beneficial in cancer, viral diseases, inflammation and bacterial infections. Pharmacological activity: It has tonic, febrifuge, mucilaginous, fragrant, analgesic and antimicrobial property. Study: Manoharan et al reported the anticarcinogenic effects of *Clerodendron inerme* on 7, 12-dimethylbenz (a) anthracene-induced hamster buccal pouch carcinogenesis. This investigation explains its use as herbal anticancer drug (26).

16. *Ruta graveolens*

Family: Rutaceae. Parts used: Aerial parts. Chemical constituents: It contains glucosiderutin and an essential oil. Medicinal uses: It is beneficial in nervousness, hysteria, dizziness and respiratory tract infections. Pharmacological activity: It has anti-inflammatory property. Study: Preethi et al reported the anti-tumour activity of *Ruta graveolens* extract (27).

17. *Papaver somniferum* Linn

Family: Papaveraceae. Parts used: Seeds and flowers. Chemical constituents: It

contains phenylalanine, tyrosine, narcotine, narceine, papaverine, morphine, codeine, tetrahydroisoquinoline alkaloid, noscapine, sanguinarine, thiamine, riboflavin, folic acid, niacin, tocopherol, stearic acid, palmitic acid, oleic acid and linolenic acid. Medicinal uses: It is beneficial in insomnia and pain. Pharmacological activity: It is hypnotic, sedative, analgesic, astringent, aphrodisiac, tonic and hypoglycemic. Study: Aruna et al described the anticarcinogenic effects of this plant (28).

18. *Trillium pendulum*

Family: Liliaceae. Parts used: Rhizome. Medicinal uses: It is beneficial in cough, bronchial problems, hemorrhage, excessive menstruation, excessive vaginal discharge, diarrhea and dysentery. Pharmacological activity: It is antitumor. Study: Mazzio et al, (2010) described the in vitro antitumor activity of this plant (29).

19. *Hydrastis canadensis*

Family: Ranunculaceae. Parts used: Rhizome. Medicinal uses: It is used in inflammations, eczema, ringworm, erysipelas, vaginal infection, tonsillitis and other throat problems. Pharmacological activity: It is antiseptic, anticancer and antibacterial. Study: Karmakar et al, described the anti-cancer effect of this plant (30).

20. *Humulus lupulus*

Family: Cannabaceae. Parts used: Flowers. Medicinal uses: It is used in psychological disorders, sleep, gastrointestinal problems, boils, tumors, painful swelling and skin inflammations. Pharmacological activity: It is diuretic. Study: Ho et al reported the anti-cancer activity of this plant(31).

21. *Eriodictyon californicum*

Family: Boraginaceae. Parts used: Leaves. Medicinal uses: It is beneficial in bronchial congestion, dysentery, diarrhea, asthma and hay fever. Pharmacological activity: It is igestive and anti-asthmatic.

Study: Liu et al, described the anti-cancer activity of this plant (32).

22. *Asclepias curassavica* Linn.

Family: Asclepiadaceae. Parts used: Leaves. Local name: Kakatundi. Medicinal uses: It is beneficial in worms, piles, leucorrhoea, constipation, boils and swellings. Pharmacological activity: It is anticancer and laxative. Study: Anticancer activity of this plant in experimental colon cancer model has been reported (33).

23. *Solanum indicum*

Family: Solanaceae. Local Name: Badi Kateri. Parts used: Root, fruit, seed. Medicinal uses: It is beneficial in sexual disorders. Pharmacological activity: It has stimulant and analgesic effect. Study: Antitumor agents from *Solanum indicum* have been isolated (34).

24. *Ichnocarpus frutescens*

Family: Apocynaceae. Local Name: Kali-Dudhi. Parts used: Root. Medicinal uses: It is beneficial in leucorrhea, menorrhea, urinary tract infections and skin complexion. Pharmacological activity: It is antacid. Study: It has been reported that polyphenolic extract of *Ichnocarpusfrutescens* has antitumor property (35).

25. *Aloe vera*

Family: Xanthorrhoeaceae. Parts used: Leaves. Medicinal uses: It is used in wounds, skin disorders. Pharmacological activity: It has antiseptic activity. Study: Anti-tumor activity of Aloe vera against DMBA/croton oil-induced skin papillomagenesis in Swiss albino mice has been reported(36).

26. *Enhydra fluctuans*

Family: Asteraceae. Parts used: Aerial parts. Local name: Komprektujombi. Medicinal uses: It is beneficial in cancer,inflammation, bacterial infections and degenerative disorders. Pharmacological activity: It has analgesic, anticancer, antibacterial and anti-oxidant property. Study: *Enhydra fluctuans* exhibit

anticancer activity against Ehrlich's ascites carcinoma(37).

27. *Ageratum conyzoides* L.

Family: Asteraceae. Parts used: Leaves. Chemical constituents: It possesses precocene I and II, beta caryophyllene and germacrene. Medicinal uses: It is beneficial in diabetes mellitus, peptic ulcer, and cancer treatment. Pharmacological activity: It is anti-diabetic, antiprotozoal, and anticancer. Study: Anticancer activity of *Ageratum conyzoides* has been reported(38).

28. *Cassia fistula* L.

Family: Fabaceae. Parts used: Bark, leaves and fruit. Chemical constituents: It contains sugar, tartaric acid, oxalic acid and cathartic acid. Medicinal uses: It is beneficial in peptic ulcer, microbial infection, liver disorders and cancer. Pharmacological activity: It has laxative property. Study: Antitumor activity of methanolic extract of *Cassia fistula* has been reported(39).

29. *Bryonia alba* L.

Family: Cucurbitaceae. Parts used: Root. Medicinal uses: It is beneficial in dropsy, chronic rheumatism, pneumonia and dysentery. Pharmacological activity: It is resolvent. Study: Antitumor substances from *Bryonia alba* have been reported(40).

CONCLUSION

Medicinal plants sustain the health and vitality of individual and also cure different diseases including cancer without causing toxicity. These plants have immuno-modulatory and antioxidant activities which possess anticancer effect. Recently, anticancer agents separated from medicinal plants are beneficial in cancer treatment. The present review indicates the chemotherapeutic efficacy of medicinal plants. Now there is the need of the day to explore medicinal plants to more range and their utilization in different further disease and toxicity studies along with clinical trials.

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Table 1. List of medicinal plants having anti-cancer activity (28, 29, 45)

Plant	Family	Function
<i>Rheum rhabarbarum</i>	Polygonaceae	Anticancer, laxative
<i>Viola odorata</i>	Violaceae	Anticancer, antidyslipidemic and hypotensive
<i>Solanum nigrum</i>	Solanaceae	Anticancer, anti- inflammatory
<i>Capsicum annuum</i>	Solanaceae	Antibacterial, antifungal
<i>Chelidonium majus</i>	Papaveraceae	Antioxidant
<i>Boerhaavia diffusa</i> Linn	Nyctaginaceae	Anticancer
<i>Aloe arborescens</i>	Xanthorrhoeaceae	Immunomodulant
<i>Copaifera multijuga</i>	Fabaceae	Anticancer, antibacterial
<i>Maytenus ilicifolia</i>	Celastraceae	Immunomodulant
<i>Acanthospermum hispidum</i> DC	Asteraceae	Anticancer, antibacterial
<i>Anacardium occidentale</i> L	Anacardiaceae	Anticancer, antioxidant
<i>Bauhinia variegata</i>	Fabaceae	Anticancer and antiinflammatory

<i>Lawsonia inermis</i>	Lythraceae	Anticancer, antimicrobial, antifungal and wound healer
<i>Daucus carota</i>	Apiaceae	Anticancer and antihypertensive
<i>Pinus koraiensis</i>	Pinaceae	Anticancer and antihyperlipidemic
<i>Ananas comosus</i>	Bromeliaceae	Anticancer, abortifacient and hypolipidemic
<i>Khaya senegalensis</i>	Meliaceae	Anticancer, antiinflammatory and anthelmintic
<i>Acacia nilotica</i>	Fabaceae	Anticancer, antispasmodic, antihypertensive, gastroprotective and antidiarrheal
