Review Article

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ANTICANCER HERBS IN AYURVEDA: A REVIEW

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ABSTRACT
Cells are the building blocks of living things. Normal cells multiply when the body needs them, and die when the body doesn't need them. Cancer is the uncontrolled growth of abnormal cells in the body. Cancer grows out of normal cells in the body. Cancer appears to occur when the growth of cells in the body is out of control and cells divide too quickly. In the present world of increased life span Cancers account for approximately 13% of all deaths each year. In 2008 approximately 12.7 million cancers were diagnosed and 7.6 million people died of cancer worldwide. There are many reasons for this like increased pollution, altered life style and increasing anxiety levels in the psychosomatic front. In Ayurveda there is mention of a condition similar to cancerous growths, their properties, types, signs and symptoms and treatments. This paper reviews the work done on anticancer properties of some of the herbs.
Key words: Cancer, Ayurveda, Herbs, Cells

INTRODUCTION

Cancer is the uncontrolled growth of abnormal cells in the body. Cancerous cells are also called as malignant cells. Cells are the building blocks of living things. Cancer grows out of normal cells in the body. Normal cells multiply when the body needs them, and die when the body doesn't need them. Cancer appears to occur when the growth of cells in the body is out of control and cells divide too quickly. It can also occur when cells forget how to die. There are many synonyms for malignant disease such as cancer/carcinoma (malignancy of epithelial cell origin), neoplasia (new growth, includes benign disease), tumor (swelling), sarcoma (malignancy of mesothelial cell origin), Lymphoma (malignancy of lymph tissue), Leukemia (malignancy of WBC) etc. Cancer can develop in almost any organ or tissue, such as the lung, colon, breast, skin, bones, or nerve tissue. Malignancies generally arise because of mutations in the DNA of at least one cell which then no longer behaves normally.

There are many causes for cancers viz, chemicals like benzene, iodine etc, drinking excess alcohol, excessive exposure to sunlight, genetic problems, obesity, radiation, viruses etc. However, the cause of many cancers remains unknown.

According to Ayurvedic signs and symptoms of karkatarbuda are similar to cancer and the cause of it i.e karkatarbuda is vitiation of tridoshas. Though modern medicine has made vast progress in cancer treatment but the rate of side effects also making the patients to suffer a lot. Off late there has been great inclination towards natural remedies and a lot of research is being made and going on the anticancerous properties of different herbs. Here is the review of some of the works going on around the globe.

***Allium sativum* Linn:** Both water and lipid-soluble allyl sulfur compounds are effective in blocking a myriad of chemically induced tumors. Part of the protection from these compounds probably relates to a block in nitrosamine formation and metabolism.[1]

***Curcuma longa* Linn:** The effect of curcumins on different stages of development of cancer was studied[2].

***Withania somnifera* Dunal:** Antitumor and radio sensitizing effects of alcoholic root extract of *W. somnifera* and their modification by heat were studied in vivo on Sarcoma-180 grown on the dorsum of adult BALB/c mouse[3].

***Emblica officinalis* Gaertn:** Plant-derived phenolic compounds manifest many beneficial effects and can potentially inhibit several stages of carcinogenesis. In an investigation, the efficacy of *Emblica officinalis* polyphenol fraction (EOP) on the induction of apoptosis in mouse and human carcinoma cell lineses and its modulatory effect on N- nitrosodiethylamine (NDEA) induced liver tumors in rats was studied[4].

Phenolic compounds and the major components from the fruit juice of EO, branches, leaves and roots showed stronger inhibition against B16F10 cell growth than against HeLa and MK-1 cell growth[5].

***Zingiber officinale*:** In a study it has been noted that ginger supplementation suppressed liver carcinogenesis by scavenging the free radical formation and reducing lipid peroxidation [6].

***Ocimum sanctum* Linn:** Studies on biological models like fibrosarcoma cell culture, papilomas in the skin of albino mice, mice having sarcoma - 180 solid tumors etc.

provide proof for its anticancer activity[7]. Ethanolic Extract of *Ocimum sanctum* exerted cytotoxicity against A549 cells, it increased the sub-G_1 population and exhibited apoptotic bodies in A549 cells[8].

***Tinospora cordifolia* willd.Miers.Ex.hook:** A study conducted on *Tinospora cordifolia* suggests that the extract of Tinospora cordifolia has anti-tumor potential in a two-stage skin carcinogenesis mouse model[9].

***Aegle marmelos* Linn conr.:** The anticancer effect of hydroalcoholic extract of *Aegle marmelos* (AME) was studied in the Ehrlich ascites carcinoma bearing Swiss albino mice[10].

Moringa oleifera* Linn*: Bharali and colleagues has showed chemopreventive potential of *Moringa oleifera* (drumstick) extract against chemical carcinogens via the hepatic pathway[11].

***Trigonella foenum graecum* Linn:** Fenugreek seed extract induces cell death, growth inhibition and morphological change indicative of apoptosis in acute lymphoblastic leukemia[12].

***Azadirachta indica* A.juss:** Effect of aqueous extract of garlic and neem was studied and the results suggest that the modulatory effects of garlic and neem leaf on hepatic and blood oxidant-antioxidant status may play a key role in preventing cancer development at extrahepatic sites[13]. Isolated compounds from Neem have shown impressive efficacy against a wide variety of human cancer cell lines, and animal models for human cancers that include colon, stomach, Ehrlich's carcinoma, lung, liver, skin, oral, prostrate, and breast cancers[14].

***Alstonia scholaris* R.Br:** *A.scholaris* is observed to possess radiomodulatory, chemomodulatory, and chemopreventive effects and free-radical scavenging, antioxidant, anti-inflammatory, antimutagenic, and immunomodulatory activities. These properties are efficacious in the treatment and prevention of cancer[15].

***Syzygium cumini* Linn skeels:** The inhibition of tumor incidence by hydro-alcoholic extract of *S.cumini* seed was evaluated in mice. The results suggest a possible chemopreventive property of *S.cumini* against DMBA induced skin carcinogenesis in mice[16].

***Phyllanthus niruri sensu* Hook F:** A study was carried out to evaluate the anti-tumor activity of a hydro-alcoholic extract of the whole plant of *Phyllanthus niruri* in 7-9 week old male Swiss albino mice, which showed significant reduction in tumor incidence, tumor yield, tumor burden and cumulative number of papillomas as compared to carcinogen-treated controls. Furthermore the average latent period was significantly increased in the PNE treated group[17].

***Tribulus terrestris*:** In an investigation the chemopreventive potential of aqueous extracts of the root and fruit of *Tribulus terrestris* on 7, 12 - dimethylbenz (a) anthracene (DMBA) induced papillomagenesis in male Swiss albino mice was studied in which a significant reduction in tumor incidence, tumor burden and cumulative number of papillomas was observed[18].

***Tephrosia purpurea* Linn Pers.:** A study was conducted where the Swiss albino mice pre-treated with *Tephrosia purpurea* prior to application of croton oil (phorbol ester) resulted in a dose-dependent inhibition of cutaneous carcinogenesis. Skin tumor initiation was achieved by a single topical application of 7,12-dimethyl benz(a)anthracene (DMBA) (25 µg per animal per 0.2 ml acetone) to mice. Ten days later tumor promotion was started by twice weekly topical application of croton oil (0.5% per animal per 0.2 ml acetone, v /v). Topical application of *Tephrosia purpurea* 1 h prior to each application of croton oil (phorbol ester) resulted in a significant protection against cutaneous carcinogenesis in a dose-dependent manner[19].

***Elettaria cardamomum* Maton:** The chemopreventive potential of cardamom was evaluated on 7,12-dimethylbenz[a]anthracene-initiated and croton oil-promoted mouse skin papillomagenesis. A significant reduction in the values of tumor incidence, tumor burden, and tumor yield and the cumulative number of papillomas was observed in mice treated orally with 0.5 mg of cardamom powder in suspension continuously at pre-, peri-, and post-initiational stages of papillomagenesis when compared with the control group. These findings indicate the potential of cardamom as a chemopreventive agent against two-stage skin cancer[20].

***Myristica fragrans* Henlt:** A study reports the chemopreventive property of mace (aril covering the seed of *Myristica fragrans*) on DMBA-induced papillomagenesis in the skin of male Swiss albino mice. When animals receiving similar treatments were put on a diet containing 1% mace during the peri initiational phase of tumorigenesis, the skin papilloma incidence was reduced to 50% and the average tumor per tumor-bearing mouse was only 1.75[21].

Saraca asoka* (Roxb*) DC: In a study significant reduction in the expression of ornithine decarboxylase, a key enzyme in the promotion stage of 2-stage skin cancer, in the Asoka treated group was observed which suggest the chemopreventive activity of flavonoids from *S. asoka* on 2-stage skin carcinogenesis[22].

***Swertia chirata* Buch Ham:** In a study the effect of *S. chirata* on apoptosis and cell proliferation was studied in mice skin exposed to DMBA. Both the crude and purified extracts significantly inhibited cell proliferation and induced apoptosis. This report and the observation suggests the chemopreventive potential of *Swertia chirata*[23].

***Bauhinia variegate*:** A study was conducted to evaluate the anticarcinogenicity and antimutagenicity of Kachanar extract in skin carcinogenesis and melanoma in Swiss

albino mice. The results suggests that Kachanar extract exerts anticarcinogenic and antimutagenic activity[24].

***Momordica charantia* Linn:** In a study the carcinogen-induced lipid peroxidation in liver and DNA damage in lymphocytes were found to be reduced following treatment with Momordica. The fruit extract was found to significantly activate the liver enzymes glutathione-S-transferase, glutathione peroxidase and catalase ($P < 0.001$), which showed a depression following exposure to the carcinogen. The results suggest a preventive role of water-soluble constituents of *M. charantia* fruit during carcinogenesis, which is mediated possibly by their modulatory effect on enzymes of the biotransformation and detoxification system of the host[25].

***Syzygium aromaticum* (Linn) M&P:** In an experiment it has been shown that oral administration of aqueous infusions of clove at a dose of 100 µl/mouse/day not only delays the formation of papilloma but also reduces the incidence of papilloma as well as the cumulative number of papillomas per papilloma bearing mouse[26].

***Santalum album* Linn:** In a study sandalwood oil treatment significantly decreased papilloma incidence by 67%, multiplicity by 96%, and TPA-induced ODC activity by 70% which proved that this oil could be an effective chemopreventive agent against skin cancer[27].

***Semecarpus anacardium* Linn:** In an experiment to assess the antitumour activity of *Semecarpus anacardium* nut extract, a flavonoid containing drug, non-enzymic antioxidant levels were analysed in control and experimental animals. Following drug administration, there was a marked increase in antioxidant levels and a dramatic elevation in cytochrome P450 content based on which they concluded that the observed anticancer property of *Semecarpus anacardium* nut extract may also be explained by its strong antioxidant capacity and capability to induce the *in vivo* antioxidant system[28].

***Holoptelea integrifolia (*Roxb) planch:** The antitumour activity of the ethanolic extract of leaves of *Holoptelea integrifolia* (EHI) has been evaluated against Dalton's ascitic lymphoma (DAL) in Swiss albino mice at the dose of 250 and 500 mg/kg, body weight[29].

***Abrus precatorius* Linn:** An *in vivo* study showed that the novel peptides present in Abrus agglutinin possess potent antitumor properties[30].

***Boerhavia diffusa* Linn**: Administration of the aqueous methanol (3:7) extract of *B. diffusa* was found to be effective in reducing the metastases formation by B16F10 melanoma cells. Prophylactic administration of the extract (0.5mg/dose) inhibited the metastases formation by about 95% as compared to untreated control animals[31].

***Glycyrrhiza glabra* Linn:** The liquorice plant contains about 8% of glycoside called glycyrrhizin which specifically reduces the activity of two enzymes that break down prostaglandin E. Liquorice shows anti-infective and anticancer properties[32].

***Oroxylum indicum* Linn vent:** Methanol extract of the fruits of *O. indicum* inhibited in vitro proliferation of HL-60 cells[33].

***Calotropis procera*:** In a recent study the cardiotonic steroid UNBS1450 01 (derived from 2-oxovoruscharin 02) from *C. procera* was shown to additionally exert an anti-cancer activity. UNBS1450 01 has been proven to be a potent sodium pump inhibitor, showing anti-proliferative and cell death-inducing activities[34].

CONCLUSION

In different classical Ayurvedic texts the drugs like gunja (*Abrus precatorius*), Arka (*Calotropis procera*), Guduchi (*Tinospora cordifolia*), Syonaka (*Oroxylum indicum*), Bilwa (*Aegle marmelos*), Sigru (*Moringa oleifera*), Bhallataka (*Semecarpus anacardium*), Yestimadhu (*Glycyrrhiza glabra*), Haridra (*Curcuma longa*) etc. were indicated in different forms in the treatment of Arbuda. The above research works provides the scientific proof and substantiate the use of these herbs in different cancers. Further research is needed to specifically find out which drug will be more effective in which type of cancer based on doshic predominance.

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