

## Selected Traditional Medicinal Plants Used in Cancer Prevention and Therapy



### Botany

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### ABSTRACT

*Cancer is a leading cause of mortality in the world and it's the cause of more than 20% of all deaths. The incidence of various forms of cancer is now rapidly rising world wide. Population rise, inadequate supply of drugs, prohibitive cost of treatments, side effects of several allopathic drugs and development of resistance to currently used drugs for diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments. Medicinal herbs play an important role in primary health care system among rural population since synthetic anti-cancer remedies are beyond the reach of common man because of the cost factor. An attempt has been made to review some medicinal plants used for the prevention and treatment of cancer. Most findings are preliminary and further studies are required for clinical applications.*

**Introduction:** Cancer is a major public health burden in both developed and developing countries. It was estimated that there were 10.9 million new cases, 6.7 million deaths, and 24.6 million persons living with cancer around the world in 2012.<sup>1,5,2,3</sup> According to the World Health Organization, over 80% of the world's populations rely upon such traditional plant-based systems of medicine to provide them primary healthcare<sup>4</sup>.

Herbal medicines have a vital role in the prevention and treatment of cancer and medicinal herbs are commonly available and comparatively economical.

Some herbs protect the body from cancer by enhancing detoxification functions of the body. Certain biological response modifiers derived from herbs are known to inhibit growth of cancer by modulating the activity of specific hormones and enzymes.

The search for anti-cancer agents from plant sources started in earnest in the 1950s with the discovery and development of the vinca alkaloids, vinblastine and vincristine, and the isolation of the cytotoxic podophyllotoxins. These discoveries prompted the United States National Cancer Institute (NCI) to initiate an extensive plant collection program in 1960, focused mainly in temperate regions. This led to the discovery of many novel chemotypes showing a range of cytotoxic activities, including the taxanes and camptothecins, but their development into clinically active agents spanned a period of some 30 years, from the early 1960s to the 1990s. This plant collection program was terminated in 1982, but with the development of new screening technologies, the NCI revived the collections of plants and other organisms in 1986.<sup>6</sup>

#### Medicinal plants with anticancer activity:

A number of studies from all over the world are pointing some medicinal plants as sources of anti-oxidants and other substances that have anti-cancer characteristics. The scientists found that these herbs help reduce cancer risk and some can even modify tumour behaviour. Some of these cancer preventing herbs are discussed here.

#### 1. *Catharanthus roseus* (Vinca rosea, Madagascar periwinkle)<sup>6,7,8,9</sup>

*Catharanthus*, apocynaceae family, well known for being rich in alkaloids. *Vinca rosea* contains vinca alkaloids, which were the first phytoconstituents ever used to treat cancer. It contains more than 70 alkaloids, known as vinca alkaloids such as Vinblastine, Vincristine,

alstonine, ajmalicine, reserpine and their derivatives. Vinca alkaloids execute anticancer effect by binding to the tubulin (mi-

crotubule protein) thereby breaking down the microtubules, thus inhibiting formation of mitotic spindle in the metaphase that arrests division of the cancerous cells. Vinca alkaloids also induce apoptosis (programmed cell death) and inhibit angiogenesis (formation of new blood vessels). Vinca alkaloids inhibit growth & spread of various cancers including that of breast, ovary, cervix, lung, colon, rectum, testis, neuroblastoma, Hodgkin's disease, malignant lymphoma, spleen, liver, and choriocarcinoma multiple myeloma, various sarcomas, rhabdomyosarcoma, leukaemia and Wilm's<sup>2</sup>.

#### *Crocus sativus* (Saffron)<sup>10-13</sup>

Saffron, Iridaceae family, is an ancient plant. Traditional therapeutic uses include: treatment of cough, flatulence, stomach disorders, insomnia, colds, fever, and heart problems. In China, saffron is used to treat depression, fear and pain. There is a growing volume of scientific publications indicating the effect of saffron extracts on the inhibition of tumour formation and the retardation of tumour progression in a variety of experimental *in vivo* and *in vitro* systems. Studies in animal models and with cultured human malignant cell lines have demonstrated antitumor and cancer preventive activities of saffron and its main ingredients. More direct evidence of anticancer effectiveness of saffron as chemopreventive agent may come from trials that use actual reduction of cancer incidence as the primary endpoint.<sup>10</sup>

A research paper, titled: "Use of *in vitro* assays to assess the potential antiproliferative and cytotoxic effects of saffron. (*Crocus sativus* L.) in human lung cancer cell line." Explain that the ethanolic extract of saffron decreased cell viability in malignant cells as a concentration and time dependent manner. Their conclusions were that the extract exerts proapoptotic effects in a lung cancer-derived cell line and could be considered as a potential chemotherapeutic agent in lung cancer<sup>11</sup> crocetin, an important carotenoid constituent of saffron, has shown significant potential as an antitumor agent in animal models and cell culture systems. mechanism of action: Crocetin affects the growth of cancer cells by inhibiting nucleic acid synthesis, enhancing anti-oxidative system, inducing apoptosis and hindering growth factor signalling pathways.<sup>12,13</sup>

#### 3. *Cannabis sativa* (Bhang, Hemp)

The Hemp is an annual herb that may reach 5 meters in height belongs to cannabaceae family, has many uses, some of which are furnishing fiber, oil, in medicine, and narcotics., Hemp is a very versatile material and is frequently used to relieve cancer pain, treat depression, and hypothermia, it also works as an appetite suppressant.

Active constituents of cannabis plant is Delta-9-Tetrahydrocannabinol. Research has shown that the administering of smoked marijuana helped treated the nausea that was caused by can-

cer chemotherapy, thereby being an aid to the cancer treatment process<sup>7</sup>. Cannabis compound inhibits lung-adenocarcinoma cell growth *in vitro* and after oral administration in mice. *Cannabis sativa* found effective against lung carcinoma *in vivo* (mouse) study.<sup>9</sup>

#### 4. *Vitex agnus-castus*<sup>13,14,15</sup>

It is a shrub with fragrant leaves and blue, violet and pink inflorescences. For over 2500 years, *Vitex agnus-castus* has been used for gynaecological conditions.

The extract may be useful for the prevention and/or treatment not only of benign prostatic hyperplasia but also of human prostate cancer. Significant studies were done in Japan by a group of scientists who collected *Vitex* fruits in Israel and tested their effect on cancer cells. A crude extract was prepared with ethanol from dried ripened *Vitex agnus-castus* fruits growing in Israel (Vitex extract). Cyto-toxicity of the extract against human uterine cervical canal fibroblast (HCF), ovarian cancer (MCF-7), cervical carcinoma (SKG-3a), breast carcinoma (SKOV-3), gastric signet ring carcinoma (KATO-III), colon carcinoma (COLO 201), and small cell lung carcinoma (Lu-134-A-H) cells was demonstrated. It was concluded that the cytotoxic activity of *Vitex* extract may be attributed to the effect on cell growth, the cell death occurs through apoptosis, and that this apoptotic cell death may be attributed to increased intracellular oxidation by *Vitex* extract treatment.

#### 5. *Ginkgo biloba*<sup>6,7,8,16,17</sup>

Ginkgetin and Ginkgolides (A & B), isolated from *Ginkgo biloba*, Ginkgoaceae family, inhibits growth & spread of various aggressive cancers such as invasive oestrogen-receptor negative breast cancer, glioblastoma multiforme, hepatocellular carcinoma and cancers of ovary, colon, prostate and liver by inducing apoptosis. *Ginkgo biloba* extract is well known for its antioxidant activity. *Ginkgo biloba* also reduces side effects of chemotherapy & radiotherapy<sup>7</sup>. It is also used to treat conditions like altitude sick ness, asthma, depression, disorientation, headaches, high blood pressure, erectile dysfunction and vertigo. It has found to improve thinking, learning and memory in people with Alzheimers disease (AD). This herb also improves blood flow. Suzuki *et al.*, reported that extract of leaves has anti cancer activity.<sup>6,16</sup> A recent study done on the workers of nuclear power station at Chernobyl in Russia has shown that *Ginkgo biloba* protects the DNA from damaging effects of nuclear radiation.<sup>8,17</sup>

#### 6. *Withania somnifera*<sup>8,21,22</sup>

*Withania somnifera* contains withanolides, which possess immuno-modulatory activity. Withaferin A and withanolide D found in *Withania somnifera* are known to inhibit growth of cancer.<sup>21</sup> Apart from these contents plant also contain chemical constituents like withaniol, acylsteryl glucosides, starch, reducing sugar, hantreacotane and ducitol. Studies have revealed that *Withania somnifera* enhances the therapeutic effect of radiotherapy. The chemopreventive activity is thought to be due in part to the antioxidant / free radical scavenging activity of the extract. An *in vitro* study showed withanolides from *Withania somnifera* inhibited growth in human breast, central nervous system, lung, and colon cancer cell lines comparable to doxorubicin.<sup>22</sup>

#### 7. *Linum usitatissimum* ( Flaxseed)

*Linum usitatissimum* contains a rich supply of lignans. These plant lignans are converted to mammalian lignans (enterolactone and enterodiol) by bacterial fermentation in the colon and they can then act as estrogens. Mammalian lignans appear to be anticarcinogenic; lignan metabolites bear a structural similarity to estrogens and can bind to estrogen receptors and inhibit the growth of estrogen-stimulated breast cancer<sup>8,18,19</sup>. Urinary excretion of lignans is reduced in women with breast cancer, whereas the consumption of flaxseed powder increases urinary concen-

tration of lignans several-folds<sup>20</sup>.

#### *Catharanthus roseus* *Crocus sativus* (Saffron)



#### *Cannabis sativa* *Vitex agnus-castus* *Ginkgo biloba*



#### *Withania somnifera* *Linum usitatissimum* ( Flaxseed)



#### Conclusions:

Medicinal plants maintain the health and vitality of individuals, and also cure various diseases, including cancer without causing toxicity. There are lots of medicinal plants available in the nature which has the anticancerous properties and majority of them are still to be explored for its anticancer property. So, considering the facts it is strongly recommended that there is an urge for these plants to be discovered so that, the cancer could be totally eradicated. A brief description of plants having anticancer activity is given in the present article. An impressive number of modern drugs have been developed from the plants. Plant secondary metabolites have proved to be an excellent reservoir of new medical compounds.

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## REFERENCE

1. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics. *CA Cancer J Clin* 2005; 55: 74-108. | 2. Dervan PA. Understanding Cancer. Jefferson, NC: McFarland, 1999. | 3. Hartwell JL. Plants used against cancer: a survey. Lawrence, MA. Quarterman Publications, 1982, pp 438-439. | 4. Calixto, J.B., (2005) Twenty five years of research on medicinal plants in Latin America: a personal review. *J Ethnopharmacol.*, 100, 131-4. | 5. Akhil Gupta and et al. Nature's treasurer: plants acting on colon cancer. *Journal of Stress Physiology & Biochemistry*, Vol. 7 No. 4 2011, pp. 217-231 ISSN 1997-0838, 2011. | 6. Vijaya T.S. et al., Phytoresources as potential therapeutic agents for cancer treatment and prevention. *Journal of Global Pharma Technology*, 2009; 1(1): 4-18M. | 7. M. Umadevi and et al., Traditionally Used Anticancer Herbs in India. *Journal of Medicinal Plants Studies Year: 2013, Volume: 1, Issue: 3, 56-74, ISSN: 2320-3862.* | 8. Sakarkar D.M., Deshmukh V.N., Ethnopharmacological Review of Traditional Medicinal Plants for Anticancer Activity. *International Journal of PharmTech Research CODEN (USA): IJPRIF ISSN : 0974-4304 Vol. 3, No.1, pp 298-308, Jan-Mar 2011.* | 9. Sushma Kainsa and et al., Medicinal Plants of Asian Origin Having Anticancer Potential: Short Review. *Asian Journal of Biomedical and Pharmaceutical Sciences*, 2(10) 2012, 01-07. | 10. Abdullaev FL, Espinosa-Aquire LL. Biomedical properties of saffron and its potential use in cancer therapy and chemoprevention trials. *Cancer Detect Prev* 2004; 8: 426-32. | 11. Samarghandian S, Boskabady MH, Davoodi S. Use of in vitro assays to assess the potential antiproliferative and cytotoxic effects of saffron (*Crocus sativus* L.) in human lung cancer cell line. *Pharmacogn mag* 2010; 24:309-14. | 12. Gutheil WG, Reed G, Ray A, Anant S, Dhar A. Crocetin: an agent derived from saffron for prevention and therapy for cancer. *Curr Pharm Biotechnol* 2012; 31:173- 913. Zohara Yaniv Bachrach et al., Contribution of Selected Medicinal Plants for Cancer Prevention and Therapy *Scientific Journal of the Faculty of Medicine in Niš* 2012; 29(3):117-123. | 14. Wuttke W, Jarry H, Christoffel V, Spengler B, Seidlova-Wuttke D. Chaste tree (*Vitex agnus-castus*) – pharmacology and clinical indications. *Phytomedicine* 2003; 10:348-75. | 15. Ohyama K, Akaike T, Hirobe C, Yamakawa T. Cytotoxicity and apoptotic inducibility of *Vitex agnus-castus* fruit extract in cultured human normal and cancer cells and effect on growth. *Biol Pharm Bull* 2003; 26:10-18. | 16. Suzuki R, Kohno H, Sugie S, Sasaki K, Yoshimura T, Wada K, Tanaka T. Preventive effects of extract of leaves of ginkgo (*Ginkgo biloba*) and its component bilobalide on azoxymethane induced colonic aberrant crypt foci in rats. *Cancer Lett.* 2004; 210(2):159-169. | 17. Kleijnen J, Knipschild P. *Ginkgo biloba* for cerebral insufficiency. *Br J Clin Pharmacol*; 1992, 34:352-8. | 18. Serraino M, Thompson LU. The effect of flaxseed supplementation on the initiation and promotional stages of mammary tumorigenesis. *Nutr Cancer*; 1992, 17:153-9 | 19. Serraino M, Thompson LU. The effect of flaxseed supplementation on early risk markers for mammary carcinogenesis. *Cancer Lett*; 1991, 60:135-42 | 20. Lampe JW, Martini MC, Kurzer MS, Adlercreutz H, Slavin JL. Urinary lignan and isoflavonoid excretion in premenopausal women consuming flaxseed powder. *Am J Clin Nutr*; 1994, 60:122-8. | 21. *Withania somnifera* Dunal (Ashwagandha): potential plant source of a promising drug for cancer chemotherapy and radiosensitization. *Devi PU. Indian J Exp Biol*; 1996, 34:927-932. | 22. *Devi PU Akagi K Ostapenko V Tanaka Y Sugahara T Withaferin A: a new radiosensitizer from the Indian medicinal plant Withania somnifera.* In: *Int J Radiat Biol*, 1996, 69(2): 193-7.