# A REVIEW ON ANTI-CANCER ACTIVITY OF MEDICINAL PLANTS

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**Abstract:**

Cancer is a disease in which abnormal cells divide uncontrollably and kill body tissue. While technology has been improved and several new medicines have been found, the importance of medicinal plants does not go out of place. Medicinal plants play a significant role in the treatment of different types of diseases. This article delineates the anti- Cancer, phytochemical activities of medicinal plants present around the world.

**Keywords**: Cancer, phytochemicals, Medicinal Plants, anti-cancer activity.

## Introduction:

Cancer is a group of diseases with the ability to invade or spread to other parts of the body involving irregular cell growth. The spread of cancer to other sites in the body is metastasis. The majority of deaths from cancer are due to cancer that has metastasized. Cancer is essentially a disorder of the regulation of tissue growth. The genes that control cell growth and differentiation must be altered in order for a normal cell to turn into a cancer cell (Croce, 2008). Usually, normal cells produce just about 30 percent of the energy for energy production from glycolysis (Al-Azzam, 2020). The phrase ‘Cancer’ is derived from the Greek word ‘tumour and crab’.

Cancer is largely caused by both genetic abnormalities and hereditary genetics. Tobacco use, diet and obesity, infections, ionizing and non-ionizing radiation and pollution are common environmental factors that lead to cancer death. Cancers are categorized by the type of cell resembling the tumor cells and are thus believed to be the source of the tumor. These forms include carcinoma, sarcoma, leukemia, lymphoma, tumor of germ cells, and blastoma.

It causes no symptoms as cancer starts. As the mass expands or ulcerates, signs and symptoms appear. Many are also seen in people that have other conditions. Cancer can be hard to detect and a 'healthy imitator' can be considered. Local symptoms can occur because of the

tumor's mass or its ulceration. Due to the reaction of the body to the cancer, systemic symptoms may occur. This may involve tiredness, unintentional weight loss, or changes in the skin (O'Dell *et al.,* 2009). Some cancers may cause a systemic inflammatory state, known as cachexia that leads to substantial muscle loss and weakness. Persistent fever can be caused by many forms of cancer, such as Hodgkin's disease, leukemia, and liver or kidney cancers.Hormones or other molecules formed by the tumor, known as paraneoplastic syndromes, are responsible for certain systemic symptoms of cancer. Hypercalcemiais a common paraneoplastic syndrome which can cause altered mental state, constipation and dehydration, or hyponatremia that can also cause altered mental status, vomiting, headache or seizures (Dimitriadis *et al.*, 2017)

Initially, most cancers are identified either because of the presence of signs or symptoms or by screening. Diagnostic tests are used to examine people with suspected cancer. These usually include blood checks, X-rays, CT scans and endoscopy (contrast). Other forms of tissue screening include cytogenetics and immunohistochemistry. These tests provide information on genetic modifications such as mutations, fusion genes, and changes in numerical chromosomes, so that the prognosis and best treatment can also be indicated.

Active steps to reduce cancer risk are known as cancer prevention. Environmental risk factors account for the vast majority of cases of cancer. Many of these environmental variables are lifestyle decisions that can be monitored. Cancer thus can be usually preventable. About 70% and 90% of common cancers are caused by environmental causes and can therefore be hopefully prevented (Wu *et al.*, 2016). By avoiding risk factors, including cigarettes, over weight/obesity, inadequate diet, physical inactivity, alcohol, sexually transmitted diseases and air pollution, more than 30 percent of cancer deaths may be avoided.Not all environmental factors, such as naturally occurring background radiation and cancers caused by inherited genetic defects, are controllable and are therefore not preventable by personal actions.

A type of gene treatment called CAR T-cell therapy has been approved by the FDA. It uses some of our own immune cells to treat cancer, called T cells. By inserting fresh genes, doctors take the cells out of our blood and change them so they can identify and destroy cancer cells faster. In order to treat breast cancer, the most common form of cancer, Ibrance, a targeted biologic therapy used for chemotherapy, has been developed. The medicine has been approved for use in advanced and secondary breast cancer cases and is given in combination with hormone therapy.

**Review:**

The assessed work was carried out through a thorough search of different research papers and patents from various web applications. The Scientifically based plant literature is also collected, which has strong anti-cancer properties.

**Anti-cancer activity of medicinal plants:**

***Allium bakhtiaricum* (Amaryllidaceae):**

Allium is a genus of monocotyledonous flowering plants consisting of garlic, onions, leek and chives, with thousands of species. Allium species occur in the Northern hemisphere's temperate climates. Chemical compounds, often derived from cysteine sulfoxide, are formed by plants of the genus Allium. The characteristic flavor of Allium relies on the sulfate content of the soil in which the plant grows (Block, 2010*)*. Invitro and invivo anti-cancer properties of *Allium bakhtiaricum* extracts were investigated against MDA-MB 231 cells and BAL/BC mice carrying 4T1 mammary carcinoma cells. MDA-MB is considered the most vulnerable cell line. MTT assay, flow cytometry, Annexin-V staining assay, Western blot analysis, beta-galactosidase-associated staining of senescence and microscopy of immunofluorescence is carried out and it was concluded that *Allium bakhtiaricum's* chloroform fraction had a suppressive effect on breast cancer via mitotic cell cycle arrest, implying a mechanism associated with disturbing polymerization of microtubules (Vafaee *et al.,* 2019).

***Aloe barbadensis miller* (Asphodelaceae):**

Aloe vera is the generic name of *Aloe barbadensis miller*. Aloe vera comprises polysaccharides like pectin, cellulose, hemicellulose, glucomannan and acemannan, carbohydrates, lignins, saponins, salicylic acid and amino acids. Acemannan in aloevera is the primary functional component. Aloevera has functions that are anti-bacterial, anti-cancer, anti-oxidant, anti-inflammatory, anti-fungal, anti-diabetic, and healing (Quispe *et al.,* 2018). Aloe vera heals wounds, enhances digestion, encourages oral hygiene, clears acne, relieves anal fissures, reduces blood sugar levels, improves skin and prevents wrinkles. It was reported that ethanolic leaf extracts of *Aloe barbadensis miller* have higher cytotoxic activity against the HepG2, HeLa and A549 cell lines of human cancer cell lines, but are non-cytotoxic to normal cells. The result indicated thatthe best anti-tumor agent commonly used in the treatment of many cancers is doxorubicin (Karpagam *et al.,* 2019).

***Angelica sinensis* (Apiaceae):**

*Angelica sinensis* in China is commonly known as 'dong quai'. It is often referred to as ‘female ginseng’. Phytosterols, polysaccharides, ligustilde, butylphthalide, cnidilde, isoenidilide,

p-cymene, ferulate, and flavonoids are phytochemical constituents present in *A.sinensis*. Z-ligustilide is the active compound found in *A. sinensis* (Chao and Lin, 2011). It has anti-inflammatory, imunostimulatory, neuroprotective, anti-cancer, anti-hepatotoxic and anti-cardiovascular effects. It is a herb that is used to enrich the blood, promote blood circulation, modulate the immune system, treat menstrual disorders and chronic constipation (Wu and Hsieh, 2011). Western blot analysis, cell proliferation assay, cell cycle analysis, cell migration and invasion assay and artificial analysis were performed and figured that there is a protective impact of female ginseng on gastric cancers (Liao *et al.,* 2018).

***Arctium lappa* (Asteraceae):**

In North America and Australia, *Arctium lappa* is commonly referred to as Greater Buddock and is an invasive plant with high-nitrogen oils. *A. lappa* contains sterols, tannins, mucilage, compounds of sulphurous acetylene, polyacetylene, bitter guaianolide, lignans of arctigenine, arctin and butyrolactone. Sequisterone lactone is considered to be the active compound in *A.lappa* (Ichihara, 2014). Heaptoprotective, antiviral, anti inflammatory, antioxidant, antiproliferative, proapoptotic, anti-neoplastic, anti-microbial and anti-cancer (Predes *et al.,* 2011) are the anti activities of *A. lappa*. Buddock is used as a diuretic, diaphoretic, purifying agent for blood, facilitating blood circulation to the surface of the skin, and curing skin diseases such as eczema (Chan *et al.,* 2010). It is used to treat gout, rheumatism, ulcers, psoriasis and acne (Nazmi *et al.,* 2018) used the cell line of HT-29 colon cancer and the cell line of MCF-7 breast cancer and performed MTT assays. *A. lappa* exhibited no cytotoxic effects on the viability of HT-29 and MCF cell line treated cells.

***Astragalus* (Fabaceae):**

Milkvetch, locoweed and goat's thorn are common names for *Astragalus*. Saponins, triterpenoids, isoflavones, flavonoids, campanulin, ononin, calycosin and formononetin are expressed in *Astragalus*. There has been no identification and characterisation of the active compound in *Astragalus*. *A.membranaceus* has cellular defensive functions that are immuno-modulatory, anti-inflammatory, anti-viral, anti-neoplastic, anti-oxidant, anti tumour, anti-aging and cardio vascular protection activities. For upper respiratory infections, allergic rhinitis, asthma, chronic fatigue syndrome and chronic kidney disorders, *A. membranaceus* is used as a nutritional supplement. HPLC analysis, MTT assay, flow cytometric analysis and western blot analysis have been carried out by (Z*hou et al., 2018)*. They reported that the supernatant method of *A. membranaceus* with water extraction-ethanol inhibits cell growth and induces apoptosis in cultured breast cancer cells and they concluded that *A.membranaceus* promises breast cancer patients an alternate approach.

***Camellia Sinensis* (Theaceae):**

The common names of *Camellia sinensis* include tea plant and tea shrub. Bioactive compounds such as alkaloids, flavonoids, hormones, terpenoids, carotenoids, tannins, folate, ascorbic acid and tocopherols (Yadav *et al.*, 2020) are found in *C. sinensis*. *C. sinensis* has anti-oxidant, anti-inflammatory, anti-hepatotoxic, anti-diabetic, anti-cancer, anti-agingand anti-microbial activity.In cognitive enhancements, diuresis, genital disorders and hyper cholesterlemia, *C. sinensis* is used. The main active constituent of *C. sinensis* is epigallocatechin-3-gallate. (*Esghaei et al., 2018)* evaluated anticancer activity of *C. sinensis* against the cell line of colorectal cancer. There is an MTT assay and an immunofluorescence assay. It is concluded that mammalian cells are safe from *C.sinensis*but toxic to cancer cells. This study showed that a good prognostic biomarker for colorectal cancer is the AQP5 protein found in intestinal cells. They have therefore verified that hydro-ethanolic extracts of *C. sinensis* which is a medicinal plant has a profound impact on cancer.

***Syzygium aromaticum* (Myrtaceae):**

*S. aromaticum* is usually referred to as clove and is used as a key spice. They are native to Indonesia's Maluku islands. Clove includes eugenol, vanillin, flavonoids, triterpenoids, glycosides, alkaloids, steroids, saponins andtannins. The compound that is active is eugenol. Clove is known to display anesthetic, anti-oxidant, anti-inflammatory, anti-microbial, anti-fungal, anti-bacterial, anti-canceractivities (Batiha *et al.*, 2020). It is used to relieve pain in the stomach, diarrhoea, hernia, nausea and vomiting. Anti-cancer activity against the thyroid cancer cell line was carried out by (Nirmala *et al.*, 2019) using MTT assay, colony formation assay and Annexin-V FITC assay. MTT studies indicated that cytotoxicity against the human thyroid cancer cell line was expressed in the formulation.The FITC assay of Annexin-V confirmed that cloves have an antiproliferative effect on cancer cells of Hth-7.

***Glycyrrhiza glabra* (Fabaceae):**

The common name for *G. glabra* is Liquorice. Triterpenoids, chalcones, and flavonones were identified as phytochemical compounds. The active compound present in *G.glabra*is Glcyrrhizin (Shah *et al.*, 2018). They are antispasmodic, anti-tussive, anti-ulcer, anti-cancer, and anti-inflammatory. Respiratory disorders, hyperdypsia, epilepsy, fever, paralysis, sexual weakness, stomach ulcers, rheumatism, haemorrhagic diseases, jaundice and skin conditions are treated. Nazmi *et al,* (2018) investigated the anticancer activity against the cell line of MCF-7 breast cancer and the cell line of HT-29 colon cancer. Their results showed that HT-29 and MCF-7 cell proliferation was prevented by *G.glabra*. On the HT-29 and MCF-7 cell lines, *G.*

*glabra* has pro-apoptotic and anti-proliferative effects. Their findings also suggested that *G. glabra* may potentially act as a chemoprotective agent for cancer.

***Psidium Guajava* (Myrtaceae):**

Guava is widely termed to as *P. guajava*. Saponins, flavonoids, phenolic compounds, carotenoids, glycosides, and ascorbic acid are the principal phytochemical constituents. The main active component present is citric acid. They have anti-cancer, anti-inflammatory, antioxidant, anti-fungal, antidiabetic and anti-inflammatory properties.They are used to treat inflammation, diabetes, hypertension, relief of wound pain, fever, diarrhoea, rheumatism, lung disease and ulcers. In order to determine their anti-angiogenic activity, (Bronwyn *et al.,* 2020) performed cell viability and rat aortic ring assays. To determine their effects on angiogenesis, cell proliferation, tube formation, colony formation and VEGF-ELISA assays have been performed.They stated that *P. guajava* ethanolic extracts have the potential to inhibit angiogenesis in the treatment of colorectal cancer.

***Carica papaya* (Caricaceae):**

*C. papaya* is usually regarded as papaya *C. Papaya* comprises papain, tocopherol, carotenoid, glucoside, alkaloid, saponin, flavonoid, polyphenols, tannins and prunasin (Nath *et al.,* 2016). *C. papaya* exhibits anti-inflammatory, antioxidant, anti-cancer, anti-diabetic and antimicrobial effects. They are used to treat malaria and used as abortifacient, purgative.Anti-cancer activity was carried out by (Mahendran *et al.*, 2021) against the MCF-7 breast cancer cell line. MTT, DNA fragmentation, caspase 7/9 induction detection assay and Annexin VFITC assays are performed.They concluded that *C. papaya* has possible anticancer activity against breast cancer after testing the extracts against MCF-7 breast cancer cell lines.

**Discussion:**

Medicinal plants have been used since ancient times for the treatment of many ailments, such as cancer. The herbs are commonly used in the treatment as it is known to be safer and more secure. Using ethno-botanical knowledge, we came to understand pharmacological importance about the medicinal plants that have potent action against cancer.The medicinal plants that are mentioned in this review paper are commonly used for cancer management.It is also seen that several researches carried out for the desire of establishing an effective treatment against cancer in India and also around the globe.

**Conclusion:**

Several medicinal plants in India are historically used in many methods of cancer treatment.Present review of the herbal anti-cancer activity helps to build successful herbal therapies.This article is intended to provide appropriate information and details about anti-cancer medicinal plants. The aspects that are mentioned here about the medicinal plants may be useful for more anticancer study.

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## About Editors

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Dr. Shakun Mishra(gold medalist)is working as Head Department of Botany, Govt. S. N.P.G.College, Khandwa (M.P.) INDIA. She is doing her research work for Ph.D. on the topic, "Ethnobotany of Korku, Gond and Nihal Tribes of East Nimar (M.P.)", from D.A.V.V. Indore (M.P.) India. She has 38 years of teaching experience at U.G. level and 28 years at P.G. level. She is actively engaged in research from three decades. Dr. Mishra published 71 research papers in various National and International journals and proceedings (39 national and 32 international), 09 book chapters and associate editor for seven booksand editor for three bookspublished by Bhumi Publishing, Maharashtra, India. She attended and presented 59 research papers in various national and international conferences and also guest lecturer resource person and chairperson in four nationalseminars. She is member of editorial board for two online journals namely, "J.S.R.I." and "A.J.T.R.". She is completed one M.R.P. funded by U.G.C. and Ex-Chairman of BOS in subject of Botany, Soil Sc., Seed Tech. and Horticulture in D.A.V.V.Indore and also same in Central University Bhopal. Typhonium flagelliforme (Lodd.) Blume (Araceae), Tinospora smilacina Benth. (Menispermaceae) and Telosma cordata (Burm.f.) Merr (Apocynaceae) are reported by Mishra for the first time from Madhya Pradesh forms an addition to the Flora of Madhya Pradesh.

Dr. Vinod Kumari is currently working as an Assistant Professor, Department of Applied Sciences and Humanities, Panipat Institute of Engineering and Technology, Panipat. She is having fifteen years of teaching experience and has proven her abilities as she is receiving appreciation certificates regarding the same for the past eight years. She completed her doctorate from Amity Institute of Applied Sciences, Amity University, Noida. Her area of interest is Nano-formulation of herbal plants, with a specific focus on therapeutic species of plants so that the nano-formulations could be helpful to mankind and the healthcare sector in the upcoming future. She has already authored two books on Engineering Chemistry. She is credited with 26 research papers in peer-reviewed national and international journals of high repute, conferences, and recently filed 01 patent also. She is a lifetime member of The Indian Society for Technical Education. She has been graced with the "Best Teacher Award" in 2017 and has the Certificate of Excellence to her credit.

Dr. Dipali L. Barate (M.Sc., Ph.D., NET), working as an Assistant Professor at Department of Microbiology, Shri Shivaji College of Arts, Commerce and Science, Akola (M.S.). She has thirteen years of teaching and research experience. She has published many research papers in the journals of national and international repute on her credit. She has also imparted two book chapters. She has participated and presented papers in various national and international conferences and symposia. She has awarded by RIO+22 UNITED NATIONS Sustainable energy for all India Programme 2015 with an excellence grade. She is a hardcore microbiologist and has keen research interest in the field of Medical Microbiology, Applied Microbiology, Enzymology, and Agricultural Microbiology. She has also guided many projects at post graduate level.

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