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The Significance of Medicinal Plants as Possible Sources For Antitumor Applications

Lovely Tyagi

Department Of Chemistry

Motherhood University, Roorkee

Email I'd-Tyagilovely29@Gmail.Com

Abstract

The wide and diverse plant kingdom on our planet is widely acknowledged for its medicinal benefits. The potential therapeutic benefits of plant species have tremendously contributed to the creation of numerous herbal treatments for a range of disorders around the world. Because herbal treatment has advantages over allopathic medicine, medicinal plants are becoming more and more essential in health and medicine. Cancer is one of the major health problems that has affected people worldwide. More effective and better-formulated drugs than those on the market are badly needed to combat this sickness. It is well-recognized that many therapeutic plants include biochemical components with anticancer capabilities. Natural chemical metabolites with anticancer qualities can be lead molecules in medication development. To create and produce anticancer medications, further investigation and testing are required regarding the relationship between medicinal plants and cancer. This review aims to gather information on some of the significant and regionally varied medicinal plants with anticancer properties.

Keywords: *diverse plant kingdom, plant species, allopathic medicine, anticancer medications.*

Introduction

Medicinal plants are thought to have a vast array of bioactive substances with a range of therapeutic applications. Over a very long time, the medicinal potential of plants has been thoroughly investigated. Medicinal plants provide a wide range of beneficial benefits, such as analgesic,

antiviral, anticancer, and anti-inflammatory. One of the main global health challenges facing people is cancer. Cancer is the disease that causes the most deaths out of all the epidemic diseases. The primary cause of the rising number of cancer cases worldwide is the global population's evolving lifestyle. According to statistical statistics, breast cancer is the most common cancer in women, making up roughly 23% of all cancer cases; lung cancer is the most common disease in men, making up 17% of all cancer cases (Jemal et al., 2011). Inadequate treatment facilities and delayed diagnosis are the main causes of the low cancer patient survival rate in developing nations. The utilization of natural substances may be able to provide more effective treatment and preventive techniques in the fight against this epidemic disease.

The therapeutic potential of medicinal plants as a source of promising anticancer drugs has recently attracted the attention of scientists. On the other hand, they were using plant-based chemicals to treat cancer dating back to the 1950s. Cytotoxic podophyllotoxins, vinblastine, vincristine, and vinca alkaloids are some of the earliest plant-based anticancer medicines. According to statistical data, 16 anticancer medicines produced from plants have so far been the topic of clinical studies. Significant findings from these clinical trials include the isolation of meisoindigo from the Chinese plant Indigofera tinctoria and flavopiridol from the Indian tree Dysoxylum binectariferum, both of which are less toxic than traditional chemotherapeutic anticancer medications. The scientific community is now more interested than ever in finding novel anticancer medicines derived from all-natural product sources, including secondary metabolites found in plants, thanks to these discoveries. The growing significance of natural anticancer drugs necessitates further investigation and testing to create effective natural treatment alternatives for this illness. With information obtained from the scientific literature in the PubMed database, this review focuses on the phytochemical aspect of some of the medicinal plants that may have anticancer properties. Therefore, the goal of this review is to compile data on various medicinal plants that have the

potential to treat cancer because they have anticancer qualities.

Medicinal herbs as an option for treating cancer

The primary antioxidant qualities of medicinal plants' chemical constituents support their potential as anticancer agents. The main types of bioactive substances that exhibit antioxidant activity are flavones, isoflavones, flavonoids, anthocyanins, coumarins, lignans, catechins, and isocatechins. Plant-based chemicals have excellent potential for both treating and preventing cancer because of their low cost, oral bioavailability, and safety. Some plant-based chemicals do, however, have some adverse consequences. These adverse effects are manageable through dosage-dependent administration and use, and they in no way preclude their use in phytochemical research. The currently available, costly traditional cancer therapies, such as radiation and chemotherapy, have several adverse effects, including myelosuppression and toxicity to the nervous system, heart, lungs, and kidneys, which can seriously impair quality of life. As a result, more effective and less hazardous anticancer medications than those that are now on the market must be developed for use as therapy choices. According to market data, almost 60% of anticancer medications are plant-based. Medicinal herbs are a popular substitute for traditional cancer treatments in several nations. Several plants have undergone cytotoxic screening to assess their anticancer potential and broaden the range of potential therapeutic uses. Because of the possible advantages of using plant-based medications to treat cancer, their use is rising from 10% to 40% worldwide; in Asia, it has risen to 50%. To generate better medications, the anticancer advantages of natural plant derivatives must be thoroughly investigated through clinical trials and intensive scientific screening.

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Anticancer properties of medicinal plants

Actaea racemosa L.

Black Cohosh, Actaea racemosa L.

Actaea racemosa is native to the eastern region of North America and is a member of the Ranunculaceae family. "Black snakeroot" and "black cohosh" are two common names for it. The primary chemical constituents of this plant are derivatives of cinnamic acid, cimicifugoside, and triterpenoids of the cycloartenol type. The herb is well known for treating ailments including amenorrhea and chronic ovaritis. This plant's active metabolite, actein, has been shown to have anticancer effects by inhibiting the growth of human breast and liver cancer cells (HepG2). The expression of genes involved in the biosynthesis of fatty acids and cholesterol, the p53 pathway, CCND1, and ID3 is modified by actein. Reduced liver levels of cholesterol and free fatty acids are the cause of action-induced suppression of human HepG2 liver cancer cell proliferation.

***Centella asiatica* L.**

Gotu Kola and Indian Pennywort, Centella asiatica L.

A little perennial herbaceous plant belonging to the Apiaceae family is called Centella Asiatica. Common names for it include "gotu kola" and "Asiatic pennywort." The plant is indigenous to Madagascar, South and Central Africa, Australia, China, India, Indonesia, and the South Pacific. Studies on phytochemistry have demonstrated the existence of asiatic

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and madecassic acid, as well as the glycoside asiaticoside. The Ayurvedic medical system has already discussed its therapeutic value in treating chronic illnesses. There, it is referred to as a "brain tonic" for a variety of mental illnesses. It's being used to treat traumatic disorders, heatstroke, diarrhea, ulcerations, and eczema. This plant's therapeutic value as an anticancer agent has been increased by the presence of asiatic acid, a pentacyclic triterpene. Studies have looked at the cytotoxic effect of asiatic acid and found that in cases of liver cancer, it reduces the viability of HepG2 cells. Increased expression of the tumor-suppressor p53 gene, which is regulated by elevated intracellular calcium levels, is the cause of the decline in cell viability.

***Curcuma Longa* L.**

turmeric, Curcuma Longa L.

Curcuma longa L. is a member of the Zingiberaceae family and is grown widely throughout Asia, primarily in China and India. It is frequently referred to as turmeric. The plant has demonstrated its medicinal qualities for several illnesses, including hepatic disorders, rheumatism, sinusitis, cough, anorexia, coryza, cough, diabetic sores, and biliary disorders. This plant has a wide range of pharmacological properties, such as nematicidal, antibacterial, anti-inflammatory, and anti-human immunodeficiency virus properties. Curcumin is its main chemical component and has a wide range of biological effects. By suppressing many events implicated in multiple phases of carcinogenesis, including transcription factor, NF-κB, AP-1, and STAT-3, as well as by repressing proinflammatory pathways like COX-2 and iNOS, the curcumin molecule also demonstrates potential as an anticancer.

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***Xanthium strumarium* L.**

common cocklebur, Xanthium strumarium L.

There are twenty-five species in the genus Xanthium, which belongs to the Asteraceae family. X. strumarium is frequently referred to as "burweed" or "cocklebur." It is widely recognized in India as a treatment for hemicrania illnesses. Antagonistic, bactericidal, fungal, anti-inflammatory, antinociceptive, antitussive, hypoglycemic, antimitotic, antitrypanosomal, antimalarial, diuretic, antioxidant, analgesic, repellent, and insecticidal properties are only a few of its health-promoting qualities. Strong proof of its antitumorous properties may be found in its metabolite, 8-epi-xanthate, and its epoxide, which both dramatically reduce the growth of human tumor cell lines in culture. 8-epi-Xanthatin inhibits microtubule-interfering substances in addition to farnesyltransferase. These inhibitions support 8-epi-xanthatin's anticancer properties.

***Bidens Pilosa* L.**

Bur Marigold, Bidens Pilosa L.

Bidens Pilosa L. (Spanish Needle), a perennial plant in the Asteraceae family, has long been known as Hairy Beggar Sticks in the United States. Bidens pilosa is also called Beggar's Tick, Spanish Needle, and Blackjack. Although native to South America, it has spread across

tropical and subtropical regions worldwide. It can also be found on many Indian Ocean islands. Pilosa extract inhibits the growth of HepG2 cell lines compared to normal cells. It was tested for cytotoxicity using molecular research targeting Raf-1 and MEK-1 as potential anticancer mechanisms, showing promising inhibition of Raf-1 and MEK-1 gene expression.

***Zingiber officinale Roscoe* L.**

Ginger, Zingiber officinale Roscoe L.

Zingiber officinale Roscoe L. is the botanical name for ginger, a prevalent spice and medicinal plant. It is a perennial flowering plant, used as an herb for its flavor and many health benefits. It has a strong rhizome or underground stem. Originating in southern Asia, this plant has been used for more than two millennia for traditional medicine and also in cooking. By activating the ATF3 promoter in human colorectal cancer cells, ginger leaves may cause apoptosis and a decrease in cell viability, which is followed by an increase in ATF3 expression. Ginger and its active ingredients may inhibit the growth and trigger apoptosis of several cancer types, including skin, ovarian, colon, breast, cervical, oral, renal, prostate, gastric, pancreatic, liver, and brain cancer, according to evidence from in vitro, animal, and epidemiological research.

***Camellia sinensis* L.**

Tea plant, Camellia sinensis L.

Camellia sinensis L., a plant species most recognized for producing tea, is a member of the theaceae family, also referred to as the tea family from Indian flora. The

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leaves and leaf buds of this evergreen shrub or small tree are used to make a variety of teas, such as black, green, white, and oolong. The plant is found in China, India, and other parts of Asia. This plant, which yields green, black, and oolong teas, has a high polyphenolic content, especially epigallocatechin-3-gallate (EGCG), which has significant anti-cancer properties. These substances have anti-inflammatory, anti-proliferative, and antioxidant properties. They inhibit the growth of tumor cells, cause apoptosis, and inhibit angiogenesis and metastasis in several malignant diseases such as breast, prostate, lung, and colon. Regular consumption of Camellia sinensis tea has been associated with improved chemopreventive potential and a reduced risk of cancer.

***Andrographis paniculata* L.**

***Green Chiretta or King of Bitters, Andrographis paniculata** L.*

Andrographis paniculata L. is a medicinal herb, often referred to as green chiretta, called kalmegh or "king of bitters," which belongs to the Acanthaceae family. This family is also known as the acanthus family, and traditional Asian medicine makes extensive use of it. It is recognized for its potential medicinal properties, including anti-inflammatory, antidiabetic, and antibacterial actions.

The diterpene lactones in the plant, especially andrographolide, which is its primary active ingredient, give it a very strong flavor. Andrographis paniculata, its main biologically active compound, has potent cytotoxic and antiproliferative properties against a range of cancer cell lines, including breast, colon, prostate, and lung. Mechanistically, it suppresses angiogenesis, triggers apoptosis, and alters critical signaling pathways such as STAT3 and NF-κB. It is a promising option for cancer treatment due to its minimal toxicity and great therapeutic potential.

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***Withania somnifera* (L.) Dunal**

Withania somnifera (L.) Dunal, ashwagandha,

Withania somnifera (L.) Dunal, commonly known as Ashwagandha. Another name for Ashwagandha is Indian ginseng and winter cherry. It is a plant of the Withania family; 10 species of Withania are found in the world, only two are found in India. It is found in the Middle East and North Africa as well as other African regions, Southern Europe and the Indian subcontinent. Many species of the Withania genus share similar morphological characteristics. It exhibits anti-cancer properties by inhibiting cancer cell survival, proliferation, motility, angiogenesis and metastasis, while inducing cell cycle arrest, apoptosis and autophagy. Withaferin A is a key compound in this activity, showing inhibitory effects on various cancers in both in vitro and in vivo studies.

Conclusion

In particular, medicinal plants remain a valuable source of bioactive compounds with promising therapeutic efficacy in the cancer war. Plants are increasingly believed to contain anticancer agents due to the increased global incidence of cancer and conventional treatment toxicity, cost, and resistance. Among them are flavonoids, alkaloids, terpenoids, and phenolic compounds that present high cytotoxic as well as antioxidant activities and therefore potential for safer, more effective treatments for cancer. From this wealth of nature, approved plant-based anticancer drugs such as camptothecin-derivatives, paclitaxel-derivatives, and vincristine-derivatives have evolved. The big shots just set the stage for going even

further into little-known medicinal plants that may bring quite specific mechanisms of action and healthbenefits. This article notes the need to pick out, split, and study plant chemicals from different healing plants, mainly those of local importance. Complete drug tests, safety checks, and medical trials are needed to turn ancient wisdom into validated treatments. Advances in life sciences technology and phytochemical analysis contribute to further rationalized and optimized production of plant-based cancer drugs. Ultimately, combining study on medicinal plants with contemporary methodologies of drug development provides an optimistic pathway.

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