ejpmr, 2025, 12(4), 612-620

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

BOTANICAL WARRIORS AGAINST CANCER: A COMPREHENSIVE REVIEW OF HERBAL ANTICANCER DRUGS

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Article Received on 27/02/2025 **Article Revised on 19/03/2025** **Article Accepted on 08/04/2025**

ABSTRACT

Herbal medicines have long been recognized for their potential in cancer treatment, with a wide range of bioactive compounds and various mechanisms of action. This review delves deeply into the efficacy, safety, and mechanisms of action of herbal anticancer medicines. We examine a wide range of botanicals, both traditional medicines and developing prospects, and highlight their potential as adjuncts or alternatives to current cancer treatments. Through a detailed analysis of preclinical and clinical trials, we examine the data supporting the anticancer capabilities of several herbal medications. We also examine issues including standardization, quality control, and drug interactions, as well as future avenues for research and clinical application. Overall, this analysis highlights the role of botanicals in the battle against cancer and offers insights.

KEYWORDS: Herbal medicine, anti-cancer drugs, Botanicals, Cancer therapy, Traditional remedies, bioactive compounds, Mechanisms of action, Efficacy, Safety, and Clinical studies.

INTRODUCTION

Cancer remains one of the most formidable challenges in modern medicine, imposing a major impact on world health. Despite advances in conventional treatments such as chemotherapy, radiation therapy, and targeted therapies, the search for more effective and less harmful anticancer drugs continues. In recent years, there has been a renewed interest in herbal therapy as a source of new anticancer medications.[1] Herbal treatments made from diverse plant species have been utilized in traditional medicine systems all over the world for ages. These botanicals include a large number of bioactive chemicals with various pharmacological effects, including anticancer potential. The use of herbal medicines in cancer therapy is not based solely on tradition; it is supported by scientific reasoning and empirical data. Numerous research have shed light on the processes by which plant-derived chemicals produce anticancer effects, such as inhibiting cell proliferation, inducing apoptosis, modulating signalling pathways, and enhancing immune response. Furthermore, herbal medications frequently demonstrate pleiotropic effects, which target numerous pathways implicated in cancer genesis and progression.This comprehensive review seeks to give a full analysis of herbal anticancer treatments, including both traditional and developing candidates. We will look at the botanicals that have shown promise in preclinical and clinical trials for the treatment and management of various forms of cancer. We will also look at the obstacles that come with developing and using herbal medications, such as standardization, quality control, and safety.

Traditional Use and Active Components

For millennia, diverse cultures have employed a variety of plants to cure tumors and cancer symptoms. Some of the most well-known examples include turmeric (Curcuma longa), ginger (Zingiber officinale), garlic (Allium sativum), green tea (Camellia sinensis), and mistletoe. These herbs include a wide variety of bioactive chemicals, including as polyphenols, alkaloids, terpenoids, and saponins, which are thought to contribute to their anti-cancer activities.[1]

Mechanism of Action

The potential mechanisms for herbal medications' anti-cancer benefits are numerous. Some herbs have anti-proliferative properties, which prevent the uncontrolled proliferation of cancer cells. Others cause cancer cells to undergo apoptosis (programmed cell death), whilst others alter the immune system's ability to recognize and fight malignancies. Furthermore, several herbs have anti-inflammatory and antioxidant effects that may help prevent cancer formation and progression.[2]

1. Aloe Plant (aloe vera)
Aloe juice is well known for its purgative capabilities and hair conditioning (De Caro et al. 2015; Ganesan and Choi 2016). It also possessed anticancer action due to existence of a chemical emodin (Tabolacci et al. 2015). Lin et al. (2006) reported revealed emodin decreased the cell viability and also stimulated the arrest of G2/M cell cycle.

2. Asafoetida (Ferula asafoetida)
The perennial herb asafoetida is typically found in the highlands of Afghanistan. and India. Ferulic acid, the primary active ingredient in this plant, is well-known for its antioxidant properties, ability to counteract oxidative stress, and ability to induce nuclear Nrf2 translocation and reactive oxygen species scavenging (Das et al. 2017). Lutein and α-pinene, which are present in it, are important for the inhibition of intracellular production of ROS.

3. Artemisia (Artemisia annua)
Other names for this plant include sweet wormwood, sweet annie, sweet sagewort, and sweet fern (Wang et al. 2017a, b). Artemisinin has been shown to protect against malaria and cancer (Mizushina et al. 2010; Blazquez et al.). 2013). Artemisinin promotes apoptosis in prostate cancer cells and has been shown to be effective against various cancers (Mizushina et al. 2010). Overexpression of the YSP50 gene in cancer cells leads to downregulation of testes-specific protease 50, an aberrant enzyme. Inhibiting its expression can reduce cell proliferation and cause death (Wang et al. 2016).

4. Barberry (Berberis vulgaris)
Since 2500 years ago, it has been a part of Ayurvedic traditional medicine. It is used to cure nausea, exhaustion, diarrhea, fever, upset stomach, and fatigue; yet, it was recently discovered to be an anticancer plant (Abd El-Wahab et al. 2013). It displayed an antibiotic. anti-inflammatory and antioxidant properties (Cybulska et al. 2011). According to Ho et al. (2009), it contains the active chemical ingredient berberine, which increases the genetic expression of caspase-3, caspase-8, and caspase-9 in mitochondria.

5. Bitter Melon (Momordica charantia)
It is used as a folk remedy to treat a variety of illnesses. According to Ray et al. (2010), it boosted apoptosis and decreased cell growth in breast cancer cells. In addition, it shown impact on prostate and cervical cancer. (Ru et al. 2011; Pongnikorn et al. 2003). It comprises the active chemical substance carantin and the BG-4 peptide, which have anticancer effects through apoptosis, a decrease in Bax and Bcl-2 expression in cells, an increase in caspase-3 expression, and an impact on the expression of the cell cycle proteins CDK2 and p21 (Dia and Krishnan).

6. Blackberry (Rubus fruticosus)
Because of its high content of vitamin K, dietary fibers, vitamin C, carbohydrates, protein, lipids, and minerals, it is utilized as a nutritional food (Bushman et al. 2004; 2013; Jakobsdottir et al. The presence of ellagic acid (EA) in blackberries is responsible for their anticancer properties. Strong antioxidant activity was present, and it causes cancer reduction of ATP by apoptosis inhibits cell development. Moreover, it exhibited antiproliferative and cytotoxic properties (Losso et al. 2004). By inhibiting the growth of tumor cells, preventing carcinogens from attaching to DNA, and inducing of apoptosis, preventing angiogenesis, and interfering with the inflammatory and drug-resistant processes necessary for tumor growth and spread (Zhang et al. 2014).

7. Cacao (Theobroma cacao)
One excellent source of polyphenols is cacao beans. Approximately 10% of the weight of the bean is made up of polyphenols. Next to vegetables in the American diet, cacao, a byproduct of chocolate, particularly dark chocolate, is a well-known antioxidant. fruits as well (Rusconi and Conti 2010). It has high levels of procyanidin and caffeine. According to Ramljak et al. (2005), procyanidin has anticanceractivity against breast cancer cells by causing reactive oxygen species and ultimately inducing death. Procyanidin is linked to site-specific dephosphorylation and the downregulation of certain cell cycle regulatory proteins (Tabolacci et al. 2016).

8. Cascara sagrada (Rhamnus purshiana)
Native to North America, cascara bark is also referred to as bearberry, chitticum bark, and Chinook Jargon (Lans et al. 2007). In some parts of the world, this plant's bark is used as a laxative. Aloe is the primary active chemical component. Cascarosides A, B, C, and D along with emodin. Aloe emodin inhibited the growth of cancer cells and suppressed the expression of matrix metalloproteinase-9 and metalloproteinase-2 in cancer cells. This suppression was mediated by the p38 mitogen-activated protein kinase signaling pathway and the Akt/phosphatidylinositol 3-kinase and kinase signaling pathways, which in turn suppressed extracellular signals (Lin et al. 2016).

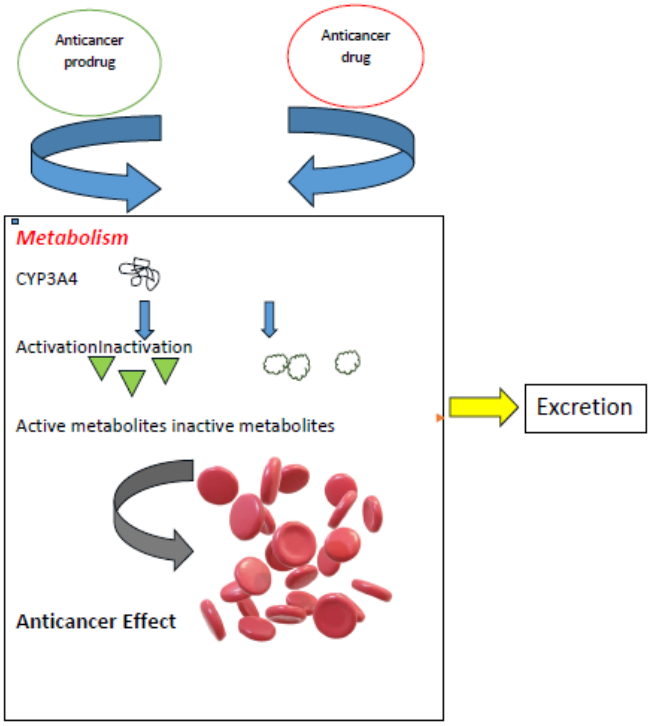
9. Clove Bude (Eugenia aromaticum)
Clove buds are used to extract volatile oil. It serves as a flavoring, aroma, and topical pain reliever. The primary pharmacologically active substances in the oil are phenylpropanoids, which include anthocyanins, eugenol, carvacrol, and cinnamonaldehyde. as well as thymol. According to Chaieb et al. (2007), anthocyanins stop malignant cells from growing. It inhibits the growth of the tumor and encourages apoptosis and the arrest of the G0/G1 cell cycle (Liu et al. 2014).

10. Dandelion (Taraxacum officinale)
Chinese and Ayurvedic doctors cure tumors, cysts, and abscesses with the leaves of this plant, and they are also used to retain water (Hu et al. 2017). Additionally, it is used as a medication to treat a variety of women, such as liver and gallbladder problems, breast and uterine cancer (Koo et al. 2004). By causing human cancer cells to undergo apoptosis, it demonstrates anticancer efficacy (Yoon et al. 2016).

11. Ginger root (Zingiber officinale)
Used in most regions of the world, ginger is a valuable and important plant economically. According to Ismail et al. (2016), ginger is used as a condiment, spice, food, and medicinal. One bioactive substance that was separated from ginger is called gingerol. efficient in the management of a variety of cancer forms, including ovarian cancer. Human cancer cells are killed by gingerol (Rhode et al. 2007). It decreases inflammation and strengthens the immune system in cases of ovarian cancer. It also helps shield the colon from colon cancer (Jeong et al. 2009).

12. Guava (Psidium guajava)
Quercetin 3-glucuronide, d-glucuronic acid, xanthyletin, and loganin are found in guavas. These substances decrease the activity and expression of matrix metalloproteinase 2 and matrix metalloproteinase 9 via downregulating lung cancer cell metastasis. control of ERK1/2 in cellular activity (Im et al. 2012). Guava leaf extract inhibits brain-derived metastatic cancer by virtue of the presence ofIt functions as a chemopreventive agent and contains significant levels of polyphenolic chemicals and flavonoids (Chen et al. 2007). This plant's component also inhibits the growth of cancer cells by Tumor development is induced by different signaling cascades (Ryu et al. 2012).

13. Medicinal Mushrooms A diverse array of physiologically active chemicals found in medicinal mushrooms have demonstrated anticancer potential in the treatment of multiple cancer types. These chemical components demonstrated a range of therapeutic actions, including free radical scavenging, immunomodulating, hepatoprotective, antiviral, antifungal, antibacterial, anti-inflammatory, and cancer-preventive. The intracellular signaling pathways linked to cell differentiation, inflammation and apoptosis, survival, tumor growth, cancer cell metastasis, and angiogenesis are disrupted by the bioactive constituents of medicinal mushrooms (Petrova 2012). By stopping the cell cycle at the G2/M phase and controlling gene expression, it also prevented the growth and dissemination of breast cancer cells. Medicinal mushrooms also inhibit the ability of breast cancer cells to invade, move, and adhere (Jiang and Sliva).



impacts and implication of CYP3A4- medicated metabolism for metabolic activation-inactivation based cancer therapy.[28]

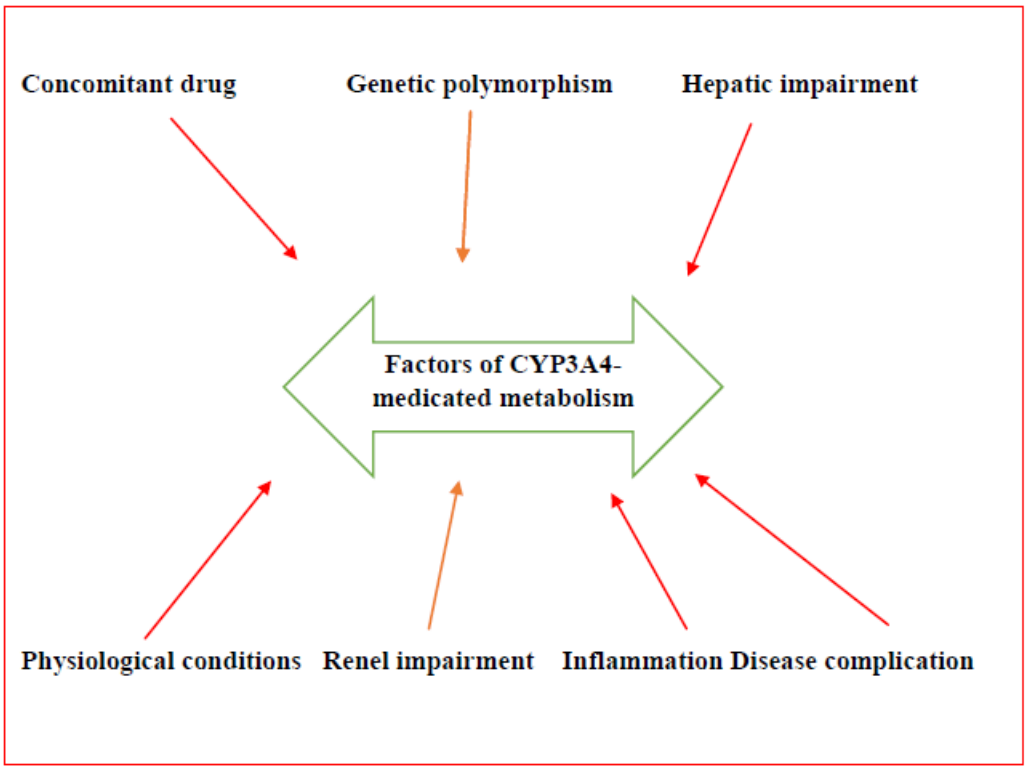


Table 1.1 The anticancer activity of various medicinal plant and their derived phytochemicals.

Plant	Phytochemicals	Anticancer activities
Aloe vera	Human neuroectodermal growth inhibition by aloe vera aloin	Tumour
Azadirachta indica	Limonoids from Azadirachta indica	Which cause Ehrilch cancer in mic and melanoma B16
Apium graveolens	Polyacetylenes Apium graveolens	Leukemia cell lines
Alisma orientale	Triterpenes from alisma orientale	HepG2 MDA-MB -231, and MCF-7 cell lines
Alstonia yunnanensis	The isoquinoline alkaloids of Alstonia yunnanensis	Colon cancer
Aristolochia curcurbitifolia	Alkaloids of isoquinoline and derivatives	A cell line for human liver cancer Artistolochia
Aristolochia manshuriensis	Alkaloids of isoquinoline and derivatives	Carcinoma of the bones
Atractylodes macrocephala	Attractylodes large headed sesquiterpenes	Cell pf lung cancer

The Current Research Landscape

While herbal medicines have been. used for centuries, robust scientific evidence for their anti-cancer efficacy is still lacking. Much of the existing research has been carried out in vitro (laboratory investigations) with cell lines. These studies have yielded promising results, with some herbs able to limit cancer cell proliferation and migration.[3] However, turning these discoveries into therapeutic efficacy requires additional research. In vivo (animal studies) with various herbal extracts have also shown promise for tumour reduction and better survival in several models.[4] However, these findings should be regarded with caution, as they may not always duplicate outcomes in humans due to physiological variations.

Clinical trials to determine the safety and efficacy of herbal medications for cancer treatment are currently limited. Some trials have yielded promising results for cancer patients' symptom management and quality of life. For example, ginger has been demonstrated to alleviate chemotherapy-induced nausea and vomiting.[5] However, conclusive evidence for the use of herbal medications as direct anti-cancer therapy is limited.

Challenges and Limitations

Several obstacles impede research on anti-cancer herbal medications. For starters, standardization and quality control of herbal goods might be significant issues. The effectiveness and composition of herbal treatments can differ greatly depending on plant source, growing

circumstances, and extraction procedures. This unpredictability makes it difficult to perform reliable clinical trials and duplicate results.

Second, the safety profile of herbal medications requires careful consideration. While some herbs are commonly thought to be natural and harmless, they can interfere with current cancer treatments or have negative side effects. Furthermore, potential drug-herb interactions can be complex, necessitating thorough examination.

Finally, the complexity of cancer needs a multifaceted approach to treatment. It is critical to understand how herbal medications may interact with conventional cancer treatments and whether they have synergistic or antagonistic effects.

Future Directions

Despite its limitations, research on anti-cancer herbal medications shows great potential for the future. Here are some significant areas for additional exploration:

Standardization and Quality Control: Creating standardized processes for herbal product cultivation, harvesting, and extraction is critical for maintaining consistent quality and simplifying clinical research.

Mechanism-based Studies: Additional research into the molecular mechanisms by which herbal extracts exert anti-cancer properties can aid in the development of targeted medicines and combination methods.

Well-Designed Clinical Trials: Conducting rigorous clinical trials with bigger patient populations and using suitable controls is critical for determining the efficacy and safety of herbal medications for cancer treatment.

Exploring Synergistic Effects: Investigating how herbal medications can combine with conventional therapy to improve efficacy and reduce adverse effects is an exciting prospect.

Herbal Medicine for Cancer Symptom Management

In addition to their potential anti-tumor actions, some herbal medications have showed promise in the management of cancer-related symptoms and treatments. Here are some examples and accompanying references.

Ginger (Zingiber officinale): Several clinical investigations have shown that ginger reduces chemotherapy-induced nausea and vomiting (CINV).[6,7] Ginger appears to function via influencing a variety of systems in the digestive tract. The majorityrandomized, double-blind, placebo-controlled studies were conducted to assess the effectiveness of ginger root powder or extract in CINV. Ginger was utilized in every study.as oral delivery, with the exception of two trials where patients receiving radioactive iodine (RAI) therapy for differentiated thyroid cancer (DTC) utilized it as aromatherapy for CINV and salivary gland injury.

In terms of CINV scores, intensity, and frequency, Ginger has demonstrated noteworthy outcomes. Sixty breast cancer patients had a five-day aromatherapy treatment using either scent-matched artificial placebo (ginger fragrance oil) or ginger essential oil, which was infused into a necklace. While the data from this study does not support the notion that breathed ginger aromatherapy is a useful adjunctive treatment for However, CINV's results for health-related QoL (HRQoL) were optimistic, showing notable improvements across a number of domains. Therefore, ginger's antiemetic efficacy in CINV for cancer care has received enough evaluation.[24,25]

Turmeric (Curcuma longa): Curcumin, a bioactive component of turmeric, has anti-inflammatory and pain-relieving qualities. Curcumin may help manage pain caused by cancer and arthritis, according to studies.[8] Three of the four studies were discovered to be RCTs, wherein In cases of radiation-induced oral mucositis (1), radiodermatitis (2), and oral mucositis (1), turmeric was applied topically and taken orally. powdered turmeric in CML (1). Applying a lotion containing turmeric topically has demonstrated a noteworthy decrease in dermatitis grades over time. As a mouthwash, turmeric exhibited both a statistically significant delay and reduction in radiation-induced oral mucositis levels over time. Turmeric also reduced the occurrence of treatment breaks during the first half of the treatment schedule prior to 4 weeks, as well as unbearable mucositis. Application of honey and turmeric locally on treatment-induced oral mucositis proved effective. Nitric oxide levels were observed to be considerably lower in both groups in the CML investigation.

Ashwagandha (Withania somnifera): This adaptogenic herb has been proven to improve fatigue and quality of life in cancer patients receiving therapy.[9] Ashwagandha's immunomodulatory properties are currently being investigated for possible advantages. Ashwagandha (Withania somnifera), commonly referred to as Indian ginseng or Winter cherry, is a proud member of the Ayurvedic family of ancient Indian medicine. Numerous toxicological tests have shown that ashwagandha is a safe, edible herb that is non-toxic when used in moderation. Like Korean ginseng, Chinese milkvetch root, female ginseng, reishi mushroom, South American suma, and Japanese green tea, it's frequently listed among the most well-known herbs in the world. It's frequently used in herbal formulas meant as a general tonic to boost vitality and endurance, enhance general health and longevity, and treat ailments like inflammation, stress, cardiovascular disease, immune system dysfunction, and cancer.[10]

Honey: There were 16 clinical trials involving cancer patients that employed honey as a supplement, either by itself or in combination with other ingredients. The majority of these research were RCTs with a 1,093 cancer patients in all were engaged. Patients with head

and neck cancer were the subject of these investigations. who experienced oral mucositis brought on by therapy.

Eleven studies—one preventive—have been conducted on cancer treatment-induced neutropenia, burn cases, radiation-induced burns in breast cancer patients, and malignant wounds. In the majority of research, honey was applied topically to treat oral mucositis, either by itself or in conjunction with propolis, beewax, turmeric, coffee, and olive oil. In addition to placebo, it was compared with a number of other well-known therapy medications, such as regular saline, lignocaine, betamethasone solution (1 honey + coffee), or silver-coated bandages. Honey was utilized both alone and in conjunction with beeswax, olive oil, and propolis extract (HOPE).

Three equal treatment groups were assessed for the grade and outcomes of acute lymphoblastic leukemia (ALL): honey, HOPE (mixture of honey), and control groups.[26]

Ethical Considerations for Herbal Cancer Research

As research into anti-cancer herbal medications advances, it is critical to follow ethical guidelines. Here are some important considerations.

Informed Consent: Patients taking part in clinical trials employing herbal medicines must be adequately informed about the potential advantages and dangers of the intervention. This includes information on the limitations of existing research and the likelihood of interactions with traditional treatments.

Transparency: Researchers must be transparent about the herbal products used in clinical studies, including their source, content, and quality control techniques. This ensures data consistency and allows patients and healthcare professionals to make more informed decisions.

Vulnerability: Cancer patients are frequently vulnerable and may be more susceptible to false claims or abuse. Ethical research techniques must prioritize patient well-being and avoid portraying herbal medicines as miraculous cures.

Future Directions and Collaborative Effort

The future of anti-cancer herbal medication research depends on collaboration among many stakeholders. Here's how teamwork can help the field advance.

The bridge between Traditional and Modern Medicine

Traditional medicine practitioners have extensive understanding of the use of herbal treatments. This gap can be bridged by collaborative research, which incorporates traditional knowledge into well-designed clinical studies.

Standards and Quality Control: Creating standardized processes for producing, harvesting, and extracting herbal products is critical for maintaining consistent quality and facilitating research. Collaboration among scientists, herbal medicine practitioners, and regulatory agencies is critical for reaching this goal.

Mechanism-based research: Further research into the molecular processes by which herbal extracts exert their effects can help shape the development of targeted medicines and combination methods. Pharmacists, botanists, and oncologists should work together to do this research.

By encouraging collaboration and addressing the aforementioned problems, anti-cancer herbal medication research can be fully realized. This integrated approach shows potential for generating safe and effective complementary medicines to improve cancer patients' lives.

The Mechanism on Cancer Therapy

1.Directly halting the growth of cancer cells by promoting macrophage phagocytosis and raising the activity of natural killer cells.
2. Encouraging the death of cancer cells by raising blood serum levels of complement, interferon, and interleukin 2.
3. By obstructing the tumor's blood supply, forcing the tumor to necrotize and preventing its translocation and dissemination.
4. Increasing leukocyte and platelet counts through hemopoietic function stimulation.
5. Encouraging the conversion of cancer cells back into healthy cells.
6. Increasing metabolism and halting the development of cancer in healthy cells.
7. Increasing hunger, enhancing sleep quality, and reducing discomfort, all of which are beneficial to the patient's health.[28]

Detail

Cancer treatment uses a variety of strategies to stop cancer cells from growing and spreading while causing the least amount of harm to healthy cells. The following are the main ways that cancer therapy works.

1. Surgery– Mechanism- the tumour and surrounding tissue are physically removed.
- Application- Used for small tumours that are accessible to the patient without causing them undue harm.
- Limitations- Ineffective against cancer that has metastasized, or spread to other body areas.

2. Radiation Therapy– Mechanism- Inflicts DNA damage on cancer cells using high-energy radiation, resulting in cell death.
- Application- Works well for locally contained tumors and can be combined with other treatments.

- Limitations- May also cause adverse consequences by injuring nearby healthy tissue.

3. Chemotherapy– Mechanism- Employs medications to stop rapidly dividing cells from proliferating and to cause apoptosis, or programmed cell death.
- Application- Applied to a range of malignancies, including metastatic and widely dispersed diseases.
- Limitations- May cause adverse consequences by impacting normally dividing cells that divide quickly, such as those in the bone marrow, digestive system, and hair follicles.

4. Targeted Therapy - Mechanism- Targets the particular proteins, genes, or tissue environment that cancer cells have that support the growth and survival of the disease by using medications or other substances.
- Application- Beneficial for tumors that have particular molecular targets (such as BCR-ABL in chronic myeloid leukemia and HER2 in breast cancer).
Restrictions-Not every malignancy has a clear target, and resistance could grow.

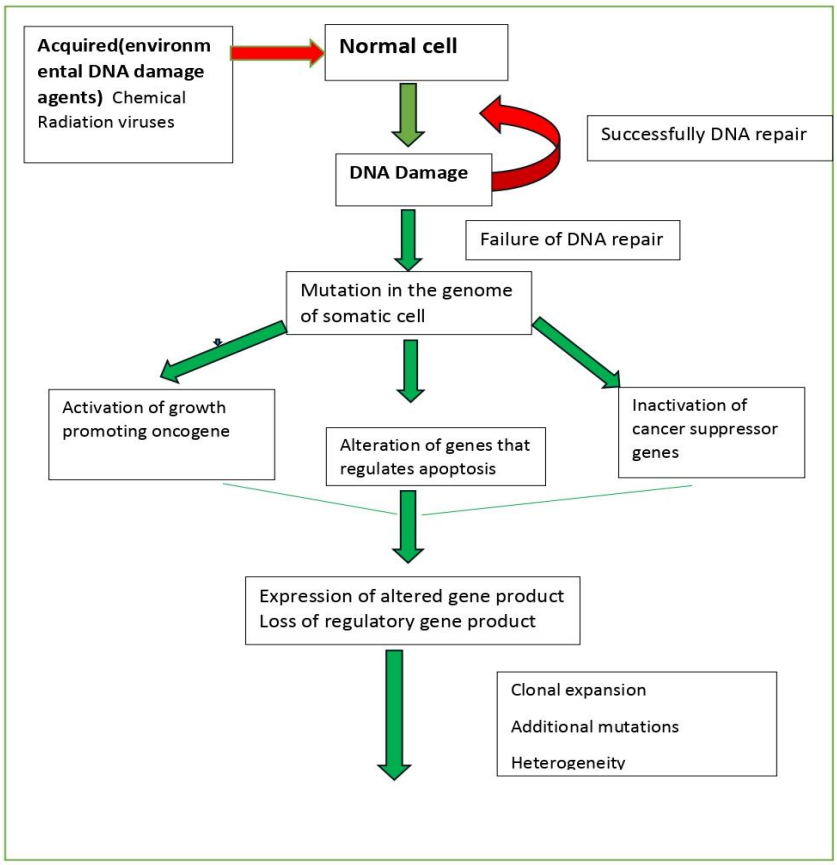
5. Immunotherapy– Mechanism- Strengthens the immune system's ability to identify and eliminate cancerous cells.
- Application- Contains monoclonal antibodies, cancer vaccines, CAR T-cell therapy, and checkpoint inhibitors.
Limitations- May not work for all cancer types and may have immune-related adverse effects.

6. Hormone Therapy– Mechanism- Prevents or eliminates hormones that cause some malignancies, such as prostate and breast cancer.
- Application- Applied to malignancies that are hormone-sensitive.
- Limitations- Only works on malignancies that grow because of hormones.

7. Stem Cell Transplant– Mechanism- Uses healthy stem cells to replace damaged bone marrow, enabling larger radiation or chemotherapy dosages.
Application- Applied to tumors of the blood, such as lymphoma and leukemia.
Limitations- Graft-versus-host disease and other problems are quite likely.

8. Photodynamic Therapy (PDT)– Mechanism- Generates reactive oxygen species that kill cancer cells by combining light and photosensitizing chemicals.
- Application- Beneficial for tumors that are visible or easily accessible.
- Limitation- Its application is limited to specific tumors due to its shallow depth of light penetration.

The type and stage of the cancer, as well as the general health of the patient, will determine whether these therapies are administered alone or in combination. Current research endeavors to enhance the effectiveness and mitigate the adverse effects of such medicines, including the advancement of customized medicine methodologies.[30,31]



CONCLUSION

Anti-cancer herbal medications are a potential option for complementary and alternative cancer treatment. While the scientific evidence for their direct anti-tumour actions is still growing, they provide significant benefits to cancer patients in terms of symptom management and quality of life. Addressing the issues of standardization, safety evaluation, and clinical trial design is critical for realizing the full promise of herbal treatments in cancer treatment. Furthermore, ethical considerations and collaborative research efforts involving traditional medicine practitioners and scientists are required to advance this area ethically. Remember that herbal medications should not be used as a substitute for traditional cancer treatment, and open conversation with a qualified healthcare expert is essential before introducing any herbal remedies into a cancer treatment regimen. Medicinal plants treat a variety of conditions while also preserving people's health and vitality. various illnesses, such as cancer, without causing poisoning. Beneficial natural compounds derived from medicinal plants have made a substantial contribution to the treatment of cancer. This review focuses on a few medicinal plants that have the ability to fight cancer. The chemical found in these plants has strong antioxidant and immunomodulatory properties, which support its anticancer effects. Information on foreign medicinal plants used worldwide that have anticancer effects is included in this page. Utilizing recently creation anticancer drugs made from medicinal plants is also essential. Addressing the development of chemoresistance is significantly hampered by the lack of this early warning system. It would be best to provide therapy that is specially tailored for each patient right from the start.

REFERENCES

1. Biomolecules. (2020). Anticancer Plants: A Review of the Active Phytochemicals, Applications in Animal Models, and Regulatory Aspects.
2. [Lin et al., 2018] Evaluation of the Anticancer Activity of Three Common Culinary Herbs: Parsley, Sage, and Thyme. Journal of Agricultural and Food Chemistry. This study investigated the anti-proliferative effects of extracts from parsley (Petroselinum crispum), sage (Salvia officinalis), and thyme (Thymus vulgaris) on various human cancer cell lines.
3. [Fulda, 2010] Modulation of apoptosis by natural products. The American Journal of Clinical Nutrition.
4. [Sun et al., 2018] A Review of the Anticancer Effects of Curcumin and Its Analogues. Molecules.
5. [National Cancer Institute] https: //www.nccih.nih.gov/health/cancer-and-complementary-health-approaches-what-you-need-to-know.
6. [Kidd et al., 2014] Ginger versus placebo for chemotherapy-induced nausea and vomiting: A meta-analysis. Journal of Clinical Oncology.
7. [Bye et al., 2008] Effectiveness of ginger for the prevention of nausea and vomiting after surgery and chemotherapy: A systematic review of controlled trials. British Journal of Anaesthesia.
8. Curcuma longa (Turmeric) for pain management: https: //www.ncbi.nlm.nih.gov/pmc/articles/PMC9353077/ [invalid URL removed]
9. [Cooley et al., 2017] Randomized, controlled trial of Withania somnifera root extract in supportive care for advanced-stage cancer patients. Journal of American Herbalists Guild.
10. Willett WC, Gold LS, and Ames BN (1995) cancer's causes and ways to prevent it. Proceedings of the National Academy of Sciences United States of America, 92: 5258–5265.
11. Arteaga S, Cardenas R, and Andrade-Cetto A (2005) Larrea tridentata, or creosote bush, an abundant plant found in the deserts of Mexico and the United States, as well as its metabolite, nordihydroguaiaretic acid, 98: 231–239. in J Ethnopharmacol.
12. Arun M, Satish S, Anima P (2016) Jasminum grandiflorum Linn.'s phytopharmacological profile. (Family Oleaceae). J Integr Med Chin, 22: 311–320.
13. Balunas MJ, Kinghorn AD (2005) Medicinal plant drug discovery. Life Sci, 78: 431-441.
14. Pinzauti S, Moneti G, Gratteri P, Coran SA, Vincieri FF, Bambagiotti-Alberti M., 1991.
15. An analysis of Sanguinaria canadensis L. Fab mass spectrometry for fluid extraction. J-Pharm Medical Journal, 9: 1083–1087.
16. Atherosclerosis and cancer: the role of free radicals (1993) Bankson DD, Kestin M, Rifai N. Clin Lab Med, 13: 463–480.
17. In 1998, Beckman K and Ames BN developed the free radical hypothesis of aging. Rev Physiol, 78: 547–5811.
18. Villa LL, Boccardo E (2011) human cancer's viral causes. Med Chem Curr, 14: 2526–2539.
19. Phillips B, Ou B, Isbell T, Bushman BS, Crane JM, and Knapp SJ (2004) The chemical makeup of
20. Caneberry seeds and oils (Rubus spp.) and their potential as antioxidants, 52: 7982–7987. in J Agric Food Chem
21. Butel JS (1999) The etiology and molecular mechanisms of viral carcinogenesis have been revealed in human disease. Cancer Development, 21: 405–426.
22. Capolupo A, Casapullo A, Cassiano C, Del Gaudio F, Esposito R, Tosco A, Riccio R, and Monti MC (2016) Targeting the ribosomal machinery, β-Boswellic acid, a bioactive ingredient in food supplements, suppresses protein synthesis, 51: 821–827 in J Mass Spectrom.
23. Rogan E, Liehr JG, Cavalieri E, Frenkel K, and Roya D (2000) Endogenous genotoxic agents: DNA adducts and mutations caused by estrogens. J National Cancer Institute Monogr.

24. Comez G, Kalender ME, Sevinc A, Dirier A, Camci C. Leech therapy as a symptomatic treatment for pain associated with cancer, 2010 Mar; 11(3): 443–4445 in Pain Med.
25. Rathi B, Rathi R, 65. An ayurvedic approach to a case report of acute lymphoblastic leukemia. Int J Ayur Alli Sci Ayurpharm, 2014 Feb; 3(3): 48–51.
26. Shukla S, Kailash U, Kashyap V, Bharti AC, Hussain S, Mahata S, Hedau S, Bhambhani S, Roy M, Batra S, et al. 'Praneem' polyherbal tablet for the treatment of high-risk HPV16 human papillomavirus infections in women with early cervix intraepithelial lesions, 2009 Dec; 135(12): 1701-1709; J Cancer Res Clin Oncol.
27. Singh S, Sharma R, Das BC, Bharti AC, Sharma K, Singh P, Atrey N, Gupta JC, and Talwar GP. BASANT, a safe polyherbal microbicide, eradicates HPV-16 in females who have Website for cancer. On the internet at http: //www.cancer.gov.
28. Ghosh A, Das B, Roy A, Mandal B, and Chandra G: Some therapeutic plant extracts have antibacterial action, Natural Medicines Journal, 2008; 62: 259–262.
29. Grayer R and Harborne J: Phytochemistry, 1994; 37: 19–42: A review of plant-derived antifungal chemicals.
30. A dictionary of Indian industrial products and raw materials, The Wealth of India, 1985; I(A-B): 29–26. Indian Journal of Pharmacol, 2012; 44(2): 225-229. Chockalingam V, Suryakiran KSDV, and Ganasambantham P: Antiproliferative and antioxidant activities of Aegle marmelos (Linn.) leaves in Dalton's lymphoma ascites transplanted mice.
31. Ketan VK, Chandrashekhar RT, Dubey H, Pramod GY, and Angad MP: The ethanolic extracts of Agave americana leaves have anticancer action. Pharmacologyonline, 2011; 2: 53-68.
32. Bayrak I, Altug T, Durak H, Karahasanoglu T, Saribeyoglu K, Hamzaoglu I: Honey-coated surgical wounds prevent tumor implantation, Archives of Surgery, 2002; 135: 1414.
33. Jean B: Medicinal plants, phytochemistry, and pharmacognosy France: Lavoisier Publisher, 1993; 832.
34. In the treatment of late chronic-phase chronic myelogenous leukemia, homoharringtonine and low-dose cytarabine are used (Kantrajian HM, Talpaz M, Smith TL, Cortes J, Giles FJ, et al.). Journal of Clinical Oncology, 18(18): 3513–3521.
35. Using the suppression of NFkappaB and AP1, cinnamon extract causes tumor cell death, according to Kwon HK, Hwang JS, So JS, Lee CG, Sahoo A, Ryu JH, Jeon WK, Ko BS, Im CR, Lee SH, Park ZY, and Im SH. BMC Cancer, 2010; 24(10): 392.
36. Jean B: Medical phytochemistry and pharmacognosy.
37. Bayrak I, Altug T, Durak H, Saribeyoglu K, Karahasanoglu T, Hamzaoglu I: Surgical wounds covered with honey inhibit the growth of tumors, Archives.
38. surgical journal, 2002; 135: 1414–62. Jean B: Phytochemistry, pharmacognosy, and medicinal plants.
39. Lavoisier Publisher, France, 1993; 832–833. Homoharringtonine and low-dose cytarabine are used to treat late chronic-phase chronic myelogenous leukemia (Kantrajian HM, Talpaz M, Smith TL, Cortes J, Giles FJ, et al.), 18(18): 3513–3521, 64 Journal of Clinical Oncology.
40. Cinnamon extract induces tumor cell death via NFkappaB and AP1 inhibition (Kwon HK, Hwang JS, So JS, Lee CG, Sahoo A, Ryu JH, Jeon WK, Ko BS, Im CR, Lee SH, Park ZY, and Im SH), 2010; 24(10): 392. 65; BMC Cancer. Jean B: Health Care
41. Aslani E, Ranjbar M, and Naghsh N. Cytotoxic effects of hydro-alcoholic extracts of Lepidium sativum (cress) on the k562 leukemia cell line, prepared from different phases of the plant, 2015; 18: 411-209. Hormozgan Med J.
42. Mbarek LA, Mouse HA, Elabbadi N, Bensalah M, Gamouh A, Aboufatima R, et al. Blackseed (Nigella sativa L.) extracts' anti-tumor qualities, 2007; 40(6): 839–47; doi: 10.1590/s0100-879x2006005000108. Braz J Med Biol Res.