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## REVIEW ARTICLE

# A Review on Medicinal Plants having Anticancer Potential

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### ABSTRACT

*One of the most important health issues facing humanity, cancer is a scary disease that demands a proactive approach to treatment. Plant, a source of novel chemical entities and a promising topic for cancer research. Despite its success, chemotherapy has so far had some unfavourable side effects. However, the use of plants and products generated from them is revolutionising the field as a simple, secure, cost-effective, time-saving, environmentally friendly, and less hazardous alternative to traditional treatment procedures. Phytochemicals have selective activities that are targeted towards tumour cells. The complex process known as carcinogenesis involves a number of signalling cascades. Phytochemicals are thought to be attractive prospects for the development of new therapeutics because of their pleiotropic effects on the target event in a number of ways." Researchers are looking at which of these phytochemicals might be possibilities for inhibiting or reducing the growth of cancer cells without causing any unfavourable side effects. There are a lot of phytochemicals and the analogues they were made from that have been identified as potential anticancer therapeutic possibilities. Hence, an attempt has been made to review some medicinal plants used to prove scientific validation for the prevention and treatment of cancer. An effort has been made to highlight the most recent developments and noteworthy accomplishments in phytomolecule-based cancer therapies that target nuclear and cellular components through this succinct overview.*

Keywords: Cancer, Phytoconstituents, carcinogenesis, medicinal plants

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### INTRODUCTION

Despite recent progress in the diagnosis and treatment of cancer, it continues to be among the top causes of morbidity and mortality globally and continues to present a significant burden to the global health systems. Traditional treatment modalities, such as chemotherapy, radiotherapy, and targeted therapy have enhanced the survival rates but their clinical applicability is frequently constrained by their side effects, resistance to drugs, excessive cost, and inability to selectively attack the cancer cells. The restrictions have led to a growing interest in alternative and complementary approaches, especially exploring medicinal plants as new sources of anticancer agents.

Traditional medicine like Ayurveda, Traditional Chinese Medicine and Unani has medicinal plants that have been part of the traditional healthcare systems centuries ago. They contain abundant bioactive phytochemicals such as alkaloids, flavonoid, terpenoids, polyphenols, glycosides among others most of which have important anticancer activities. It is worth mentioning that some of the most popular chemotherapeutic agents, including paclitaxel (*Taxus* species) and vincristine (*Catharanthus roseus*), are of plant origin, which is a testament to the enormous potential of phytochemicals in the discovery of cancer drugs.

Medicinal plants have anticancer effects that can be attributed to their capacity to alter various cellular and molecular mechanisms that trigger carcinogenesis. These are induction of apoptosis, cell proliferation, angiogenesis and metastasis, antioxidant activity and immune responses. Plant-derived compounds have multi-targeted effects unlike the more traditional, single-target drugs, and therefore seem useful in complex ailments such as cancer.

Over the past few years, a scientific literature on the effectiveness of many medicinal plants and their constituent compounds in cancer prevention and treatment has been accumulated. The progress in the molecular biology and pharmacology has also contributed to the discovery of new targets and mechanisms of action of these natural products. Nonetheless, amidst encouraging preclinical outcomes, issues like standardization, bioavailability, toxicity assessment, and clinical validation are yet to be overcome.

The purpose of the review is to offer a detailed discussion of medicinal plants that have notable anticancer properties with special attention to bioactive constituents, their mechanisms of action and their therapeutic potential. The focus is also made on the recent progress, constraints, and perspectives of the plant-based anticancer drug discovery field.

## HISTORY OF THE DISEASE

The origin of the word cancer is credited to the Greek physician Hippocrates (460-370 BC), who is considered the “Father of Medicine.” Hippocrates used the terms *carcinos* and *carcinoma* to describe non-ulcer forming and ulcer-forming tumors. In Greek, these words refer to a crab, most likely applied to the disease because the finger-like spreading projections from a cancer called to mind the shape of a crab. The Roman physician, Celsus (25 BC - 50 AD), later translated the Greek term into cancer, the Latin word for crab. Galen (130-200 AD), another Greek physician, used the word *oncos* (Greek for swelling) to describe tumors. Although the crab analogy of Hippocrates and Celsus is still used to describe malignant tumors, Galen’s term is now used as a part of the name for cancer specialists – oncologists.

Accumulation of toxins through carcinogenic food like fast food, colas, habits like smoking, drinking, paan chewing, stressful lifestyle, toxic medicines and environmental pollution lowers immunity causing cancer. There are 10.9 million new cases, 6.7 million deaths, and 24.6 million persons alive with cancer. The most commonly diagnosed cancers are lung (1.35 million), breast (1.15 million), and colorectal (1 million); the most common causes of cancer death are lung cancer (1.18 million deaths), stomach cancer (700,000 deaths), and liver cancer (598,000 deaths).[2] Internationally the cancer burden doubled between 1975 and 2000 and is set to double again by 2020 and nearly triple by 2030. There were around 12 million new cancer cases and 7 million cancer deaths worldwide in 2008, with 20-26 million new cases and 13- 17 million deaths projected for 2030.[3] In India Every year about 8, 50,000 new cancer cases being diagnosed, resulting about 5, 80,000 cancer related death every year.[4] The control of cancer, one of the leading cause of death worldwide, may benefit from the potential that resides in alternative therapies. Every year, more than 10 million new cases of cancer are scrutinized, according to the World Health Organization (WHO), and statistical trends predict that this number will double in the decades.[5]

Table No. 1: Types of cancer[6]

Type	Site of cancer
Carcinomas	Cells that cover internal and external parts of the body such as lung, breast, and colon cancer.
Sarcoma	Bone, cartilage, fat, connective tissue, muscle and other supportive tissues.
Lymphomas	Lymph nodes and immune system tissues.
Leukemias	Bone marrow and often accumulate in the bloodstream.
Adenomas	Thyroid, the pituitary gland, the adrenal gland and other glandular tissues.

## Sign and Symptoms:

You should know some signs and symptoms of cancer. But remember, having any of these does not mean that you have cancer- many other things cause these sign and symptoms, too.

- Unexplained weight loss
- Fever
- Fatigue
- Pain
- Skin changes
- Change in bowel habits or bladder function
- Sores that do not heal
- White patches inside the mouth or white spots on the tongue
- Unusual bleeding or discharge
- Thickening or lump in the breast or other parts of the body
- Indigestion
- Recent change in a wart or mole or any new skin change

- Nagging cough
- Breathlessness
- Unexplained vaginal bleeding
- Persist heart burn or indigestion
- Croaky voice or hoarseness
- Looser poo or pooing more often
- Persistent bloating
- Difficulty swallowing
- Mouth or tongue ulcer that won't heal
- Heavy night sweats
- Unusual breast changes

### **DIAGNOSIS OF CANCER**

The diagnosis of cancer involves several tests, including imaging tests such as X-rays, CT scans, and MRI scans, as well as laboratory tests such as biopsies and blood tests. Biopsies involve taking a small sample of tissue from the tumor and examining it under a microscope to determine if it is cancerous or benign (non-cancerous). Blood tests can detect certain substances in the blood that are associated with cancer, such as tumor markers.

#### **Factors Influencing Cancer:**

##### **Age:**

Cancer most commonly develops in aged people; 78% of all cancer diagnoses are in people 55 years of age or older. Anyone can develop cancer. However, the risk of being diagnosed increases with age.

##### **Obesity and Physical activity:**

Obesity and lack of physical activity are associated with increased risk at various cancer sites, including breast and endometrial cancer. [7]

##### **Tobacco and Smoking:**

The consumption of tobacco is the leading cause of cancers. The regular use of tobacco via smoking, chewing, snuffing, which is responsible for 65% to 85% cancer incidences in men and women, respectively. [8]

##### **Alcohol consumption:**

Alcohol consumption has been considered as one of the major causes of colorectal cancer as per a recent monograph of WHO. Annually, about 9.4% new colorectal cancer cases are attributed to the consumption of alcohol, globally. [8]

##### **Radiation**

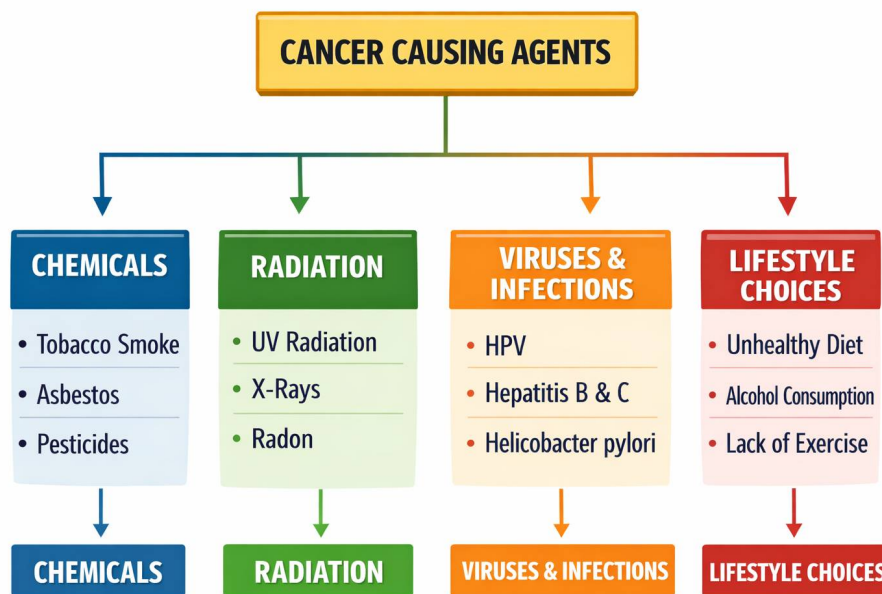
In the developed and developing countries, the radiations are also notorious carcinogens. About 10% cancer occurrence is due to radiation effect, both ionizing and non-ionizing. The major sources of radiations are radioactive compounds, ultraviolet [UV] and pulsed electromagnetic fields. [6]

### **CAUSES OF CANCER**

In the late 1800s, several ideas were proposed by various scientists to establish the origins of cancer.[9] Cancer was thought to be caused by displaced embryonal tissue by Lobstein and Recamier, and subsequently Cohnheim, although Virchow argued that persistent irritation was a major cause of cancer.[10] Viruses were later identified as one of the major causes of cancer based on a few experimental pieces of evidence.[11] All of these studies concluded that cancer is a multifaceted sickness, with a complex web of causes and there is no single factor identified for any type of cancer.

The following are some of the factors that damage DNA and are known to cause cancer [10]:

1. Gene mutations
2. Poor immune system
3. Exposure to UV rays and air pollution are two major environmental concerns
4. *Helicobacter pylori* (H. pylori), *Hepatitis B virus* (HBV), *Hepatitis C virus* (HCV), Human papillomavirus (HPV), and Epstein-Barr virus are examples of microbiological infections
5. Unhealthy Habits (smoking, high alcohol intake, tobacco use, exposure to chemicals, obesity)
6. Intake of nonsteroidal anti-inflammatory medicines (NSAID) for a long period.



**Fig. No. 1: Cancer causing agents**

**PATHOPHYSIOLOGY OF CANCER**

Mutation and tumor initiation: A genetic change causes a mutation in a single cell, which causes that cell to proliferate abnormally, that results in a tumor cell.

Cell proliferation and Tumor progression: As more mutations arise among the tumor population, tumor development continues. Mutated cells have a selective advantage over normal cells in that they proliferate and divide quickly. As a result, in the tumor population the progeny of a cell with an extra mutation will become dominant [11].

Clonal selection and malignancy: Tumor cell proliferation results in a new clone of tumor cells with a faster growth rate or other characteristics (such as survival, invasion, or metastasis) that provide them a advantage for selection. The method is known as clonal selection. Clonal selection persists throughout tumor growth, resulting in tumors that grow faster and become more aggressive.

Metastasis: Metastasis is a complicated process in which cancer cells break out from the main tumor and travel [11].

to other parts of the body via the bloodstream or lymphatic system. The cells continue to expand in other locations, eventually forming secondary tumors made up of cells that are similar to the original tissue. The capacity of tumors to metastasis, such as pancreatic cancer and uveal (iris, ciliary body, or choroid of eye) malignancies, is a major factor in their lethality. Many fundamental questions about metastatic tumor clonal structures, phylogenetic relationships among metastases, the scale of ongoing parallel evolution in metastatic and primary sites, how the tumor disseminates, and the role of the tumor microenvironment in determining the metastatic site remain unanswered.[12]

The pathophysiology of cancer involves several stages.

**Table no.2 : Stages of cancer**

First stage	Initiation	A mutation occurs in a cell's DNA, leading to the activation of oncogenes (genes that promote cell growth) or the inactivation of tumor suppressor genes (genes that inhibit cell growth).
Second stage	Promotion	The mutated cells are stimulated to divide and grow rapidly, forming a small cluster of abnormal cells.
Third stage	Progression	The abnormal cells continue to divide and grow, forming a tumor that can invade surrounding tissues and spread to other parts of the body through the bloodstream or lymphatic system.

## ALLOPATHIC REMEDIES FOR CANCER

Allopathic drugs have made a name for themselves in nanofiber drug delivery for the treatment of cancer cells. They have been researched upon more than natural drugs and have been showing promising results. Combinations of natural and allopathic drugs in carriers have been experimented upon too [13,14].

### List of Some Anticancer Drugs:

1. Docetaxel
- 1.1 Paclitaxel
2. Anthracyclines
  - 2.1. Doxorubicin
  - 2.2 Epirubicin
3. Alkylating Agents
  - 3.1. Cyclophosphamide
4. Vinca-Alkaloids
  - 4.1. Vinorelbine [Intravenous]
  - Vinorelbine [Oral]
5. Anti-Metabolites
  - 5.1. 5-Fluorouracil
  - 5.2 Capecitabine

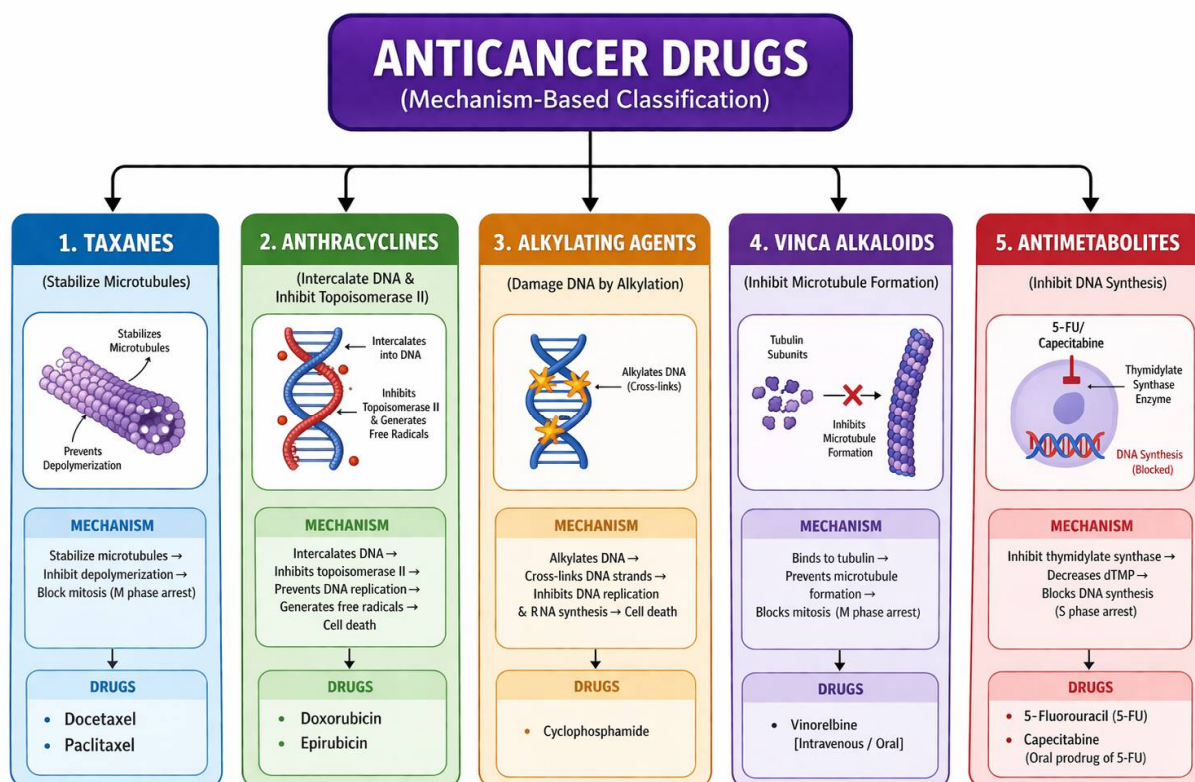


Fig. No. 2: Anticancer drugs (Mechanism based)

## HERBAL ANTICANCER DRUGS

Herbal anticancer drugs—from plants long used in systems like Ayurveda, Traditional Chinese Medicine, and Unani—are getting a lot of attention in cancer research. People have turned to these plants for centuries, and it turns out, modern science keeps finding reasons to take them seriously. In fact, many of today's anticancer drugs can trace their roots, directly or indirectly, back to plants [28].

These herbal agents don't just work through one pathway. They can trigger cancer cell death by activating mitochondria or death receptors, stop tumor growth by arresting the cell cycle, and hold back the formation of new blood vessels that tumors need. They also target crucial signaling pathways in cancer cells, like NF- $\kappa$ B, PI3K/Akt, MAPK, and p53. Plenty of these plant compounds are also known for their

antioxidant and anti-inflammatory effects, which help protect cells and lower cancer risk even before it starts [29-34].

Lately, nanotechnology and new drug delivery methods have made plant-based compounds way more effective. Now these compounds stay stable longer, absorb better, and reach the right spots in the body. On top of that, mixing herbal compounds with traditional cancer drugs has proven to work even better together—they boost each other's effects, lower side effects, and help fight drug resistance.

### WHO GUIDELINES FOR STANDARDIZING HERBAL ANTICANCER DRUGS [37]

The WHO established guidelines for standardizing herbal drugs and focused on present and future trends of methods used for analysis of herbal drugs for such as:

1. Quality control of raw drug materials, plant preparations and finished products.
  2. Evaluation of stability and shelf life
  3. Safety assessment and documentation based on toxicological studies or experience
  4. Evaluating biological activity and ethno-medical data to determine effectiveness. The chromatographic fingerprints and active principal or major compounds should be used to standardize bioactive extract.
- About 35,000 plant species have received approval from the National Cancer Institute [NCI] for possible anticancer properties. One person will solely believe in the benefits of chemotherapy, while another will think that herbs and plants can actually delay or even kill cancer cells. Here is a list of herbs and medicinal plants that have been the subject of scientific research and have shown promise in the fight against cancer, even though there is still more to be done in this field.

**able no. 3. Plants used for management of cancer**

Medicinal plants (Common name)	Family	Part of the plant used	Active constituents	Mechanism of action	Reference
<i>Curcuma longa</i> (Turmeric)	Zingiberaceae	Rhizomes	Curcumin	Induces apoptosis	14
<i>Zingiber officinale</i> (Ginger)	Zingiberaceae	Rhizomes	Curcumin, gingerenone A, gingerols, zingerone	Suppress and arrest the G0/G1-phase, reduces DNA synthesis, and induces apoptosis	15
<i>Withania somnifera</i> (Ashwagandha)	Solanaceae	Roots	Withaferin A, D	Inhibits growth & spread of various cancers	16
<i>Allium Sativum</i> (Garlic)	Liliaceae	Bulbs	Allicin, alliin, allixin	Enhances the activity of macrophages and inhibits metastases	17
<i>Catharanthus roseus</i> (Madagascar periwinkle)	Apocynaceae	Dried whole plants	Vinblastine, vincristine	Act as an anti-mitotic and anti-microtubule agent	18
<i>Glycyrrhiza glabra</i> (Liquorice)	Leguminosae	Extract of plant	Glycyrrhizin	Inhibit abnormal cell proliferation and tumor formation	19
<i>Podophyllum hexandrum</i> (Mayapple)	Podophyllaceae	Roots and Rhizomes	Podophyllotoxin, asiragalin, podophyllin.	Arrests multiplication of Cancerous cells by breaking down the microtubule	20
<i>Silybum marianum</i> (Milk thistle)	Asteraceae	Leaves	Silymarin, Silybin	Reduces the tumor multiplicity and down-regulates the gene product which is associated with the tumor cells proliferation, angiogenesis, invasion, and metastasis	21
<i>Camellia sinensis</i> (Green Tea)	Theaceae	Leaves	Epicatechin, epigallocatechin,	Inhibition of cancer cells proliferation	22

			epigallocatechin gallate, epigallocatechin-3-gallate		
<i>Cannabis sativa</i> (Hemp)	Cannabinaceae	Leaves	Cannabinoids, cannabinol,	Induces cancer cell death by apoptosis and inhibits proliferation of cancer cell	<b>23</b>
<i>Aloe barbadensis</i> (Aloe vera)	Asphodelaceae	Leaves	Aloe-emodin, Aloin	Inhibit metastasis, enhances the immune system	<b>24</b>
<i>Plumbago zeylanica</i> (Ceylon leadwort)	Plumbaginaceae	Leaves	Plumbagin	Plumbagin Induces cell death through apoptosis	<b>25</b>
<i>Betula pendula</i> (Silver birch)	Betulaceae	Bark	Betulin, Betulinic acid	Inhibiting cancer cells growth	<b>26</b>
<i>Centella asiatica</i> (Asiatic Pennywort)	Apiaceae	Whole plant	Asiaticoside, Asiatic acid	Inhibit cell growth by inducing apoptosis	<b>27</b>
<i>Digitalis purpurea</i> (Foxglove)	Plantaginaceae	Leaves	Gitoxigenin, gitoxin	Involved in apoptosis induction	<b>28</b>
<i>Eugenia aromatic</i> (Clove)	Myrtaceae	Flower buds	Eugenol, carvacrol, thymol, anthocyanins	Inhibit and arrest the growth of cancerous cell	<b>29</b>
<i>Psidium guajava</i> (Guava)	Myrtaceae	Fruits, Leaves extract	Quercetin 3-glucuronide, d-glucuronic acid, xanthyletin	Inhibits cancer cells through various signaling cascades and induces the growth of tumors	<b>30</b>
<i>Thuja occidentalis</i> (Arborvitae, white cedar)	Cupressaceae	Leaves extract	Thujone	Decreases the cell viability and showed pro-apoptotic and promotes neoplasia regression	<b>31</b>
<i>Taraxacum officinale</i> (Dandelion)	Asteraceae	Leaves	Vitamins (A, C, K), calcium, lipotropic choline	Induction of apoptosis in the cancer cells	<b>32</b>
<i>Olea europae</i> (Olive)	Oleaceae	Leaves and fruits	Oleic acid, oleuropein, pinosresinol, oleanolic acid, maslinic acid	Inhibition of angiogenesis and induction of apoptosis	<b>33</b>
<i>Ammi visnaga</i> (Toothpick plant)	Apiaceae	Shoot	Visnadine, Quercetin, sitosterol, kaempferol, cimifugin, khellol	Cell cycle arrest	<b>34</b>
<i>Artemisia absinthium</i> (Wormwood)	Asteraceae	Root and shoot	Artemisinin, quercetin, -pinene, -pinene, isorhamnetin, myrcene, limonene, linalool, artesunate	Inhibition of angiogenesis and induction of apoptosis	<b>35</b>
<i>Ferula asafoetida</i> (Asafoetida- evil's Dung)	Apiaceae	Shoot and resin	Sesquicoumarin, oleic acid, -sitosterol	Inhibition of mutagenesis and cancer cells proliferation	<b>36</b>
<i>Tinospora cordifolia</i> (Heart-leaved moonseed)	Menispermaceae	Whole herbs	Tinosporine, Berberine	Causes activation of macrophages	<b>37</b>
<i>Azadirachta indica</i>	Meliaceae	Leaves	Azadirachtin, nimbolide	Tumor suppressors	<b>38</b>

(Neem)					
<i>Momordica charantia</i> (Bitter Melon)	Cucurbitaceae	Fruits	Momorcharins, momordicine, charantin	Induce autophagy, apoptosis, and cell cycle arrest	<b>39</b>
<i>Thymus vulgaris</i> (Thyme)	Lamiaceae	Shoot	Thymol, carvacrol	Cell cycle arrest	<b>40</b>
<i>Garcinia indica</i> (Kokum)	Clusiaceae	Fruits	Garcinol, isogarcinol, Cyanidin-3- glucoside	Induces apoptosis	<b>41</b>
<i>Lepidium sativum</i> (Cress)	Brassicaceae	Shoot	Vitamins (A, B, C, and E), $\omega$ -linolenic acid, isothiocyanate, glucosinolates	Cell cycle arrest	<b>42</b>
<i>Nigella sativa</i> (Black cumin)	Ranunculaceae	Seeds	Thymoquinone, dinitroquinone	Induce apoptosis and cell cycle arrest	<b>43</b>

## CONCLUSION

Cancer consumed the lives of millions of people every year. Various cancer treatments are accessible, but they all have drawbacks such as renal damage, gastrointestinal disorders, and so on, necessitating the development of a new solution to this problem. Given that nowadays more than 50% of medicines are derived from plants so it is crystal clear that natural resources, especially plants could be radically used to find active drugs for cancer treatment. There was been a discrepancy in the past that the use of natural resources, especially plants can be time-consuming. Though nowadays using new techniques has been accelerated active plant compounds extraction and this, in turn, has been used as medicinal plants. The rebirth of medicines created in plants especially ones used for cancer treatment and autoimmunity is remarkable. The number of herbal constituents that have been used to treat cancer is not more than 60 combinations. Since there is little evidence about the helpfulness and safety of plant production compared to products commonly consumed more research can improve the appropriate use of herbal preparations. There are some disadvantages in cancer treatment using chemotherapy, surgery, and radiation therapy that make challenges in treatment for these methods. Chemotherapy repeatedly leaves severe adverse effects and can cause hurt to healthy cells. Therefore, all efforts have to be targeted to reveal the properties of the plant extracts and clearly suggest that they have prospects as anticancer agents.

## REFERENCES

1. Prakash O. (2013). Anticancer Potential of Plants and Natural Products: A Review. *Am J Pharm Sci.* 1(6):104–15.
2. Max Parkin D, Freddie Bray MD, Ferlay J, Paola Pisani, (2002). Global Cancer Statistics.
3. Mulcahy N, Cancer to Become Leading Cause of Death Worldwide by 2010, Medscape Medical News, 2008.
4. Dhanamani M, Lakshmi Devi S, Kannan S, (2011). Ethnomedicinal plants for cancer therapy - a review, *J. Drugs Med*, 3, 1-10.
5. Pandey G, Madhuri S. (2009). Some medicinal plants as natural anticancer agents. *Phcog Rev.* 3(6):259–63.
6. Radha Sharma, Suman Jain, (2014). "Cancer Treatment: An Overview of Herbal Medicines" *WJPPS*, 3: 224.
7. Sinha R, Anderson DE, McDonald SS, Greenwald P, (2003). Cancer Risk and Diet in India. *J Postgrad Med.*, 49: 222-228.
8. Imran Ali, Waseem A. Wani and Kishwar Saleem, (2011). Cancer Scenario in India with Future Perspectives *Cancer Therapy*, 8: 56-70.
9. Oberling C. (1944). Three hypotheses in The Riddle of Cancer, (Translated from French by William H. Woglom). London: Yale University Press; p. 17–37.
10. Triolo VA. (1965). Nineteenth century foundations of cancer research advances in tumor pathology, nomenclature, and theories of oncogenesis. *Cancer Res.* 25:75–106.
11. Taborelli M, Polesel J, Montella M, Libra M, Tedeschi R, Battiston M, et al. Hepatitis B and C viruses and risk of non-Hodgkin lymphoma a case-control study in Italy. *Infect Agent Cancer.* 2016;11(1):27.
12. J. Varshosaz, et al., (2018). Poly (butylene adipate-co-terephthalate) electrospun nanofibers loaded with 5-fluorouracil and curcumin in treatment of colorectal cancer cells, *Polym. Test* 65: 217–230.
13. G. Yang, J. Wang, L. Li, S. Ding, S. Zhou, (2014). Electrospun micelles/drug-loaded nanofibers for time-programmed multi-agent release, *Macromol. Biosci.* 14 (7) : 965–976.
14. 15.Ahmad R, Fatima N, Srivastava AN, Khan MA. (2015). Anticancer Potential of Medicinal Plants *Withania Somnifera*, *Tinospora Cordifolia* and *Curcuma Longa*: A Review. *World Res J Med Aromatic Plants.* 3(1):47–56.
15. Abdullah S, Abidin S, Murad NA, Suzana M, Ngah WZW, Yusof Y, et al. (2010). Ginger extract (*Zingiber officinale*) triggers apoptosis and G0/G1 cells arrest in HCT 116 and HT 29 colon cancer cell lines. *Afr J Biochem Res.* 2010;4(4):134.

16. Umadevi M, Kumar K, Bhowmik D, Duraivel S. (2013). Traditionally Used Anticancer Herbs In India. *J Med Plants Stud.* 1(3):56–74.
17. Thomson M, Garlic AM. (2003). *Allium sativum*: a review of its potential use as an anti-cancer agent. *Current Cancer Drug Targets.* 3(1):67.
18. Heijden R, Jacobs D, Snoeijer W, Hallard D, Verpoorte R. (2004). The Catharanthus Alkaloids: Pharmacognosy and Biotechnology. *Curr Med Chem.* 11(5):607–28. doi:10.2174/0929867043455846.
19. Jung GD, Yang JY, Song ES, Park JW. (2001). Stimulation of melanogenesis by glycyrrhizin in B16 melanoma cells. *Exp Mol Med.* 33(3):131–5.
20. Deshmukh VN, Sakarkar DM. (2011). Ethnopharmacological review of traditional medicinal plants for anticancer activity. *Int J Pharm Tech Res.* 3(1):298–308.
21. Sheela MA, Salar S, Khanna S, Bhattacharjee A. (2010). Dietary supplements as anti-cancer agents. *Int J Pharm Sci Rev Res.* 4(2):159–63.
22. Cabrera C, Artacho R, Giménez R. (2006). Beneficial Effects of Green Tea—A Review. *J Am Coll Nutr.* 25(2):79–99. doi:10.1080/07315724.2006.10719518.
23. Pushkarev VM, Kovzun OI, Tronko MD. (2008). Antineoplastic and apoptotic effects of cannabinoids. N-acylthanolamines. *J Cancer Res Exp Oncol.* 30(1):6–21.
24. Majumder R, Das CK, Mandal M. (2019). Lead bioactive compounds of Aloe vera as potential anticancer agent. *Pharmacol Res.* 148:104416. doi:10.1016/j.phrs.2019.104416.
25. Sandur SK, Ichikawa H, Sethi G, Ahn KS, Aggarwal BB. (2006). Plumbagin (5-Hydroxy-2-methyl-1,4-naphthoquinone) Suppresses NF- $\kappa$ B Activation and NF- $\kappa$ B-regulated Gene Products Through Modulation of p65 and I $\kappa$ B Kinase Activation, Leading to Potentiation of Apoptosis Induced by Cytokine and Chemotherapeutic Agents. *J Biol Chem.* 281(25):17023–33. doi:10.1074/jbc.m601595200.
26. Drag M, Surowiak P, Drag-Zalesinska M, Dietel M, Lage H, Oleksyszyn J, et al. (2009). Comparison of the Cytotoxic Effects of Birch Bark Extract, Betulin and Betulinic Acid Towards Human Gastric Carcinoma and Pancreatic Carcinoma Drug-sensitive and Drug-Resistant Cell Lines. *Molecules.* 14(4):1639–51. doi:10.3390/molecules14041639.
27. Punturee K, Wild CP, Kasinrerker W, Vinitketkumnuen U. (2005). Immunomodulatory activities of *Centella asiatica* and *Rhinacanthus nasutus* extracts. *Asian Pac J Cancer Prev.* 6(3):396–400.
28. López-Lázaro M, Peña NPDL, Pastor N, Martín-Cordero C, Navarro E, Cortés F, et al. (2003). Antitumour activity of *Digitalis purpurea* L. subsp. *heywoodii*. *Planta Med.* 69(8):701–5.
29. Liu H, Schmitz JC, Wei J, Cao S, Beumer JH, Strychor S, et al. (2014). Clove extract inhibits tumor growth and promotes cell cycle arrest and apoptosis. *Oncol Res.* 21:247–59.
30. Ryu NH, Park KR, Kim SM, Yun HM, Lee ND, Jang SG. (2012). A hexane fraction of guava Leaves (*Psidium guava* L.) induces anticancer activity by suppressing AKT/mammalian target of rapamycin/ribosomal p70 S6 kinase in human prostate cancer cells. *J Med Food.* 15:231–41.
31. Torres A, Vargas Y, Uribe D, Carrasco C, Torres C, Rocha R, et al. (2016). Pro-apoptotic and anti-angiogenic properties of the  $\alpha$ -thujone fraction from *Thuja occidentalis* on glioblastoma cells. *J Neuro-Oncol.* 128(1):9–19. doi:10.1007/s11060-016-2076-2.
32. Yoon JY, Cho HS, Lee JJ, Lee HJ, Jun SY, Lee JH, et al. (2016). Novel TRAIL sensitizer *Taraxacum officinale* Wigg enhances TRAIL-induced apoptosis in Huh7 cells. *Mol Carcinog.* 55:387–96.
33. Menendez JA, Vazquez-Martin A, Oliveras-Ferraro C. (2009). Extravirgin olive oil polyphenols inhibit HER2 (erbB-2)-induced malignant transformation in human breast epithelial cells: relationship between the chemical structures of extra-virgin olive oil secoiridoids and lignans and their inhibitory activities on the tyrosine kinase activity of HER2. *Int J Oncol.* 34:43–51.
34. Mohammed ZY, Nada SM, Al-Halbosiy MM, Fattah SA, (2014). Abdul-Hameed B. Cytotoxic effects of Ammi visnaga volatile oil on some cancer cell lines. *J Biotechnol Res Cent.* ;8:5–7.
35. Gordanian B, Behbahani M, Carapetian J, Fazilati M. (2012). Cytotoxic effect of *Artemisia absinthium* L. grown at two different altitudes on human breast cancer cell line MCF7. *Res Med.* 36:124–31.
36. Sadooghi SD, Nezhad-Shahrokh-Abadi K, Balanezhad SZ, Baharara J. (2013). Investigating the cytotoxic effects of ethanolic extract of *Ferula asafoetida* resin on HepG2 cell line. *Feyz.* 17:323–30.
37. Singh SS, Pandey SC, Srivastava S, Gupta VS, Patro B, Ghosh AC, et al. (2003). Chemistry and medicinal properties of *Tinospora cordifolia* (Guduchi). *Ind J Pharmacol.* 35:83–91.
38. Moga M, Bălan A, Anastasiu C, Dimienescu O, Neculoiu C, Gavris, C, et al. (2018). An Overview on the Anticancer Activity of *Azadirachta indica* (Neem) in Gynecological Cancers. *Int J Mol Sci.* 19(12):3898. doi:10.3390/ijms19123898.
39. Dia VP, Krishnan HB. (2016). BG-4, a novel anticancer peptide from bitter melon (*Momordica charantia*), promotes apoptosis in human colon cancer cells. *Sci Rep.*;6(1):33532. doi:10.1038/srep33532.
40. Sertel S, Eichhorn T, Plinkert PK, Efferth T. (2011). Cytotoxicity of *Thymus vulgaris* essential oil towards human oral cavity squamous cell carcinoma. *Anticancer Res.* 31:81–7.
41. Padhye S, Ahmad A, Oswal N, Sarkar FH. (2009). Emerging role of Garcinol, the antioxidant chalcone from *Garcinia indica* Choisy and its synthetic analogs. *J Hematol Oncol.* 2(1):38–49. doi:10.1186/1756-8722-2-38.
42. Aslani E, Naghsh N, Ranjbar M. (2015). Cytotoxic effects of hydro-alcoholic extracts of cress (*Lepidium sativum*)-made from different stages of the plant-on k562 leukemia cell line. *Hormozgan Med J.* 18:411–9.

43. Mbarek LA, Mouse HA, Elabbadi N, Bensalah M, Gamouh A, Aboufatima R, et al. (2007). Anti-tumor properties of blackseed (*Nigella sativa* L.) extracts. *Braz J Med Biol Res.* 40(6):839–47.

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