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Anticancer activity of Medicinal plant extract-A review

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ABSTRACT

Traditional medicine has a long history of serving peoples all over the world. India is without doubt a herbal hub. Medicinal plants that are native to India and their use in various traditional systems of medicine are indeed awe-inspiring. The ethnobotany and ubiquitous plants provide a rich resource for Natural drug research and development. In recent years, the use of traditional medicine information on plant research received considerable interest. The medicinal plants contain several phytochemicals such as vitamins, carotenoids, terpenoids, flavonoids, polyphenols, alkaloids, tannins, saponins, enzymes, minerals etc. These phytochemicals possess antioxidant activities, which, prevent or can be used in the treatment of many diseases, including cancer. There are the several medicinal plants all over the world, including India, which are being used traditionally for the prevention and treatment of cancer. The present paper is a comprehensive review of different literature sources. The paper discusses the potential of different medicinal plants in curing different types of carcinomas.

Keywords Medicinal plants, cancer, anticancer activity.

INTRODUCTION

Over the past decades, herbal medicine has become a topic of global importance, making an impact on both world health and international trade. Medicinal plants continue to play a central role in the healthcare system of large proportions of the world's population. This is particularly true in developing countries, where herbal medicine has along and uninterrupted history of use. Recognition and development of the medicinal and economic benefits of these plants are on the increase in both developing and industrialized nations. Continuous usage of herbal medicine by a large proportion of the population in the developing countries is largely due to the high cost of western pharmaceuticals and healthcare.[4]

Among the human diseases treated with the medicinal plants is cancer, which probably the most important genetic disease. Every year, millions of people are diagnosed with cancer, leading to death in the majority of the cases. According to the American Cancer Society, deaths arising from cancer constitute 2-3% of the annual deaths recorded worldwide.

In South Africa, cancer rates are increasing every year, breast cancer being the most common form of cancer in women worldwide and the second most common cancer amongst South African women. Current statistics indicates that across all ethnic groups, one in every 31 women in this country is likely to develop breast cancer.[15]

Many traditional healers and herbalists in the Eastern Cape of South Africa have been treating cancer patients for many years using various medicinal plants species. Despite the long history of cancer treatment using herbal remedies in the Province, the knowledge and experience of these herbalists have not been scientifically documented. According to Grierson and Afolayan, information on traditional herbal practice in the Province is passed from one generation to the other through oral tradition. Considering the rapid rate of deforestation and loss of biodiversity, there is a need for accurate scientific documentation of the knowledge and experience of these herbalists.[11]

CANCER

- It is a group of diseases caused by loss of cell cycle control.
- Cancer is associated with abnormal uncontrolled cell growth.
- Carcinogens are substances, which cause cancer by mutating DNA.
- There are many genes that can mutate to cause loss of control of the cell cycle or cause genomic instability (DNA damage).
- Same mutations.
- Transplantable
- Dedifferentiated: cell lose their specialized
- Different appearance: reflects dedifferen-ntiation
- Lack contact inhibition: will divide in a crowd of cells and pile on top of each other
- Induce angiogenesis (local blood vessel formation)
- Increased mutation rate
- Invasive: squeeze in to any space available
- Metastasize: cells move to new location in the body[7]

CAUSES OF CANCER

Cancer begins with damage (mutation) in your DNA.Your DNA is like a set of instructions for your cells, telling them how to grow and divide. Normal cells often develop mutations in their DNA, but they have the ability to repair most of these mutation. Or, if they can't make repair most of these mutations. Or, if they can't make the repairs, the cells often die. However, certain mutations aren't repaired, causing the cells to grow and become cancerous. Mutations also cause cancer cells to live beyond a normal cell life span. This causes the cancerous cell to accumulate.[13] "Decades long work has resulted in the widely accepted estimate that 80 to 90 percent of human cancer is due to environmental factors. The gold standard for distinguishing genetic from environmental traits has been the study of twins" (Robert N. Hoover, M. D., National Cancer Institute NEJM-2000). Environmental factors which, from a scientist's standpoint, include smoking, diet, and infectious diseases as well as chemicals and radiation in our homes and workplaces.

NATURAL PRODUCTS

Medicinal plants are the most exclusive source of life saving drugs for the majority of the world's population. Medicinal herbs have been widely used for treatment of diseases in traditional way for several generations. An interaction between traditional medicine and modern biotechnological tools is

to be established towards New Drug development. The interface between cell biology, in vitro assays and structural chemistry will be the best way forward to obtain valuable leads. Out of an estimated 250000 higher plants, less than 1% have been screened pharmacologically. In recent years, focus on plant research has increased all over the world. The present study is focused to screen traditionally used medicinal plants for anticancer effect.

Medicinal plants represent a vast potential resource for anticancer compounds. As with all areas of phytomedicine, the value of medicinal plants lies in the potential access to extremely complex molecular structures that would be difficult to synthesize in the laboratory. The antitumor activity of medicinal-plant-derived compounds may result from a number of mechanisms, including effects on cytoskeletal proteins that play a key role in cell division, inhibition of DNA topoisomerase enzymes, antiprotease or antioxidant activity, stimulation of the immune system, etc. Medicinal plants continue to be subject to extensive screening worldwide, in an attempt to develop still more effective anticancer treatments.

Azadirachta indica

Azadirachta indica, abundantly prevalent in the tropical countries of the world. Multidirectional therapeutic uses of neem have been known in India since the Vedic times. Almost all parts of the tree have been in use as traditional medicine for human-hold remedies against various ailments from antiquity. Although there is a lot of research work been available in neem. Molecular mechanism studies like apoptosis induction, cell cycle analyses are lacking.

The National Research Institute's 1992 report on neem anticipated that continuing research in to the components of a tree known in India as a village pharmacy would demonstrate useful cures for various ailments, but it's unlikely that even the most optimistic researcher could have predicted the potentially life-saving treatments being identified now for preventing or treating multiple type cancer. Although clinical trials with human beings are still in the future, this early test tube and animal research combined with neem's few side effect, easy availability, and low cost in most parts of the world is cause for tremendous excitement.[10]

Azadirachta indica, commonly known as neem, has attracted worldwide prominence in recent years, owing to its wide range of medicinal properties. All parts of the neem tree have been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental disorders. The medicinal utilities have been described especially for neem leaf. Neem leaf and its constituents have been demonstrated to exhibit antibacterial, immunomodulatory, anti-inflammatory, antiulcer, antioxidant, anticarcinogenic properties etc. Bioassay-guided studies and photochemical analyses utilizing modern state-of-the-art techniques such as HPLC-MS, GC-MS, NMR and Infra Red spectroscopy have revealed that phytocompounds like azadirachtins, nimocinol, isomeldenin, nimbin, nimolicinol, odoratone, isoazadironolide, azadironolide, naheedin, mahmoodin are responsible for varied biological, pharmacological and toxicological properties observed.

Neem contains multiple active compounds that work simultaneously via different mechanisms. This characteristic explains its effectiveness as a pesticide, and

appears to be responsible for its potent impact on cancer as well. One of these documented mechanisms is apoptosis (programmed cell death), which directly kills cancer cells to take over identifying and destroying them as well, a process called cross priming. Neem has also been shown to produce substantially higher levels of antioxidant, including the carcinogen-detoxifying enzyme glutathione. Perhaps the most important and least surprising is neem's strengthening impact on the immune system. And neem, or isolated compounds, have shown impressive efficacy against a wide variety of human cancer cell lines, and animal models for human cancers that include colon, stomach, Ehrlich's carcinoma, lung, liver, skin, oral, prostrate, and breast cancers.[14]

In addition to studies showing that pretreatment with neem is highly protective against cancer in animals (e.g. neem leaf given to mice reduced chemically induced tumors by up to 87%), and demonstrating the efficacy of neem as a stand-alone treatment, two recent report suggest that neem pretreatment also enhances the activity while reducing the side effects of some conventional cancer treatments.

Tinospora cordifolia

Giloy is one of the most useful ayurvedic herb which acts as tonic and aphrodisiac, it is also an antihelminthic, antihelminthic, anti-arthritic, anti-periodic, anti-pyretic, blood purifier, cardiac, carminative, digestive, diuretic an expectorant, stomachic, rejuvenating, appetizing and anti-inflammatory.[12]

In Ayurvedic literature Giloy is described as Amrita because of its innumerable medicinal properties and it is also said to increase the lifespan of humans by preventing them from many chronic diseases. Starch from roots of Giloy as well as from its stems can be used for chronic diarrhea and dysentery. The juice of the fresh chronic fevers, gouts, vomiting, cardiac debility, skin diseases, leprosy, anemia, cough, asthma, jaundice, seminal weakness, and splenopathy. It is also used in cancer prevention, cancer treatment support, high cholesterol and liver protection. It is used as strong anti-aging factor.

The main important chemical constituents of the plant are tinosporin, perberillin, palmarin, berberine, tinosporon, and hepta consol tinosporic acid adntinosporol. The fresh stem bark yield giloin, giloinin and gilosterol. Hypoglycemia agent and phenolic lignin have also been isolated from this plant.
There has been an upsurge in the discovery of bioactive phytochemicals having a chemo preventive ability against various diseases including immunological disorder and cancer. Based on their uses in Ayurveda or herbal medicine, many plants have been the subjects of experimental evaluation to provide a scientific rationale for their medicinal values. In this regard, *Tinospora* has a long history of use against various ailments including spasms, inflammation, arthritis, allergy, diabetes, cardio toxicity, and immunosuppression. However, scientific evidences for its biological activities are limited. Recently, many studies have been carried out to support the acclaimed as well as to discover the novel potential of *Tinospora*, which have also revealed its anticancer and radio protective activities.[1]

Triticum aestivum

Wheatgrass is a special strain of grass that has the highest chlorophyll content among all plants: 70% in fact chlorophyll is plant blood with a very similar structure to our own blood. It's very rich in enzymes and amino acids beneficial to both plants and you.

Wheatgrass has so much chlorophyll in it that just one ounce of wheatgrass juice is equivalent to 2.5 pounds (that's a kilo) of raw vegetables. Natural foods, vitamins, minerals and enzymes all play a big part of maintaining healthy cells. Healthy cells, in turn, make it difficult for cancer cells to form and spread. Essential nutrients have natural detoxifying properties, which can prevent cancers.

Fresh wheatgrass juice has been found to contain over a hundred elements beneficial to humans. A truly complete food, wheatgrass has a full spectrum of vitamins and minerals, amino acids and enzymes packed in an easily absorbed package. In fact, taking wheatgrass on an empty stomach is recommended. The energy your body uses to digest complex and cooked foods is lessened, and the extra energy can be used to aid in metabolism and regeneration.[2]

Wheatgrass also has four other special components particularly valuable in the prevention of cancer- superoxide dismuatase (SOD), P4D1, abscisic acid, and chlorophyll.[8]

Findings show that cancer cells have protective coatings that make them hard for the immune system to identify, allwing cancer cells to grow and multiply uncontrollably in the body. Abscisic acid and P4D1 are compounds that eat away the protective coating of cancer cells, making them vulnerable to the immune system, P4D1 also has an antiaging effect known to rebuild damaged DNA. Both the compounds can be found in wheatgrass roots. Chlorophyll is also like liquid oxygen, delivering fresh oxygen through the body, creating an oxygen rich environment in the body. Superoxide dismutase (SOD, an-anticancer factor), often called the antiaging enzyme, is also found in wheatgrass and has significant antioxidant activity to protect cells from damage caused by infections, inflammation, irritants, poisons, radiation, and free radicals.

Aloe barbadensis

Aloe vera has been used for many centuries for its curative and therapeutic properties and although over 75 active ingredients from the inner gel have been identified, therapeutic effect have not been correlated well with each individual component. Many of the medicinal effect of aloe leaf extracts have been attributed to the polysaccharides found in the inner leaf parenchymatous tissue, but it is believed that these biological activities should be assigned to a synergistic action of the compounds contained therein rather than a single chemical substance.

The two fractions from aloes that are claimed to have anti-cancer effect include glycoproteins (lectins) and polysaccharides. The anti-tumour activity of polysaccharides isolated from *A. Vera* and specifically acemannam has been investigated in many in vitro models as well as in different animal species. Different studies indicated anti-tumour activity for *A. Vera* gel in terms of reduced tumour burden, tumour shrinkage, tumour necrosis and prolonged survival rates. In addition to these effects, A. vera gel has also chemo preventative and anti-genotoxic effects on benzo[α]pyrene-these anticancer effect of aloe polysaccharides is stimulation of the immune response.[5]

The cure for cancer is found in natural ingredients, A. vera is known to cure a myriad of diseases including cancer. Combined with bee's honey, this natural substance has the ability to convey the healing power of aloe vera to the remotest receptors of our organism. The other ingredient is grappa. One may also use brandy. 'Aloe barbadensis' is the best

species that has reached the age of flowering. Grappa enlarges the blood vessels, allowing for a general detoxification. The blood thus can be purified eliminating infected substances.[3]

Ocimum sanctum

Ocimum sanctum Linn (OS), is a small erect herb belonging to the family Labiatae (Laminaceae. Commonly known as sacred Tulsi, it is a fragrant bushy plant found in semi tropical and tropical parts of India.

Many active components have been isolated from the leaves of this plants, eugenol is identified as the major active constituent by means of liquid chromatography of the essential oil from the leaves.[9] Other components identified include eugenol methyl ester, caryophyllene, terpinene-4-ol, decyladehyde, ^{3}-selinene, ±-pinene, camphor and cervacrol. It was also revealed that among the different parts of the plant, leaves contain the highest percentage of essential oil.

Several medicinal properties have been attributed to Ocimum sanctum L. different parts of tulsi plant e.g. leaves, flowers, stem, root, seeds etc. are known to possess therapeutic potentials and have been used, by traditional medicinal practitioners, as expectorant, analgesic, anticancer, antiasth-matic, antiematic, diaphoretic, antidiabetic, antifertility, hepatoprotective, hypotensive, hypolipidmic and antistress agents. Tulsi has also been used in the treatment of fever, bronchitis, arthritis, convulsions etc.[6]

Ocimum sanctum L. (Labiatae), a plant with various medicinal properties, has been investigated against human fibrosarcoma cells (HFS cells) in culture. Treatment with an ethanolic extract of Ocimum sanctum induced cytotoxicity at μg/ml and above. Morphologically the cells showed shrunken cytoplasm and condensed nuclei. The DNA was found to be fragmented on observation in agarose gel electrophoresis. Biochemically the extract-treated HFS cells showed depleted intracellular glutathione and increased levels of lipid per oxidation products. Administration of aqueous and ethanolic extracts of Ocimum sanctum to mice bearing Sarcoma-180 solid tumors mediated a significant reduction in tumor volume and an increase in lifespan. These observations clearly indicate that Ocimum sanctum extracts possess anticancer activity.[16]

It is heartening that a traditional Indian plants has now led to several therapeutically and useful preparation and compounds, which generates enough encouragements among the scientists in exploring more information about these medicinal plants. As the global scenario is now changing towards the use of nontoxic plant products having traditional medicinal use, development of modern drug from medicinal plants should be emphasized for the control of various diseases including cancer.

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KEYWORDS: Anticancer activities, Cancers, Herbs/medicinal plants, Phytoconstituents. INTRODUCTION A large number of medicinal plants act as anticancer herbs in experimental and/or clinical cancers/tumours of. various organs. Some of those cancers are sarcoma, leukaemia, lymphoma and carcinoma1-2. This review. article contains 35 anticancer herbs (anticancer medicinal plants) which have been described ahead. The general. data of these plants have been collected from some books authored by different authors3-6. However, the particular. phytoconstituents (phytochemicals) present in these plants, Benefits of medicine from plant origin over synthetic (chemical) medicine have increased the importance of medicinal plants in the field of healthcare. Numerous medicinal plants are known to possess anticancer activity. Phytocompounds from these plant sources can prevent cancer initiation, promotion and progress by exerting anti-oxidant effects which mediates by the integration of NF-ÎºB, Nrf2 and AP-1 signaling pathways. Overall this chapter provides a comprehensive repository for the scientific community working to develop new and improved medicines for cancer which poses serious threat to ma Anticancer, Medicinal plants, Herbal medicines, Cancer treatment. INTRODUCTION.Â The chemopreventive activity is thought to be due in part to the antioxidant / free radical scavenging activity of the extract65. An in vitro study showed withanolides from Withania somnifera inhibited growth in human breast, central nervous system, lung, and colon cancer cell lines comparable to doxorubicin.