International Journal of Research Instinct
(Peer-reviewed Journal)

ISSN ONLINE 2348-2095
Research Article

ANTICANCER ACTIVITY OF SOME MEDICINAL PLANTS – A REVIEW

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ABSTRACT

Plants have long history of use in treatment of cancer. Emerging evidence has demonstrated that many natural products isolated from plant sources possess antitumor properties. Over the past decade, 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. Many traditional healers and herbalists have been treating cancer patients for many years using various medicinal plant species. Despite the long history of cancer treatment using herbal remedies, the knowledge and experience of these herbalists have not been scientifically documented. Information on traditional herbal practice 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. In this article we covered the information gathered from the plants used previously and recently identified in the treatment of cancer.

Keywords

Medicinal Plants, Anti Cancer Activity, Active Constituent, Habitat, Family, Cancer Treatment.

1. INTRODUCTION

Cancer is an abnormal growth of cells that grows and spreads through uncontrolled cell division. These 'malignant' cells may invade other tissues and spread (metastasize) to more distant parts of the body. Cancer is not one disease but a group of more than 100 distinct disorders. It is the world's second biggest killer after cardiovascular disease and was responsible for the death of 7.6

million people in 2005 [1]. Globally the number of people diagnosed with cancer is estimated at around 11 million people, a figure that is set to rise to 16 million by 2020 [2]. Of all new cancer cases, it is estimated that one third could be cured if they were adequately diagnosed and treated [3]. Cancer may affect people of all ages, but risk tends to increase with age, due to the fact that DNA damage becomes more apparent in aging DNA. Statistics indicate that men are largely plagued by lung, colon, rectum, and prostate cancer, whilst women increasingly suffer from breast, colon, rectal, and stomach cancer. Despite many therapeutic advances in the understanding of the processes in carcinogenesis, overall mortality statistics are unlikely to change until, it is believed, there is a reorientation of the concepts for the use of natural products as new chemopreventive agents [5].

Artocarpus obtusus

F.M. Jarrett The Artocarpus obtusus species belongs to Moraceae family.Artocarpusis distributed from South East Asia to Oceania.Several Artocarpusspecies have been introduced throughout the tropics and are harvested for food. Different species of Artocarpus are also found in Africa, Madagascar, Malay peninsula and also in Sumatra and Thailand.6An investigation of the chemical constituents in Artocarpus obtusus species led to the isolation of three new xanthones, pyranocycloartobiloxanthone A (1), dihydroartoindonesianin C (2), and pyranocycloartobiloxanthone B (3). The compounds were sub jected to antiproliferative assay against human promyelocytic leukemia (HL60), human chronicmyeloid leukemia (K562), and human estrogen receptor (ER+) positive breast cancer (MCF7) cell lines. The extracts of A. obtusus were found to exhibit good cytotoxic and potential antiproliferative activity against these cell lines.Pyranocycloartobiloxanthone A (1) inhibits the cell proliferation of human promyelocytic leukemia and breast cancer cells. The potent activity of Pyranocycloartobiloxanthone A (1) isexhibited by the presence of both resorcinol moiety in ring B and isoprenyl substituent at C-3 position. This phytochemical investigation of Malaysian Artocarpus species can identify new lead compounds as anticancer agents.

Blumea balsamifera DC

Blumea balsamifera (also known as sambong)isa medicinal plant that grows in Southeast Asia. It belongs to the Family Asteraceae. The leaves of B. balsamifera are used as tea, and to cure certain disorders such as rheumatism and hypertension. Its leaves have attracted attention as this part of the plant has various physiological activities, including plasmin -inhibitory, antifungal, and liver -protective effects 8In Thailand, the dried leaves are cut into small pieces and smoked as a cigarette to relieve sinusitis pain. An infusion of the leaves is used as a stomachic, carminative, diaphoretic,

expectorant and emmenagogue. Leaves of Blumea balsamifera DC consist of compounds, two dihydroflavonols, dihydroquercetin - 4́-methyl ether (1) and dihydroquercetin - 7,4 -dimethyl ether (2), two flavanones, 5,7,3 ,5 - tetrahydroxyflavanone (3) and blumeatin (4), three flavonols, quercetin (5), rhamnetin (6) and tamarixetin (7), two flavones, luteolin (8) and luteolin-7-methyl ether (9).9 Methanolic extract of B. balsamifera induced cell cycle arrest at G1 phase via decreases in expression of cyclin - E and phosphorylation of retinoblastoma (Rb) protein in both dose - and time-dependent manners. It also reduced the level of a proliferation related ligand which stimulates tumor cell growth . B. balsamifera extract is also effective against human hepatocellular carcinoma cells

Boerhaavia diffusa L

Boerhaavia diffusa L. is a perennial creeping herb which belongs to the family Nyctaginaceae.It is commonly known as "punarnava"in the Indian system of medicine. The various parts of the plant are used in the treatment of cancer, jaundice, dyspepsia, inflammation, enlargement of spleen, abdominal pain and as an anti-stress agent.Punarnava possesses punarnavoside, which exhibits a wide range of properties such as diuretic, antifibrinolytic, anticonvulsant and antibacterial. Liriodendrin isolated from the methanol extract of the roots of B. diffusa exhibits significant calcium channel antagonistic activity. Punarnavine, an alkaloid from B. diffusa enhanced the immune response against metastatic progression of B16 F-10 melanoma cells in mice.10Ethanolic extract of B. diffusa Showed cytotoxicity against HeLa cell line and inhibits the S-phase of the cell cycle. It also suppressed the growth of cancer cells in DMBA-induced cancer carcinogenesis in mice by preventing the promotional events in the mouse skin through free radical scavenging mechanism.11Two rotenoids isolated from B. diffusa, boeravinones G and H, have been found to potently inhibit the drug efflux activity of breast cancer resistance protein (BCRP/ABCG2), a multidrug transporter responsible for cancer cell resistance to chemotherapy.

Oroxylum indicum Vent

Oroxylum indicum Vent is a member of the family Bignoniaceae and is widely used by Indians for the treatment of various ailments. It is a medium sized deciduous tree which is mostly sighted along the riverbanks or slopes of the hills and is distributed throughout India and Southeast Asia. The decoction of Oroxylum indicum bark could cure nasopharyngeal cancer. This is also used for curing gastric ulcer while the paste of the bark is applied to mouth for cancer, scabies, tonsil pain and other diseases.25The bioactive constituents present in the plant are baicalin, Chrysin,baicalein-7-O-glucoside and baicalein. Methanolic extract of the fruit of Oroxylum indicum inhibited in vitro

proliferation of HL-60 cells. The flavanoid baicalein was found to be an active component that induced apoptosis in HL-60 cell line.26

Vitex negundo Linn

Vitex negundo Linn.(Nirgundi in Hindi) which is a species of Verbenaceae family, is a large evergreen, climbing, much branched shrub and ascending up to an altitude 1100 - 1400 ft, is found almost throughout India.Although all parts of V.negundo are used as medicine in the indigenous system of medicine, the leaves are the most potent part for medicinal use. It is used for treatment of eye disease, toothache, inflammation, leucoderma, enlargement of the spleen, skin - ulcers, in cattarhal fever, rheumatoid arthritis, gonorrhoea and bronchitis. They are also used as tonics, vermifuge, lactagogue, emmenagogue, antibacterial, antipyretic and antihistaminic agents.Ethanolic extract of Vitex negundo treatment was found to enhance nonviable counts in peritoneal exudates and decrease the viable cell count.34This extract is effective against the major problems ,myelosuppression and anaemia, that are being encountered during chemotherapy and can bring back hemoglobin and RBC count to normal.

Zingiber officinale Roscoe

Zingiber officinale Roscoe (Ginger), belonging to the family Zingiberaceae, is a commonly used medicinal herb throughout the world. It is a natural dietary component with antioxidant and anticarcinogenic properties. Active phenolic compounds of ginger such as shagaol and gingerol, have antioxidant, anti-angiogenesis, anti-inflammatory, anti-atherosclerotic and anticancer properties.[6]-gingerol, a compound of ginger can inhibit angiogenesis of human endothelial cells and cause cell cycle arrest in the G1 phase through the down regulation of cyclin D1. The oleoresin from the roots of ginger also contains a structurally related vanilloid, [6]-paradol. These compounds suppress the proliferation of human cancer cells through the induction of apoptosis and exert inhibitory effects on the viability of human HL-60 (promyelocytic leukemia) cells. Keum et.al, found that [6]-paradol and other structurally related derivatives like [10]paradol, [3]-dehydroparadol, [6]-dehydroparadol and [10] -dehydroparadol, induced apoptosis in an oral squamous carcinoma cell line, in a dose dependent manner througha caspase-3-dependent mechanism.38Beta-Elemene is a novel anticancer drug, which is extracted from the ginger plant. It triggers apoptosis in non-small cell lung cancer cells through a mitochondrial release of the cytochrome c-mediated apoptotic pathway. Beta-Elemene also induced caspase-3, -7 and -9 activities and decreased Bcl-2 expression.3

Withania Somnifera (L.)Dunal

Withania somnifera (L.) Dunal (also known as ashwagandha), belongs to the family Solanaceae, is an importantmedicinal plant that is widely used as a home remedyfor several diseases in the Indian subcontinent and other parts of the world. W. somnifera is a dietary supplement composed of various nutrients, polyphenols and alkaloids that have free radical scavenging capacity as well as other chemical constituents that possess anti-inflammatory, antitumor,anti-aging, anti-stress, antioxidant,immune modulatory, and rejuvenating properties.Over 35 chemical constituents have been identified from Withania.The biologically active chemical constituents are alkaloids-isopelletierine and anaferins, steroidal lactones-withanolides and withaferins, saponin containing an additional acyl group-sitonidoside VII and VIII and withanolides with a glucose at carbon 27-sitoindoside IX and X. Withania somniferais also rich in iron.35 W. somnifera decreases NF-kB levels, suppresses intercellular tumor necrosis factor and potentiates apoptotic signaling in animal cancerous cell lines.Invitro and in vivo studies of W. somnifera has showed stimulary effects on cytotoxic T lymphocyte generation and demonstrated the potential to reduce tumor growth.36The chemopreventive effect of W. somnifera root extract was demonstrated in a study on induced skin cancer in Swiss albino mice. A study of an alcohol extract of dried W. somnifera roots and the active component withaferin A isolated from the extract showed significant antitumor and radiosensitizing effects in in vivo experimental tumors and lacked any noticeable systemic toxicity.These isolated compounds of W. somnifera could provide a potential and relatively safe radiosensitizer or chemotherapeutic agent.

Rheum officinale Baill

Rheum officinale Baill. of the family Polygonaceae, is also known as Da Huang in Chinese herbal medicine. It has been widely used as a laxative, antiphlogistic and haemostatic agent in the treatment of obstipation, gastrointestinal indigestion, diarrhea and Jaundice.In addition, it is one of the herbs commonly used in traditional Chinese medicine formulae prescribed to cancer patients. The major pharmacologic constituents of Da Huang in the rhizome and root portions of the plant are anthraquinone and bianthrone derivatives. Da Huang has been reported to have anti-tumor activity with hepatocarcinoma.30Da Huang significantly inhibited the proliferation of A549 and MCF-7 cells invitro, confirmed by the cell viability and colony formation assays. Da Huang water extract treatment resulted in inter-nucleosomal DNA cleavage in both A549 and MCF-7 cell lines, while the internucleosomal DNA from untreated cancer cells remained intact. Da Huang water extract has

strong dose and time dependent antiproliferative activity on A549 and MCF-7 cells in culture. Aqueous extract of Rheum officinale has a general function in suppressing cancerous cell growth but mayact through multiple pathways.31

Panax ginseng C.A

Panax ginseng C.A. Meyer or Ginseng is one of the best known Korean and Chinese traditional herbal medicines,which is used worldwide. Ginseng belongs to the family Araliaceae.The efficiency of ginseng has been demonstratedin the central nervous system and in the cardiovascular,endocrine, immune systems and it has antineoplastic, anti-stress, and antioxidant activities. The most important bioactive components of ginseng are ginsenosides,polyacetylenes, polysaccharides, alkaloide, and phenoliccompounds. The ginsenoside is one of the most important secondary metabolites in ginseng and contains glucosylmoiety at carbon-3,-6, and-20.27Panax ginseng and its chemical constituents have been tested for their inhibitingeffect on putative carcinogenesis mechanisms such as cell proliferation, apoptosis, immune surveillance andangiogenesis and in most experiments inhibitory effects werefound.28Cancers of the lip, oral cavity, pharynx, esophagus,stomach, colorectal, liver and pancreas showed decreased odds ratios with increasing ginseng intake. It was found that ginsenoside Rp1 inhibited breast cancer cell proliferation and inhibited both anchorage -dependent and-independent breast cancer cell colony formation

2. CONCLUSION

India has a rich culture of medicinal herbs and spices, which includes about more than 2000 species and has a vast geographical area with high potential abilities for Ayurvedic, Unani, Siddha traditional medicines but only very few have been studied chemically and pharmacologically for their potential medicinal value. In conclusion this article provides the knowledge about anticancer medicinal plants of Indian and Foreign origin, which are used by people all over the world. Also it is of significance to exploit novel anticancer drugs from medicinal plants. However, the mechanism of the anticancer role has not yet been fully elucidated of many plants. Further research is needed to explore the molecular mechanism of herbal drugs.

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