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HERBAL DRUG USE OF ANTICANCER

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ABSTRACT

India is the largest producer of medicinal plants and is rightly called the "Botanical garden of the World". The medicinal plants, besides having natural therapeutic values against various diseases, also provide high quality of food and raw materials for livelihood. Considerable works have been done on these plants to treat cancer, and some plant products have been marketed as anticancer drugs, based on the traditional uses and scientific reports. These plants may promote host resistance against infection by re-stabilizing body equilibrium and conditioning the body tissues. Several reports describe that the anticancer activity of medicinal plants is due to the presence of antioxidants in them. In fact, the medicinal plants are easily available, cheaper and possess no toxicity as compared to the modern (allopathic) drugs. Hence, this review article contains medicinal plants, which are the natural sources of anticancer agents.

KEYWORDS: Cancer, medicinal plants, natural anticancer agents, antioxidants.

INTRODUCTION

Cancer (malignant tumour) is an abnormal growth and proliferation of cells. It is a frightful disease because the patient suffers pain, disfigurement and loss of many physiological processes. Cancer may be uncontrollable and incurable, and may occur at any time at any age in any part of the body. It is caused by a complex, poorly understood interplay of genetic and environmental factors. It continues to represent the largest cause of mortality in the world and claims over 6 millions. Cancer kills annually about 3500 per million population around the world. A large number of chemo preventive agents are used to cure various cancers, but they produce side effects that prevent their extensive usage. Although more than 1500 anticancer drugs are in active development with over 500 of the drugs under clinical trials, there is an

urgent need to develop much effective and less toxic drugs. The plant kingdom plays an important role in the life of humans and animals. India is the largest producer of medicinal plants and is rightly called the "Botanical garden of the World". Medicinal plants have been stated. to comprise about 8000 species and account for approximately 50% of all the higher flowering plant species of India. In other words, there are about 400 families of the flowering plants; at least 315 are represented by India. Medicinal properties of few such plants have been reported but a good number of plants still used by local folklore are yet to be explored. Ayurveda, Siddha and Unani systems of medicine provide good base for scientific exploration of medicinally important molecules from nature. The rediscovery of Ayurveda is a sense of redefining it is modern medicines. Emerging concept of combining Ayurveda with advanced drug discovery programme is globally acceptable. Traditional medicine has a long history of serving peoples all over the world. The ethnobotany provides a rich resource for natural drug research and development. In recent years, the use of traditional medicine information on plant research has again received considerable interes The Western use of such information has also come under increasing scrutiny and the national and indigenous rights on these resources have become acknowledged by most academic and industrial researchers. According to the World Health Organization (WHO), about three quarters of the world's population currently use herbs and other forms of traditional medicines to treat diseases. Traditional medicines are widely used in India. Even in USA, use of plants and phytomedicines has increased dramatically in the last two decades. It has been also reported that more than 50% of all modern drugs in clinical use are of natural products, many of which have been recognized to have the ability to include apoptosis in various cancer cells of human origin.

SOME ANTICANCER MEDICINAL PLANTS

With the above background, this review article enumerates 66 medicinal plants (Tables 1 & 2) possessing anticancer properties3,8-44, and are used against various types of cancer. The chemopreventive potential of an 80% hydroalcoholic extract. of Andrographis paniculata has been reported. against chemotoxicity, including carcinogenicity. The authors observed the modulatory influence of A. paniculata on hepatic and extrahepatic carcinogen metabolizing enzymes (viz. cytochrome P), antioxidant enzymes, glutathione (GST) content, lactate dehydrogenase (LDH) and lipid peroxidation in Swiss albino mice. Some other workers also reported the anticancer and immunostimulatory activities of A. paniculata. Azadirachta indica (Neem) has been used in buccal carcinogenesis, skin carcinogenesis, prostate cancer,

mammary carcinogenesis, gastric carcinogenesis, Ehrlich carcinoma and B16 melanoma. Dietary neem flowers caused a marked increase in glutathione S-transferase (GST) activity in the liver, while resulting in a significant reduction in the activities of some hepatic P450-dependent monooxygenases. These results strongly indicate that neem flowers may have chemopreventive potential. Young animals were fed with AIN-76 purified diets containing either 10-12.5% ground freeze-dried neem flowers for 1 week prior to, during, and for 1 week after the administration of each carcinogen. Interestingly, it was found that neem flowers resulted in a marked reduction of the incidence of mammary gland (about 35.2%) and liver tumours (61.7% and 80.1% for benign and malignant tumours, respectively). Furthermore, the multiplicity of tumours per rat was also lower in the neem flower groups, i.e. those for mammary gland tumours and benign and malignant liver tumours were reduced to 44 and 88.9%, respectively. These results clearly demonstrated that neem flowers contain some chemopreventive agents capable of inhibiting liver and mammary gland carcinogenesis in rats. Administration of ethanolic neem leaf extract (ENLE) inhibited DMBAinduced hamster buccal pouch carcinogenesis, as revealed by the absence of neoplasm. These results suggest that the chemopreventive effect of ENLE may be mediated by induction of apoptosis. The modulatory effect of neem leaf with garlic on hepatic and blood oxidant-antioxidant status may play a key role in preventing cancer development at extrahepatic sites. The ethanolic extract of neem has been shown to cause cell death of prostate cancer cells by inducing apoptosis, as evidenced by a dose-dependent increase in DNA fragmentation and a decrease in cell viability. Camellia sinensis (Tea) is one of the most popular beverages in the world. The consumption of tea has been associated with a decreased risk of developing cancers of the ovary, oral cavity colon stomach and prostate. This beneficial health effect has been attributed to the catechins (flavonoids) in tea. Their biological benefits are due to their strong antioxidant and antiangiogenic activity as well as ntioned in their potential to inhibit cell proliferation and modulate carcinogen metabolism. Citrus limon (Nibu) fruit contains flavonoid, flavone, limonoid, limonene, nobiletin and tangeretin. The flavonoid, tangeretin and nobiletin are potent inhibitors of tumor cell growth and can activate the detoxifying P450 enzyme system. Limonoids inhibit tumour formation by stimulating the GST enzyme. The limonene (a terpenoid) also possesses anticancer activity. Nibu fruit is used for inhibition of human breast cancer cell proliferation and delaying of mammary tumorigenesis. It is also used in metastasis and leukemia. The derivatives (viz. chlorogenic, dicaffeoylquinic and tricaffeoylquinic acids) of caffeoylquinic acid contained in Ipomoea batatas tubers (Shakarkand) have potential cancer chemoprotective effect 4-Ipomeanol (a furanoterpenoid)

isolated from I. batatas has been found to exhibit anticancer activity against non-small cell lung cancer lines. Further, leaves of Martynia annusa bark of Prunus spp. and stem of Rhaphidophora pertusa (have been used against neck, lung and abdominal cancers, respectively. It has been reported that medicinal plants may promote host resistance against infection by re-stabilizing body equilibrium and conditioning the body tissues. Several reports describe that the anticancer activity of these plants is due to antioxidants such as vitamins.

Garlic

National Cancer Institute (affiliated to the NIH) recognizes garlic to have potential anticancer properties. The sulphydryl compounds in garlic have the ability to block the formation of cancer - causing substances. Several population studies have shown an association between increased garlic consumption and reduced risk of cancers of the stomach, colon, esophagus, pancreas, and also breast cancer. A study has found that garlic intake of 10 g per day could reduce the risk of prostate cancer by 50 Zn), polysaccharides, polyphenols (e.g., ellagic acid, gallic acid and tannins), flavonoids (e.g., quercetin, anthocyanins, catechins, flavones, flavonones and isoflavones), lignins, xanthones, etc. Many medicinal plants meTables 1 and 2 contain several of these antioxidants.

TURMERIC

Although turmeric is promoted mainly as anti-inflammatory herbal remedy, some scientists believe that the anti-oxidant curcumin present in turmeric may prevent or slow the growth of many cancers including tumor of esophagus, stomach and intestine, breast cancer and also skin cancer in experimental animals. However, clinical research is needed to determine its efficacy in cancer prevention and treatment in human beings. But, the laboratory studies have confirmed the cucumin interferes with several molecular pathways involved in cancer development, growth and spread. Further, a study found that ethanolic extract of turmeric produces remarkable symptomatic relief in patients with external cancerous lesions. There was a reduction in smell in 90 percent of cases and reduction in itching in almost all cases.

Green Tea

polyphenols in green tea and sometimes black tea, help kill cancerous cells and stop their progression. Mayo Clinic studies have revealed that a substance called epigalloacatechin gallate (EGCG) in green tea reduces the number of leukemia cells in patients with CLL

(chronic lymphocytic leukemia), a form of blood cancer. Similarly, another study found that women who drank powdered green tea were less likely to develop bladder cancer.

Hemp

Cannabis Sativa Common Names – Marijuana, Bhang, Ganja, and Hashish The Hemp is an annual herb that may reach 5 meters in height with leaves that form a fan-like structure with jagged edges. This plant is native to central Asia and as a result of importation, has expanded toward Europe and the Americas. This plant has many uses, some of which are furnishing fiber, oil, in medicine, and narcotics. Commonly referred to as Cannabis, Hemp is a very versatile material and is frequently used to relieve cancer pain, treat depression, and hypothermia, it also works as an appetite suppressant. A controversial plant in the field of medicine, it has been up for the debate of its use being an abused or medically prosperous drug. Compound – Delta-9-Tetrahydrocannabinol Research has shown that the administering of smoked marijuana helped treated the nausea that was caused by cancer chemotherapy, thereby being an aid to the cancer treatment process. Side effects of this compound are not often seen in the physical aspect, rather in the mental or cognitive domain such as inability to distinguish space distances and time intervals, vigilance, and memory.

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Ginger

Some pungent substance spresent in ginger rhizome have anti-oxidant and anti-inflammatory activities. The anticancer properties of ginger are attributed to phenolic substances such as 6-gingerol and 6-paradol and other constituents such as shogaols and zingerone. A study published in the journal Biochemical and Biophysical Research Communications reported that 6- gingerol can reduce viability of gastric cancer cells and limit the spread of cancer.

Alo Vera

Acemannan (a polysaccharide), isolated from Aloe vera, stimulates the immune system, accelerates wound healing and possess significant anticancer property. Emodin and Lectins isolated from Aloe vera exhibit strong anticancer and immunoenhancing activities. Aloe-emodin inhibits growth & spread of stomach cancer and various sarcomas by inducing apoptosis. Aloe-emodin has selective anticancer activity against neuroectodermal tumours (PNET). Alexin B isolated from Aloe vera possesses strong anticancer activity against leukaemia. Polysaccharides isolated fromAloe vera have strong immunoenhancing and anticancer properties. Aloe vera contains "super carbohydrates" that protect against many cancers, particularly the liver cancer. Aloe vera prevents genesis of cancer, regresses growth of cancer and prevents metastasis of cancer. Aloe verastimulates immune system response of the body by activating macrophages and releasing cytokines such as interferon, interleukin and tumour necrosis factor.

Cinnamon Bark

Cinnamon has antioxidant properties that can significantly decrease lipid peroxidation that lead to cancer. Further, cinnamon bark oil has been found by researchers to be one of the most effective inhibitors of bacteria, such as Helicobacter pylori, that facilitate the invasion and progression of cancer. However, high amount of coumarin present in cinnamon can damage liver tissues. Although there are no reports of coumarin related tumor formation, high levels of coumarin did trigger cancer in experimental rodents. Aloe vera has an extraordinary antioxidant profile and reduces side effects of chemotherapy & radiotherapy.

Curcuma Longa

Curcumin (Di-feruloyl-methane) and curcuminoids isolated from Curcuma longa suppress cancer at every step, i.e. initiation, growth and metastasis. Curcumin arrests the cancer cells proliferation in G2/S phase and induces apoptosis (programmed cell death). It inhibits angiogenesis, a crucial step in the growth and metastasis of cancer. Curcumin and Genistein (isolated from Glycine max) act synergistically to inhibit growth & spread of oestrogen-positive breast cancer. Curcumin works even in multidrug-resistant breast cancers. Curcumin suppresses adhesion of cancer cells, thus preventing metastasis. Curcumin inhibits growth & spread of various cancers including that of breast, lung, oesophagus, liver, colon, prostate, head & neck and skin. Curcumin is particularly effective in radiotherapy-resistant prostate cancer. Curcumin is effective even in advanced stages of cancer.

Catharanthus Roseus

Catharanthus roseus (Vinca rosea, Madagascar periwinkle) contains more than 70 alkaloids, known as vinca alkaloids such as Vinblastine, Vincristine and their derivatives. Vinca alkaloids arrest cancer cell proliferation by binding to tubulin in the mitotic spindle. Vinca alkaloids also induce apoptosis (programmed cell death) and inhibit angiogenesis (formation of new blood vessels). Vinca alkaloids inhibit growth & spread of various cancers including that of breast, ovary, cervix, lung, colon, rectum, testis, neuroblastoma, Hodgkin's disease, malignant lymphoma, multiple myeloma, various sarcomas, rhabdomyosarcoma and leukaemia.

Emblica Officinalis

Emblica officinalis contains ellagic acid, gallic acid, quercetin, kaempferol, emblicanin, flavonoids, glycosides and proanthocyanidins. Emblica officinalisis valued for its unique tannins and flavanoids, which possess powerful antioxidant and anticancer properties. Ellagic acid isolated from Emblica officinalis is a powerful antioxidant and has the ability to inhibit mutations in genes. Ellagic acid also repairs chromosomal abnormalities. Quercetin, isolated from Emblica officinalis has hepatoprotective effect. Emblicanin A & B (tannins) possess strong antioxidant and anticancer properties. Emblica officinalis inhibits growth & spread of various cancers including that of the breast, uterus, pancreas, stomach, liver and malignant ascites. Emblica officinalis is an excellent rejuvenator and antioxidant herb. It is highly nutritious and an important source of Vitamin C, minerals and amino acids.Emblica officinalis protects against much cancer particularly the liver cancer. Emblica officinalis reduces side effects of chemotherapy & radiotherapy.

Glycine Max

Isoflavones (such as genistein & daidzein) and saponins isolated fromGlycine max inhibit growth & spread of various cancers such as cancers of the breast, uterus, cervix, ovary, lung, stomach, colon, pancreas, liver, kidney, urinary bladder, prostate, testis, oral cavity, larynx, and thyroid. Glycine max is also effective in nasopharyngeal carcinoma, skin cancer, malignant lymphoma, rhabdomyosarcoma, neuroblastoma, malignant brain tumours and leukaemia. Isoflavones & saponins isolated from Glycine maxpossess wide ranging anticancer properties such as inhibition of cancer cell proliferation, promotion of cell differentiation and induction of apoptosis. Genistein works by blocking angiogenesis (formation of new blood vessel), acting as a tyrosine kinase inhibitor (the mechanism of

action of many new cancer drugs) and inducing apoptosis. Genistein is an excellent intracellular antioxidant. Genistein also blocks the supply of oxygen and nutrients to cancer cells, thus killing them by starving. Genistein and quercetin have synergistic anticancer effect against ovarian carcinoma. Saponins isolated from Glycine max decrease invasiveness of the glioblastoma cells. Anthocyanins isolated from Glycine max induce apoptosis in leukaemic cells. Glycine max protects against.

CONCLUSION

From the present review, it can be concluded that herbal medicinal plants and their derivatives are active against various type of cancers like lymphomas, breast, ovarian, lung, liver, stomach, prostate and testicular cancers. The cheap herbal medicinal treatment which may highly be recommended to the rural and poor people especially of developing countries to treat effectively the cancers of different type is an ideal choice. The investigated traditional medicinal plants in this article could be a key to identify the compounds with anti-cancer effects; therefore, if their compounds are examined, they might help to develop new, more efficient drugs, in addition to contributing to identify the main mechanisms involved in cancer.

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