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## Traditionally Used Anticancer Herbs In India

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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. Thus, the various combinations of the active components of these plants after isolation and identification can be made and have to be further assessed for their synergistic effects. Preparation of standardized dose and dosage regimen may play a critical role in the remedy of cancer. The rate with which cancer is progressing, it seems to have an urgent and effective effort for making good health of humans as well as animals. There is a broad scope to derive the potent anticancer agents from medicinal plants, which need thorough research.

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### 1. Introduction

Plants used in traditional medicine have stood up to the test of time and contributed many novel compounds for preventive and curative medicine to modern science. India is sitting on a gold mine of well recorded and traditionally well practiced knowledge of herbal medicine. Specially, plants growing at high altitude in Himalayan pastures are time-honored sources of health and general well-being of local inhabitants. As of today, Himalayan plants are a major contributor to the herbal pharmaceutical industry both of India and other countries. Plants growing at higher altitudes are subjected to an assault of diverse testing

situations including higher doses of mutagenic UV-radiation, physiological drought, desiccation and strong winds. Plants interact with stressful environments by physiological adaptation and altering the biochemical profile of plant tissues and producing a spectrum of secondary metabolites. Secondary metabolites are of special interest to scientists because of their unique pharmacophores and medicinal properties. Secondary metabolites like polyphenols, terpenes and alkaloids have been reported to possess antimutagenic and anticancer properties in many studies. The fundamental aspiration of the current review is to divulge the antimutagenic/anticancer

potential of five alpine plants used as food or medicine by the populations living at high altitudes. 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 66 medicinal plants, which are the natural sources of anticancer agents. 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 million. Cancer kills annually about 3500 per million population around the world. A large number of chemopreventive 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<sup>[4]</sup> 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 interest. 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<sup>[6]</sup>. It has been also reported<sup>[7]</sup> 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.

Natural Products have long been a fertile source of cure for cancer, which is projected to become the major causes of death in this century. However, there is a continuing need for development of new anticancer drugs, drug combinations and chemotherapy strategies, by methodical and scientific exploration of enormous pool of synthetic, biological and natural products. There are at least 250,000 species of plants out of which more than one thousand plants have been found to possess significant anticancer properties. While many molecules obtained from nature have shown wonders, there are a huge number of molecules that still either remains to be trapped or studied in details by the medicinal chemists. The article reviews many such structures and their related chemistry along with the recent advances in understanding mechanism of action and structure-function relationships of nature derived anti-cancer agents at the molecular, cellular and physiological levels. Taxol, one of the most outstanding agents, has been found beneficial in treatment of refractory ovarian, breast and other cancers. Another prominent molecule includes Podophyllotoxin. Synthetic modification of this molecule led to the development of Etoposide, known to be effective for small cell cancers of the lungs and testes. Camptothecin isolated from *Camptotheca acuminata* also have been extensively studied. Other important molecules discussed include Vincristine, Vinblastine, Colchicine, Ellipticine and Lepachol along with Flavopiridol, a semi-synthetic analogue of the chromone alkaloid Rohitukine from India, a pyridoindole alkaloid from leaves of *Ochrosia* species and many more. The review also deals with the lesser-known plants of sub-Himalayan region.

### 1.1 Plants Used for Cancer Treatment

Cancer is often deadly and affects a considerable number of people worldwide. Ongoing research is being done throughout

the world to seek out effective treatments for cancer, including the use of plants to relieve and treat cancer patients. This treatment makes use of the compounds naturally present in plants that are known to inhibit or kill carcinogenic cells. An alternative to chemotherapy, which is the most common means by which doctors and specialists treat cancer, organically based treatments may not have the severe side effects that radical treatments and chemotherapy has. The harsh side effects of cancer treatments is one motivating factor to finding alternative methods. The use of botanical when treating cancer patients is considered a natural alternative, because some plants may contain properties that naturally have the ability to prevent the spread or risk of developing various forms of cancer. As in all medical testing, careful precautions and considerations are taken when studying the different compounds present in plants that are known to treat cancer. Some examples of plants that may be used for cancer treatment are discussed below with their respective advancements. Some side effects are still expected, and it is important that any patient interested in exploring botanical treatment seek the advice of a licensed medical professional. There are around 460 species of plants that can be used as herb for remedy, including plant healer various types of cancer. Various types of anti-cancer plant are Zedoary (*Curcuma zedoaria*), Rodent Tuber (*Typhonium flagelliforme*), God's Crown (*Phaleria macrocarpa*), Madagascar Periwinkle (*Catharanthus roseus*), Artocarpus Integer (*Selaginella corymbosa*), Bamboo Grass (*Loathatreum Gracies*), handsome (*Taraxacum mongolicum*), fruit makasar (*Brucca javanica*), Garlic (*Allium sativum*), Echo China (*Smilax china*), Sunflower (*Helianthus annuus*), Leunca (*Solanum nigrum*), Job's Tears (*Coix Lachryma-Jobi*), Bamboo Rope (*Asparagus cochinchinensis*), and others.

### Anticancer Herbs

Anticancer herbs, there are many different anticancer herbs that have been used by different cultures throughout time for medicinal purposes. In fact, much of modern medicine owes itself to plants and herbs. With such a wide variety of herbs in the world it's no surprise that there are quite a few anticancer herbs that can really help with cancer prevention. There are also many other anticancer herbs which will help to alleviate the symptoms if you already suffer from cancer treatments. One of the many anticancer herbs is Alfalfa. Considered one of the most nutritious foods available, Alfalfa has very important uses for counteracting the effects of chemotherapy. Alfalfa contains antibacterial and anti fungal properties that make it a great body cleanser and infection fighter. It works to increase the production of white blood cells and replace those lost during treatments. The large amount of nutrients in these anticancer herbs makes them invaluable in restoring healthy levels of vitamins in the blood stream. Alfalfa has been researched and found to help lower cholesterol levels and neutralize cancer. Another anticancer herb is Andrographis. It is an ancient medicinal herb and is an annual plant that grows in the wastelands and forests of Asia. There have been many conclusive studies of its use against cancer, AIDS and both bacterial and viral infections. This herb has been shown to have a dramatic effect in maturing cancer cells, a process which seems to stop the cancer cells growing out of control. In addition, extracts from Andrographis leaves have been recorded as being able to kill cancer cells. Research done in Japan has reportedly found that Andrographis reduced the likelihood of cancer cells in the stomach multiplying. Many independent studies have also discovered impressive results with other cancers including prostate and breast cancer.

Anticancer herbs come in many forms one of which is a type of thistle plant. Blessed thistle has a hugely positive effect on the reduction in size of tumors due to its main component cnicin. This has the effect of reducing fluid around the tumor, cooling any inflammation in the body as well as fighting off bacteria. Not only this but the anti-inflammatory properties help rejuvenate the body and speed up recovery one of the more well-known anticancer herbs is Burdock. The root has been used in natural medicine for centuries. Although it was originally used for liver function, joint pain and skin health burdock root has been discovered to have anti-tumor effects alongside its detoxifying qualities. This has been shown in animal studies where it was discovered that this anticancer herbs inhibits mutations in cells that are exposed to mutation causing chemicals that can lead to cancer. Mushrooms, although not really an herb, are still a very natural cure. As a fungus there are many qualities that certain types of mushrooms possess that aren't found in herbs. For example the Maitake mushroom has excellent healing properties. Extracts of the mushroom are most effective when used as Maitake D-fraction and is available in capsule or tablet form. Maitake is a proven cancer fighter. The FDA has recently approved clinical studies of a Maitake extract on participants with advanced breast and prostate cancer. American studies also show positive results on colorectal cancer and Chinese studies show positive results with liver, lung, stomach cancer and leukemia. These mushrooms should be used as a complementary therapy for such conditions and not be a substitute for standard treatments. Anticancer herbs include the garden variety rosemary that is found all over the place. Rosemary is a potent antioxidant, antispasmodic and antiseptic. It is rarely respected for its powerful effect on the body. Rosemary

helps to prevent cancer from ever forming in the first place. It does this by helping to prevent carcinogenic chemicals from attaching themselves to cells and causing the mutations that lead to cancer. A number of green tea blends are also anticancer herbs and act in a very similar way to rosemary. To make a tea infusion of Rosemary, pour 1 cup boiling water over 1 teaspoon of rosemary leaves and steep for 15 minutes. Strain and drink. Half a teaspoon of cinnamon spice is also known to aid the fight against cancer. These anticancer herbs are just a small percentage of the plants that can benefit the body through healing. These herbs can be a preventative measure to ensure the body has everything it needs to stop mutations from occurring in the first place. They can also be used to lessen the horrible side effects when taken alongside chemotherapy treatments. But most importantly they have been shown to reduce the effects of cancerous cells and even reduce the size of tumors. With all the benefits these anticancer herbs can provide you may want to start growing some in your own garden.

### 1.2 Autumn Crocus

Species Name – *Colchicum Autumnale*

Common Names – Naked Ladies, *Colchicum*, and Meadow Saffron

The Autumn Crocus, of the Lily Family (*Liliaceae*), is a plant with small flowers of varying colors. This plant is indigenous to Europe, Northern African, and Asian continents. Being a plant with a history of medicinal use, records have shown that it had been used in Ancient Greece, India, and Egypt with records being stored in the oldest medical text, known as the Ebers Papyrus. At present, it is used to treat inflammatory disorders. The Autumn Crocus is also valued for its' chemotherapeutic properties.

Compound - Colchicine

Otherwise known as the alkaloid colchicine, its medicinal use was in the treating gout, a painful disease that is the result of the joints being inflamed. The other major use of colchicine is in its effect on the mitosis of animal and plant cells; it works by interrupting the process altogether, especially in the division of cancerous cells. Some common reactions to using colchicine are diarrhea and reversible malabsorption syndrome.

### 1.3 Birch

Species Name – *Betula Alba*

Common Name – Birch

The Birch or *Betula Alba* plant has a variety of different uses. Its medicinal use include diuretic, anti-inflammatory, and a general pain reliever. There are currently several side effects associated with the use of the birch leaf, including chest pains, tightness in the chest or that that may cause breathing problems, and skin irritation. The Birch has sixty species throughout the world, ten of which are native to Canada and the northern part of the United States.

Compound – Betulinic Acid

The effects of Betulinic Acid, as studied by Dr. Brij Saxena of Weill Cornell Medical College, has been known to kill cancerous cells, and has been especially effective in the treatment of prostate cancer patients. This compound does not cause side effects, in typical patients. However the compound is being researched further for its compatibility with patients suffering from HIV.

### 1.4 Camptotheca

Species Name – *Camptotheca Acuminata*

Common Names – Xi Shu, Happy Tree

The *Camptotheca*, otherwise known as the Happy Tree, is a fern-like deciduous tree with a variety of medicinal uses. From its scientific name, *Camptotheca Acuminata*, its genus "*Camptotheca*" is Greek for

"curved sheath" which resembles the pods that are formed in a curve found in the plant. Although its used medically, Camptotheca is very unstable. It isn't soluble in water and can be highly toxic, so special care should be taken to observe any dangerous side effects and a patient's health should be carefully monitored by a medical professional. Although Camptotheca has been used medically, it has since been discontinued by many professionals due to the development of treatments with less severe side effects. The side effects of Camptotheca are attributed to its compounds.

Compound – Camptothecin, Topotecan, CPT-11, 9-Aminocamptothecin

Extracted from the Camptotheca Acuminata plant, CPT-11 is a compound administered in patients with brain tumors through the drug Irinotecan. It contains antineoplastic, used to prevent the mutation of cells into cancerous cells with the possibility of preventing or reducing the disease into one that is benign. Some common side effects of this compound include diarrhea, alopecia or hair loss, vomiting, weakness, and lowering of white and red blood cells.

Species Name – Taxus Baccata

Common Name – Yew

The English Yew is an evergreen tree that flowers from March to April. Not self-fertile, the yew is known for attraction of wildlife. This plant can grow in almost any soil, but it is most prominent in groups. This tree has known to be used in wood furniture, especially cabinets. English Yew can also be used medicinally to treat chest pains. English Yew is also valued for its 'taxol' that has been found to effectively been used as treatment for ovarian cancer, as well as less serious ailments.

Compound – Docetaxel, Taxol

Although toxic, the occasional use of the docetaxel in medicine has shown potential in being an anti-cancer drug, especially in

breast cancer cases. The toxicity of the compound requires proper management to avoid the worsening of the situation. Other treatments that are possible are cystitis, heart and kidney problems, and others. Common side effects of docetaxel are constipation, dizziness, diarrhea, hair loss, loss of appetite, joint pain, as well as weakness in different parts of the body. When these side effects persist, medical attention should be sought right away.

### 1.5 Hemp

Species Name – 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 processes.

### 1.6 Lapacho Tree

Species Names – *Tabebuia Impetiginosa*, *T. Avellaneda*

Common Names – Lapacho, Pau D'Arco, Taheebo, and Ipe Roxo

Found in the rainforests of South America, especially in Argentina, Paraguay, and Brazil, the Lapacho Tree is an evergreen with blossoms that may be red or purple. It has proven to be medically useful, even since the time of the Incas. Locals still use the tree for many diseases, including the common cold, flu, herpes, psoriasis, as well as other discomforts that cancer patients are more susceptible to due to their decreased immune system.

Compound – Beta-Lapachone, Lapachol

Beta-lapachone has anti-cancer properties that are being researched with focus on pancreatic cancer. Dr. David Boothman of the Harold C. Simmons Comprehensive Cancer Center, and other colleagues, have conducted study on the properties that beta-lapachone harnesses and they have discovered that it reacts with NQ01, an enzyme present in lung cancer and solid tumors. The interaction between the beta-lapachone and the NQ01 form a bond that extinguishes the tumor cells that the NQ01 catalyzes.

### 1.7 Mayapple

Species Name – *Podophyllum Peltatum*

Common Names – Devil's Apple, Hog Apple, Indian Apple, Umbrella Plant, Wild Lemon

Known to be a perennial native herb, it is native in Eastern North America. This plant resembles a fan-like structure with wide leaves that is edible and medicinal. The medicinal property of this plant has been used by the Native Americans. Although the plant is edible, its seeds and rind are not and they have been known to be poisonous. Mayapple has been used to treat snakebites and as a laxative. Recently, Mayapple has

been used in the United States to treat both lung and testicular cancer.

Compound – Podophyllotoxin, Etoposide, Podophyllinic Acid, and Teniposide

With the other forms of the compound, medicinally in the removal of genital warts which was first used in 1942 with outstanding success. The Etoposide compound form is useful in anticancer drugs which kill the cancerous cells through the process of enzyme-mediated DNA scission. This blocks the action of the cell on the DNA of the cancer cells that will prevent their development, thereby killing them. Some side effects of Etoposide are loss of appetite, back pain, skin discoloration, hair loss, diarrhea, and increased sweating.

### 1.8 Nothapodytes Tree

Species Name – *Nothapodytes Foetida*

Common Name – Nothapodytes Tree

The Nothapodytes Tree has its medicinal use whose wood-extract is used in treating diseases. This tree is found in western Ghats, India, which have become important because of it being an anti-cancerous compound containing plant with medicinal properties similar to the camptothecin plant, due to their remarkably similar chemical makeup.

Compound – Acetylcamptothecin, Camptothecin, Scopolectin

Camptothecin found in the Nothapodytes Tree is an inhibitor of the DNA topoisomerase found in cancerous cells. This halts the process of mutation and development of the cancer cells that render them useless and as a result, they die. This means of cancer curation makes use of the property of inhibition that the camptothecin compound has with the DNA of the cancerous cells. Some side effects in using this compound include diarrhea and anemia.

### 1.9 Pacific Yew

Species Name – Taxus Brevifolia

Common Name – Yew

The Pacific Yew, otherwise known as the Western Yew, is a tree with many special uses. Its bark contains valuable properties that are effective in treating various forms of cancer. Native to Southeast Alaska, this coniferous tree commonly exists in the western part of the United States as well. A plant of many uses; its medicinal uses are integral in cancer treatment, especially refractory ovarian cancer.

Compound – Paclitaxel

Taxol, or a variant of which being Paclitaxel, has been studied to have anticancer properties as identified by the National Cancer Institute to be a very likely candidate in the cancer treatment process. The compound works in the way that it binds with cancer cells thus stopping their division. This method of cancer treatment limits the spread of the disease on to other parts of the body, thereby allowing further chemotherapy to deal with the now bounded cells. Side effects include anemia, neutropenia, and hair loss

### 1.10 Periwinkle

Species Name – Catharanthus Roseus

Common Names – Madagascar Periwinkle, Periwinkle

The Periwinkle plant is located in the southern portion of North America. Its fruit has an ellipsoid structure with pink or purple shaded petals in its flower. Being an annual plant, this plant has medicinal properties, such as being hypoglycemic to lower the blood glucose, especially for diabetics. Other than that, research has shown that Periwinkle has anticancer properties that have shown promise.

Compound – Vinblastine, Vincristine, Vindesine, Vinorelbine

Vinblastine, being an anti-cancer drug extracted from the periwinkle plant has

shown to be effective in slowing down the effect of tumors. This is due that the compound has been studied to have an inhibiting property that slows down microtubule formation in cancer cells. This then disrupts the assembling of mitotic spindles in tumor cells which halt the development of the cancer. Vinblastine can cause side effects including bone pain, depression, dizziness, constipation, hair loss, stomach pain, and loss of appetite.

## 2. Herbs and Anti-Oxidants That Fight Cancer

A number of studies from all over the world are pointing to **culinary herbs** as sources of anti-oxidants and other substances that have anti-cancer characteristics. The scientists found that these herbs help reduce cancer risk and some can even modify tumor behavior.

Some of these cancer preventing herbs are discussed here.

**2.1 Oregano:** Amongst the dried herbs, oregano has perhaps the highest anti-oxidant levels. Rosmarinic acid is the compound in oregano that has the strong anti-oxidant activity. An Indian study reported that oregano supplementation of 40 mg per kg of body weight had a modulatory role on tissue lipid peroxidation in colon cancer-bearing experimental rodents. The dosage for human beings has not yet been determined, but then, how much of oregano would you need to flavor your dish!

**2.2 Thyme:** Thyme is sweeter and milder than oregano. Thyme as a dried herb contains very high levels of anti-oxidants in the form of rosmarinic acid and phenolic compounds such as thymol and carvacrol. A Turkish study supported by Hacettepe University Research Foundation suggested that these phenolic compounds at concentrations below 0.2 mM and 0.1 mM



respectively can significantly reduce the oxidative DNA damage and thus prevent the development of any type of cancer.

**2.3 Cilantro:** Cilantro or, more commonly, coriander is another potent herb that has anti-cancer properties. The prevalent anti-oxidants in cilantro are beta-carotene, quercetin and rutin. This herb, normally used in chelation therapy for people suffering from lead poisoning, helps remove free radicals by getting rid of the heavy metals in your body. Dr. Yoshiaki Omura from the Heart Disease Research Foundation, New York, NY, USA, has actually found that fresh cilantro removes heavy metals – and with it the free radicals too – from the body in less than 2 weeks.

**2.4 Basil:** Basil is well known for its medicinal value. Apart from having anti-inflammatory, blood pressure lowering, and nervous system stimulating properties, this popular herb has been found to have chemoprotective potential for colon cancer. In fact, a study found that basil played a significant role in reducing colon tumors in experimental animals. However, no human clinical trials have been conducted to confirm this experiment.

**2.5 Garlic:** The 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 percent.

**2.6 Ginger:** Some pungent substances

present in ginger rhizome have anti-oxidant and anti-inflammatory activities. The anti-cancer 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.

**2.7 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 curcumin 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.

**2.8 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 epigallocatechin 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. Again, men who drank the most green tea were 37 percent less likely to develop pancreatic cancer. A large Chinese clinical study found

that the risk of prostate cancer declined with increasing frequency and quantity of green tea consumption. However, scientists found that green tea could reduce the chances of recurrence of breast cancer but it could not prevent or improve breast cancer.

**2.9 Maitake Mushroom:** Maitake is an edible mushroom native to the mountains of northeast Japan. Its active ingredient is a polysaccharide called beta glucan. Maitake mushroom extract is said to limit or even reverse tumor growth. It also enhances the benefits of chemotherapy and lessens the side effects of anti-cancer drugs. It acts by activating certain cells and proteins that attack cancer, T-cells and interleukin-1 and interleukin-2. The daily dose of dried mushroom is between 3 to 7 g. Maitake may not be suitable for those on hypoglycemic medication.

**2.10 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.

### 3. Anticancer Potential Herbs in India

As we can see, herbs and other antioxidants are not only very helpful in preventing cancer and in some cases inhibiting progression of cancer, they also help with overall wellness by improving the immune system. But be sure to consult your doctor before taking any of these herbs for preventing or treating cancer.

#### 3.1 *Aegle marmelos*

Lupeol, isolated from *Aegle marmelos*, possesses strong anticancer activity against breast cancer, malignant lymphoma, malignant melanoma, malignant ascites and leukaemia. *Aegle marmelos* possesses significant antioxidant activity and reduces side effects of chemotherapy & radiotherapy.

#### 3.2 *Aloe 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 from *Aloe 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 vera* stimulates immune system response of the body by activating macrophages and releasing cytokines such as interferon, interleukin and tumour necrosis factor. *Aloe vera* has an extraordinary antioxidant profile and reduces side effects of chemotherapy & radiotherapy.

#### 3.3 *Alpinia galanga*

Acetoxy-chavicol-acetate (ACA), isolated from *Alpinia galanga*, possesses significant anticancer activity against cancers of breast, lung, stomach, colon, prostate, multiple

myeloma and leukaemia. Pinocembrin isolated from *Alpinia galanga* inhibits growth & spread in colon cancer by arresting cell proliferation and inducing apoptosis. Galangin, a flavonoid isolated from *Alpinia galanga*, possesses strong anticancer, antioxidant, antimutagenic and anti-inflammatory properties. Galangin protects against breast and prostate cancers.

### 3.4 *Amoora rohituka*

Amooranin (a triterpene acid), isolated from *Amoora rohituka* inhibits growth & spread of breast and cervical cancers by arresting G2/M phase of the cell cycle and by inducing apoptosis. Amooranin and its derivatives are effective in both chemotherapy-sensitive and chemotherapy-resistant cancers. Amooranin has the ability to overcome (reverse) multidrug resistance in breast cancer, colon cancer and leukaemia.

### 3.5 *Andrographis paniculata*

Andrographolide, active diterpine component, isolated from *Andrographis paniculata*, has immunoenhancing and strong anticancer activity against cancers of breast, ovary, stomach, colon, prostate, kidney, nasopharynx malignant melanoma and leukaemia. Andrographolide exerts direct anticancer activity on cancer cells by arresting G0/G1 phase of cell-cycle and inducing apoptosis. Dichloromethane fraction of methanolic extract of *Andrographis paniculata* has strong anticancer activity against colon cancer. *Andrographis paniculata* possesses anticancer, immunostimulant, antioxidant, anti-HIV and anti-inflammatory properties. *Andrographis paniculata* enhances the activity of protective liver enzymes and reduces side effects of chemotherapy & radiotherapy.

### 3.6 *Azadirachta indica*

*Azadirachta indica* contains about 40 different active principles, known as liminoids, which exhibit immunoenhancing, anti-inflammatory, antiulcer, antifungal, antiviral, antioxidant, hepatoprotective, antimutagenic, anticancer and antimetastatic properties. Liminoids regress growth & spread of various cancers such as cancers of breast, lung, stomach, prostate and skin. Nimbolide, a natural triterpenoid, isolated from *Azadirachta indica* leaves and flowers inhibits growth & spread of various cancers including colon cancer, malignant lymphoma, malignant melanoma and leukaemia by inducing apoptosis (programmed cell death), a process that directs the body's immune cells to identify and destroy cancer cells. Nimbolide also prevents metastasis of cancer. Ethanolic extract of *Azadirachta indica* inhibits growth & spread of prostate cancer by inducing apoptosis and its antiandrogenic effect. *Azadirachta indica* reduces side effects of chemotherapy & radiotherapy.

### 3.7 *Bauhinia variegata*

Cyanidin glucoside, malvidin glucoside, peonidin glucoside and kaempferol galactoside isolated from *Bauhinia variegata* inhibit growth & spread of various cancers such as cancers of breast, lung, liver, oral cavity, larynx and malignant ascites. *Bauhinia variegata* also possesses significant hepatoprotective activity.

### 3.8 *Berberis vulgaris*

*Berberis vulgaris* root contains berberine, berbamine, chelidonic acid, citric acid, columbamine, hydrastine, isotetrandrine, jacaranone, magnoflorine, oxycanthine and palmatine. Berberine (an isoquinoline alkaloid), possesses anticancer, immunoenhancing, antioxidant and anti-inflammatory properties. Berberine arrests cancer cell cycle in G1-phase and induces

apoptosis. Berberine possesses strong anticancer activity against prostate cancer, liver cancer and leukaemia. Berberine interferes with P-glycoprotein in chemotherapy-resistant cancers. Berberine also increases the penetration of some chemotherapy drugs through the blood-brain barrier, thereby enhancing their effect on intracranial tumours. *Berberis vulgaris* root bark contains three phenolic compounds, tyramine, cannabisin-G and lyoniresinol. Cannabisin-G and lyoniresinol exhibit strong antioxidant activity. Cannabisin-G protects against breast cancer. *Berberis vulgaris* also inhibits growth of stomach and oral cavity cancers.

### 3.9 *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.

### 3.10 *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. Curcumin also protects from stomach cancer and colon cancer. *Curcuma longa* also possesses antimutagenic, antioxidant, immunostimulant, anti-inflammatory, hepatoprotective and radioprotective properties.

### 3.11 *Emblica officinalis*

*Emblica officinalis* contains ellagic acid, gallic acid, quercetin, kaempferol, emblicanin, flavonoids, glycosides and proanthocyanidins. *Emblica officinalis* is valued for its unique tannins and flavonoids, 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.

### 3.12 *Ginkgo biloba*

Ginkgetin and Ginkgolides (A & B), isolated from *Ginkgo biloba* inhibits growth & spread of various aggressive cancers such as invasive oestrogen-receptor negative breast cancer, glioblastoma multiforme, hepatocellular carcinoma and cancers of ovary, colon, prostate and liver by inducing apoptosis. *Ginkgo biloba* extract is well known for its antioxidant activity. *Ginkgo biloba* also reduces side effects of chemotherapy & radiotherapy.

### 3.13 *Glycine max*

Isoflavones (such as genistein & daidzein) and saponins isolated from *Glycine 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 max* possess 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

many cancers including that of the colon, lung and ovary.

### 3.14 *Glycyrrhiza glabra*

Flavonoids (flavones, flavonols, isoflavones, chalcones, licochalcones and bihydrochalcones), derived from *Glycyrrhiza glabra* possess strong anticancer, antioxidant, antimutagenic, anti-ulcer, anti-HIV and hepatoprotective properties. Licochalcone-A isolated from *Glycyrrhiza glabra*, inhibits growth & spread of various cancers particularly the androgen-refractory prostate cancer by inducing apoptosis and arresting cancer cells division. Licoagrochalcone, possesses strong anticancer activity against cancers of breast, lung, stomach, colon, liver, kidney and leukaemia. Glycyrrhizin isolated from *Glycyrrhiza glabra* inhibits growth & spread of lung cancer and fibrosarcomas. Glycyrrhizic acid isolated from *Glycyrrhiza glabra* protects against aflatoxins (powerful fungal carcinogens of the liver). *Glycyrrhiza glabra* stimulates immune system response of the body and protects against colon cancer and oestrogen-positive breast cancer.

### 3.15 *Gossypium hirsutum*

Gossypol isolated from *Gossypium hirsutum* inhibits growth & spread of various cancers such as cancers of the breast, oesophagus, stomach, colon, liver, pancreas, adrenal gland, prostate, urinary bladder, malignant lymphoma, malignant ascites, brain tumours, sarcomas and leukaemia by inducing apoptosis and arresting cancer cell division in G0/G1 phase. The negative isomer of gossypol, (-) gossypol, inhibits growth & spread of chemotherapy & radiotherapy-resistant cancers of prostate, breast, ovary, lung, pancreas, head & neck and brain by inducing apoptosis. Gossypolone, oxidative metabolite of gossypol, inhibits growth & spread of various cancers including that of

the breast, cervix, lung, malignant melanoma and leukaemia.

### 3.16 *Morinda citrifolia*

Damnacanthol, NB10 and NB11 isolated from *Morinda citrifolia* possess strong anticancer activity against various cancers particularly lung cancer and sarcomas. *Morinda citrifolia*, possesses strong antioxidant, hepatoprotective and immunoenhancing properties.

### 3.17 *Nigella sativa*

Thymoquinone and dithymoquinone isolated from *Nigella sativa* have strong anticancer activity against various cancers including cancers of the colon, prostate, pancreas, uterus, malignant ascites, malignant lymphoma, malignant melanoma, sarcomas and leukaemia. Thymoquinone is effective in both hormone-sensitive and hormone-refractory prostate cancer. *Nigella sativa* kills cancer cells by binding to the asialofectin (lectin) on the surface of cancerous cells, causing their aggregation and clumping. *Nigella sativa* also possesses immunoenhancing and anti-inflammatory properties. It protects against liver cancer. *Nigella sativa* enhances immune function of the body and reduces side effects of chemotherapy & radiotherapy.

### 3.18 *Ocimum sanctum*

*Ocimum sanctum* contains eugenol, eugenol derivatives, linolenic acid, rosmarinic acid and flavonoids such as orientin, vicenin, cirsilineol, cirsimaritin, isothymusin, isothymonin & apigenein. Eugenol, orientin and vicenin inhibits growth & spread of various cancers such as breast cancer, liver cancer and sarcomas particularly fibrosarcoma by blocking supply of oxygen and nutrients to the cancer cells and killing them by starving. Ursolic acid isolated from *Ocimum sanctum* has immunoenhancing and tissue-protective

properties. Polysaccharides isolated from *Ocimum sanctum* have antioxidant and radioprotective properties. *Ocimum sanctum* protects against various cancers particularly the breast cancer and reduces side effects of chemotherapy & radiotherapy.

### 3.19 *Oldenlandia diffusa*

*Oldenlandia diffusa* (Bai Hua She She Cao) contains oldenlandosides, stigmasterol, ursolic acid, oleanolic acid, beta-sitosterol, p-coumaric acid and flavonoid glycosides. Ursolic acid inhibits growth & spread of various cancers such as cancers of lung, ovary, uterus, stomach, liver, colon, rectum, brain, malignant melanoma, malignant ascites, lymphosarcoma and leukaemia. Ursolic acid works by a typical cytotoxic effect on cancer cells and by inducing apoptosis.

### 3.20 *Panax ginseng*

Ginsenosides (panaxadiol and panaxatriol saponins) isolated from *Panax ginseng* inhibits growth & spread of various cancers such as cancers of breast, ovary, lung, prostate, colon, renal cell carcinoma, malignant melanoma, malignant lymphoma and leukaemia. Panaxadiol ginsenosides (Rb1, Rb2, Rc, Rd, Rg3, Rh2) and Panaxatriols ginsenosides (Re, Rf, Rg1, Rg2, Rhi) have both preventive and therapeutic role in cancer treatment. Ginsenosides possess strong anticancer activity against lung cancer and also prevent lung metastasis by blocking angiogenesis. Compound K (a metabolite of ginsenosides) inhibits growth & spread of chemo-resistant lung cancer. Ginsenosides Rc, Rd, Rg1 and Re overcome (reverse) P-glycoprotein mediated multidrug resistance to chemotherapy. Ginsenoside Rf helps in reducing doses of morphine in terminally ill cancer patients. Polysaccharides of *Panax ginseng* possess strong immunoenhancing

and anticancer activities against many cancers, particularly lung cancer. These polysaccharides also reduce side effects of chemotherapy & radiotherapy. *Panax ginseng* also possesses antistress, hepatoprotective, haemopoietic, immunoenhancing, antioxidant, radioprotective, chemoprotective, and anti-inflammatory properties. *Panax ginseng* inhibits proliferation and seeding (metastases) in various cancers by inducing cell differentiation and apoptosis. *Panax ginseng* is effective in both hormone-responsive & hormone-refractory prostate and breast cancers.

### 3.21 *Plumbago zeylanica*

Plumbagin isolated from *Plumbago zeylanica* inhibits growth & spread of breast cancer, liver cancer, fibrosarcoma, malignant ascites and leukaemia by inhibiting cancer cell proliferation. *Plumbago zeylanica* also possesses strong antioxidant, hepatoprotective, neuroprotective and immunoenhancing properties.

### 3.22 *Podophyllum hexandrum*

Podophyllotoxin & podophyllin (lignans) isolated from *Podophyllum hexandrum* (Himalayan May Apple) inhibit growth & spread of various cancers including that of the breast, ovary, lung, liver, urinary bladder, testis, brain, neuroblastoma, Hodgkin's disease, non-Hodgkin's lymphoma and leukaemia. Podophyllotoxin is the most active among all the natural anticancer compounds. *Podophyllum hexandrum* also possesses potent radioprotective and haemopoietic properties.

### 3.23 *Prunella vulgaris*

Ursolic acid and oleanolic acid, isolated from *Prunella vulgaris* (Xia-ku-cao/Self heal), inhibit growth & spread of various

cancers such as cancers of the breast, cervix, lung, oral cavity, oesophagus, stomach, colon, thyroid, malignant lymphoma, intracranial tumours and leukaemia. *Prunella vulgaris*, is traditionally used in China to treat sores in mouth and throat. *Prunella vulgaris* also possesses immunoenhancing, hepatoprotective, antioxidant, anti-HIV and anti-Herpes properties. *Prunella vulgaris* has normoblastic effect on the bone marrow.

### 3.24 *Psoralea corylifolia*

Bavachinin, corylfolinin and psoralen isolated from *Psoralea corylifolia* (Bu Gu Zhi), possess strong anticancer activity against lung cancer, liver cancer, osteosarcoma, fibrosarcoma, malignant ascites and leukaemia. Psoralen enhances immunity of the body by stimulating natural killer cell activity. Psoralidin isolated from *Psoralea corylifolia* inhibits growth & spread of stomach and prostate cancers by inhibiting G2/M phase of cell cycle. Psoralidin induces apoptosis in both androgen-responsive and androgen-refractory prostate cancers. *Psoralea corylifolia* also possesses strong antioxidant, immunoenhancing and hepatoprotective properties.

### 3.25 *Rubia cordifolia*

Rubidianin, rubiadin, RA-7, RA-700 and RC-18 isolated from *Rubia cordifolia* inhibit growth & spread in cancers of breast, ovary, cervix, colon, lung, malignant ascites, malignant lymphoma, malignant melanoma sarcoma and leukaemia. Rubiadin also possesses hepatoprotective activity.

### 3.26 *Saussurea lappa*

Sesquiterpenes and costunolide dehydrocostuslactone, isolated from *Saussurea lappa* inhibit growth & spread of breast cancer. Cynaropicrin, isolated from *Saussurea lappa* possesses

strong anticancer activity against malignant lymphoma and leukaemia. Costunolide, isolated from *Saussurea lappa* inhibits growth & spread of intestinal cancer. Mokolactone isolated from *Saussurea lappa* induces apoptosis in leukaemic cells. Shikokiols isolated from *Saussurea lappa* exhibit anticancer activity against cancers of the ovary, lung, colon and central nervous system. *Saussurea lappa* inhibits growth & spread of cancers by arresting cancer cell division in G2 phase and inducing apoptosis.

### 3.27 *Solanum nigrum*

Solamargine and solasonine, isolated from *Solanum nigrum* (Lo-ing-kue) inhibit growth & spread of various cancers including that of the breast, liver and lung. Steroidal glycosides (spirostane, furostane, spirosolane and pregnane), isolated from *Solanum nigrum* inhibit growth & spread of colon cancer and pheochromocytoma. Glycoproteins isolated from *Solanum nigrum* have antiproliferative and apoptotic effects on colon and breast cancers. Polysaccharides isolated from *Solanum nigrum* have significant inhibitory effect on growth of cervical cancer. *Solanum nigrum* inhibits growth & spread of liver cancer by two distinct anticancer activities, i.e. apoptosis (programmed cell death) and autophagy (autophagocytosis). Higher doses of *Solanum nigrum* induce apoptotic cell death while lower doses lead to autophagocytic death of cancer cells. Lunasin, isolated from *Solanum nigrum* is a cancer-preventive peptide. *Solanum nigrum* and *Solanum lyrati* (Shu-yang-quan) inhibit growth & spread of stomach cancer, sarcomas, malignant ascites and leukaemia.

### 3.28 *Tinospora cordifolia*

Sesquiterpenes and diterpenes isolated from *Tinospora cordifolia* inhibit growth &

spread of various cancers including cancers of lung, cervix, throat and malignant ascites. Polysaccharide fraction isolated from *Tinospora cordifolia* inhibits lung metastasis. Arabinogalactan, syringine, cordiol, cordioside, cordifoliosides (A & B) isolated from *Tinospora cordifolia* possesses significant immunoenhancing activity. *Tinospora cordifolia* also possesses neuroprotective, hepatoprotective, antistress, antiulcer and antipyretic properties. *Tinospora cordifolia* reduces side effects of radiotherapy & chemotherapy.

### 3.29 *Viscum album*

Lectins (such as viscumin), polypeptides (viscotoxins) and phenolic compounds (such as digallic acid) isolated from *Viscum album* inhibit growth & spread of various cancers including that of the breast, cervix, ovary, lung, stomach, colon, rectum, kidney, urinary bladder, testis, malignant melanoma, sarcomas, fibrosarcoma, malignant ascites, lung metastasis and leukaemia by inducing apoptosis and anti-angiogenesis activity. Lectins isolated from *Viscum album* possess both anticancer and immunostimulating activities. Viscumin, responsible for most of the biological activities of *Viscum album*, works by bringing together immune system effector cells and cancer cells. Lectin-II induces apoptosis in cancer cells via activation of caspase cascades.

### 3.30 *Withania somnifera*

Withanolides isolated from *Withania somnifera*, are similar to ginsenosides (the active principles of *Panax ginseng*) in both structure and activity. Withanolides (including Withaferin A, Sitoindoside IX, Physagulin D, Withanoside IV and Viscosalactone B) inhibit growth & spread of various cancers such as cancers of the breast, lung, colon and central nervous system due to their antiproliferative and antiangiogenic properties. Withaferin-A (the



most important withanolides) inhibit growth & spread of various cancers including that of the breast, cervix, colon, prostate, nasopharynx, larynx, malignant ascites and sarcomas by inducing apoptosis. Withaferin A is effective in both androgen-responsive and androgen-refractory prostate cancers. Sitoindosides VII-X and Withaferin A have strong antioxidant, antistress, immunomodulatory, anti-inflammatory and antiaging properties. Withanolide D inhibits the metastatic colony formation in the lungs by malignant melanoma. Ashwagandhanolide, a new dimeric withanolide, isolated from *Withania somnifera*, inhibits growth & spread in cancers of breast, stomach, colon, lung and central nervous system. *Withania somnifera* also possesses immunoenhancing, haemopoietic and neuroprotective properties and reduces side effects of radiotherapy & chemotherapy.

### 3.31 *Zingiber officinale*

Gingerols isolated from *Zingiber officinale* inhibit growth & spread of various cancers including that of the ovary, cervix, colon, rectum, liver, urinary bladder, oral cavity, neuroblastoma and leukaemia by inducing apoptosis. The most active individual component, 6-shogaol, isolated from *Zingiber officinale*, inhibit growth & spread of many cancers particularly the ovarian cancer by blocking formation of new blood vessels and by inducing apoptosis & autophagy. It is effective even in chemotherapy resistant ovarian cancer. *Zingiber officinale* also possesses antioxidant, antimutagenic and anti-inflammatory properties and reduces side effects of chemotherapy & radiotherapy.

**Table 1:** List of plants has Anti-Cancer activity

S. No.	Common name	Botanical Name	Part Used	Family	Uses
1	Arjuna Bark	<i>Terminalia arjuna</i>	Bark	Combretaceae	Anticancer
2	Kalmegh	<i>Andrographis paniculata</i>	Dried leaves	Acanthaceae	Anticancer
3	Vinca	<i>Catharanthus roseus</i>	Whole plant	Apocynaceae	Anticancer
4	Ochrosia	<i>Ochrosia elliptica</i>	Trunk Bark	Apocynaceae	Anticancer
5	May Apple	<i>Podophyllum peltatum</i>	Dried Rhizome	Berberidaceae	Anticancer
6	Ginger	<i>Zingiber officinalis</i>	Rhizome	Zingibaraceae	Anticancer
7	Turmeric	<i>Curcuma longa</i>	Rhizome	Zingibaraceae	Anticancer
8	deerberry	<i>Vaccinium stamineum</i>	fruit	Ericaceae	Anticancer
9	Indian mulberry	<i>Morinda citrifolia</i>	fruit	Rubiaceae	Anticancer
10	Bhilwa	<i>Semecarpus anacardium</i>	fruit	Anacardiaceae	Anticancer
11	Madar	<i>Calotrophis gigantea</i>	Whole plant	Asclepiadaceae	Anticancer
12	Arhar Dal	<i>Cajanus cajan</i>	Leaves	Fabaceae	Anticancer
13	Palash	<i>Butea monosperma</i>	Bark	Fabaceae	Anticancer
14	Orchid Tree	<i>Bauhinia variegata</i>	Root	Caesalpinaceae	Anticancer
15	Onion	<i>Alium cepa</i>	Bulb	Liliaceae	Anticancer
16	Indian Aloe	<i>Aloe barbadensis</i>	Leaves	Liliaceae	Anticancer
17	Tarwar	<i>Cassia auriculata</i>	Root	Caesalpinaceae	Anticancer
18	Senna	<i>Cassia senna</i>	Leaves	Caesalpinaceae	Anticancer
19	Lemon	<i>Citrus medica</i>	Root	Rutaceae	Anticancer
20	Carrot	<i>Daucus carota</i>	Root	Apiaceae	Anticancer
21	Danti	<i>Jatropha curcas</i>	Leaves, seed, oils	Euphorbiaceae	Anticancer
22	Mint	<i>Mimosa pudica</i>	Whole plant	Mimosaceae	Anticancer

23	Tobacco	<i>Nicotiana tabacum</i>	Leaves	Solanaceae	Anticancer
24	Indian Ipecac	<i>Tylopora indica</i>	Root, Leaf	Asclepiadaceae	Anticancer
25	Nichinda	<i>Vitex trifolia</i>	Leaf	Verbanaceae	Anticancer

#### 4. Conclusion

There are many traditional systems of medicine in the world, each with different associated philosophies and cultural origins. Some of these, such as Tibetan traditional medicine, remain relatively localised in their country of origin; while others such as Ayurvedic and Chinese traditional medicines are increasingly used in many different areas of the world. This paper will concentrate on the issue of treatment of chronic diseases and heavy metal poisoning related to herbal traditional medicines. Ayurveda is the most widely practised of the Indian traditional medicine systems, but there are others such as Siddha and Unani which are also used in the Indian subcontinent. Cancer is a major public

health burden in both developed and developing countries. Cancer is an abnormal malignant growth of body tissue or cell. A cancerous growth is called a malignant tumor or malignancy. A non-cancerous growth is called benign tumor. The process of cancer metastasis is consisting of series of sequential interrelated steps, each of which is rate limiting. Plants loaded with chemical with chemo protective activities of some of them are undergoing clinical trial. Inhibition of angiogenesis is a novel process of cancer therapy. The selected and careful use of this plant may definitely in anti-angiogenic therapy and thus in cancer management.

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