

# Some anticancer medicinal plants of foreign origin

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**An attempt has been made to review some medicinal plants used for the prevention and treatment of cancer in foreign countries. Information on the botanical names of plants with family names, parts used and their main active components, and original/native place of these plants have been collected from the literature. This article considers 62 medicinal plants of foreign origin. These plants belong to 40 families, and their different parts (root, stem, bark, corm, bulb, leaf, fruit and seed) or the whole plants/herbs are used. The extracts or decoctions of these are generally used. The medicinal plants contain several phytochemicals such as vitamins (A, C, E, K), carotenoids, terpenoids, flavonoids, polyphenols, alkaloids, tannins, saponins, enzymes, minerals, etc. These phytochemicals possess antioxidant activities, which prevent or can be used in the treatment of many diseases, including cancer. Herbal drugs are also known to have good immunomodulatory properties. These act by stimulating both non-specific and specific immunity.**

**Keywords.** Anticancer medicinal plants, cancer, foreign origin, phytochemicals.

CANCER is the abnormal growth of cells in our bodies that can lead to death. Cancer cells usually invade and destroy normal cells. These cells are born due to imbalance in the body and by correcting this imbalance, the cancer may be treated. Billions of dollars have been spent on cancer research and yet we do not understand exactly what cancer is<sup>1</sup>. Every year, millions of people are diagnosed with cancer, leading to death. According to the American Cancer Society<sup>2</sup>, deaths arising from cancer constitute 2–3% of the annual deaths recorded worldwide. Thus cancer kills about 3500 million people annually all over the world. Several chemopreventive agents are used to treat cancer, but they cause toxicity that prevents their usage<sup>3</sup>.

Cancer is the second leading cause of death in America. The major causes of cancer are smoking, dietary imbalances, hormones and chronic infections leading to chronic inflammation<sup>4</sup>. Breast cancer is the most common form of cancer in women worldwide<sup>1,5</sup>. Amongst South

African women, breast cancer is likely to develop in one out of every 31 women in the country<sup>5</sup>. Colon cancer is the second most common cause of cancer deaths in the US<sup>1</sup>. Prostate cancer is the most frequently diagnosed cancer among men in the US, second to skin cancer with an estimated 180,000 new cases and 37,000 deaths expected by American Cancer Society<sup>6</sup> each year. With increase in longevity, the disease is going to be a problem even in India. Cancers affecting the digestive tract are among the most common of all the cancers associated with aging. About one out of every 14 men and women in America is diagnosed with gastrointestinal cancer at some time in his/her life.

Because of high death rate associated with cancer and because of the serious side effects of chemotherapy and radiation therapy, many cancer patients seek alternative and/or complementary methods of treatment. The important preventive methods for most of the cancers include dietary changes, stopping the use of tobacco products, treating inflammatory diseases effectively, and taking nutritional supplements that aid immune functions. Recent researches revolve round the urgency to evolve suitable chemotherapy consistent with new discoveries in cell biology for the treatment of cancer with no toxic effect. Chemotherapy, being a major treatment modality used for the control of advanced stages of malignancies and as a prophylactic against possible metastasis, exhibits severe toxicity on normal tissues<sup>7,8</sup>. Plants have been used for treating various diseases of human beings and animals since time immemorial. They maintain the health and vitality of individuals, and also cure diseases, including cancer without causing toxicity. More than 50% of all modern drugs in clinical use are of natural products, many of which have the ability to control cancer cells<sup>9</sup>. According to the estimates of the WHO, more than 80% of people in developing countries depend on traditional medicine for their primary health needs. A recent survey shows that more than 60% of cancer patients use vitamins or herbs as therapy<sup>10,11</sup>.

Over the past decade, herbal medicines have been accepted universally, and they have an impact on both world health and international trade. Hence, medicinal plants continue to play an important role in the healthcare system of a large number of the world's population<sup>12</sup>. Traditional medicine is widely used in India. Even in USA, use

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of plants and phytomedicines has increased dramatically in the last two decades. A National Centre for Complementary and Alternative Medicine has been established in USA. The herbal products have been classified under 'dietary supplements' and are included with vitamins, minerals, amino acids and 'other products intended to supplement the diet'<sup>13</sup>. Use of plants as a medicinal remedy is an integral part of the South African cultural life<sup>14</sup>. It is estimated that 27 million South Africans use herbal medicines from more than 1020 plant species<sup>5,15</sup>.

In fact, there are several medicinal plants all over the world, including India, which are being used traditionally for the prevention and treatment of cancer. However, only few medicinal plants have attracted the interest of scientists to investigate the remedy for neoplasm (tumour or cancer). Hence, an attempt has been made to review some medicinal plants used for the prevention and treatment of cancer in foreign countries.

### Anticancer medicinal plants of foreign origin

Data on 62 medicinal plants of foreign origin have been collected from the literatures<sup>16-36</sup> (Table 1). These plants are used against various types of tumours/cancers such as sarcoma, lymphoma, carcinoma and leukaemia. Many of these medicinal plants have been found effective in experimental and clinical cases of cancers. Table 1 contains the botanical names of the medicinal plants (alphabetically) along with their family names, parts used and main active components, and origin/native place.

Medicinal plants possess immunomodulatory and antioxidant properties, leading to anticancer activities. They are known to have versatile immunomodulatory activity by stimulating both non-specific and specific immunity<sup>8,37</sup>. Plants contain several phytochemicals, which possess strong antioxidant activities. The antioxidants may prevent and cure cancer and other diseases by protecting the cells from damage caused by 'free radicals' – the highly reactive oxygen compounds. Thus consuming a diet rich in antioxidant plant foods (e.g. fruits and vegetables) will provide a milieu of phytochemicals, non-nutritive substances in plants that possess health-protective effects. Many naturally occurring substances present in the human diet have been identified as potential chemopreventive agents; and consuming relatively large amounts of vegetables and fruits can prevent the development of cancer<sup>2,38</sup>. Compared with meat eaters, most, but not all, studies have found that vegetarians are less likely to be diagnosed with cancer. Vegetarians have also been shown to have stronger immune function, possibly explaining why they may be partially protected against cancer<sup>10,39</sup>. Many plant-derived products have been reported to exhibit potent antitumour activity against several rodent and human cancer cell lines<sup>40</sup>.

Phytochemicals such as vitamins (A, C, E, K), carotenoids, terpenoids, flavonoids, polyphenols, alkaloids, tan-

nins, saponins, pigments, enzymes and minerals have been found to elicit antioxidant activities<sup>3,41,42</sup>. Ellagic acid and a whole range of flavonoids, carotenoids and terpenoids present in *Fragaria vesca* (strawberries) and *Rubus idaeus* (raspberries) have been reported to be responsible for antioxidant activity. These chemicals block various hormone actions and metabolic pathways that are associated with the development of cancer<sup>27,28</sup>. *Rosmarinus officinalis* (rosemary) contains substantial amounts of carnosol and ursolic acid, the potent antioxidants that possess antitumour activity<sup>34</sup>. Quercetin is the major flavonol in the Western diet. Rich sources of quercetin are red and yellow onions, kale, broccoli, red grapes, cherries, French beans, apples and cereals. Quercetin possesses both anticarcinogenic activity and the ability to inhibit LDL oxidation<sup>29,43</sup>. A whole variety of phenolic compounds, in addition to flavonoids, are widely distributed in grains, fruits, vegetables and herbs. Phenolic compounds such as caffeic, ellagic and ferulic acids, sesamol and vanillin have been reported to exhibit antioxidant and anticarcinogenic activities and inhibit atherosclerosis<sup>29,44</sup>.

Some medicinal plants (Table 1) have been found effective in various types of malignant (cancer) and benign tumours of humans and experimental animals. These include: *Agrimonia pilosa*<sup>17-22</sup> in sarcoma-180; *Ailanthus altissima*<sup>16-22</sup> in intestinal cancer, sarcoma-180, sarcoma-37 and leukaemia-16; *Akebia quinata*<sup>17-22</sup> in sarcoma-180 and sarcoma-37; *Chelidonium majus* var. *asiaticum*<sup>16</sup> in stomach cancer; *Chimaphila umbellata*<sup>16</sup> in breast tumour; *Coix lachryma jobi*<sup>17-22</sup> in ascites cancer and Yoshida's sarcoma; *Fritillaria thunbergii*<sup>16</sup> in tumours of the throat, chest, neck and breast; *Larrea tridentata*<sup>16</sup> in various cancers, especially leukaemia; *Lonicera japonica*<sup>16-22</sup> in ascites carcinoma and sarcoma-180; *Nidus vespa*<sup>17-22</sup> in gastric and liver cancers; *Oldenlandia diffusa*<sup>17-22</sup> in leukaemia, Yoshida's sarcoma, sarcoma-180 and Ehrlich's ascites sarcoma; *Patrinia heterophylla* and *P. scabiosaefolia*<sup>17-22</sup> in ascites cancer; *Phaleria macrocarpa*<sup>32</sup> in oesophageal cancer; *Polygonum cuspidatum*<sup>17-22</sup> in sarcoma-180; *Pteris multifida*<sup>17-22</sup> in sarcoma-180, sarcoma-37 and Yoshida's sarcoma; *Pygeum africanum*<sup>16</sup> in prostate cancer; *Pyrus malus*<sup>33</sup> in lung, colon, breast and intestinal cancers; *Scutellaria barbata*<sup>16-22</sup> in sarcoma-180 and Ehrlich's ascites carcinoma; *Smilax chinensis* and *S. glabra*<sup>16-22</sup> in sarcoma-180 and ascites sarcoma; *Solanum lyrati*<sup>17-22</sup> in sarcoma-180, sarcoma-37, Ehrlich ascites carcinoma and stomach cancer; *Sophora flavescens* and *S. subprostrata*<sup>16-22</sup> in sarcoma-180, leukaemia and cervical cancer-14 cells; *Taraxacum mongolicum*<sup>16-22</sup> in ascites cancer, sarcoma-180 and lung cancer cells, and *Vitex rotundifolia*<sup>36</sup> in lung tumour.

### Conclusion

Medicinal plants maintain the health and vitality of individuals, and also cure various diseases, including cancer

**Table 1.** Anticancer medicinal plants of foreign origin

Botanical name of plant with family name	Parts used and their main active components	Origin/native place
<i>Agave americana</i> Agavaceae	Leaf contains steroidal saponin, alkaloid, coumarin, isoflavonoid, hecogenin and vitamins (A, B, C)	Central America
<i>Agropyron repens</i> Poaceae	Rhizome contains essential oil, polysaccharide and mucilage	Europe
<i>Agrimonia pilosa</i> Rosaceae	Herb contains agrimonolide, flavonoid, triterpene, tannin and coumarin	China, Japan, Korea, India
<i>Ailanthus altissima</i> Simaroubaceae	Bark contains triterpene, tannin, saponin and quercetin-3-glucoside	China, Korea
<i>Akebia quinata</i> Lardizabalaceae	Fruit contains flavonoid and saponin	China, Japan, Korea
<i>Alpinia galanga</i> Zinziberaceae	Rhizome contains kaempferide and flavone	Europe
<i>Aristolochia contorta</i> Aristolochiaceae	Root and fruit contain lycicamine and oxaaporphine	China, Korea
<i>Aster tataricus</i> Asteraceae	Whole plant and root contain triterpene, monoterpene and epifriedelanol	Japan, Korea
<i>Broyonia dioica</i>	Root contains cucurbitacin and glycoside	Europe
<i>Cannabis sativa</i> Cannabinaceae	Leaf contains stereo isomers of cannabitol	South Africa
<i>Chelidonium majus</i> var. <i>asiaticum</i> Papaveraceae	Herb contains alkaloids (sanguinarine, chelerythrine, berberine)	Asia, Europe
<i>Chimaphila umbellata</i> Ericaceae	Whole plant contains ericolin, arbutin, urson and tannin	Asia, Europe
<i>Coix lachryma jobi</i> Poaceae	Seed contains trans-ferulyl stigmaterol	China
<i>Dryopteris crassirhizoma</i> Polypodiaceae	Rhizome contains filicinic and filicic acids, aspidinol and aspidin	China, Japan, Korea
<i>Echinops setifer</i> Asteraceae	Whole plant contains echinopsine	Korea
<i>Erythronium americanum</i> Liliaceae	Whole plant contains alpha-methylenebutyrolactone	North America
<i>Euonymus alatus</i> Celastraceae	Whole plant contains triterpene, euolatin, steroid and sesquiterpene alkaloid	China, Japan, Korea
<i>Eupatorium cannabinum</i> Asteraceae	Whole plant contains sesquiterpene, lactone, pyrrolizidine alkaloid and flavonoid	Europe, Asia, North America
<i>Fragaria vesca</i> Rosaceae	Leaf and fruit contain flavonoid, tannin, borneol and ellagic acid	Asia, Europe
<i>Fritillaria thunbergii</i> Liliaceae	Whole plant contains alkaloid and peimine	China, Siberia
<i>Galium aparine</i> Rubiaceae	Cleaver contains iridoid, polyphenolic acid, tannin, anthraquinone and flavonoid	Europe, Africa, Australia
<i>Hydrastis canadensis</i> Ranunculaceae	Whole plant contains isoquinoline alkaloids (hydrastine, berberine, berberastine, candaline), resin and lactone	Canada, United States
<i>Hypoxis argentea</i> Hypoxidaceae	Corm	South Africa
<i>Junchus effuses</i> Juncaceae	Whole plant contains tridecanone, effusol, juncanol, phenylpropanoid and a-tocopherol	China, Japan, Korea
<i>Knowltonia capensis</i> Ranunculaceae	Leaf	South Africa
<i>Lantana camara</i> Verbenaceae	Whole plant contains alkaloids (camerine, isocamerine, micranine, lantanine, lantadene)	Tropical America
<i>Larrea tridentate</i> Zygophyllaceae	Whole plant contains resin	Southwestern USA, Mexico
<i>Lonicera japonica</i> Caprifoliaceae	Whole plant, stem and flower contain tannins, saponins and carotenoids	China
<i>Merwillia plumbea</i> Hyacinthaceae	Bulb	South Africa
<i>Nidus vespae</i>	Whole plant	China
<i>Olea europaeae</i> Oleaceae	Leaf and oil contain oleic acid and polyphenol	America
<i>Oldenlandia diffusa</i> Rubiaceae	Whole plant	China
<i>Panax quinquefolium</i> Araliaceae	Root contains ginsenoside, sesquiterpene, limonene and vitamins (B <sub>1</sub> , B <sub>2</sub> , B <sub>12</sub> )	China, Japan, Korea
<i>Patrinia heterophylla</i> Vlerianaceae	Whole plant	China
<i>Patrinia scabiosaefolia</i> Vlerianaceae	Whole plant	China, Japan, Korea
<i>Phaleria macrocarpa</i>	Fruit contains gallic acid	Indonesia
<i>Polygonum cuspidatum</i> Polygonaceae	Whole plant	China
<i>Polygonatum multiflorum</i> Liliaceae	Whole plant contains saponin, flavonoid and vitamin A	Asia, Europe, North America
<i>Potentilla chinensis</i> Rolsaaceae	Whole plant contains gallic acid and tannin	China, Japan, Korea
<i>Pteris multifida</i>	Whole plant	China
<i>Pygeum africanum</i> Boraginaceae	Bark contains phytosterol, triterpene and tannin	Africa
<i>Pyrus malus</i> Rosaceae	Bark and fruit contain quercetin, catechin, flavonoid, coumaric and gallic acids, phloridzin and procyanidin	Britain
<i>Rhus chinensis</i> Anacardiaceae	Leaf contains tannin, apigenin and glycoside; seed contains bruceosides (A, B), brucein D and fatty oil	China, Japan, Korea
<i>Rosmarinus officinalis</i> Lamiaceae	Whole plant contains volatile oil, borneol, carnosol, ursolic acid, diterpene, rosmarinic acid, flavonoid and tannin	South Europe
<i>Rubia akane</i> Rubiaceae	Whole plant contains anthraquinone and triterpene	Japan, Korea

(Contd ...)

## REVIEW ARTICLES

**Table 1.** (Contd ...)

Botanical name of plant with family name	Parts used and their main active components	Origin/native place
<i>Rubus idaeus</i> Rosaceae	Leaf contains flavonoid and tannin; fruit contains vitamins (A, B, C) and ellagic acid	Asia, Europe
<i>Scilla natalensis</i> Hyacinthaceae	Bulb	South Africa
<i>Scrophularia nodosa</i> Scrophulariaceae	Aerial part contains iridoid, flavonoid and phenolic acid	Europe
<i>Scutellaria barbata</i> Lamiaceae	Whole plant	China
<i>Smilax chinensis</i> Liliaceae	Rhizome contains tannin, saponins and flavonoid	China, Japan
<i>Smilax glabra</i> Liliaceae	Rhizome	China
<i>Solanum aculeastrum</i> Solanaceae	Root bark, leaf and fruit	South Africa
<i>Solanum lyrati</i> Solanaceae	Whole plant.	China
<i>Sophora flavescens</i> Fabaceae	Root	China
<i>Sophora subprostrata</i> Fabaceae	Root	China
<i>Tabebuia</i> spp. Bignoniaceae	Bark contains quinine, bioflavonoid and co-enzyme Q	South America
<i>Taraxacum mongolicum</i> Asteraceae	Whole plant	China, Korea, Mongolia
<i>Thuja occidentalis</i> Cupressaceae	Whole plant contains flavonoid, tannin, volatile oil and mucilage	Northeastern USA, Europe
<i>Thymus vulgaris</i> Lamiaceae	Whole plant contains volatile oil, flavonoid and tannin	South Europe
<i>Trifolium pratense</i> Fabaceae	Flower contains glucosides (trifolin, trifolitin, trifoliano), flavonoid and phenolic acid	Asia, Europe, Africa, Australia
<i>Tulbaghia violacea</i> Alliaceae	Bulb	South Africa
<i>Vitex rotundifolia</i> Verbenaceae	Whole plant contains camphene, pinene and diterpene	China, Japan, Korea

without causing toxicity. In this review, some anticancer medicinal plants of foreign origin have been presented. These medicinal plants possess good immunomodulatory and antioxidant properties, leading to anticancer activities. The antioxidant phytochemicals protect the cells from oxidative damage. Thus, consuming a diet rich in antioxidant plant foods (e.g. fruits and vegetables) will provide health-protective effects. In conclusion, this article provides the knowledge about anticancer medicinal plants of foreign origin, which are used by the people all over the world. Also, it is of significance to exploit novel anticancer drugs from these medicinal plants.

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