

## TRADITIONAL MEDICINAL PLANTS FOR ANTICANCER ACTIVITY

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## ABSTRACT

Plants have long history of use in treatment of cancer. Emerging evidence has demonstrated that many natural products isolated from plant sources possess antitumor properties. Over the past decade, herbal medicine has become a topic of global importance, making an impact on both world health and international trade. Medicinal plants continue to play a central role in the healthcare system of large proportions of the world's population. Many traditional healers and herbalists have been treating cancer patients for many years using various medicinal plant species. Despite the long history of cancer treatment using herbal remedies, the knowledge and experience of these herbalists have not been scientifically documented. Information on traditional herbal practice is passed from one generation to the other through oral tradition. Considering the rapid rate of deforestation and loss of biodiversity, there is a need for accurate scientific documentation of the knowledge. In this article we covered the information gathered from the plants used previously and recently identified in the treatment of cancer.

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

## INTRODUCTION

Cancer is an abnormal growth of cells that grows and spreads through uncontrolled cell division. These 'malignant' cells may invade other tissues and spread (metastasize) to more distant parts of the body. Cancer is not one disease but a group of more than 100 distinct disorders. It is the world's second biggest killer after cardiovascular disease and was responsible for the death of 7.6 million people in 2005 [1]. Globally the number of people diagnosed with cancer is estimated at around 11 million people, a figure that is set to rise to 16 million by 2020 [2]. Of all new cancer cases, it is estimated that one third could be cured if they were adequately diagnosed and treated [3].

It is believed that cancer will be soon a global problem with its entire consecutive burden. Cancer therapy is, therefore, in the focus the world over. For the time being the treatment of any malignancy is based on surgery, radiotherapy and drug therapy. This complex approach is capable of curing approximately half of the cancer patients. While the other half of the affected individuals may have only prolonged survival or even no benefit at all from the treatment. While the results obtained by surgery and radiotherapy (which are locoregional interventions) are close to their maximum accomplishment, success of drug therapy, the only systemic approach, is far from satisfactory [4].

Cancer may affect people of all ages, but risk tends to increase with age, due to the fact that DNA damage becomes more apparent in aging DNA. Statistics indicate that men are largely plagued by lung, colon, rectum, and prostate cancer, whilst women increasingly suffer from breast, colon, rectal, and stomach cancer. Despite many

therapeutic advances in the understanding of the processes in carcinogenesis, overall mortality statistics are unlikely to change until, it is believed, there is a reorientation of the concepts for the use of natural products as new chemopreventive agents [5].

Natural Plant compounds are highly varied in structure; many are aromatic substances, most of which are phenols or their oxygen-substituted derivatives. However, there is an increased attention on extracts and biologically active compounds isolated from plant species used in herbal medicine, due to the side effects and the resistance that pathogenic micro-organisms build against the antibiotics. Plants generally produce many secondary metabolites which are biosynthetically derived from primary metabolites and constitute an important source of microbicides, pesticides and many pharmaceutical drugs. From a long period of time medicinal plants or their secondary metabolites have been directly or indirectly playing an important role in the human society to combat diseases [6]. Even though there are number of synthetic antitumour agents available, efforts are still on to search for effective naturally occurring anticarcinogens that would prevent, slow or reverse cancer development. Plants have a special place in the treatment of cancer. It is estimated that plant derived compounds constitute more than 50% of anticancer agents [7, 8]. Extracts of plants were used for the treatment of various diseases and this forms the basis for all Indian systems of Medicine. However, this area is not much developed when compared to modern system of medicine, mainly because of the lack of scientific documentation in this field [9]. In this article we report the information gathered from earlier studies on plant extracts preparations which are used in the treatment of cancer.

Table 1: Plants with Anti-Cancer activity

S. No.	Plant Name/Family	Habitat	Active constituent	Class
1)	<i>Actinidia chinensis</i> Actinidiaceae	China	Polysaccharide known as "ACPS-R" [10]	Carbohydrates
2)	<i>Aegle marmelos</i> Rutaceae	India	Lupeol [11]	Triterpene
3)	<i>Agapanthus africanus</i> Agapanthaceae	S.Africa	Isoliquiritigenin	Chalcone [12]
4)	<i>Aglaila sylvestre</i> Meliaceae	India	Silvesterol	-----
5)	<i>Ailanthus Altissima</i> Simarubaceae	China	Ailnthon, allicin alliin, diallyldisulphide, quercetin, flavonoids, vit.C and E. [11]	Ailantenol quassinoids [13]
6)	<i>Allium cepa</i> Liliaceae/ Alliaceae	India	Alliin, allicin alliin, alliinase, S-allylcysteine (SAC), diallyldisulphide (DADS), diallyltrisulphide (DATS) and methylallyltrisulphide. [14,15,16]	Flavonoids
7)	<i>Allium sativum</i> Liliaceae	India	Alliin, allicin alliin, alliinase, S-allylcysteine (SAC), diallyldisulphide (DADS), diallyltrisulphide (DATS) and methylallyltrisulphide. [14,15,16]	Flavonoids
8)	<i>Aloe ferox</i> , <i>Aloe barbadensis</i>	India	Aloe-emodin, emodin, aloin acemannan, [17,18]	Anthraquinone glycoside

9)	Liliaceae <i>Alpinia galanga Willd</i> Zingiberaceae	Japan	Acetoxy Chavicol Acetate, pinocembrin, galangin [11]	Flavonoid
10)	<i>Ananas comosus</i> Bromeliaceae	Central and south America	Ananas Bromelain [19]	Enzyme complex
11)	<i>Andrographis paniculata</i> Acanthaceae	India	andrographolide	Diterpene compound [11]
12)	<i>Angelica sinensis</i> Umbelliferae	China, Korea, Japan	Angelica Polysaccharide fraction of known as "AR-4" [20]	Carbohydrates
13)	<i>Annona species</i> Annonaceae	India, Africa	Acetogenins [21]	Alkaloids, acid
14)	<i>Aphanamixis polystachya</i> Meliaceae	-----	Amooranin [11]	Triterpene acid
15)	<i>Apium graveolens</i> N Umbelliferae	America	Apigenin	Flavonoid [22]
16)	<i>Arctium lappa</i> , Compositae	England, Europe, Northen asia	Potent anticancer factors [23]	-----
17)	<i>Astragalus membranaceus</i> Papilionaceae	China	Swainsonine [24]	-----
18)	<i>Azadiracta indica</i> Meliaceae	India	Liminoids, limbolide,	Triterpenoid [11]
19)	<i>Bauhinia variegata</i> Cesalpiniaceae	Southeastern Asia	Cyaniding glucoside, malvidin and peonidin glucoside,kaempferol [11]	Glycosides, essential oil
20)	<i>Berberis vulgaris linn</i> berberidaceae	Europe	Berberine [11]	An isoquinoline alkaloid
21)	<i>Betula utilis</i> Betulaceae	Northen India	Betulin [25]	-----
22)	<i>Bleckeria vitensis</i> Apocynaceae	France	Ellipticine	Alkaloid [26]
23)	<i>Brucea antidysenterica</i> Simaraubaceae	Africa	Bruceantin	Quassinoid [26]
24)	<i>Bursera microphylla</i> Burseraceae	Mexico	Burseran	Lignan
25)	<i>Camellia sinensis</i> Theaceae	East, south, Southeast Asia	Epigallocatechin gallate [27,28,29]	Catechin
26)	<i>Campotheca acuminata</i> Nyssaceae	China	Campothecin	Alkaloid [26]
27)	<i>Catharanthus roseus</i> Apocynaceae	India, Africa	Vinblastine, Vincristine, Alstonine, Ajmalicine and Reserpine.	Alkaloid [26,30]
28)	<i>Centaurea montata</i> Asteraceae	Europe	Montamine	Alkaloid
29)	<i>Centaurea schischkinii</i> Asteraceae	-----	Schischkinnin	Lignans, sesquiterpenes
30)	<i>Cephalotaxus harringtonia</i> Cephalotaxaceae	Japan	Homoharringtonine	Alkaloid [26]
31)	<i>Chlorella pyrenoidosa</i> Oocystaceae	-----	Lysine [31]	Amino acid
32)	<i>Cleistanthus collinus</i> Euphorbiaceae	India	Cleistanthin, Collinusin	Lignan
33)	<i>Colchicum luteum</i> Liliaceae	India, Pakistan	Colchicines demecolcine [32]	Alkaloids
34)	<i>Combretum caffrum</i> Combretaceae	S.Africa	Combrestatins	Stilbenes [33,34]
35)	<i>Croton lechleri</i> Euphorbiaceae	S.America	Taspine	Alkaloid [35]
36)	<i>Curcuma longa</i> Linn. Zinziberaceae	India	Tumerone, curcumine. [36,37,38,39]	Phenol
37)	<i>Daphne mezereum</i> Thymelaeaceae	Asia Europe	Mezerein	-----
38)	<i>Diphylleia grayi</i> Berberidaceae	Japan	Diphyllin	Lignan [26]
39)	<i>Dysoxylum binectariferum</i> Meliaceae	India	Rohitukine	Alkaloid [26]
40)	<i>Echinacea angustifolia</i> Asteraceae	North America	Arabinogalactan, Jucogalactoxyloglucans. [40]	-----
41)	<i>Embllica officinalis</i> euphorbiaceae	India	Ellagic acid, gallic acid, quercetin, emblicannins A and B	Tannins, flavonoids [11]
42)	<i>Erythroxylyum pervillei</i> Erythroxylyaceae	Madagascar	Pervilleine	Alkaloid
43)	<i>Euphorbia semiperfoliata</i> Euphorbiaceae	Europe	Jatrophane	Terpenoid [17]
44)	<i>Fagopyrum esculentum</i> , Polygonaceae	India	Amygdalin, Rutin [41]	Tannins, flavonoids
45)	<i>Fragaria vesca</i> linn Rosaceae	-----	Borneol, Ellagic Acid	Tannins, flavonoids [11]
46)	<i>Fritillaria thunbergii</i> Liliaceae	China, Japan	Zhebeinone	Alkaloid
47)	<i>Ginkgo biloba</i> Ginkgoaceae	China	Ginkgolide-B, A, C and J [42, 43]	Lactones, diterpenoids
48)	<i>Glycine max</i> Leguminosae	India	Zinc, selenium, vitamins (A, B1, B2, B12, C, D, E and K), amino acids, isoflavones, protease inhibitors, saponins and phytosterols [44]	Flavonoids, saponins
49)	<i>Glycyrrhiza glabra</i> Leguminosae	India	Glycyrrhizin [45]	Triterpenoid saponin,

50)	<i>Gossypium barbadense</i> Malvaceae	Egypt	Gossypol [46]	flavonoids
51)	<i>Gunnera perperna</i> Gunneraceae	Brazil	2-methyl-6(3-methyl 2-butenyl) benzo 1-4 quinone	----- Quinone
52)	<i>Gyrophora esculenta</i> Umbilicariaceae	Korea	Polysaccharides $\beta$ -glucans, $\alpha$ -glucans, and galactomannans. [47]	Carbohydrates
53)	<i>Hypericum perforatum</i> Clusiaceae	Europe	Hypericin	Anthraquinone
54)	<i>Hypoxis colchicifolia</i>	S.Africa	Hypoxoside, Rooperol	Glycoside
55)	<i>Indigofera tinctoria</i> Leguminosae	Asia	Indirubins	Indigoids [26]
56)	<i>Justicia procumbens</i> Acanthaceae	India	Justicidin A,B	Lignan
57)	<i>Lantana camara</i> Verbenaceae	America	Verbascoside	Glucoside
58)	<i>Larrea tridentate</i> Zygophyllaceae	Mexico	Terameprocol	Lignan [48]
59)	<i>Lentinus edodes</i> Agaricaceae	East Asia	Lentinan [49,50]	Polysaccharide
60)	<i>Linium album</i> Linaceae	Japan	Podophyllotoxin	Lignan
61)	<i>Linum usitatissimum</i> Linaceae	India	Cynogenetic glycosides, Lignans [51,52]	Glycosides, lignans
62)	<i>Lonicera japonica</i> Caprifoliaceae	Japan	Luteolin	Flavonoid [53]
63)	<b>MALUS DOMESTICA ROSACEAE</b>	Asia, Europe, north america	-----	Polyphenols
64)	<i>Mentha species</i> Labiateae	India, America	Monoterpene ketones [54,55]	Ketone
65)	<i>Morinda citrifolia linn rubiaceae</i>	Southeast Asia, Australasia	Damnacanthal, rubiadin-methyl ether, alizarin, morindone and anthragallol-2,3-dimethyl ether, damnacanthol	Anthraquinones [11]
66)	<i>Mylabris phalerlata</i> family	China	Magnolol [56]	-----
67)	<i>Nigella sativa linn ranunculaceae</i>	India	Thymoquinone, dithymoquinone [11]	Quinone
68)	<i>Ochrosia elliptica</i> Apocynaceae	Northeastern Australia	Ellipticine and 9-methoxy ellipticine are pyridocarbazole (monomeric indole) alkaloids [57]	Alkaloids
69)	<i>Ocimum sanctum linn lamiaceae</i>	India	Eugenol, orientin and vicenin [11]	Volatile oil, flavonoids, phenolic compounds
70)	<i>Oldenlandia diffusa roxb. rubiaceae</i>	china	Ursolic acid [11]	-----
71)	<i>Panax ginseng</i> Aralaceae		Ginsenosides, Panaxosides [58,59,60,61,62]	Saponins
72)	<i>Paris polyphilla</i> Trilliaceae	China	-----	Polyphyllin [63]
73)	<i>Pestemon deustus</i> Serophulariaceae	U.S.A	Liriodendrin	Lignan
74)	<i>Phaleria macrocarpa</i> Thymelaeaceae	Indonesia	Pinosresinol, Laricinesinol	Lignan
75)	<i>Picrorrhizia kurroa</i> Scrophulariaceae	India	Picrorrhizia (kutki) Picrosides I, II, III and kutkoside [64]	-----
76)	<i>Plumbago zeylanica plumbaginaceae</i>	India, Pakistan, Africa	-----	Flavonoids, quinones
77)	<i>Podophyllum emodii</i> Berberidaceae	India	Epipodophyllotoxin	Alkaloid
78)	<i>Podophyllum hexandrum</i> Berberidaceae	India	Podophyllin, astragalins [65]	-----
79)	<i>Polygonum cuspidatum</i> Polygonaceae	Japan China	Resveratrol	Flavonoid
80)	<i>Prunella vulgaris linn Labiatae/lamiaceae</i>	Europe, Asia, North America	Ursolic acid, oleanolic acid [11]	-----
81)	<i>Psoralea corylifolia linn fabaceae</i>	India	Bavachinin and psoralen, psoralidin [11]	Coumarins, flavonoids
82)	<i>Pteris multifida</i> Pteridaceae	Japan	Pterokaurane	Terpenoid [66]
83)	<i>Punica granatum linn punicaceae</i>	Africa, Europe, America, india	-----	Alkaloids, anthocyanidins
84)	<i>Pygeum africanum</i> Rosaceae	Africa	Amygdalin	Glycoside
85)	<i>Rubia cordifolia linn rubiaceae</i>	India	Rubidianin, rubiadin, rosemary acids, purpurin, alizarin, xanthopurpurin [11]	Anthraquinone
86)	<i>Saussurea lappa C.B.Clarke Compositae/asteraceae</i>	India	Cynaropicrin, costunolide dehydrocostuslactone, shikokio	Sesquiterpenes [11]
87)	<i>Scutellaria baicalensis</i> family	China	<i>Baicalin, wogonoside, baicalein, Wogonin</i> [56]	-----
88)	<i>Solanum nigrum linn</i>	India	Solamargine, solasonine, solanin, quercetin	Alkaloids, flavonoids

	<i>solanaceae</i>			
89)	<i>Taxus brevifolia</i> Taxaceae	India	Taxanes, taxol cepholomannine [67]	
90)	<i>Tinospora cardifolia</i> (willd) <i>menispermaceae</i>	India	Berberin, tinosporin, giloin, giloinin	Sesquiterpenes, diterpenes [11]
91)	<i>Viscum album linn</i> <i>viscaceae</i>	Europe, western and south asia	Lectin, proprionyl choline, lupeol, viscotoxin, digallic acid	Alkaloids, phenolic compounds [11]
92)	<i>Vitex rotundifolia</i> Verbenaceae	India	Korea Casticin	Flavanoid [68]
93)	<i>Wikstroemia viridi</i>	China	Wikstromo	Caumarin
94)	<i>Withania somnifera</i> Solanaceae	India	Withanolides, <i>Withaferin</i> [69-74]	Alkaloids, steroidal lactones
95)	<i>Zingiber officinale</i> Zingiberaceae	India	Curcumin,gingerenoneA, Gingeols, shogaols, zingerone [75,76]	Curcuminoids,

## CONCLUSION

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

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