

Complementary and Alternative Approach to Heal Cancer: A Review

Sabira Sultana^{1*}, Abdul Wadood Chishti², Syed Muhammad Ali Shah¹, Sultan Ayaz¹, Muhammad Akram¹, Jaweria Nisar¹

Abstract: Cancer is the dreadful and life threatening disease characterized by irregular proliferation of cells and it is considering the main health issue of equally developed and developing states. After cardiovascular disease, cancer is one of the second foremost diseases of mortality. In view of high death rate related with malignant growth and on account of adverse and toxic reactions of its chemotherapy and radiation treatment, people have a preference to use natural plant products for treatment of cancer. Plants were being utilized for treating diseases since the beginning of human civilization. Herbs have played a key role in the prevention and treatment of cancer. The phytochemical investigation of the medicinal plants has contributed to some extent in the discovery of new anticancer drugs. This article has been made to evaluate some therapeutic plants utilized for the treatment of cancer and also gives the information about medicinal plants with anticancer property, which are utilized by people everywhere throughout the world. This review can help the researchers to investigate herbs to additional level and its use in different more diseases and toxicity studies along with clinical trials.

Keywords: Anti-cancer activity, medicinal plants, efficacy, literature review

1. Department of Eastern Medicine, Directorate of Medical Sciences, Government College University Faisalabad
2. University College of Conventional Medicine, Faculty of Pharmacy and Alternative Medicine, The Islamia University Bahawalpur, Pakistan

Corresponding author email:
drsabirachishti12@gmail.com

INTRODUCTION

Cancer is the dreadful disease caused by abnormal proliferation of cells in our bodies that usually invades in the adjacent tissues and destroys these tissues (1). These cells are appears because of certain variation in the body and by correcting this variation, the cancer must be healed. Billions of people every year are detected with cancer and it is the subsequent foremost cause of mortality in America (2). Hence, about 3500 million people annually all over the world killed by cancer (3). In both developing and developed countries, cancer is one of the most serious medical issues. Along with the most recognized (breast, stomach, lung, liver, colorectal) cancers categories, lung cancer is the most well-known cancer recognized in men and breast cancer is the mainly well-known cancer recognized in women. In 2008, round about 12.7 million people were diagnosed with cancer and 7.6 million people deceased from the cancer during the same year. Stomach, breast, lung and colorectal cancers represented for two-fifths of the cancers total cases recognized throughout the world. It is estimated that more than 70% of all deaths caused by cancer happened in low- and middle-income countries. Mortality rate because of cancer are constantly increase. It has been proposed that in the year 2030, there will be 11.5 million deaths and 27 million new cancer cases and 17.5 million cancer deaths are expected to happen in the world by 2050 (4). Cancers more than 30% are caused by change environmental and behavioral risk factors, including dietary factors, obesity, alcohol and tobacco, physical inactivity, lacking standard use of fruit and vegetable, occupational risks including exposure to ionizing and non- ionizing radiation and chronic infections from HBV, HCV, Helicobacter pylori, and

some types of human papilloma virus. Conservative cancer treatments include *radiotherapy*, chemo-therapy, psychosocial support and surgery. At present, the mainly usually utilize cancer chemotherapy comprises antimetabolites, antitumor, alkylating agents, antibiotics, natural anticancer agents and platinum analogs. Though, because of the rising rate of death related with cancer and harmful effects of cancer radiation therapy and chemotherapy (5) an alternative solution to allopathic medicine is the medicinal plant preparations use to control the subtle disease nature. In clinical trials, many medicinal plants have been evaluated and are currently being studied phytochemically to identify their anti- tumour effects against different type of cancers. Thus, patients of cancer who just got weakened with this disease, who are more loaded by lethal effects of chemotherapy, have now turned to look for help from the complementary and alternative medicine in suspense for a better cure(6).

MEDICINAL PLANTS USED TO TREAT CANCER

For thousands of years, plants have been used for the treatment of various diseases. Terrestrial plants have been utilized for therapeutic purpose in China, Egypt, Greece and India from ancient times and large numbers of current drugs were derived from those. From the Sumerians and Akkaidians, the first written documents on the medicinal plants uses come into sighted in about 2600 BC (7). In the last decade, plant based medicine has developed into a subject of global importance, creating an influence on both world health and international trade. In maintaining the health system of large proportions of the world's population, medicinal plants continue to play

a central role predominantly in developing countries where natural medicine has an extensive and constant history of use (8). Constant utilization of plant based medicine by a huge part of the population in the developing countries is because of the high expenditure of Western Pharmaceuticals and Healthcare (9). Within the human diseases healed with herbal medicines is cancer, which is presumably the mainly significant genetic disease, chief cause of death in a majority of the cases (8). Because of high mortality rate due to cancer and harmful effects of chemotherapy and radiation therapy, several cancer patients look for alternative or complementary methods of treatment (8). Plants have been used for treating several diseases of human and animals since dawn of civilization. They maintain the health of persons, and alleviate diseases, including cancer without causing toxic effects. In clinical use, more than 50% of all modern drugs are of plant derivative and several of which have the capability to control cancer cells (10). A recent survey report shows that more than 60% of cancer patients use vitamins or herbs as therapy (8). In this review attempt has been made to compile several of the plants containing anticancer activity for different cancer types. This review can help the researchers to investigate herbs to advance level and its utilization in different other disease and toxicity studies along with clinical trials.

MEDICINAL PLANTS HAVING ANTICANCER ACTIVITY

1. *Camellia sinensis*

Family: Theaceae. Parts used: Leaves. Chemical constituents: It possesses caffeine, linoleic glyceride, oleic glyceride, naringenin and catechins. Medicinal uses: It is beneficial in rheumatoid arthritis treatment. Pharmacological activity: It is anticancer, gastroprotective and immunomodulant. Study: Ravindranath et al (2006) reported that epicatechins refined from *Camellia sinensis* differentially restrain gender- dependent human cancer cell lines growth (11).

2. *Aegle marmelos*

Family: Rutaceae, Parts used: Roots, fruit, stem and leaves. Chemical constituents: It contains lignan glucosides, coumarin, marmin, umbelliferone, skimmianine tannin, phlobotannin saegeline, ordinal and ethyl cinnamamide. Medicinal uses: It is beneficial in jaundice and cancer treatment. Pharmacological activity: It is anti-inflammatory, laxative, diuretic, stomachic, digestive and anticancer. Study: Vijaya et al reported the antiproliferative and antioxidant activity of *Aegle marmelos* (Linn.) leaves in Dalton's lymphoma ascites transplanted mice (12).

3. *Boswellia serrata*

Family: Burseraceae, Parts used: Gum. Chemical constituents: It possesses glycyrrhetic acid, oleanolic acid and boswellic acid. Medicinal uses: It is beneficial in osteoarthritis and other inflammatory diseases of joints. Pharmacological activity: It has adhesive, anti-inflammatory and anticancer properties. Study: Yadav et al reported that Boswellic acid inhibits growth and metastasis of human colorectal cancer in orthotopic mouse model by down regulating inflammatory, proliferative, invasive and angiogenic biomarkers (13).

4. *Curcuma longa*

Family: Zingiberaceae. Parts used: Rhizome. Chemical constituents: It contains zerumbone, cineole, alpha zingiberene, alpha curcumene and germacrene. Medicinal uses: It is used in arthritis. Pharmacological activity: It is aromatic, anti-inflammatory and antiseptic. Study: Kuttan et al reported the potential anticancer property of *Curcuma longa* (14). Park et al reported the cancer chemoprotective effects of *Curcuma longa* (15).

5. *Alternanthera philoxeroides*

Family: Amaranthaceae. Parts used: Aerial parts. Chemical constituents: It contains phytol, cycloeucalenol, 24-methylenecycloartanol, alpha spinasterol, beta sitosterol, oleanolic acid and pheophytin. Medicinal uses: It is beneficial in cancer treatment. Pharmacological activity: It has anti-tumor, febrifuge and antioxidant properties. Study: Fang et al reported the antitumor constituents from *Alternanthera philoxeroides* (16).

6. *Solanum pseudocapsicum* L.

Family: Solanaceae. Local name: Golemirchi. Parts used: Leaves and roots. Chemical constituents: It has aldehydes, terpenoids, fatty acids, beta and delta elemene and hexadecanoic acid. Medicinal uses: It is beneficial in cancer treatment. Pharmacological activity: It is antitumor. Study: Alcoholic extract of roots and stem of the lint possess antibacterial activity. Badami et al reported that total alkaloid fraction of *Solanum pseudocapsicum* leaves has antitumor property (17).

7. *Fumaria indica*

Family: Fumariaceae. Local name: Papra. Parts used: Leaves and flowers. Chemical constituents: It possesses sterol, tannins,

saponins, flavonoids, alkaloids and carbohydrates. Medicinal uses: It is beneficial in anxiety, liver diseases, cancer and inflammation.

Pharmacological activity: It is diuretic, sedative, stomachic, cholagogue, laxative, diaphoretic, diuretic, anthelmintic, aperients and diaphoretic.

Study: Hussain et al reported the chemopreventive activity of *Fumaria indica* against N-nitrosodiethylamine and CCl₄-induced hepatocellular carcinoma in Wistar rats (18).

8. *Stinging nettle*

Family: Urticaceae.

Parts used: Seeds and herb.

Chemical constituents: It possesses linoleic acid, lignin, kaempferol, formic acid, choline, histamine, caffeic acid, acetophenone and agglutinin.

Medicinal uses: It is beneficial in lumbago and osteoarthritis.

Pharmacological activity: It is anti-inflammatory, antirheumatic and immunosuppressant.

Study: Konrad et al described the antiproliferative effect on human prostate cancer cells by a stinging nettle root *Urticadioica* extract (19).

9. *Zingiber officinale*

Family: Zingiberaceae.

Parts used: Rhizome.

Chemical constituents: It possesses zingiberene, zingiberol and shagaol.

Medicinal uses: It is beneficial in rheumatoid arthritis, cancer, migraine, gout and inflammatory diseases.

Pharmacological activity: It is analgesic and anti-inflammatory.

Study: Haniadka et al described the efficacy of *Zingiber officinale* as an anti-emetic in cancer chemotherapy (20).

10. *Cynodon dactylon*

Family: Poaceae.

Local name: Khabal, Dub.

Parts used: Leaves and stem.

Medicinal uses: It is beneficial in piles, wounds, hysteria, epilepsy, chronic diarrhea and dysentery treatment.

Pharmacological activity: It has astringent and antiseptic properties.

Study: Albert et al reported the chemopreventive activity of *Cynodon dactylon*(L.) Pers. extract against DMH-induced colon carcinogenesis in experimental animals (21).

11. *Juglans regia L.*

Family: Juglandiaceae.

Local name: Akhor, Akhori.

Parts used: Bark.

Medicinal uses: It is beneficial in cancer, cardiovascular disorders and inflammation.

Pharmacological activity: It is anthelmintic.

Study: Kaur et al reported the antimutagenic and antiproliferative activities of *Juglans regia* L (22).

12. *Mallotus philippensis*

Family: Euporbiaceae.

Local name: Kamila.

Parts used: Stem bark.

Medicinal uses: It is beneficial in intestinal worms.

Pharmacological activity: It is anatheromatic, cathartic and styptic.

Study: Tanaka et al reported the potential anti-tumor-promoting activity of 3alpha-hydroxy- D:A-friedooleanan-2-one from the stem bark of *Mallotus philippensis* (23).

13. *Bryophyllum pinnatum Lam*

Family: Crassulaceae.

Parts used: Leaves.

Chemical constituents: It possesses quercetin, diarabioside, kaempferol, glucoside, ferulic, coumaric and fatty acids.

Medicinal uses: It is applied in wound, boils, edema and arthritis.

Pharmacological activity: It is antineoplastic and antibacterial.

Study: Mahata et al reported the anticancer property of *Bryophyllum pinnata* (Lam.) Oken leaf on human cervical cancer cells. This investigation explains its use as herbal drug in cancerous diseases (24).

14. *Catharanthus roseus*

Family: Aponaceae.

Parts used: Whole plant.

Chemical constituents: It contains coronaridine, methoxytabersonine, tetrahydroalsticine, ajmalicine, vindorosine, catharanthine, mitraphylline, vindoline, vincristine, vinblastine, urosolic acid, leurosine, Isoleurosine and previne.

Medicinal uses: It is prescribed to treat cancerous diseases.

Pharmacological activity: It is antihyperglycemic and anticancer.

Study: Asano et al reported the anti-tumor dimericindole alkaloids in *Catharanthus roseus* (25).

15. *Clerodendrum inerme*

Family: Verbenaceae.

Parts used: Leaves and roots.

Chemical constituents: It possesses resins, gums, sterols and triterpenoids.

Medicinal uses: It is beneficial in cancer, viral diseases, inflammation and bacterial infections.

Pharmacological activity: It has tonic, febrifuge, mucilaginous, fragrant, analgesic and antimicrobial property.

Study: Manoharan et al reported the anticarcinogenic effects of *Clerodendron inerme* on 7, 12-dimethylbenz (a) anthracene-induced hamster buccal pouch carcinogenesis. This investigation

explains its use as herbal anticancer drug (26).

16. *Ruta graveolens*

Family: Rutaceae,

Parts used: Aerial parts.

Chemical constituents: It contains glucosiderutin and an essential oil.

Medicinal uses: It is beneficial in nervousness, hysteria, dizziness and respiratory tract infections.

Pharmacological activity: It has anti-inflammatory property.

Study: Preethi et al reported the anti-tumour activity of *Ruta graveolens* extract (27).

17. *Papaver somniferum* Linn

Family: Papaveraceae,

Parts used: Seeds and flowers.

Chemical constituents: It contains phenylalanine, tyrosine, narcotine, narceine, papaverine, morphine, codeine, tetrahydroisoquinoline alkaloid, noscapine, sanguinarine, thiamine, riboflavin, folic acid, niacin, tocopherol, stearic acid, palmitic acid, oleic acid and linolenic acid.

Medicinal uses: It is beneficial in insomnia and pain.

Pharmacological activity: It is hypnotic, sedative, analgesic, astringent, aphrodisiac, tonic and hypoglycemic.

Study: Aruna et al described the anticarcinogenic effects of this plant (28).

18. *Trillium pendulum*

Family: Liliaceae.

Parts used: Rhizome.

Medicinal uses: It is beneficial in cough, bronchial problems, hemorrhage, excessive menstruation, excessive vaginal discharge, diarrhea and dysentery.

Pharmacological activity: It is antitumor.

Study: Mazzio et al, (2010) described the in vitro anti- tumor activity of this plant(29).

19. *Hydrastis canadensis*

Family: Ranunculaceae.

Parts used: Rhizome.

Medicinal uses: It is used in inflammations, eczema, ringworm, erysipelas, vaginal infection, tonsillitis and other throat problems.

Pharmacological activity: It is antiseptic, anticancer and antibacterial.

Study: Karmakar et al, described the anti-cancer effect of this plant (30).

20. *Humulus lupulus*

Family: Cannabaceae.

Parts used: Flowers.

Medicinal uses: It is used in psychological disorders, sleep, gastrointestinal problems, boils, tumors, painful swelling and skin inflammations.

Pharmacological activity: It is diuretic.

Study: Ho et al reported the anti-cancer activity of this plant(31).

21. *Eriodictyon californicum*

Family: Boraginaceae.

Parts used: Leaves.

Medicinal uses: It is beneficial in bronchial congestion, dysentery, diarrhea, asthma and hay fever.

Pharmacological activity: It is digestive and anti-asthmatic.

Study: Liu et al, described the anti-cancer activity of this plant (32).

22. *Asclepia scurassavica* Linn.

Family: Asclepiadaceae.

Parts used: Leaves.

Local name: Kakatundi.

Medicinal uses: It is beneficial in worms, piles, leucorrhoea, constipation, boils and swellings.

Pharmacological activity: It is anticancer and laxative.

Study: Anticancer activity of this plant in experimental colon cancer model has been reported (33).

23. *Solanum indicum*

Family: Solanaceae.

Local Name: Badi Kateri.

Parts used: Root, fruit, seed.

Medicinal uses: It is beneficial in sexual disorders.

Pharmacological activity: It has stimulant and analgesic effect.

Study: Antitumor agents from *Solanum indicum* have been isolated (34).

24. *Ichnocarpus frutescens*

Family: Apocynaceae.

Local Name: Kali-Dudhi.

Parts used: Root.

Medicinal uses: It is beneficial in leucorrhea, menorrhoea, urinary tract infections and skin complexion.

Pharmacological activity: It is antacid.

Study: It has been reported that polyphenolic extract of *Ichnocarpus frutescens* has antitumor property (35).

25. *Aloe vera*

Family: Xanthorrhoeaceae.

Parts used: Leaves.

Medicinal uses: It is used in wounds, skin disorders.

Pharmacological activity: It has antiseptic activity.

Study: Anti-tumor activity of Aloe vera against DMBA/croton oil-induced skin papillomagenesis in Swiss albino mice has been reported(36).

26. *Enhydra fluctuans*

Family: Asteraceae.

Parts used: Aerial parts.

Local name: Komprektujombi.

Medicinal uses: It is beneficial in cancer, inflammation, bacterial infections and degenerative disorders.

Pharmacological activity: It has analgesic, anticancer, antibacterial and anti-oxidant property.
Study: *Enhydra fluctuans* exhibit anticancer activity against Ehrlich's ascites carcinoma(37).

27. *Ageratum conyzoides* L.

Family: Asteraceae.
Parts used: Leaves.
Chemical constituents: It possesses precocene I and II, beta caryophyllene and germacrene.
Medicinal uses: It is beneficial in diabetes mellitus, peptic ulcer, and cancer treatment.
Pharmacological activity: It is anti-diabetic, antiprotozoal, and anticancer.
Study: Anticancer activity of *Ageratum conyzoides* has been reported(38).

28. *Cassia fistula* L.

Family: Fabaceae.

Parts used: Bark, leaves and fruit.

Chemical constituents: It contains sugar, tartaric acid, oxalic acid and cathartic acid.

Medicinal uses: It is beneficial in peptic ulcer, microbial infection, liver disorders and cancer.

Pharmacological activity: It has laxative property.

Study: Antitumor activity of methanolic extract of *Cassia fistula* has been reported(39).

29. *Bryonia alba* L.

Family: Cucurbitaceae.

Parts used: Root.

Medicinal uses: It is beneficial in dropsy, chronic rheumatism, pneumonia and dysentery.

Pharmacological activity: It is resolvent.

Study: Antitumor substances from *Bryonia alba* have been reported(40).

Table 1. List of medicinal plants having anti-cancer activity

Plant	Family	Parts Used	Function	References
<i>Rheum rhabarbarum</i>	Polygonaceae	Roots	Anticancer, laxative and antidiabetic	(Huang, Lu et al. 2007)39
<i>Viola odorata</i>	Violaceae	Leaves	Anticancer, antidyslipidemic and hypotensive	(Perwaiz and Sultana 1998)40
<i>Solanum nigrum</i>	Solanaceae	Fruit	Anticancer, anti-inflammatory and hepatoprotective	(Li, Li et al. 2007) 41 Li, Li et al. 2008)42
<i>Capsicum annuum</i>	Solanaceae	Fruit	Anticancer and antioxidant	(Maoka, Mochida et al. 2001)43
<i>Chelidonium majus</i>	Papaveraceae	Aerial parts	Anticancer, antibacterial, antifungal and anti-oxidant	(Biswas, Bhattacharjee et al. 2008)44
<i>Boerhaavia diffusa</i> Linn	Nyctaginaceae	Leaves	Anticancer, antifungal, anti diabetic and immunomodulant	(Manu and Kuttan 2009)45
<i>Aloe arborescens</i>	Xanthorrhoeaceae	Leaves	Anticancer, wound healer, antibacterial and anti-diabetic	(Furukawa, Nishikawa et al. 2002)46
<i>Copaifera multijuga</i>	Fabaceae	Resin	Anticancer and anti-inflammatory	(Lima, Junior et al. 2003)47
<i>Maytenus ilicifolia</i>	Celastraceae	Leaves	Anticancer, antibacterial and anti-protozoal	(da Costa, Ferreira et al. 2008)48
<i>Acanthospermum hispidum</i> DC	Asteraceae	Flowers and leaves	Anticancer and anti-parasitic	(Deepa and Rajendran 2007)49
<i>Anacardium occidentale</i> L	Anacardiaceae	Fruit	Anticancer, anthelmintic and hypoglycemic	(Mothé, De Souza et al. 2008)50

<i>Bauhinia variegata</i>	Fabaceae	Stem bark	Anticancer, antihyperlipidemic, antioxidant & antidiabetic	(Raj Kapoor, Jayakar et al. 2006)51
<i>Moringa oleifera, Lam</i>	Moringaceae	Bark	Anticancer and antipyretic	(Bharali, Tabassum et al. 2003)52
<i>Angelica archangelica</i>	Apiaceae	Roots	Anticancer, antiseizure and hepatoprotective	(Sigurdsson, Ögmundsdóttir et al. 2005)53
<i>Nigella sativa</i>	Ranunculaceae	Seeds	Anticancer, antihypertensive, anti-inflammatory and antiproliferative	(Worthen, Ghosheh et al. 1998)54
<i>Withania somnifera</i>	Solanaceae	Roots	Anticancer, anti-inflammatory, anti-arthritis and anti-gout	(Devi, Sharada et al. 1992)55
<i>Moringa oleifera Lam</i>	Moringaceae	Bark	Anticancer, antioxidant and antidiabetic	(Guevara, Vargas et al. 1999)56
<i>Leonotis nepetaefolia</i>	Lamiaceae	Leaves	Anticancer, antipyretic, antimalarial and antimicrobial	(Gurunagarajan and Pemaiah 2010)57
<i>Curcuma longa</i>	Zingiberaceae	Rhizome	Anticancer, hypolipidemic, anti-oxidant, anti-inflammatory and radioprotective	(Mahata, Maru et al. 2012)58
<i>Asteracantha longifolia</i>	Acanthaceae	Seeds	Anticancer, hepatoprotective, aphrodisiac, antidiabetic, diuretic and antiarthritis	(Ahmed, Rahman et al. 2001)59
<i>Calotropis procera</i>	Asclepiadaceae	Leaves	Anticancer, anti-convulsant and anti-nociceptive	(Choedon, Mathan et al. 2006)60
<i>Calendula officinalis</i>	Asteraceae	Stems and leaves	Anticancer, anti-inflammatory, hepatoprotective, antigenotoxic, antiviral, astringent, renoprotective and wound healer	(Muley, Khadabadi et al. 2009)61
<i>Lawsonia inermis</i>	Lythraceae	Bark	Anticancer, antimicrobial, antifungal and wound healer	(Endrini 2007)62
<i>Daucus carota</i>	Apiaceae	Roots and flowers	Anticancer and antihypertensive	(JING, YANG et al. 2008)63
<i>Pinus koraiensis</i>	Pinaceae	Seeds	Anticancer and anti-hyperlipidemic	(LiK et al., 2007) 64
<i>Ananas comosus</i>	Bromeliaceae	Fruit	Anticancer, abortifacient and hypolipidemic	(Taussig, Szekerczes et al. 1985)65

<i>Khaya senegalensis</i>	Meliaceae	Stem bark	Anticancer, anti-inflammatory and anthelmintic	(Zhang, Wang et al. 2007)66
<i>Acacia nilotica</i>	Fabaceae	Pods, bark	Anticancer, antispasmodic, antihypertensive, gastroprotective and antidiarrheal	(Sakthive, Kannan et al. 2012)67

CONCLUSION

Medicinal plants sustain the health and vitality of individual and also cure different diseases including cancer without causing toxicity. These plants have immuno-modulatory and antioxidant activities which possess anticancer effect. Recently, anticancer agents

separated from medicinal plants are beneficial in cancer treatment. The present review indicates the chemotherapeutic efficacy of medicinal plants. Now there is the need of the day to explore medicinal plants to more range and their utilization in different further disease and toxicity studies along with clinical trials.

REFERENCES

- Zhu W, Jiménez Ma, Jung W-H, Camarco DP, Balachandran R, Vogt A, et al. Streamlined syntheses of (–)-dictyostatin, 16-desmethyl-25, 26-dihydrodictyostatin, and 6-epi-16-desmethyl-25, 26-dihydrodictyostatin. 2010;132(26):9175-87.
- Madhuri S, Pandey GJCs. Some anticancer medicinal plants of foreign origin. 2009;779-83.
- Kadali VN, Pola SR, Sandeep B. Anti cancer properties of plants present in west Godavari district of Andhra Pradesh, India-a mini review. Indian Journal of Traditional Knowledge. 2010. 211-217
- Garcia M, Jemal A, Ward E, Center M, Hao Y, Siegel RJ-hwCo. Global Cancer Facts & Figures 2007 American Cancer Society. 2007. 36-42
- Cragg GM, Newman DJJoe. Plants as a source of anti- cancer agents. 2005;100(1-2):72-9.
- Rao GV, Kumar S, Islam M, Mansour SEJCT. Folk medicines for anticancer therapy-a current status. 2008;6(2).
- Samuelsson G. Drugs of natural origin, Apotekarsocieteten. Swedish Pharmaceutical Press; 1999. 65-71
- Kaur R, Singh J, Singh G, Kaur HJJNPPR. Anticancer plants: a review. 2011;1(4):131-6.
- Cunningham A. An investigation of the herbal medicine trade in Natal/KwaZulu: Institute of Natural Resources, University of Natal; 1988. 45-51
- Meyer J, Afolayan A, Taylor M, Engelbrecht LJJoE. Inhibition of herpes simplex virus type 1 by aqueous extracts from shoots of *Helichrysum aureonitens* (Asteraceae). 1996;52(1):41-3.
- Ravindranath MH, Saravanan TS, Monteclaro CC, Presser N, Ye X, Selvan SR, et al. Epicatechins purified from green tea (*Camellia sinensis*) differentially suppress growth of gender-dependent human cancer cell lines. 2006;3(2):237-47.
- Chockalingam V, Kadali SS, Gnanasambantham PJJop. Antiproliferative and antioxidant activity of *Aegle marmelos* (Linn.) leaves in Dalton's Lymphoma Ascites transplanted mice. 2012;44(2):225.
- Yadav VR, Prasad S, Sung B, Gelovani JG, Guha S, Krishnan S, et al. Boswellic acid inhibits growth and metastasis of human colorectal cancer in orthotopic mouse model by downregulating inflammatory, proliferative, invasive and angiogenic biomarkers. 2012;130(9):2176-84.
- Kuttan R, Bhanumathy P, Nirmala K, George MJCl. Potential anticancer activity of turmeric (*Curcuma longa*). 1985;29(2):197-202.
- Park JH, Park KK, Kim MJ, Hwang JK, Park SK, Chung WYJPRAIJDtP, et al. Cancer chemoprotective effects of *Curcuma xanthorrhiza*. 2008;22(5):695-8.
- Fang J-B, Jia W, Gao W-Y, Yao Z, Teng J, Zhao A-H, et al. Antitumor constituents from *Alternanthera philoxeroides*. 2007;9(6):511-5.
- Vijayan P, Prashanth H, Vijayaraj P, Dhanaraj S, Badami S, Suresh BJPb. Hepatoprotective effect of the total alkaloid fraction of *Solanum pseudocapsicum* leaves. 2003;41(6):443-8.
- Hussain T, Siddiqui HH, Fareed S, Vijayakumar M, Rao CVJAPjotm. Evaluation of chemopreventive effect of *Fumaria indica* against N-nitrosodiethylamine and CCl₄-induced hepatocellular carcinoma in Wistar rats. 2012;5(8):623-9.
- Konrad L, Müller H-H, Lenz C, Laubinger H, Aumüller G, Lichius JJJpm. Antiproliferative effect on human prostate cancer cells by a stinging nettle root (*Urtica dioica*) extract. 2000;66(01):44-7.
- Haniadka R, Rajeev AG, Palatty PL, Arora R, Baliga MSJTJoA, Medicine C. *Zingiber officinale* (ginger) as an anti-emetic in cancer chemotherapy: a review. 2012;18(5):440-4.
- Albert-Baskar A, Ignacimuthu SJE, Pathology T. Chemopreventive effect of *Cynodon dactylon* (L.) Pers. extract against DMH-induced colon carcinogenesis in experimental animals. 2010;62(4):423-31.
- Kaur K, Michael H, Arora S, Harkonen PL, Kumar SJJJoep, toxicology, oncology. Studies on correlation of antimutagenic and antiproliferative activities of *Juglans regia* L. 2003;22(1). 11-21
- Tanaka R, Nakata T, Yamaguchi C, Wada S-i, Yamada T, Tokuda HJpm. Potential anti-tumor-promoting activity of 3 α -Hydroxy-D: A-friedooleanan-2-one from the stem bark of *Mallotus philippensis*. 2008;74(04):413-6.
- Mahata S, Maru S, Shukla S, Pandey A, Mughesh G, Das BC, et

- al. Anticancer property of *Bryophyllum pinnata* (Lam.) Oken. leaf on human cervical cancer cells. 2012;12(1):15.
25. Asano M, Harada K, Yoshikawa T, Bamba T, Hirata KJB, biotechnology,, biochemistry. Synthesis of anti-tumor dimeric indole alkaloids in *Catharanthus roseus* was promoted by irradiation with near-ultraviolet light at low temperature. 2010;74(2):386-9.
26. Manoharan S, Kavitha K, Senthil N, Renju GJSMJ. Evaluation of anticarcinogenic effects of *Clerodendron inerme* on 7, 12-dimethylbenz (a) anthracene induced hamster buccal pouch carcinogenesis. 2006;47(12):1038-43.
27. Preethi K, Kuttan G, Kuttan RJAjocp. Anti-tumour activity of *Ruta graveolens* extract. 2006;7(3):439.
28. Aruna K, Sivaramakrishnan VJF, Toxicology C. Anticarcinogenic effects of some Indian plant products. 1992;30(11):953-6.
29. Mazzio EA, Soliman KFJPr. In vitro screening of tumoricidal properties of international medicinal herbs: part II. 2010;24(12):1813-24.
30. Karmakar SR, Biswas SJ, Khuda-Bukhsh ARJAPJCP. Anticarcinogenic potentials of a plant extract (*Hydrastis canadensis*): I. Evidence from in vivo studies in mice (*Mus musculus*). 2010;11(2):545-51.
31. Ho YC, Liu CH, Chen CN, Duan KJ, Lin MTJPRAIJDtP, Derivatives TEoNP. Inhibitory effects of xanthohumol from hops (*Humulus lupulus* L.) on human hepatocellular carcinoma cell lines. 2008;22(11):1465-8.
32. Liu Y-L, Ho DK, Cassady JM, Cook VM, Baird WMJJonp. Isolation of potential cancer chemopreventive agents from *Eriodictyon californicum*. 1992;55(3):357-63.
33. Baskar AA, Ignacimuthu S, Paulraj GM, Al Numair KSJBc, medicine a. Chemopreventive potential of β -sitosterol in experimental colon cancer model-an in vitro and in vivo study. 2010;10(1):24.
34. Chiang H, Tseng T, Wang C, Chen C, Kan WJAR. Apoptosis induced by dioscin in hela cells. 1991;11(5):1911-7.
35. Kumarappan C, Mandal SCJEo. Antitumor activity of polyphenolic extract of *Ichnocarpus frutescens*. 2007.
36. Saini M, Goyal PK, Chaudhary GJJoEP, Toxicology, Oncology. Anti-tumor activity of *Aloe vera* against DMBA/croton oil-induced skin papillomagenesis in Swiss albino mice. 2010;29(2). 36-43
37. Sannigrahi S, Mazumder UK, Mondal A, Pal D, Mishra SL, Roy SJNpc. Flavonoids of *Enhydra fluctuans* exhibit anticancer activity against Ehrlich's ascites carcinoma in mice. 2010;5(8):1934578X1000500818. 85-91
38. Adebayo A, Tan N-H, Akindahunsi A, Zeng G-Z, Zhang Y-MJPM. Anticancer and antiradical scavenging activity of *Ageratum conyzoides* L.(Asteraceae). 2010;6(21):62.
39. Gupta M, Mazumder U, Rath N, Mukhopadhyay DJJoE. Antitumor activity of methanolic extract of *Cassia fistula* L. seed against Ehrlich ascites carcinoma. 2000;72(1-2):151-6.
40. Konopa J, Jereczek-Morawska E, Matuszkiewicz A, Nazarewicz TJN. Antitumor substances from *Bryonia alba* L. 1966;13(3):335-8.
41. Huang Q, Lu G, Shen HM, Chung MC, Ong CNJMrr. Anticancer properties of anthraquinones from rhubarb. 2007;27(5):609-30.
42. Perwaiz S, Sultana SJApjop. Antitumorigenic effect of crude extract of *Viola odorata* on DMBA-induced two stage skin carcinogenesis in the Swiss albino mice. 1998;13(1):43-50.
43. Li K, Li Q, Li J, Zhang T, Han Z, Gao D, et al. Antitumor activity of the procyanidins from *Pinus koraiensis* bark on mice bearing U14 cervical cancer. 2007;127(7):1145- 51.
44. Li J, Li Q, Feng T, Li KJF. Aqueous extract of *Solanum nigrum* inhibit growth of cervical carcinoma (U14) via modulating immune response of tumor bearing mice and inducing apoptosis of tumor cells. 2008;79(7-8):548-56.
45. Maoka T, Mochida K, Kozuka M, Ito Y, Fujiwara Y, Hashimoto K, et al. Cancer chemopreventive activity of carotenoids in the fruits of red paprika *Capsicum annum* L. 2001;172(2):103-9.
46. Biswas S, Bhattacharjee N, Khuda-Bukhsh AJF, Toxicology C. Efficacy of a plant extract (*Chelidonium majus* L.) in combating induced hepatocarcinogenesis in mice. 2008;46(5):1474-87.
47. Manu K, Kuttan GJI. Anti-metastatic potential of Punarnavine, an alkaloid from *Boerhaavia diffusa* Linn. 2009;214(4):245-55.
48. Furukawa F, Nishikawa A, Chihara T, Shimpo K, Beppu H, Kuzuya H, et al. Chemopreventive effects of *Aloe arborescens* on N-nitrosobis (2-oxopropyl) amine- induced pancreatic carcinogenesis in hamsters. 2002;178(2):117-22.
49. Lima SR, Junior VFV, Christo HB, Pinto AC, Fernandes PDJPRAIJDtP, Derivatives TEoNP. In vivo and in vitro studies on the anticancer activity of *Copaifera multijuga* Hayne and its fractions. 2003;17(9):1048-53.
50. da Costa PM, Ferreira PMP, da Silva Bolzani V, Furlan M, Macedo VAdFF, Corsino J, et al. Antiproliferative activity of pristimerin isolated from *Maytenus ilicifolia* (Celastraceae) in human HL-60 cells. 2008;22(4):854- 63.
51. Deepa N, Rajendran NJNPS. Anti-tumor activity of *Acanthospermum hispidum* DC on dalton ascites lymphoma in mice. 2007;13(3):234-40.
52. Mothé CG, De Souza IA, Calazans GMJAFIH-T. Antitumor activity of cashew gum from *Anacardium occidentale* L. 2008;19(6):50-2.
53. Raj Kapoor B, Jayakar B, Murugesh N, Sakthisekaran DJJoe. Chemoprevention and cytotoxic effect of *Bauhinia variegata* against N-nitrosodiethylamine induced liver tumors and human cancer cell lines. 2006;104(3):407-9.
54. Bharali R, Tabassum J, Azad MRHJAPJoCP. Chemomodulatory effect of *Moringa oleifera*, Lam, on hepatic carcinogen metabolising enzymes, antioxidant parameters and skin papillomagenesis in mice. 2003;4(2):131-40.
55. Sigurdsson S, Ögmundsdóttir HM, Hallgrímsson J, Guðbjarnason SJiv. Antitumour activity of *Angelica archangelica* leaf extract. 2005;19(1):191-4.
56. Worthen DR, Ghosheh OA, Crooks PJAr. The in vitro anti-tumor activity of some crude and purified components of blackseed, *Nigella sativa* L. 1998;18(3A):1527-32.
57. Devi PU, Sharada A, Solomon F, Kamath MSJJjoeb. In vivo growth inhibitory effect of *Withania somnifera* (Ashwagandha) on a transplantable mouse tumor, Sarcoma 180. 1992;30(3):169-72.
58. Guevara AP, Vargas C, Sakurai H, Fujiwara Y, Hashimoto K, Maoka T, et al. An antitumor promoter from *Moringa oleifera* Lam. 1999;440(2):181-8.
59. Gurunagarajan S, Pemaiah BJJPR. Anti-tumor and antioxidant potentials of ethanolic extract of *Leonotis nepetefolia* R. Br. against Ehrlich Ascites carcinoma cell lines. 2010;3(12):2990-2.

60. Ahmed S, Rahman A, Mathur M, Athar M, Sultana SJF, Toxicology C. Anti-tumor promoting activity of *Asteracantha longifolia* against experimental hepatocarcinogenesis in rats. 2001;39(1):19-28.
61. Choedon T, Mathan G, Arya S, Kumar VL, Kumar VJWJoGW. Anticancer and cytotoxic properties of the latex of *Calotropis procera* in a transgenic mouse model of hepatocellular carcinoma. 2006;12(16):2517.
62. MuleyB, KhadabadiS, BanaraseNJTJoPR. Phytochemical constituents and pharmacological activities of *Calendula officinalis* Linn (Asteraceae): a review. 2009;8(5).
63. Endrini SJJMS. Comparing of the cytotoxicity properties and mechanism of ansonin inermis and *Strobilanth es crispus* extract. 2007;7:1098-102.
64. JING J, YANG R, LU YJJoGMC. The anticancer activity of compounds in lipophilic fraction of *Daucus carota*. 2008;5:014.
65. Taussig S, Szekerczes J, Batkin SJPM. Inhibition of tumour growth in vitro by bromelain, an extract of the pineapple plant (*Ananas comosus*). 1985;51(06):538-9.
66. Zhang H, Wang X, Chen F, Androulakis XM, Wargovich MJJPR. Anticancer activity of limonoid from *Khaya senegalensis*. 2007;21(8):731-4.
67. Sakthive K, Kannan N, Angeline A, Guruvayoorappan CJAPJoCP. Anticancer Activity of *Acacia nilotica* (L.) Wild. Ex. Delile Subsp. *indica* Against Daltons Ascitic Lymphoma Induced Solid and Ascitic Tumor Model. 2012;13(8):3989-95.