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RESEARCH ARTICLE

Role of plants in treating cancer : a review.

Deepika Sharma and Dr. C.B.S. Dangi.
Department of Biotechnology, Faculty of Life science, RKDF, Bhopal (M.P), India.

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Corresponding Author
Deepika Sharma.

Abstract

Plants have been used for treating diseases since the dawn of modern civilization. Since time immemorial plants are used as traditional medicines for basic health care. But during the last century research have been focused on developing drugs from plants to treat cancer. Cancer is one of the world's dangerous diseases and it is one of the leading causes of death globally. The number of cancer patients in the world is being increasing rapidly. There are several treatment available for cancer like surgery, radiotherapy and chemotherapy but they are costly and have serious side effects. Plants and plant derived products have proved effective and safe in the treatment and management of cancers. The present review is an attempt to describe some common plants that possess anticancer activity.

Introduction:-

Plants are the greatest gift from god to the mankind. Plants not only fulfill our basic needs to continue life but also provide valuable natural products that helps in curing disease and leads to a better life. In traditional system of medicines like Ayurveda, Unnani plants are used as medicines for basic health care but they have stood up to the test of time and contributed many novel compounds for preventive and curative medicine to modern science[1].

Cancer has become a major health problem worldwide. CANCER is an abnormal growth and proliferation of cells. Cancer cells usually invade and destroy normal cells. It is a dreadful disease because the patient suffers pain, disfigurement and loss of many physiological processes and ultimately leads to death. 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. Most cancers are related to environmental, lifestyle, or behavioral exposures[2]. The major causes of cancer are smoking, dietary imbalances, hormones and chronic infections leading to chronic inflammation[3]. Cancer is an enormous global health burden, touching every region and socioeconomic group. According to American society of cancer, cancer accounts for about 1 in every 7 deaths worldwide – more than HIV/AIDS, tuberculosis, and malaria combined. In 2012, there were an estimated 14.1 million cases of cancer diagnosed around the world and 8.2 million cancer deaths[4].

There are several chemopreventive agents that are used to treat cancer, but they cause toxicity that prevents their usage[5]. To find out effective treatments for cancer, research is being done throughout the world, which includes the use of plants to relieve and treat cancer patients. This treatment makes use of the compounds naturally present in plants especially secondary metabolities that posses ability to inhibit or kill carcinogenic cells.

Role of plants in treating cancer:-

From a wide variety of plant species there are more than one thousand plants that 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 remains to be tapped. Taxol, one of the most outstanding agents, obtained from yew tree has been found beneficial in treatment of refractory ovarian, breast and other cancers. Paclitaxel is a drug used to treat ovarian, breast, lung, pancreatic and other cancers[6]. Another prominent molecule includes Podophyllotoxin extracted from the roots and rhizomes of Podophyllum species[7]. 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[8]. Curcumin a polyphenol derived from the rhizome of turmeric is used for both cancer prevention and treatment[9]. Other important molecules include Vincristine, Vinblastine, Colchicine, Ellipticine and Lepachol and many more[10].

Keeping in view the importance of plant species for the treatment of cancer, this study was planned to know about the medicinal plants and their use in cancer treatment. Present work is includes some common anti-cancer plant species present around us. This review includes 50 plants describing their scientific name, common name, plant part used, active principle, families and various cell lines used in different studies. These plants are used directly or their extracts made in different solvents or only active components are isolated from the plant and used against cancer. Different plant parts like seeds, roots, fruit, flower, bud, stem, leaves and sometimes the whole plant have been used in cancer treatment. The available literature pertaining to the present study is reviewed as follows:

List of common anticancer plants:-

S. No	Plant Species / Family	Common Name	Active Principle /Extract	Plant part Used	Cell-lines Used and Reference
1.	*Aegle marmelos* L. Rutaceae	Indian beal	Methanol extract	Fr.	Anti-cancer[11]
2.	*Allium sativum* L. Liliaceae	Garlic	Allicin	Bu.	MCF-7 / HT-29 cells[12]
3.	*Amaranthus gangeticus* L. Amaranthacea	Tandalja bhaji	Aqueous extract	ND	HepG2 / MCF-7/ Caco-2[13]
4.	*Asparagus racemos* L. Asparagaceae	Shatavari	Saponins(A4)(A5)(A6)A(7) Which have Sarsasapogenin / Glucose / Rhamnose	R L	Human epidermal carcinoma [14]
5.	*Bauhinia variegata* L. Fabaceae	Kachnar	Ethanolic extract	ND	Ehrlich Ascites Carcinoma[15]
6.	*Beta vulgaris* L. Chenopodiaceae	Beet	Vitexin-2"O-rhamnoside / isorhamnetin 3- gentiobiosid / rutin	L	MCF-7[16]
7.	*Brassica chinensis* L. Brassicaceae	Pak choi	Sulforaphane / erucin	S	Anti-cancer[17]
8.	*Calotropis gigantea* L. Apocynaceae	Arka	Alcoholic / hydro-alcoholic(1:1) / aqueous; highest effect in alcoholic	R.Br.	Colo 320[18]
9.	*Camellia sinensis* L. Theaceae	Green tea	Epicatechin (EC) / epigallocatechin (EGC) / EC 3-gallate (ECG) / EGC 3-gallate (EGCG)	L	(HH870)/ (DU145) / (HH450) / (HH639) [19]
10.	*Carica papaya* L. Caricaceae	Papaya	Aqueous extract	L	Jurkat, Molt-4, CCRF-CEM and HPBALL / K562 / Hela / (H9) / ARH77 [20]
11.	*Catharanthus roseus* L. Apocynaceae	Peri winkle	Vinblastine/ vincristine	F	Anti-cancer[21]
12.	*Cedrus deodara* L. Pinaceae	Deodar	Quercetin / 8-C-methyl Quercetin	W, Ba.	Human epidermal carcinoma of

					nasophyrynx[22]
13.	*Curcuma longa* L. Zingiberaceae	Turmeric	Turmerin / curcumin	Rh.	Colorectal cancer[23]
14.	*Datura innoxia* L. Solanaceae	Datura	Methanolic extract	L	HCT 15 Hep-2[24]
15.	*Dillenia indica* L. Dilleniaceae.	Elephant apple	Betulinicacid	Fr	Cancer cell lines[25]
16.	*Eclipta alba* L. Asteraceae	Bhringraj	Steroidal Alkaloids	ND	M-109[26]
17.	*Eleusine indica* L. Poaceae	Goose grass	Methanol extract	WP	HeLa / A549 / MRC-5 cells[27]
18.	*Euphorbia hirta* L. Euphorbiaceae	Asthma plant	Euphorbins A/ B/ C/ D/E/Euphorbianin/ leucocyanidol/camphol/ quercitrin and quercitol /Gallic acid/ myricitrin/	ND	Malignant melanomas/ squamous cell Carcinoma [26]
19.	*Ficus bengalensis* L. Moraceae	Banyan	Leucopelargonidin-3-0-α-Lrhamnoside / leuco cynidin 3-0-α-D galactosyl cellobioside / glucoside / beta glucoside / pentatriacontan-5-one/beta 19-20 sitosterolalpha-D-glucose	Ba.	Anti-cancer[29]
20.	*Ficus carica* L. Moraceae	Commom fig	Apigenin / apigenin 7-O-glucoside / kaempferol 3-Oglucoside / kaempferol 3,7-di-O-rhamnoside / quercetin and quercetin 3-O-glucoside	L T	Anti-cancer[30]
21.	*Ficus hispida* L. Moraceae	Hairy fig	Ethanol water / methanol / water / methanol and ethyl acetate	Ba.	Anti-cancer[31]
22.	*Garcinia densivenia* L. Clusiaceae	Garcinia	Gallic acid (3,4,5-trihydroxybenzoic acid)	ND	Anti-cancer[32]
23.	*Ginkgo biloba* L. Ginkgoaceae	Ginko	Ginkgo-flavone glycosides / terpenoids / Ginkgolides and Bilobalides	L	HepG2 (BCRCNo. 60025) / Hep3B2.1-7 (Hep3B, BCRC No. 60434)[33]
24.	*Hibiscus syriacus* L. Malvaceae	Rose of Sharon	Acetone extract / water extract	Ba.	A549 / H209 / H661[34]
25.	*Indigofera tinctoria* L. Fabaceae	Indigo or neelini	Methanol extracts	ND	HCT 116[35]
26.	*Jasminum sambac* L. Oleaceae	Jasmine or Mogra	Alkaloids / flavonoids / terpenoids / carbohydrates / Proteins / phenols / tannins / saponins / phytosterols	T W	Breast cancer[36]
27.	*Jatropha curcas* L. Euphorbiaceae	Barbados nut	ND	L, St.	HepG2 / NCIH460 / HCT116 / HeLa[37]
28.	*Lantana camara* L. Verbenacea	Big sage	Different extract	R	Leukemia cell line[38]
29.	*Luffa cylindrica* L.	Sponge gourd	N-hexane / chloroform and ethyl	F	Anti-cancer[39]

	Cucurbitacea		acetate extract		
30.	*Lycium barbarum* L. Solanaceae	Goji berry	Polysaccharide- protein complex	R, Ba.	S180 cell[40]
31.	*Maclura tinctoria* L. Moraceae	Old fustic	Glycosides	St. Ba.	Anti-cancer[41]
32.	*Marjorana hortensis* L. Labiaceae	Marjoram	Essential oils	L	Leukemia HL-60 / NB4cells[42]
33.	*Melissa officinalis* L. Lamiaceae	Lemon balm	Cardiac glycosides / flavonoids / alkaloids / tannins	L	Anticancer[43]
34.	*Minquartia guianensis* L. Olacaceae	Black manwood	Minquartynoic acid	St. Ba.	Ovarian cancer cell lines[44]
35.	*Ocimum gratissimum* L. Olacaceae	Clove basil	ND	L	Prostate cancer / breast cancer[45]
36.	*Olea europaea* L. Oleaceae	Olive	Maslinic acid	ND	HT29[46]
37.	*Origanum vulgare* L. Lamiaceae	Oregano	Ethanol extract	ND	Caco2[47]
38.	*Oryza sativa* L. Poaceae	Rice	Cyanidin (1) and malvidin	ND	U937[48]
39.	*Pinus acutisleginum* L. Pinaceae	NA	Aristolactams / 4,5-dioxoaporphines	ND	A-549, SK-MEL-2 and SK-OV-3[49]
40.	*Piper betel* L. Piperaceae	Betel	Aristolactams and 4,5-dioxoaporphines	ND	Anti-cancer[50]
41.	*Piper longum* L. Piperaceae	Long pepper	Beta -sitosterol	Fr.	Anti-cancer[51]
42.	*Plumeria rubra* L. Apocynaceae	Frangipani	Ethanolic extract	L	Ehrlich ascites carcinoma cell[52]
43.	*Podophylum hexandrum* L. Berberidaceae	Himalayan may apple	Podophyllotoxin	R, Rh.	Anti-cancer[53]
44.	*Rubia cordifolia* L. Rubiaceae	Indian madder or Manjistha	1-hydroxytectoquinone	ND	Ehrlich ascites / carcinoma A375 Hep2 U937[54]
45.	*Solanum indicum* L. Solanaceae	Brihati	β-Sitosterol / β-sitosterol glucoside / dioscin/methyl protoprosapogenin A of dioscin / methyl protodioscin / protodioscin	WP	Colo-205/KB HA22T / Hep-2 GBM8401/ TSGH / H1477[55]
46.	*Solanum nigrum* L. Solanaceae	Black nightshade	Steroidal glycoside / galactopyranoside / Solamargine / solasonine	WP	(PC-12)10) and (HCT116) cells[56]
47.	*Waltheria indica* L. Malvaceae	Sleepy morning	Epicatechin / quercetin / tiliroside	WP	Anticancer[57]
48.	*Withania somnifera*	Ashwagandha	Withanolides / withaferin A /	B L	NCI-H460/

	L. Solanaceae	or Rennet	viscosalactone		HCT-116/ SF-268 / MCF-7 [58]
49.	*Zea mays* L. Poaceae	Maize	Crude ethanolic extract	WP	Anti-cancer[59]
50.	*Zingiber zerumbet* L. Zingiberaceae	Bitter ginger	Diethyl ether-95% EtoH	Fr.	P-388 cells[60]

Conclusion:-

Cancer has become an unsolved mystery for the researchers and plants have proved the key to solve that mystery. Natural products discovered from medicinal plants have played an important role in treatment of cancer. In this review some anticancer plants have been presented. These plants possess good immunomodulatry and antioxidant properties leading to anticancer activity. In conclusion this article provides the knowledge about anticancer medicinal plants, their active principle etc. This will also prove beneficial for further studies in development of novel anticancer drugs from medicinal plants.

References:-

1. M. Umadevi, K.P.Sampath Kumar, Debjit Bhowmik, S. Duraivel, Traditionally Used Anticancer Herbs In India, Journal of Medicinal Plants Studies,1(3), 2013, 56-74.
2. Stewart, BW; Wild, CP, eds. (2014). "Cancer etiology". World Cancer Report 2014. World Health Organization.
3. B.N Ames; L.S Gold. The cause and prevention of cancer. Proceedings of the National Academy of Sciences USA, 1995, 92, 5258-65.
4. American Cancer Society. Cancer Facts & Figures 2016. Atlanta: American Cancer Society; 2016.
5. K.Kathiresan; N.S Boopathy; S. Kavitha. Natural Product Radience, 2006, 5, 115-19.
6. "Paclitaxel". The American Society of Health-System Pharmacists. Retrieved January 2, 2015.
7. Xu, H; Lv, M; Tian,X (2009). "A review on hemisynthesis, biosynthesis, biological activities, mode of action, and structure-activity relationship of podophyllotoxins: 2003-2007.". Current Medicinal Chemistry **16** (3): 327–349.
8. G. Samuelsson (2004). Drugs of Natural Origin: a Textbook of Pharmacognosy (5ed.). Stokkholm: Swedish pharmaceutical press.
9. Kuttan R, Bhanumathy P, Nirmala K, George MC. Cancer Lett. 1985;29:197–202.
10. M. Umadevi, K.P.Sampath Kumar, Debjit Bhowmik, S. Duraivel, Traditionally Used Anticancer Herbs In India, Journal of Medicinal Plants Studies,1(3), 2013, 56-74.
11. Kaur P, Walia A, Kumar S, Kaur S, Antigenotoxic activity of polyphenolic rich extracts from Aegle marmelos, Journal of Natural Products, 3(1), 2009, 68-75.
12. Ejaz S, Woong LC, Ejaz A, Extract of Garlic (Allium sativum) in cancer chemoprevention, Experimental Oncology, 25, 2003, 93-97.
13. Sani HA, Rahmat A, Ismail M, Rosli R, Endrini S,Potential anticancer effect of red spinach (Amaranthus gangeticus) extract, Asian Pacific Journal of Clinical Nutrition, 13(4), 2004, 396-400.
14. Rastogi RP, Mehrotra BN, Compendium of Indian medicinal plants, Central Drug Research Insitute. Lukhnow and Publications and Information Directorate, New Delhi, 1991, 20.
15. Rajkapoor B, Jayakar B, Murugesh N, Antitumour activity of Bauhinia variegata against Ehrlich ascites carcinoma induced mice, Journal of Ethnopharmacology, 41(8), 2003, 604-607.
16. Kanner J, Harel S, and Granit R, Betalainss: a new class of dietary cationized antioxidants, Journal of Agriciculture and Food Chemistry, 49, 2001, 5178-5185.
17. You Y, Wu Y, Mao J, Zou L, Liu S, Screening of Chinese Brassica species for anticancer sulforaphane and erucin, African Journal of Biotechnology, 7 (2), 2009,147-152.
18. Bhagat M, Arora JS, Saxena AK, In vitro cytotoxicity of extracts and fractions of Calotropis procera (Ait.) roots against human cancer cell lines, International Journal of Green Pharmacy, 4(1), 2007, 36-40.
19. Ravindranath MH, Saravanan TS, Monteclaro CC, Presser N, Ye X, Selvan SR, Brosman SE Epicatechins purified from green tea (Camellia sinensis) differentially suppress growth of gender-dependent human cancer cell lines, Evidence Based Complement and Alternative Medicine, 3(2), 2006, 237-247.

20. Otsuki N, Dang NH, Kumagai E, Kondo A, Iwata S, Morimoto C, Aqueous extract of Carica papaya leaves exhibits anti-tumor activity and immunomodulatory effects, Journal of Ethnopharmacology, 127, 2010, 760-767.
21. Prajakta JP, Ghosh JS, Antimicrobial activity of Catharanthus roseus – a detailedstudy, British Journal of Pharmacology and Toxicology, 1(1), 2010, 40-44.
22. Rastogi RP, Mehrotra BN, Indian medicinal plants, Delhi book publications, 1979, New Delhi, 59.
23. Sharma AR, Gescher JA, Steward PW, Curcumin: The story so far, European Journal of Cancer, 41, 2005, 1955-1968.
24. Arulvasu C, Babu G, Manikandan R, Srinivasan P, Sellamuthu S, Prabhu D, Dinesh D, Anti-cancer effect of Datura innoxia P. Mill. leaf extract in vitro through induction of apoptosis in human colon adenocarcinoma and larynx cancer cell lines, Journal of Pharmacy Research, 3, 2010, 1485-1488.
25. Kumar V, Poonam, Prasad AK, Parmar VS, Naturally occurring aristolactams, aristolochic acids and dioxoaporphines and their biological activities, Journal of Natural Products, 20, 2003, 565-583.
26. Abdel-Kader MS, Bahler BD, Malone S, Werkhoven MCM, Troon FV, David, Wisse JH, Bursuker I, Neddermann KM, Mamber SW, Kingston DGI, DNA-damaging steroidal alkaloids from Eclipta alba from the Suriname rainforest, Journal of Natural Products, 61(10), 1998, 1202-1208.
27. Hansakul P, Ngamkitidechakul C, Ingkaninan K, Sireeratawong S, Panunto W, Apoptotic induction activity of Dactyloctenium aegyptium (L.) P.B. and Eleusine indica (L.) Gaerth. extracts on human lung and cervical cancer cell lines, Songklanakarin Journal of Science and Technology, 31, 2009, 273-279.
28. Patil SB, Naikwade MRSNS, Magdum CS,Review on phytochemistry and pharmacological aspects of Euphorbia hirta linn. Asian Journal of Pharmaceutical Research and Health Care, 1(1), 2009, 113-133.
29. Josep B, Raj SJ, An overview Ficus bengalensis L., International Journal of Pharmaceutical Sciences Review and Research, 6(1), 2011, 21-24.
30. Rubnov S, Kashman Y, Rabinowit R, Schlesinger M, Mechoulam R, Suppressors of cancer cell proliferation from fig (Ficus carica) resin: isolation and structure elucidation, Journal of Natural Products, 64, 2001, 993-996.
31. Josep B, Raj SJ, An overview Ficus bengalensis L., International Journal of Pharmaceutical Sciences Review and Research, 6(1), 2011, 21-24.
32. Khadem S, and Marles RJ, Monocyclic phenolic acids; hydroxy- and polyhydroxybenzoic acids: occurrence and recent bioactivity studies, Molecules, 15, 2010, 7985-8005.
33. Chao JC, Chu CC, Effects of Ginkgo biloba extract on cell proliferation and cytotoxicity in human hepatocellular carcinoma cells. World Journal of Gastroenterology, 10(1), 2004, 37-41.
34. Cheng YL, Lee SC, Harn HJ, Huang HC, Chang WL,The extract of Hibiscus syriacus inducing apoptosis by activating p53 and AIF in human lung cancer cells, The Journal of Chinese Medicine, 36(1), 2008, 171-184.
35. Magesh V, Yuvaraj G, Deecaraman M, Kalaichelvan, PT, Methanolic extract of Indigofera tinctoria induces apoptosis in HCT116 cells, Journal of Applied Biosciences, 14, 2009, 768-774.
36. Kalaiselvi M, Kalaivani K, Phytochemcial analysis and anti lipid peroxidative effect of Jasminum sambac (L.) Ait oleaceae, Pharmacology, 1, 2011, 38-43.
37. Balaji R, Suba V, Rekha N, Deecaraman M, Hepatoprotective activity of methanolic fraction of Jatropha curcas on aflatoxin b1 induced hepatic carcinoma, International Journal of Pharmaceutical Sciences, 1(2), 2009, 287-296.
38. Badakashan MP, Sreenivasan S, Jegathambigai RN, Surash R, Anti-leukemia activity of methanolic extracts of Lantana camara, Pharmacognosy Research, 1(5), 2009, 274-279.
39. Bulbul IJ, Zulfiker AHM, Hamid K, Khatun MH, Begum Y, Comparative study of in vitro antioxidant, antibacterial and cytotoxic activity of two Bangladeshi medicinal plants- Luffa cylindrica and Luffa acutangula, Pharmacognosy Journal, 3**,** 2011, 1-11.
40. Gan L, Zhang SH, Yang XL, Xu HB, Immunomodulation and antitumor activity by a polysaccharide–protein complex from Lycium barbarum, International Journal of Immunopharmacology, 4, 2004, 563-569.
41. Kupeli E, Orhan I, Toker G, Yesilada E, Anti-inflammatory and antinociceptive potential of Maclura pomifera (Rafin.) Schneider fruit extracts and its majorisoflavonoids, scandenone and auriculasin, Journal of Ethnopharmacology, 107(2),2006, 169-174.
42. Romeilah RM, Anticancer and antioxidant activities of Matricaria chamomilla and Marjorana hortensis essential oils, Research Journal of Medicine and Medical Sciences, 4(2), 2009, 332-339.
43. Gazola R, Machado D, Ruggiero C, Singi G, Alexandre MM, Lippia alba, Melissa officinalis and Cymbopogon citratus: effects of the aqueous extracts on the isolated hearts of rats, Pharmacological Research, 50(5), 2004, 477-480.

44. Sabitha G, Reddy CS, Yadav JS, Total synthesis of the highly potent anti-cancer polyacetylenes, (S)-18-hydroxyminquartynoic acid, (S)-minquartynoic acid and (E)- 15,16-dihydrominquartynoic acid, Tetrahedron Letters, 47(2)**,** 2006, 4513-4516.
45. Ekunwe SIN, Thomas MS, Luo MS, Wang H, Chen Y, Zhang X, Begonia GB, Potential cancer-fighting Ocimum gratissimum leaf extracts: increased antiproliferatio activity of partially purified fractions and their spectral fingerprints, Ethnicity & Disease, 20, 2010, 1-5.
46. Reyes-Zurita FJ, Rufino-Palomares EE, Lupianez JA, Cascante M, Maslinic acid, a natural triterpene from Olea europaea L., induces apoptosis in HT29 human coloncancer cells via the mitochondrial apoptotic pathway, Cancer Letters, 273(1),2009, 44-54.
47. Savini I, Arnone R, Catani MV, Avigliano L, Origanum vulgare induces apoptosis in human colon cancer caco2 cells, Nutrition and Cancer, 61(3), 2009, 381-9.
48. Hyun JW, Chung HS, Cyanidin and malvidin from Oryza sativa cv. Heugjinjubyeo mediate cytotoxicity against human monocytic leukemia cells by arrest of G2/M phase and induction of apoptosis, Journal of Agriculture Food Chemistry, 52, 2004,2213-2217.
49. Kumar V, Poonam, Prasad AK, Parmar VS, Naturally occurring aristolactams, aristolochic acids and dioxoaporphines and their biological activities, Journal of Natural Products, 20, 2003, 565-583.
50. Kumar V, Poonam, Prasad AK, Parmar VS, Naturally occurring aristolactams, aristolochic acids and dioxoaporphines and their biological activities, Journal of Natural Products, 20, 2003, 565-583.
51. Hullatti KK, Murthy UD, Activity guided isolation of cytotoxic compounds from Indian medicinal plants using bsl bioassay, Journal of Current Pharmaceutical Research, 1, 16-18.
52. Rekha JB, Jayakar B, Anti cancer activity of ethanolic extract of leaves of Plumeria rubra (Linn), Journal of Current Pharmaceutical Research, 1(2), 2011, 175-179.
53. Giri A, Narasu ML, Production of podophyllotoxin from Podophyllum hexandrum: a potential natural product for clinically useful anticancer drugs, Journal of Cytotechnology, 34 (2), 2000, 17-26.
54. Ghosh S, Sarma MD, Patra A, Hazra B, Anti-inflammatory and anticancer compounds isolated from Ventilago madraspatana Gaertn., Rubia cordifolia L. and Lantana camara L, Journal of Pharmacy and Pharmacology, 62(9), 2010, 1158-1166.
55. Chiang HC, Tseng TH, Wang CJ, Chen CF, Kan WS, Experimental antitumoragents from Solanum indicum L, Anticancer Research, 11(5), 1991, 1911-1917.
56. Ikeda T, Tsumagari H, Honbu T, Nohara T, Cytotoxic activity of steroidal glycosides from Solanum plants, Biology and Pharmaceutical Bulletin, 26(8), 2003, 1198-1201.
57. Koteswara RY, Hua FS, Nd-Min TY, Inhibitory effects of the flavonoids isolated from Waltheria indica on the production of NO, TNF-ALPHA. and IL-12 in activated macrophages, Biology and Pharmaceutical Bulletin, 28(5), 2005, 912-915.
58. Jayaprakasam B, Zhang Y, Seeram NP, Nair MG, Growth inhibition of human tumor cell lines by withanolides from Withania somnifera leaves, Journal of Life Sciences, 74**,** 2003, 125-132.
59. Habtemariam S, Extract of corn silk (Stigma of Zea mays) inhibits tumour necrosis Factor-α- and bacterial lipopolysaccharide-induced cell adhesion and ICAM-1 expression, Planta Medica, 64(4), 1998, 314-318.
60. Huang GC, Chien TY, Chen LG, Wang CC, Antitumor effects of zerumbone from Zingiber zerumbet in P-388D1 cells in vitro and in vivo, Planta Medica, 71, 2005, 219-224.