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Review article **Ayurvedic research**

Part-I

Anti-cancerous properties of the medicinal herbs mentioned in ayurveda and its availability in the north eastern region of India

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ABSTRACT

Ayurveda one of the ancient medical procedures is providing a great impact in the life of human society. Many medicinal herbs are mentioned in Ayurveda having the capacity to mitigate many disease conditions that is prevailing in the human society. In today's world scientist around the world have shown great interest in medicinal herbs and trying relevantly to get a solution for cancer. The main aim of the article is to reflect anti-cancerous activities of the medicinal herbs mentioned in Ayurveda and its availability in the north eastern states of India.

Keywords: Anticancer, Ayurveda, Arbuda,

INTRODUCTION

Ayurveda one of the ancient medical procedure had a great impact in the life of human society. Sufferings of the people are increasing day by day because of the prevalence of chaotic conditions making the human society a prey to submerge in the depth of unfavorable commodities leading them to lead a life where disease and death exist. Cancer one of the unsolved question had made the human race miserable and downtrodden and leading them no-where but had made the society where only fear and death exist. In some few years the rate of cancer patient had increased and the main etiological factor behind this scenario is the prevalence of un-wanted harmful products or eatables that the human society is using or facing in the long run of life. Description of cancer is also available in the ayurvedic texts and the acharyas of Ayurveda has given the nomenclature as arbuda (tumor). Cancer is a condition where a mass of tissue formed a result of abnormal, excessive, un-coordinated, autonomous and purposeless proliferation of cells. The common term used for all malignant tumors is cancer. Hippocrates (a60-337 BC) coined the term karkinos for cancer of the breast. The word "cancer" means crab, thus reflecting the true character of cancer since it sticks to the part stubbornly like a crab. Similar description is also available in Ayurveda where it says that- vata and other dosas of the body is responsible for the formation of round, static, with little pain, deep-seated mass and the acharyas of Ayurveda has given the nomenclature as arbuda.

Medicinal plants and their anticancer activities:- North East India is very rich in vegetation. Many plants species are available with great medicinal values and the peoples of North East are using these plants in their day to day life to carry out their activities. Many plants are still need to be explored or need to be identified. Medicinal plants have

reflected a great impact in the field of medical science. Research is progressing around the world in different medicinal herbs in order to sense a good result in cancer bearing patients. List of medicinal plants with their anticancer activities has been listed below:-

Sanskrit name	Scientific Name	Family	Anticancerous activities
Raktachandan	*Pterocarpus santalinus* Linn. f.	Papilionaceae	The antibacterial, anticancer, hepato protective, and wound healing properties of this drug have been established recently, Stem bark powder with soft porridge has been used in treating diarrhoea and the paste of the wood has been considered as a cooling agent for external application treating inflammations and headache, mental aberrations, and ulcers, The lignan isolated from the heartwood is known to inhibit tumor necrosis factor alpha production and T-cell proliferation.[1]
Pita Sairyak	*Barleria prionitis* Linn	Acanthaceae	It was first time reported that Phthalazine (76.74%) was the most abundant compound of *Barleria prionitis*rhizome in methanol extract.The other compound 2,3-Dihydro-3,5-Dihydroxy-6-Methyl-4H-Pyran -4-one and some inositol analyzed by GC/MS has an anti-cancerous and anti-proliferate property.[2]
Ankola	*Alangium salvifolium* (Linn. F.); Wang.	Alangiaceae	In EAC tumor bearing mice, a regular rapid increase in ascetic tumor volume was observed. Ascetic fluid is the direct nutritional source for tumor cells and a rapid increase in ascetic fluid with tumor growth would be a means to meet the nutritional requirement of tumor cells (Prasad et al., 1994).Treatment with AS chloroform extract reduced the intra peritoneal tumor burden, thereby reducing the viable tumor cell count and increased the life span of the tumor bearing mice. The steadfast criteria for judging the potency of any anticancer drug are prolongation of life span of animals (Clarkson et al., 1965). It can therefore be inferred that chloroform extract increased the life span of EAC bearing mice may be due to decrease the nutritional fluid volume and delay the cell division (Sur et al., 1997).[3]
Palandu	*Allium cepa* Linn.	Alliaceae	It has also been found that alliins can prevent the growth of malignant cells. In other words they are an anti-carcinogen and can help prevent the growth of cancerous cells in animals. It has been documented that in areas of high garlic and onion consumption rates of

			stomach cancer are relatively low.[4]
Rason	*Allium sativum* Linn	Alliaceae	Garlic is a rich source of a wide variety of organosulfur compounds which can undergo further chemical modifications when garlic is crushed, cut or minced. Allicin, a diallylsulfinothiolate which imparts much of garlic's pungent characteristics (Stoll and Seebeck 1951), is considered to be the precursor compound from which other thioallyl compounds are derived (Block 1985). Experimental investigations have implicated specific thioallyl constituents and their derivatives regarding the anti-cancer actions of garlic (Dorant et al 1993, Milner 1996), although many other cancer chemo preventive compounds are also known to be present. The efficacy of various garlic derived compounds in inhibiting experimental carcinogenesis has been investigated by many.[5]
Apamarga	*Achyranthes aspera* Linn.	Amaranthaceae	The plant has been reported to have cancer chemopreventive activity and antitumor property. Non alkaloid fractions of the plant were found to be valuable antitumour promoters. Leaves extracted in methanol were found to have inhibitory activity against human pancreatic cancer cells indicating its anti-proliferative and anti-cancer properties. Swiss albino mice induced by intra peritonial injection of mineral oil was used to screen anti-cancerous efficacy of A. aspera. Brine shrimp lethality (BSL) bioassay was performed in the plant to select the secondary metabolites with cytotoxic effect. Whole plant extract was found to inhibit Nnitroso di ethylamine (NDEA) and Carbon tetrachloride (CCl4) induced hepato carcinigenesis in rats.[6]
Jira	*Cuminum cyminum* Linn.	Apiaceae	*In vitro* study of anti-cancer properties of ethanolic extract of *Cuminum cyminum* Linn 25 %,61%,40%,31%,31%,28%,27% activity was found against SF-295,Colon 502713, Colo-205, Hep-2,A-549,OVCAR-5,PC-5 human cancer cell lines respectively. Maximum activity was observed against Colon 502713 (61%).[7]
Indrayaba	*Wrightia tinctoria* R. Br.	Apocynaceae	In one of the study the methanolic extract of *Wrightia tinctoria* has showed some cytotoxic activity in lymphocyte (MT-4) cells proving its potential as an effective anti-cancer agent

			in near future.[8]
Saptaparna	*Alstonia scholaris* R. Br	Apocynaceae	The alkaloid, (Elisabetsky and Campos, 2006) is reported to have anticancerous property (Beljanski and Beljanski, 1982, 1986).[9]
Kutaj	*Holarrhena antidysenterica* (Linn.) Wall.	Apocynaceae	In vitro cytotoxic potential of extracts of (95% and 50% ethanolic extract and hot water extract at concentration of 100µg/ml) from leaves of Holarrhena antidysentrica was evaluated against fourteen human cancer cell lines – A-549, COLO-205, DU-145, HeLa, HEP-2, IMR-32, IMR-32, KB, MCF-7, NCI-H23, OVCAR-5, SiHa, SK-N-MC, SW-620 and ZR-75-1 from nine different tissues (breast, colon, cervix, CNS, lung, liver, oral, ovary and prostate) using SRB assay. The 95% ethanolic extract displayed maximum anti-proliferative effect in the range of 73-92% against eight human cancer cell lines, while 50% ethanolic extract showed cytotoxic activity in the range of 70-94% against seven human cancer cell lines. However, the hot water extract did not show any activity. Among the fractions of 95% and 50% ethanolic extract, significant cytotoxic activity was found in the chloroform soluble fraction of 95% ethanolic extract at 100µg/ml; it inhibited the growth in the range of 71-99% of seven human cancer cell lines from five different tissues viz, OVCAR-5 (ovary), HT-29 (colon), SK-N-MC (neuroblastoma), HEP-2 (liver), COLO-205 (colon), NIH-OVCAR-3 (ovary) and A-549 (lung). The cytotoxic activity of chloroform soluble fraction was found to be higher than 5 – fluroracil, adriamycin, mitomycin-c and paclitaxel (anticancer drugs used as positive controls). Further in vitro studies and identification of active components from the chloroform fraction and their exact mechanism of action could be useful in designing new anticancer therapeutic agents.[10]
Karavira	*Nerium indicum* Mill.	Apocynaceae	The Methanolic extract of leaves (LE) and Methanolic extract of flowers (FE) of Nerium indicum (Arali) was analysed for Antioxidant activity (AOA) in terms of DPPH free radicals, Total Phenolic Content (TPC) was measured in terms of Gallic acid equivalent and Flavonoid content was analysed in terms

			of Quercetin equivalent. The antioxidant activities of (LE & FE) were found to be 72.8% and 67 %. TPC of study extracts (LE & FE) were found to be 227 mg/100g and 449 mg/100g. The Total Flavonoid content of (LE & FE) were found to be 125 mg/100g and 199 mg/100g respectively. Superoxide anion radical scavenging activity of flowers was 66 % compared to leaves 25 %. Similarly Lipid Peroxidation showed higher activity in flowers than leaves. Enzymatic antioxidant activity such as Superoxide Dismutase, Glutathione peroxidase and Catalase of Nerium indicum flowers were around 10% to 30% higher than that of leaves. The results clearly indicate that the methanol extracts of Nerium indicum flowers have more potent antioxidant activity than leaves.[11]
Vacha	*Acorus calamus* Linn.	Araceae	Cancer is the major disease caused by the abnormal proliferation of the tumour cells. α-asarone has been found to show the anticancerogenic activity against the human carcinoma cells. Essential oil obtained from this plant is b-asarone which is also responsible for its anti carcinogenic activity.[12]
Kramuk	*Areca catechu* Linn.	Arecaceae	Though piper betel leaf as a part of quid has been implicated in oral cancer, many scientists did not agree with these observations. The first indication of it being noncarcinogenic emerged from the work of Bhide and his group20, when they showed non-mutagenic properties in betel leaves and the presence of hydroxyl chavicol (HC), a phenol in piper betel leaf with anti-mutagenic properties. This proved to be the turning point in piper betel leaf research, when it was established that piper betel leaf per se do not contribute to oral cancer. This provided opportunities to explore the properties of piper betel. Since then, many biological activities have been demonstrated in betel leaf. Several medicinal properties have been attributed to piper betel, which include antioxidant, anti-infective, analgesic, anticancer, antidiabetic, hepatoprotective, immuno modulatory, cardio vascular, etc. piper betel is considered to provide strength to the heart (cardiotonic) and regulates irregular heart beat and blood pressure.[13]

Alarka	*Calotropis gigantia* (Linn) R. Br. Ex Ait.	Asclepiadaceae	1)Administration of uscharin may kill or reduce the growth rate of cancer cells and may also be of application in other medical conditions presenting symptoms of excessive or uncontrolled cell proliferation, 2) Zhu Nian Wang et al studied on new cytotoxic pregnancy *calotropis gigantea*. A new pregnanone, named calotropone, was isolated from the EtOH extract of the roots of Calotropisgigantea L. together with a known cardiac glycoside. The structures were elucidated by a study of their physical and spectral data. Compounds 1 and 2 displayedinhibitory effects towards chronic myelogenous leukemia K562 and human gastric cancer SGC-7901 cell lines.[14]
Arka	*Calotropis procera* (Ait) R Br.	Asclepiadaceae	1) MTT assay was used to demonstrate the viability of Hep2 cells exposed to CM, CH,CE and CW.CM, CH and CE caused cell death in a concentration and time dependent manner. CE showed the strongest growth inhibitory factor. CM and CH showed milder cytotoxic effect. 2) Root extract induced changes in cellular morphology.[15]
Sariba	*Hemidesmus indicus* R. Br.	Asclepiadaceae	The extract showed a significant in vitro cytotoxic activity against Ehrlich Ascites Tumor (EAT) cell line. IC50 value for EAT cell line was 274.83µg.The anticarcinogenic activity of the extract was determined by using EAT cell line induced ascites tumor model in mice and its comparison with standard anticancer drug cyclophosphamide. The treatment with methanolic root extract of *Hemidesmus indicus* (50 mg/kg and 100 mg/kg body weight) significantly increased the body weight of ascites tumor model. The life span of treated animal was increased up to 67.78%.The results were more significant in mice treated with 100 mg/kg body weight. This study revealed that *Hemidesmus indicus* may have a great potential to be exploited for the search of anticancer drugs.[16]
Chikkika	*Centipeda minima* (L) A.BR.	Asteraceae	Bioactivity-guided fractionation of the anti-NPC compound(s) from *C. minima* led to the isolation of 2β- (isobutyryloxy) florilenalin (IF), a sesquiterpene lactone. IF showed significant dose- and time- dependent inhibition on the growth of the human nasopharyngeal carcinoma epithelia cells

			(CNE). It induced apoptosis in CNE cells, as shown by the accumulation of sub-G1 cell population, DNA fragmentation and nuclear condensation, caspase-3 activation and PARP cleavage. Such induction was associated with the depletion of mitochondrial membrane potential and the release of cytochrome *c* to cytosol to regulate the expression of Bcl-2 family proteins. These activities led to the cleavage of caspases and the trigger of cell death process. Overall, IF in *C. minima* showed potent antiproliferative effect of *C. minima* on NPC cells, suggesting that the plant deserves more extensive investigation for its potential medicinal application.[17]
Rasanjan/Daru haridra	*Berberis arisata* DC	Berberidaceae	Methanolic extract of stem of *B. aristata* was screened for anticancer potential for human colon cancer cell line and it was found to be effective Methanolic extract of stem of *B. aristata* shows concentration dependent inhibition of HT29 cells[18].
Bantrapushi	*Podophyllum hexandrum* Royle	Berberidaceae	A fully defined MS medium supplemented with Naphthalene acetic acid and 6-benzylaminopurine (BAP) were effective for both initiation and sustained growth of callus tissue. The relative proportion of callus was markedly influenced by presence of plant growth regulators. The amount of Podophyllo toxin obtained from callus was 0.78 and 0.79 percent as characterized by HPLC and HPTLC respectively. The study revealed that callus culture may be a fruitful tool for the production of Podophyllotoxin resin, an anticancer entity.[19]
Soynak	*Oroxylum indicum* Vent.	Bignoniaceae	The chemo preventive properties of *O. indicum* hot and cold non-polar extracts (petroleum ether and chloroform) were investigated with MDA-MB-231 (cancer cells) and WRL-68 (non-tumor cells) by XTT assay. All the extracts, and particularly the petroleum ether hot extract (PHO), exhibited significantly ($P<0.05$) higher cytotoxicity in MDA-MB-231 when compared to WRL-68 cells. PHO was then tested for apoptosis induction in estrogen receptor (ER)-negative (MDA-MB-231) and ER-positive (MCF-7) breast cancer cells by cellular DNA fragmentation ELISA, where it proved more efficient in the MDA-MB-231 cells. Further,

			when PHO was tested for anti-metastatic potential in a cell migration inhibition assay, it exhibited beneficial effects. Thus non-polar extracts of *O. indicum* (especially PHO) can effectively target ER-negative breast cancer cells to induce apoptosis, without harming normal cells by cancer-specific cytotoxicity. Hence, it could be considered as an extract with candidate precursors to possibly harness or alleviate ER-negative breast cancer progression even in advanced stages of malignancy[20].
Patla	*Stereospermum susveolens* DC.	Bignoniaceae	The plant root extract is known to possess anticancer activity due to the presence of lapacho[21].
Rajika	*Brassica juncea* Czern and Coss.	Brassicaceae	Two varieties of *Brassica juncea* (L.) Czern. (Indian mustard) (RSPR-01 and RSPR-03) seeds and different day sprout extract (3 days, 5 days and 7 days) were made in dichloromethane. These extracts were tested for the hydroxyl radical scavenging activity and *in vitro* cytotoxicity activity. The hydroxyl free radical scavenging of extracts was determined by using DNA nicking assay and *in vitro* cytotoxicity activity against the rat cancer cell line (C6) and three different human cell lines(PC3, HELA and A549) by using MTT dye assay. In addition to this, the morphological changes in the cells treated with extracts were observed under confocal microscope. A critical analysis of results showed that both the varieties were effective in scavenging the hydroxyl radicals as well as inducing the death of cancer cells by apoptosis but RSPR-01 was significantly effective thanRSPR-03[22].
Sabarrodhra/Chandrasura	*Lepidium sativum* Linn.	Brassicaceae	*lepidium sativum* was also investigated for its chemoprotective properties toward 2- amino-3-methyl imidazo quinolin (IQ)-genotoxic effects and in colonic periplastic lesion reduction. The mediators of these protective effects are certain compounds of *lepidium sativum* juice, glucotropeteolin(GT) and a break down product of GI (benzyl iso thocyatel BITC).Results were significantly affirmative($p<0.05$). IQ –induced DNA damage incolon and liver cells in F344 rats was reduced in the range of 75%-92%. It is suggested that this chemo protective effect is

			mediated by glucurosyl transferrase (UDPG) which is a key enzyme in the detoxification of IQ. The amount of *lepidium sativum* juice needed to induce these effects is quite small and similar to the amount consumed in regular salad[23].
Latakaranja	*Caesalpinia crista* Linn.	Caesalpiniaceae	1*α*-acetoxy-5*α*, 7*β*-dihydroxycassa-11,13(15)-diene-16,12-lactone, a new cassane-type diterpene was isolated from *Caesalpinia crista*. The structure of this compound was elucidated by analysis of NMR spectra, and the relative configuration was established by NOE experiment. The new compound was evaluated for antitumour activity against T47D, DU145 and showed significant inhibitory activities[24]
Patanga	*Caesalpinia sappan* Linn.	Caesalpiniaceae	The mice tumor models of C57BL/6 Lewis lung cancer are established and dieted with different concentrations of *Caesalpinia Sappan* decoction 1 times a day. Then those different groups of mice are killed in different time at 7th, 14th, 21st day respectively. Each lung is observed for lung metastasis. The results showed that in 7th, 14th day the treatment group and model group had no lung metastasis, in the 21st days those mice of each group have visible lung metastases. But in the low dose group (SML group) and the high dose group (group SMH) of *Caesalpinia Sappan* the number of lung metastasis tumor are significantly less than the control group (P=0.0117, 0.0042). This result suggests that the Sappan has the effect of inhibiting lung cancer metastasis. However, with the development of the stage of the disease, this function will be weakened gradually[25]
Amaltas	Cassia fistula Linn.	Caesalpiniaceae	Rhein was found to be cytotoxic toward COLO320 DM cells in a concentration and time dependant manner. Rhein exhibited 40.59%, 58.26%, 65.40%, 77.92% and 80.25% cytotoxicity at 200 µg/mL concentration for 6, 12, 24, 48 and 72 h incubation time. The IC50 values of Rhein were 100, 25, 15, and 12.5 µg/mL for 12, 24, 48 and 72 h incubation respectively. The COLO 320DM cells treated with Rhein showed the characters of apoptosis at 24 h period of treatment at 6.25 and 12.5 µg/mL. Apoptosis in early stages was 2.29% at 6.25

			µg/mL and at late stages it was 1.94%. When the concentration was increased to 12.5 µg/mL, apoptosis was 4.36% at early stages and 5.61% at late stages, respectively. The results indicated that Rhein could be utilized in the treatment of cancer.[26]
Kasamarda	*Cassia occidentalis* Linn.	Caesalpiniaceae	Aqueous and hydro-alcoholic extracts of whole plant had been shown to cause growth inhibition of eight human cancer cell lines viz. HCT-15, SW-620, COLO-205 (colon); OVCAR-5 (ovary), PC-3 (prostate), HOP-62 (lungs), MCF (breast) and SiHa (cervix).[27]
Ashok	*Saraca asoca* (Roxb) De Wilde	Caesalpiniaceae	50% Ethanolic extract of *Saraca asoca* Roxb. de Wilde flowers (SAE) was screened for its anti hyper glycemic and antioxidant effect in streptozotocin-nicotinamide induced diabetic rats. Phytochemical analysis of SAE revealedthe presence of phenolic compounds phytosterol, flavonoids and saponins. After the administration of extract 200 mg/kg body weight/day) in diabetic rats has improved the elevated levels of blood glucose ($p<0.01$). The decreased activities of key antioxidant enzymes such as superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase and glutathione in diabetic rats were brought back to near normal range upon SAE treatment. Our studies demonstrate the anti-hyperglycemic and anti-oxidative potential of *Saraca asoca* which could exert sympathetic effects against the diabetes and associated free radicals complications[28].
Varun	*Crateva nurvala* Buch-Ham	Capparidaceae	Recent studies have shown that diets rich in phytochemicals can significantly reduce cancer risk by as much as 20%. Epidemiological data suggest that the phytosterols content of the diet is associated with a reduction in common cancers including cancers of the colon, breast, and prostate60, 61, 62. A number of triterpenoids have shown promise as antineoplastic agents and exhibit anti-proliferative activity when tested against various cancer cell lines. These triterpenoids include members belong to the cycloartane, lupane, friedelane, dammarane, ursane, oleanane, limonoid and cucurbitacin family. Betulinic acid and its derivative also posses anticancer activity as have action against mouse leuckemia. Topical application of

			Lupeol [40 mg/kg/3 times a week] for 28weeks was shown to significantly decrease tumor burden, tumor multiplicity and increase tumor latency period in the mouse model66.Lupeol [2 mg/animal] was not only found to suppress the tumor growth, but also to impair head and neck cancer cell invasion by targeting NFκB signaling67. The chemotherapeutic potential of Lupeol was also tested against the human hepatocellular carcinoma cell SMMC7721 cells. Lupeol treatment was shown to inhibit the growth and induce the apoptotic death of SMMC7721 cells. This study showed that Lupeol-induced growth inhibition and apoptosisis due to down-regulation of DR3 expression in SMMC7721 cells68[29].
Ajagandha	*Gynandropsis gynandra* (L.) Briq.	Cleomaceae/Capparidaceae	Four flavonoid fractions were isolated with mixture of minor compounds and administered at the doses of 150 mg/kg body weight intraperitoneally for 9 consecutive days. Twenty four hours of last dose and 18 h of fasting, the mouse were sacrificed and antitumor effect of all the fractions were assessed by evaluating tumor volume, viable and nonviable tumor cell count, tumor weight, biochemical, enzymatic and hematological antioxidant parameters of EAC bearing host. The high amount of antioxidant flavonoid is responsible for significant antitumor activity which correlates its *in vitro* cytotoxic effect. But the antitumor and cytotoxic activity shows synergistic action along with saponin[30].
Nagakeshar	*Mesua ferrea* Linn.	Cluciacea e	Evaluation of in vitro antioxidant activity was carried out by total antioxidant, DPPH, Ferric reducing, ABTS and nitric oxide assays. In vitro anti-inflammatory assays was also studied through inhibition of HRBCs membrane stabilization, heat induced hemolysis, Proteinase inhibitory activity and albumin denaturation assay. Results revealed that the methanolic extracts have significantly higher antioxidant activity scavenging for DPPH assay (89.70%), ABTS assay (77.64%), and Nitric oxide scavenging 89.28%. Total phenolics-content found to be 33,600 mg/100g plant material, total flavonoids 164 µg/ml and total tannins content 156 µg/ml were significantly higher in methanol extract. The methanol extract of the plant exhibited

			significant anti-inflammatory activity for HRBCs membrane stabilization (78.20%), heat induced hemolysis (47.40%), Albumin Denaturation (70.58%) and for Proteinase inhibitory activity (50.73%)[31].
Briddhadaruk	*Argyreia nervosa* (Burm.f.) Boj.	Convolvulaceae	The ethanolic extract of the flower of *A. speciosa* showed ulcer protective effect on rats (Rao et al., 2003). The antiulcer activity of Ethanolic root extract of *Argyreiaspeciosa* in rats was studied at the dose of 25, 50 and 100 mg/kg were evaluated in rats using ethanol, indomethacin and aspirin induced ulcer methods, which showed that the ethanolic root extract exhibited significant and dose dependent anti-ulcer activity in all ulcer models. Percentage ulcer inhibitions of extract at 100 mg/kg for ethanol, aspirin and indomethacin induced ulcers were 73.5, 60.5 and 87.5%, respectively (Khan et al., 2010)[32].
Patol	*Trichosanthes dioica* Roxb.	Cucurbiaceae	Present study evaluated anti proliferative effect of hydro alcoholic extract from *T. dioica* root (TDA) on Ehrlich ascites carcinoma (EAC) cells *in vitro*. The cytotoxic activity of TDA (1 to 10 µg/ml) against EAC cells was assessed *in vitro* by trypan blue cell viability assay and MTT cell proliferation assay. TDA at all test concentrations exhibited significant ($p < 0.001$) increment in non-viable cells in trypan blue cell viability assay as compared to vehicle control; the percentage of non-viability increased up to a concentration of 4 µg/ml of TDA (48.45%), followed by decrease at higher concentrations. Similarly, in MTT cell proliferation assay, the percent cytotoxicity increased up to a concentration of 2 µg/ml of TDA (34.58%) followed by gradual decrease on increasing TDA concentrations. From the present study it can be concluded that the hydroalcoholic extract of *T. dioica* root demonstrated significant antiproliferative effect at lower concentrations against Ehrlich ascites carcinoma cells *in vitro*, thus suggesting the feasibility of its possible promise as natural anticancer agent[33].
Kushmanda	*Benincasa hispida* (Thumb.) Cogn.	Cucurbitaceae	The DPPH free radical scavenging activity of each sample was conducted according to the method described by (Braca et al., 2001)15. A solution of 0.1 mM DPPH in ethanol was

			prepared. The butylated hydroxytoluene (BHT) / butylated hydroxyannisole (BHA) combination and ascorbic acid were used as standards. The concentration of extracts and standards were prepared from 200 until 1000 µg/ml. An aliquot of 0.6 ml of each concentration of extracts and standards were added to 4.5 ml of ethanolic DPPH solution. The mixture was shaken vigorously and left to stand for 20 minutes at room temperature in a dark room. Absorbance was read using a spectrophotometer at 517 nm. EC50 value was determined from the plotted graph of scavenging activity against the concentration of extracts which is defined as the total antioxidant necessary to decrease the initial DPPH radical concentration by 50.[34]
Indrayana	*Citrullus colocynthis* Schrad	Cucurbitaceae	The cytotoxic effect were evaluated in two phase, initially the effect of the extract were demonstrated on brine shrimp lethality assay (on freshly hatched napolii of Artemiasalina). The effect of the extract exhibited strong cytotoxic effect (LC50=3.30µg/mL) due to its potent cytotoxicity components. On the second stage its anti cancer activity has been analysed on human cancerous cells. Initially the effect has been evaluated on MCF-7 cells which exhibited significant reduction in cell viability in dose dependant manner (LC50=17.2µg/mL) in very low concentration at 5µg/mL, 10µg/mL, 20µg/mL. Similar effect has been observed in human hepatoma cells (HepG-2), proved to be potent anti-cancer moiety (LC50=12.54µg/mL). These effects were observed maintained even after 48 and 72 hours (time dependant manner).[35]
Bimbi	*Coccinia indica* W. and A.	Cucurbitaceae	There are a number of vegetables occurred to reduce the risk of cancer. One of them is *Coccinia grandis*. The anticancer activity of the *Coccinia grandis* is due to the antioxidant nature. The antioxidant nature of *Coccinia grandis* reduces the ferro cynaide to ferrous. Hydrogen peroxide scavenged from *Coccinia grandis* neutralizes to water (Behera *et al.,* 2012).Bhattacharya (2011) evaluated the aqueous extract of leaves of *Coccinia grandis* for anticancer activity. Nitric oxide is a free radical which acting an important role in the pathogenesis of pain, inflammation. The antioxidant principle of *Coccinia grandis*

			decreases the nitrite generated by decomposition. Graded response produced by the cell is comparatively less. *Coccinia grandis* significantly reduced viable cell count and increased non-viable cell count suggesting comparable anticancer property with that of the reference drug (vinblastine) (Nanasombat *et al.,* 2009;Bhattacharya *et al.,* 2011).[36]
Karkotaki	*Momordica dioica* Roxb. ex. Willd	*Cucurbita ceae*	Luo, et al isolated three triterpenes and two steroidal compounds from dry roots of *Momordica dioica*. Their structures were elucidated by spectral analysis (NMR, IR, MS, 1HNMR, 13CNMR and DEPT) and chemical methods. These compounds are alpha-spinasterol octadecanonate (I), alpha-spinasterol-3-O-beta-D-glucopyranoside(II), 3-O-beta-D-glucuronopyranosyl gypsogenin (III), 3-O-beta-D-glucopyranosyl gypsogenin (IV) and 3-O-beta-D-glucopyranosyl hedera-genin (V). Constituent III is a new compound. The CHCl3 extract of *Momordica dioica* roots and five isolated constituents showed anticancer activity in pharmacologic testing on cancer cell (L1210). The growth inhibitory index (%) of compound II was shown to be 50%, at the dose of 4 micrograms.ml-1.[37]
Karaila	*Momordica charantia* Linn.	Cucurbita ceae	There is absolutely no evidence that itcan treat cancer. Bitter Melon and Bitter Melon Extracts inhibit cancer and tumor. A novel phytochemical in bitter melon has clinically demonstrated the ability to inhibit an enzyme named guanylate cyclase. This enzyme is thoughtto be linked to the pathogenesis and replication of not only psoriasis, but leukemia and cancer as well. One clinical trial found very limited evidence that bitter melon might improve immune cell function in people with cancer, but this needs to be verified and amplified in other research. Other phytochemicals that have been documented with cytotoxic activity are a group of ribosome-inactivating proteins named alpha- and beta-momorcharin, momordin, and cucurbitacin B. A chemical analog of bitter melonproteins was developed and named MAP-30 and its inventors reported that it was able to inhibit prostate tumor growth. The phytochemical momordin has clinically demonstrated cytotoxic activity against Hodgkin's lymphoma in vivo, and several

			other in vivo studies have demonstrated the cytostatic and antitumor activity of the entire plant of bitter melon. Further studies reported that, a water extract blocked the growth of rat prostate carcinoma and a hot water extract of the entire plant inhibited the development of mammary tumors in mice. Numerous invitro studies have also demonstrated the anti-cancerous and anti-leukemic activity of bitter melon against numerous cell lines including liver cancer, human leukemia, melanoma and solid sarcomas[38].
Patol	*Trichosanthes dioica* Roxb.	Cucurbitaceae	Present study evaluated antiproliferative effect of hydroalcoholic extract from *T. dioica* root (TDA) on Ehrlich ascites carcinoma (EAC) cells *in vitro*. The cytotoxic activity of TDA (1 to 10 µg/ml) against EAC cells was assessed *in vitro* by trypan blue cell viability assay and MTT cell proliferation assay. TDA at all test concentrations exhibited significant ($p < 0.001$) increment in non-viable cells in trypan blue cell viability assay as compared to vehicle control; the percentage of non-viability increased up to a concentration of 4 µg/ml of TDA (48.45%), followed by decrease at higher concentrations. Similarly, in MTT cell proliferation assay, the percent cytotoxicity increased up to a concentration of 2 µg/ml of TDA (34.58%) followed by gradual decrease on increasing TDA concentrations. From the present study it can be concluded that the hydro alcoholic extract of *T. dioica* root demonstrated significant antiproliferative effect at lower concentrations against Ehrlich ascites carcinoma cells *in vitro*, thus suggesting the feasibility of its possible promise as natural anticancer agent[39].
Sal	*Shorea robusta* Gaertn	Dipterocarpaceae	Antioxidants are one of the key players in tumorigenesis, several natural and synthetic antioxidants were shown to have anticancer effects. The aim of the present study is to divulge the preventive nature of *Shorea robusta* bark extract (SRBE) during diethyl nitrosamine (DEN)-induced liver cancer in male Wistar albino rats. Administration of DEN to rats resulted in increased serum marker enzymes aspartate transaminase (AST), alanine transaminase (ALT), lactate dehydrogenase (LDH), and gamma glutamyl trans peptidase (GGT). The levels of lipid

			peroxides elevated with subsequent decrease in the tissue antioxidants like superoxide dismutase (SOD), catalase (CAT), reduced glutathione (GSH), glutathione peroxidase (GPx), and glutathione reductase (GR). SRBE supplementation (500mg/kg body weight) significantly attenuated these alterations, thereby showing potent anticancer effect in liver cancer. These findings suggest that SRBE prevents lipid peroxidation, hepatic cell damage, and protects the antioxidant system in DEN-induced hepatocellular carcino-genesis[40].
Danti	*Baliospermum montanum* Muell.- Arg.	Euphorbiaceae	Alcoholic extracts of *Bacopamonnieri* and *Baliospermum montanum Muell Arg*. were screened for their possible antioxidant activity by DPPH free radical scavenging and cytotoxicity on proliferation of HT-29 colon cancer)cell line was determined by 3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyl tetrazolium bromide (MTT micro culture tetrazolium viability assay. The cells were exposed to different concentrations (100, 50, 25, 12.5, 6.25and 3.125µg/ml). In DPPH radical scavenging assay the % activity at100 (µg/ml) was 78.12 and 62.5 respectively and % cytotoxicity in MTT assay at100 (µg/ml) was 75.93 and 65.97 with IC50 of 35.5 and 47.14 respectively andR2 value of the extracts are0.9987 0.9994 respectively. From the above results it was observed that alcoholic extract of *Bacopamonnieri* was more significant than the alcoholic extract of *Baliospermum montanum MuellArg*[41].
Drabanti	*Croton tiglium* Linn.	Euphorbiaceae	*Croton tiglium* L is a leafy shrub of the Euphorbiaceae family that is native to Southeastern Asia. The seed oil (croton oil)obtained from this plant or its major active constituent, 12-*O*-tetradecanoylphorbol-13-acetate(TPA), is an irritant and inflammatory agent that has been used widely as a tumor promoter (usual dose = 5-16 nmol, twice a week) on the skin of mice previously initiated with 7,12-dimethylbenz(*a*) anthraceneor other polycyclic aromatic hydrocarbons [19-24].TPA at a 10,000-fold lower concentration is an extra ordinarily potent stimulator of differentiation in myeloid leukemia cells *in vitro* [25-28]. In studies with solid tumors, TPA was shown to inhibit the growth,

				stimulate apoptosis, or enhance differentiation in human tumor cell lines derived from patients with melanoma or prostate, breast, colon, or lung cancer [29-33]. Treatment of prostate cancer LNCaP cells with clinically achievable concentrations of TPA (1–1.6 nM) resulted in growth inhibition [29-36], and treatment of these cells with a several fold higher concentration of TPA caused apoptosis [29,34-36].A synergistic inhibitory effect of TPA and ATRA on the growth of cultured prostate cancer LNCaP cells, and an inhibitory effect of TPA or ATRA administration on the growth of well-established LNCa P tumors in immuno deficient mice were observed[42].
Amalki	*Emblica officinalis* Gaertn.		Euphorbiaceae	Aqueous extract of *Emblica officinalis* (E.O) was found to be cytotoxic to L 929 cells in culture in a dose dependent manner. Concentration needed for 50% inhibition was found to be 16.5 µg/ml. E.O and chyavanaprash (a non-toxic herbal preparation containing 50% E.O) extracts were found to reduce ascites and solid tumours in mice induced by DLA cells. Animals treated with 1.25 g/kg b.wt. of E.O extract increased life span of tumour bearing animals (20%) while animals treated with 2.5 g/kg b.wt. of chyavanaprash produced 60.9% increase in the life span. Both E.O and chyavanaprash significantly reduced the solid tumours. Tumour volume of control animals on 30th day was 4.6 ml where as animals treated with 1.25 g/Kg b.wt. of E.O extract and 2.5 g/kg b.wt. Of chyavanaprash showed a tumour volume of 1.75 and 0.75 ml, respectively. E.O extract was found to inhibit cell cycle regulating enzymes cdc 25 phosphatase in a dose dependent manner. Concentration needed for 50% inhibition of cdc 25 phosphatase was found to be 5 µg/ml and that needed for inhibition of cdc2 kinase was found to be >100 µg/ml. The results suggest that antitumour activity of E.O extract may partially be due to its interaction with cell cycle regulation.[43]
Snuhi	*Euphorbia neriifolia* Linn.		Euphorbiaceae	Male mice were pre-administered with EN extract (150 and 400 mg/kg body weight; p.o.) and standard (0.5% BHA) prior to single dose of DENA (50 mg/kg body weight; p.o.). Various *in vivo* biochemical parameters like

	lipid peroxidation, superoxide dismutase and catalase were evaluated to determine the hepatoprotective and antioxidant activity of EN. DENA significantly increased LPO and decreased the endogenous antioxidant enzymes (SOD and CAT). The EN extract significantly restored the antioxidant enzyme level in the liver and exhibited significant dose dependant protective effect against DENA induced liver toxicity, which can be mainly attributed to the antioxidant property of the extract. This study rationalized the ethno-medicinal use of the EN for curing liver cancer.[44]

CONCLUSION

Literature search has shown that the plants listed above have got immense ant cancerous activities. These research works has created an atmosphere of positive approach in the field of cancer. Ancient, Ayurveda, a traditional Indian System has proven to be successful since time immemorial in using natural products to prevent or suppress tumors using various line of treatment. Medicinal herbs may enable healthy cells in body to put up a strong fight cancer cells. Still more and more research work is needed in different phases to get a better answer in the field of cancer.

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