

**Review**

Traditional medicinal plants as anticancer agents from Chhattishgarh, India: An overview

Ritesh Jain^{1*}, Sanmati K. Jain¹

*Corresponding author:

Ritesh Jain

1 SLT institute of Pharmaceutical Sciences, Guru Ghasidas Viswavidyalaya Bilaspur, Chhattisgarh, 495009.
Phone: 07752-260027
Email: sanmatijain72(at)yahoo.co.in
reteshjain81(at)yahoo.com

Abstract

An attempt has been made to review some medicinal plants used for the prevention and treatment of cancer in Chhattisgarh. Information on the name of plants, family, parts used and method of preparation has been collected from Ethanobotanical literatures. Information collected has revealed 53 plants species that are used for treatment of cancer in Chhattisgarh. All these plants were further reviewed for scientific evidence, 33 plants out of 53 plants were found for possess anticancer, cytotoxic or antioxidant activity in various preclinical or clinical studies.

Keywords: Anticancer, Medicinal plants, Ethanobotanical, Chhattisgarh.

Introduction

Over the past decade, herbal medicines have become a topic of global importance, making an impact on both world health and international trade. Medicinal plants continue to play a central role in the healthcare system of large proportions of the world's population [1]. This is particularly true in developing countries, where herbal medicine has a long and uninterrupted history of use. Recognition and development of the medicinal and economic benefits of these plants are on the increase in both developing and industrialized nations[2]. Continuous usage of herbal medicine by a large proportion of the population in the developing countries is largely due to the high cost of Western pharmaceuticals and healthcare. In addition, herbal medicines are more acceptable in these countries from their cultural and spiritual points of view [3]. Every year, millions of people are diagnosed with cancer, leading to death in a majority of the cases.

According to the American Cancer Society deaths arising from cancer constitute 2–3% of the annual deaths recorded worldwide [4].

Recently, a greater emphasis has been given towards the researches on complementary and alternative medicine that deals with cancer management. Plants have long history of use in the treatment of cancer [5-7]. Several studies have been conducted on herbs under a multitude of ethnobotanical grounds [8-11]. For example, Hartwell has collected data on about 3000 plants, those of which possess anticancer properties and subsequently been used as potent anticancer drugs. Plants derived components have played an important role in the development of several clinically useful anticancer agents. These include vinblastine, vincristine, the camptothecin derivatives, topotecan and irinotecan, etoposide, derived from epipodophyllotoxin and paclitaxel (taxol). Several promising new agents are in clinical development based on selective activity against cancer related molecular targets,

including flavopiridol and combretastin A4 phosphate, and some agents which failed in earlier clinical studies are stimulating renewed interest. Sixty percent of currently used anticancer agents are derived in one way or another from natural sources [12].

Use of plants for medicinal remedies is an integral part of the Indian cultural life, and this is unlikely to change in the years to come. Many traditional healers and herbalists in the Chhattisgarh region of India have been treating cancer patients for many years using various medicinal plant species [13, 14]. Despite the long history of cancer treatment using herbal remedies, the knowledge and experience of these herbalists have not been scientifically documented. Information on traditional herbal practice in the cancer is passed from one generation to the other through oral tradition. Considering the rapid rate of deforestation and loss of biodiversity, there is a need for accurate scientific documentation of the knowledge and experience of these herbalists. Hence, an attempt has been made to review some medicinal plants used for the prevention and treatment of cancer in Chhattisgarh state, India.

About Chhattisgarh

Chhattisgarh known as the rice bowl of India, is located between 17-23.70N latitude and 80.40-83.380E longitude in the Central Eastern India with extremely rich natural resources and very fertile land stretched across 136.03 thousand sq. km with more than 20 million population. Chhattisgarh has also been declared as the **Herbal state** of India.

Chhattisgarh state is divided into three agro-climatic zones namely the Northern hills, Chhattisgarh plains and the Bastar plateau. Rice is the main crop, grown in about 37 lakh hectare covering 77 % of the net sown area [15, 16].

Medicinal Plants Used For The Treatment Of Cancer In Chhattisgarh, India

Data on 53 medicinal plants of Chhattisgarh region have collected from the literature and

ethnobotanical information available [11, 13-14, 17-19]. Information collected revealed 53 plants species belonging to 29 families. Bark, root, leaves, flower and bulb are the commonest part of plants used, while decoction and infusions are the main methods of preparation (Table 1). Our main aim to write this review was find out scientific evidence for their anticancer activity. After thorough review the literatures, 33 out of 53 plants have been found effective in experimental or clinical studies (Table 2). These plants are used against various types of cancer/tumors such as sarcoma, lymphoma, carcinoma and leukemia in *invitro* cell lines or *invivo* cancer model. These include: *Abrus precatorius* in yoshida sarcoma, fibrosarcoma & Ascites tumour cells; *Acacia nilotica* in Ames salmonella histidine reversion assay; *Adhatoda vasica* in against ferric nitrilotriacetate (Fe-NTA)-induced renal oxidative stress, hyperproliferative response, and two-stage renal carcinogenesis; *Aegle marmelos* in brine shrimp lethality assay and ehrlich ascites carcinoma in mice; *Albizia lebbek* in sarcoma 180; *Asteracantha longifolia* in cyclophosphamide-induced bone marrow suppression, hepatocarcinogenesis in rats; *Balanites aegyptiaca* in A549 non-small cell lung cancer and U373 glioblastoma cell line; *Bauhinia variegata* in dalton's ascitic lymphoma; *Butea monosperma* in against 2-AAF induced hepatic toxicity and hyperproliferation; *Calotropis gigantean* in human epidermal carcinoma of nasopharynx; *Cannabis sativa* in uterine cervix cancer cells; *Cassia fistula* in ehrlich ascites carcinoma in mice; *Citrus medica* in SH-SY5Y human neuroblastoma cells; *Coriandrum sativum* in ames reversion mutagenicity assay; *Curcuma longa* in preclinical and clinical trial and against fibrocarcoma; *Datura metal* in human epidermal carcinoma of the nasopharynx; *Embllica officinalis* in L 929 cells culture; *Euphorbia neriifolia* in COLO 320 tumor cells & freund virus lukaemia; *Gloriosa superba* in HeLa, cervical carcinoma; HT29, colon adenocarcinoma and A431 skin carcinoma; *Hibiscus rosasinensis* in against brine shrimps; *Mangifera indica* in HL-60 mammalian cell lines; *Melia azedarach* in

Table: 1. Medicinal plants used for treatment of cancer in Chhattisgarh.

S. No.	Biological Name & Family	Local Name	Parts used	Preparations
1	<i>Abrus precatorius</i> Fabaceae	Gunja	Roots and leaves	Leaves decoction, flowers internally and aqueous extract of roots in treatment of blood cancer
2	<i>Acacia nilotica</i> Fabaceae	Bambri, babul	Stem and root barks	Stem and root barks decoction and patients are advised to gargle with this decoction.
3	<i>Adhatoda vasica</i> Acanthaceae	Arusa	Roots, leaves, flowers and stem	Juice/extract given internally, plant is burnt and the patients are advised to inhale the fume.
4	<i>Aegle marmelos</i> Rutaceae	Bael	Bark and flower	The roots, leaves, bark and flowers decoction.
5	<i>Alangium salviifolium</i> Alangiaceae	Ankol	Roots, bark and fruits	Bark decoction or boil the fresh bark in base oil to prepare special oil is considered beneficial for the cancerous wound, fruits for lung cancer.
6	<i>Albizia lebbek</i> Fabaceae	Sirsa	Flower and bark	Flowers in form of aqueous extract applied externally and bark in the form of powder given internally.
7	<i>Anthocephalus cadamba</i> Rubiaceae	Kadam	Fruits and leaves	Consuming Kadam fruits during growing season, dried leaves powders internally
8	<i>Artocarpus heterophyllus</i> Moraceae	Kathal	Seed, bark and roots	Few pinches of root powder are given internally and the roots decoction.
9	<i>Astercantha ongifolia</i> Acanthaceae	Mokhla	Root	Aqueous extract.
10	<i>Balanites aegyptiaca</i> Balanitaceae	Hingot	Bark and fruits	Dried bark powder, fruits pulps for blood cancer
11	<i>Bambusa sp.</i> Poaceae	Bans	Leaves, bark and seed	Leaf juice and bark decoction internally, seeds with Shahad (Honey).
12	<i>Bauhinia variegata</i> Fabaceae	Son Patta	Flower and leaves	Flower given with cow milk, leaves decoction.
13	<i>Buchanania lanzan</i> Anacardiaceae	Char	Seed, bark and root	Roots are used in form of dry powder, in form of decoction, bark powder with cow milk and honey.
14	<i>Butea monosperma</i> Fabaceae	Parsa	Leaves and fruits	Leaf juices & fruit powder.
15	<i>Calotropis gigantea</i> Asclepiadaceae	Fudhar	Root and latex	Root decoction for lung cancer and roots are dipped in its latex, burnt and patients are advice to inhale it.
16	<i>Cannabis sativa</i> Cannabaceae	Bhang	Leaves	The leaves are crushed and with the help of cow milk an aqueous paste is prepared. This paste is applied externally on the wound

17	<i>Cassia fistula</i> Fabaceae	Dhanbaher	Leaves and fruits	Leaf juice in treatment of cancerous wound, The fruit pulp is boiled in water to prepare concentrate decoction given internally.
18	<i>Citrus medica</i> Rutaceae	Bijaura	Fruit, seed, bark and root	Dried fruits powder, root in the form of paste, bark in the form of decoction
19	<i>Coriandrum sativum</i> Apiaceae	Dhania	Seed and whole herbs	Boil the seed powder in water to prepare concentrate decoction. The patients are advised to gargle with this decoction, whole herb juice advised to take it internally.
20	<i>Curcuma sp.</i> Zingiberaceae	Haldi	Rhizome	Both internally as well as externally in treatment of cancer.
21	<i>Datura species</i> Solanaceae	Dhatra	Leaf and flower	Dhatra leaf juice, opium and sonth (Dried Ginger) and in form of paste applied this combination on cancerous wound.
22	<i>Diospyros elanoxylon</i> Ebenaceae	Tendu	Fruits and bark	Bark paste with cow milk.
23	<i>Embelia ribes</i> Euphorbiaceae	Baibirang	Leaves, Roots and fruits	Leaves are used externally in form of decoction and paste
24	<i>Embllica officinalis</i> Euphorbiaceae	Aonla, amala	Leaf, roots and bark	Leaf juices, root boil in mustard oil for cancerous wound
25	<i>Euphorbia neriifolia</i> Euphorbiaceae	Thura	Latex and leaves	Fresh latex and leave extract
26	<i>Ficus benghalensis</i> Moraceae	Bar, bargad	Bark, root and fresh latex	Barks of Bar, Maharukh (<i>Ailanthus excelsa</i>) and Neem (<i>Azadirachta indica</i>) and prepare the combination, fresh latex internally
27	<i>Ficus glomerata</i> Moraceae.	Doomar	Leaves, bark and roots	Leaves juice bark juice, dried root powder given internally.
28	<i>Ficus religiosa</i> Moraceae	Pipal	Leaves and fruits	Leaf extract
29	<i>Gloriosa superba</i> Colchicaceae	Kalihari	Bulb, leaves and seeds	Freshly collected bulbs are crushed and added in mustard seed oil. The combination is boiled and when all watery contents evaporate the boiling is stopped and special oil is used after filtration. The special oil is considered beneficial for the cancerous wound, The leaves are given internally in form of juice
30	<i>Gmelina arborea</i> Lamiaceae	Khamhar	Leaves and fruits	Leaves juice, dried fruits powder.
31	<i>Hibiscus rosasinensis</i> Malvaceae	Jason	Flowers	Dried flower powder.
32	<i>Mangifera indica</i> Anacardiaceae	Ama	Leaves and inner bark	The leaves of Arusa (<i>Adhatoda vasica</i>), Kukurmutta (<i>Blumea lacera</i>) and Chirchita (<i>Achyranthes aspera</i>) are mixed in equal proportion. The Ama leaves are taken in

				double amount of this combination and mixed thoroughly. The combination is burnt and the patients are advised to inhale the fumes for lung cancer.
33	<i>Melia azedarach</i> Meliaceae	Bakain	Root, bark and fruits	Dried root powder is given internally, inner bark and extract the juice given internally
34	<i>Moringa oleifera</i> Moringaceae	Munga	Bark, flowers	Bark decoction, dried flowers powder.
35	<i>Mucuna pruriens</i> Fabaceae	Kevatch	Root, seed and whole herbs	Patients having mouth cancer to always put the freshly collected Kevatch root inside the mouth, seed powder useful in treatment of cancer pain.
36	<i>Nerium odorum</i> Apocynaceae	Kaner	Root and flowers	Roots decoction is prepared. The patients are advised to wash the wound with the help of this decoction
37	<i>Nyctanthes arbor-tristis</i> Oleaceae	Harshringar	Leaves and bark	Dried bark powder given internally, leaves decoction
38	<i>Ocimum sanctum</i> Lamiaceae	Tulsi	Seed and leaves	Decoction of seed and leaves internally
39	<i>Pandanus odoratissimus</i> Pandanaeae	Kevra	Root and leaves	Aqueous extract of roots, leaf juice
40	<i>Ricinus communis</i> Euphorbiaceae	Andi	Roots and leaves	Root decoction, leaf juice
41	<i>Saraca asoca</i> Fabaceae	Ashok	Bark and flower	Boil the fresh bark in cow milk and after filtration give the milk to the patients
42	<i>Semecarpus anacardium</i> Anacardiaceae	Bhelwa	Seed oil and roots	Oil applied externally, roots with combination of other herbs
43	<i>Sesbania grandiflora</i> Fabaceae	Agasti	bark and root	Bark and root juice is extracted. Both juices are mixed in equal proportion and given internally to the patients
44	<i>Solanum xanthocarpum</i> Solanaceae	Bhatkatiya	Fruits, leaves and flower	The half-matured seeds are collected and dried in shade. The seeds are burnt and the fumes are directed to the lung, leaf juices or decoction
45	<i>Syzygium cumini</i> Myrtaceae	Nadiya Chiraijam	Leaves and roots	Decoction of leaves and bark
46	<i>Tamarindus indica</i> Fabaceae	Amla	Fruit, bark and leaves	Leaves are used in the form of Chatani, bark ash used internally and externally.
47	<i>Terminalia arjuna</i> Combretaceae	Koha	Bark	Dried bark powder or decoction
48	<i>Terminalia bellirica</i> Combretaceae	Bahera	Leaves, bark and fruits,	Leaves are used in form of decoction, boiled bark .
49	<i>Terminalia chebula</i> Combretaceae	Harra	Fruits and roots	Decoction is given internally to the patients

50	<i>Tinospora cordifolia</i> Menispermaceae	Giloi	Whole herbs	Decoction of small herbs used externally
51	<i>Woodfordia fruticosa</i> Lythraceae	Dhawai	Leaves, flower and roots	Leaves are used in form of juice, dried flower and root powder.
52	<i>Wrightia tinctoria</i> Apocynaceae	Dudhi	Bark, leaves and flowers	Bark in form of decoction, flowers for breast cancer
53	<i>Ziziphus sp.</i> Rhamnaceae	Boir	Bark, fruits and leaves	Bark decoction internally and externally, boil the matured fruits and prepare special decoction

Table 2 Anticancer activities of Medicinal plants of Chhattisgarh.

S. No.	Name of plant	Indication (s)	Reference (s)
1	<i>Abrus precatorius</i>	Yoshida sarcoma (rats) Fibrosarcoma (mice) Ascites tumour cells	Subbareddy and Sirsi [20]
2	<i>Acacia nilotica</i>	Ames Salmonella histidine reversion assay	Arora S. et al [21]
3	<i>Adhatoda vasica</i>	Against ferric nitrilotriacetate (Fe-NTA)-induced renal oxidative stress, hyperproliferative response, and two-stage renal carcinogenesis.	Jahangir T. et al [22]
4	<i>Aegle marmelos</i>	brine shrimp lethality assay, Ehrlich ascites carcinoma in mice	Letícia VCL et al. [23] Jagetia GC. et al [24]
5	<i>Albizia lebbek</i>	Sarcoma 180 (mice)	Dhar et al. [25]
6	<i>Asteracantha longifolia</i>	cyclophosphamide-induced bone marrow suppression hepatocarcinogenesis in rats	Pawar RS. et al. [26] Ahmed S. et al. [27]
7	<i>Balanites aegyptiaca</i>	A549 non-small cell lung cancer and U373 glioblastoma cell line	Gnoula . et al. [28]
8	<i>Bauhinia variegata</i>	Dalton's ascitic lymphoma	Raj Kapoor B. et al [29]
9	<i>Butea monosperma</i>	Against 2-AAF i.p. induced hepatic toxicity and hyperproliferation.	Sehrawat A & Sultana S [30]
10	<i>Calotropis gigantea</i>	Human epidermal carcinoma of nasopharynx	Bhakuni et al. [31] Dhar et al [29]
11	<i>Cannabis sativa</i>	Uterine cervix cancer cells	Contassot E. et al [32]
12	<i>Cassia fistula</i>	Ehrlich ascites carcinoma in mice	Gupta M. et al [33]
13	<i>Citrus medica</i>	SH-SY5Y human neuroblastoma cells	Tian Q. et al [34] Poulose SM. et al [35]
14	<i>Coriandrum sativum</i>	Ames reversion mutagenicity assay	Josefina CE. et al [36]
15	<i>Curcuma longa</i>	preclinical and clinical trial review, fibrocarcoma	Agrawal et al [37] Shrinath NPI et al [38]
16	<i>Datura metel</i>	Human epidermal carcinoma of the nasopharynx	Dhar et al [25]
17	<i>Emblica officinalis</i>	L 929 cells in culture	Jose JK et al [39]
18	<i>Euphorbia nerifolia</i>	COLO 320 tumor cells Freund virus leukaemia	Smith HF. Et al [40] Dhar et al [5]

19	<i>Gloriosa superba</i>	HeLa, cervical carcinoma; HT29, colon adenocarcinoma; and A431, skin carcinoma	Kamuhabwa A. et al [41]
20	<i>Hibiscus rosasinensis</i>	Against brine shrimps	Olaleye MT. [42]
21	<i>Mangifera indica</i>	HL-60 mammalian cell lines	Percival SS. [43]
22	<i>Melia azedarach</i>	P 388 cells, human prostate (PC-3) and pancreatic (PACA-2) cell lines, walker carcinosarcoma	Takeya K. et. al [44] Bhakuni et al. [31]
23	<i>Moringa oleifera</i>	Human epidermoid lymphocytic leukemia, Skin papillomagenesis	Dhawan et al [45] Bharali et al [46] Guevara AP. et al [47]
24	<i>Mucuna pruriens</i>	Ehrlich ascites carcinoma in mice	Yerra R. et. al [48]
25	<i>Nerium odorum</i>	Human, canine and murine tumor cells	Pathak, S. et al [49]
26	<i>Ocimum sanctum</i>	Skin and liver tumor Human fibrosarcoma cells	Dubey et al [50] Karthikeyan K. et al [51]
27	<i>Ricinus communis</i>	SK-MEL-28 human melanoma cells	Panda S. et al [52] Darmanin S. et al [53]
28	<i>Saraca asoca</i>	Dalton's lymphoma ascites and Sarcoma-180 tumour cells	Varghese CD et al [54]
29	<i>Semecarpus anacardium</i>	Hepatocellular carcinoma	Balachandran P et al [55]
30	<i>Tamarindus indica</i>	Escherichia coli WP2 trp65 uvrA rfa/pKM 101, FL-cells, a human amniotic epithel cell line	Ramos A. et al [56] Al-Fatimi M et al [57]
31	<i>Terminalia arjuna</i>	S9-dependent mutagens, hepatocellular carcinoma in rats.	Sarveswaran S [58] Kandil FE et al [59] Kaura K et al [60]
32	<i>Terminalia chebula</i>	Human (MCF-7) and mouse (S115) breast cancer cell line, (HOS-1), (PC-3) and (PNT1A)	Saleem A et al [61] Kaur S et al [62],[63] Prasad L et al [64]
33	<i>Tinospora Cordifolia</i>	Red bone marrow Ehrlich Ascites Carcinoma	Kapil A et al [65] Jagetia GC et al. [66]

P 388 cells, human prostate (PC-3) and pancreatic (PACA-2) cell lines, walker carcinosarcoma; *Moringa oleifera* in human epidermoid lymphocytic leukemia, skin papillomagenesis; *Mucuna pruriens* in ehrlich ascites carcinoma in mice; *Nerium odorum* in human, canine and murine tumor cells; *Ocimum sanctum* in skin and liver tumor, Human fibrosarcoma cells; *Ricinus communis* in SK-MEL-28 human melanoma cells; *Saraca asoca* in dalton's lymphoma ascites and sarcoma-180 tumour cells; *Semecarpus anacardium* in hepatocellular carcinoma; *Tamarindus indica* in *Escherichia coli* WP2 trp65 uvrA rfa/pKM 101,

FL-cells, a human amniotic epithel cell line; *Terminalia arjuna* in S9-dependent mutagens, hepatocellular carcinoma in rats; *Terminalia chebula* in human (MCF-7) and mouse (S115) breast cancer cell line, (HOS-1), (PC-3) and (PNT1A); *Tinospora cordifolia* in red bone marrow and ehrlich ascites carcinima.

Conclusion

Medicinal plants maintain the health and vitality of individuals, and also cure various diseases, including cancer without causing toxicity. Plants derived components have played an important role in the development of several clinically

useful anticancer agents. In different region of Chhattisgarh many traditional healers use various medicinal plants for treating of various cancer. This review revealed that many of medicinal plants used by traditional healer are reported to have scientific evidence. There is a need to explore the plants which are not reported scientifically by *in-vitro or in-vivo* screening methods. These plants can provide potential bioactive compounds for the development of new 'leads' to combat cancer diseases.

Acknowledgement: University Grant Commission for JRF [F. No.10-01/2005 (SA-I)] and Dr. Pankaj Oudhia (www.botanical.com) for ethanobaotnical information on medicinal plants of Chhattisgarh.

References

1. Akerele O. Medicinal plants and primary health care: An agenda for action. *Fitoterapia*. 1988;59: 355–63.
2. WHO, Regulatory situation of herbal medicines, A worldwide review, Geneva, Switzerland. 1998, 1–5.
3. Koduru S, Grierson DS, Afolayan AJ. Ethnobotanical information of medicinal plants used for treatment of cancer in the Eastern Cape province, South Africa. *Curr Sci*. 2007;92(2): 906-9.
4. American Cancer Society, A biotechnology company dedicated to cancer treatment [Internet] viewed on 2009, October 21, available From: www.cancervax.com/info/index.htm.
5. Balachandran P, Govindrajan R. Cancer-an ayurvedic perspective. *Pharmacological research*. 2005;51: 19-30.
6. Mukherjee AK, Basu S, Sarkar N, Ghosh AC. Advances in cancer therapy with plants based natural products. *Current medicinal chemistry*. 2001; 8: 1467-86.
7. Madhuri S, Pandey G. Some anticancer medicinal plants from foreign origin. *Current Science*. 2009; 96 (6): 779-83.
8. Hartwell JL, Plants used against cancer. A survey. *Lloydia*. 1969; 32: 247–96.
9. Hartwell JL, Plants used against cancer. A survey. *Lloydia*. 1969; 32:153–205.
10. Hartwell JL, Plants used against cancer. A survey. *Lloydia*. 1971; 34: 103–50.
11. Pandey G. Anticancer herbal drugs of India with special reference to Ayurveda. New Delhi: Sri Satguru Publications. 2002; 18–121.
12. Cragg GM, Newman DJ. Plants as a source of anti-cancer agents, In ethanopharmacology. Eds. Elisabetsley E. Etkin NL. in Encyclopedia of life support system (EOLLSS), Eloss Publisher, oxford, UK.
13. Traditional Medicinal Knowledge about Herbs used in Treatment of Cancer in Chhattisgarh, India. Interactions with Senior Traditional Healers, (Internet) Cited on 2009, October 22, Available from: http://botanical.com/site/column_poudhia/publish/journal.cgi?folder=journal&next=11328.
14. Traditional Medicinal Knowledge about Herbs used in Treatment of Cancer in Chhattisgarh, India. Herbs for Cancerous Wounds, (Internet) cited on 22 October 2009, Available from: http://botanical.com/site/column_poudhia/publish/journal.cgi?folder=journal&next=11324.
15. Overview of Chhattisgarh. (Internet) Cited on 22 October 2009, Available from: <http://chips.nic.in/content/chhattisgarh.htm>.
16. Scope for organic farming in Chhattisgarh: an Indian perspective, (Internet) Cited on 22 October 2009. Available from: <http://www.inra.fr/ciab/papers/RaoJACS.pdf>.
17. Jadhav D. Medicinal plants of Madyapradesh and Chhattisgarh. Daya publishing house, New delhi ,India. 2006; 28-112.
18. Tiwari RKS, Ojha BM, Singh A & Sahu SK. Medicinal plants of Chhattisgarh. Published by Agriculture collage and research center, Bilaspur. Pub. No. TCBCARS/Technical Bulletin/06-07/01.

19. Medicinal plants of Dantewada district, Chhattisgarh. (Internet), Cited on 22 oct. 2009, available from: <http://www.dantewada.nic.in/medi2.htm>.
20. Subbareddy VV, Sirsi M. Effect of *Abrus precatorius* Linn. On experimental tumours, *Cancer Res*, 1969;29: 1447–51.
21. Arora S, Kaur K, Kaur S. Indian medicinal plants as a reservoir of protective phytochemicals. *Teratog Carcinog Mutagen*. 2003;23: 295 – 300.
22. Jahangir T, Sultana S. Tumor Promotion and Oxidative Stress in Ferric Nitrotriacetate-Mediated Renal Carcinogenesis: Protection by *Adhatoda vasaca*. *Toxicol Mech Methods*. 2007;17 (7): 421-30.
23. Leticia VCL. Studies of the anticancer potential of plants used in Bangladeshi folk medicine. *J Ethnopharmacol*. 2005; 99 (1): 21-30.
24. Jagetia GC, Venkatesh P , Baliga MS. *Aegle marmelos* (L.) Correa Inhibits the proliferation of transplanted ehrlich ascites carcinoma in mice. *Biol. Pharm. Bull*, 2005;28(1): 58-64.
25. Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN, Ray C. Screening of Indian plants for biological activity. Part-I. *Indian J Exp Biol*. 1968;6 :232–47.
26. Pawar RS, Jain AK, Kashaw SK , Singhai AK. Haematopoietic activity of *Asteracantha longifolia* on cyclophosphamide-induced bone marrow suppression. *Indian J. Pharm. Sci*. 2006;68 (3): 337-340.
27. Ahmed S, Rahman A, Mathur M, Athar M , Sultana S. Anti-tumor promoting activity of *Asteracantha longifolia* against experimental hepatocarcinogenesis in rats. *Food Chem Toxicol*. 2001; 39 (1): 19-28.
28. Gnoula C, Mégalizzi V, De Nève N, Sauvage S, Ribaucour F, Guissou P *et al.* Balanitin-6 and -7: diosgenyl saponins isolated from *Balanites aegyptiaca* Del. display significant anti-tumor activity in vitro and in vivo. *Int J Oncol*. 2008; 32(1): 5-15.
29. Raj Kapoor B, Jayakara B , Muruges N. Antitumor activity of *Bauhinia variegata* on Dalton's ascitic lymphoma. *J Ethnopharmacol*. 2003; 89(1) : 107-9.
30. Sehrawat A, Sultana S. Chemoprevention by *Butea monosperma* of hepatic carcinogenesis and oxidative damage in male wistar rats. *Asian Pac J Cancer Prv..* 2006; 7(1): 140-8.
31. Bhakuni DS, Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN. Screening of Indian plants of biological activity, Part-II. *Indian J Exp Biol*. 1969;7: 250–62.
32. Contassot E, Tenan M, Schnuriger V, Pelte MF, Dietrich PY. Arachidonyl ethanolamide induces apoptosis of uterine cervix cancer cells via aberrantly expressed vanilloid receptor-1. *Gynecol Oncol*. 2004;93:182–8.
33. Gupta M, Mazumder UK, Rath N, Mukhopadhyay DK. Antitumor activity of methanolic extract of *Cassia fistula* L. seed against Ehrlich Ascites Carcinoma. *J Ethnopharmacol*, 2000; 72: 151-6.
34. Tian Q, Miller EG, Ahmad H, Tang L, Patil BS. Differential inhibition of human cancer cell proliferation by *Citrus limonoids*. *Nutr Cancer*. 2001; 40: 180-4.
35. Poulouse SM, Harris ED, Patil BS, *Citrus limonoids* induce apoptosis in human neuroblastoma cells and have radical scavenging activity. *J Nutr*. 2005; 870-8.
36. Josefina CE, Sandra GA, Rafael VP, Jesús JEA. Antimutagenicity of coriander (*Coriandrum sativum*) juice on the mutagenesis produced by plant metabolites of aromatic amines. *Toxicol Lett*. 2004;153 (2): 283-92.
37. Aggarwal BB, Kumar A, Bharti AC. Anticancer potential of curcumin: preclinical and clinical studies. *Anticancer Res*. 2003; 23 ; 363-98.
38. Shrinath NPI, Premalatha B. Dietary curcumin with cisplatin administration modulates tumour marker enzymes indices in

- experimental fibrosarcoma. *Pharmacol Res.* 1999; 39: 175-9.
39. Jose JK, Kuttan G, Kuttan R. Antitumour activity of *Embllica officinalis*. *J Ethnopharmacol.* 2001;75 (2-3): 65-9.
 40. Smit HF, Woerdenbag HJ, Singh RH, Meulenbeld GJ, Abadie RP, Waving JH. Ayurvedic herbal drugs with possible cytostatic activity. *J Ethnopharmacol.* 1995; 47: 75-84.
 41. Kamuhabwa A, Nshimo C, Witte PD. Cytotoxicity of some medicinal plant extracts used in Tanzanian traditional medicine. *J Ethnopharmacol,* 2000;70: 143-9.
 42. Olaleye MT. Cytotoxicity and antibacterial activity of Methanolic extract of *Hibiscus sabdariffa*. *J Medicinal Plants Research.* 2007;1(1): 9-13.
 43. Percival SS, Talcott ST, Chin SR, Mallak AC, Lounds SA, Pettit MJ. Neoplastic transformation of BALB/3T3 cells and cell cycle of HL-60 cells are inhibited by mango (*Mangifera indica* L.) juice and mango juice extracts, *J Nutr.* 2006;136 (5): 1300-4.
 44. Takeya K, Qiao ZS, Hirobe C, Itokawa H. Cytotoxic trichilin-type limonoids from *Melia azedarch*. *Bioorg Med Chem.* 1996;4 (8): 1355-9.
 45. Dhawan BN, Dubey MP, Mehrotra BN, Rastogi RP, Tandon JS. Screening of Indian Plants for biological activity, part-IX. *Indian J Exp Biol.* 1980;18: 594-606.
 46. Bharali R, Tabassum J, Azad MRH. Chemomodulatory effect of *Moringa oleifera*, Lam, on hepatic carcinogen metabolizing enzymes, antioxidant parameters and skin papillomagenesis in mice. *Asian Pac J Cancer Prev.* 2003;4:131-9.
 47. Guevara AP, Vargas C, Sakurai H, Fujiwara Y, Hashimoto K, Maoka T *et al.* An antitumor promoter from *Moringa oleifera* Lam. *Mutat Res.* 1999;440: 181-8.
 48. Yerra R, Gupta M, Mazumder KU. Antitumor Activity and *in vivo* Antioxidant Status of *Mucuna pruriens* (Fabaceae) seeds against Ehrlich Ascites Carcinoma in Swiss Albino Mice. *Iran J Pharmacol Therap.* 2005; 4 (1): 46-53.
 49. Pathak S, Multani AS, Narayan S, Kumar V, Newman RA, Anvirzel TM. An extract of *Nerium oleander*, induces cell death in human but not murine cancer cells. *Anticancer Drugs.* 2000;11(6): 455-63.
 50. Dubey NK. Cytotoxicity of the essential oil of *Cymbogon citrus* and *Ocimum grattissimum*, *Indian j Pharm Sci.* 1997;59: 263-9.
 51. Kartikeyan K, Gunasekaran P, Ramamurthy N, Govindasamy S. Anticancer activity of *Ocimum sanctum*. *Pharm Biol.* 1999;37(4): 285-90.
 52. Panda S, Yadav R. Plants with anticancer activity: need for *in vitro* study. *Vaniki Sandesh.* 2005;29 (1): 32-4.
 53. Darmanin S, Wismayer PS, Podesta MTC, Micallef MJ, Buhagiar JA. An extract from *Ricinus communis* L. leaves possesses cytotoxic properties and induces apoptosis in SK-MEL-28 human melanoma cells. *Nat Prod Res,* 2009;23 (6): 561-71.
 54. Varghese CD, Nair SC, Panikkar KR. Potential anticancer activity of *Saraca asoca* extracts towards transplantable tumours in mice. *Indian j Pharm Sci.* 1992;54 (1) : 37-40.
 55. Balachandran P, Vallinayagam M, Panchanatham S. Anticancer potency of the milk extract of *Semecarpus anacardium* Linn. nuts against aflatoxin B₁ mediated hepatocellular carcinoma bearing wistar rats with reference to tumour marker enzymes. *Phytother Res.* 1999;13 (3): 183 -7.
 56. Ramos A, Visozo A, Piloto J, Garcia A, Rodriguez CA, Rivero R. Screening of antimutagenicity via antioxidant activity in Cuban medicinal plants. *J Ethnopharmacol.* 2003; (87):241-6.
 57. Al-Fatimi M, Wurster M, Schroder G & Lindequist U. Antioxidant, antimicrobial and cytotoxic activities of selected

- medicinal plants from Yemen. *J Ethnopharmacol.* 2007;111: 657–66.
58. Sarveswaran S, Muthaiyan I, Balasubramanian MP. Anticancer potency of *Terminalia arjuna* bark on N-nitrosodiethylamine-induced hepatocellular carcinoma in rats. *Nat Prod Sci.* 2004;10 (4):190-5.
59. Kandil FE, Nassar MI. A tannin anti-cancer promotor from *Terminalia arjuna*, *Phytochemistry.* 1998;47(8): 1567-8.
60. Kaura K, Arora S, Kumar S, Nagpala A. Antimutagenic activities of acetone and methanol fractions of *Terminalia arjuna*. *Food Chem Toxicol.* 2002;40: 1475-82.
61. Saleem A, Husheem M, Harkonen P, Pihlaja K. Inhibition of cancer cell growth by crude extract and the phenolics of *Terminalia chebula* retz. Fruit. *J Ethnopharmacol.* 2002;81: 327-36.
62. Kaur S, Arora S, Kaur K, Kumar S. The *in vitro* antimutagenic activity of Triphala - an Indian herbal drug. *Food Chem Toxicol.* 2002;40 (4): 527-34.
63. Kaur S, Grover IS, Singh M, Kaur S. Antimutagenicity of hydrolyzable tannins from *Terminalia chebula* in *Salmonella typhimurium*. *Mutat Res.* 1998;419:169–79.
64. Prasad L, Khan TH, Jahangir T, Sultana S. Chemo-modulatory effects of *Terminalia chebula* against nickel chloride induced oxidative stress and tumor promotion response in male Wistar rats. *J Trace Elem Med Biol.* 2006;20: 233–9.
65. Kapil A, Sharma S. Immunopotentiating compounds from *Tinospora cordifolia*. *J Ethnopharmacol.* 1997;58: 89–95.
66. Jagetia GC, Rao SK. Evaluation of the antineoplastic activity of Guduchi (*Tinospora cardifolia*) in ehrlich ascites carcinoma bearing mice. *Biol Pharm Bull.* 2006;29 (3): 460-6.