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SELECTIVE MEDICINAL PLANTS FOR THE TREATMENT OF VARIOUS TYPES OF CANCER: A SHORT REVIEW

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ABSTRACT: *Cancer is a deadly disease. Patients seek alternative treatments of cancer because of the high death rate and the adverse side effects of chemotherapy and radiotherapy. Traditional medicine has a long history that begins with the search for botanicals to treat various diseases, including cancer. In the traditional medicinal practice, several plants used to treat diseases have many bioactive compounds with preventive capability. In this short review, I have found 12 medicinal plants with active significant anticancer property as well as their anticancer bio-active compounds. This short review will provide a basic set of information for researchers interested in developing a safe active medicinal herbal-based treatment for cancer. It will be able to give a scientific foundation for the traditional usage of these medicinal plants to treat deadliest cancer*.

KEYWORDS: Cancer, Medicinal Plants, Phytochemicals, Cytotoxicity

1. INTRODUCTION

In ancient time herbal medicines were the only way treatment of diseases. Herbal medicines were using internally as well as externally. Primary or secondary plant metabolites were playing the main significant role in treatment of disease. Ancient peoples had no idea about phytochemicals. Many studies and articles from all over the world have reported the anticancer property of phytochemical ingredients [1,2]. Plants are a source of natural bioactive compounds. Various bioactive compounds of plants are cytotoxic and have the anticancer potentiality (3-6). When contained in diets, the cytotoxicity of phytochemicals must target specific cells, such as cancer cells, and must not be harmful to consumers [8]. The investigation of anticancer phytochemicals from medicinal plants to treat cancer began with the isolation of alkaloids; vincristine and vinblastine from *Catharanthus roseus* and podophyllotoxin from *Podophyllum* species [7]. Several other anticancer phytochemicals such as campothecin

derivatives, homoharringtonine, vinca alkaloids, podophyllotoxin derivatives, and taxanes have been isolated from different medicinal plants [8-10].

Some medicinal plants with effective phytochemicals against different types of cancers are discussed below:

Annona squamosa (Assamese name-**Atlas**)

Family-Annonaceae Part use- leaf

Leaves of Annona squamosa have anticancer activity. (6S, 7aR)-6-hydroxy-4,4,7a-trimethyl-6,7-dihydro-5H-1-benzofuran-2-one or loliolide, cocamidopropyl betaine, N- [3-(dimethylamino)propyl] dodecanamide or lauramidopropyl dimethylamine, linolenic acid, and 1-dodecyl-2-azepanone or laurocapram are the main phytochemicals of Annona squamosa leaves. Loliolide and linolenic acid have high anticancer property. These two phytochemicals can prevent cervical cancer of human [11].

Arnebia euchroma **(Assamese** name- ***Arnebia*****)**

Family – Boraginaceae, Part use-root and leaf.

Phytochemical studies have identified several bioactive compounds in *A. euchroma*, such as eugormoside A, eugormoside B, scopoletin, and β-sitosterol, which exhibit diverse biological activities like antioxidant, antimicrobial, anticancer, and anti-ulcer effects. shikonin has been shown to have antitumor effects against a wide variety of cancer cell types, from lung cancer to breast and prostate cancer [12].

Albizia lebbeck (Assamese name-***Sirish***)

Family-Leguminosae, Part use -bark.

The organic compounds present in Albizia lebbeck bark has the anti-migratory, anti-proliferative and cytotoxic potentials on MDA-MB 231 and MCF-7 human breast cancer cell lines. (S)-(E)-(−)-4-Acetoxy-1-phenyl-2-dodecen-1-one, Cyclotrisiloxane, hexamethyl-(CAS), 1,2-Dihydro-1,4-diphenylphthalazine , 2-(5-acetyl-2-thienyl)-1,4-naphthoquinone , 4H-3-(p-methylanilino)1-benzothiopyran-4-one 1-oxide , Cyclooctasiloxane, hexadecamethyl-,4-Ethylbenzoic acid, 2-butyl ester , Cyclononasiloxane, octadecamethyl-these phytochemicals have anti-cancer and anti-tumour activity. Saponin controls cervical, larynx, hepatocarcinoma, breast, and colon carcinoma [13].

Asclepias curassavica, (Assamese name-***Bhadoi tita***)

Family -Apocynaceae, Part use- whole plant.

The ethanol extract of the whole plant showed Asclepiasterol enhances the anticancer efficacy of chemotherapeutic agents in MDR cells. This plant is a rich source of calotropin and calotrpin helps in prevention of nasopharynx carcinoma [14].

Asparagus racemosus *(Assamese name-* ***Satamul****)*

Family- Liliaceae, Part use-root.

The major bioactive ingredient present in the plant are steroidal saponins. It mainly contains six components, shatavarin I-VI, and shatavarin IV a major glycoside being present in the roots of the plant. The structure of shatavarin IV consist of two molecules of asparagus rhamnose along with 1 molecule of glucose and is mainly found in the leaf, fruits and roots of the plant. The root extract of the plant which contains shatavarin IV fraction exhibits significant activity against cancer cells. Shatavarin IV is active against Ehrlich ascites carcinoma [15].

Camptotheca acuminata. (English name-Happy tree)

Family- Nyssaceae, Part use- stem wood.

Camptothecin is a potent drug against cancers, originally from *Camptotheca acuminate* plants. Camptothecin exhibited effective activity at inhibiting cell growth and inducing apoptosis on Vero cells. Camptothecin is active against colorectal, lung and ovarian cancer [16].

Catharanthus roseus *(*Assamese name-***Nayantara***)

Family - Apocynaceae, Part use-root.

Catharanthus roseus has been found to contain a wide range of alkaloids possessing anticancer activity including vinblastine, vincristine, vindoline, vindolidine, vindolicine, vindolinine and vindogentianine. These alkaloids inhibit cell proliferation through changing the microtubular dynamics, which induces apoptosis. Vinblastine sulphate is using for treatment of Hodgkin's disease, lymphosarcoma, choriocarcinoma, neuroblastoma, carcinoma of breast and lungs and other organs in acute and chronic leukaemia [17].

Centella asiatica (Assamese name- ***Manimuni***)

Family -Apiaceae, Part use- whole plant.

The Anti-Carcinogenic Effect of *Centella asiatica* on Oral Cancer Cell Line or oral cancer had established. *Centella asiatica* has a potential anti-carcinogenic effect on oral cancer cell line. So, this can be used to treat oral and lung cancer [18].

Colocasia gigantea (Assamese name- ***Kosu)***

Family- Araceae, Part use -tuber.

The n-hexane tuber fraction (Fr. 1T) of Colocasia gigantea exhibited significant cytotoxicity on HeLa cells and encouraged WBC cell proliferation. 4,22-Stigmastadiene-3-one, Diazoprogesterone, 9-Octadecenoic acid (Z)-, hexyl ester, and Oleic Acid were the components of Fr. 1T that demonstrated cytotoxic potential. In conclusion, C. gigantea's Fr. 1T shows potential for cervical cancer treatment [19].

Ocimum sanctum (Assamese name -***Tulsi***)

Family – Lamiaceae, Part use- leaves,

Ocimum sanctum has high concentrations of eugenol and shown to have anticancer properties. In various cancer, eugenol exerts its antitumour effects through a number of different mechanisms. Tulsi contains flavonoids and phenolics, neo-lignans, tannins, triterpenoids, sterols, cerebrosides, alkaloids, and saponin. Tulsi is known for biological effects both in vivo and in vitro, including antioxidant or prooxidant, cytotoxic, antiviral, hepatoprotective, anti-inflammatory, and anticancer [20].

Piper nigrum (Assamese name- ***Jaluk***)

Family -Piperaceae, Part use-fruits and roots.

Piper nigrum's main ingredient piperine, is a phytochemical. Piperine contains various bioactive effects and several physiological benefits that could help overall human health, such as immunomodulatory, hepatoprotective, antioxidant, antimetastatic, anticancer, and many more properties that have been established. Piperine is extracted and refined from pepper fruits and roots. Piperine suppresses cancer cell proliferation and increases apoptosis [21].

Zingiber officinale (Assamese name-***Aada***)

Family -Zingiberaceae, Part use- rhizome.

The volatile oil components of ginger consist mainly of sesquiterpene, hydrocarbons, zingeberene, curcumene and farnesene, with lesser amounts of bisabolene and bisesquiphellandrene. Ginger contains biologically active constituents gingerols, paradols, shogaols, and zingerone. [6]-gingerol may inhibit tumour growth and metastasis via its anti-angiogenic activity. Effect of ginger on ovarian cancer cells in vitro revealed that inhibition in

growth of cells effectively by 6- Shogaol and also inhibition of NF- kB activation and decreases VEGF (growth factor) and IL-8 secretion [22].

REFERENCES

1. Brown, A.C. *et al.* (2005) 'The anti-cancer effects of poi (Colocasia esculenta) on colonic adenocarcinoma cellsIn vitro', *Phytotherapy Research*, 19(9), pp. 767–771. Available at: https://doi.org/10.1002/ptr.1712.

2. Reynertson, K.A., Charlson, M.E. and Gudas, L.J. (2011) 'Induction of murine embryonic stem cell differentiation by medicinal plant extracts', *Experimental Cell Research*, 317(1), pp. 82–93. Available at: https://doi.org/10.1016/j.yexcr.2010.10.010.

3. Bonham, M. *et al.* (2002) 'Molecular effects of the herbal compound PC-SPES: identification of activity pathways in prostate carcinoma.', *PubMed*, 62(14), pp. 3920–4.

4. Hu, H. *et al.* (2002) 'Ganoderma lucidum extract induces cell cycle arrest and apoptosis in MCF-7 human breast cancer cell', *International Journal of Cancer*, 102(3), pp. 250–253. Available at: https://doi.org/10.1002/ijc.10707.

5. El-Shemy, H.A. *et al.* (2007) 'Willow Leaves' Extracts Contain Anti-Tumor Agents Effective against Three Cell Types', *PLoS ONE*. Edited by F. Romesberg, 2(1), p. e178. Available at: https://doi.org/10.1371/journal.pone.0000178.

6. Nassr-Allah, A.A. *et al.* (2009) 'Anti-cancer and anti-oxidant activity of some Egyptian medicinal plants.', *Journal of Medicinal Plants Research*, 3(10), pp. 799–808. Available at: https://doi.org/10.5897/jmpr.9000091.

7. Jang, M. (1997) 'Cancer Chemopreventive Activity of Resveratrol, a Natural Product Derived from Grapes', *Science*, 275(5297), pp. 218–220. Available at: https://doi.org/10.1126/science.275.5297.218.

8. CRAGG, G.M. and NEWMAN, D.J. (2003) 'Plants as a source of anti-cancer and anti-HIV agents', *Annals of Applied Biology*, 143(2), pp. 127–133. Available at: https://doi.org/10.1111/j.1744-7348.2003.tb00278.x.

9. Ahmed Elnour, M., Penech, F. and Ahmed Mesaik, M. (2017) 'Four Selected Sudanese Medicinal Plants Induce Anticancer and Cytotoxic Effects in Prostate Cancer Cell Line', *Clinical & Medical Biochemistry*, 03(02). Available at: https://doi.org/10.4172/2471-2663.1000134.

10. Cai, Y. *et al.* (2004) 'Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer', *Life Sciences*, 74(17), pp. 2157–2184. Available at: https://doi.org/10.1016/j.lfs.2003.09.047.

11.Swantara, Made Dira, et al. "C." ervical Anticancer Activities of Annona Squamosa Linn. Leaf Isolate *Veterinary World*, 24 Jan. 2022, pp. 124–131, https://doi.org/10.14202/vetworld.2022.124-131. Accessed 25 Sept. 2022.

12.Urmat KAZYBEKOV, et al. "Review of Arnebia Euchroma as a Potential Medicinal Plant Based on Phytochemistry and Pharmacological Activity." *Yüzüncü Yıl Üniversitesi Tarım Bilimleri Dergisi*, vol. 34, no. 1, 31 Mar. 2024, pp. 176–191, https://doi.org/10.29133/yyutbd.1306035. Accessed 1 Sept. 2024.

13.Umar, Huzaifa, et al. "Prediction of Cell Migration Potential on Human Breast Cancer Cells Treated with Albizia Lebbeck Ethanolic Extract Using Extreme Machine Learning." *Scientific Reports*, vol. 13, no. 1, 14 Dec. 2023, www.nature.com/articles/s41598-023-49363-z#Sec14, https://doi.org/10.1038/s41598-023-49363-z. Accessed 27 Aug. 2024.

14.Yuan, Wei-Qi, et al. "Asclepiasterol, a Novel C21 Steroidal Glycoside Derived from Asclepias Curassavica, Reverses Tumor Multidrug Resistance by Down-Regulating P-Glycoprotein Expression." *Oncotarget*, vol. 7, no. 21, 25 Apr. 2016, pp. 31466–31483, www.ncbi.nlm.nih.gov/pmc/articles/PMC5058771/pdf/oncotarget-07-31466.pdf, https://doi.org/10.18632/oncotarget.8965. Accessed 13 Feb. 2021.

15.Singh, Akshay K., et al. “Phytochemicals, Medicinal and Food Applications of Shatavari (Asparagus Racemosus): An Updated Review.”*The Natural Products Journal*, vol. 8, no. 1, 9 Feb. 2018, pp. 32–44, https://doi.org/10.2174/2210315507666170922145258.

16.Ran, Xueqin, et al. “Characterization and Antitumor Activity of Camptothecin from Endophytic Fungus *Fusarium Solani* Isolated from *Camptotheca Acuminate*.” *African Health Sciences*, vol. 17, no. 2, 17 July 2017, p. 566, https://doi.org/10.4314/ahs.v17i2.34. Accessed 23 June 2021.

17.Pham, Hong Ngoc Thuy, et al. “Phytochemicals Derived from Catharanthus Roseus and Their Health Benefits.” *Technologies*, vol. 8, no. 4, 21 Dec. 2020, p. 80, https://doi.org/10.3390/technologies8040080.

18.Vijayakumar, Tharani, et al. “Evaluation of the Anti-Carcinogenic Effect of Centella Asiatica on Oral Cancer Cell Line: In Vitro Study.” *Asian Pacific Journal of Cancer Prevention: APJCP*, vol. 24, no. 5, 1 May 2023, pp. 1695–1700, pubmed.ncbi.nlm.nih.gov/37247290/, https://doi.org/10.31557/APJCP.2023.24.5.1695. Accessed 1 Jan. 2024.

19.Apichai Pornprasertpol, et al. “Anticancer Activity of Selected Colocasia Gigantia Fractions.” *PubMed*, vol. 98 Suppl 1, 1 Jan. 2015, pp. S98-106. Accessed 1 Sept. 2024.

20.Hasan, Mohammad Raghibul, et al. “An Update on the Therapeutic Anticancer Potential of Ocimum Sanctum L.: “Elixir of Life.”” *Molecules*, vol. 28, no. 3, 1 Jan. 2023, p. 1193, www.mdpi.com/1420-3049/28/3/1193, https://doi.org/10.3390/molecules28031193.

21.Alves, Fabrine Silva, et al. “Evaluation of Antimicrobial Activity and Cytotoxicity Effects of Extracts of Piper Nigrum L. And Piperine.” *Separations*, vol. 10, no. 1, 1 Jan. 2023, p. 21, www.mdpi.com/2297-8739/10/1/21, https://doi.org/10.3390/separations10010021. Accessed 5 Mar. 2024.

22.Pereira, M M, et al. “Zingiber Officinale Roscoe (Ginger) as an Adjuvant in Cancer Treatment: A Review.” *PubMed*, vol. 16, no. 3, 19 Oct. 2011, pp. 414–24. Accessed 1 Sept. 2024.