Medicinal plants-A versatile source of anticancer agents

Tanu Bansal and Harpreet Kaur*

School of Chemical Engineering and Physical Sciences
Lovely Professional University, Phagwara

Plants are always remained the part of medicines from very ancient times. Ayurveda and Unani forms of medication use plants for remedy. Even nowadays due to increasing health hazards and toxicity in the environment the need to use herbal methods for treatment of ailment become priority of the scientists. Hence, these essential oil forms the important part of therapeutic industry as they show anti- bacterial and anti- fungal potencies.

Essential oils are basically volatile oil, obtained by distillation and possessing a distinctive scent, of a plant or other source from which it is extracted. These are either in the chloroplastic layer of the root, the vesiingic layer of the cell wall, or the hydrolysis of other glycosides. Many essential oil constituents of the same plant can be derived from different parts of plants with entirely different properties [1]. They are developed using a variety of methods, steam distillation is a common process, whereas other methods such as mechanical expression, solvent extraction or surface fluid extraction are often used [2]. The key components of these oils are terpenoids synthesized from isoprene [3] followed by diterpenes and aromatic compounds [4].

Not only in the field of medicines, they are now widely used in food industry, perfume industry, in aromatherapy, in cosmetic industry etc. and it’s all because of their toxicity and are not harmful for ecosystem. Their wide usage is creating more and more interest of researches to use them in different other fields and replace the synthetic chemical products.

Approximately 3000 of essential oil are known in the present scenario and out of them 300 are commercially used in different industries for human existence in this chemical scenario. The quality, quantity and composition of the extracted product can vary depending upon soil, climate, age of plant, plant organ and vegetative cycle stage[5]. Various researches have been carried out on the plant oil and plant extract of essential oil-bearing plants. Cancer being one of the leading causes of motality and the number of cancer cases is growing slowly across the globe. There are various medications available in the market for treatment of different forms of cancer, but none of the drugs is known to be fully effective and safe. The biggest issue with cancer chemotherapy is the limitation of efficacy of used drugs. However, plants and plant-based products have been shown to be efficient and healthy in the cure and control of cancers. Hence, nowadays, much of the scientific work is engrossed in plants and plants extracted from natural products. Plants have been used for the health benefits of all cultures since ancient times, as well as the source of medicinal drugs. Approximately 80-85 per cent of the global population are estimated to
rely on conventional medicines for their primary health care needs, and it is believed that a large part of traditional therapy requires active principles or the use of plant extracts as such [6].

**Plants having anticancer agents:**

The hexane extract of *P. amarus* and the various distilled lignans, that are nirtetraline, niranthrin, phyllanthin, phyltetraline, have been reported to be efficient in inhibiting P-glycoprotein function *in vitro*. In addition, these lignans, have been used in combination with daunorubicin, the combination acts as an excellent multidrug resistant agent [7]

![Phyllanthin](image1)

![Nirtetralin](image2)

![Phyltetralin](image3)

Curcumin is related to its activity to inhibit the growth of many angiogenesis-associated and genetumor.

![Curcumin](image4)

Fruit from *A. Atemoya* contains bullatacin, acetogenin believed to have anti-tumor activities. Bullatacin causes chromatin marginalization and condensation of tumor cells, accompanied by apoptosis. [8]

![Bullatacin](image5)

Isomeric triterpenediol consisting of a mix of 3α, 24-dihydroxyurs-12-ene (2) and 3α, 24-dihydroxyolean-12-ene (3) of *Boswellia serrata* causes cancer cells apoptosis. [9]

![Isomeric triterpenediol](image6)
Camptothecines have a wide variety of anti-tumor activities. Camptothecines, have found to be good inhibitors of synthesis of nucleic acid in L-120 cells and HeLa cells.[10]

Andrographolide showed cytotoxicity against a range of cancers. For instance, andrographolide are cytotoxic against, human epidermoid cancer cells, HCT-116 colon cancer and lymphocytic leukemia, and breast cancer cells (MCF-7).[11]

**Morinda citrifolia**

Two glycosides for example, 6-O-(β-D-glucopyranosyl)-1-O-octanoyl-β-D-glucopyranose (A) and Asperlosidic acid (B) were extracted from the n-butanol soluble noni extract. Their medicinal value was studied in the mouse epidermal cell line JB6 and it was found to suppress TPA-(12-O-tetradecanoyl-phorbol-13-acetate) and EGF(epidermal growth factor)-mediated cell changes, related API activity.[12]

Compounds damnacanthal, anthraquinone is isolated from the roots of the plant and tested for human colorectal cancer cell lines (HCT-116, LoVo, and SW480) and has been observed to stop cell growth as well as to induce caspase activity in colorectal cancer cells.[13]
These compounds were tested against TPA-induced early antigen Epstein-Barr virus (EBV-EA) activation, all of which show inhibitory activity with IC50 values of 386 - 578 mol /32 pico mol TPA [14].

\[ \text{IC50 values for Zanthoxylum americanum} \]

Zanthoxylum americanum –
Four isolated pyranocoumarins, i.e. dipetalyne(1), alloxanthoxyletin(2), xanthoxyletin(3) and xanthyletin(4), and two lignans, sesamine(5) and asarine(6), were active against HL-60 (human leukemia) cells, with IC50 values ranging from 2.18 μM to 15.28 μM [15]
**Blumea balsamifera** – on fractionation, leaves extract of plants yielded flavonoids, out of which four major constituents are 5,7,3',5'-tetrahydroxyflavanone- luteolin-7-methyl ether dihydroquercetin- 7,4'-dimethyl ether, Rhamnetin, these exhibited anti-cancer activity against human lung cancer cell line (NCI-H187) [16]
**Ferulago angulate**- Methanol crude extract from *F. Angulata* demonstrated tumor-specific, dose-dependent and time-dependent inhibitory effect on the spread of lymphoma and leukemic cells, likely through apoptosis-dependent pathway[17].

**Callistemon citrinus**- The hexane extract of the leaves of the plant demonstrated anti-cancer activity in Osteosarcoma (MG-63), Skin Carcinoma (A431), and Human Keratinocyte (HaCaT) cell lines due to the existence of flavonoid, 1,8-Cineole. [18].

Conclusion:
Medicinal plants are very rich source of anticancer agents and this heritage could be harnessed to get more and more potent compounds that could be potential drugs.

**References**


