



### Research Article

## Polyphenols, alkaloids and ethanol extracts from medicinal plants in treatment of cancer

**Hamad Hassan\*<sup>1</sup> and Asad Mushtaq<sup>2</sup>**

<sup>1</sup>*Department of Horticulture MNS-University of Agriculture, Multan.*

<sup>2</sup>*Department of Biotechnology Bahauddin Zakariya University Multan.*

\*Corresponding author: [hamadhassa.hort@gmail.com](mailto:hamadhassa.hort@gmail.com)

### Abstract

The fundamental purpose of this review article is to bring forth discussion, summary, evaluation, and conclusion of treating cancer with medicinal plants. Cancer is amongst the most life-threatening diseases which dates back all the way to 1600 B.C. Cancer is a dangerous disease that mostly is caused when a part of human body witnesses uncontrolled division within the abnormal cells that slowly dismantle that particular body part's function until it spreads to death. With latest technology advancement in the medicine, scientists, doctors, and researchers have gathered legitimate facts of plants that could not only provide essential treatment but also help in future eradication of this disease. This review article consists of researches of theoretical, mathematical, and practical nature. In lieu of random cancer treatment approach, certain chemicals such as Polyphenols, Alkaloids, and ethanol will specifically be discussed throughout the paper followed by their possible extracts from medicinal plants. Furthermore, profound review of evaluation of antioxidant, anti-inflammatory, and properties of anti-cancer with medicinal plants will be discussed along with how it is utilized in the conventional medication production.

**Keywords:** Cancer, Medicinal Plants for Cancer, Polyphenols, Alkaloids, Ethanol

### Introduction

There are numerous medicinal plants found in abundant quantity on our planet. Scientists and researchers are on a surge to find and come up with advanced ways to utilize plants for the cure of various diseases. Considering Cancer for instance, has been in existence for quite some time and has become a rarely treatable disease. Chemical entities such as Alkaloids, Polyphenols, and ethanol have shown promising results over the time in regards of treating cancer. These are also called antioxidant compounds which are found in ample quantity in fruits and vegetables. According to several studies, flavonoids, lignins, and tannins (all phenolic compounds) along with vitamins A, C, E can easily be found in plants as antioxidants.

Since fruits and vegetables contain health benefits and more nutritional value which is good for the human body, medicinal plants have become prominent entity in today's medicine. Antioxidants carry ability to lessen and control the digestive damage (oxidative) by simply suspending the ROS (reactive oxygen species) that causes inhibiting oxidation in the body. Phenolic compounds such as Ascorbic acid and Beta Carotene are also being used widely around the world to reduce inflammation and Cancer probabilities.

This review article comprises of previous and latest researches made on the topic of

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extracting polyphenols, alkaloids, and ethanol extracts from medicinal plants specifically for the treatment of cancer. Yazan et. Al (2016) obtained a saponin steroidal that was partially characterized by means of RMN techniques. The same was isolated as from an extract hydroalcoholic that submitted to successive extractions with solvents of increasing polarity to the obtaining of one crude of saponin (extract n-butanoic) than him splitting through chromatographic methods using silica gel, reverse phase. The crude ethanolic extract was evaluated with Cancer Cell Lines MCF-7 (breast cancer hormones), A549 (Lung Cancer), HeLa (Cervical Cancer), MDAMB-231 (breast cancer), HT29 (Colon Cancer), and 3T3, showing the Phenolics-saponin steroidal rich portion of defatted kenaf seed displays unmistakable cytotoxicity to growth cells. Cell line HT29 was present amid to demonstrate a suitable rate ( $P < 0.05$ ) when experimented with the n-butanol portion. Roy et al. (2018) landed similar with suggestion that represents biotechnological implements. In general, their experiment was beneficial enough to conclude that the Kenaf (medicinal plant) extraction with n-Butanol Phenolics-Saponin showed significant healing to the Cancer cells Lines of Colon Cancer (HT29). To cater the issue, over 800 discrete phenolic compounds were experimented to distinguish bioactive compounds measurements. The first method that authors have described is extraction of phenolic compounds using solvents where methanol, hexane, and ethyl alcohol were analysed specifically antioxidant extraction from medicinal plants. One thing that is fascinating is that if there is even a slight presence of phenolic compounds in medicinal plants (leaves and seeds in particular), then approximate extraction can be obtain for cancer prevention. Zhang et. Al. (2017) investigated that organic water soluble of ethanol extraction can practically serve as better anticancer. Chen et. Al (2010) used *Inonotus Obliquus* (white rot fungus) to treat cell lines of Gastrointestinal Cancer. He used the ethanol extraction (80%) to obtain already preserved *I. obliquus* powder which later

was utilised with Jurkat Cells (HTLJ) and Daudi cell lines (HBLD). He further suggests that Microwave-Assisted Extraction (MAE) is yet another advanced technique that scientists believe could beneficially help in extraction of bioactive compounds from plants (Kuetee et. Al, 2017) Similar to this, Ultrasonic-Assisted Extraction (UAE) is widely used food-processing technique that scientists use to extract bioactive compounds from medicinal plants.

In conclusion, the study suggests that polyphenol extraction from medicinal plants is a cost-effective method because it lessens the use of solvents and further avoids the need for longer extraction which supports experiments of Prejeena, Suresh, and Varsha, (2017).

Finco et. Al (2016) experimented Bacaba (medicinal plant) with Phenolic and Alkaloid extracts to treat the Breast Cancer Cell Lines MCF-7. They compared the intracellular content of Dox and changing the number of stem and non-stem cells of the breast cancer line MCF-7 with the single and combined action of ionizing radiation, free Dox, dendrimers second generation loaded Dox (G2-Dox) and conjugates of the same dendrimers with a vector protein and Dox (3D-G2-Dox). USC was identified by flow cytometry by the ability of these cells to pump out into the extracellular environment the fluorescent dye Hoechst33342 and form a population that is poorly coloured by this colorant (side population SP). The results of the study indicate a relatively low intracellular content of Dox in USC (SP) compared to the rest of the cells (NSP) using all the compounds studied, which largely explains the difference in cytotoxic effect of these compounds to different cell populations. Under the influence of the Dox compounds used, the absolute number of NSP cells decreased, while the number of SP cells tended to increase. Alhourani et al. (2018) conducted an experiment on the Jordanian plants that resulted positive as anticancer material.

As a result, the average proportion of SP cells increased to 13.1%, 4.2% and 3.4% after incubation with free Dox, G2-Dox and

3D-G2-Dox, respectively, accounting for 1.8% ( $p < 0,05$  in comparison with the control in all cases) (Nile, S. H., Nile, A. S., & Keum, 2017). Apparently, a more effective approach to elimination of OSK is the use of transport systems based on nanoparticles that provide targeted delivery to the USC of chemotherapy drugs with a selective effect on this particular cell population, including OSK differentiation agents and inhibitors of the dedifferentiation of the remaining cells. The experiment showed a promising result as the apoptotic effect of bacaba fruit extract obtained healing parameters which was the objective of this work (Kallassy et al. 2017).

Mohan, Jeyachandran, & Deepa (2012) classified Alkaloids as naturally occurring compounds that group of nitrogen atoms. Apart from other Alkaloids usage, these chemical compounds have the strong anti-cancer ability to fight against cancers. Mbaveng et. Al. (2018) provides essential discussion over how potent Alkaloids anticancer fighting strength can be identified and isolated from medicinal plants.

Found anticancer agents of Alkaloids in the study includes indole Alkaloids such as Vinblastine, Vincristine, Camptothecin, Vindesine, Coronaridine, Taxol, Montamine, Berbine, and few Indole Alkaloids. The paper of Gul et. Al. (2018) has briefly described the chemical structure and requires nomenclature that demonstrates which and how Indole Alkaloids of excellent anti-cancer strength can be extracted from medicinal plants.

Koti et. Al (2017) experimented several remedial flowers specifically for curing different types of Cancer. *Myrtus communis* (Mort) showed an excessive amount of cytotoxic activity on Cancer Lines MCF7 (Breast Cancer). With Polyphenols and ethanol extraction, *Myrtus* reacted positively to the cell layer of the MCF7 along with cell cytotoxic effects.

*Rosa damascenes* Mill, or Damask Rose was also used in the process having tannin as active ingredient with Phenolics. The toxic effect results of this plant showed substantial results that were tested with

Breast Cancer Cell Lines (MCF7). And Lung Cancer Cell lines (A549). Furthermore, Damask Rose (essential oil) also has astonishing results for cervical cancer cell lines (HeLa) that shows similar results as shown in Ghagane et. Al (2017). Several research centres in South Asia and America are utilising the Rose plant in two different ways to cure the gastric cancer cell lines; the soluble phase and flow cytometry that consists of cell death. Thompson et. Al (2017) suggests that it destroys the gastric cancer cell lines from layer only if appropriate apoptosis mechanism is applied in certain atmospheric conditions. Hijazi et. Al (2017) states that chemical composition of medicinal plants especially Extract from Leaves and Stems of Lebanese *Anacyclus nigellifolius* Boiss could be beneficial in medicine.

Cancer treatment from medicinal plants experiments are normally divided into several phases, each in correspondence to Human Cancer cultures. The ethanol extracted samples first undergo atmospheric tests to check whether the environment has any impact on its strength or not (Lee et. Al 2018). Further, the cell lines from human were also taken into consideration to check the growth of primary human cancer cultures followed by DNA laddering and few other techniques. Akinrinde et. Al (2018) suggests that Plants used for the management of diabetes mellitus in Eastern Cape could result positive.

For better understanding and clarity in the context, ethanol extraction experimented during the study were found to be killing anticancer agents that completely eradicated human tumor cancer cells in both cancer patients. This research is a cell-death extraction by whole plant which demonstrated strong and promising anticancer agents for breast cancer. Gupta et. Al. (2018) found Significance in reference to Diabetes Mellitus in their experiment.

*Taverniera Spartea* D (Medicinal plant grows near Iran-Pakistan) was used with methanol extract, chloroform fractions. Surprisingly, the obtained toxic effects were tested for breast cancer cell lines

MCF-F and BT-474 which also supports the Cimanga Kanyanga et. Al. (2018). The plant has been named anti-cancer plant for its further breakthrough when experimented with ethanol extraction and PC-3 and DU-145 (human prostate cancer cell lines).

Abdel\_Salam et. Al. (2018) suggests that the reasons why these unrivalled results were successful is because analysis of breast cancer experiment. Also, the plant flowers in March so that's means only seasons researches on Silver Spartea plant can be conducted.

According to this study, cancer cannot be cured instantly by testing a drug but rather it should be treated with general legal drug approaches that are effective, less-toxic, and have inconsequential atmospheric effects. The study also focuses the chemoprevention by phenolic phytochemicals which is significantly low-cost, pertinent, and beneficial for the control and management of cancer (Shipton et. Al. 2017).

Abu-Darwish and Efferth (2018) have utilized ethanol and Polyphenol extraction with water and *Leptadenia pyrotechnica* (Forssk) Decne that is a local restorative herbal originate in the inlet nations. The utilised Polyphenol extraction were n-hexane, ethyl acetic acid derivation and n-butanol (Azad et. Al., 2018). The blend was utilized again Colon Cancer cell lines such as HCT116 also known as 'wild type' and HCT116 which is the subsidiary cell line called 'p53 knockout'. The plant showed the most astounding cytotoxic action against both cell lines and lessened cell feasibility in a measurement and time-subordinate way. Joseph Anna et.

Al (2017)'s study is quite similar which is merely is about Effects of ethanolic extracts of *Cola millenii* K. Schum seed on biochemical.

The mixture was placed in ethanol and a mixture process is made with different solvents in order to extract its compounds, obtaining several extracts. Two things are done with the extracts. On the one hand, they are fractionated and applied to tumor cells to know the different biological effects of the *L. pyrotechnica*. The group observed

antitumor effects in those extracts of the plant produced from a mixture of ethyl acetate and other solvents, in different proportions. The authors have discussed some of previous researches that highlight significant antioxidant activity in vitro and vivo that resulted in positive. But researchers claim that extraction of medicinal plants for cancer treatment must not be taken for granted as new and improved methods have come during the last three decades. Apart from theoretical criticism, the result of Augustine, A., & Pillai (2017) study produced more quantitatively acceptable ratio of total antioxidant capacity and total phenolic content extracted from medicinal herbs. In fact, the Chinese traditional medicinal plants with anticancer association.

Scientists from the National Polytechnic Institute (IPN) study an endemic plant in the state of Tabasco, known as *Kalanchoe Flammaea*, whose properties could be used for the treatment of prostate cancer (Kaur et. Al. 2017).

Asadi-Samani et. Al (2018) experimented on a plant that has a species native to Asia, where the original *Kalanchoe Pinnea* shrub has been pulverized and used in capsules to treat some types of cancer (Prostate Cancer Cell Lines HDF, PC-3, and DU145). Euphorbia et al. observed the remarkable and what they believe is a break-through anti-cancer effect obtained from PC-3. The experiment showed that PC-3 produced promising results than other herbs. Furthermore, IC50s for common nettle (*Urtica dioica*) showed significantly displayed lower rate when experimented along with DU-145 at a certain temperature. Talole, B., Salve, P., & Waje (2017) suggests that cancers can be treatable by Phytochemical screening and determination of total phenolic content of *Citrullus colocynthis* Linn.

To proceed further with in-depth effect study of the cytotoxicity of homoeopathic flora. Certain plants were collected in the region of Chaharmahal and Bakhtiari Province found that the normal cells from collected herbs had unique effects when underwent a brief experiment with ethanol extraction. It was found that the plants have

intriguing effect on Human Dermal Fibroblasts (HDF) cell lines.

The general consensus of the entire aforementioned research concludes that there are numerous natural ways to cure cancer but unfortunately due to less study and funding such findings only remain in the books or the internet. Extractions of ethanol, alkaloids, and polyphenol have promising effects in regard to the cancer treatment. Even though, such extracts can easily be available, the rate of cancer diseases is still at peak. Several doctors rather prefer to use drugs over such medicinal herb extraction.

## References

- Abdel-Salam, I. M., A.M. Ashmawy, A. M., Hilal, O. A. Eldahshan, and M. Ashour. 2018. Chemical composition of aqueous-ethanol extract of *Luffa cylindrica* leaves and its effect on representation of caspase 8, caspase 3 and the proliferation marker Ki67 in intrinsic molecular sub\_types of breast cancer in vitro. *Chemistry & biodiversity*.
- Abu-Darwish, M. S. and T. Efferth. 2018. Medicinal Plants from Near East for Cancer Therapy. *Frontiers in pharmacology*. 9: 56.
- Akinrinde, A. S., A.J. Afolayan and G. Bradley. 2018. Phytochemical composition and antioxidant activities of *Dianthus Thunbergii* hooper and *Hypoxis Argentea* harv ex baker: Plants used for the management of diabetes mellitus in Eastern Cape, South Africa. *Pharmacognosy magazine*. 14:195.
- Alhourani, N., V. Kasabri, Y. Bustanji, R. Abbassi and M. Hudaib. 2018. Potential Antiproliferative Activity and Evaluation of Essential Oil Composition of the Aerial Parts of *Tamarix aphylla* (L.) H. Karst.: A Wild Grown Medicinal Plant in Jordan. *EvidenceBased Complementary and Alternative Medicine*. 2018.
- Asadi-Samani, M., M. Rafieian-Kopaei, Z. Lorigooini and H. Shirzad. 2018. A screening of growth inhibitory activity of Iranian medicinal plants on prostate cancer cell lines. *BioMedicine*, 8:2.
- Augustine, A. and G.S. Pillai. 2017. Cancer Combating Biomolecules From Plants. In *Bioresources and Bioprocess in Biotechnology*. Springer, Singapore. 185-199
- Azad, A. K., M.A. Jainul and Z.K. Labu. 2018. Cytotoxic Activity on Brine Shrimp, MCF-7 Cell Line and Thrombolytic Potential: Seven Different Medicinal Plant Leaves Extract. *Journal of Scientific Research*. 10: 175-185.
- Chen, Y., X. Gu, S.Q. Huang, J. Li, X. Wang and J. Tang. 2010. Optimization of ultrasonic/microwave assisted extraction (UMAE) of polysaccharides from *Inonotus obliquus* and evaluation of its anti-tumor activities. *International Journal of Biological Macromolecules*. 46: 429-435.
- Cimanga Kanyanga, R., F. M. Bool-Miting, G. Tona Lutete, O. Kambu Kabangu, A.J. Vlietinck and L. Pieters. 2018. Antibacterial screening of aqueous extracts of some medicinal plant and their fractions used as antidiarrheal agents in Kinshasa-Democratic Republic of Congo. *World journal of pharmacy and pharmaceutical sciences*, 7: 223-242.
- Finco, F. D. B. A., L. Kloss and L. Graeve. 2016. Bacaba (*Oenocarpus bacaba*) phenolic extract induces apoptosis in the MCF-7 breast cancer cell line via the mitochondria-dependent pathway. *NFS Journal*. 5: 5-15.
- Ghagane, S. C., S.I. Puranik, V.M. Kumbar, R.B. Nerli, S.S. Jalalpure, M.B. Hiremath and R. Aladakatti. 2017. In vitro antioxidant and anticancer activity of *Leea indica* leaf extracts on human prostate cancer cell lines. *Integrative medicine research*, 6: 79-87.
- Gul, M. Z., M.Y. Bhat, R. Maurya, I.A. Qureshi and I. A. Ghazi. 2018. In vitro Evaluation of Antioxidant and

- Antiproliferative Activities of Artemisia nilagirica Extracts. Indian Journal of Pharmaceutical Sciences. 79: 872-884.
- Gupta, N., T. Gudipati. and G.B.K.S. Prasad. 2018. Plant Secondary Metabolites of Pharmacological Significance in Reference to Diabetes Mellitus: An Update. Int. J. Curr. Microbiol. App. Sci, 7: 3409-3448.
- Hijazi, A., A. Sabbah, F. As-Sadi, S. Zeiter, H. Rammal and M. Nasser. 2017. Antioxidant, Antiproliferative Properties and Chemical Composition of the Ethanolic Extract from Leaves and Stems of Lebanese Anacyclus nigellifolius Boiss.
- Joseph Anna, U. B. O. N., M.I. Akpanabiatu and E. Okon. 2017. Effects of ethanolic extracts of Cola millenii K. Schum seed on biochemical and toxicological indices of male wistar albino rats. Journal of Pharmacognosy and Phytochemistry. 6:160-166.
- Kallassy, H., M. Fayyad-Kazan, R. Makki, Y. El-Makhour, E. Hamade, H. Rammal and B. Badran. 2017. Chemical Composition, Antioxidant, Anti-Inflammatory, and Antiproliferative Activities of the Plant Lebanese Crataegus Azarolus L. Medical science monitor basic research. 23: 270.
- Kaur, K., G. Kaur R. Kaur. 2017. Withania somnifera: An important herb in Ayurveda and Indigenous Medicinal System. Journal of Plant Science Research. 33(2).
- Kooti, W., K. Servatyari, M. Behzadifar, M. Asadi-Samani, F. Sadeghi, B. Nouri and H. ZareMarzouni. 2017. Effective medicinal plant in cancer treatment, part 2: review study. Journal of evidence-based complementary & alternative medicine, 22: 982-995.
- Kuete, V., F.W. Fokou, O. Karaosmanoğlu, V.P. Beng and H. Sivas. 2017. Cytotoxicity of the methanol extracts of Elephantopus mollis, Kalanchoe crenata and 4 other Cameroonian medicinal plants towards human carcinoma cells. BMC complementary and alternative medicine. 17: 280.
- Lee, K. W., S.M. Ching, F.K. Hoo, V. Ramachandran and M.K. Swamy. 2018. Traditional Medicinal Plants and Their Therapeutic Potential Against Major Cancer Types. In Anticancer Plants: Natural Products and Biotechnological Implements Springer, Singapore. 383-410.
- Mbaveng, A. T., H.T. Manekeng, G.S. Nguenang, J.K. Dzotam, V. Kuete, and T. Efferth. 2018. Cytotoxicity of 18 Cameroonian medicinal plants against drug sensitive and multifactorial drug resistant cancer cells. Journal of ethnopharmacology, 222: 21-33.
- Mohan, K., R. Jeyachandran and R. Deepa. 2012. Alkaloids as anticancer agents. Ann. Phytomed. 1: 46-53.
- Nile, S. H., A.S. Nile and Y.S. Keum. 2017. Total phenolics, antioxidant, antitumor and enzyme inhibitory activity of Indian medicinal and aromatic plants extracted with different extraction methods. Biotech. 7: 76.
- Prejeena, V., S.N. Suresh and V. Varsha. 2017. Phytochemical screening, antioxidant analysis and antiproliferative effect of costus pictus d. Don leaf extracts. Cell. 2: 974.
- Roy, A., N. Jauhari and N. Bharadvaja. 2018. 6 Medicinal Plants as Anticancer Plants: Natural Products and Biotechnological Implements. 2:109.
- Shipton, F. N., T.J. Khoo, M.S. Hossan and C. Wiart. 2017. Activity of Pericampylus glaucus and periglaucone A in vitro against nasopharyngeal carcinoma and anti-inflammatory activity. Journal of ethnopharmacology. 198: 91-97.
- Talole, B., P. Salve and M. Waje. 2017. Phytochemical screening and determination of total phenolic content of Citrullus colocynthis Linn. International Journal of

- Pharmaceutical and  
Phytopharmacological Research, 3:  
44-45.
- Thompson, M., Y. Jaiswal, I. Wang and L.  
Williams. 2017. Hepatotoxicity:  
Treatment, causes and applications of  
medicinal plants as therapeutic  
agents.
- Yazan, L. S., N.A. Rahman, K.W. Chan,  
W.N.H.W.A. Ghani, Y.S. Tor and  
J.B. Foo. 2016. Phenolics-saponins  
rich fraction of defatted kenaf seed  
meal exhibits cytotoxicity towards  
cancer cell lines. Asian Pacific  
Journal of Tropical Biomedicine, 6:  
404-409.
- Zhang, L., C. Khoo, S.R. Koyyalamudi,  
N.D. Pedro and N. Reddy. 2017.  
Antioxidant, antiinflammatory and  
anticancer activities of ethanol  
soluble organics from water extracts  
of selected medicinal herbs and their  
relation with flavonoid and phenolic  
contents.  
Pharmacologia, 8: 59-72.