



"Natural Remedies: A Comprehensive Review of Herbal Medicines in Oncology

Satpute Nikita Ramdas¹, Mule Abhijeet Balasaheb², Shinde Trupti Suresh³, Shejwal Payal Rajaram⁴, Shinde Sakshi Santosh⁵, Maniyar Sana⁶

Mail id:- nikitasatpute53@gmail.com, sakshishinde7023@gmail.com
abhimule9999@gmail.com, shindetrupti024@gmail.com, shejwalpayal9@gmail.com

ABSTRACT:

Cancer, characterized by the uncontrolled proliferation of abnormal cells, poses significant health challenges worldwide. This review explores the role of herbal medicine in cancer treatment, emphasizing the diverse bioactive compounds present in medicinal plants and their therapeutic potential. Key groups of bioactive compounds, including flavonoids, alkaloids, terpenoids, and polyphenols, exhibit notable anti-cancer properties through mechanisms such as apoptosis induction, cell cycle inhibition, and modulation of signaling pathways. Notable examples include curcumin from turmeric, which showcases antioxidant and anti-inflammatory effects, and epigallocatechin gallate (EGCG) from green tea, known for its tumor-inhibiting capabilities. The review also highlights the potential of Aloe vera, ginger, and garlic, among others, in promoting healing and enhancing immune response. Recent studies underscore the promise of these natural products as adjunct therapies, offering protection against various types of cancer while minimizing side effects associated with conventional treatments. Furthermore, the multifaceted action of these compounds against cancer their potential in integrated cancer management strategies. The mechanisms of action and therapeutic benefits of herbal medicines, this review advocates for their inclusion in cancer treatment regimens, the way for further research into their applications in oncology. Cancer prevention and treatment, addressing the urgent need for effective therapeutic options in the fight against cancer.

Keywords: Herbal Medicine, Bioactive Compounds, Cancer Treatment, Apoptosis, Antioxidants, Phytochemicals

Introduction:

Cancer is a complex disease characterized by the uncontrolled growth of abnormal cells in the body, referred to as cancer cells, malignant cells, or tumor cells. These cells originate from normal cells that have undergone mutations, which cause them to evade programmed cell death (apoptosis). Rather than dying as they should, these abnormal cells continue to divide and proliferate, leading to the formation of cancerous tissue. Cancer types are typically named after the organ or tissue from which they arise. Common examples include breast cancer, lung cancer, and skin cancer.(1) This uncontrolled growth can invade surrounding tissues, disrupting normal bodily functions. A particularly concerning aspect of cancer is its ability to metastasize. Metastasis occurs when cancer cells detach from the primary tumor, travel through the bloodstream or lymphatic system, and establish new tumors in other organs. For instance, if breast cancer cells spread to the bones, it is termed metastatic bone cancer.(2) Other prevalent cancer types include bladder cancer, colon and rectal cancer, endometrial cancer, kidney cancer, leukemia, liver cancer, melanoma, non-Hodgkin lymphoma, pancreatic cancer, prostate cancer, and thyroid cancer. The understanding of cancer has evolved significantly over time. In 1775, British surgeon Percivall Pott was the first to identify a link between environmental factors and cancer, noting the high incidence of scrotal cancer among chimney sweeps. Early research efforts varied, but significant breakthroughs were made through collaboration among physicians. The advent of microscopy in the 18th century provided insights into the spread of what was termed "cancer poison" from the original tumor to lymph nodes and other sites, a concept articulated by English surgeon Campbell De Morgan between 1871 and 1874.(3)

Natural products have emerged as promising anti-cancer agents, primarily due to their diverse chemical structures and biological activities. This review highlights their central role in cancer treatment, emphasizing their mechanisms of action and therapeutic benefits. Herbal medicine, which has been utilized for centuries, consists of medicinal plants that possess therapeutic properties. These plants contain a multitude of chemical compounds that can offer protection against various diseases, including cancer.(4) Many phytochemicals exhibit potential biological functions, but the complexity of their interactions means that the efficacy of whole-plant preparations is often uncertain. Moreover, the concentration and safety of phytochemicals in medicinal plants require extensive scientific investigation to confirm their therapeutic potential. Natural products have emerged as promising anti-cancer agents, primarily due to their diverse chemical structures and biological activities.(5) This review highlights their central role in cancer treatment, emphasizing their mechanisms of action and therapeutic benefits.

Bioactive Compounds in Medicinal Plants: A Focus on Anti-Cancer Properties:

Medicinal plants contain various bioactive compounds that exhibit significant pharmacological effects, particularly anti-cancer properties. These compounds can be categorized into four main groups: flavonoids, alkaloids, terpenoids, and polyphenols.(6) Flavonoids, found in nearly all fruits and vegetables, are known for their antioxidant properties, which help protect cells from oxidative damage. They can inhibit the growth of cancer cells and reduce inflammation, enhancing their potential for cancer prevention and treatment. Alkaloids, which include nitrogen-containing compounds like vincristine and vinblastine derived from the Madagascar periwinkle (*Catharanthus roseus*), are recognized for their analgesic and anti-cancer effects, as they interfere with mitotic spindle formation and prevent cancer cell division.(7) Terpenoids, the largest and most diverse group of plant secondary metabolites, play crucial roles in plant defense and exhibit medicinal properties.(8) A notable example is Taxol (paclitaxel), extracted from the bark of the Pacific yew tree (*Taxus brevifolia*), which is widely used in cancer chemotherapy for its ability to disrupt cell division and inhibit tumor growth. Lastly, polyphenols, characterized by multiple phenol groups, are well-known for their antioxidant and anti-inflammatory properties.(9) Compounds like resveratrol, found in grapes and red wine, have shown promise in cancer prevention and treatment by modulating signaling pathways involved in cell growth, apoptosis, and metastasis.(10)

Aloe Vera: A Potent Natural Resource in Cancer Treatment:

Aloe vera, derived from the dried juice of the leaves of *Aloe barbadensis* Miller (commonly known as Curacao aloe), *Aloe perryi* Baker (Socotrine aloe), and *Aloe ferox* Miller, along with hybrids of these species like *Aloe africana* Miller and *Aloe spicata* Baker (referred to as Cape aloe), belongs to the family Liliaceae. This versatile plant has gained recognition for its wide array of medicinal properties, particularly in the realm of cancer treatment. Aloe vera contains over 75 potentially active constituents, including vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids. Among its rich composition, vitamins A (in the form of beta-carotene), C, and E stand out for their antioxidant properties, which play a crucial role in protecting cells from oxidative stress. Additionally, Aloe vera provides essential nutrients such as vitamin B12, folic acid, and choline, contributing to its overall health benefits.

Research has highlighted two primary fractions of Aloe vera believed to possess anti-cancer properties: glycoproteins (specifically, lectins) and polysaccharides. Various studies have demonstrated the antitumor activity of Aloe vera gel, showcasing its ability to reduce tumor burden, promote tumor shrinkage, induce tumor necrosis, and extend survival rates in cancer models. These findings suggest that Aloe vera may serve as an adjunct therapy in cancer management. One of the notable mechanisms by which Aloe vera exerts its anticancer effects involves the induction of glutathione S-transferase, an enzyme that plays a key role in detoxifying harmful substances in the body. Additionally, Aloe vera has been shown to inhibit the tumor-promoting effects of phorbol myristate acetate, indicating its potential in cancer chemoprevention. This protective action suggests that Aloe vera may help mitigate the effects of carcinogenic agents, thereby reducing cancer risk. Aloe vera appears to have an indirect antitumor effect through its ability to stimulate the immune response. By enhancing immune function, Aloe vera may assist the body in identifying and combating cancer cells more effectively. This immune-boosting capability makes Aloe vera a valuable ally in the holistic approach to cancer treatment. (11)

Tea: A Potent Source of Antioxidants and Disease-Fighting Compounds:

Tea is derived from the prepared leaves and leaf buds of *Thea sinensis* (Linne) Kuntz, a plant belonging to the family Theaceae. It is widely consumed for its rich flavor and numerous health benefits, owing to its remarkable composition. (12) The leaves of tea are primarily known for their caffeine content, which ranges from 1-5%. Along with caffeine, tea contains small amounts of theobromine and theophylline, both of which contribute to its stimulating effects. The characteristic color of tea leaves is due to the presence of tannins, specifically gallotannic acid, which constitutes 10-20% of the tea's dry weight. Additionally, the pleasant aroma of tea is attributed to the presence of yellow oil in the leaves. Beyond these basic components, tea contains a wide range of bioactive compounds. A study conducted by the USDA in 2006 identified over 700 different compounds in tea, many of which have been shown to exhibit disease-fighting properties. Among these compounds are polysaccharides, flavonoids, vitamins, and amino acids, all of which contribute to tea's health-promoting effects. Flavonoids, in particular, are powerful antioxidants that help protect the body from oxidative stress and damage caused by free radicals. All varieties of tea—whether green, white, black, or oolong—are rich in antioxidants, which have been recognized for their anti-aging and anti-tumor properties. These antioxidants, such as catechins found in green tea, play a crucial role in neutralizing free radicals, thereby reducing the risk of chronic diseases, including cancer. Additionally, tea has been shown to have high levels of vitamin C, a potent antioxidant known for its ability to combat cancer-causing free radicals and support immune function. Tea's health benefits extend beyond its antioxidant content. It has a low glycemic index, meaning it has minimal impact on blood sugar levels, making it an excellent choice for individuals looking to manage or prevent diabetes. Tea possesses strong cleansing properties, aiding in the detoxification of the body. Regular consumption of tea has been linked to improved cardiovascular health.(13)

Ginger:

Ginger, derived from the dried rhizomes of *Zingiber officinale* Roscoe, belongs to the Zingiberaceae family. This spice is celebrated not only for its culinary applications but also for its numerous health benefits, largely attributed to its rich nutritional profile.(14) The primary constituents of ginger rhizomes include carbohydrates (50-70%) and lipids (3-8%), alongside a diverse array of bioactive compounds such as terpenes and phenolic substances. The terpene components in ginger are particularly noteworthy, featuring compounds like zingiberene, β -bisabolene, α -farnesene, β -sesquiphellandrene, and α -curcumene. These terpenes contribute to ginger's distinctive aroma and flavor. Additionally, ginger is rich in phenolic compounds, notably gingerol, paradol, and shogaol, which are present in significant quantities. Gingerols constitute about 23-25% of the rhizome, while shogaols account for approximately 18-25%. These compounds are primarily responsible for the pungent taste and therapeutic properties of ginger. Beyond these, ginger also

contains amino acids, dietary fiber, ash, proteins, phytosterols, vitamins (including nicotinic acid and vitamin A), and essential minerals. Other compounds related to gingerol and shogaol, such as 6-paradol, 1-dehydrogingerdione, 6-gingerdione, 10-gingerdione, 4-gingerdiol, 6-gingerol, 8-gingerdiol, and 10-gingerdiol, have been identified within the ginger rhizome. Additionally, diarylheptanoids contribute to its pharmacological activities. The health benefits of ginger extend beyond its flavoring capabilities.(15)

Turmeric:

Turmeric, obtained from the dried rhizome of *Curcuma longa* Linn. (syn. *C. domestica* Valetton), is a member of the Zingiberaceae family, known for its distinctive yellow color and myriad health benefits. The rhizome of turmeric contains 3-6% polyphenolic compounds collectively referred to as curcuminoids. Curcuminoids are the primary bioactive components responsible for turmeric's therapeutic properties, and this group comprises curcumin, demethoxycurcumin, and bisdemethoxycurcumin.(16)

Among the curcuminoids, curcumin is the most studied and potent compound. Curcumin has demonstrated superior superoxide anion scavenging activity compared to demethoxycurcumin and bisdemethoxycurcumin, making it a powerful antioxidant. This activity plays a key role in reducing oxidative stress in the body, which is linked to various chronic diseases. Additionally, curcumin exhibits strong anti-inflammatory properties, contributing to its broad therapeutic potential.

One of curcumin's most promising health benefits is its potential anti-cancer activity. Curcumin has been shown to selectively induce cancer cell death while sparing healthy cells. This selective toxicity is achieved through the suppression of the nuclear factor kappa B (NF- κ B) activation pathway, which is involved in various diseases driven by inflammation, including cancer. By inhibiting this pathway, curcumin can disrupt the growth and survival of cancer cells. Inflammation is a known contributor to cancer progression, and curcumin's ability to modulate this process offers a potential avenue for cancer prevention and treatment. Recent studies have highlighted the anti-cancer properties of curcumin, especially in animal models. When administered orally to laboratory mice, turmeric was found to be effective in preventing several types of cancers, including those of the stomach, lung, colon, breast, and skin. These studies suggest that curcumin's ability to inhibit cancer development may extend across multiple organs, providing a broad spectrum of protective effects.(17)

Table 1: Various Herbal Ingredients Useful for Natural Treatment of Cancer

Sr. No.	Herbal Product	Type of Cancer Targeted	Uses	Key Ingredients
1	Turmeric	Colon, Breast, Prostate	Antioxidant, anti-inflammatory, inhibits cancer cell growth	Curcumin(18)
2	Green Tea	Breast, Prostate, Skin	Antioxidant, inhibits tumor growth	Epigallocatechin gallate (EGCG) (19)
3	Ginger	Colorectal, Ovarian, Pancreatic	Reduces inflammation, anticancer	Gingerol, Shogaol
4	Garlic	Stomach, Colon, Prostate	Inhibits cancer cell proliferation, antioxidant	Allicin, Diallyl sulfide (20)
5	Ashwagandha	Breast, Lung, Colon	Boosts immunity, induces apoptosis	Withaferin A (21)
6	Ginseng	Lung, Liver, Colon	Anti-inflammatory, improves overall immunity	Ginsenosides
7	Milk Thistle	Liver, Prostate	Protects liver, antioxidant	Silymarin
8	Cat's Claw	Breast, Lung	Boosts immune response, antioxidant	Oxindole alkaloids (22)
9	Aloe Vera	Skin, Lung, Breast	Promotes healing, reduces inflammation	Polysaccharides, Aloin
10	Mistletoe	Breast, Pancreatic, Colon	Enhances immune function, reduces tumor growth	Viscotoxins, Lectins
11	Chinese Skullcap	Prostate, Liver, Breast	Inhibits tumor growth, anti-inflammatory	Baicalin, Wogonin (23)
12	Holy Basil (Tulsi)	Lung, Breast	Reduces oxidative stress, anticancer	Eugenol, Ursolic acid
13	Reishi Mushroom	Breast, Prostate, Lung	Boosts immunity, antioxidant	Polysaccharides, Triterpenes

14	Flaxseed	Breast, Prostate	Omega-3 rich, reduces tumor proliferation	Lignans, Omega-3 fatty acids
15	Berberine	Colorectal, Lung	Inhibits cancer cell proliferation	Berberine
16	Neem	Skin, Breast, Lung	Boosts immune response, antioxidant	Azadirachtin, Nimbolide
17	Lycopene (Tomato Extract)	Prostate, Lung, Stomach	Antioxidant, inhibits cancer cell growth	Lycopene
18	Black Cumin Seed	Colon, Breast, Pancreatic	Reduces inflammation, anticancer	Thymoquinone
19	Soursop (Graviola)	Breast, Pancreatic, Prostate	Induces apoptosis, anticancer	Acetogenins (24)
20	Phyllanthus Niruri (Bhumyamalaki)	Liver, Breast, Prostate	Protects liver, inhibits tumor growth	Phyllanthin, Hypophyllanthin

Polyphenols: Nature's Anticancer Agents:

Polyphenols represent a diverse class of compounds, recognized for their multiple phenolic rings in their structure. These phytochemicals can be categorized into several subgroups, including phenolic acids, stilbenes, and lignans. Found abundantly in the plant kingdom, polyphenols are prevalent in a variety of foods, particularly fruits, vegetables, grains, and beverages such as tea and wine. Key sources of polyphenols include grapes, berries, nuts, and green tea, making them accessible through a balanced diet. (25)

The health benefits of polyphenols has been widely studied, particularly their potential in cancer prevention and treatment. Numerous studies suggest that polyphenols possess significant anticancer properties, which can be attributed to several mechanisms of action. One of the most notable mechanisms is their antioxidant activity, which helps neutralize free radicals and reduce oxidative stress—two factors closely linked to cancer development. By combating oxidative damage to DNA, polyphenols may help lower the risk of cancer initiation. In addition to their antioxidant properties, polyphenols can modulate various cellular signaling pathways, influencing processes such as cell proliferation, apoptosis (programmed cell death), and angiogenesis (the formation of new blood vessels). For instance, resveratrol, a well-known stilbene predominantly found in grapes, has garnered attention for its ability to inhibit cell proliferation and induce apoptosis in a range of cancer cell lines. This compound exemplifies how polyphenols can disrupt cancer cell growth and promote cell death, presenting a promising avenue for therapeutic applications. (26)

Flavonoids: Powerful Polyphenols with Anticancer Potential:

Flavonoids are a class of polyphenolic compounds widely distributed in plants, characterized by their basic structure, which consists of two aromatic rings linked by a three-carbon bridge. These compounds can be classified into several subgroups, including flavonols, flavones, flavanones, isoflavones, and anthocyanidins. (27) Each subgroup has distinct chemical properties that contribute to their diverse biological activities. Found abundantly in fruits, vegetables, grains, nuts, and beverages like tea and wine, flavonoids are key dietary components. Common sources include citrus fruits, berries, onions, soybeans, and green tea, all of which are known to be rich in these compounds. The widespread availability of flavonoids through everyday foods makes them easily accessible for promoting health and preventing disease. Research has shown that flavonoids possess significant anticancer properties. One well-studied flavonoid, quercetin, has demonstrated the ability to induce apoptosis and inhibit the growth of cancer cells across multiple cancer types. By influencing key molecular pathways that control cell survival and death, quercetin exemplifies how flavonoids can target cancer cells while leaving normal cells largely unaffected. These properties highlight flavonoids' potential as safe and effective agents in cancer prevention and therapy. (28)

Alkaloids: Potent Bioactive Compounds with Therapeutic Potential:

Alkaloids are a diverse class of nitrogen-containing compounds, distinguished by their heterocyclic ring structure and well-known for their potent biological activities. These naturally occurring compounds are found in a variety of plant families, including Solanaceae (such as tobacco and tomato), Papaveraceae (opium poppy), and Ranunculaceae (buttercup). Alkaloids have been extensively studied for their medicinal properties and are frequently used as therapeutic agents due to their wide-ranging pharmacological effects. (29) One of the most significant applications of alkaloids lies in cancer treatment. Numerous alkaloids have shown promising anticancer properties by targeting critical cellular processes. (30) Similarly, vinca alkaloids (e.g., vincristine and vinblastine) and taxanes (e.g., paclitaxel) are well-known for their ability to disrupt microtubule dynamics. These compounds interfere with the formation and function of microtubules, which are critical for proper cell division. By preventing cancer cells from dividing, these alkaloids induce apoptosis and suppress tumor growth. Their ability to target rapidly dividing cancer cells makes them effective agents in chemotherapy. (31)

Conclusion:

Herbal medicine has emerged as a significant complementary approach in cancer treatment, the therapeutic potential of various medicinal plants and their bioactive compounds. Natural agents such as flavonoids, alkaloids, terpenoids, and polyphenols have shown notable anticancer properties through multiple mechanisms of action. Prominent plants like turmeric, green tea, ginger, and aloe vera have been recognized for their benefits, which include reducing inflammation, inducing apoptosis, and boosting immune responses. Furthermore, ongoing research emphasizes the need to comprehend the interactions and concentrations of these compounds to ensure their efficacy and safety in clinical applications. As oncology advances, the integration of herbal medicine with conventional treatments may for cancer management, potentially enhancing patient outcomes. By investigating the synergistic effects of herbal medicines in conjunction with standard cancer therapies, there is significant potential to improve therapeutic outcomes and provide patients with more comprehensive options in the battle against cancer.

REFERENCES:

1. Weinberg RA. How cancer arises. *Scientific American*. 1996 Sep 1;275(3):62-70.
2. Koul B, Koul B. Types of Cancer. *Herbs for Cancer Treatment*. 2019:53-150.
3. Moscucci O. *Gender and cancer in England, 1860-1948*. London: Palgrave Macmillan; 2016.
4. Wang H, Oo Khor T, Shu L, Su ZY, Fuentes F, Lee JH, Tony Kong AN. Plants vs. cancer: a review on natural phytochemicals in preventing and treating cancers and their druggability. *Anti-Cancer Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Anti-Cancer Agents)*. 2012 Dec 1;12(10):1281-305.
5. Naeem A, Hu P, Yang M, Zhang J, Liu Y, Zhu W, Zheng Q. Natural products as anticancer agents: current status and future perspectives. *Molecules*. 2022 Nov 30;27(23):8367.
6. Khan MI, Bouyahya A, Hachlafi NE, Menyiy NE, Akram M, Sultana S, Zengin G, Ponomareva L, Shariati MA, Ojo OA, Dall'Acqua S. Anticancer properties of medicinal plants and their bioactive compounds against breast cancer: a review on recent investigations. *Environmental Science and Pollution Research*. 2022 Apr;29(17):24411-44.
7. Sharma N, Singh I, Ajee RS, Kaushik S. *Catharanthus Roseus: A Source of Anticancer Phytomedicines*. In *The Catharanthus Genome 2022* Jan 24 (pp. 15-33). Cham: Springer International Publishing.
8. Gupta SC, Kim JH, Prasad S, Aggarwal BB. Regulation of survival, proliferation, invasion, angiogenesis, and metastasis of tumor cells through modulation of inflammatory pathways by nutraceuticals. *Cancer and Metastasis Reviews*. 2010 Sep;29:405-34.
9. Magrone T, Magrone M, Russo MA, Jirillo E. Recent advances on the anti-inflammatory and antioxidant properties of red grape polyphenols: in vitro and in vivo studies. *Antioxidants*. 2019 Dec 31;9(1):35..
10. Shukla Y, Singh R. Resveratrol and cellular mechanisms of cancer prevention. *Annals of the New York Academy of Sciences*. 2011 Jan;1215(1):1-8.
11. Bachynski M. *Nature's Cure: Healing the Body with Herbal Remedies*. eBookIt. com; 2024 Mar 27.
12. Mukhopadhyay M, Mondal TK, Chand PK. Biotechnological advances in tea (*Camellia sinensis* [L.] O. Kuntze): a review. *Plant cell reports*. 2016 Feb;35:255-87.
13. Huda HS, Majid NB, Chen Y, Adnan M, Ashraf SA, Roszko M, Bryła M, Kieliszek M, Sasidharan S. Exploring the ancient roots and modern global brews of tea and herbal beverages: A comprehensive review of origins, types, health benefits, market dynamics, and future trends. *Food Science & Nutrition*.
14. Zhukovets T, Özcan MM. A review: composition, use and bioactive properties of ginger (*Zingiber officinale* L.) rhizoms. *J. Agroalim. Proc. Technol*. 2020;26:216.
15. Ma RH, Ni ZJ, Zhu YY, Thakur K, Zhang F, Zhang YY, Hu F, Zhang JG, Wei ZJ. A recent update on the multifaceted health benefits associated with ginger and its bioactive components. *Food & Function*. 2021;12(2):519-42.
16. Kaufman PB, Kirakosyan A, McKenzie M, Dayanandan P, Hoyt JE, Li C. The uses of plant natural products by humans and risks associated with their use. *Natural products from Plants*. 2006:441-73.
17. Unlu A, Nayir E, Kalenderoglu MD, Kirca O, Ozdogan M. Curcumin (Turmeric) and cancer. *J buon*. 2016 Sep 1;21(5):1050-60.
18. Mbese Z, Khwaza V, Aderibigbe BA. Curcumin and its derivatives as potential therapeutic agents in prostate, colon and breast cancers. *Molecules*. 2019 Nov 30;24(23):4386.
19. Lecumberri E, Dupertuis YM, Miralbell R, Pichard C. Green tea polyphenol epigallocatechin-3-gallate (EGCG) as adjuvant in cancer therapy. *Clinical nutrition*. 2013 Dec 1;32(6):894-903.
20. Cetinkaya S, Süntar I. Garlic: allyl sulfur compounds and cancer prevention. *Nutraceuticals and Cancer Signaling: Clinical Aspects and Mode of Action*. 2021:259-89.
21. Dutta R, Khalil R, Green R, Mohapatra SS, Mohapatra S. *Withania somnifera* (Ashwagandha) and withaferin A: Potential in integrative oncology. *International journal of molecular sciences*. 2019 Oct 25;20(21):5310.
22. Pulipati S, Srinivasa BP, Sree NB, Kumar UE, Shaheela SK, Krishna JM, Chakradhar T. A modern approach to boost health. *The Indian Pharmacist*. 2016;13(10):21-30.
23. Wang L, Zhang D, Wang N, Li S, Tan HY, Feng Y. Polyphenols of Chinese skullcap roots: from chemical profiles to anticancer effects. *RSC advances*. 2019;9(44):25518-32.
24. TJ MJ. SOURSOP AND ITS ROLE IN CANCER THERAPY: A DETAILED REVIEW.
25. El Gharras H. Polyphenols: food sources, properties and applications—a review. *International journal of food science & technology*. 2009 Dec;44(12):2512-8.

26. Estrela JM, Mena S, Obrador E, Benlloch M, Castellano G, Salvador R, Dellinger RW. Polyphenolic phytochemicals in cancer prevention and therapy: bioavailability versus bioefficacy. *Journal of medicinal chemistry*. 2017 Dec 14;60(23):9413-36.
27. Tsao R, McCallum J. Chemistry of flavonoids. *Fruit and vegetable phytochemicals*. 2010;131.
28. Singh A, Singh J, Parween G, Khator R, Monga V. A comprehensive review of apigenin a dietary flavonoid: biological sources, nutraceutical prospects, chemistry and pharmacological insights and health benefits. *Critical Reviews in Food Science and Nutrition*. 2024 Aug 8:1-37.
29. Gutiérrez-Grijalva EP, López-Martínez LX, Contreras-Angulo LA, Elizalde-Romero CA, Heredia JB. Plant alkaloids: Structures and bioactive properties. *Plant-derived bioactives: chemistry and mode of action*. 2020:85-117.
30. Lee WL, Shiau JY, Shyur LF. Taxol, camptothecin and beyond for cancer therapy. In *Advances in Botanical Research* 2012 Jan 1 (Vol. 62, pp. 133-178). Academic Press.
31. Zulkpli IN, David SR, Rajabalaya R, Idris A. Medicinal plants: a potential source of compounds for targeting cell division. *Drug target insights*. 2015 Jan;9:DTI-S24946.