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ORIGINAL RESEARCH

Some African Plants With Anti-Cancer Properties

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Abstract:

Introduction: Every year, cancer takes the lives of millions of people. Indeed, medicinal plants have long been investigated by scientists for their anti-cancer properties. Herbal plants have recently attracted the attention of researchers for their possible use in the management of diseases such as diabetes, cardiovascular diseases, cancer, and respiratory diseases. Most of the conventional cancer treatment options have produced unsatisfactory results for some types of cancers, and in most instances, the side effects are severe, leading to a shift in the focus of treatment towards alternative medicines. Plant-derived compounds have been a vital source of most of the known clinically useful anti-cancer agents.

Aims: This review attempts to examine scientific information in the available literature on some specific African plants with anti-cancer properties.

Materials and Methods: In this review article, required information was collected through literature review and keyword (cancer, natural products, medicinal plants and anticancer agent) query in credible scientific databases such as Pubmed, Scopus and Google Scholar.

Results: The results of these studies led to an improved understanding of the mechanism and role of some afircan medicinal plants as an anticancer agent.

Conclusion: Natural products derived from African herbal plants have played an important role in cancer treatment and future cancer management. More than 270,000 higher plants exist on this planet, but only a small portion has been explored phytochemically.

Keywords: : Natural Product, Anti-cancer, Camptothecin, Africa Medicinal plants.

All co-authors agreed to have their names listed as authors.

1.0 INTRODUCTION

Non-synthetic compounds are derivatives of secondary metabolism within living organisms. These secondary metabolites (SM) are biological molecules (natural products) that may or may not be essential or directly involved in the normal growth, reproduction, or survival of the organism [1]. Phytocompounds are natural products produced by living plants and may possess pharmacological and biological properties that can be used in drug development [2]. These phytocompounds include alkaloids, phenols, saponins, glycosides, tannins, and flavonoids among other plant SM [3]. Some of these compounds are utilized by plants in defense mechanisms against pathogens, herbivores, and environmental stress [4]. They are also produced to promote the survival of the plant in its ecosystem. Examples of this include enhancing the plant's reproductive appeal through pigmentation. For ages, living beings have been dependent on nature for shelter, food, clothing, transport, and medicine [5].

Plants of medicinal importance have come to human knowledge since the time of Hippocrates (late 5th century and 4th century BCE) [6], and have variously been employed by tribes as an infusion, decoction, concoction, and enema to feed, retard growth, heal, kill, sedate, hypnotize, empower, relief pain and evoke psychiatric disorders [6,7]. Such plants contribute significantly to rural livelihoods. Apart from the traditional healers practicing herbal medicine, many people are involved in collecting and trading in medicinal herbs to manage a variety of disorders or abnormalities such as diarrhoea, malaria, hypertension, cancer, and psychiatric disorders [8].

The World Health Organization (WHO) estimates that about four-fifths of the world's population relies on herbal plants for their primary health care [9]. Non-synthetic herbal preparations have been historically deployed to treat several disease conditions. The quest for plant-derived anticancer agents dated back to the 1950s with the discovery and development of the vinca alkaloids, namely vinblastine and vincristine, and with the isolation of the cytotoxic podophyllotoxins [10]. Ample percentage of the current commercially approved anticancer drugs and several non-synthetic compounds in various stages of clinical development as novel anticancer therapies originate from plants. African herbs and natural metabolites have hitherto remained an excellent source for discovering and developing new effective cancer chemotherapies. Most developing nations still largely rely on natural medicine for their primary health care and often encourage and promote the use of herbal remedies in their public traditional health clinics as a result of the prohibitive costs of most of the conventional drugs [11]. Consequently, there is a growing scientific and commercial interest in screening medicinal plants aimed at discovering and developing newer more effective, and affordable drugs especially for cancer treatment [12]. Examples of plant-derived drugs include artemisinins (antimalarial drug) from *Artemisia annua*, atropine (a parasympatholytic agent) from *Atropa belladonn*a, digoxin from *Digitalis lanata* (anti-heart failure regimen), and vincristine (anticancer drug) from *Catharanthus roseus* or rose periwinkle [13]. Cancer is a leading cause of death and a global public health burden despite hitherto significant efforts geared at combating this menace, therefore, remains a prime and major disease of global attention for which there is renewed and intense quest for newer affordable and more effective and efficacious chemotherapy and chemoprophylaxis worldwide [14]. Medicinal plants have gained increasing attention over the past three decades because of their encouraging prospects as potential or novel agents for cancer treatment and prevention. Moreover, within the last ten years, novel synthetic chemotherapeutic agents currently in use clinically have not succeeded in meeting expectations despite the considerable cost of their development. Therefore, the search to develop new, effective, and affordable anticancer drugs have been a focal point [15]. This review attempts to examine scientific information in the available literature on some of the selected African plants with anti-cancer properties.

2.0 Literature Review

2.1 CANCER OVERVIEW

Cancer remains a major global health burden in terms of epidemiology and economic costs, with an increasing quest for better effective treatment and preventive strategies. Worldwide, about 19.3 million new cases and 10 million cancer deaths occurred in 2020. Globally about 10 million patients died from cancer in 2020 with about 19.3 million new cases reported [16-17]. By 2040, the global incidence of cancer is projected to be 28.4 million cases, amounting to about a 50% rise over that of 2020. This global burden may further be worsened by escalating risk factors associated with globalization and industrialization [18-19]. Cancer cure and prevention, therefore, remain a high priority for the scientific and medical community worldwide.

This complex disease is caused by endogenous and exogenous factors leading to the sequential accumulation of genetic alterations, a scenario known as multi-step oncogenesis [20]. The transformation of a normal cell into a cancer cell is a consequence of genetic mutations which result in loss of control of cellular proliferation and division, as well as loss of DNA repair mechanism [21]. One of the accepted bases of carcinogenesis is genetic mutations resulting in dysregulation of gene expression, activation of oncogenes, insensitivity to growth-inhibitory signals, etc. [21-22]. However, the characteristic pathological mechanisms of the various cancers arise from the activity of the particular malignant cells [23]. Cancer

induced mechanisms of injury include the release of inflammation mediators such as pro-inflammatory cytokines, chemokines, and growth factors [23]; immune modulators[24], immune evasion by cancer cells [25], unrestricted proliferative capacity, and limitless replicative potential [26]; invasive and metastatic potentials [27]; elaboration of growth factors that promote increased vascularisation and nourishment of tumour cells[28]; increased generation of reactive oxygen species) [29-30]. Each of the aforementioned cancer-induced mechanisms of the injury is a known or potential target for developing various effective anti-cancer agents.

The advent of more advanced imaging and diagnostic modalities coupled with newer treatment approaches especially targeted therapy in cancer management has inadvertently led to a further increase in the existing prohibitive cost of conventional cancer treatment, thus making it affordable to much fewer patients [31]. Prevention, particularly primary prevention, is an effective strategy of combating the cancer challenge since thirty to fifty percent of cancers could be prevented based on our current knowledge of risk factors. Primary prevention has a far-reaching effect on the general population especially the high-risk individuals [32]. Moreover, it is cheap, cost-effective, and independent of socioeconomic status.

2.2 TREATMENT OPTIONS FOR CANCER

Surgery (surgical resection of the tumour), chemotherapy (the use of drugs to kill the cancer cells), and radiotherapy (the use of high dose radiation to kill the tumour cells or de-bulk the mass) are considered as the commonest modalities of cancer treatment [33], although all of these treatment options are not always effective and the clinical outcomes are less desirable. Chemotherapy in common use includes antimetabolites (e.g. Methotrexate), DNA-interactive agents (e.g. cisplatin, doxorubicin), anti-tubulin agents (taxanes), hormones, and molecular targeting agents [34]. However, they are associated with several side effects. Other treatment modalities include immunotherapy (a type of treatment that helps the immune system fight cancer), targeted therapy, hormone therapy (the use of hormones to stop or slow down the growth of cancer cells), and stem cell transplant. All the treatment options are associated with one form of side effects or the other thus searching for affordable effective and potent natural compounds with effective anticancer properties is imperative [35].

2.3 Side Effect Associated with Different Treatment Options

Risks of Surgery: Common problems associated with surgery are: Pain, wound infection, prolonged or poor wound healing, wound breakdown, post-surgical scars, hypertrophic scars or keloids (i.e. bumps), and other peri-operative and post-operative associated complications [36].

2.3.1 ***Chemotherapy****:* Chemotherapy does not only kill the rapidly proliferating tumour cells but equally kills or slows down the growth of rapidly dividing normal cells such as blood cells, the cells of the skin, and those that line the mouth and the intestines. Damage to healthy cells may lead to adverse effects, such as anemia), sores in the mouth, nausea, vomiting, and loss of hair. These side effects often disappear or diminish the following cessation of chemotherapy [37].

2.3.2 ***Radiation****:* Radiation kills the tumour cells as well as those of the surrounding normal healthy cells and thus causing side effects such as skin damage and infertility [38]. Other side effects of radiation therapy depend on the part of the body being radiated.

2.3.3 ***Immunotherapy****:* The nature of adverse effects associated with immunotherapy depends on the level of immunity of the individual patients before treatment, the cancer type and stage, type of immunotherapy, and the dose. The commonly encountered adverse effects of immunotherapy include skin reactions at the injection site. These adverse effects include pain, swelling, soreness, redness, itching, and skin rashes. Immunotherapy may also rarely be associated with extreme or fatal allergic reactions [39, 40].

2.3.4 ***Hormone Therapy****:* This treatment option acts by blocking the production of the hormones by the body or by interfering with the hormones' actions or effects in the body. The associated side effects depend on the kind of hormone therapy received body response as well as the sex of the patients. These adverse effects include decreased libido, weakened bones, diarrhoea, nausea, enlarged and tender breasts, fatigue, hot flushes, dryness of the vagina, irregular menstrual cycle or abnormal menstrual bleeding, and mood changes [41].

2.3.5 ***Stem Cell Transplant****:* The commonest side effect of stem cell transplant especially allogeneic transplant includes graft-versus-host disease. This adverse effect damages the skin, liver, intestines, and several other organs. The closer the donor's blood-forming stem cells match that of the recipient, the less likely to develop graft-versus-host disease [42]. Severe immunosuppression from high doses of cancer therapy before stem cell transplant may be associated with bone marrow failure characterized by; anaemia, bleeding abnormality, and increased susceptibility to infections.

2.4 MEDICINAL PLANTS/ HERBAL MEDICINE

About three-fourths or more of the global population especially those residents in developing countries use herbal medicines. Herbal Medicines can be classified into immunomodulation herbs and chemo-preventive or adaptogenic herbs [9] Herbal drugs may also be broadly categorized into four classes namely: methyltransferase inhibitors, DNA damage preventing drugs or antioxidants, Histone deacetylase (HDAC)

inhibitors, and mitotic disruptors. Herbal therapy includes plants, herbal complexes, and herbal products or a combination of one or more of the above [42]. The current safety level and efficacy data on traditional medicine are grossly inadequate to meet the criteria needed to support its use worldwide. The reasons for these might not be unrelated to the paucity of research data on herbal medicine particularly in our environment, inadequate or lack of acceptable research methodology for evaluating traditional medicine [43]. Furthermore, the prevalent deluge of substandard or adulterated herbs in our environment is largely attributable to the lack of standard parameters for the standardization of herbal preparation. Therefore, for use of medicinal plants to gain the much-desired acceptance, mandatory standardization of herbals should be of utmost national and global priority. Luckily, the use of herbal remedies has been gaining widespread acceptance globally especially in developing countries in recent times [9]. However, there still exist the hydra-headed challenges of scarcity of necessary raw materials, lack of authentication of the available raw materials, and quality control parameters.

2.5 NATURAL ANTI-CANCER PRODUCTS AND DRUG DISCOVERY

Herbal remedies are desirable and preferred anticancer therapy as they are natural, affordable, and readily available. They are easy and convenient to use since most herbal drugs can be administered orally as part of a patient's dietary intake [44]. Also, they are generally well-tolerated and possess little or no deleterious effect on normal human cells. If a plant-derived active substance with scientifically demonstrable selective cytotoxicity for cancer cell lines but non-deleterious to normal cell lines, then such active agent can be subjected to clinical trials for further therapeutic development. Significant numbers of plants with suggested anticancer properties have been discovered or in common use as anticancer therapy with proven efficacy throughout the world [45].

The quest for advances in the field of drug discovery to develop novel chemical compounds with better efficacy and efficiency in combating human diseases such as cancer is ever increasing because of the growing trends of rapid development of drug-resistant tumours and frequent incidence of recurrence of most cancers for which cure had previously been achieved. In principle, there are three pathways for discovering new pharmacologically significant compounds. These include Rational drug design, in which case, the drug is purposefully tailored towards specific targets in the microbial cell [46]. Combinatorial chemistry, which involves the synthesis of a combinatorial library of compounds, which are then tested against the cellular target to determine the most potent compounds [47] and natural product discovery, in which case bioactive compounds are isolated from biological sources.

3.0 PLANTS WITH ANTI-CANCER PROPERTIES

About sixty-five percent of anti-cancer agents in common use in contemporary times are derived from natural sources such as plants and marine organisms [48]. Medicinal plants such as *Sutherlandia frutescens*, *Cotyledon orbiculata*, *Tulbaghia violacea*, *Taxus baccata*, and *Camptotheca acuminate* [49,50] have a long history of use as anticancer medications. Anti-cancer agents derived from plants currently in use can be categorized into the following groups of compounds. Namely, Vinca alkaloids (i.e. mitosis inhibitors) [51]. They bind to protein tubulin to form a complex that inhibits polymerization into microtubules and thus prevents spindle formation in mitotic cells and causes the arrest of metaphase). Epipodophyllotoxins block the cells in the late S-G2 phase of the cell cycle by inhibiting topoisomerase II and consequent DNA damage through strand breakage induced by the formation of a ternary complex of a drug, DNA and enzyme), Taxanes act by binding to the tubulin resulting in the formation of stable non-functioning microtubule and consequent polymerization of the microtubules and disruption of mitosis resulting ultimately in cell death., Camptothecins interfere with the activities of topoisomerase I resulting in DNA damage [52], while homoharringtonine interferes with the functions of the ribosome [53].Table1 shows a list of some anticancer plant extracts with their corresponding mechanisms.

Table 1: List of Medicinal plants for anti-cancer with scientific validation

Scientific name	Part with extracted solvent	Mechanism of action	Reference
Allium sativum	Hydro-alcoholic bulb extract	Induced apoptosis in both cell lines and cancer-induced animals, able to scavenge reactive oxygen species (ROS) and normalize the altered Alpha-fetoprotein (AFP) levels in liver cancer induced rat model. mRNA expression of NF-κB was markedly decreased in vitro and in vivo upon being treated with the plant extract.	[54]
Aloe vera	Aloe-emodin from leaves	S-phase arrest through promoted p53, p21, and p27, but inhibited cyclin A, E, thymidylate synthase, and Cdc25A levels. Promoted the release of apoptosis-inducing factor (AIF), endonuclease G (Endo G), procaspase-9, and cytochrome c from the mitochondria via a loss of the mitochondrial membrane potential which was associated with an increase in the ratio of B-cell lymphoma 2-associated X protein (Bax)/B cell lymphoma/leukemia-2 (Bcl-2) and activation of caspase-9 and -3. The free radical scavenger N-acetylcysteine (NAC) and caspase inhibitors markedly blocked aloe-emodin-induced apoptosis	[55]
Momordica charantia	Aqueous green fruits extract	Increase the release of Caspase - 3 and caspase-9 and Cytochrome-c and elevate [Ca2+] to avoid the damage of Mitochondria	[56]
Solanum nigrum	Polyphenols and anthocyanidin isolated from aqueous leaf extract	A lower dose of extract induced autophagy but not apoptosis. Higher doses of leaf extract could inhibit the level of p-Akt and cause cell death due to the induction of autophagy and apoptosis.	[57]
Triumfetta rhomboidea	Methanolic leaf extract	Effect on peritoneal macrophages or other components of the immune system.	[58]
Annona muricata	Ethanolic leaf extract	Shows only slight hyperplasia and absence of keratin pearls and rete ridges.	[59]
Alangium salvifolium	Methanolic stem and leaf extract	Dihydrofolate reductase inhibition and damage the DNA.	[60]
Azadirachta indica	Aqueous leaf extract	Showed severe alterations in organelle organization, cellular arrangement, and degree of differentiation, cellular metabolism, and morphology of the hepatocytes.	[61]
Cassia tora	Methanolic leaf extract	Induce a marked concentration-dependent inhibition on proliferation, reduced DNA content, and apoptosis in HeLa.	[62]
Zingiber officinale	Terpenes isolated from Steam Distilled Extract	Rapid and strong increase in intracellular calcium and a 20-40% decrease in the mitochondrial membrane potential. Ser-15 of p53 was phosphorylated. This increase in p53 was associated with a 90% decrease in Bcl2 whereas no effect was observed on Bax. Inhibitor of p53, pifithrin-α, attenuated the anti-cancer effects, and apoptosis was also not observed in the p53 (neg) SKOV-3 cells	[63]
Tinospora cordifolia	Dichloromethane extracts of the whole plant	Decline the clonogenicity, glutathione-S-transferase (GST) activity, and a concentration-dependent increase in lipid peroxidation and lactate dehydrogenase.	[64]
Smilax zeylanica	Methanolic leaf extract	Decreases the extent of lipid peroxidation with a concomitant increase in the activities of enzymatic antioxidants (superoxide dismutase, catalase, glutathione peroxidase, glutathione	[65]

		reductase, and glutathione-S-transferase) and non-enzymatic antioxidants (reduced glutathione, vitamin C, and vitamin E) levels.	
Clerodendrum serratum	Methanolic leaf extract	Significantly curtailed tumor development and counteracted all the biochemical effects. Increases the body and testis weight, DNA, RNA, protein, glycogen, GSH level, SDH, AKP, SOD, CAT, and GST activities. Decreases the cholesterol content, LDH, ACP activities, and TBARS level.	[66]

3.1 Vinca alkaloids

Vinca alkaloids belong to an important class of anti-cancer drugs [40]. Vinblastine and vincristine are alkaloids (Figure 1) isolated from *Catharanthus roseus,* formally known as *Vinca rosea*. These drugs are used in combination with other cancer chemotherapeutic agents for the treatment of different types of cancers such as leukaemia, lymphomas, acute leukaemia, advanced testicular cancer, Kaposi's sarcoma, Hodgkin's lymphoma, neuroblastoma, breast cancer, and lung cancer [67]. The drugs act by interfering with glutamic acid metabolism, and by inhibiting cell division (mitosis) in metaphase. The drugs bind to tubulin and thus prevent the cells from making the spindles required for chromosomes separation during cell division [68]. Vinblastine and vincristine have a series of side effects such as headache, stomach pain, constipation, nausea, numbness, mouth sores, hair loss, lowered blood cell counts, and sensory impairment. Nirmala [69] reported that the novel Vinca alkaloid is currently under Phase II clinical trials and that both Vinflunine and Vinorelbine exhibit reduced toxicity in animal models.

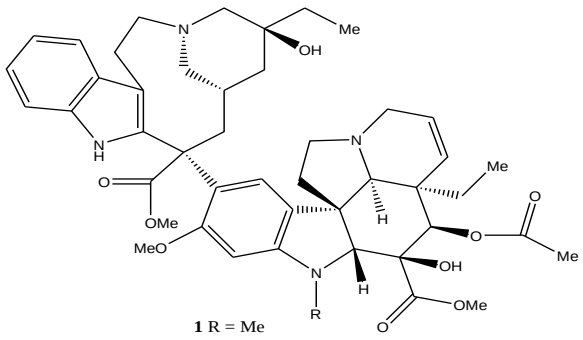


Figure 1: Chemical structures of vinblastine and vincristine. Vinblastine = 1 R (Me), Vincristine = 2 R (CHO).

3.2 Epipodophyllotoxins

Epipodophyllotoxin is an isomer of podophyllotoxin isolated from the roots of *Podophyllum peltatum* and *Podophyllum emodi* [70]. Podophyllotoxin and its derivatives are anti-mitotic glycosides. They act by blocking the cell cycle at both G1 and S phases by causing damage to DNA through its interaction with DNA topoisomerase II. The two semi-synthetic derivatives of epipodophyllotoxin are etoposide and teniposide (Figure 2). They are used for the treatment of lymphomas, bronchial and testicular cancers, Kaposi sarcoma, malignant melanomas [71]. Podophyllotoxin is also used to treat genital warts which are caused by Human Papilloma Virus (HPV), and this virus is associated with squamous cell carcinomas [72]. Some of the side effects of these drugs include low leucocyte and low platelet counts, hair loss, nausea, vomiting, and diarrhoea.

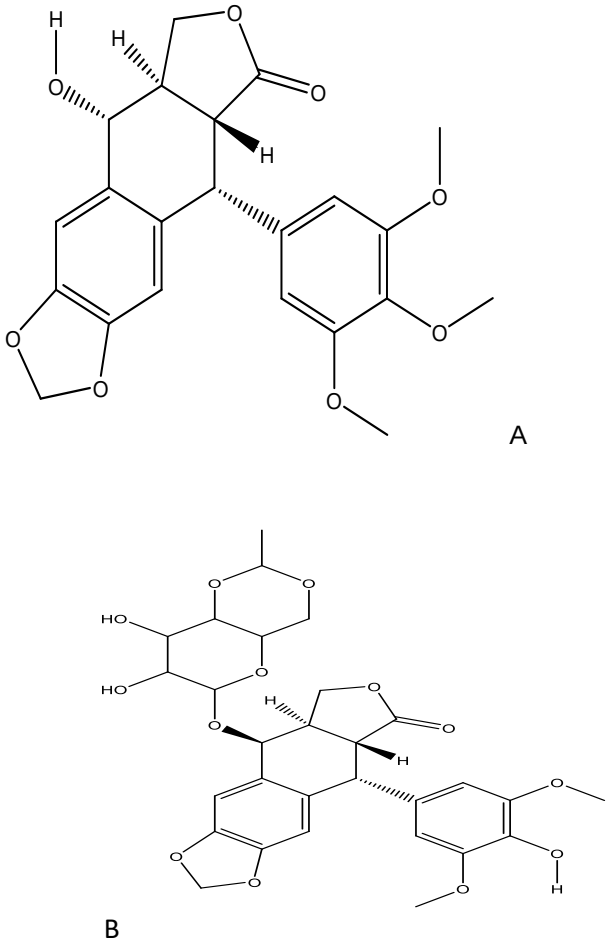


Figure 2: Chemical structures of podophyllotoxin (A) and etoposide (B)

3.3 Taxanes

The taxanes which are mitotic inhibitors are believed to be the most recently solicited chemotherapeutic drugs of our era [73]. They inhibit tumours primarily by preventing cells from entering mitosis, a process of cell division. They accomplish this by inhibiting microtubule polymerization. Taxanes also appear to stimulate apoptosis, or programmed cell death, which is often inhibited in some cancer cells. Taxanes were isolated from *Taxus brevifolia* Nutt [74]. Paclitaxel, an example of taxanes was isolated from the bark of the Pacific Yew, also known as *Taxus brevifolia.* The structure of paclitaxel (Figure 3) was elucidated in 1971. Different parts of *Taxus brevifolia*, *Taxus Canadensis,* and *Taxus baccata* have been used by some Native American tribes for treatments other than cancer, while *Taxus baccata* was used in the Indian Ayurvedic medicine for the treatment of cancer [75]

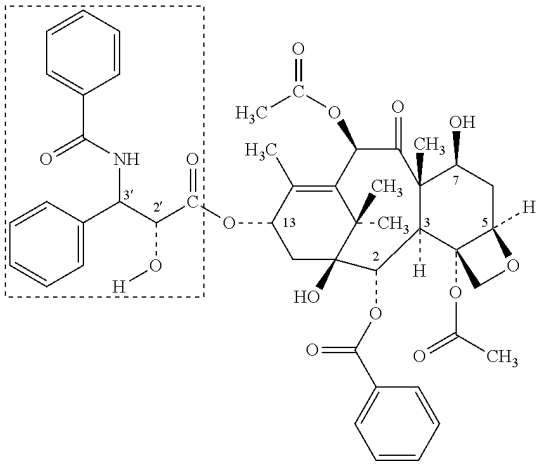


FIGURE 3: Chemical structures of Taxanes

3.4 Paclitaxel

Paclitaxel was clinically introduced to the USA market in the early 1990s (figure 4). It has been widely used in the treatment of ovarian cancer, advanced breast cancer, small and non-small cell lung cancers [76]. Paclitaxel acts by binding to the microtubules thereby affecting their depolymerisation into tubulin. Paclitaxel exerts its action by preventing the assembly of a mitotic spindle which leads to failure of chromosome segregation during cell division [77]. Side effects of taxol include oedema, low platelet count, anaemia, and breathing problems. The mode of action is that these active agents bind to the polymerized microtubules and prevent the normal mitosis to occur and thus they are called anti-mitotic drugs [78].

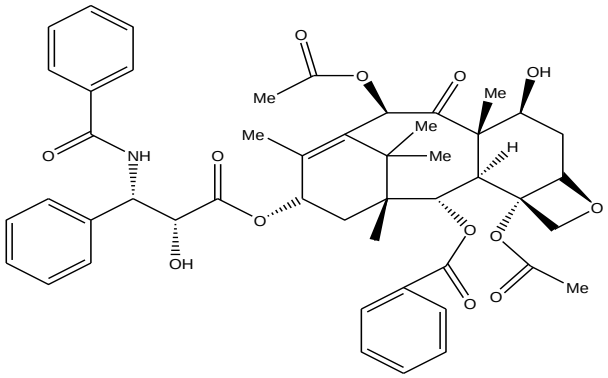
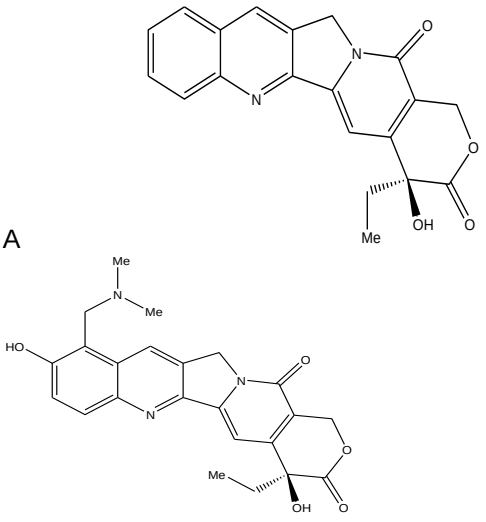


FIGURE 4: Chemical structure of Paclitaxel (Taxol®)

3.5 Camptothecin

Camptothecin (Figure 5A) is a quinoline-based anti-cancer drug that was isolated from the Chinese ornamental tree, *Camptotheca acuminate* Decne (Nyssaceae). Camptothecin induces apoptosis by targeting the nuclear enzyme topoisomerase I [79]. Information on the structure-activity relationships of the parent compound camptothecin has led to the development of a more effective soluble analogue with manageable toxicities. The National Cancer Institute (NCI) took the drug into clinical trials in the 1970s but its use was stopped due to severe bladder toxicity [80]. Semi-synthetic derivatives of camptothecin, which include topotecan (Figure 5B) and irinotecan, are used to treat ovarian cancer, small cell lung cancers, and colorectal cancers. Antitumour activity of irinotecan and topotecan has been confirmed in phase I/II preclinical studies. The side effects of these drugs include nausea, vomiting, low blood cell counts, and severe diarrhoea [81].



A

B

FIGURE 5 Chemical structures of camptothecin (A) and topotecan (B)

3.6 Homoharringtonine

Homoharringtonine (Figure 6) was isolated from the Chinese tree, *Cephalotaxus Harrington* [82]. Homoharringtonine (HHT) is a Cephalotaxus alkaloid plant that was originally isolated in the People's Republic of China. HHT was obtained by alcoholic extraction from the evergreen tree *Cephalotaxus Harrington.* The use of a racemic mixture of harringtonine and homoharringtonine was reported for the treatment of acute and chronic myelogenous leukaemia after failure with interferon [83]. They inhibit the synthesis of proteins which later leads to apoptosis. Previous studies have suggested anti-tumour activity of HHT in many neoplastic diseases such as acute non lymphoblastic leukaemia and there are no records of cross-resistance with conventional antileukemic agents. The activity of HHT against myeloid leukaemias has been through inhibition of protein synthesis, promotion of cell differentiation as well as apoptosis induction through a caspase-3-dependent mechanism [83].

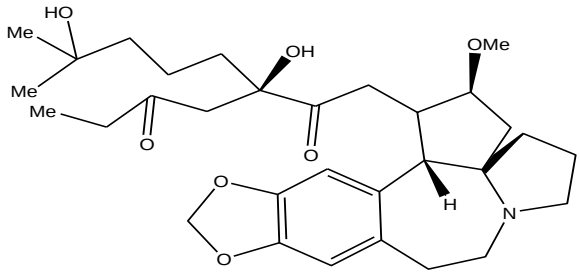


FIGURE 6: Chemical structure of homoharringtonine

3.7 Elliptinium

Elliptinium is an intercalating agent belonging to the ellipticine family. In France, elliptinium (Figure 7) was isolated from species of the plant family Apocynaceae, including Bleekeria vitensis, and it is presently marketed as a therapy for metastatic breast cancer [84]. Elliptinium is a topoisomerase II inhibitor and helps in stabilizing the cleavable complex of topoisomerase II and induction of DNA breakages, leading to the prevention of DNA replication, RNA, and protein synthesis. Elliptinium can be oxidized, yielding a reactive electrophilic form which then covalently binds to a nucleophilic biological molecule. A weekly regimen of Elliptinium has demonstrated better clinical outcomes in breast cancer. However, some toxicity effects such as xerostomia and immune-mediated hemolytic anaemias occur because of the development of anti-elliptinium IgM antibodies [84].

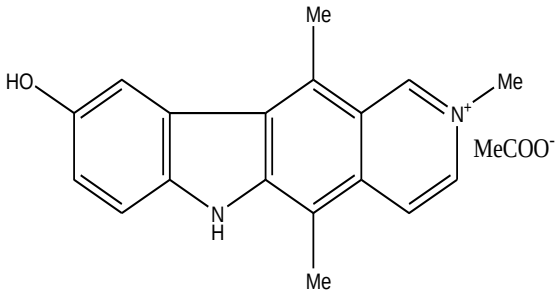


FIGURE 7: Chemical structure of Elliptinium

Few of the other plants proven to be effective as an anti-cancer agents *in vivo* or in vitro, include *Achyranthes Aspera*, *Allium sativum* (Allicin), *Andrographis paniculata*, *Annona muricata*, *Bidens pilosa, Centaurea ainetensis, Salvia miltiorrhiza*, *Apis mellifera*, *Camellia sinensis* (Green tea), *Bolbostemma paniculatum*, *Cannabis sativa, Astralagus Hedysarum*, *Hypericum Perforatum*, *Daphne mezereum*, *Mangifera indica*, *Gossypium hirsutum*, *Hydrocotyle Asiatica*, *Nervilia fordii*, *Picrorrhiza kurroa*, *Scutellaria*, *Picrorrhiza kurroa, Silybum marianum, Withania somnifera* (Withanolides), *Pygeum africanum* (Boraginaceae), and *Scilla natalensis* (Hyacinthaceae) [85, 86].

4.0 CONCLUSION

Natural products derived from herbal plants have played an important role in cancer treatment and future cancer management. More than 270,000 higher plants exist on this planet, but only a small portion has been explored phytochemically. Thus, plants can provide potential bioactive compounds for the development of new 'leads' to combat cancer diseases. Drug discovery from medicinal plants will continue to be an important source of new drug leads, however, numerous challenges are encountered such as the procurement of plant materials, the selection, and implementation of appropriate high-throughput screening bioassays as well as the scale-up of active compounds. It is therefore good to stress that, the research field of quality control of herbal medicines should be intensified to provide a platform for the quality control of traditional herbal medicines and further to discover the novel therapeutics multiple chemical compounds present in natural plants. Clinical trials of herbal medicines should be encouraged in the African continent and funds should be made available for intensive and comprehensive research in this field.

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