



# Plant Extracts as Anticancer agent



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## Abstract

Cancer is a global disease that will ultimately lead to death. Though there are therapies, such as radiotherapy, chemotherapy and chemically derived drugs to treat and prolong this life-threatening disease, research have been progressing on the use of plant extracts as anti-cancerous agents. Guyana has a highly rich bio diversified forest, whose aqueous and ethanolic crude extracts can be used to test for their anti-cancerous effects. In addition, natural products, both novel and non-novel can be isolated, and their anticancer activity investigated. Once successful, isolated natural products can be subjected to clinical trials and should add to the list of isolated natural products used as anti-cancerous agents. The use of plant extracts as anticancer drugs should be superior to that of current treatments such as chemotherapy, because plant extracts have less side effects and some are toxic to cancerous cells. Thus, there is a need to screen the bio diversified flora of Guyana for its anticancer effect.

**Keywords:** Cancer; Therapies; Bio diversified Flora; Plant extracts; Anti-cancer agents; Crude drugs; Botanical; Derived Drugs; Isolated natural; Anticancer effect; Chemically derived drugs; Herbal medicine; Alternative treatment; Alkaloids; Antioxidant property; Secondary metabolites

**Abbreviations:** BRs: Brassinosteroids; MLF: 4'-Methoxy Licoflavone; ALF: Alpinumi Soflavone; DNA: Deoxyribonucleic Acid

## Introduction

Globally, cancer is a disease that severely affects the human population, ultimately resulting in death. The disease is characterized by cells in the human body, undergoing uncontrollable mitotic divisions, resulting in the formation of tumors of malignant cells which can lead to a metastatic state [1]. Tumors causes many of the symptoms of cancer by pressuring, crushing and destroying surrounding non-cancerous cells and tissues [2]. This abnormal growth is caused by the damage of the cell DNA as a result of chemical and environmental factors. Environmental factors include exposure to tobacco smoke etc. According to the American Cancer Society, deaths arising from cancer constitute, 2-3% of the annual worldwide deaths [3]. There has been an increase in the mortality rate resulting from cancer over the years. Cancer is the second leading cause of death in the USA.

The major causes of cancer are smoking, dietary imbalances, hormones and chronic infections, resulting in chronic inflammation [2-4]. Cancer treatment depends on the stage and type of cancer. These include surgery, radiation therapy, chemotherapy, biological therapy, hormone therapy etc. Despite the positive effects, and its use to combat cancer, chemotherapy and radiation therapy can cause traumatic side effects such as fatigue, sleep disturbance, appetite loss, hair loss, sore mouth, changes in taste, fever and infection, anxiety, depression, nausea and vomiting. These side effects are often difficult to manage.

Other harmful effects of these treatments include hormonal and reproductive problems, effects on the immunologic system, heart diseases, effects on kidney and urinary bladder, effects on gastrointestinal organs, neurologic and psychological changes [4-5] etc. Thus, there is an urgent need to find an alternative treatment for cancer.

This alternative complementary medicine comes from herbs. An herb, also known as a botanical, is a plant or plant part used for its scent, flavor and its therapeutic properties. The crude ethanolic and aqueous extract of plants from the Guyanese flora have been shown to possess antimicrobial [6-17] and antidiabetic activities [18]. However, their anticancer research profile remains untouched. It must be stressed that mankind first medicine were herbs and research should continue in that direction to exploit herbal medicines.

## Chemically derived drugs

Chemically derived drugs used in the treatment of cancer includes 5-azacytidine (azacytidine; Vidaza) and 5-aza-2-deoxycytidine (decitabine; Dacogen) [19] etc. However, these drugs have toxic side effects. Hence, the need for the use of plant based complementary treatments.

## Plants used in the treatment of cancer

Over the years, plant extracts have been studied for their anticancer activities. The results have been promising. Table 1

shows a list of some plants used for their anticancer activities. The list will continue to expand, as herbal cancer research continues. In Guyana, the anticancer activity of plants has received very little attention. However, its anticipated soon, this will be addressed.

**Table 1:** List of Plants with Anticancer Activities.

Scientific Name of Plant	Family
<i>Allium Sativum</i>	
<i>Actinidia Chinensis</i>	Actinidiaceae
<i>Agapanthus Africanus</i>	Agapanthaceae
<i>Betulia Utilis</i>	Betulaceae
<i>Camellia Sinensis</i>	Theaceae
<i>Catharanthus Roseus</i>	Apocynaceae
<i>Colchicum Luteum</i>	Liliaceae
<i>Echinacea Angustifolia</i>	Asteraceae
<i>Daucus Carota</i>	Apiaceae
<i>Ginkgo Biloba</i>	Ginkgoaceae
<i>Glycine Max</i>	Leguminosae
<i>Glycyrrhiza Glabra</i>	Leguminosae
<i>Lentinus Edodes</i>	Agaricariaceae
<i>Linum Usitatissimum</i>	Linaceae
<i>Mentha Species</i>	Labiataeae
<i>Ochrosia Elliptica</i>	Apocynaceae
<i>Panax Ginseng</i>	Aralaceae
<i>Taxus Brevifolia</i>	Taxaceae
<i>Cannabis Sativa</i>	
<i>Heracleum Persicum</i>	Apiaceae
<i>Gmelina Asiatica</i>	Verbenaceae
<i>Lens Culinaris Medikus</i>	Fabaceae
<i>Limonia Acidissima</i>	Rutaceae
<i>Macrotyloma Uniform</i>	Fabaceae
<i>Momordica Dioica</i>	Cucurbitaceae
<i>Cynodon Dactylon</i>	Poaceae
<i>Drosera Indica</i>	Droseraceae
<i>Barleria Grandiflora</i>	Acanthaceae
<i>Terminalia Chebula</i>	Combretaceae
<i>Cucurbita Maxima</i>	Cucurbitaceae

The anticancer activities of plants may be due to a single compound or a combination of compounds. These compounds include polyphenols, brassinosteroids and taxols. Polyphenolic compounds include flavonoids, tannins, curcumin, resveratrol and gallacatechins [20]. Resveratrol are found in foods including peanuts, grapes and red wine. Gallacatechins are present in green

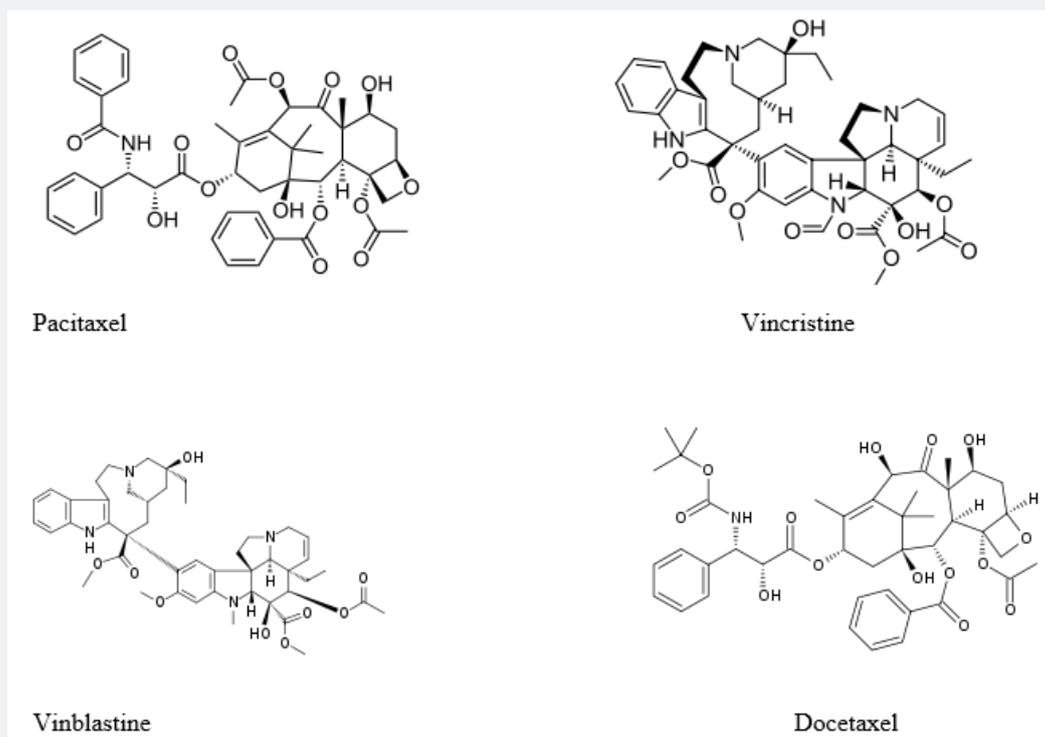
tea. Polyphenols reduce the risk of cancers and improve a person health by virtue of their natural antioxidant properties [20-22]. Polyphenols are thought to kill cancer cells via apoptosis. They can achieve apoptosis via the mobilization of copper ions which are bound to chromatin inducing DNA fragmentation. In the presence of Cu (II) ions, resveratrol was seen to be capable of DNA degradation. In addition, polyphenols can interfere with proteins which are present in cancer cells, thus destroying cancer cells [23].

Flavonoids are another class of compounds with anticancer activities. They are from the polyphenolic compounds and constitute a large family of plant secondary metabolites with over 10,000 known structures [24]. Several plants have been investigated for their high flavonoid content and anti-cancer activity [24-28]. There is a high content of flavonoid compounds in anthocyanins, flavones, flavonols, chalcones in seed of certain plants [27]. Plant extracts have also shown anticancer effects. For example, flavonoids extracted from *Erythrina suberosa* stem bark (4'-Methoxy licoflavanone (MLF) and Alpinumi soflavone (ALF) were shown to have cytotoxic effects in HL-60 human leukaemia cells [27]. Fern leaf extracts, which are rich in flavonoids, have demonstrated high percentage of anticancer activity [28]. Purified flavonoids from plant extracts have also shown anti-cancer activities against other human cancers including hepatoma (Hep-G2), cervical carcinoma (Hela) and breast cancer (MCF-7) [27].

Brassinosteroids (BRs) are naturally occurring compounds found in plants which have hormones regulation process that controls growth, differentiation of cells, elongation of stem and root cells, resistance and tolerance against disease and stress. Some Naturally BRs have shown anti-cancerous effects. For example, 28-homocastasterone (28-homoCS) and 24-epibrassinolide (24 epiBL) [28-30].

### Anticancer natural products

Anticancer Natural Products derived from plants, which have been proven successful at clinical trials have been reported. These drugs are administered as part of a patient's dietary intake [31], Examples of natural products isolated from plants that have been used as anticancer drugs are vinca alkaloids such as vincristine, vinblastine, vinorelbine, vindesine and vinflunine. These drugs inhibit microtubules formation of cancerous cells by binding to  $\beta$ -tubulin. Another class includes the Taxanes such as paclitaxel and its analogue docetaxel. These drugs function as microtubule inhibitor of cancerous cells. Paclitaxel prevents replication of cancer cells as it stabilizes or polymerises microtubules in the cells [32,33]. Drugs combination may have a synergistic effect that augment their anticancer activity and improve their efficacy as therapeutic agents. This is noticeable with vinca alkaloids, Taxus diterpenes, Podophyllum lignans and *Camptotheca* alkaloids in plant extracts [34]. Figure 1 shows some isolated natural products with anticancer activity.



**Figure 1:** The Structure of Some Anticancer Natural Products Drugs.

### Conclusion

Thus, there is an urgent need to continue the use of herbal medicines to combat cancer. Plant extracts are advantageous in that they are selective i.e. non-toxic to normal cells, but cytotoxic to cancer cells. Guyana's flora needs urgent screening to add to the list of plants that can combat against cancerous cells. In addition, isolation of natural products may lead to new anticancerous agents.

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