Available online at www.elixirpublishers.com (Elixir International Journal)

Applied Botany

Elixir Appl. Botany 92 (2016) 39047-39050

ISSN: 2229-712X

Plant Derived Drugs and Use in Cancer Treatment

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ARTICLE INFO

Article history:

Received: 13 January 2016;

Received in revised form:

9 March 2015;

Accepted: 14 March 2015;

Keywords

Taxol,
Etoposide,
Camptothecin,
Topotican,
Vinblastine,
Anti-Cancer Activity.

ABSTRACT

Plant derived components have a great significance and act as potent alternatives for the treatment of cancer without having harmful after effects on human body. There are about 250,000 plant species out of which more than one thousand plants possess significant anticancer properties which has been proven by scientists. Plant derived components such as Taxol, podophyllotoxin, etoposide, camptothecin, topotican, vinblastine, etc are of great contribution towards anti-cancer activity by plants.

Introduction

Abnormal growth of cells that have potential to invade or spread to other parts of the body is termed as cancer or malignant tumor [1] [2]. Cancers are mainly caused due to various environmental factors with 90-95% cases attributed to environmental factors and 5-10% due to genetic disorder. The major cancer causing environmental factors are consumption of tobacco (25-30%), diet and obesity (30-35%), infections (15-25%), ionizing and non ionizing radiations (up to 10%), stress, lack of physical activity, and environmental pollutants. Approximately 18% of deaths all over the world due to cancer are because of infectious diseases. This percentage may be as high as 25% in Africa to as low as 10% in developed countries[3].All environmental factors cannot be controlled such as exposure to naturally occurring radiations or genetic factors but many of other factors such as diet, amount of physical activity, obesity, consumption of tobacco or alcohol, sexually transmitted infections can be controlled[4].Cancer deaths were 5.8 million in 1990 and this death rate is increasing by each passing year due to change in lifestyle and aging population. As per world health organization on cancer database on cancer incidence and mortality indicates occurrence of cancer cases more in less developed countries in accordance to year 2000, (Table 1. [5]), In 2008, diagnosis of approximately 12.7million cancer patients was done [6] and about 7.98 million people died in 2010, (Fig:1,[7]), [8].

There are a number of therapies and treatments that are available for cancer patients of all ages like surgery, chemotherapy, radiotherapy, etc. Different types of chemotherapeutic agents such as alkylating agents, antimetabolites, anti-tumor antibiotics like anthracyclines, topoisomerase inhibitors, mitotic inhibitors, corticosteroids, targeted therapies, differentiating agents, hormone therapy, immunotherapy, etc are available [9]. Due to harmful and life threatening hazards including cytotoxicity of these synthetic therapies and treatments people are moving towards natural and plant derived medicines and drugs against cancer treatment.

Plant derived compounds such as vinblastine, vincristine, the camptothecin derivatives, topotecan, and irinotecan, etoposide, derived from epipodophyllotoxin, and paclitaxel are a few potential compounds derived from plants that show anti-cancer properties.

Harmful Effects of Synthetic Chemotherapy and Radiotherapy

According to American Cancer Society, alkylating agents that are included in chemotherapy, target DNA and disrupt cell functioning thus blocking cell reproducing capacity. Since these agents directly affect the DNA, they may lead to bone marrow malfunctioning and its permanent damage. Anthracyclins such as Daunorubicin, Doxorubicin, Epirubicin, Idarubicin may lead to permanent cardiac damage if given at high dose. Mitoxantrone, an anti-tumor antibiotic is a potent drug for permanent cardiac damage and an inhibitor of topoisomerase II that can cause treatment related leukemia. Mitotic inhibitors such as Taxanes, Epothilones, Vinca alkaloids, Estramustine, etc that are known to work against various cancers including breast, lung, myelomas, lymphomas, and leukemias may lead to peripheral nerve damage, that is a dose limiting side effect[9]. Corticosteroids used in chemotherapy also has multiple hazards such as steroid psychosis[10], cardiovascular disorders like fluid retention and hypertension, muscle wasting[11], hyperglycemia[11], insulin resistance, diabetes mellitus[11], by inhibiting sex steroids action ,erectile dysfunction, hypogonadism and amenorrhea may be caused. Steroid -induced osteoporosis, colitis, Crohn's disease, peptic ulceration [12].Cataract and retinopathy may also be caused due to prolonged use of corticosteroids.

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