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By-Products Utilized to Extract Anticancer Agents

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Introduction

Cancer is becoming a high profile disease in developed and developing worlds. In 2007 the WHO published that in 2005, 7.6 million people died from cancer related diseases with the majority of these people living in low-income countries. In the United States cancer is the cause of 1 in 4 deaths and in 2010 it was estimated there were over 1.5 million new cases of cancer. Cancer Research UK said in 2012 14.1 million adults were diagnosed with cancer and 8.2 million people were killed by cancer globally [1]. Therefore, the demand for a cure and the prevention of cancer is extremely high. Chemically-derived drugs have been developed and other cancer treatments pre-exist. However, current methods such as chemotherapy have their limitations due to their toxic effects on non-targeted tissues furthering human health problems. Therefore, there is a demand for alternative treatments with naturally-derived anticancer agents with plants being the desired source [2]. The secondary metabolites in the plant kingdom such as polyphenols, flavonoids and brassino-steroids have been studied for their potential use as anticancer agents [3]. Collectively they have been shown to possess anticancer activities which include; antioxidant activity; inhibition of cancer cell growth; induction of apoptosis; target specificity; cancer cell cytotoxicity. Plant-derived drugs have been developed from positive results in research and have progressed into clinical trials [4]. Drugs derived from vinca alkaloids were some of the first compounds to be utilized and are developing in clinical Phase III trials along with Pacitaxel and other anticancer agents. These compounds are readily available from the natural environment and are relatively non-toxic to healthy human cells. Also there are currently developments using new technologies such as nanoparticles to be used in administration of anticancer compounds and therapies [5]. Their development could be applied to control sustained drug release and help in aims to create drugs that are tissue specific reducing severe side effects of treatments [6]. Increasing demand for plant-derived drugs is putting pressure on high-value medicinal plants and risking their biodiversity. Increasing populations, urbanization and deforestation are contributing to species endangerment in developing countries [7]. To aid conservation of these species germplasm conservation, cryopreservation, tissue cultures and plant part substitution strategies need to be in place. Mass cultivation of medicinal plant species and utilizing raw by-products in industries may also help with conservation [8]. Plant-derived anticancer agents are effective inhibitors of cancer cells lines, making them in high demand. Exploitation of these agents needs to be managed to keep up with demands and be sustainable [9]. However, its high polyphenolic content may make it advantageous for anticancer drug development and make a profitable scheme to solve environmental issues. Grape stem extracts have demonstrated to have antioxidant properties, prevent DNA damage from reactive oxygen species and shown anti-carcinogenic potential against an array of cancer cell lines from cervical cancer, thyroid cancer and many more [10].

Acknowledgement

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Conflict of Interest

None

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