

Chapter 1

An Introduction: Terpenes as Anticancer

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ABSTRACT

Terpenes, a class of chemical molecules produced by many plants, have garnered significant interest for their potential applications in cancer and other medical fields. Known for their biological effects beyond just their scent, terpenes have demonstrated capabilities to combat cancer, bacteria, and inflammation. Recent studies in cancer research have shown that terpenes can inhibit cancer cell proliferation, induce cell death, and enhance the efficacy of conventional chemotherapy. Various terpene compounds, such as sesquiterpenes like artemisinin, diterpenes like taxol, and monoterpenes like limonene and pinene, have been found to block vasculature and slow tumor growth. Furthermore, studies have shown that terpenes can effectively treat several types of cancers, including lung, prostate, and breast cancer. Incorporating terpenes into traditional cancer treatments could open new avenues for more effective and potent cancer therapies. This chapter focuses on the most promising terpenes and their potential medical applications.

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1. INTRODUCTION

Terpenes are a broad and diverse class of chemical substances found in fungus, plants, and certain animals. They are also known as isoprenoids. Their unique carbon structure, which consists of many isoprene units organized in a spherical, branched, or linear pattern, sets them apart. Terpenes have a critical role in several physiological processes, including as development & growth, fertilization, & defense against abiotic & biotic stress (Tholl, 2006). Biochemical and molecular research on terpenes is focused on their many biological characteristics, including antiviral, antibacterial, anticancer, and anti-inflammatory effects. Terpenes may attach themselves to enzymes, receptors, and ion channels, among other biological targets. Additionally, they could change the pathways of communication used in different cellular functions including cell division, growth, and death (Christianson, 2017). One of the most obvious impacts of terpenes is the biological influence on inflammation. Due to their antioxidant qualities, certain terpenes may protect cells against damage from free radicals & reactive stress (Christianson, 2017).

Terpenes have been proven in many experimental studies to offer promise as medical therapy against different forms of cancer. There has been interest in employing terpenes as a supplementary drug in cancer treatment since they may expose cancer cells to chemotherapy treatments and minimize their toxicity. The goal of this effort is to spread the growing amount of information on mechanisms of action of certain terpenes and how they contribute to their anticancer effects (Pichersky & Raguso, 2018). Terpenes may be able to treat cancer because they have ability to change a number of signaling pathways which are necessary for growth, cell division, & survival. We can use knowledge that DNA damage & oxidative stress are produced by cancer cells to show how terpenes may help fight cancer. Since it causes cancer cells to undergo apoptosis, it could kill cancer cells (Gershenzon & Dudareva, 2007).

1.1. Cancer and Need for Novel Anticancer Therapies

Chemo-diversity, a feature of biodiversity, is the outcome of millions of unique chemical compounds synthesized by living things, including plants, since the dawn of life on Earth. Even though some of these chemicals don't seem to play any significant function in basic processes of plant growth & development, they are nonetheless referred to as secondary metabolites. Various uses of these secondary chemicals in business, agriculture, and health have been the subject of several research (Baser & Buchbauer, 2015).

Cancer is one of main causes of death in globe. The effect of cancer is measured by number of newly identified cases & deaths from illness. In a study on global cancer incidence based on GLOBOCAN 2020, International Agency for Research

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