


# Chapter 2

## From Aroma to Efficacy: The Synergistic Power of Terpenes in Drug Potentiation for Cancer Therapeutics

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### ABSTRACT

*Cancer remains a significant global health challenge. Despite its widespread acceptance, chemotherapy has several limitations such as high resistance rates, susceptibility, and lack of precision targeting tumor cells. In response to these drawbacks, alternative therapeutic approaches are needed that have negligible side effects, high specificity, and can amplify anti-tumor effects. Organic compounds, such as Terpenes, are naturally available, cost-effective, and less toxic. They hold promise in enhancing the effectiveness of existing cancer treatments. In addition to potentiating therapeutic outcomes, terpenes reverse drug resistance with specific pathway inhibition, and facilitate repair in healthy tissues caused by treatment. The review examines the potential synergy between nature's products, like Terpenes, and conventional therapies, which could enhance cancer treatments, reduce side*

DOI: 10.4018/979-8-3693-6972-2.ch002

*effects, and benefit patients.*

## **INTRODUCTION**

Cancer is a significant global health issue, responsible for leading causes of death worldwide. This lethal disease is popularly known for its fatality and high mortality rate, affects millions of people around the world every single year. A report from the International Agency for Research on Cancer (IARC) in recent years suggested nearly 7.6 million deaths across the world were caused due to cancer (Benoit et al. 1978).

It is a group of masses that involve rapid and uncontrollable cell growth in an individual's body, having the potential of widespread to the other parts, making it malignant. Hallmarks of cancer that make it deadly include independence and irresponsiveness to the growth signalshaltng cell division, sustained angiogenesis, evasion of apoptosis, uncontrolled replication and the capacity to penetrate inside neighbouring tissues (Benoit et al. 1978).

Different conventional treatment methods are available and functional in today's date, to treat and manage cancer. Some traditional techniques like surgery, chemotherapy, radiotherapy and radiation-based surgical knives are being widely used. These therapeutic techniques demonstrate a major role in curing cancer, shrinking the disease and possibly reduce the progression of cancer. Despite of the significant benefits it offers, the old techniques have also shown prominent signs of having harsh side-effects. For instance, Surgeries are seeming to be fruitful against cancer at several stages only and it is easy to acknowledge that it is not effective to surgically remove cancer at all early-stages. The surgery is limited to how deep the tumor is sited and also the size. Relatively bigger tumor size might automatically affect the normal functioning of the neighbouring tissues or the organ. One relevant example is the negative impact on functioning of brain's thinking, speaking capacity post brain surgery. Other notable example include impairment in fertility after prostate or ovarian surgeries, effect on vocal cords after lung surgeries. Despite of the complications associated, surgeries enhance the risk of infections, bleeding and pain among its patients, limiting success of the procedure (Gyanani, Haley, and Goswami 2021).

Moving from one treatment method to the other, Chemotherapy remains one of the few options available for treatment of cancer at advanced stages, directing a combination of several drugs into the body of the patient. In spite of its high-profile function, the technique has proven to have a substantial number of drawbacks. One of them being lack of target selectivity of chemotherapeutic drugs. This poor selectivity impacts cell growth of normal body tissues like hair follicles, bone marrow and gastro-intestinal tract known as the GIT. The subsequent important limitation is the development of 'Multiple Drug Resistance' (MDR) due to exposure of drugs

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