Chapter 7
Terpenes in Treatment of Ovarian Cancer

Emine İncilay Torunoğlu
https://orcid.org/0000-0003-4641-0067
Necmettin Erbakan University, Turkey

Gamze Demirel
https://orcid.org/0000-0001-6037-378X
Selçuk University, Turkey

Erdi Can Aytar
https://orcid.org/0000-0001-6045-0183
Usak University, Turkey

Bahattin Avcı
Ondokuz Mayıs University, Turkey

ABSTRACT

Ovarian cancer is the deadliest among gynecological cancers, with a high mortality rate due to late-stage diagnosis and inconspicuous early symptoms. A family history significantly increases the risk of ovarian cancer. Despite advances in treatment, survival rates remain low. Plants are valuable sources of various phytochemicals such as terpenes, carotenoids, and saponins, known for their antioxidant and antitumor properties. Terpenes like perillyl alcohol induce apoptosis in tumor cells, while compounds like oridonin, baicalein, and quercetin inhibit cancer cell growth and enhance the effectiveness of chemotherapy. These natural compounds are being explored as alternative or adjunctive treatments for ovarian cancer, with future research needed to optimize their therapeutic potential.

DOI: 10.4018/979-8-3693-6972-2.ch007

1. INTRODUCTION

Cancer is deemed the most perilous disease globally, recognized as a significant catastrophe for humanity. Its mortality rate escalates continually. Among all gynecological cancers, ovarian malignancy stands as the deadliest, constituting the most prevalent cause of death among women worldwide. Despite considerable progress in ovarian cancer treatment, its survival rate remains notably low. This is primarily due to the tendency for ovarian cancer to be diagnosed at advanced stages, as symptoms often remain inconspicuous in the early phases. Ovarian cancer is notably more probable in women with a family history of the disease, raising the risk by 3 to 7 times, especially if multiple relatives are affected. This scenario accounts for a significant portion of all ovarian cancer cases.

Plants are acknowledged as nature's factories, producing various chemical compounds. Traditional medical systems and natural products have become significant sources of pharmacotherapy. Many people in developing countries resort to medicinal plants to treat various ailments. Plants harbor various phytochemicals such as terpenoids, lignans, tannins, quinones, coumarins, amines, betalains, flavonoids, vitamins, alkaloids, stilbenes, phenols, and other metabolites. These compounds possess antioxidant properties and exhibit activities including antitumor, antimutagenic, antibacterial, antiviral, anticarcinogenic, and anti-inflammatory effects.

Terpenes are among the most prevalent phytochemicals, typically containing flammable hydrocarbons and found in liquid form. They are classified into mono-, di-, tri-, and sesquiterpenoids based on the number of carbon atoms. Carotenoids, which impart bright colors to plants and are soluble in natural fats, are effective antioxidant compounds. By scavenging reactive oxygen and free radicals, they enhance immune function, protect against sunburn, and inhibit the development of certain cancer types. Although the mechanism of action of carotenoids remains uncertain, their antioxidant properties and provitamin A activities play a significant role. Perillyl alcohol and limonene are among the monoterpenes. Perillyl alcohol plays a crucial role in initiating apoptosis in tumor cells without affecting normal cells, facilitating the division of ovarian tumor cells. Limonene, characterized by the strong odor of oranges, is classified as a colorless liquid hydrocarbon. Saponins are water-soluble compounds with high molecular weights, possessing cholesterol-lowering, anticancer, and immune-stimulating properties. Oridonin inhibits the insensitivity of ovarian cancer cell lines to the chemotherapeutic drug paclitaxel (PTX10) and sensitive (A2780) to it. It inhibits the NF-kB signaling pathway, demonstrating cytotoxic effects in ovarian cancer cell lines and primary cultured cells of epithelial ovarian cancer at complex stages (III to IV). It helps prevent the spread of ovarian cancer cells and contributes to suppressing inflammation and inducing cytoprotection. When combined with cisplatin, oridonin is considered a useful method for treating