Chapter 9
Bioactive Terpenes for the Treatment and Prevention of Breast Cancer

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ABSTRACT

Breast cancer is the most often diagnosed malignancy worldwide and the leading cause of cancer-related deaths in women. Chemotherapeutic resistance may hinder the efficacy of therapies for breast cancer, therefore finding novel therapeutic approaches is crucial. Terpenoids are widely distributed throughout the kingdom of plants and constitute a vast array of secondary metabolites mostly composed of isoprenoid components. Terpenoids are known to have a wide spectrum of bi-

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ological features. Based on the structure, terpenoids are divided into six classes. Potent natural terpenoids have been widely acknowledged as key components of contemporary breast cancer pharmacotherapy. Several compounds within this class hold promise as viable agents against breast cancer. These substances now hold promise as therapeutic agents due to significant advancements in the elucidation of the precise mechanism behind their anticancer effect. Therefore, this chapter aims to present a current summary of the most recent advances in terpenoids' potential benefits against breast cancer. Furthermore, this review offers recommendations for the development of specific terpenoids as possible medicines for breast cancer in the future.

INTRODUCTION

Terpenes And Breast Cancer

Breast cancer is a dreadful disease that affects women worldwide (Askar MA, et al., 2022; Hussein M, et al., 2024). Its high morbidity and mortality rates constitute an imminent risk to women. In 2020, the WHO stated that 2.3 million women worldwide had been identified with cancer of the breast, with 685,000 fatalities. The most prevalent form of cancer is breast cancer, which accounts for the second majority of deaths of female due to cancer globally, and the fifth highest cause of cancer-related fatalities worldwide (Lukasiewicz S, et al., 2021; Iacoviello L, et al., 2021). Treatment approaches including chemotherapy, radiotherapy, and surgery have increased survival rates, but their effectiveness is restricted due to factors like metastasis, which makes surgical removal impossible (Morris P.G., et al., 2009). Unfortunately, the high morbidity of breast cancer has only been slightly impacted by current treatment modalities (Bange J, et al., 2001; Wong JS and Harris JR., 2001). Conventional therapy for breast cancer is ineffective, leading to an increase in tumor relapse with varying morphological, molecular, and behavioral features. Despite advances in the field of cancer, many patients continue to experience severe side effects from radiotherapy and chemotherapy, as well as medication resistance (Ghate N, et al., 2014; El-Nashar HAS, Aly SH, et al., 2021; El-Nashar HAS, El-dehna WM, et al., 2021). Plants include several natural chemicals that have multiple medicinal properties (Abd El-Ghfar EA, et al., 2017; Abdelazim et al. 2024; Goher SS, et al., 2023; Mia et al. 2023; Abdelghfar et al. 2021). Bioactive compounds found in plants and human diets are being developed for cancer prevention and treatment, including breast cancer. Terpenoids are a common type of phytochemical found in nature. The most prevalent naturally occurring substances in plants are called terpenoids, sometimes referred to as terpenes or isoprenoids, and they are made up of