

Sophocarpine as a Promising Natural Anticancer Agent: Mechanistic Insights and Therapeutic Potential in Breast Cancer

Yasmin Shahin^{1,*}, Doaa Ghareeb¹, Nihal El Guindy¹, Seham Elabd², Mahmoud Balaa¹

¹Biochemistry Department, Faculty of Science, Alexandria University, Alexandria, Egypt.

²Physiology Department, Medical Research Institute, Alexandria University, Alexandria, Egypt.

*Yasmin Ramadan Shahin: E-mail: yasminshahin47@gmail.com.

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ABSTRACT: Recent investigations have increasingly focused on natural compounds as potential anticancer agents, attributable to their widespread availability and lower cytotoxicity relative to conventional chemotherapeutics. A wide range of phytochemicals exhibits promise for incorporation into molecularly targeted therapies, particularly through the modulation of microRNAs and associated intracellular signaling pathways. Alkaloids, in particular, have a significant potential in cancer treatment and prevention. Sophocarpine (SC), a quinolizidine alkaloid isolated from *Sophora* species, demonstrates multifaceted pharmacological activities, including immunomodulatory, anti-inflammatory, anticancer, and antiviral effects. In this study, we provided insight into the molecular mechanisms behind the SC's anticancer effects in breast cancer cells. Our findings indicated that SC exerts antiproliferative effects by disrupting key oncogenic signaling molecules. Furthermore, SC modulates the expression profiles of some non-coding RNAs and upregulates tumor suppressor genes, thereby contributing to its antineoplastic efficacy. Importantly, SC exhibited minimal cytotoxic effect on normal cells, reinforcing its safety profile and therapeutic promise as a natural compound. These findings emphasize the potential of SC as a natural bioactive compound for breast cancer treatment, requiring further preclinical and clinical evaluation.