Received: 3 April 2024 | Accepted: 7 June 2024

DOI: 10.1002/fft2.439

FOOD FRONTIERS Open Access

REVIEW ARTICLE

Serving up health: How phytochemicals transform food into medicine in the battle against cancer

Eshita Sharma[1] | **Manju Tewari**[2] | **Priyanka Sati**[2] | **Isha Sharma**[3] | **Dharam Chand Attri**[4] | **Supriyanka Rana**[5] | **Afaf Ahmed Aldahish**[6] | **Daniela Calina**[7] | **Praveen Dhyani**[8] | **Javad Sharifi-Rad**[9] | **William C. Cho**[10]

[1]Department of Molecular Biology and Biochemistry, Guru Nanak Dev University, Amritsar, Punjab, India

[2]Department of Biotechnology, Kumaun University, Nainital, Uttarakhand, India

[3]Department of Biotechnology, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Himachal Pradesh, India

[4]Department of Botany, Central University of Jammu, Rahya-Suchani (Bagla), Jammu and Kashmir, India

[5]Department of Cardiology, Indira Gandhi Medical College & Hospital, Shimla, Himachal Pradesh, India

[6]Department of Pharmacology, College of Pharmacy, King Khalid University, Abha, Kingdom of Saudi Arabia

[7]Department of Clinical Pharmacy, University of Medicine and Pharmacy of Craiova, Craiova, Romania

[8]Institute for Integrated Natural Sciences, University of Koblenz, Koblenz, Germany

[9]Department of Biomedical Sciences, College of Medicine, Korea University, Seoul, Republic of Korea

[10]Department of Clinical Oncology, Queen Elizabeth Hospital, Kowloon, Hong Kong

Correspondence
Daniela Calina, Department of Clinical Pharmacy, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania. Email: calinadaniela@gmail.com

Praveen Dhyani, Institute for Integrated Natural Sciences, University of Koblenz, Universitätsstraße 1, 56070 Koblenz, Germany. Email: praveendhyani86@gmail.com

Javad Sharifi-Rad, Department of Biomedical Sciences, College of Medicine, Korea University, Seoul 02841, Republic of Korea. Email: javad.sharifirad@gmail.com

William C. Cho, Department of Clinical Oncology, Queen Elizabeth Hospital, Kowloon, Hong Kong. Email: chocs@ha.org.hk

Abstract

The escalating global cancer burden underscores the urgent need for more effective therapeutic strategies. Phytochemicals, naturally occurring compounds in plants, have garnered attention for their potential in cancer chemoprevention and chemotherapy. Their ability to modulate molecular mechanisms and influence cell signaling pathways offers a promising avenue for cancer management. This review aims to synthesize current knowledge on phytochemicals' chemopreventive and chemotherapeutic potential, focusing on their molecular mechanisms of action and impacts on cell signaling pathways involved in cancer. A systematic literature search was conducted across major databases, including PubMed/Medline, Web of Science, Scopus, and Google Scholar. The search strategy uses Medical Subject Headings (MeSH) and free-text terms using Boolean operators to capture relevant studies. Inclusion criteria targeted original research and reviews on the effects of phytochemicals in cancer, with a specific focus on molecular mechanisms. Phytochemicals, including flavonoids, polyphenols, and terpenoids, demonstrated significant anticancer properties by inducing cell cycle arrest, apoptosis, and autophagy. They modulate critical cell signaling pathways, such as cyclooxygenase-2, nuclear factor kappa B, and various growth factor-related