Plant derived bioactive compounds in human health and disease - Book review

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Book Review

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"*Plant Derived Bioactive Compound in Human Health and Disease*," edited by Surajit Pathak and Antara Banerjee, is a comprehensive exploration of the multifaceted roles of phytochemicals in promoting human health and combating diseases. Published in 2025 by CRC Press, this book serves as a vital resource for researchers, healthcare, professionals, and students interested in therapeutic potential of plant-derived compounds. The editors have curated a collection of chapters that delve into various aspects of phytochemicals, from their nutritional significance to their role in modern medicine.

The book is structured into several chapters, each focusing on different dimensions of phytochemicals. The initial chapters introduce the concept of phytochemicals, providing a foundational understanding of these bioactive compounds. Subsequent chapters explore their roles in combating oxidative stress, their therapeutic potential against multidrug-resistant bacterial infections, and their modulation of critical pathways in inflammation and cancer.

In this book there are 18 chapters, namely

Chapter 1, Harnessing Nature's Richness: Exploring the Health Impacts of Phytochemicals from Fruit Peels. This chapter comprehensively reviews the nutritional composition and therapeutic potential of phytochemicals extracted from fruit peels. Emphasizing their potent antioxidant activities, the chapter discusses their role in promoting gut health, enhancing immune responses, and contributing to the prevention of chronic diseases such as cardiovascular disorders and diabetes.

Chapter 2, Bioactive Principles from Traditional Medicinal Plants in the Management of Metabolic Disorders. This chapter examines the medicinal applications of bioactive compound found in traditional plants, particularly in treating metabolic syndromes. It highlights the mechanisms through which these natural substances help regulate blood glucose levels, reduce insulin resistance, and manage obesity, offering a promising complementary approach to conventional therapies.

Chapter 3, Phytochemicals as Potential Alternatives to Overcome Multidrug-Resistant Bacterial Infections. Addressing the urgent global challenge of antibiotic resistance, this chapter discusses how phytochemicals present a viable alternative to

conventional antibiotics. It explores specific plant-derived compounds exhibiting significant antimicrobial activity and elucidates their mechanisms in inhibiting bacterial growth and survival.

Chapter 4, Mechanisms of Phytochemicals in Modulating Inflammatory and Cancer-Related Signaling Pathways. Focusing on molecular biology, this chapter investigates how phytochemicals interact with cellular signaling pathways associated with inflammation and carcinogenesis. It outlines key pathways such as NF-κB, MAPK, and PI3K/Akt and describes how phytochemicals can alter these pathways to exert anti-inflammatory and anti-cancer effects.

Chapter 5, Structure-Activity Relationship (SAR) of Plant-Based Bioactive Compounds in Anti-Cancer Therapy. This chapter emphasizes the importance of understanding the structure-activity relationship (SAR) of phytochemicals in cancer treatment. It analyzes how specific chemical structures of natural compounds influence their biological effectiveness, offering insights crucial for the design of new, more potent anti-cancer agents.

Chapter 6, Advancements in Plant-Based Therapeutics for Colorectal Cancer. Presenting recent research findings, this chapter discusses the anti-colorectal cancer effects of various plant-derived compounds. It highlights their mechanisms of action, such as apoptosis induction and inhibition of tumor growth, and their potential role as adjuncts to existing chemotherapeutic treatments.

Chapter 7, Nutraceuticals in the Prevention and Management of Oral Cancer. This chapter evaluates the effectiveness of plant-based nutraceuticals in the context of oral cancer prevention and treatment. It underscores the benefits of integrating phytochemical-rich diets into daily life as a strategic measure to lower cancer risk and enhance therapeutic responses.

Chapter 8, Resveratrol and Its Therapeutic Role in Targeting Melanoma. Focusing on resveratrol, a well-studied polyphenolic compound, this chapter reviews its molecular mechanisms against melanoma cells. It discusses resveratrol's ability to induce apoptosis, inhibit metastasis, and sensitize cancer cells to conventional therapies.

Chapter 9, Targeting Cancer Stem Cells with Phytochemicals. Recognizing the critical role of cancer stem cells (CSCs) in tumor progression and recurrence, this chapter explores how specific phytochemicals can selectively target CSC populations. It elaborates on the mechanisms involved, including the suppression of CSC self-renewal pathways.

Chapter 10, Plant-Derived Bioactive Compounds for Cardiovascular Disease Management. This chapter provides an overview of the cardioprotective effects of plant-derived bioactive compounds. It discusses how these phytochemicals can reduce oxidative stress, modulate lipid metabolism, and improve endothelial function, offering protective benefits against heart disease

Chapter 11, Antioxidant Activities of Phytochemicals Found in Colostrum. Examining colostrum, this chapter discusses the presence of antioxidant phytochemicals and their role in enhancing neonatal health. It highlights how these compounds help in combating oxidative stress during early developmental stages.

Chapter 12, Impact of Phytochemicals on Endocrine Disruption and Female Reproductive Health. This chapter investigates the protective effects of phytochemicals against endocrine-disrupting chemicals (EDCs) and their implications for female reproductive health. It explains how plant-derived compounds can restore hormonal balance and improve fertility outcomes.

Chapter 13, Natural Compounds and Biogenic Nanoparticles in Polycystic Ovarian Syndrome (PCOS) Therapy. Focusing on innovations in reproductive medicine, this chapter examines the potential of combining natural compounds with biogenic nanoparticles to effectively treat PCOS. It presents these approaches as promising alternatives with fewer side effects compared to conventional therapies.

Chapter 14, Therapeutic Strategies Targeting Amyloidosis Using Natural Products. This chapter delves into the pathology of amyloidosis and evaluates how natural products can intervene in the formation and deposition of amyloid fibrils. It highlights the promising role of phytochemicals in modifying disease progression.

Chapter 15, Phytochemicals Regulating Cell Signaling Pathways in the Aging Brain. Addressing neurodegenerative diseases, this chapter discusses how phytochemicals influence signaling pathways implicated in brain aging. It illustrates their potential in protecting neurons, reducing oxidative stress, and enhancing cognitive function.

Chapter 16, Ethnopharmacological Approaches in Addressing Age-Related Brain Disorders. This chapter presents recent ethnopharmacological findings on plant-based treatments for age-related brain disorders. It emphasizes the integration of traditional knowledge with modern pharmacological techniques to discover new therapeutic agents.

Chapter 17, Anthocyanins and Their Derivatives: Innovative Applications in Drug Delivery Systems. Exploring drug delivery innovations, this chapter discusses the role of anthocyanins and their derivatives in improving bioavailability and targeted delivery of therapeutic agents, enhancing their clinical efficacy.

Chapter 18, Toxic Phytochemicals and Their Health Implications. Concluding the discussion, this chapter addresses the potential toxicity of certain phytochemicals. It stresses the importance of proper dosage, identification, and regulation to prevent adverse health effects from plant-derived compounds.

The book offers a comprehensive exploration of the nutritional significance, therapeutic potential, and biological mechanisms of phytochemicals. Emphasizing the vital role of phytochemicals in enhancing nutrition and preventing chronic diseases, it highlights the health benefits derived from fruit peels and nutraceuticals. The therapeutic applications of plant-derived compounds in addressing cancer, metabolic disorders, and infections are thoroughly examined, supported by evidence from clinical settings. A notable strength of the book lies in its detailed discussion of the mechanisms of action, particularly in relation to signaling pathways, apoptosis, and cell cycle regulation. Moreover, the book showcases innovative approaches, such as the utilization of biogenic nanoparticles and combination therapies, illustrating the promising integration of traditional knowledge with modern scientific advancements. Importantly, it maintains a balanced perspective by addressing the safety concerns and potential risks associated with toxic phytochemicals, underscoring the need for careful and responsible application of these natural compounds.

In conclusion, the book "Plant Derived Bioactive Compounds in Human Health and Disease" is a timely and essential contribution to the field of phytochemistry and its applications in health and disease management. The editors have successfully compiled a diverse range of topics that reflect the current state of research and the potential of phytochemicals in modern medicine. This book serves as a valuable resource for researchers, healthcare professionals, and students, inspiring further investigation and innovation in the dynamic area of plant-derived bioactive compounds. The holistic view presented in this book underscores the importance of integrating traditional knowledge with contemporary scientific research to enhance human health and well-being.

In summary, this book is a must-read for anyone interested in the therapeutic potential of phytochemicals and their role in promoting health and combating diseases. The comprehensive analysis of research findings, clinical applications, and future directions makes it an invaluable addition to the literature on plant-derived bioactive compounds.

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