



**Biotechnology  
of Bioactive  
Compounds**

**Sources and Applications**

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and Maria G. Tuohy

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# **Biotechnology of Bioactive Compounds**

Sources and applications

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# Foreword

Industrial biotechnology encompasses the application of biotechnology-based tools for traditional industrial processes and the manufacturing of bio-based products from renewable feedstocks. Microorganisms, enzymes, and plant-derived compounds form the basis of a suite of technologies and processes that a diverse group of companies, researchers, and scientists are seeking to develop for commercial use. The World Economic Forum estimated that by 2020 the market for biofuels, bio-based bulk chemicals and plastics, and bioprocessing enzymes will approach \$95 billion.

The possibility of utilization of microorganisms or vegetables for obtaining molecules' potential in many industrial sectors can place any nation in a prominent position on the international scene. This theme currently has received great attention in science, technology, and innovation policies as fundamental to the future development of a country. One of the more concrete possibilities of use of microbial and vegetable biodiversity in sustainable development of a country is in the agricultural, food, and pharmaceutical sectors, which could put the country in a relevant world position in the production of bioactive compounds in a sustainable way.

In this scenario, the use of biomolecules is highlighted as a sustainable practice to be encouraged. The wide biodiversity of the planet yet unexplored can be an infinite source of bioactive compounds with industrial applications. Some examples of applications are related to the use of microorganisms and microalgae for production of biomolecules, mainly for the pharmaceutical and food industries. Plants, fruits, and residues of fruit-processing industries can be a source of many industrial compounds.

This book describes the current stage of knowledge of production of bioactive compounds from microbial, algal, and vegetable sources. In addition, the molecular approach for screening bioactive compounds is also discussed as well examples of applications of these compounds on human health.

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# Preface

Since time immemorial, natural products have not only been used as dyes and colors all over the world, but they have also made a tremendous contribution through pharmacognosy to a myriad of drugs currently used in medicine. Today bioactive compounds are central in high-value product development in the chemical industry. Bioactive compounds have been identified from diverse sources and their therapeutic benefits, nutritional value and protective effects in human and animal healthcare have underpinned their application as pharmaceuticals and functional food ingredients. The end of the 19th century witnessed a decline in the level of interest in natural products, mainly due to the escalating expectations of scientists and industries regarding the identification of new compounds and their potential synthesis. However, shortly afterward, concern for the environment through the excessive use of synthetic chemicals, along with the growing need to search for new and better drugs, provided a fresh impetus for the analysis of bioactive compounds and their sources, with the focus again being on their pharmacological application, either directly or as synthetic derivatives of parent natural compounds.

This book considers recent developments in the field of pharmacognosy, especially the interdisciplinary efforts to identify new sources of bioactive compounds and biological applications. The orderly study of biologically active products and the exploration of potential biological activities of these secondary metabolites, including their clinical applications, standardization, quality control, mode of action, and potential biomolecular interactions, has emerged as one of the most exciting developments in modern natural medicine. This book provides specific examples of current research and development in natural products biochemistry. Information on diverse sources of bioactive compounds, ranging from microorganisms and algae to plants and dietary foods (Chapters 1–12), as well as selected bioactivities and biotechnological and biomedical potential reviewed in Chapters 13–27. The bioactive compounds profiled include compounds such as C-phycoyanins, glycosides, phytosterols, and natural steroids. An overview of the usage of bioactive compounds as antioxidants, anti-inflammatories, and antiallergics and in stem cell research is presented (Chapters 21–27), with an overview provided in Chapter 21 on overall medicinal applications of plant-derived compounds.

This book has been designed to be an informative text for undergraduate and graduate students of biomedical chemistry who are keen to explore the potential of bioactive natural products and also provides useful information for scientists working in various research fields where natural products have a primary role.

*Vijai Kumar Gupta and Maria G. Tuohy*

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