

**NATURAL PRODUCTS:**  
*Research Reviews*

— *Volume 2* —

### *The Editor*

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Dr. Gupta has to his credit more than 100 scientific publications and review articles which have appeared in internationally recognized Indian and foreign journals. Founder fellow, life member and office bearer of many national societies, academies and associations. He has successfully completed a number of research/consultancy projects funded by government, private and multinational agencies. His current areas of interest are histopathology, toxicology, pre-clinical safety pharmacology, reproductive efficacy studies of laboratory animals and biodiversity.

He is the Series Editor of the recently published multi-volume set of books, "**Comprehensive Bioactive Natural Products (Vols. 1-8)**", published by M/S Studium Press, LLC, USA. He is also Editor-in-Chief of the books, "**Utilisation and Management of Medicinal Plants**", "**Medicinal Plants: Phytochemistry, Pharmacology and Therapeutics (Vols. 1 and 2)**", "**Traditional and Folk Herbal Medicine**", "**Natural Products: Research Reviews**", "**Bioactive Phytochemicals: Perspectives for Modern Medicine**", "**Perspectives in Animal Ecology and Reproduction (Vols. 1-9)**" and "**Animal Diversity, Natural History and Conservation (Vols. 1-3)**". The Editor-in-Chief of the American Biographical Institute, USA, has appointed him as *Consulting Editor* of *The Contemporary Who's Who*. Dr. Gupta also appointed as Nominee for the *Committee for the Purpose of Control and Supervision of Experiments on Animals* (CPCSEA, Govt. of India). The *Linnaean Society of London*, U.K. has awarded fellowship to him in November 2009 in recognition of his contribution towards the cultivation of knowledge in Science of Natural History. Recently, Modern Scientific Press, USA has nominated Dr. Gupta as the Editor of the *International Journal of Traditional and Natural Medicine*.

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*Editor*

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## Foreword

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With the advent of modern day civilization many efforts have been made by mankind for a better living. This includes consumption and use of synthetic products and drugs. Continuous or prolong use of such synthetic drugs may provide consumers with immediate benefit and comfort but at the cost of harmful side effects. In the midst of all these, we forget the greatest treasure that we are gifted from 'Mother Nature'. Nature has provided us several products like, penicillin, vincristin, taxol etc. that has proved to be benevolent for the mankind. Despite of landmark advancement of science made in today's world, we still fail to harness the goodness of nature completely for benefit of the mankind. But in the light of recent discoveries and research, it can be said that people are now realizing the need for nature based health care components and therefore making efforts to utilize them for benefit of the human race. There are several reasons for such inclination towards natural products. One of them is the non-toxic nature of these bio-active natural products. Wonderful natural resources are distributed worldwide that need to be harnessed. In this regard, Dr. V. K. Gupta came forward and published a Book Series named - *Natural Products: Research Reviews* (with M/S Daya Publications, New Delhi) as his initiative towards this noble cause. After successful publication of Volume I, Volume II is going to be published with its wide spectrum and vastness of knowledge that will help the readers to understand the benefits of natural products and also their medicinal importance (low cost and minimal toxicity). I am very pleased to see the representation of all the authors here in this book who have come up with Natural Products having immense medicinal properties from various corners of the Globe like Norway, India, Brazil, Portugal, Italy, Malaysia etc.

Plants are the rich sources of lectins (carbohydrate binding proteins) that have great implications in medicines and beyond. In the first article, Selma Aricigil and Ian F. Pryme reviewed potential beneficial effects of dietary plant lectins on health. The content of the article should help the readers and dieticians to supplement lectins in their meals to strengthen body's immunity, the ultimate remedy of all diseases.

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Inflammation is the manifestation of several diseases, including Cancer. Steroidal and non-steroidal anti-inflammatory drugs are available with alarming side-effects. Two chapters by Baravalia *et al.* and Namita *et al.* described some valuable anti-inflammatory agents obtained from medicinal plants. In today's world people are prone to diseases like Alzheimer's and Stroke. Suganthy and co-workers and Richa Shri in two articles discussed herbal anti-oxidants as a remedy for these two burning health problems. Ten species and/or their genus are introduced by scientific groups from different countries in nine articles. Those species are, *Salicornia* Genus, *Euphorbia tirucalli*, *Chrysanthemum cinerariaefolium* L., *Kalanchoe pinnata*, *Kalanchoe brasiliensis*, *Pterocarpus santalinus*, *Zanthoxylum alatum*, *Withania somnifera*, *Lippia nodiflora*, *Ficus benjamina*. Their nature and applications in human life are nicely described here as a reference text for further readership, applications and research. As it is said that "Not every battle is struck by violence and not every fight culminates in bloodshed", therefore often in case of many incurable diseases our dietary supplements seem to play a major role. Spices are essential ingredients of our diet, especially in Indian cuisine. Applications of selected spices are discussed in biological and anti-microbial fields. In addition to plant based natural products, protective effects of marine biota are addressed in relation to oxidative stress disorders by Ilavarasi *et al.* Besides natural products obtained from endophytic bacteria as discussed by Dhankhar and others also hold a special place. Importance of *Ficus arnottiana* in wound healing purpose is also reviewed by Ashok Kumar. Wound healing is a complex process that involves closure of the wound and restoration of the functional barriers. We depend on antibiotics for the same. However, several traditional medicines are available for wound healing. Therefore, this article may help us to rethink about the uses of natural medicine as the remedies for wound.

The effort given by editor, publisher and contributors to accumulate the knowledge on medicinal plants and present them beautifully on a single platform (Volume II of the Review series) deserves appreciation. Further they have successfully delivered their social responsibility of making the common people aware of the vastness and usefulness of the Nature that surrounds us. After publication of Volume I in 2012, Volume II is going to be published soon with in-depth knowledge of various aspects of natural product biology. Succeeding volumes will come with more such discoveries. By implementing this knowledge in our daily lives, we can surely dream of a healthier and a beautiful world to live in.

**Rathindranath Baral**

# Preface

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Compounds which have biological activities and are derived from natural sources, *e.g.*, plants, animals and microorganisms, are defined as natural products. Natural products have been used by human societies for millennia. History of medicine dates back practically to the existence of human civilization and use of Natural Products by human have been traced from ancient records such as the use of *Artemisia annua* in China, opium poppy (active principle morphine) in Egypt, snakeroot plant (active principle reserpine) in India, willow tree (salicin) and foxglove (active principle digitalis - a mixture of compounds such as digitoxin, digitonin, digitalin) in England and ipecacuanha root (active principle emetine), coca bush (active principle cocaine) and cinchona bark (active principle quinine) in Mesoamerica. The current accepted modern medicine or allopathy has gradually developed over the years by scientific and observational efforts of scientists. However, the basis of its development remains rooted in traditional medicine and therapies.

The number of natural product drug discovery programs has steadily declined since the 1980s, primarily because pharmaceutical companies have shifted to using synthetic chemical libraries that are more amenable to high throughput screening and simplified synthesis. Between 1981 and 2002, approximately 50% of all new chemical entities approved by the U.S. Food & Drug Administration (FDA) were natural products, natural product derivatives, or synthetic mimetics related to natural products. However, clinical trials for new natural product therapeutics dropped 30% between 2001 and 2008.

Despite this shift, natural products remain an important part of the drug discovery process. They are often used as a starting point for the production of simplified bioactive molecules or to inform the production of synthetic small molecule libraries that are more amenable to high throughput screening. Automated fractionation and characterization methods to improve screening, molecular modeling programs to guide rational modification of natural products, and engineering strategies for heterologous production of natural products in laboratory amenable

organisms are making natural product drug discovery and development more accessible and may lead to more programs in this area. It was with this approach that this 2<sup>nd</sup> volume entitled, “**Natural Products: Research Reviews**” has been compiled. Some of the interesting studies included in the volume are: Potential Beneficial Effects of Dietary Plant Lectins on Health; Therapeutic Potential of Medicinal Plants as Anti-Inflammatory Agents; Multipotent Antioxidants from Herbal Drugs to Combat Alzheimer’s Disease; The Role of Natural Products in the Search for a P2X7R Antagonist; Modulation of Death Receptor Mediated Apoptosis by Natural Products; An Overview of *Salicornia* Genus; A Detail Review on *Euphorbia tirucalli*; Micropropagation and *in vitro* Culture of Pyrethrum; Morpho-Anatomy, Phytochemistry and Pharmacology of Anticancer Spike-Mosses; Biological and Antimicrobial Properties of Selected Spices; Protective Effect of Marine Natural Products Against Oxidative Stress Related Disorders; Wound Healing and *Ficus arnottiana* Miq.; An Overview Description of Two *Kalanchoe* Species: *K. pinnata* and *K. brasiliensis*; A Hidden Source of Natural Products: Endophytic Bacteria; *Pterocarpus santalinus*: A Wonder Medicinal Plant for Next Generation; *Zanthoxylum alatum*: A Miraculous Species from Genus *Zanthoxylum*; *Withania somnifera*: An Exhaustive Review on Chemical Profile of Plant of Enormous Medicinal Properties; Natural Products Against Bovine Mastitis Pathogens; Antimicrobial Activity of Copaiba Oil (*Copaifera* sp.) and its Compounds; Potential of Plants with Antioxidant Activity for Management of Ischemic Stroke; Morphological, Phytochemical and Pharmacological Profiles of *Lippia nodiflora* (L); Compendium of *Ficus benjamina* Linn.

The Editor express his gratefulness to the contributors who have shared valuable thoughts through their scholarly contributions and timely submission of manuscripts for this volume and also thanks to the publisher, Astral International Pvt. Ltd., New Delhi and their staff for timely and expeditious job rendering the manuscript press-ready.

**J.K. Gupta**

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