
Therapeutic Applications of Honey and its Phytochemicals

Muneeb U. Rehman • Sabhiya Majid
Editors

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Vol.1

 Springer

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ISBN 978-981-15-6798-8

ISBN 978-981-15-6799-5 (eBook)

<https://doi.org/10.1007/978-981-15-6799-5>

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The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Dedicated to all Frontline COVID Warriors

Foreword



The book *Therapeutic Applications of Honey and its Phytochemicals* edited by Dr. Muneeb U. Rehman, a Faculty Member at King Saud University, Riyadh, Saudi Arabia, and Dr. Sabhiya Majid, Professor and Chairperson of Biochemistry Department, Govt. Medical College (GMC-Srinagar), University of Kashmir, India, is in my opinion the first volume in this series. The editors are specialised in biochemistry, toxicology, in particular cancer biology and natural product research, as well as pharmacogenomics. In this volume they have included 20 chapters on the theme with contributions mainly from India, Canada, USA, Taiwan, UAE, Saudi Arabia, and Egypt.

“Bee and Honey” are known as the symbols of productivity, even resurrection. Honey has been used as the material for embedding the dead because of its air proof features. Its nutritional value is associated with human immortality because it was known as a drink of the “gods”. The wall paintings from 8000 to 9000 BC in Çatalhöyük (Turkey) depict that honey was known in Anatolia as an important part of nutrition. History reveals that honey and bee keeping were known in Mesopotamia during the middle period of 3000 BC. The King of Babylon, in the Sin Temple at Harran (Urfa-Turkey), poured honey on the walls as well as wooden structures with other materials.

Apitherapy or “treatment with bee products” has developed fast at a global scale. It is a complex natural food, monofloral or plurifloral type, varying in composition depending on the season, origin of nectar, method of production, species of honeybees, honeydew sources, flora and their origin, geographic region, manipulation,

processing, packaging, and time of the storage. According to the FAO agricultural statistics 1.78 million metric tons of honey is produced globally. The average honey production per comb in the world is 20 kg. In the ancient Egyptian culture, honey was documented to have used for gynaecological issues and consumed to prevent pregnancy. A comparison of honey with other foods of the same calorific value reveals that it is more appropriate for diabetic patients than other sugar products, resulting in lesser insulin production. However, there is another type known as “Mad Honey”. Its poisoning effect was reported by Xenophon (an Athenian military commander and author) for the first time in 401 BC. Moreover, mad honey was used by King Mithradates IV (Northeast Anatolia, Turkey) as a weapon in 67 BC against Pompey the great. Mad honey, which is contaminated with grayanotoxins, generally found in *Rhododendron* genus (family: Ericaceae), is different from natural or commercially available honey. It leads to poisoning upon consumption. Such types of honey have been commonly used as an aphrodisiac, in alternative therapy for peptic ulcer disease, dyspepsia, and gastritis, and for hypertension for a long time. Although fatalities are very rare, its ingestion may lead to arrhythmias, which can be life-threatening. It is mostly reported in Nepal, Korea, and Turkey whereas the consumption of honey containing tutin (a neurotoxin from *Coraria* species), which is termed tutin honey that also has poisoning effect, is reported from New Zealand.

The salient features of this volume are the historical and traditional usage of honey presented in Chap. 1, which focuses on the historical aspects of honey consumption, along with its uses in traditional folk medicine. Chapter 2 deals with “Honey: A Powerful Natural Antioxidant and Its Possible Mechanism of Action”. It includes information on honey composition, type, antioxidant properties, and antioxidant mechanism. A detailed overview of the phytochemical characteristics of honey and pollen, the therapeutic ability of its biologically active ingredients, and their use in value-added food products are presented in Chap. 3. The data on “Honey: A Sweet Way to Health” provides readers a better understanding of complex composition, biological activities, adverse effects, and therapeutic benefits of honey; possibilities for its development as a natural therapeutic agent for many pathologies and extensive studies are summarised in Chap. 4. In Chap. 5 authors have reviewed how honey composition and its concentration influence the shelf life of the product and how ingredients of honey’s quality and quantity fix the nutritive and medicinal value. The nectars as secretion of plants are the main component of honey and its properties are discussed in Chap. 6 presenting information on honey and its authenticity—an analytical approach. Chapters 7–9 cover data on the anti-microbial activities, the traditional and modern applications, and recent advances in the discovery of bioactive components from natural honey. In Chap. 10, researchers have focused their interest towards honey as a successful antioxidant and antimicrobial agent and the possibilities for its use against organisms with antimicrobial resistance, specifically the expansion in multi-drug resistance (MDR), the quantity of efficient antibiotics which has compelled scientists to think back to the pre-antibiotic period for creating solutions, directing their consideration towards the mechanisms of action of antimicrobial activity of honey. “Honey as Component of Diet: Importance and Scope” is the title of Chap. 11. It discusses the part played by honey in symbolism

and religion. In Chap. 12 authors discuss the positive influence of honey on human health, as advocated by all religious and cultural beliefs as well as traditions whether ancient or modern. This chapter presents insights into the health benefits associated with the consumption of honey and a brief description about the composition and clinical trials of honey. “Different Types of Honey and Their Properties” is the topic of Chap. 13, followed by data on the “Pharmaceutical Applications of Honey” in Chap. 14. The authors provide information on the effectiveness of honey in the eradication of multidrug resistant pathogens such as methicillin resistant *Staphylococcus aureus* (MRSA), controlling blood sugar in diabetic patients, accelerating healing of wounds and chronic ulcers, improving cough and asthma, treatment of different types of cancers, and reducing symptoms associated with periodontal diseases.

Chapter 15 summarises the data on certain clinical attributes of honey and the active chemical ingredients responsible, together with some of its physicochemical properties. In Chap. 16 Chinese honey composition, production, trade, and health benefits have been reviewed as China is the top producer of honey in the world. “The Gut–Brain Axis, Cognition and Honey” is the topic of Chap. 17, which provides data on the use of honey as a prebiotic. Authors conclude that improvement in cognitive functions is a cumulative effect of the unique chemical composition of honey, and it may not be identical for all types of honey. More longitudinal research is required to establish honey as a brain tonic. Chapter 18 “Antiproliferative and Apoptotic Activities of Natural Honey” provides insights into the role of honey in regulating anti-proliferative and pro-apoptotic mechanisms in human cancers and also endorses honey as a promising candidate against cancer. Chapter 19 deals with the “Health Benefits of Phenolic Compounds in Honey: An Essay” with a discussion on the classification, structural, medicinal, and health benefits of phenolic compounds. In Chap. 20, the role of honey for enhancing performance in endurance sports has been presented, because there are limited studies showing that honey improves the physical performance among endurance athletes.

Since times immemorial honey has been an integral part of the human diet, used in traditional medicines for ages and is considered as “health tonic”. It is mentioned in the holy books including The Holy Quran: “And thy Lord taught the bee to build its cells in hills, on trees, and in men’s habitation: Then to eat of all the produce (of the earth), and find with skill the spacious paths of its Lord: there issues from within their bodies a drink of varying colours, wherein is healing for humans: verily in this is a sign for those who give thought” illustrating the potential curative worth of honey.

The editors have put concerted efforts while compiling this volume with a very rich content. I am sure it will prove a very valuable document for researchers engaged in the field of natural products and for entrepreneurs, those involved in research and development in industries, medical practitioners and academicians, as well as graduates and undergraduates. The book is a thorough compilation of the latest literature regarding the chemistry and pharmacology of honey. The editors have painstakingly provided a solid foundation of the subject which can be of immense value for researchers involved in the therapeutic role of natural

compounds, especially honey in various diseases and illnesses. In both Unani and Ayurveda, honey has been documented to possess the potential to treat various ailments. Recent studies report that honey is used as a natural remedy against respiratory disorders and nervousness. The indicator of COVID-19 infection suggests that increased inflammation, oxidation, and an overstressed immune response are the key contributor of COVID-19 pathology. This adds to the importance of this volume while humanity is passing through a pandemic. It will mainly prove helpful to pharmacologists, toxicologists, chemists, phytochemists, and pharmacognosists.

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