Natural Products Isolated from Various Parts of Mangosteen (*Garcinia mangostana* L.) as Therapeutic Agent: A Review

Arif Nur Muhammad Ansori[1,2,3,4,5], Yulanda Antonius[6]*, Ahmad Affan Ali Murtadlo[3,4,5], Viol Dhea Kharisma[3,4], Bayyinatul Muchtaromah[7], Muhammad Khaliim Jati Kusala[8], Dora Dayu Rahma Turista[3,9], Imam Rosadi[10], Vikash Jakhmola[2], Maksim Rebezov[11,12], Tarun Parashar[2], and Rahadian Zainul[13,14]

Postgraduate School, Universitas Airlangga, Surabaya, Indonesia
Uttaranchal Institute of Pharmaceutical Sciences, Uttaranchal University, Dehradun, India
Generasi Biologi Indonesia Foundation, Gresik, Indonesia
Division of Research and Development, CV Jalan Tengah, Pasuruan, Indonesia
The Indonesian Society of Bioinformatics and Biodiversity (MABBI), Jakarta, Indonesia
Faculty of Biotechnology, University of Surabaya, Surabaya, Indonesia
Master Program of Biology, Universitas Islam Negeri Maulana Malik Ibrahim, Malang, Indonesia
Research Center for Veterinary Sciences, National Research and Innovation Agency, Bogor, Indonesia
[1] *Department of Biology Education, Faculty of Teacher Training and Education, Mulawarman University, Samarinda, Indonesia*
[3] *Department of Biology, Faculty of Mathematics and Natural Sciences, Mulawarman University, Samarinda, Indonesia*
[5] *Department of Scientific Research, V. M. Gorbatov Federal Research Center for Food Systems, Moscow, Russian Federation*
[7] *Department of Scientific Research, Ural State Agrarian University, Yekaterinburg, Russian Federation*
[8] *Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Padang, Indonesia*
Center for Advanced Material Processing, Artificial Intelligence, and Biophysic Informatics (CAMPBIOTICS), Universitas Negeri Padang, Padang, Indonesia
Corresponding author. Email: yulandaantonius@staff.ubaya.ac.id

ABSTRACT

This review provides a comprehensive analysis of the therapeutic potential of natural products derived from mangosteen (*Garcinia mangostana* L.). Mangosteen, a tropical fruit native to Southeast Asia, has long been valued for its medicinal properties. The review focuses on the isolation and characterization of bioactive compounds from different parts of the plant, including the fruit, rind, and leaves. The bioactive compounds identified in mangosteen exhibit a diverse range of therapeutic activities, making them promising candidates for the development of various therapeutic agents. These compounds include xanthones, flavonoids, tannins, and phenolic acids, among others. Xanthones, in particular, have shown potent antioxidant, anti-inflammatory, anticancer, antimicrobial, and neuroprotective properties. Additionally, they have been reported to have beneficial effects on various chronic diseases such as cardiovascular disorders, diabetes, and obesity. This review highlights the mechanisms of action underlying the therapeutic effects of mangosteen-derived compounds.

Keywords: *drug discovery, herbs, secondary metabolite, therapy*

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1. INTRODUCTION

Mangosteen (*Garcinia mangostana* L.) is a tropical fruit native to Southeast Asia that has gained considerable attention in recent years due to its potential therapeutic properties. It has been traditionally used in folk medicine to treat various ailments such as diarrhea, dysentery, wounds, and skin infections [1]. This fruit is known for its unique flavor and nutritional value, but it is the bioactive compounds found in mangosteen that have gained significant scientific interest [2].

Extensive research has been conducted to isolate and characterize the bioactive compounds present in different parts of the mangosteen plant, including the fruit, rind, and leaves. These studies have revealed a wide array of phytochemicals, such as xanthones, flavonoids, tannins, and phenolic acids, which possess various pharmacological activities [3]. Among these, xanthones have been identified as the major class of bioactive compounds in mangosteen, with over 60 different types identified to date [4].

The therapeutic potential of mangosteen-derived natural products is extensive and covers a broad spectrum of health conditions. These bioactive compounds have been found to exhibit antioxidant, anti-inflammatory, anticancer, antimicrobial, and neuroprotective activities [5,6]. Additionally, they have demonstrated beneficial effects on chronic diseases, including cardiovascular disorders, diabetes, and obesity [7,8]. Understanding the mechanisms of action and exploring the potential applications of these natural products could lead to the development of novel therapeutic agents for a wide range of diseases.

2. AN OVERVIEW OF MANGOSTEEN (*GARCINIA MANGOSTANA* L.)

Mangosteen is a tropical fruit tree belonging to the family Clusiaceae. It is native to Southeast Asia and is highly regarded for its delicious flavor and potential health benefits. The fruit is small, round, and purple in color, with a thick rind and juicy white pulp. Mangosteen is often referred to as the "queen of fruits" due to its unique taste and nutritional value [9]

One of the most notable features of mangosteen is its rich content of bioactive compounds. Xanthones, a class of polyphenolic compounds, are the primary bioactive constituents found in mangosteen. These compounds have been extensively studied for their potential health-promoting effects, including antioxidant, anti-inflammatory, antimicrobial, and anticancer properties [10]. They have been shown to scavenge free radicals, reduce inflammation, inhibit the growth of bacteria and fungi, and exhibit toxicity effects on cancer cells.

In addition to xanthones, mangosteen contains other important phytochemicals such as flavonoids, tannins, and phenolic acids. These compounds contribute to the fruit's antioxidant activity and may play a role in its potential therapeutic benefits. Mangosteen has been traditionally used in Southeast Asian folk medicine to treat various ailments, including skin infections, diarrhea, and dysentery [11]

Research on mangosteen and its bioactive compounds has gained momentum in recent years, leading to a better understanding of their potential health applications. Studies have suggested that mangosteen may have a positive impact on cardiovascular health by reducing oxidative stress, improving lipid profiles, and exerting anti-inflammatory effects [8,9]. It also shows promise in managing diabetes by regulating blood glucose levels and enhancing insulin sensitivity [3-5]. Additionally, mangosteen extracts have exhibited neuroprotective effects, which could have implications for the prevention and treatment of neurodegenerative diseases [10].

While the therapeutic potential of mangosteen and its bioactive compounds is intriguing, further research is needed to fully understand their mechanisms of action and optimize their application in various health conditions. Nevertheless, mangosteen continues to attract attention as a promising natural ingredient with potential health benefits, and its inclusion in functional foods, dietary supplements, and pharmaceutical products is being explored.

3. PHARMACOLOGICAL ACTIVITIES OF *GARCINIA MANGOSTANA* L.

The bioactive compounds of mangosteen fruit demonstrated various pharmacological properties, including antioxidant, anti-inflammatory, anticancer, antimicrobial, and neuroprotective activities. The main component in mangosteen fruit is xanthones with 68 various xanthones. Whilst mangosteen peel contained phenol and xanthone. Moreover, the extract of hot water derived from mangosteen peel demonstrated epicatechin as the main component. Furthermore, based on Suhartati et al (2018), mangosteen leaves demonstrated four active compounds, such as tannins, flavonoids, alkaloids, and saponins [12-14].

In general, the xanthone compound is abundant in mangosteen. This xanthone demonstrated protection on cells and tissues from oxidative damage, reducing the risk of chronic diseases associated with oxidative stress, such as cardiovascular diseases and neurodegenerative disorders. Furthermore, mangosteen exhibits significant anti-inflammatory effects. The bioactive compounds present in mangosteen can inhibit the production of pro-inflammatory mediators, thereby suppressing inflammation. This anti-inflammatory activity has implications for the management of inflammatory

diseases, such as arthritis and inflammatory bowel disease [15].

Recent studies have highlighted the anticancer potential of mangosteen. The xanthones and other bioactive compounds in mangosteen have demonstrated cytotoxic effects on various cancer cell lines. They can induce cell cycle arrest, promote apoptosis (programmed cell death), and inhibit the growth and spread of cancer cells [6-8]. Mangosteen has been found to possess antimicrobial properties as well. Its bioactive compounds have shown inhibitory effects against bacteria, fungi, and even some drug-resistant strains. This antimicrobial activity suggests the potential use of mangosteen-derived compounds as natural alternatives for the treatment of infections [7]. Additionally, mangosteen exhibits neuroprotective effects, which are attributed to its ability to modulate neuronal signaling pathways, reduce neuroinflammation, and enhance antioxidant defenses. These properties make mangosteen a promising candidate for the prevention and treatment of neurodegenerative diseases, such as Alzheimer's and Parkinson's disease [15].

In brief, the pharmacological activities of mangosteen and its bioactive compounds demonstrate their potential in various health conditions. From their antioxidant and anti-inflammatory effects to their anticancer, antimicrobial, and neuroprotective properties, mangosteen exhibits a wide range of pharmacological activities that warrant further exploration and clinical research for their therapeutic applications [17-27].

4. CONCLUSION

In conclusion, the review highlights the significant therapeutic potential of natural products derived from mangosteen. The diverse array of bioactive compounds, particularly xanthones, exhibit various pharmacological activities, including antioxidant, anti-inflammatory, anticancer, antimicrobial, and neuroprotective effects. These compounds have demonstrated promising results in the treatment of chronic diseases such as cardiovascular disorders, diabetes, obesity, and neurodegenerative disorders. The synergistic interactions among the different compounds in mangosteen extract further enhance their therapeutic efficacy. Despite the promising findings, further research and clinical studies are needed to fully understand the mechanisms of action, optimize their application, and explore their potential as therapeutic agents in various diseases. Overall, the review emphasizes the need for continued investigation and utilization of these natural products from mangosteen to harness their full therapeutic potential.

AUTHORS' CONTRIBUTIONS

ANMA and YA participated in the writing and reviewing draft of manuscript. AAAM, VDK, BM, and MKJK contributed in the design of the study. DDRT and IR carried out the data collection. VJ, MR, TP, and RZ support the data gathering. All authors read and approved the final manuscript.

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