PHARMACY GENIUS
Vol. 05 No. 01 Hal. 45-50 Tahun: 2026
ISSN 2964-4771

Recent Research Mapping On The Effects Of Mango *(Mangifera Indica L.)* On Autoimmune Diseases: A Bibliometric Study

Afnizar Fawwaz F [1],Nurhidayati Harun[1]
[1]*D3 Pharmacy Study Program STIKes Muhammadiyah Ciamis, Indonesia*

Korespondensi: Afnizar Fawwaz F
Email: fawaazafnizar@gmail.com
Alamat : Jl. K.H. Ahmad Dahlan No.20 Ciamis, Kec. Ciamis. Kab. Ciamis. Jawa Barat, Indonesia

ABSTRAK

Introduction: Autoimmune diseases are characterized by dysregulated immune responses that result in chronic inflammation and progressive tissue damage. Mango (Mangifera indica) and its principal bioactive compound, mangiferin, have gained increasing scientific attention because of their immunomodulatory, anti-inflammatory, and antioxidant properties. However, the global research landscape regarding their potential role in autoimmune disease management has not yet been comprehensively mapped.
Objectives: To present a bibliometric research mapping on the effects of mango fruit in the management of autoimmune diseases and to identify current research trends, emerging directions, and existing knowledge gaps.
Methods: A data extraction table containing article metadata, including title, authors, publication year, journal, keywords, abstract, main topic, and relevance, was used as the research instrument. Literature was retrieved from PubMed, Scopus, and Web of Science using the keywords “mango and autoimmune” and “mangiferin and inflammation.” Eligible studies investigated the effects of mango fruit or its bioactive compounds on immune regulation and autoimmune diseases. Zotero was used for reference management, while VOSviewer and Biblioshiny were employed to analyze keyword co-occurrence, research trends, and author collaboration networks.
Results: Bibliometric analysis revealed that the dominant keywords were “nonhuman,” “mouse,” “in vivo study,” and “drug efficacy,” indicating that current research is primarily based on experimental animal models. Cluster analysis identified immunological themes involving regulatory T lymphocytes, TH17 cells, and dendritic cells, alongside molecular pathways including NF-kappa B, antiapoptotic activity, and cell death, all associated with mangiferin-mediated immune regulation. Overlay visualization demonstrated that these immunological and molecular pathway-related keywords represent recent research hotspots. Although “mangiferin” was not a dominant keyword, its established association with these pathways highlights its potential as a promising therapeutic candidate for autoimmune disease management while emphasizing the need for further mechanistic and clinical investigations.

Kata Kunci: Mango, Autoimmune, Mangiferin, Bibliometric

Introduction

Mango (*Mangifera indica* L.) is a common plant in Indonesia. The fruit, which has a sweet– sour taste, soft texture, and yellow-orange color, offers numerous health benefits. Mango flesh contains various nutrients beneficial for human health. Its antioxidant content, such as carotenoids (vitamin A) and vitamin C, plays a role in cancer prevention. Additionally, potassium and vitamin C contribute to cardiovascular health. Mango also contains phenolic compounds such as ellagic acid, gallic acid, and mangiferin, which support overall well-being. These phenolic compounds are believed to help repair cells damaged by oxidative stress caused by free radicals, which are associated with cancer and other degenerative diseases (Herwin & Meilani, 2016). Phenolic compounds, particularly mangiferin and ellagic acid, also exhibit anti-inflammatory properties and enhance immune system function. Nearly all parts of the mango plant—including the fruit pulp, bark, leaves, and even seeds—possess bioactive potential. Mangiferin has been reported to demonstrate various pharmacological activities, including antiviral, antioxidant, anticancer, anti-inflammatory, antibacterial, antifungal, antihelminthic, analgesic, and immunomodulatory effects (Ayyun et al., 2023).

Autoimmune diseases are complex conditions in which the immune system mistakenly attacks the body's own cells and tissues. Recent studies indicate that these diseases are among the leading causes of morbidity and mortality worldwide. The etiology of most autoimmune diseases remains incompletely understood, and diagnosis is often delayed due to the diverse and nonspecific nature of their symptoms (Napitupulu & Sipayung, 2024). Bibliometric mapping reveals the relationships among various domains, disciplines, individual publications, and authors worldwide. Quantifying specific elements of a given body of research and analyzing the results form the foundation of bibliometric studies, enabling the identification of patterns within a field. Bibliometric analysis ensures that studies, researchers, institutions, and the general flow of scientific knowledge related to a particular topic can be systematically tracked. Two of the most useful approaches for uncovering publication patterns within a specific body of literature are quantitative and statistical analyses. Researchers may explore the influence of a single author or the relationships between two or more works or authors (Septiyanto et al., 2022).

Purpose

To present a research mapping on the effects of mango fruit in the management of autoimmune diseases, as well as to understand the directions and gaps in the existing literature.

Method

To collect data, keywords such as *"mango and autoimmune"*, *"mangiferin and* autoimmune *diseases"*, and *"mango and inflammation"* were used to search for scientific articles in the Scopus database. Relevant articles were peer-reviewed and discussed the relationship between mango fruit or its active compounds, such as mangiferin, and autoimmune diseases. Articles without full-text availability or deemed irrelevant were excluded. The data collected included the title, authors, year of publication, journal, keywords, and abstract. Each article was manually reviewed to ensure its relevance. Scopus was also used to manage references, while VOSviewer was employed to generate visualizations such as topic trends and author collaboration networks.

Results and Discussion

1. Recapitulation of the VOSviewer Mechanism

The network overlay visualization from VOSviewer displays the relationships among keywords in the scientific literature related to immunology, drug trials, and biomedical research. It can be observed that terms such as *"nonhuman"*, *"mouse"*, *"in vivo study"*, and *"drug efficacy"* dominate the central area, indicating a strong focus on animal models and drug testing. The blue cluster highlights immunology-related themes such as *"regulatory T lymphocyte"*, *"TH17 cells"*, and *"dendritic cells"*, which are relevant to autoimmune mechanisms. Meanwhile, the green and yellow clusters show connections to molecular pathways such as *"NF-kappa B"*, *"antiapoptotic activity"*, and *"cell death"*, all of which are known targets that can be influenced by mangiferin.

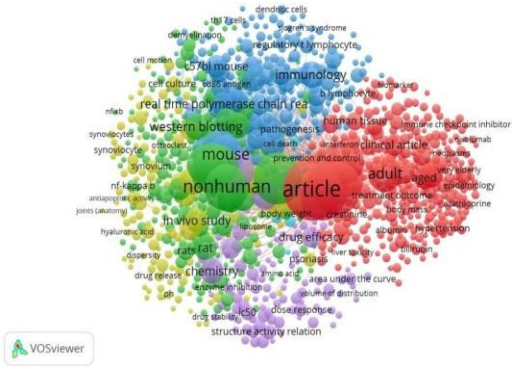


Figure.1. Characteristics of included journals

Although the keyword *"mangiferin"* does not appear explicitly in this visualization, many of the terms in the blue–green clusters represent biological pathways and immune cells that are potential targets of this compound. Mangiferin is known to possess immunomodulatory activity through the inhibition of the NF-κB pathway and the regulation of T cells, thus providing indirect support for its potential use in the context of autoimmune diseases.

Therefore, this map can be utilized to design further studies on the effects of mangiferin in autoimmune pathogenesis, particularly in areas such as immune cell regulation and inflammatory responses.

2. Visualisasi Overlay from VOSviewer

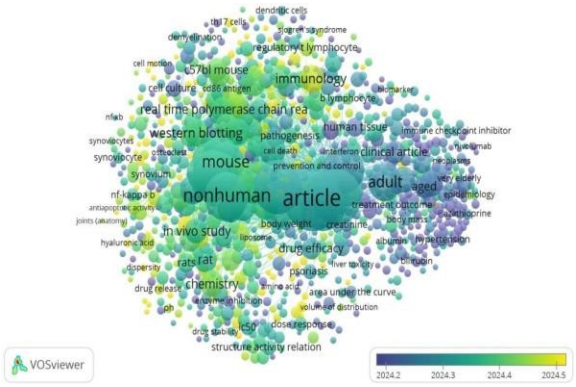
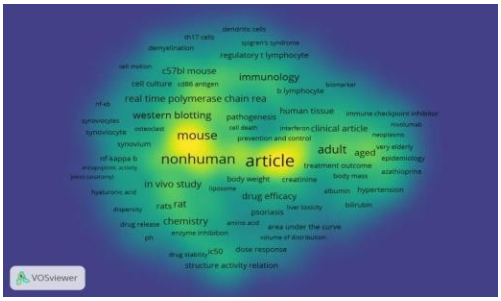


Figure.1. Visualisasi Overlay

The overlay visualization from VOSviewer illustrates the temporal distribution of keywords in the recent scientific literature, with a color gradient representing the average year of publication— from dark purple (early 2024) to yellow (mid to late 2024). Keywords related to autoimmune and immunological research, such as *"regulatory T lymphocyte"*, *"TH17 cells"*, *"NF-kappa B"*, and *"cell death"*, predominantly appear in shades of green to yellow, indicating that these topics are currently trending and actively investigated. Although the term *"mangiferin"* does not appear explicitly, many of these biological terms are closely associated with targets known to be influenced by mangiferin, particularly in the context of immune modulation and inflammation. This pattern reflects a growing interest in research areas highly relevant to the therapeutic potential of mangiferin in autoimmune diseases. The presence of recent and frequently co-occurring terms—especially those related to immune system regulation and inflammatory pathways such as NF-κB

and regulatory T cells—presents strategic opportunities to further explore the role of mangiferin. These findings support the rationale for future studies investigating mangiferin as an anti-inflammatory or immunomodulatory compound, particularly within the evolving field of autoimmune research.



The density visualization from VOSviewer depicts the concentration of keyword occurrences in the scientific literature related to the topic of mangiferin and autoimmune diseases. Bright yellow areas indicate regions with a high concentration of terms, signifying topics that are frequently discussed in scientific publications. In this visualization, keywords such as *"nonhuman"*, *"article"*, *"mouse"*, *"clinical article"*, and *"adult"* appear in the most densely populated regions (bright yellow), suggesting that autoimmune research remains heavily dominated by studies conducted on animal models (particularly mice) and within the context of clinical articles or adult-focused studies. In this visualization, the keyword *"mangiferin"* does not appear directly. However, several terms related to mangiferin's mechanisms of action—such as *"NF-kappa B"*, *"regulatory T lymphocyte"*, and *"in vivo study"*—are found in regions with medium to high density (green to yellow). This indicates that the field is being actively investigated and may be associated with the biological activities of mangiferin, particularly its immunomodulatory and anti-inflammatory functions. Consequently, this visualization supports the potential for further studies on mangiferin in autoimmune therapy, especially using animal models and biomolecular-based studies.

Conclusion

Based on the results of bibliometric analysis of the scientific literature over the last ten years (2015–2025), it can be concluded that research on the effects of mango fruit (Mangifera indica L.), especially its active compounds such as mangiferin, on autoimmune diseases has developed significantly. Most of the research is still in the preclinical stage using test animal models and focusing on molecular mechanisms such as the NF-κB pathway as well as the regulation of immune

cells such as regulatory T cells and Th17 cells. Although mangiferin has not explicitly dominated the keyword in the literature network, the interconnectedness of the terms that have emerged suggests that this compound has great potential as an anti-inflammatory agent and immunomodulator in the management of autoimmune diseases

ACKNOWLEDGEMENTS

Would like to express my sincere gratitude to the Diploma in Pharmacy Program and the laboratory staff of STIKes Muhammadiyah Ciamis for their support, facilities, and assistance throughout the course of this research. Their contributions have been invaluable to the smooth progress and success of this study.

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