

Trends in Herbal Medicine Research for Inflammatory Bowel Disease: A Bibliometric Analysis with Emphasis on Ulcerative Colitis

Tren Penelitian Pengobatan Herbal untuk Penyakit Radang Usus: Analisis Bibliometrik dengan Penekanan pada Kolitis Ulseratif

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Abstract

Inflammatory bowel disease (IBD), particularly ulcerative colitis (UC), is a chronic gastrointestinal disorder that significantly affects quality of life. Despite advances in conventional therapy, some patients experience adverse effects, relapse, high treatment burden, or inadequate response, contributing to interest in complementary approaches, including herbal medicine. This study aims to map the development of herbal medicine research in IBD, specifically UC, by examining publication trends, key contributors, collaboration patterns, and emerging themes. This study analyzed 518 English-language journal articles indexed in Scopus from 2016 to 2025. VOSviewer (version 1.6.20) and Biblioshiny (R package version 5.0) were used to analyze source productivity, country collaboration, citation relationships, and keyword co-occurrence. Among the ten most productive sources, the Journal of Ethnopharmacology (44 articles), Frontiers in Pharmacology (24), and Phytomedicine (22) contributed 90 of 160 articles (56.3%) in the top-ten-source subset; this percentage does not represent the entire 518-document corpus. Among records with identifiable corresponding-author countries, China contributed 46.0%, followed by India (11.1%) and South Korea (8.3%). The thematic structure centered on anti-inflammatory pathways, immune modulation, DSS-induced colitis, intestinal-barrier function, gut microbiota, and emerging systems approaches such as network pharmacology and metabolomics. The journal profile and keyword network suggest that the evidence base remains predominantly preclinical and translational. Clinical validation, extract standardization, safety reporting, and multinational collaboration are therefore priorities before wider clinical adoption.

Keywords: Herbal medicine; ulcerative colitis; inflammatory bowel disease; bibliometric analysis.

Abstrak

Penyakit radang usus atau inflammatory bowel disease (IBD), khususnya kolitis ulseratif atau ulcerative colitis (UC), merupakan gangguan gastrointestinal kronis yang berdampak signifikan terhadap kualitas hidup. Meskipun terapi konvensional terus berkembang, sebagian pasien masih mengalami efek samping, kekambuhan, beban pengobatan yang tinggi, atau respons yang kurang memadai sehingga mendorong ketertarikan terhadap pendekatan komplementer, termasuk pengobatan herbal. Penelitian ini bertujuan memetakan perkembangan riset pengobatan herbal pada IBD, khususnya UC, dengan menelaah tren publikasi, kontributor utama, pola kolaborasi, dan tema-tema yang berkembang. Penelitian ini menganalisis 518 artikel jurnal berbahasa Inggris yang terindeks Scopus pada periode 2016–2025. VOSviewer versi 1.6.20 dan paket Biblioshiny versi 5.0 pada R digunakan untuk menganalisis produktivitas sumber, kolaborasi antarnegara, hubungan sitasi, dan ko-kemunculan kata kunci. Di antara sepuluh sumber paling produktif, Journal of Ethnopharmacology (44 artikel), Frontiers in Pharmacology (24), dan Phytomedicine (22) menyumbang 90 dari 160 artikel (56,3%) pada kelompok sepuluh sumber tersebut; persentase ini bukan proporsi dari keseluruhan 518 dokumen. Di antara rekaman yang memiliki informasi negara penulis korespondensi, Tiongkok memberikan kontribusi terbesar (46,0%), diikuti India (11,1%) dan Korea Selatan (8,3%). Struktur tematik berpusat pada jalur antiinflamasi, modulasi imun, kolitis yang diinduksi DSS, fungsi sawar usus, mikrobiota, serta pendekatan sistem yang mulai muncul, seperti network pharmacology dan metabolomik. Profil jurnal dan jaringan kata kunci menunjukkan bahwa basis bukti masih didominasi penelitian praklinis dan translasi. Oleh karena itu, validasi klinis, standardisasi ekstrak, pelaporan keamanan, dan kolaborasi multinasional tetap menjadi prioritas sebelum penerapan klinis yang lebih luas.

Kata Kunci: Obat herbal; kolitis ulseratif; inflammatory bowel disease; analisis bibliometrik.



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<https://doi.org/10.36490/journal-jps.com.v9i3.1538>

Article History:

Received: 26/04/2026,
Revised: 25/07/2026
Accepted: 25/07/2026,
Available Online: 15/08/2026.

QR access this Article



Introduction

Inflammatory bowel disease (IBD) is a chronic, relapsing inflammatory disorder of the gastrointestinal tract that can impair quality of life and requires long-term management [1,2]. Its two principal forms are Crohn's disease and ulcerative colitis (UC). This study emphasizes UC because UC typically involves continuous inflammation that is primarily limited to the colonic mucosa, whereas Crohn's disease is transmural and may affect any segment of the gastrointestinal tract. This pathophysiological distinction makes mucosal-barrier integrity and gut-microbiota interactions especially relevant endpoints in UC-focused herbal research [3,4]. UC may cause bloody diarrhea, abdominal pain, and urgency, and uncontrolled symptoms can disrupt work, education, social relationships, and mental health. Although conventional therapies continue to advance, some patients experience adverse effects, recurrent flares, high costs, or inadequate responses, prompting interest in complementary approaches, including herbal medicine [5–7].

Research on herbal interventions for IBD and UC has expanded to include plant species, extracts, fractions, isolated compounds, and traditional formulas with potential anti-inflammatory, antioxidant, immunomodulatory, or microbiota-modulating properties [8,9]. In this study, “herbal medicine” is operationally defined as a plant-derived product used for a therapeutic purpose, including crude extracts, fractions, traditional formulations, and isolated phytochemicals. “Medicinal plants” refers to the source plant species, “phytopharmacy” refers to the pharmaceutical development and quality control of herbal preparations, and “botany” is retained only as a broad search term related to plant science. Because the evidence spans heterogeneous interventions, methods, and outcomes, it remains difficult to synthesize. This fragmentation makes it challenging for researchers, clinicians, and policymakers to identify the direction of herbal research in IBD, the most productive contributors, dominant themes, and areas requiring further investigation [10–13]. A comprehensive bibliometric map can therefore clarify the field beyond the findings of individual reviews or primary studies [14,15].

Bibliometric analysis quantitatively examines publication metadata—including titles, keywords, authors, institutions, countries, sources, and citations—to characterize growth, influence, collaboration, and thematic structure [16]. The interpretation of these patterns is informed by three foundational bibliometric concepts: Lotka's law concerning the concentration of author productivity, Bradford's law concerning the distribution of articles across core and peripheral sources, and Zipf's law concerning the frequency distribution of terms. These concepts provide a theoretical basis for interpreting productive contributors, source concentration, and keyword prominence. Bibliometric mapping complements clinical guidelines and evidence reviews by showing how herbal research on UC is organized as a field, which themes are connected, and where knowledge production is concentrated [17–19].

This study aims to: (1) describe publication growth in herbal medicine research on IBD from 2016 to 2025; (2) identify the most productive and influential authors, institutions, countries, and journals; (3) map collaboration and keyword networks; and (4) assess the position of UC and associated herbal themes within the broader IBD literature. The analysis is intended to help researchers identify relevant priorities and avoid unnecessary duplication, assist clinicians in understanding the development of the evidence base, and support policymakers in identifying needs for funding, standardization, clinical validation, and international collaboration [19,20].

Methods

This study used a bibliometric design to map the distribution, collaboration structure, citation relationships, and thematic development of peer-reviewed journal articles. Bibliometric methods are suitable for identifying publication trends and research gaps, but they describe the structure and visibility of a literature rather than directly evaluating the methodological quality or clinical effectiveness of the included studies [21,22].

Data Source

This study examined scholarly articles concerning herbal medicine, IBD, and UC that were indexed in Scopus between 2016 and 2025. Scopus was selected because it provides broad multidisciplinary coverage and structured citation, authorship, affiliation, and keyword metadata suitable for bibliometric analysis. The use of a single database was intended to maintain consistency in metadata fields, although it may omit records indexed only in other databases.

This study conducted the search in the title, abstract, and keyword fields using the following conceptual structure: ("ulcerative colitis" OR "Crohn's disease" OR "inflammatory bowel disease" OR "IBD") AND ("herbal medicine" OR "phytopharmacy" OR "botany" OR "medicinal plant*"). Data were retrieved from Scopus on March 3, 2026. The initial search identified 1,324 records. After applying the publication-year filter, document-type restrictions, language criterion, duplicate removal, and title-and-abstract relevance screening, 518 journal articles remained for analysis.

Inclusion and Exclusion Criteria

The inclusion criteria were: (1) journal articles published from 2016 to 2025; (2) English-language records; (3) direct relevance to herbal medicine and IBD or UC based on the title, abstract, or author keywords; and (4) availability of sufficient Scopus metadata for analysis. Editorials, letters, conference abstracts, book chapters, duplicate records, records outside the specified period, and records without substantive relevance after title-and-abstract screening were excluded. During data cleaning, titles, identifiers, years, document types, affiliation fields, and keywords were checked for duplicates and obvious inconsistencies. A separate numerical validation rate or inter-rater reliability statistic was not calculated and is therefore not reported. Because this study analyzed publicly available publication metadata and did not involve human participants or animals, ethical approval was not required.

Bibliometric analysis

Bibliometric analysis was performed using VOSviewer (version 1.6.20) and the Biblioshiny R package (version 5.0). Keyword co-occurrence analysis used full counting, a minimum occurrence threshold of five, and association-strength normalization. Country-collaboration analysis applied a minimum threshold of two documents per country. Node size represented frequency or productivity, distance represented relatedness, line thickness represented link strength, and colors represented clusters or overlay attributes [21,23–25]. Scopus records were exported in CSV format for VOSviewer and RIS format for Biblioshiny. The annual growth rate reported by Biblioshiny was interpreted as a compound annual growth rate (CAGR), calculated as $[(\text{documents in the final year} / \text{documents in the initial year})^{(1/n)} - 1] \times 100\%$, where n is the number of annual intervals.

Term mapping and visualisation

Terms extracted from article titles, abstracts, and keywords were used to construct term maps [26–28]. Each bubble represented a term, bubble size indicated occurrence frequency, and proximity represented co-occurrence relationships. The overlay color reflected average citation impact. Because raw citation averages are influenced by publication age, the color gradient was interpreted descriptively rather than as an age-neutral measure of impact. A year-normalized citation analysis would be preferable for direct comparison of older and newer documents but could not be recalculated from the available export. Generic or irrelevant terms were manually excluded to improve interpretability.

Results and Discussion

Main Information

The final corpus comprised 518 journal articles on herbal medicine for IBD, with particular attention to UC, published between 2016 and 2025 (Table 1).

Table 1. Main Information Trends in Herbal Medicine Research for Inflammatory Bowel Disease

Description	Results
Main Information About Data:	
Timespan	2016:2025
Sources (Journals, Books, etc)	251
Documents	518
Annual Growth Rate %	11.75
Document Average Age	4.44
Average citations per doc	21.75
References	4,147
Document contents:	
Keywords Plus (ID)	6,228
Author's Keywords (DE)	1,386
Authors:	
Authors	2,792
Authors of single-authored docs	7
Authors collaboration:	
Single-authored docs	7
Co-Authors per Doc	7.72
International co-authorships %	15.64
Document Types:	
Article	518

A total of 518 documents were published across 251 sources, with an annual growth rate of 11.75%, indicating increasing academic interest in herbal interventions for IBD, including UC. The mean document age was 4.44 years, suggesting that a substantial proportion of the corpus is recent. The articles received an average of 21.75 citations per document and collectively cited 4,147 references. These indicators describe publication growth and citation visibility but should not be interpreted as direct measures of methodological quality or clinical effectiveness.

The corpus involved 2,792 authors and an average of 7.72 co-authors per document, indicating extensive team-based authorship. International co-authorship accounted for 15.64% of documents, suggesting that most collaboration remained within national research systems. The table distinguishes between “authors of single-authored documents” (the number of individuals who authored a paper alone) and “single-authored documents” (the number of such papers); both values are seven in this dataset and are not duplicate indicators. The 6,228 Keywords Plus and 1,386 author keywords demonstrate thematic diversity, ranging from active compounds and inflammatory mechanisms to gut-barrier, microbiota, and UC-related topics.

Leading Journals and Research Sources

Figure 1 presents the ten sources with the highest publication counts in the analyzed corpus. These sources provide an overview of where the most visible segment of the literature is published, but they do not represent the complete thematic profile of all 251 sources.

The Journal of Ethnopharmacology ranked first with 44 articles, representing 27.5% of the 160 articles published by the ten most productive sources. Frontiers in Pharmacology contributed 24 articles (15.0%), followed by Phytomedicine with 22 articles (13.8%). Together, these three journals contributed 90 articles, or 56.3% of the top-ten-source subtotal—not 56.3% of the entire 518-document corpus. Their prominence suggests that a substantial portion of highly concentrated publishing activity occurs in journals focused on ethnopharmacology and pharmacology. This interpretation should remain cautious because 248 other sources were not examined individually at the same level of detail.

The American Journal of Chinese Medicine contributed 14 articles (8.8% of the top-ten subtotal), followed by Nutrients with 12 (7.5%) and International Immunopharmacology with 11 (6.9%). Biomedicine &

Pharmacotherapy and Evidence-Based Complementary and Alternative Medicine each contributed nine articles (5.6%), the World Journal of Gastroenterology contributed eight (5.0%), and the International Journal of Biological Macromolecules contributed seven (4.4%). This distribution is compatible with a literature concentrated in preclinical, pharmacological, immunological, nutritional, and translational research. Nevertheless, journal identity alone cannot establish study design; controlled clinical trials, standardized extracts, safety reporting, and evaluation of herb–drug interactions remain necessary for evidence-based UC management.

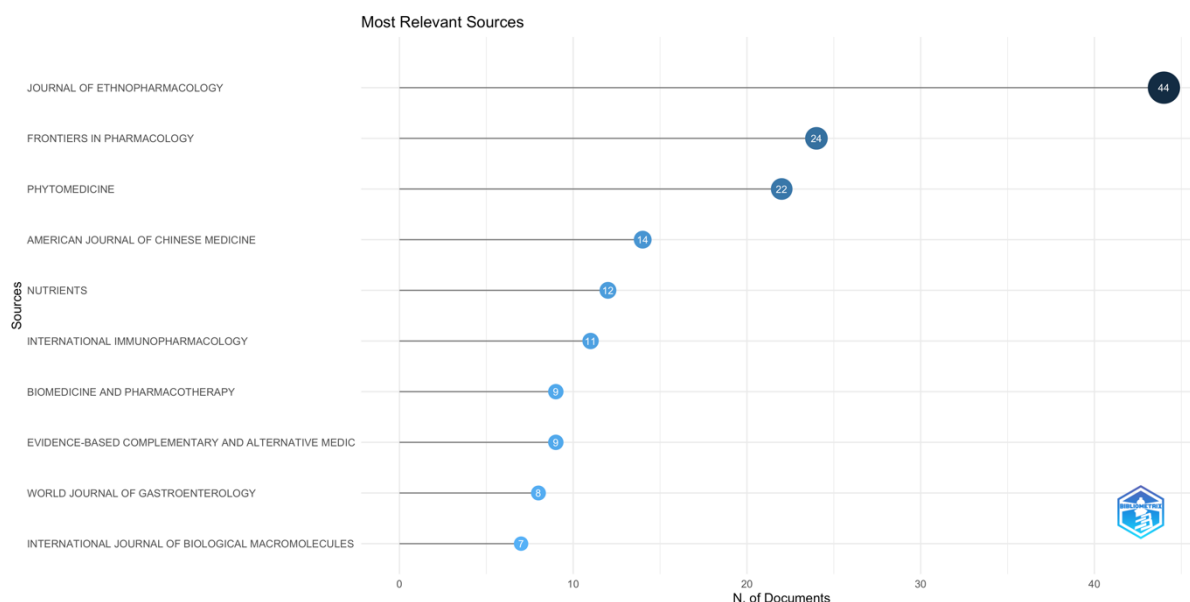


Figure 1. Top ten sources with the highest number of publications on herbal medicine in inflammatory bowel disease with an emphasis on ulcerative colitis.

Thematic Structure of Research

The VOSviewer keyword network maps the thematic structure of herbal medicine research in IBD, with UC as its central disease term. Among 1,397 distinct keywords, 44 met the minimum occurrence threshold of five and were included in Figure 2.

“Ulcerative colitis” was the largest node (265 occurrences) and the principal point of connectivity, followed by “inflammatory bowel disease” (143 occurrences). The inflammatory-mechanism cluster included “inflammation” (92 occurrences), NF- κ B, cytokines, NLRP3 inflammasome, macrophages, apoptosis, and oxidative stress. A related disease-model and gut-biology cluster included dextran sulfate sodium (DSS), experimental colitis, intestinal barrier, and microbiota. The close connections between these clusters are conceptually important: plant-derived compounds are frequently investigated for their effects on oxidative and inflammatory signaling, which may influence epithelial-barrier integrity and microbiota-associated immune regulation. The network therefore links molecular targets with experimental models and intestinal-system outcomes rather than representing isolated themes.

Network pharmacology and metabolomics appeared within the thresholded keyword network alongside traditional Chinese medicine, Chinese herbal medicine, indigo naturalis, curcumin, flavonoids, and medicinal plants. Their presence indicates emerging interest in multi-compound, multi-target, and systems-level interpretation. However, Figure 2 is a static co-occurrence map and does not quantify changes between 2016–2020 and 2021–2025. Consequently, the findings support describing network pharmacology and metabolomics as emerging topics, but they do not by themselves demonstrate a confirmed temporal shift in research focus. A dedicated time-sliced or overlay analysis is required to quantify such a shift.

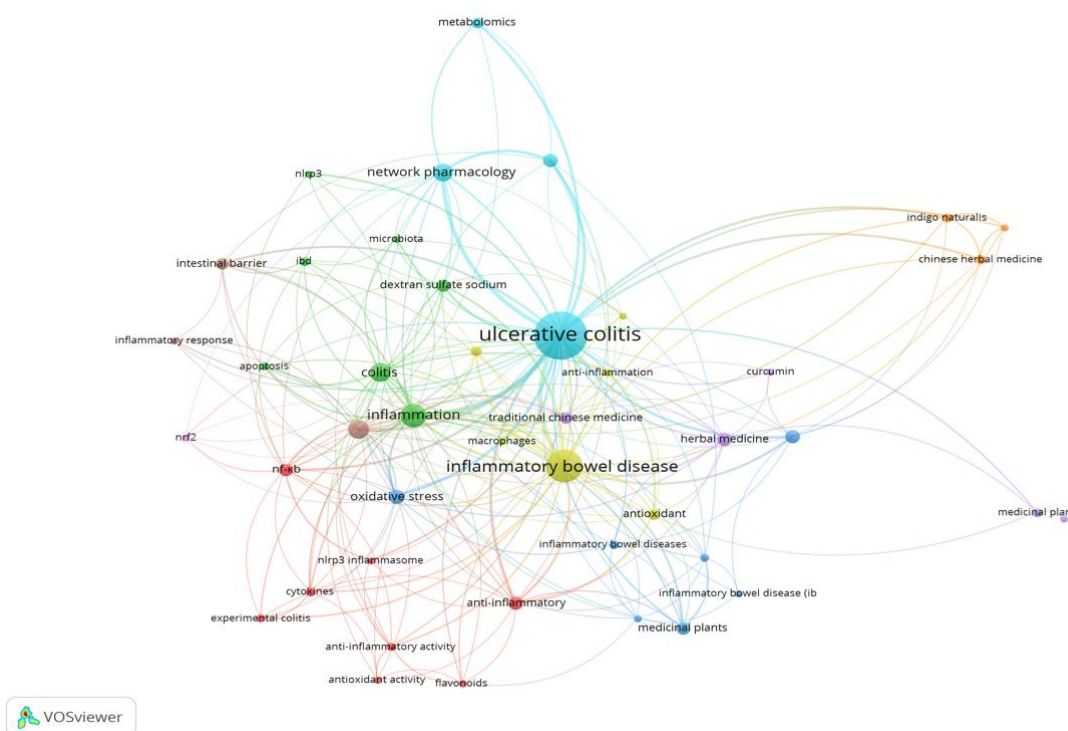


Figure 2. Network visualisation of keywords used by authors.

Contribution of Author Countries

Figures 3 and 4 show corresponding-author country productivity and cross-country collaboration patterns in herbal medicine research on IBD and UC.

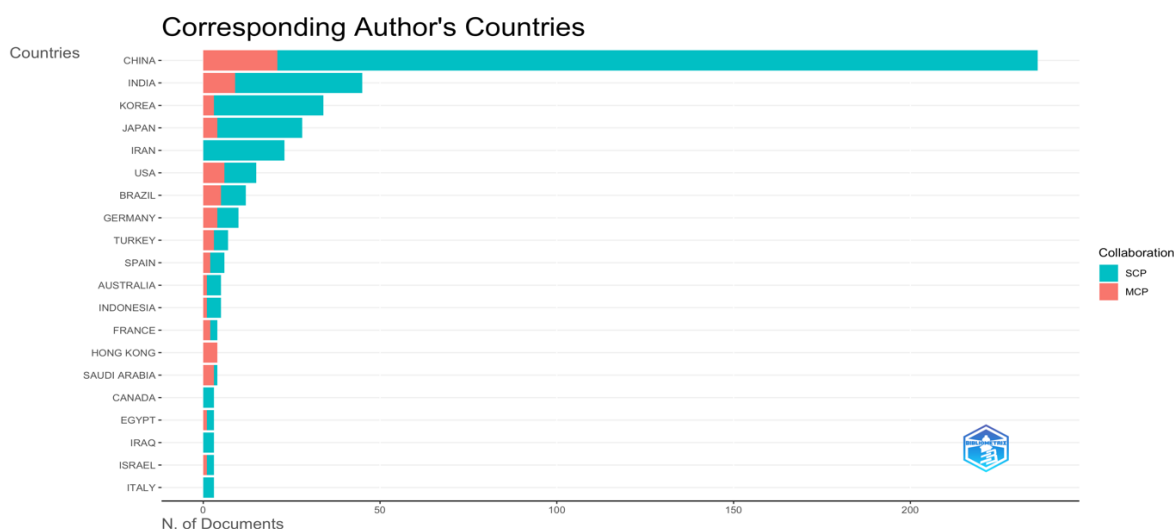


Figure 3. Collaboration on inflammatory bowel disease research, with an emphasis on herbal medicine for ulcerative colitis treatment.

In the corresponding-author-country output, China contributed 46.0% of the documents represented in that analysis, followed by India (11.1%), South Korea (8.3%), Japan (6.9%), Iran (6.0%), and the United States (3.8%). Single-country publications (SCP) accounted for 83.5% and multi-country publications (MCP) for 16.5% of records with usable collaboration metadata. The country-contribution and SCP/MCP percentages are calculated from records containing the relevant affiliation and collaboration fields; they should therefore be interpreted as conditional on available metadata rather than automatically as percentages of all 518 documents. The predominance of SCP indicates that the field remains largely organized within national research ecosystems.

Several countries with smaller publication volumes showed relatively high MCP proportions: Hong Kong (100%), Saudi Arabia (77.8%), France (50.0%), Brazil (40.6%), Turkey (39.6%), Germany (38.5%), and the

United States (36.1%). In the VOSviewer network, China was the largest hub and had prominent links with the United States and Japan, while the United States appeared to bridge East Asian and other clusters. South Korea, India, and several European countries formed connected subclusters. Indonesia contributed approximately 1.2% of the country output and had an MCP proportion of 15.4%. The available bibliometric output does not support a reliable plant-by-plant profile of Indonesian publications; therefore, specific local species are not attributed here. Nevertheless, Indonesia's biodiversity and existing international links create opportunities for comparative studies of locally sourced materials, standardized extracts, and multicenter clinical research.

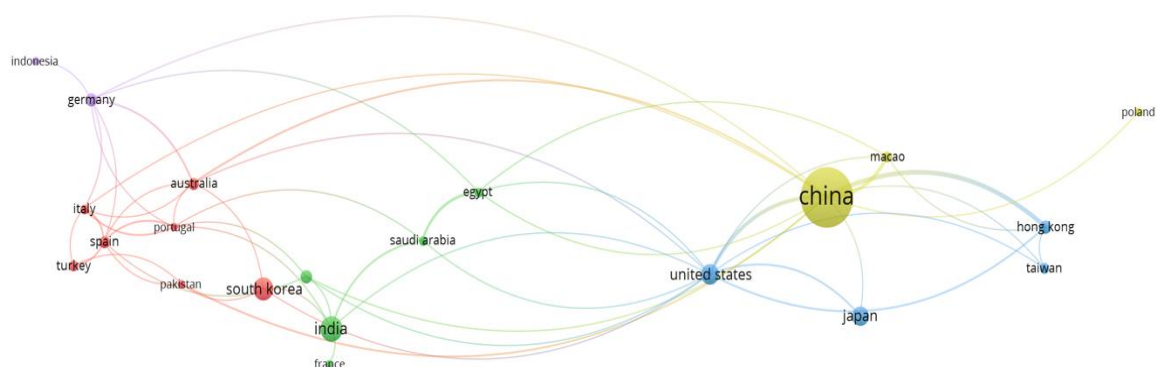


Figure 4. Network visualisation of author countries in inflammatory bowel disease research, with an emphasis on herbal medicine for ulcerative colitis treatment.

The source profile and keyword structure indicate that the most visible literature is concentrated in ethnopharmacology, pharmacology, immunology, and translational research. The 56.3% value refers only to the three leading journals within the top-ten-source subtotal. It should not be generalized to all 518 articles or used to infer that 56.3% of the entire corpus investigates a particular mechanism. Across the network, research frequently addresses active-compound identification, anti-inflammatory and antioxidant pathways, DSS-based colitis models, intestinal-barrier restoration, and microbiota modulation [29–33]. These patterns support the need to translate preclinical findings through rigorously designed trials, standardized preparations, reproducible dosing, comprehensive safety reporting, and assessment of interactions with conventional therapies.

The appearance of NF- κ B, cytokines, macrophages, microbiota, intestinal barrier, network pharmacology, and metabolomics illustrates the field's interdisciplinary character. Curcumin and indigo naturalis are among the recurrent candidate interventions, while traditional Chinese medicine contributes strongly to formula-based and multi-component research [34–36]. The observed leadership of China is consistent with previous bibliometric studies of flavonoids in UC and traditional Chinese medicine in IBD, which also identified China as a major contributor [18,19]. Direct numerical comparisons are inappropriate, however, because those studies used different periods, databases, search strategies, and topic scopes.

China's prominent output and central network position are accompanied by a high proportion of nationally authored publications. By contrast, some lower-output countries show higher MCP shares, indicating that productivity and international connectedness are distinct dimensions. Broader multinational collaboration could improve external validity, facilitate cross-country comparison of herbal materials and formulations, and support harmonized multicenter trials. For Indonesia, the current dataset supports identifying collaboration potential but not making specific claims about the plants or study designs represented in its small publication subset [37,38]. Overall, herbal medicine research in UC demonstrates sustained publication growth and increasingly connected mechanistic themes. Nevertheless, bibliometric prominence does not establish therapeutic efficacy. The most important translational priorities are adequately powered controlled trials, reproducible extract characterization, dose standardization, long-term safety assessment, and evaluation of herb–drug interactions [39,40].

Conclusions

Herbal medicine research in ulcerative colitis has expanded substantially from 2016 to 2025, with UC serving as the central term in a literature focused on inflammatory signaling, oxidative stress, DSS-based colitis models, intestinal-barrier function, and gut microbiota. Network pharmacology and metabolomics appear as emerging topics, but the present static analysis does not establish a quantified temporal shift. China is the leading contributor, whereas international co-authorship remains limited overall. Because most of the visible evidence is preclinical or translational, broader clinical adoption requires standardized extracts, reproducible dosing, well-designed multicenter trials, long-term safety evaluation, and systematic assessment of interactions with conventional therapies.

Conflict of Interest

The authors declare that there is no conflict of interest.

Acknowledgment

The authors gratefully acknowledge Universitas Syiah Kuala for providing research facilities and technical support for this study.

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