ORIGINAL RESEARCH ARTICLE

Bibliometric analysis of scientific publications on the effects of rangeland and wild plants on women's health

DOI: 10.29063/ajrh2025/v29i12s.15

Yasir Tufan[1,2] and Zeynep Tufan[3]*

Department of Herbal Production and Technologies, Faculty of Applied Science, Muş Alparslan University, Muş, Türkiye[1]; Department of Field Crops, Faculty of Agriculture, Atatürk University, Erzurum, Türkiye[2]; Tokat Gaziosmanpasa University, Faculty of Health Sciences, Department of Midwifery, Tokat, Turkey[3]

***For Correspondence:** Email: *y.tufan@alparslan.edu.tr*

Abstract

This study presents a comprehensive bibliometric assessment of global research on the use of rangeland and wild plants in women's health from 1996 to 2025. A total of 718 publications retrieved from Web of Science and Scopus were analysed using the Bibliometrix/Biblioshiny platform. Descriptive indicators, co-occurrence networks, thematic evolution, clustering, and Multiple Correspondence Analysis (MCA) were used to map structural and conceptual trends in the field. The findings indicate a steady increase in scientific output, with an annual growth rate of 11.02%. Publications were concentrated in core journals such as Phytomedicine and Journal of Ethnopharmacology, while Iran, India, and China were the leading contributing countries. Keyword and conceptual analyses showed that traditional knowledge, medicinal plants, phytochemistry, and pharmacology form the central research axis. Notably, themes related to women's health - particularly menopause, pregnancy, infertility, polycystic ovary syndrome, and endometriosis - appeared consistently across trend, thematic, and cluster analyses, indicating a stable and growing research focus. The study highlights the multidimensional nature of ethnopharmacology at the intersection of ecosystem-derived plant resources, cultural knowledge, and clinically relevant women's health research, underscoring the need for broader geographic representation and interdisciplinary integration in future studies. *(Afr J Reprod Health 2025; 29 [12s]: 149-164).*

Keywords: Medicinal plants, Female reproductive system, Reproductive health, Ethnopharmacology, Natural vegetation

Résumé

Cette étude fournit une évaluation bibliométrique complète de la recherche mondiale sur l'utilisation des plantes des parcours naturels et des plantes sauvages pour la santé des femmes entre 1996 et 2025. Un total de 718 publications extraites de Web of Science et Scopus ont été analysées à l'aide de la plateforme Bibliometrix/Biblioshiny. Des indicateurs descriptifs, des réseaux de co-occurrence, l'évolution thématique, le clustering et l'Analyse des Correspondances Multiples (ACM) ont été utilisés pour cartographier les tendances structurelles et conceptuelles dans ce domaine. Les résultats montrent une augmentation régulière de la production scientifique, avec un taux de croissance annuel de 11,02 %. Les publications étaient concentrées dans des revues de base telles que Phytomedicine et Journal of Ethnopharmacology, tandis que l'Iran, l'Inde et la Chine sont apparus comme les principaux pays contributeurs. Les analyses des mots-clés et des concepts ont révélé que les connaissances traditionnelles, les plantes médicinales, la phytochimie et la pharmacologie constituent l'axe de recherche central. Fait important, les thèmes liés à la santé des femmes, en particulier la ménopause, la grossesse, l'infertilité, le syndrome des ovaires polykystiques et l'endométriose, sont apparus de manière constante dans les analyses de tendances, thématiques et de regroupement, indiquant un focus de recherche stable et croissant. L'étude souligne la nature multidimensionnelle de l'ethnopharmacologie à l'intersection des ressources végétales dérivées des écosystèmes, des connaissances culturelles et de la recherche clinique pertinente sur la santé des femmes, soulignant le besoin d'une représentation géographique plus large et d'une intégration interdisciplinaire dans les études futures. *(Afr J Reprod Health 2025; 29 [12s]: 149-164).*

Mots-clés: Plantes médicinales, Santé des femmes, Santé reproductive, Ethnopharmacologie, Plantes des parcours naturels

Introduction

Pastures and natural rangelands are critical ecosystems that provide biomass for livestock and support rich biodiversity, including thousands of wild plant species used in traditional medicine[1]. Historically, from before the advent of synthetic drugs to the present day, wild plants collected from these ecosystems have formed the backbone of primary health care, especially in rural communities. According to the World Health Organization (WHO) data, a large portion of the population in developing

countries still relies on traditional medicine and herbal resources for primary health care[2].

Women's health and gynecology represent some of the most intensive and diverse applications of this ethnobotanical heritage[3]. Women use pasture-based plants to address health issues encountered at various stages of life, from adolescence to old age. A review of the literature shows that this use extends beyond managing Polycystic Ovary Syndrome (PCOS) or menopausal symptoms such as hot flushes and risk of osteoporosis. Pasture plants are used in a wide range of clinical contexts, including alleviating menstrual irregularities such as dysmenorrhoea (painful menstruation) and amenorrhoea, treating infertility, facilitating childbirth, controlling postpartum bleeding, and promoting lactation (galactagogue)[1,3,4]. In addition, many wild species from the Lamiaceae and Asteraceae families are recognised for their anti-inflammatory and antimicrobial properties in treating vaginal infections, endometriosis, and pelvic pain caused by hormonal imbalances[5].

Although the number of scientific studies on the complex relationship between pasture plants and women's health has increased rapidly over the past three decades (1996–2025), the literature remains fragmented. Existing studies generally focus either on clinical trials examining the effects of a specific plant (e.g., *Vitex agnus castus* L. or *Trifolium pratense* L.) on a single symptom or on regional ethnobotanical inventories. There is a lack of comprehensive mapping studies that holistically address global research trends in this field, identify which health problems are receiving more attention (e.g., oncology or obstetrics), and examine interdisciplinary collaborations. This rapid increase in scientific knowledge production and the diversity of topics make it difficult for researchers to keep up with the literature and prevent them from seeing the "big picture"[6].

Bibliometric analysis is a powerful method that enables the statistical examination of large volumes of scientific data to map trends, gaps, and influential actors in the field[7]. This study aims to analyse scientific publications focusing on the use of pasture and wild plants in women's health (including gynaecology, obstetrics, reproductive endocrinology, etc.) between 1996 and 2025 using bibliometric methods. The study is unique in quantitatively demonstrating the impact of ecosystem services on public health. The findings will guide pharmacognosists in identifying plants that may be potential drug candidates and in determining future research directions for preventive medicine practices.

Methods

Data sources and research design

This bibliometric study examined global research trends on pasture and wild plant use in the context of women's health (gynaecology, obstetrics, and reproductive health). The literature search used publications retrieved from the Web of Science (WoS) Core Collection and Scopus databases, which are comprehensive interdisciplinary citation indexes. Data collection was conducted on 1 November 2025 (Figure 1).

Search strategy

The search strategy integrated two main groups of keywords to identify publications on the use of rangeland and wild plants in women's health. The first group included terms related to plants and traditional knowledge, such as rangeland plant, wild plant, ethnobotany, phytomedicine, and forage plant. The second group comprised terms relevant to women's health and reproductive conditions, including women's health, gynaecology, obstetrics, menopause, pregnancy, lactation, breastfeeding, menstruation, dysmenorrhoea, polycystic ovary, Polycystic Ovary Syndrome (PCOS), endometriosis, reproductive health, postpartum, and maternal health. The search was limited to titles, abstracts, and author keywords in peer-reviewed articles and reviews published in English from 1996 to 2025.

Data processing and cleaning

A total of 1,407 records were initially collected, comprising 776 entries from the Web of Science Core Collection and 631 from Scopus. The records were acquired in plain text format from Web of

Science and in BibTeX format from Scopus, then imported and consolidated into a single dataset using the Biblioshiny interface of the Bibliometrix package in R software. Duplicate entries were detected and removed automatically using the matching algorithms integrated within Bibliometrix. Publications unrelated to the research focus, non-scientific content such as editorials, conference abstracts, proceedings, and entries with incomplete or unreliable metadata were excluded manually. This process resulted in a refined dataset of 718 valid documents.

Extensive cleaning and standardisation procedures were undertaken to ensure the dataset's quality and the validity of subsequent analyses. Author names, affiliations, and keywords were refined by resolving spelling inconsistencies and unifying synonyms via a custom thesaurus file. Subject categories and keyword fields underwent manual verification and adjustment as needed. Entries containing persistent errors were discarded. These steps produced a reliable, high-quality dataset suitable for robust bibliometric analyses.

Bibliometric analyses

Bibliometric analyses were conducted using Biblioshiny (Bibliometrix version 4.1.3). These analyses included descriptive bibliometric indicators, such as annual publication trends, author contributions, institutional and country-level outputs, and citation metrics. Conceptual structure analyses were also performed, including keyword co-occurrence networks, thematic mapping, trend topic analysis, hierarchical clustering, and tree maps. Multiple correspondence analysis (MCA) was used to provide a detailed examination of the structural, temporal, and thematic dynamics within the field.

Results

General bibliometric properties of the dataset

A total of 718 publications (1996–2025) obtained from the Web of Science and Scopus databases were included in the final analysis after deduplication. The annual growth rate of the dataset was calculated

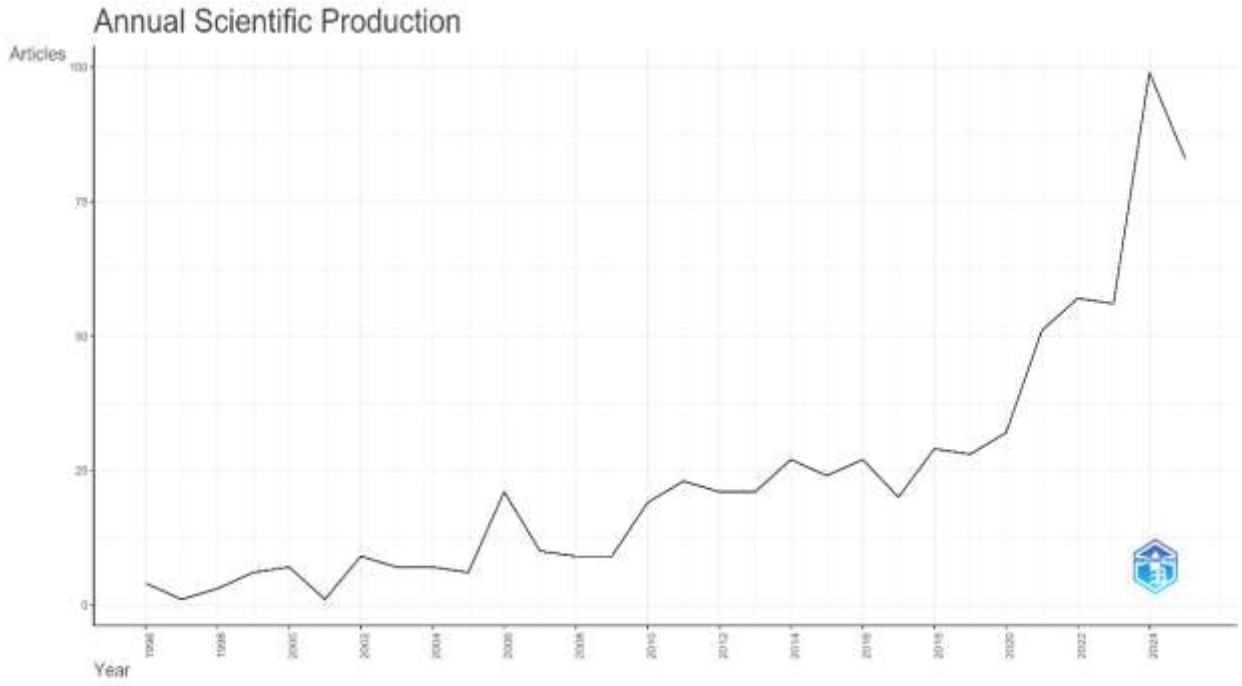

Figure 1: Temporal distribution of annual scientific output (1996–2025) in ethnobotany and ethnopharmacology

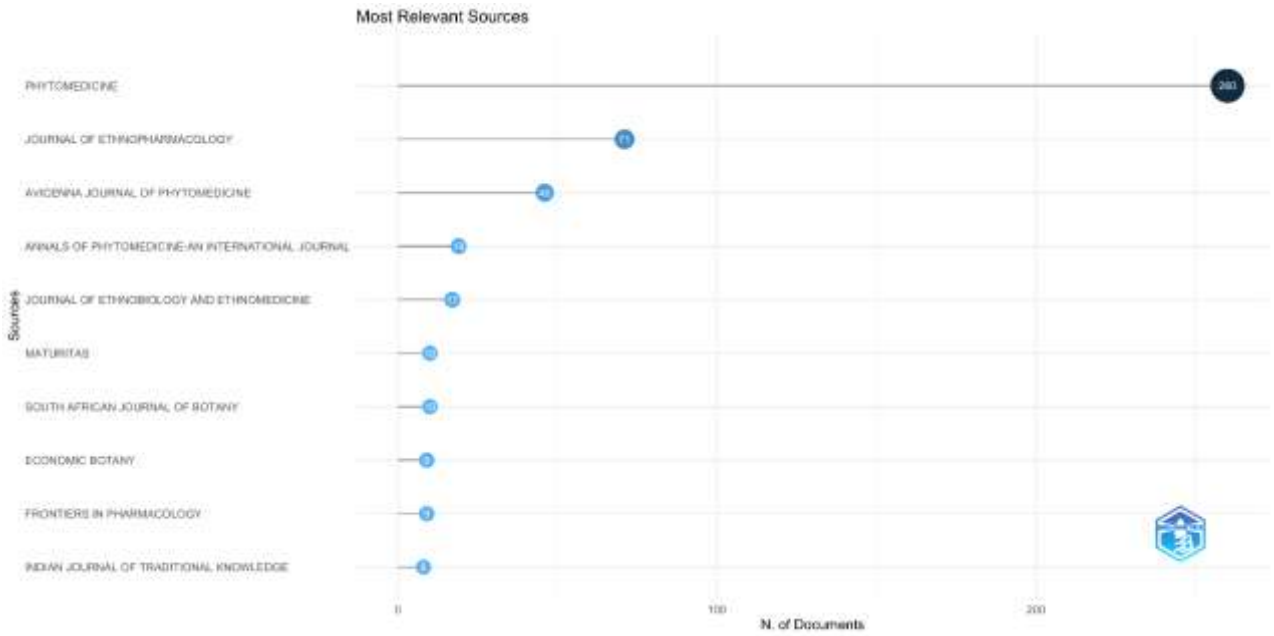

Figure 2: Leading journals contributing to ethnobotanical and ethnopharmacological research: Publication frequency analysis

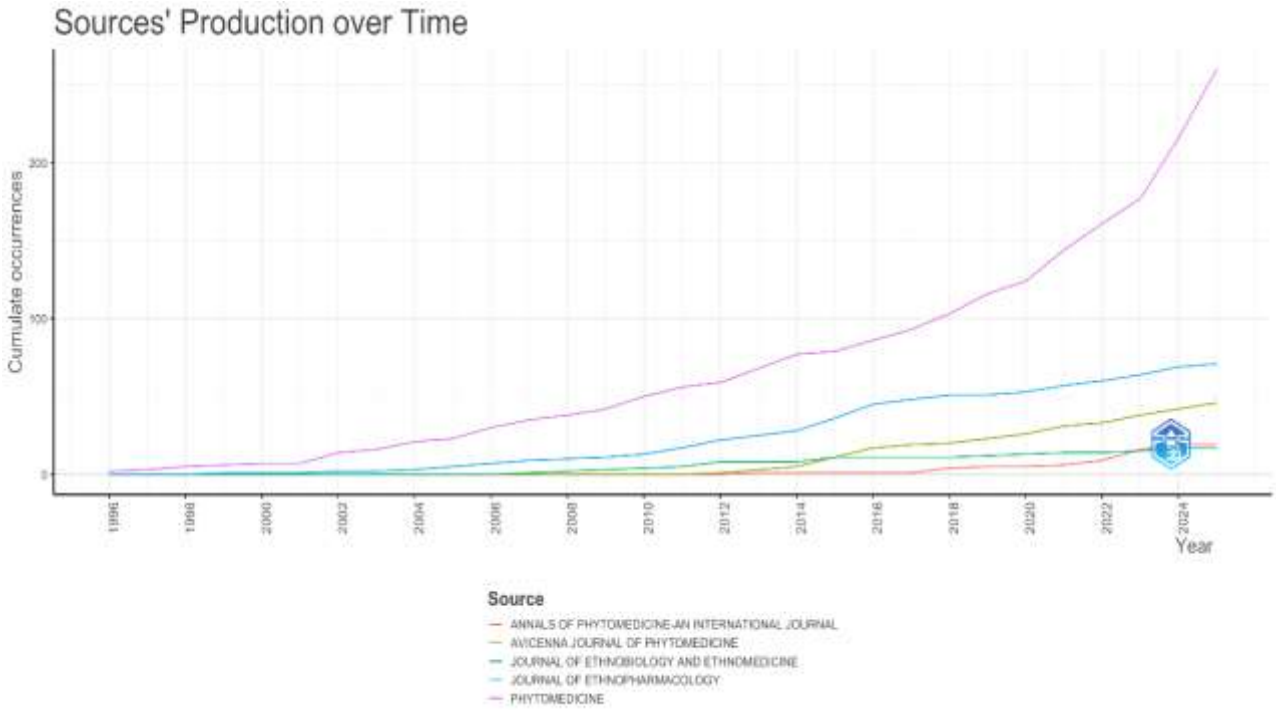

Figure 3: Longitudinal growth trajectories of the top five journals in the field (Cumulative source dynamics)

as 11%. This high growth rate indicates that interest in the use of pasture and wild plants in women's health has accelerated in recent years. The average number of authors per study was 6.7, and the Collaboration Index was 6.86. These data show that the field is being advanced by multicentre and multidisciplinary teams (botany, pharmacology, and medicine) rather than by individual researchers. Figure 1

Figure 1 shows the annual distribution of studies published between 1996 and 2025. The graph reveals a steady increase in the number of publications included in the dataset. Annual publication output remained low between 1996 and 2005, with the number of publications generally in single digits during this period. A gradual increase in publications is observed after 2006, with annual output rising significantly from the 2010s onwards. A more rapid increase in the number of publications occurred, particularly after 2015; by 2020, annual output had surpassed 50. The graph shows that the number of publications reached approximately 100 in 2023, and that annual output was much higher than in previous periods during the final years of the analysis. In 2024, output remained high, although slightly lower than in 2023. Examination of the general trend reveals a steady increase in the number of annual publications over time, accelerating towards the end of the analysis period. The figure demonstrates, based on the data, a long-term growth trend in the field's research volume.

Figure 2 presents the most frequently published sources among the 718 publications analysed. The graph shows that publications are concentrated in specific journals. Phytomedicine has the highest number of publications, with significantly more than any other source. This is followed by journals with lower but consistent publication counts, such as the Journal of Ethnopharmacology, Avicenna Journal of Phytomedicine, Annals of Phytomedicine, Journal of Ethnobiology and Ethnomedicine, and Maturitas. The list also includes sources such as the South African Journal of Botany, Economic Botany, Frontiers in Pharmacology, and Indian Journal of Traditional Knowledge. Overall, the graph demonstrates that publications are concentrated in a specific group of journals, which constitutea significant portion of the literature in the dataset. Examining the differences in publication numbers between journals shows that some sources contribute a greater volume to the literature, while others have a more limited but steady publication flow.

Figure 3 presents the cumulative publication trends over the years for the five most productive journals in the dataset. The Journal of Phytomedicine gained significant momentum after 2005, with a particularly rapid increase after 2015, indicating that it has become a major publication hub for the field. This aligns with the literature, which notes that it provides a high-volume platform for phytotherapy and natural product research.

The Journal of Ethnopharmacology, which consistently ranks second, demonstrates its long-standing role as a key resource for ethnobotanical and traditional medicine studies. The Avicenna Journal of Phytomedicine and the Journal of Ethnobiology and Ethnomedicine, both of which saw accelerated output after 2010, serve as complementary resources supporting the field's thematic diversity. The later rise of the Annals of Phytomedicine indicates that it is a relatively new addition to the field.

The general acceleration observed after 2010, and especially since 2020, parallels the growing global interest in medicinal plants and complementary medicine research. The widening cumulative difference between sources suggests that the literature is becoming centralised around a distinct core journal structure.

Figure 4 presents the authors who contributed most to the 718 studies in the dataset, revealing a concentration of research within a specific group of researchers. Li and Zhang lead the field with 13 publications each, followed by Wang (10), Chen, and Wu. This demonstrates the dominance of China-based research groups in the field and aligns with previous bibliometric findings highlighting the significant influence of studies on traditional Chinese medicine and medicinal plants in the global ethnopharmacology literature. After the top five authors, researchers such as Wuttke, Grenetille, Kronenberg, Li Jing, and Van der Broek,

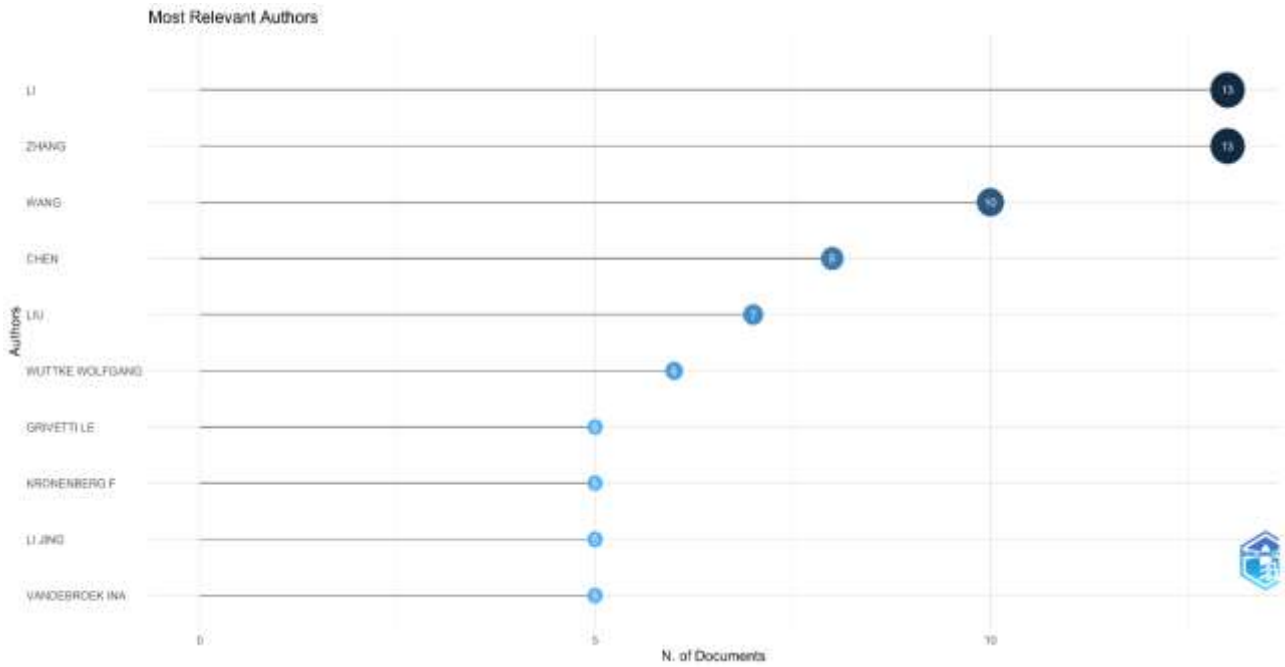

Figure 4: Publication productivity of the most prolific authors in the ethnopharmacology literature

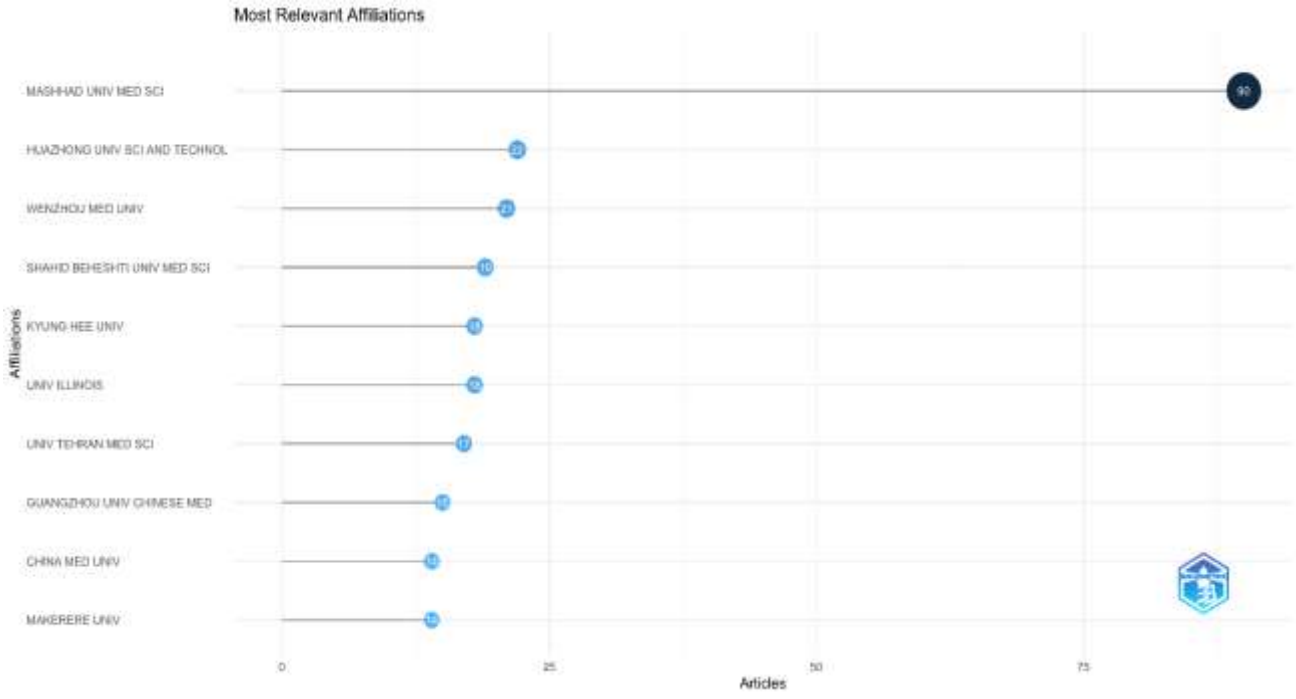

Figure 5: Institutional contributions to ethnobotanical and ethnopharmacological research: Top affiliations by publication volume

although having fewer publications, appear to form a stable group of contributors through their consistent output. Wuttke's work, in particular, focusing on phytoestrogens and menopause biology, shows that natural products occupy a significant place in subthemes related to hormonal processes.. Overall, the findings indicate that authorship distribution is not homogeneous and that the literature is driven by a core group of researchers. The fact that many of the most productive authors are affiliated with East Asian, especially Chinese, institutions is consistent with the increasing publication trend observed after 2010.

Figure 5 shows the significant institutional concentration within the research field by presenting the institutional distribution of the 718 publications analysed. Mashhad University of Medical Sciences has by far the highest output, with approximately 90 publications, reflecting Iran's strong and sustained academic presence in ethnopharmacology and medicinal plant research. International assessments that highlight the growing scientific interest in phytotherapy and traditional Iranian medicine in recent years also support this trend. Several institutions, particularly Huazhong University of Science and Technology, form a notable secondary group in the field, with contributions ranging from 15 to 25 publications. Among the top ten institutions, the University of Illinois, University of Tehran, Guangzhou University of Chinese Medicine, China Medical University, and Makerere University represent considerable geographical diversity. These institutions have varied research focuses, including natural product chemistry, pharmacological mechanisms, African ethnobotanical field studies, and the documentation of traditional knowledge. Overall, the findings indicate that research output is concentrated in specific centres, but smaller, more stable institutions also contribute to the development of the literature. This situation shows that the field of ethnopharmacology has a multi-centred production structure based on the interaction of national and continental research centres.

Figure 6 shows the geographic distribution of the countries contributing most to the ethnobotany and ethnopharmacology literature, revealing a clear concentration of output in Asia. The colour intensities on the map indicate that Iran, India, and China are the primary centres of production in the field. Iran, represented by the darkest shade, makes the highest publication contribution, consistent with the institutional distribution, where Mashhad, Shahid Beheshti, and Tehran Universities of Medical Sciences are prominent (see Figure 5). India, the second-largest centre of production, contributes significantly to the literature due to its research tradition in phytotherapy, Ayurvedic-based herbal therapies, and ethnobotanical fieldwork. This is confirmed by previous bibliometric analyses focusing on India. China is the third-largest production centre, and its contribution aligns with the affiliation of the most prolific authors, such as Li, Zhang, and Wang, with Chinese institutions. The high volume of research on TCM, herbal formulations, and pharmacological validation processes supports China's prominence in the literature. The overall picture suggests that the field is strongly Asia-centric, with contributions from Africa, Europe, and North America more limited. However, some institutions, such as the University of Illinois, make notable contributions in specific subfields. This pattern, as shown in Figure 6, suggests that countries with strong research infrastructures, both institutional and individual, are driving the literature.

Figure 7 presents the basic conceptual structure of the field, displaying the keywords used in 718 publications. The most frequently used term, "ethnobotany", with 71 occurrences, indicates that research largely focuses on the interaction between plants and cultural knowledge. "Medicinal plants", with 48 occurrences, further supports the centrality of plant diversity and traditional usage patterns in the literature. The high rankings of the keywords "menopause" and "pregnancy" (23 and 21 occurrences, respectively) indicate that women's health is a prominent thematic focus within the field. This shows that menopausal symptoms and pregnancy-related practices are often examined from both clinical and traditional perspectives. "Phytochemistry" (20 occurrences) and "traditional medicine" (19 occurrences), which appear in the middle of the list, reflect the connections between ethnobotanical knowledge, chemical constituent

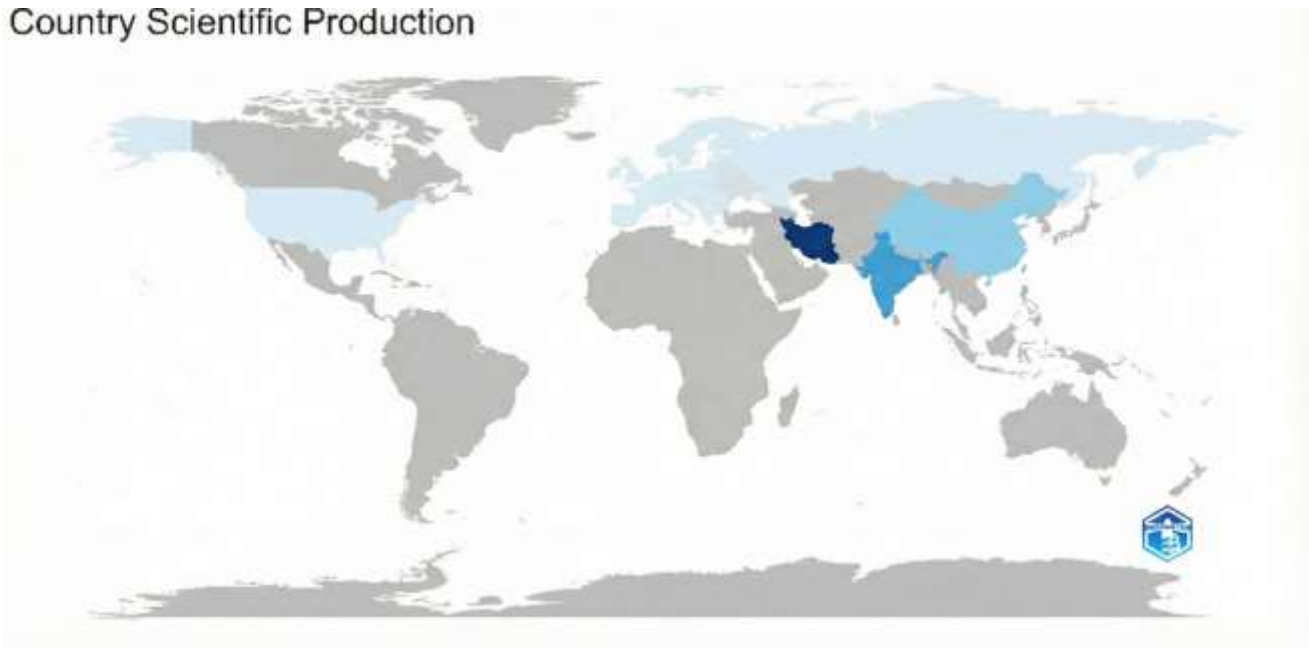

Figure 6: Global geographical distribution of scientific output: Country-level contribution matrix

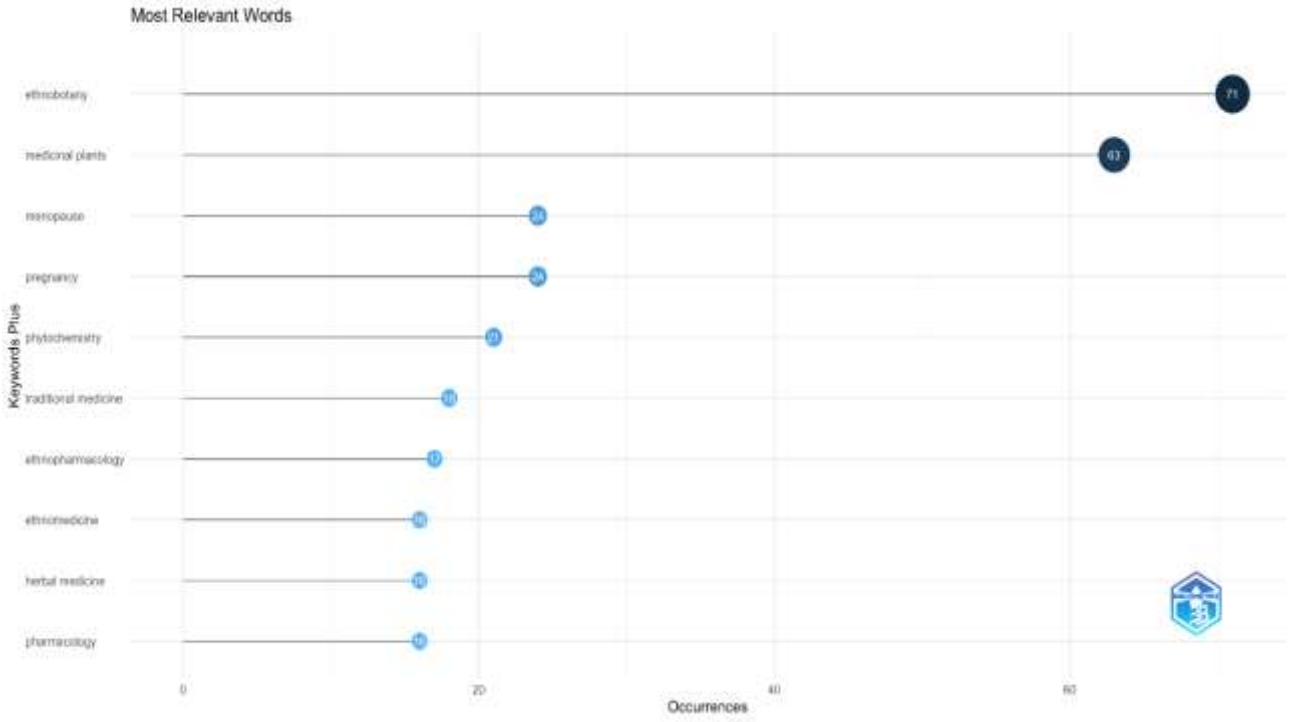

Figure 7: High-frequency keywords representing core research themes (Keyword occurrence analysis)

analysis, and pharmacological validation. Terms with 15–17 occurrences, such as "ethnopharmacology", "ethnomedicine", "herbal medicine", and "pharmacology", form the interdisciplinary terminological foundation of the field. Figure 7 demonstrates that the keywords are generally concentrated around ethnobotanical knowledge, medicinal plants, women's health, and phytochemical research, and that the literature displays a consistent thematic structure.

Figure 8 shows the visibility of prominent thematic concepts in the literature from 2006 to 2024. Studies in the early period (2006–2010) focused on a limited but distinct set of themes, including "climacteric menopause," "black cohosh," "women's health," "reproductive medicine," and "indigenous knowledge." This suggests that women's health and traditional knowledge systems have had a long-standing presence in the literature. The increased visibility of key terms such as "ethnobotany," "medicinal plants," "traditional medicine," and "herbal medicine" over extended periods since the early 2010s indicates that the conceptual framework of the field became more apparent during this time. After 2016, the thematic structure shifted towards more biological and pharmacological processes. The growing use of terms such as "oxidative stress," "inflammation," "antioxidant," "phytochemistry," and "bioactivity" between 2018 and 2024 reflects increased research on the biological effects of natural products. Women's health themes remained important during this period, with terms such as "menopause," "polycystic ovary syndrome," "endometriosis," and "pregnancy" showing a marked increase in visibility after 2017. The period after 2020, which represents the greatest thematic diversity, shows that the field has developed into a multifaceted structure integrating both traditional knowledge and modern pharmacological approaches. Overall, Figure 8 shows a gradual increase in thematic diversity within the research area, with women's health, biological mechanisms, and phytochemical processes becoming the main focuses of the literature.

Figure 9 presents a thematic map positioning themes within a research area on a two-dimensional plane, with axes representing measures of centrality and development. This structure reveals each theme's position in the literature, its scope, and its function within the research network. The map is divided into four quadrants. The upper-right quadrant highlights motor themes characterized by both high centrality and high density, with "traditional medicinal plants" standing out prominently. The lower-right quadrant consists of foundational yet evolving themes, including "ethnobotany," "medicinal plants," "traditional medicine," "polycystic ovary syndrome," "oxidative stress," and "inflammation." The upper-left quadrant encompasses highly developed but more specialized niche themes such as "pregnancy," "herbal medicine," "infertility," "menopause," "phytomedicine," "black cohosh," and "toxicity." Thelower-left quadrant captures either emerging or declining themes like "apoptosis," "pregnane X receptor," and "emerging depression." Figure 9 demonstrates the coexistence of both broad, fundamental themes (e.g., ethnobotany, medicinal plants) and more clinical and biological subtopics (e.g., oxidative stress, menopause, infertility) within the research area. The centralized structure of the motor and core themes shows that the core topics of the literature are clearly defined, while niche themes indicate that subfields requiring high expertise are well-developed within the research network. Declining or emerging themes reflect the dynamic nature of the field and periodic shifts in interest.

Figure 10 illustrates thematic communities in the literature by displaying the concurrent use of keywords. Node sizes represent term frequency, and links show the strength of association between terms. The graph presents a single, large central cluster focused on "herbal medicine" and "pregnancy." The high link density between these two terms suggests that the use of herbal products during pregnancy, as well as the safety and efficacy of herbal therapies, are prominent research topics in the literature. Strong branching connections from the central cluster highlight thematic associations with clinical concepts related to women's health, such as "reproductive health," "gynaecology," "childbirth," "menstruation," "menorrhagia," and "abortion."

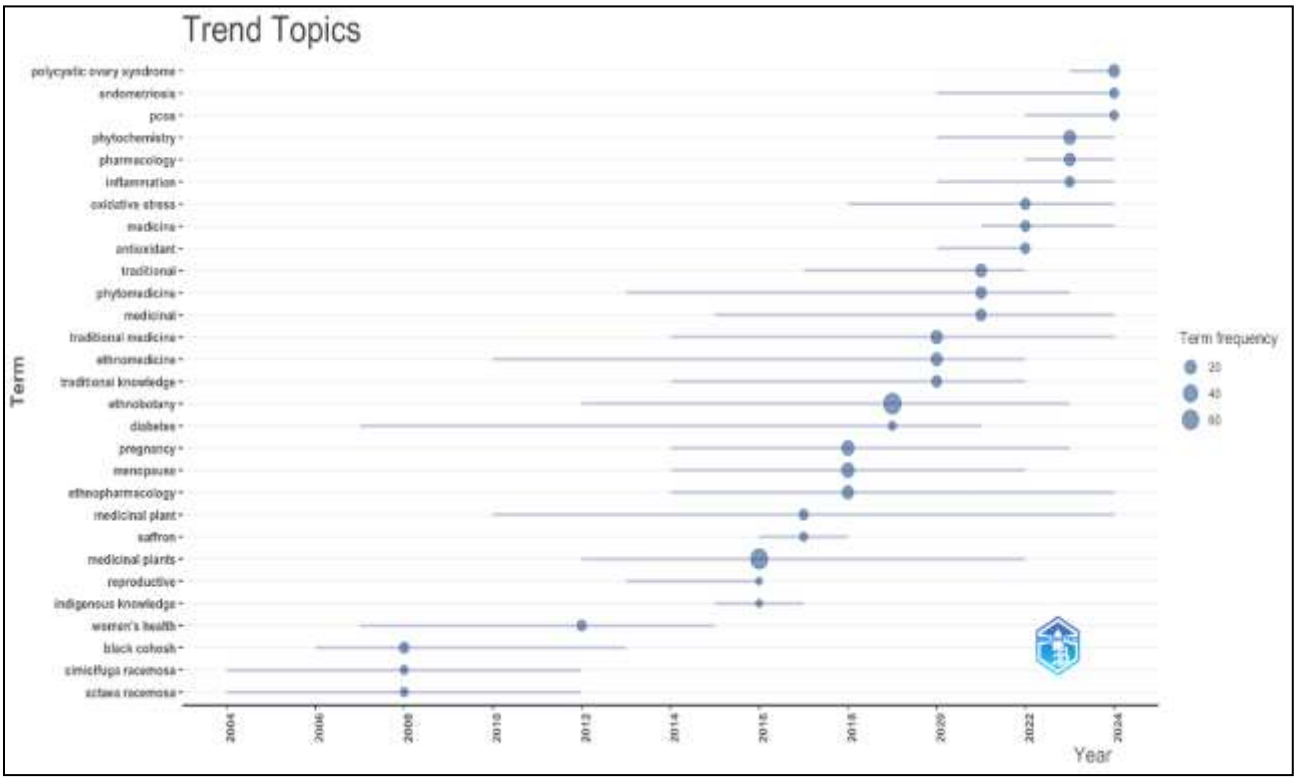

Figure 8: Evolution of major research topics over time (Trend topic analysis, 2006–2024)

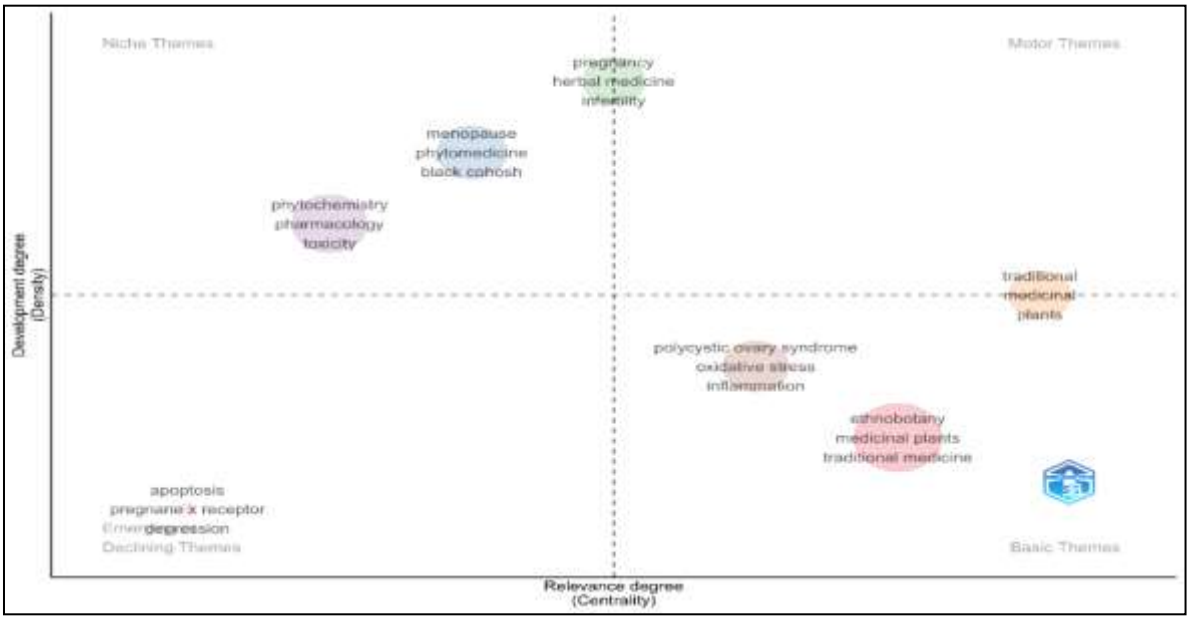

Figure 9: Thematic structure of the literature: Strategic diagram of conceptual clusters (Centrality × Density)

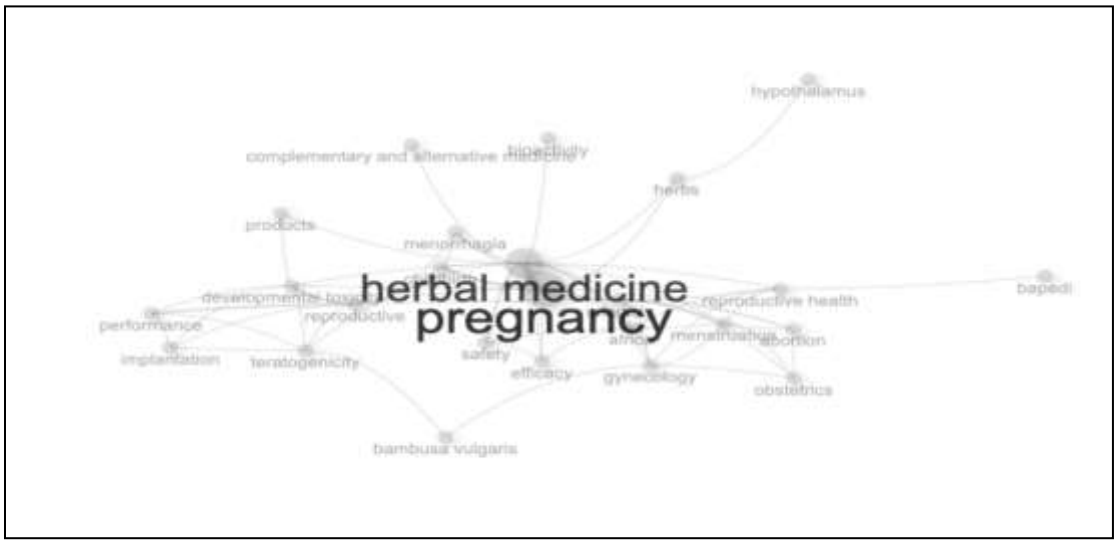

Figure 10: Network-based co-occurrence clustering of keywords: Conceptual proximity map

Figure 11: Relative prevalence of major keywords displayed through hierarchical tree map visualization

The proximity of toxicological and pharmacological terms, such as "safety," "efficacy," and "teratogenicity," to the centre suggests that the biological effects of herbal therapies are regularly evaluated, particularly in the context of pregnancy. Terms such as "bambusa vulgaris," "hypothalamus," and "pregnane X receptor," located at the periphery of the network, represent subthemes related to specific plants or biological targets, while broader concepts such as "complementary and alternative medicine," "medicinal plants," and "products" establish wide thematic connections to the central cluster. The overall network structure demonstrates that these concepts form an integrated theme radiating from the centre to the periphery, with herbal therapy, pregnancy, reproductive health, and toxicological assessments converging around a common research axis in the literature.

Figure 11 presents a tree map illustrating the relative weights and thematic diversity of the most frequently used keywords in the literature. The size of each box indicates term frequency, while the colours represent thematic clusters. The largest fields, "ethnobotany" (71; 12%) and "medicinal plants" (63; 11%), show that the primary focus of the literature is on cultural knowledge systems and herbal therapies. Medium-sized boxes show that women's health themes such as "menopause" and "pregnancy" are consistently discussed. Gynaecological concepts such as "polycystic ovary syndrome," "endometriosis," "infertility," and "reproductive health" surround this group, highlighting the importance of reproductive health as a subtheme. Terms related to biological mechanisms – "phytochemistry" (21; 4%), "oxidative stress," "antioxidant," "inflammation," and "toxicity" – appear in separate colour blocks, indicating that chemical compound analysis and biological activity studies form a strong subfield. Terms focused on herbal therapy ("herbal medicine," "traditional medicine," "ethnomedicine," "curcumin") are represented by smaller but significant boxes and form a complementary axis of the phytotherapy literature. Terms in smaller boxes, such as "black cohosh," "bambusa vulgaris," "saffron," "lactation," "diabetes," and "cancer," represent more specific research topics related to plant species or clinical conditions. Overall, Figure 11 reveals a multilayered structure of the literature, based on both high-frequency core concepts and narrowly specialised themes.

Figure 12 presents a word cloud in which keywords are scaled according to their frequency of use, highlighting the most prominent concepts in the literature through visual density. The largest font sizes, "medicinal plants" and "ethnobotany", represent core concepts in the field, consistent with the thematic distribution results in Figures 8 and 11. Medium-sized terms – "pregnancy", "menopause", "traditional medicine", "herbal medicine", "phytochemistry", "ethnomedicine", and "ethnopharmacology" – indicate that women's health, herbal therapies, and chemical compound analysis are broad but regularly addressed thematic areas in the literature. Smaller font sizes, such as "oxidative stress", "inflammation", "toxicity", "polycystic ovary syndrome", "endometriosis", "safety", "efficacy", and various plant species, represent subthemes focusing on specific biological mechanisms and clinical conditions. The variety of colours and sizes in the word cloud illustrates the coexistence of both high-frequency core concepts and more narrowly defined research topics in the literature. Figure 12 shows that the research area is primarily focused on ethnobotany and medicinal plants, with subthemes such as women's health, phytochemistry, and pharmacology serving as important complements to this core structure.

Figure 13 employs Multiple Correspondence Analysis (MCA) to reduce conceptual relationships among keywords to a two-dimensional plane and visualise the conceptual structure of the literature. Axis 1 accounts for 33.9% of the total variance, while Axis 2 accounts for 21.7%, together representing approximately half of the structure. The concentration of most terms on the right side of the graph indicates a high level of co-occurrence among core concepts such as "traditional uses", "pharmacology", "phytochemistry", "toxicity", "ethnopharmacology", "traditional medicine", and "medicinal plants".

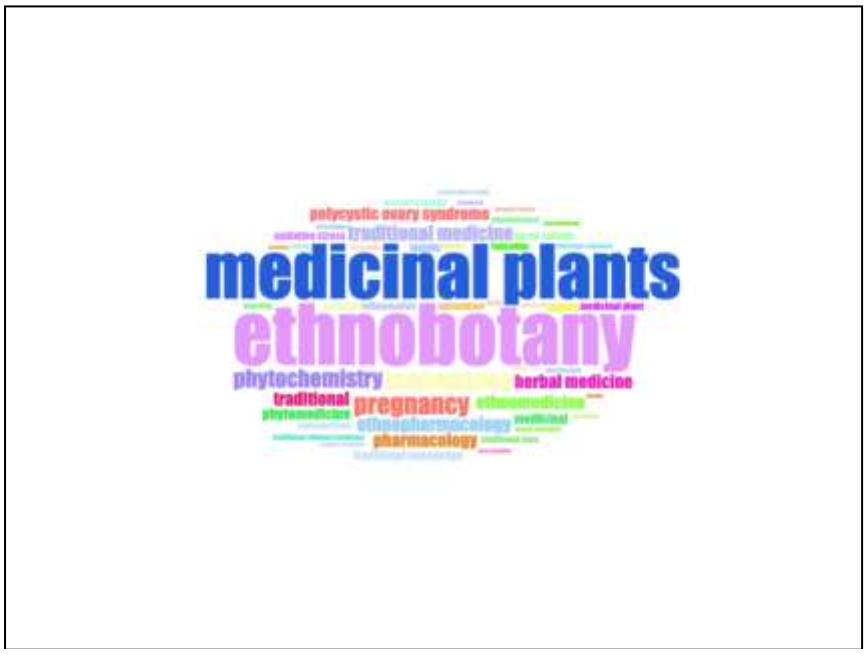

Figure 12: Visual representation of keyword F\frequencies using word cloud scaling

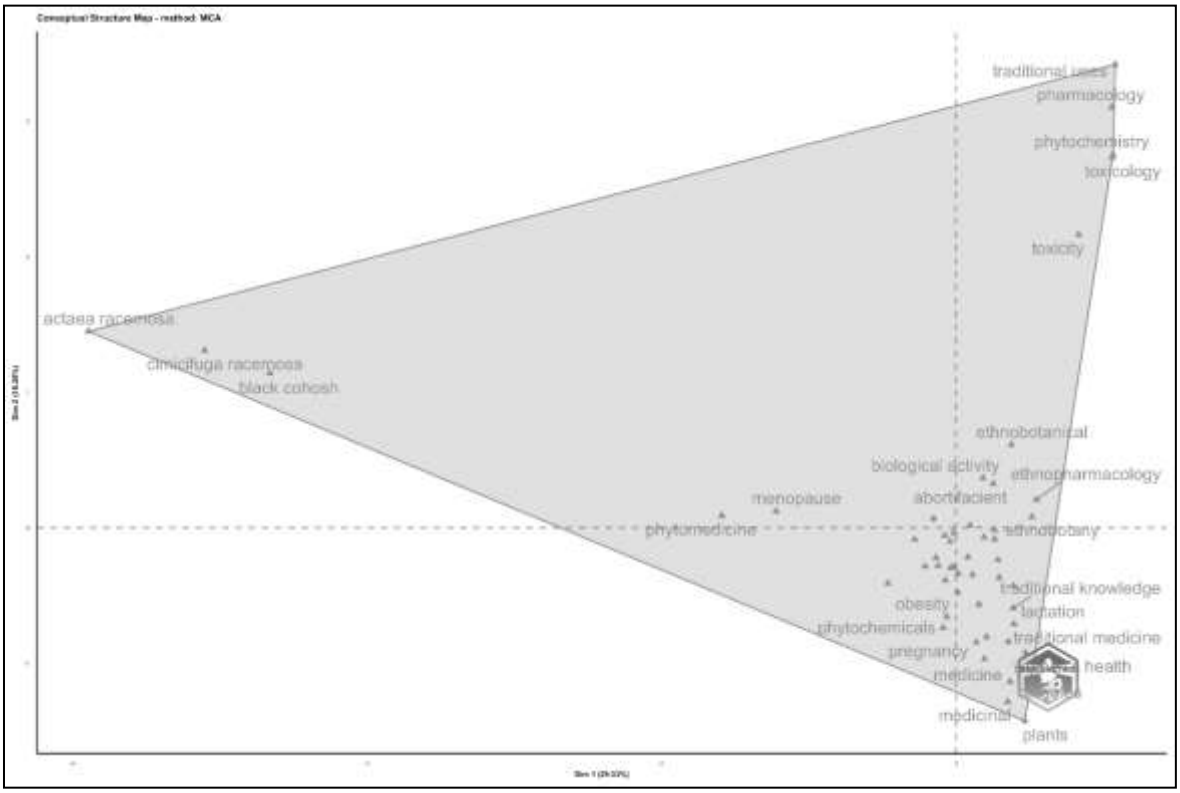

Figure 13: Multiple correspondence analysis (MCA) of conceptual Relationships: Factorial projection of keywords

A more dispersed subset of clinical and biological effect-focused terms, including "pregnancy", "obesity", "biological activity", "phytochemicals", and "herbal medicine", appears in the lower-middle section of the graph, demonstrating that these themes, while related to core terminology, span a broader thematic area. The small cluster in the upper left corner, comprising "actaea racemosa", "cimicifuga racemosa", and "black cohosh", represents a narrow but consistent thematic structure specific to a particular plant species. The overall pattern of the figure indicates three main clusters in the literature: (1) the comprehensive core cluster on the right (traditional medicine, pharmacology, phytochemistry, and ethnobotany); (2) the medium-sized cluster in the lower-middle region, focused on clinical and biological effects; and (3) the small cluster in the upper left, centred on plant species. This structure clearly reveals the multilayered conceptual organisation of the literature based on keyword co-occurrence patterns.

Discussion

This study provides a comprehensive bibliometric analysis of 718 publications from 1996 to 2025, detailing the structural transformation of the ethnobotany and ethnopharmacology literature. The findings show that the field has evolved significantly in conceptual, methodological, and clinical orientations. While colleagues (2020) observed rapid increase in ethnopharmacology publications, particularly after 2000, our study shows that this growth accelerated even more sharply after 2015[14-16]. This suggests that global interest in herbal products and complementary medicine research is increasingly prominent.

The distribution of resources reveals that the field is organized around a distinct core set of journals. The dominance of Phytomedicine and the Journal of Ethnopharmacology indicates that research on natural products and traditional medicine is largely driven by these two journals. This finding is consistent with previous studies emphasizing that ethnopharmacology research is concentrated in specific academic centres with respect to methodological standardization and scientific rigour[17]. The trend towards centralization of resource dynamics, which has become more pronounced over time, suggests an increasing level of institutionalization in the field.

The distribution of research by country and institution indicates that research output is predominantly concentrated in Asia. The emergence of Iran, India, and China as distinct centres of production at both institutional and individual levels demonstrates the strong integration of traditional medical knowledge systems into academic research in these regions. This aligns with the increasing visibility of both Ayurvedic and traditional Chinese medicine-based studies in the international literature[13]. Furthermore, the high output from research groups based in the Far and Middle East indicates that studies on the clinical validation of herbal products and pharmacological mechanisms are conducted more systematically in these regions.

One of the most notable findings of this study is the strong representation of concepts related to women's health in keyword and thematic analyses. Terms such as "menopause," "pregnancy," "polycystic ovary syndrome," "endometriosis," and "infertility" are among the most frequently used and are positioned as mature or emerging themes on the thematic map, demonstrating that women's health remains persistent focus in the ethnobotany and ethnopharmacology literature. The clustering of these concepts with terms such as "herbal medicine," "safety," "efficacy," and "toxicity" in word cloud, tree map, and cluster analyses suggests that research on herbal treatments related to women's health is associated not only with ethnographic but also with biological validation processes. This pattern is consistent with research demonstrating the rise of modern pharmacological studies on the management of menopausal symptoms with herbal products[11].

The structure revealed by the thematic map and factorial analyses shows that the literature is conceptually organized around three main axes: (1) a broad core based on traditional knowledge, (2) a biological axis focused on pharmacological and phytochemical mechanisms, and (3) a clinical axis related to women's and reproductive health. The close proximity of these axes indicates that the field is evolving into a more integrated, interdisciplinary

research structure. The distinct clustering of plant species such as *Actaea racemosa* (black cohosh) in the MCA, in particular, suggests that certain plants are becoming the focus of specific research subfields associated with women's health[18,19].

Taken together, these findings show that the ethnobotany and ethnopharmacology literature is now significantly more clinically focused, methodologically diverse, and thematically broad than in previous years. The prominence of women's diseases in the literature has created a multidimensional research field informed by both field-based traditional knowledge and laboratory-based pharmacological validation studies. However, the concentration of the growing literature in certain geographic centressuggests that global diversity is not fully represented and that additional research is needed in less studied regions.

Crucially, the centralization of women's health themes signals more than a trend; it highlights significant gap in conventional pharmacotherapy. The continued reliance on ethnobotanical solutions for conditions such as PCOS, menopause, and endometriosis suggests that modern medicine has yet to fully address the complexities of these chronic conditions. Consequently, the direction of ethnopharmacology is shifting from a descriptive science of 'preservation' to a prescriptive science of 'innovation,' where traditional knowledge provides viable alternatives to the limitations of synthetic drugs. Future research should not only document these plants but also prioritise their rapid translation into clinical trials to bridge this therapeutic gap.

Study strengths and limitations

This study provides comprehensive and methodologically robust bibliometric assessment based on 718 publications spanning nearly three decades, integrating multiple scientometric techniques including co-occurrence mapping, clustering, and factorial analysis to reveal structural, thematic, and temporal patterns within ethnobotanical and ethnopharmacological research, with particular emphasis on the consistent prominence of women's health related topics. However, as the analysis is limited to indexed records, publication patterns may be influenced by database coverage, regional representation, and metadata quality. Additionally, keyword-based mapping relies on author terminology and may not fully capture conceptual overlaps, while bibliometric indicators inherently reflect publication and citation trends rather than the methodological rigour or clinical value of individual studies. These factors should be considered when interpreting the findings.

Conclusion

This bibliometric analysis provides a comprehensive overview of the structural and thematic evolution of ethnobotanical and ethnopharmacological research over the past three decades. The findings show a sustained increase in scientific output, a clear concentration of publications in a core group of journals, and a strong geographic contribution from Asian research centres, particularly in Iran, India, and China. Keyword, cluster, and thematic analyses reveal a well-defined conceptual landscape in which traditional knowledge, medicinal plants, phytochemistry, and pharmacology form the central research axis. Notably, women's health related topics including menopause, pregnancy, infertility, polycystic ovary syndrome, and endometriosis consistently emerge across multiple analytical dimensions as prominent and interconnected themes. This suggests that reproductive and gynaecological health constitute a significant and enduring focus within the broader field. Overall, the study highlights the expanding multidimensionality of ethnopharmacology, driven by the integration of cultural knowledge, biological mechanisms, and clinically relevant themes, while also emphasizing the need for more geographically diverse and methodologically rigorous research in the future.

Contribution of authors

Y.T. conceived and designed the study. Y.T. and Z.T. collected and analysed the data. Y.T. prepared the manuscript. All authors mentioned in the article approved the manuscript.

References

1. Zwingelberg SB. Diagnosis and Surgical Therapy of Infantile Corneal Opacities. Springer Nature; 2024.
2. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Frontiers in pharmacology. 2014;4:177.
3. Zhang RP, Luo JH, Lu HX, Zhang LR, Dong ZM, Xu AL, Duan BZ and Zhao WZ. Ethnobotanical survey of antifertility medicinal plants in Dali District, Yunnan Province, China. African Journal of Reproductive Health. 2022;26(5):107-19.
4. Wang B, Yang S, Hu J and Li Y. Multifaceted interaction of the traditional Chinese medicinal herb Schisandra chinensis with cytochrome P450-mediated drug metabolism in rats. Journal of Ethnopharmacology. 2014;155(3):1473-82.
5. Sirotkin AV and Harrath AH. Phytoestrogens and their effects. European Journal of Pharmacology. 2014;741:230–6.
6. Ellegaard O and Wallin JA. The bibliometric analysis of scholarly production: How great is the impact? Scientometrics. 2015;105(3):1809–31.
7. Donthu N, Kumar S, Mukherjee D, Pandey N and Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research. 2021;133:285–96.
8. Aria M and Cuccurullo C. bibliometrix : An R-tool for comprehensive science mapping analysis. Journal of Informetrics. 2017;11(4):959–75.
9. El Allaoui H, El Ahmadi K, El Abdouni A, Dira I, El Bastrioui M, Bouhrim M, Eto B, Shahat AA, Herqash RN and Haboubi K. Trends and insights in medicinal plant extract research: a ten-year bibliometric and visualization study. Horticulturae. 2024 Nov 1;10(11):1163.
10. Yeung AW, Heinrich M, Kijjoa A, Tzvetkov NT and Atanasov AG. The ethnopharmacological literature: An analysis of the scientific landscape. Journal of ethnopharmacology. 2020 Mar 25;250:112414.
11. Oh MR, Park JH, Park SK, and Park SH. Efficacy of plant-derived dietary supplements in improving overall menopausal symptoms in women: An updated systematic review and meta-analysis. Phytotherapy Research. 2024;38(3):1294-309.
12. Mojab F. Pharmacognosy in Iran.Iran J Pharm Res.2010;5(3):e128279.
13. Baby RM and Akarsh R. Bibliometric analysis of ethnobotanical research in India (1963-2024): Trends, collaborations and themes based on Scopus. Ethnobotany Research and Applications. 2025;31:1-6.
14. Yeung AWK, Heinrich M, Kijjoa A, Tzvetkov NT and Atanasov AG. The ethnopharmacological literature: An analysis of the scientific landscape. Journal of Ethnopharmacology. 2020; 250: 112414.
15. Ng JY, Anant S and Parakh ND. Characteristics of the research literature on herbal medicines corresponding with herbal supplements yielding the highest total sales: A bibliometric analysis. Advances in Integrative Medicine. 2023;10(2):64–79.
16. Musa HH, Musa TH, Oderinde O, Musa IH, Shonekan OO, Akintunde TY and Onasanya AK. Traditional herbal medicine: overview of research indexed in the scopus database. Advances in Traditional Medicine. 2023 Dec;23(4):1173-83.
17. Aremu AO and Luo B, Mussarat S. Medical ethnobotany. BMC Complement Med Ther. 2024 Jun 5;24(1):216.
18. Sadahiro R, Matsuoka LN, Zeng BS, Chen KH, Zeng BY, Wang HY, Chu CS, Stubbs B, Su KP, Tu YK and Wu YC. Black cohosh extracts in women with menopausal symptoms: an updated pairwise meta-analysis. Menopause. 2023;30(7):766-73.
19. Borrelli F and Ernst E. Black cohosh (Cimicifuga racemosa) for menopausal symptoms: A systematic review of its efficacy. Pharmacological Research. 2008;58(1):8–14.