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Ethnoherbal Medicine in Kalinga, Philippines: Bibliometric Trends, Research Gaps, and Opportunities for Indigenous Knowledge-Driven Bioproduct Development

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ABSTRACT: Philippine ethnoherbal medicine links Indigenous Knowledge Systems, biodiversity conservation, and natural-product discovery, yet its scientific development and thematic evolution have not been comprehensively mapped. This review assessed the research landscape and identified opportunities relevant to Kalinga Province. Scopus-indexed publications from 2000 to 2025 were retrieved using a predefined search strategy, and 177 records were analyzed using Bibliometrix/Biblioshiny and VOSviewer. Scientific output increased over time, with ethnobotany, medicinal plants, traditional knowledge, ethnomedicine, phytochemistry, and biodiversity as dominant themes. Influential contributors and international partnerships improved the visibility of Philippine ethnobotanical scholarship, but domestic collaboration remained fragmented. Biotechnology-oriented approaches, including metabolomics, genomics, DNA barcoding, systems pharmacology, tissue culture, artificial intelligence, product standardization, clinical validation, and commercialization, were underrepresented. Philippine ethnoherbal research is shifting from descriptive documentation toward laboratory validation but has not fully progressed to translational innovation. Kalinga offers a strategic setting for

multidisciplinary, community-centered research integrating ethnobotany, biotechnology, conservation, ethical benefit-sharing, and sustainable bioproduct development.

Abbreviations: DNA, deoxyribonucleic acid; FGD, focus group discussion; DOI, digital object identifier.

INTRODUCTION

Ethnoherbal medicine, defined as the use of medicinal plants based on indigenous and traditional knowledge systems, represents one of humanity's oldest healthcare practices. Long before the development of synthetic pharmaceuticals, indigenous communities relied on locally available plant resources to prevent, manage, and treat various diseases. This accumulated knowledge of medicinal plant use, transmitted across generations through oral traditions and cultural practices, underpins ethnobotany, which examines relationships between people and plants, and ethnopharmacology, which investigates the traditional uses, biological activities, safety, and therapeutic potential of medicinal species (World Health Organization, 2019; Heinrich et al., 2018). Traditional medicine predates modern biomedicine and commonly incorporates knowledge, practices, and nature-based remedies that developed within particular historical and cultural settings.

According to the World Health Organization, traditional medicine continues to play an important role in primary health care worldwide, particularly in remote and rural communities where it may be culturally acceptable, available, and affordable. WHO further recognizes appropriately integrated traditional medicine as a potential contributor to universal health coverage, provided that its use is supported by scientific evidence, appropriate regulation, quality assurance, and safety standards (World Health Organization, 2025).Beyond their role in community healthcare, medicinal plants have become indispensable resources for pharmaceutical research, with approximately one-quarter of modern medicines originating directly or indirectly from natural products (Atanasov et al., 2021). Consequently, ethnobotanical knowledge has emerged as an important foundation for biodiversity conservation, sustainable healthcare, and natural product-based drug discovery.

Recent technological advances have transformed ethnobotany from a largely descriptive discipline into an interdisciplinary scientific field integrating taxonomy, phytochemistry, molecular biology, pharmacology, biotechnology, metabolomics, and computational drug discovery. Modern ethnopharmacological investigations increasingly combine traditional medicinal knowledge with phytochemical characterization, bioactivity-guided fractionation, DNA barcoding, molecular docking, metabolomics, and network pharmacology to validate the efficacy of medicinal plants and identify novel bioactive compounds (Atanasov et al., 2021; Heinrich et al., 2022). These developments have strengthened ethnobotanical research's contribution to evidence-based medicine while expanding opportunities for the discovery of new therapeutic agents

The growing scientific importance of medicinal plants is reflected in the rapid expansion of ethnobotanical and ethnopharmacological literature worldwide. Bibliometric studies have consistently reported increasing publication outputs during the past two decades, driven by renewed interest in biodiversity conservation, antimicrobial resistance, emerging infectious diseases, climate change, and sustainable natural product development (Yeung et al., 2020; Donthu et al., 2021). Research themes have likewise evolved from descriptive inventories of medicinal plant use toward multidisciplinary investigations encompassing phytochemistry, molecular pharmacology, genomics, artificial intelligence, biotechnology, and translational medicine.

Despite this global expansion, research productivity remains geographically uneven, with publication output concentrated in a relatively small number of countries. Biodiversity-rich nations possessing extensive indigenous knowledge systems, such as China, India, Brazil, and the Philippines, continue to make substantial contributions to medicinal plant research because of their exceptional floristic diversity and long-standing traditions of medicinal plant use (Yeung et al., 2020; Bussmann et al., 2023; Meñiza et al., 2024). Nevertheless, substantial differences remain in research capacity, international collaboration, and the translation of traditional medicinal knowledge into evidence-based healthcare products and commercially viable bioproducts.

The Philippines is recognized as a global biodiversity hotspot and is estimated to harbor at least 10,000 vascular plant species, approximately 50% of which are endemic to the archipelago (Brooks et al., 2002; Pelser et al., 2011 onwards). Coupled with more than 100 ethnolinguistic groups, the Philippines possesses a rich repository of Indigenous knowledge related to biodiversity and traditional medicinal-plant use, although much of this knowledge remains incompletely documented and vulnerable to loss (Dapar et al., 2020; Plang et al., 2024). Traditional herbal medicine remains an integral component of

community healthcare among many Indigenous Cultural Communities, where medicinal plants are used to manage various illnesses and common health concerns (Dapar et al., 2020).

Recent Philippine studies demonstrate increasing efforts to connect ethnobotanical documentation with phytochemical, toxicological, and pharmacological investigation. Medicinal plants are being evaluated for antioxidant, antimicrobial, anti-inflammatory, anticancer, cytotoxic, and other biological activities, while phytochemical screening has revealed potentially bioactive compound classes such as flavonoids, alkaloids, tannins, terpenoids, and phenolic compounds (Clemen-Pascual et al., 2022; Cordero et al., 2022). This progression reflects a broader shift toward evidence-based validation of indigenous medicinal knowledge while supporting the development of functional foods, herbal medicines, nutraceuticals, and pharmaceutical products.

The present bibliometric dataset similarly demonstrates that ethnobotany, Philippines, medicinal plants, traditional knowledge, traditional medicine, ethnomedicine, phytochemistry, and biodiversity constitute the principal conceptual pillars of Philippine ethnoherbal medicine research. Keyword co-occurrence analysis reveals that documentation of indigenous medicinal plant knowledge remains the dominant scientific focus, while phytochemical characterization and laboratory validation have emerged as increasingly important complementary research directions. Conversely, biotechnology-oriented themes, including molecular docking, metabolomics, systems pharmacology, and product commercialization remain relatively peripheral within the knowledge network, indicating that translational research has yet to fully mature. These patterns are further supported by the thematic and keyword analyses presented in the Results and Discussion section.

These observations underscore an important research gap. While Philippine ethnobotanical studies have successfully documented medicinal plant diversity and validated numerous traditional therapeutic claims, comparatively few investigations have advanced toward biotechnology-driven innovation, standardized herbal formulations, intellectual property generation, clinical validation, and commercialization (Dapar et al., 2020; Meñiza et al., 2024). Addressing this gap is particularly relevant for biologically and culturally rich provinces such as Kalinga, where Indigenous Cultural Communities continue to preserve extensive ethnomedical knowledge that remains insufficiently represented in the international scientific literature. Understanding the evolution of Philippine ethnoherbal medicine research is therefore essential for identifying future research priorities that integrate the preservation of indigenous knowledge with biodiversity conservation and the development of sustainable bioproducts.

MATERIALS AND METHODS

Study design

This study employed a bibliometric analysis to examine the scientific landscape of ethnoherbal medicine research relevant to the Philippines, with particular emphasis on identifying trends, intellectual structures, collaborative networks, thematic evolution, and research opportunities applicable to Kalinga Province. Bibliometric analysis provides a quantitative and objective approach for evaluating scientific publications through citation analysis, science mapping, and knowledge network visualization (Donthu et al., 2021). Unlike traditional literature reviews, bibliometric methods enable the identification of influential publications, prolific authors, collaboration patterns, and emerging research themes within a discipline (Aria & Cuccurullo, 2017). Science mapping and bibliometric analyses were conducted using Bibliometrix/Biblioshiny and VOSviewer (Page et al., 2021; van Eck & Waltman, 2010)

Study selection and search strategy

On July 15, 2026, a systematic literature review was performed using the Scopus database, chosen for its broad coverage of peer-reviewed publications, which contributes to higher citation rates and increased h-index values (Mongeon & Paul-Hus, 2016). A comprehensive search strategy was developed to maximize retrieval of publications related to Philippine ethnoherbal medicine. Boolean operators ("AND", "OR"), truncation symbols (*), and phrase searching were employed to capture variations in terminology associated with ethnobotany, medicinal plants, indigenous knowledge, phytochemistry, and bioproduct development.

The Scopus search query was as follows:

TITLE-ABS-KEY((ethnobotan* OR ethnomedic* OR ethnopharmacolog* OR "ethnoherbal medicine" OR "herbal medicine" OR "medicinal plant" OR "medicinal plants" OR "traditional medicine" OR "traditional healing" OR "folk medicine"

) AND (Philippines OR Philippine OR Filipino OR Kalinga OR Cordillera OR "Cordillera Administrative Region" OR "Northern Luzon") AND (indigenous OR "indigenous knowledge" OR "traditional knowledge" OR "local knowledge" OR ethnolinguistic OR "indigenous people" OR "indigenous peoples" OR bioproduct* OR "natural product" OR phytochemical* OR pharmacolog* OR bioactiv* OR formulation OR commercialization OR "product development" OR "drug discovery"))

Data collection

A total of 177 articles were extracted from the selected database. The search was limited to English-language publications from 2000 to 2025 indexed in the Scopus database. Duplicate records, errata, notes, editorials, conference abstracts lacking sufficient bibliographic information, and unrelated publications were excluded during the screening process. All bibliographic records were exported in CSV format with complete citation information, including the authors, article title, abstract, author keywords, indexed keywords, author affiliations, source title, publication year, cited references, citation counts, funding information, document type, and digital object identifier (DOI). These metadata served as the basis for the subsequent bibliometric analyses.

Eligibility criteria

Publications were considered eligible for inclusion if they focused on medicinal plants, ethnobotany, ethnomedicine, ethnopharmacology, or traditional herbal medicine; contained Philippine-related data or documented indigenous medicinal knowledge relevant to the Philippines; were indexed in the Scopus database; were published between 2000 and 2025; and were available in the English language. Conversely, publications were excluded if they were duplicate records, lacked complete bibliographic metadata, were unrelated to medicinal plants or ethnobotanical research, or consisted solely of editorials, corrigenda, meeting abstracts, or notes.

Bibliometric analysis

Bibliometric analyses were conducted using the Bibliometrix package (version 4.3) implemented in Biblioshiny, an R-based web interface specifically developed for comprehensive science mapping and bibliometric analysis. Descriptive bibliometric indicators included annual scientific production, publication growth trends, document types, source journals, the most productive authors, institutional productivity, country productivity, citation analysis, and the most cited publications. Science mapping analyses comprised co-authorship analysis, co-citation analysis, bibliographic coupling, keyword co-occurrence analysis, thematic mapping, thematic evolution, historiographic mapping, collaboration network analysis, and country collaboration analysis. Collectively, these analytical approaches were used to characterize the intellectual, conceptual, and social structure of Philippine ethnoherbal medicine research and to identify emerging research themes, collaboration patterns, and knowledge development over time.

Network visualization

Network visualizations were generated using VOSviewer version 1.6.20 (van Eck & Waltman, 2010), a software application designed for constructing and visualizing bibliometric networks. VOSviewer employs a distance-based visualization algorithm in which the spatial proximity between nodes reflects the strength of their relationships. The software was used to generate author collaboration networks, keyword co-occurrence networks, co-citation networks, bibliographic coupling networks, and country collaboration maps. In the resulting visualizations, node size represents the frequency of publications or citations, line thickness indicates the strength of relationships between nodes, and colors denote clusters identified using VOSviewer's modularity-based clustering algorithm. These visualizations facilitated the identification of major research themes, influential contributors, collaborative structures, and knowledge domains within Philippine ethnoherbal medicine research.

Thematic evolution and conceptual structure analysis

To identify research hotspots, thematic development, and emerging scientific directions, thematic evolution analysis was conducted in Biblioshiny using author keywords as the unit of analysis. Themes were classified according to Callon's centrality and density metrics, which evaluate the importance of a theme within the overall research field and its level of internal development, respectively (Callon et al., 1991). Based on these metrics, themes were categorized into four quadrants: Motor Themes (high centrality and high density), representing well-developed and influential research areas; Basic Themes (high centrality and low density), which constitute fundamental topics that underpin the research field; Niche Themes (low centrality and high density), representing specialized but well-developed areas of research; and Emerging or Declining Themes (low centrality and low density), which indicate either newly developing topics or areas experiencing reduced scholarly attention. In

addition, treemaps, word clouds, and thematic maps were generated to visualize the frequency, distribution, and relative importance of major research concepts, thereby providing a comprehensive overview of the conceptual evolution of Philippine ethnoherbal medicine research.

Data interpretation

Bibliometric findings were interpreted by integrating quantitative bibliometric indicators with a qualitative synthesis of the retrieved literature to provide a comprehensive understanding of the development and direction of Philippine ethnoherbal medicine research. Particular emphasis was placed on identifying research trends related to indigenous medicinal knowledge, ethnopharmacology, phytochemistry, biodiversity conservation, biotechnology, natural product development, translational medicine, and sustainable commercialization. The results were further contextualized to identify research gaps, emerging opportunities, and priority areas for future investigation, with particular focus on Kalinga Province. These opportunities include the systematic documentation of indigenous medicinal plants, phytochemical and pharmacological validation of traditionally used species, molecular characterization and DNA-based authentication of medicinal flora, biotechnology-driven product development, and community-centered innovation aimed at promoting sustainable utilization, biodiversity conservation, and local economic development.

RESULTS AND DISCUSSION

Intellectual Structure of Philippine Ethnoherbal Medicine Research

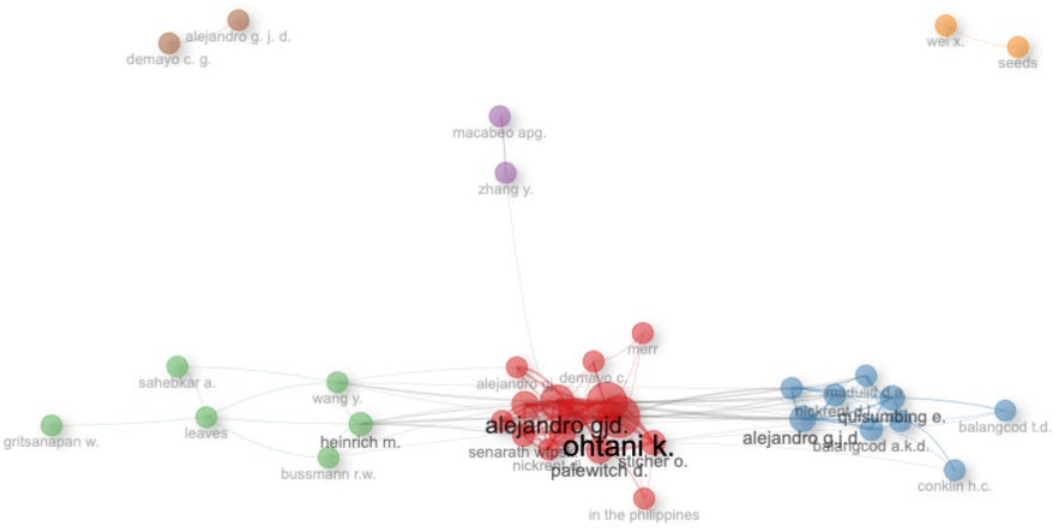

Figure 1. Co-citation network of cited authors.

The co-citation network (Figure 1) reveals the intellectual foundation of Philippine ethnoherbal medicine research through several interconnected scholarly clusters. The largest cluster is centered on Alejandro G.J.D. and Ohtani K., indicating that their publications constitute the principal intellectual base upon which subsequent ethnobotanical and ethnopharmacological investigations have been built. Their central positions and numerous citation links suggest sustained scholarly influence in medicinal plant taxonomy, phytochemistry, and ethnopharmacology. Alejandro has likewise been identified as one of the most prolific contributors to Philippine ethnobotanical research, while the Journal of Ethnopharmacology remains among the most influential publication venues in the field. These observations are consistent with previous bibliometric analyses, which recognized Alejandro as the country's leading ethnobotanical researcher and highlighted medicinal plants as the dominant research theme.

Secondary clusters represented by Balangcod, Dumilag, Macabeo, Demayo, Heinrich, Bussmann, and Wei reflect specialized research domains ranging from indigenous medicinal plant documentation to phytochemical characterization and natural product pharmacology. The presence of internationally recognized scholars such as Heinrich and Bussmann further

demonstrates that Philippine ethnobotanical research has adopted globally established conceptual and methodological frameworks in ethnopharmacology and medicinal plant research.

The interconnectedness among these clusters indicates that Philippine ethnobotany has progressively evolved from descriptive inventories of medicinal plants toward multidisciplinary investigations integrating taxonomy, phytochemistry, pharmacology, biodiversity conservation, and natural product research. Similar transitions have been documented in the global ethnopharmacological literature, where studies of medicinal plants increasingly bridge traditional knowledge and evidence-based biomedical research.

Nevertheless, several peripheral and weakly connected nodes remain evident within the network, suggesting limited incorporation of emerging approaches such as metabolomics, systems pharmacology, artificial intelligence-assisted drug discovery, and biotechnology. This finding corroborates recent reviews indicating that although Philippine ethnobotanical research has expanded considerably, translational studies linking indigenous medicinal knowledge to advanced pharmaceutical development remain relatively scarce.

Research Themes and Knowledge Domains

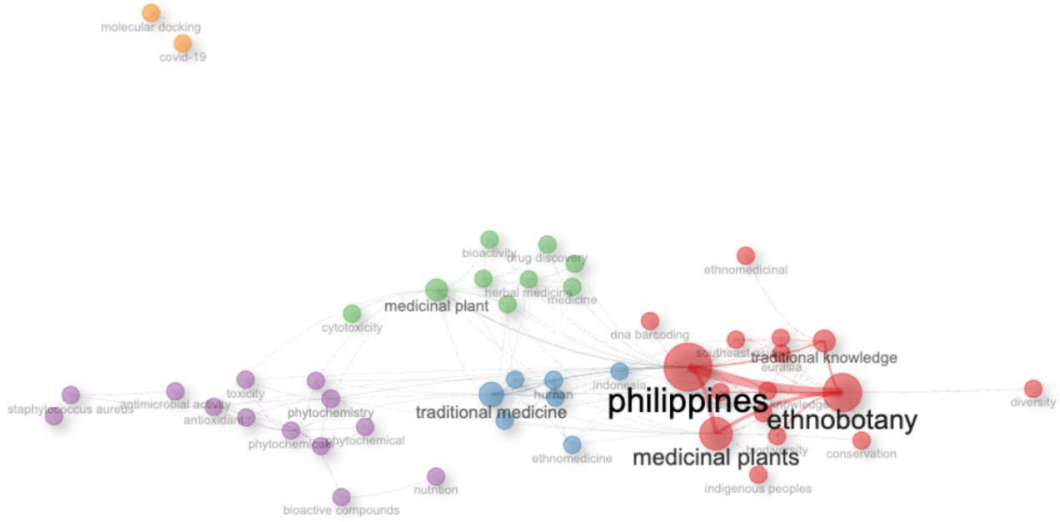

Figure 2. Keyword co-occurrence network.

The keyword co-occurrence network demonstrates that Philippine ethnoherbal medicine research is primarily organized around three highly connected concepts—ethnobotany, Philippines, and medicinal plants—which function as the central conceptual framework of the discipline. These dominant keywords indicate that documenting indigenous medicinal plant knowledge continues to be the principal scientific objective of ethnobotanical investigations in the country. Similar findings were reported in recent bibliometric studies, which identified medicinal plants and ethnobotany as the most persistent and productive research themes in Philippine scholarship.

The red cluster, comprising ethnobotany, traditional knowledge, biodiversity, conservation, indigenous peoples, and medicinal plants, reflects the continuing emphasis on preserving indigenous ecological knowledge while documenting culturally important medicinal flora. This trend is expected because ethnobotany fundamentally seeks to understand the interactions between people, plants, and traditional healthcare systems.

A second cluster links phytochemistry, bioactive compounds, toxicity, antioxidants, and antimicrobial activity, illustrating the increasing integration of laboratory validation into ethnobotanical research. This progression mirrors international developments where medicinal plant investigations increasingly incorporate phytochemical profiling and biological assays to verify traditional therapeutic claims.

Another notable cluster connects herbal medicine, drug discovery, bioactivity, and medicinal plants, suggesting that Philippine ethnobotanical research is gradually transitioning toward translational applications. However, keywords such as molecular docking, network pharmacology, and COVID-19 remain relatively isolated from the central knowledge network, indicating that computational pharmacology and in silico approaches are still emerging research directions. Comparable observations have been reported in global bibliometric analyses, where ethnopharmacology continues to evolve toward computational and systems-based methodologies.

Author Collaboration Network

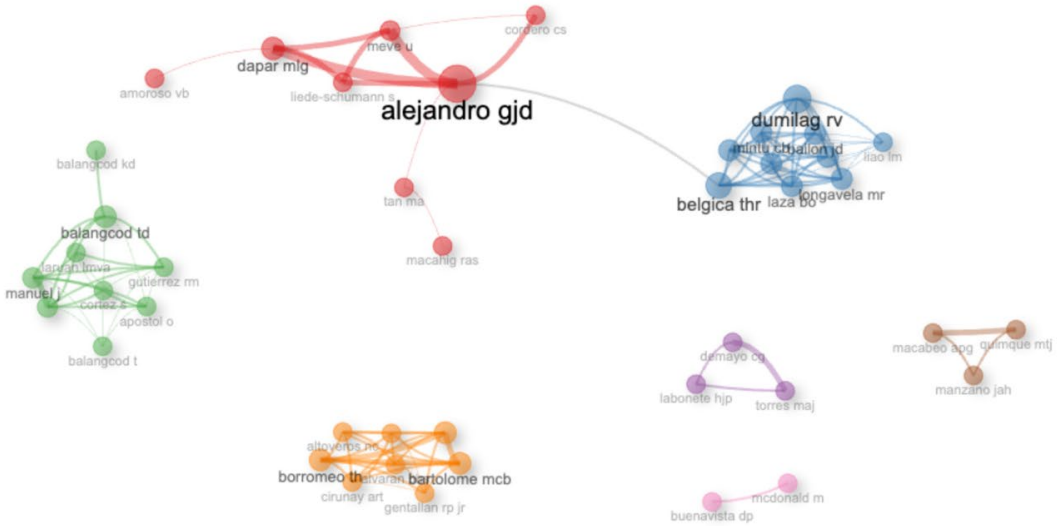

Figure 3. Author collaboration network.

The author collaboration network reveals that Philippine ethnobotanical research is characterized by several productive but relatively independent research groups rather than a single highly integrated national collaboration network.

The largest collaboration cluster is centered on Alejandro G.J.D., whose extensive collaborations with Dapar, Cordero, Amoroso, and colleagues demonstrate his leadership in Philippine ethnobotanical and taxonomic research. Another major cluster involves Dumilag, Belgica, Longavela, and collaborators, reflecting increasing scholarly productivity in biodiversity documentation and medicinal plant investigations.

Despite these productive groups, relatively few links connect the different collaboration clusters. This fragmented structure suggests that research productivity remains concentrated within several universities and research laboratories. Similar collaboration patterns were reported in the recent bibliometric assessment of Philippine ethnobotany, which observed that although publication output has increased substantially, broader institutional collaboration remains limited.

Strengthening collaborations among ethnobotanists, molecular biologists, pharmacologists, conservation scientists, Indigenous Cultural Communities, and biotechnology researchers would facilitate multidisciplinary investigations that advance medicinal plant validation, conservation, and commercialization. Such interdisciplinary collaboration has become a defining characteristic of contemporary ethnopharmacological research worldwide.

International Research Collaboration

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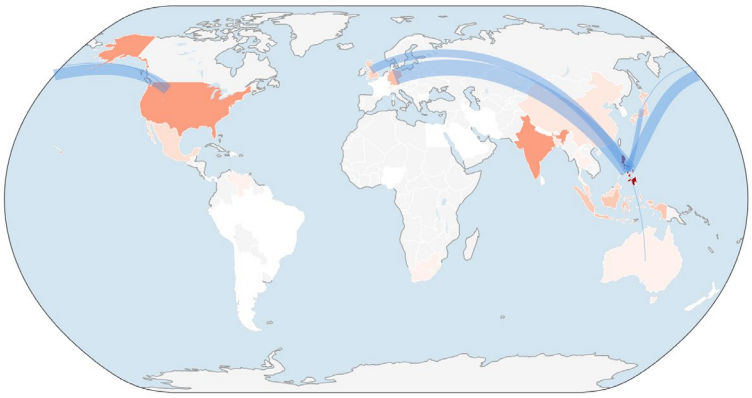

Figure 4. Country collaboration map.

The international collaboration map demonstrates that Philippine ethnobotanical research maintains active partnerships with researchers from the United States, Japan, China, India, and several European countries.

These collaborations indicate increasing international recognition of Philippine medicinal plant resources and indigenous knowledge systems. Foreign partnerships are particularly valuable for advanced phytochemical analyses, molecular characterization, metabolomics, and pharmaceutical validation that require sophisticated laboratory infrastructure.

However, collaboration remains concentrated among relatively few countries, while partnerships within Southeast Asia remain comparatively limited despite the region sharing similar biodiversity hotspots and ethnomedical traditions.

Future collaborations involving Indonesia, Malaysia, Thailand, and Vietnam could substantially enhance comparative ethnobotanical studies and regional biodiversity conservation initiatives.

Conceptual Structure Through Document Coupling

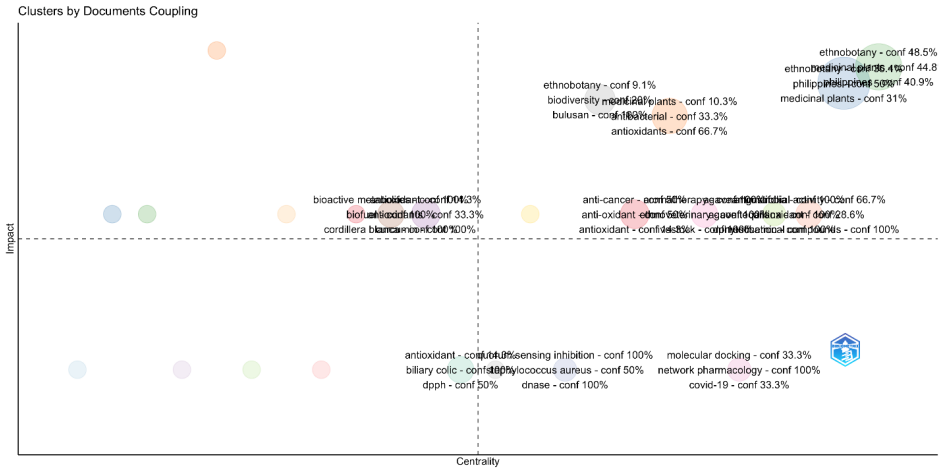

Figure 5. Document coupling map.

Document coupling identifies research papers sharing similar reference lists, thereby revealing current research fronts.

The strongest coupling cluster centers on ethnobotany, medicinal plants, and Philippine biodiversity, indicating that recent investigations continue to focus on documentation of indigenous medicinal plant knowledge. Other coupling clusters emphasize antioxidant activity, antimicrobial activity, phytochemistry, anti-cancer properties, and medicinal chemistry, reflecting growing laboratory validation of traditional medicinal plants. The presence of isolated clusters involving molecular docking, COVID-19, quorum sensing inhibition, and network pharmacology suggests that these themes remain emerging research directions rather than mainstream areas.

This finding implies that Philippine ethnobotanical research continues to prioritize documentation and phytochemical characterization, whereas translational research toward biotechnology and pharmaceutical development remains comparatively limited.

Historical Evolution of Ethnobotanical Research

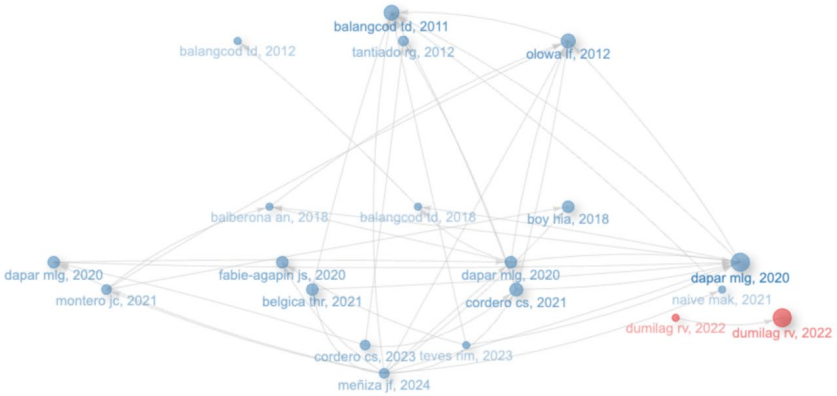

Figure 6. Historiographic citation network.

The historiographic map illustrates the chronological development of Philippine ethnobotanical research. Early influential publications by Balangcod established the scientific foundation through comprehensive documentation of medicinal plants used by indigenous communities. Beginning around 2020, publications by Dapar became highly influential and increasingly interconnected, indicating a shift toward ethnopharmacological validation and broader multidisciplinary investigations. More recent contributions by Dumilag demonstrate continued expansion into biodiversity documentation, phytochemistry, and conservation.

Overall, the historiographic analysis suggests a progressive transition from descriptive ethnobotanical inventories toward evidence-based medicinal plant research integrating chemistry, pharmacology, and biodiversity conservation.

Thematic Evolution of Philippine Ethnoherbal Medicine

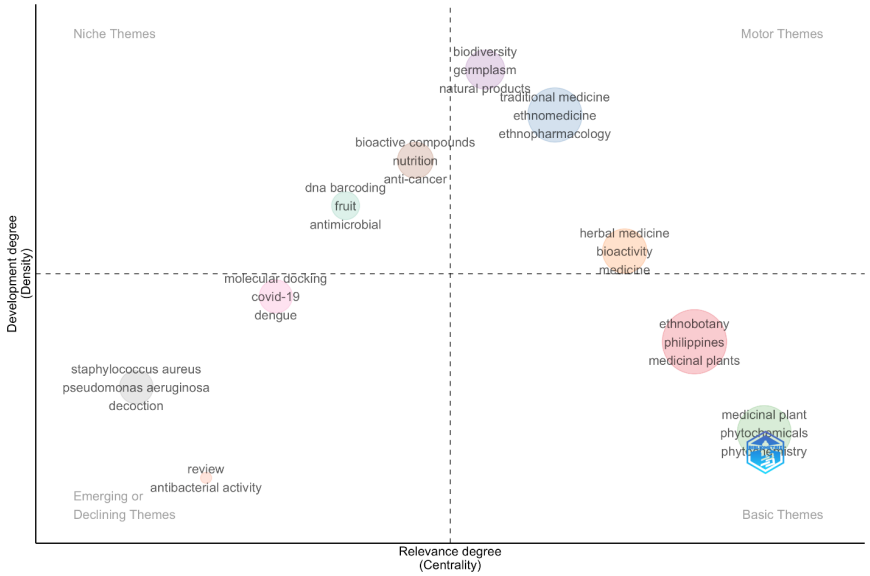

Figure 7. Thematic map.

The thematic map categorizes research themes according to centrality and developmental maturity. Motor themes include traditional medicine, ethnomedicine, ethnopharmacology, natural products, and biodiversity, indicating well-developed research

areas that strongly influence the field. Basic themes consist of ethnobotany, Philippines, medicinal plants, phytochemistry, and phytochemicals, reflecting foundational topics supporting virtually all subsequent investigations. Emerging themes include molecular docking, COVID-19, dengue, and antibacterial activity, suggesting increasing interest in computational pharmacology and disease-oriented medicinal plant research.

Meanwhile, topics such as Staphylococcus aureus, Pseudomonas aeruginosa, and decoction occupy the declining or highly specialized quadrant, indicating narrower research attention. The thematic evolution demonstrates that Philippine ethnobotany is transitioning from traditional documentation toward translational biomedical research, although computational biology, systems pharmacology, metabolomics, synthetic biology, and biotechnology remain insufficiently integrated.

Research Hotspots

Figure 8. Treemap of author keywords.

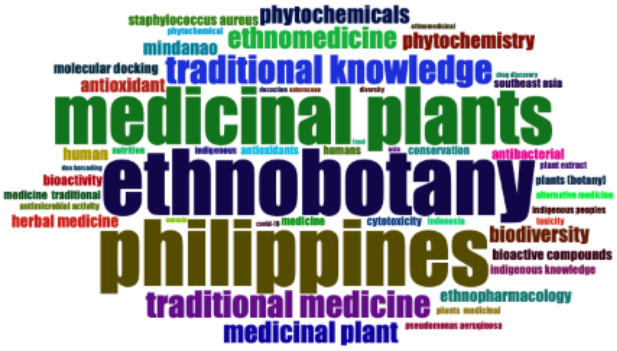

Figure 9. Word cloud of author keywords.

Figures 8 and 9 visualizations consistently identify ethnobotany, Philippines, medicinal plants, traditional knowledge, traditional medicine, ethnomedicine, phytochemistry, and biodiversity as dominant research topics. The prominence of these keywords confirms that indigenous medicinal plant documentation remains the principal research focus nationwide. Conversely, biotechnology-oriented terms-including genomics, metabolomics, synthetic biology, plant tissue culture, metabolic engineering, bioprospecting, clinical validation, and product commercialization-are notably absent. This observation reveals a substantial research gap.

Implications for Kalinga and Indigenous Knowledge-Driven Bioproduct Development

The bibliometric evidence suggests that Philippine ethnobotanical research has matured considerably in documenting medicinal plants and validating their phytochemical properties. However, relatively few studies extend these findings toward biotechnology innovation, intellectual property generation, clinical translation, or commercialization.

This gap is particularly relevant for Kalinga Province, which possesses exceptionally rich indigenous ethnomedical knowledge but remains poorly represented in national and international scientific literature.

Future investigations should prioritize: comprehensive documentation of Kalinga ethnomedicinal knowledge; DNA barcoding and molecular authentication of medicinal species; metabolomics and phytochemical profiling; bioactivity-guided compound isolation; tissue culture for conservation and mass propagation; genomic and transcriptomic characterization; formulation of standardized herbal products; clinical validation and safety assessment; intellectual property protection and benefit-sharing with Indigenous Peoples; and development of community-based biotechnology enterprises.

These research priorities align with the growing international movement toward biodiversity conservation, sustainable bioprospecting, Indigenous Knowledge preservation, and evidence-based herbal medicine.

Overall, the bibliometric analyses indicate that Philippine ethnoherbal medicine research has evolved from descriptive ethnobotanical documentation toward multidisciplinary investigations incorporating phytochemistry, pharmacology, and biodiversity conservation. Although scientific productivity and international collaboration have increased, important opportunities remain in biotechnology-driven product development, clinical validation, molecular approaches, and commercialization. These findings provide a foundation for defining future research priorities, particularly in biodiversity-rich regions such as Kalinga, where indigenous medicinal knowledge offers considerable potential for sustainable bioproduct innovation.

CONCLUSION

This bibliometric analysis provides a comprehensive assessment of the development of Philippine ethnoherbal medicine research from 2000 to 2025, revealing a steadily expanding body of literature centered on medicinal plants, indigenous knowledge systems, traditional medicine, phytochemistry, and biodiversity conservation. The findings demonstrate that the field has established a strong scientific foundation through ethnobotanical documentation and phytochemical validation, supported by influential researchers and growing international collaboration. Nevertheless, institutional collaboration within the Philippines remains fragmented, indicating opportunities to strengthen interdisciplinary partnerships among ethnobotanists, pharmacologists, molecular biologists, conservation scientists, and Indigenous Cultural Communities.

The thematic evolution further indicates that Philippine ethnoherbal medicine research is undergoing a transition from descriptive documentation toward evidence-based validation and translational applications. However, advanced approaches such as metabolomics, genomics, DNA barcoding, systems pharmacology, artificial intelligence, tissue culture, formulation science, clinical validation, intellectual property management, and technology commercialization remain insufficiently represented. Addressing these gaps is essential to transform indigenous medicinal knowledge into scientifically validated, safe, and market-ready herbal products while ensuring ethical access and equitable benefit-sharing.

For Kalinga Province, the findings underscore substantial opportunities to position its rich ethnomedical heritage as a driver of biodiversity conservation and biotechnology innovation. Future research should integrate comprehensive ethnobotanical documentation with phytochemical characterization, molecular authentication, pharmacological evaluation, formulation development, and community-based bioproduct commercialization. Such an integrated approach would not only preserve Indigenous Knowledge Systems but also support sustainable healthcare innovation, local enterprise development, and biodiversity stewardship. Ultimately, this study provides an evidence-based roadmap for researchers, policymakers, and development institutions seeking to advance Philippine ethnoherbal medicine through collaborative, interdisciplinary, and innovation-oriented research while safeguarding the cultural and biological resources upon which these traditions depend.

Ethics statement

Ethics approval and consent to participate: Not applicable. This study analyzed bibliographic metadata from published literature and did not involve human participants, personal data, or biological specimens.

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