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GLOBAL RESEARCH TRENDS IN INDIGENOUS TRADITIONAL KNOWLEDGE OF TRIBAL COMMUNITIES: A COMBINED BIBLIOMETRIC AND SYSTEMATIC REVIEW (2001–2025)

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ABSTRACT
Indigenous Traditional Knowledge (ITK) represents a unique, cumulative repository of ecological intelligence, cultural identity, and adaptive practices deeply rooted in localized historical experiences. Whereas, rapid modernization, environmental degradation, and inadequate legal frameworks threaten to erode this vital heritage and emphasize the need and importance of documentation. This study aims to systematically synthesize the fragmented landscape of ITK literature, evaluating its diverse applications in ethnobotany, sustainable agriculture, and climate resilience, while identifying critical contemporary threats to its preservation. A comprehensive systematic literature review and meta-analysis were coupled with a bibliometric analysis to objectively map the 25-year evolutionary trajectory of tribal traditional knowledge from 2001 to 2025. Data were harvested from mainstream academic databases to track publication dynamics, institutional collaborations, keyword clusters, and co-occurrence networks. The synthesis reveals that ITK operates as a highly specialized socio-ecological tool. Traditional ecological knowledge offers affordable primary healthcare remedies; providing templates for modern drug discovery; facilitates ways to improve soil health, seed preservation, and water conservation. This study underscores the urgent necessity of moving away from destructive resource exploitation toward a model of constructive dependence. It advocates for a hybrid framework that blends indigenous empirical wisdom with modern nutritional and conventional sciences. Ultimately, the findings provide a strategic roadmap for policymakers to implement inclusive, equitable sustainability policies that safeguard indigenous intellectual property rights, enhance food security, and promote long-term global biodiversity conservation.

KEYWORDS: Indigenous Traditional Knowledge (ITK); Ethnobotany; Agro-ecology; Bibliometric Analysis; Systematic Literature Review; Socio-ecological Resilience.

INTRODUCTION

Indigenous Traditional Knowledge (ITK) is a unique repository deeply rooted in specific cultures and localized historical experiences. This knowledge is systematically generated by members of tribal and indigenous communities over time through observing local conditions, experimenting with solutions, and readapting previously identified methods to shifting environmental, socio-economic, and technological contexts (Brouwers, 1993). Structurally, ITK functions as a foundational mechanism for communities to navigate and cope with their distinct agro-ecological and socio-economic environments (Fernandez, 1994) by fostering sustainable modalities of natural resource utilization (Senanayake, 2006).

It represents a cumulative body of practices, ecological intelligence, and cultural identity describing the relationships of living beings with their physical environment. This framework is constantly reinforced by experience, evolved through adaptive processes, and passed down across generations via oral transmission (Sahoo et al., 2024) and cultural rituals, enabling the long-term sustenance of both society and its environment.

As a consequence of practical engagement in everyday life, ITK plays an important role in climate resilience, biodiversity conservation, and sustainable resource management (Berkes, 2012). It is globally recognized under various terminologies, including traditional wisdom, people's knowledge, traditional science, folk knowledge, ecological knowledge, farmer's or fisher's knowledge, tacit knowledge, and local knowledge. Furthermore, indigenous peoples' traditional model of education offers a balanced, complementary framework acceptable to local communities that promotes constructive, rather than destructive, dependence (Senanayake, 2006). This knowledge encompasses not only the practical aspects of resource management but also cultural, spiritual, and social dimensions (Jakes, 2024), advocating for local development based on co-evolution within the carrying capacity of the ecosystem (Mazzocchi, 2006). Consequently, traditional knowledge contributes to sustainable development by fostering community cohesion and social capital. Indigenous practices often

emphasize collective action, cooperation, and resource sharing, which strengthen social bonds and enhance community resilience (Jakes, 2024).

Historically, the introduction of Western education during colonial rule replaced these everyday aspects of indigenous knowledge with Eurocentric ideas (Senanayake, 2006). Furthermore, a significant portion of indigenous knowledge continues to disappear due to the intrusion of foreign technologies and the decontextualized transfer of indigenous practices to external areas. Although the indigenous knowledge of colonial countries was heavily documented by early scholars (Slikkerveer, 1989; Warren, 1989), many mainstream scientists established negative biases toward these frameworks (Warren, 1989). They frequently regarded ITK as primitive simply because it lacks a systematically written form readily accessible to external observers.

In contrast to modern, resource-intensive practices, the indigenous management of the environment constitutes an integral part of the cultural identity and social integrity of many indigenous populations. Over time, the capacity of indigenous knowledge to balance cultural and ecological dimensions has increasingly gained the attention of researchers, policymakers, and scientists worldwide.

However, despite this expanding scholarly interest, the existing academic literature on the traditional knowledge of tribal communities remains deeply fragmented, siloed, and geographically scattered, continuously generating critical conceptual blind spots. This structural disjointedness underlines the urgent necessity for a comprehensive systematic literature review and meta-analysis to synthesize the fragmented landscape. Concurrently, a bibliometric analysis is essential to facilitate the objective tracking of publication dynamics, institutional collaborations, keyword clusters, and co-occurrence networks, mapping the critical 25-year evolutionary trajectory of this field from 2001 to 2025.

METHODOLOGY

In order to examine the role of indigenous knowledge in agriculture, climate change, biodiversity conservation, protection of environment, this study adopts a systematic literature review method combined with bibliometric analysis. To ensure a holistic examination of the literature, this research design combines quantitative data with qualitative synthesis. The bibliometric analysis serves as a quantitative diagnostic of the publication environment, identifying citation-heavy studies, key thought leaders, and central thematic shifts (Passas, 2024). This methodological framework effectively delineates the intellectual architecture and research frontiers, exposing the long-term evolution of scientific knowledge production (Linnenluecke, 2020).

Database selection and search strategy

Primary data for the bibliometric mapping was sourced from prominent scholarly engine namely Scopus to ensure a robust inventory of rigorous, peer-reviewed literature. The search strategy employed involves a combination of Boolean characters with appropriate keywords to capture a comprehensive set of relevant studies on indigenous knowledge of tribal communities such as agriculture, biodiversity conservation, climate change adaptation and protection of environment. Keywords such as, “indigenous knowledge”, “traditional knowledge”, “tribal communities”, “tribes” and “local knowledge”.

INCLUSION AND EXCLUSION CRITERIA

The criteria for selecting articles were 2001-2025 (timespan), research and review articles (document type), English (language), Agriculture and Social sciences (subject), Open access and published article were selected for the study. Whereas, the articles before and after the timespan, other than research and review article (document type), Non-English, other than agriculture and social science subject articles were excluded. The structured framework for evaluating studies is presented in Table.1.

Table.1. Inclusion and Exclusion criteria

Criteria	Inclusion	Exclusion
Identification		
Time span	2001-2025	<2001 & >2025
Document type	Research article, Review	Conference paper, Book chapters
Language	English	Non-English
Access	Open access	Gold, Hybrid Hold, Green, Bronze
Source	Journal	Conference proceedings, Book and Book chapters
Subject	Agriculture and Social science	Environmental science, Earth and Planetary science, Engineering and other
Publication	Published article	Under review, Under press
Screening		
Title and Abstract	Relevant and pre-defined keywords in the titles and abstract	
Full text	Relevant studies that focus on pre-defined keywords and purpose of the study	

Screening and selection process

An extensive corpus of literature was initially retrieved during the baseline search phase. This dataset was systematically refined through an initial screening of titles and abstracts to filter out irrelevant studies. Shortlisted records then underwent a rigorous full-text examination to guarantee they met the established inclusion criteria. This systematic extraction workflow was executed under the guidance of the PRISMA framework, with the precise step-by-step breakdown detailed in Figure 1.

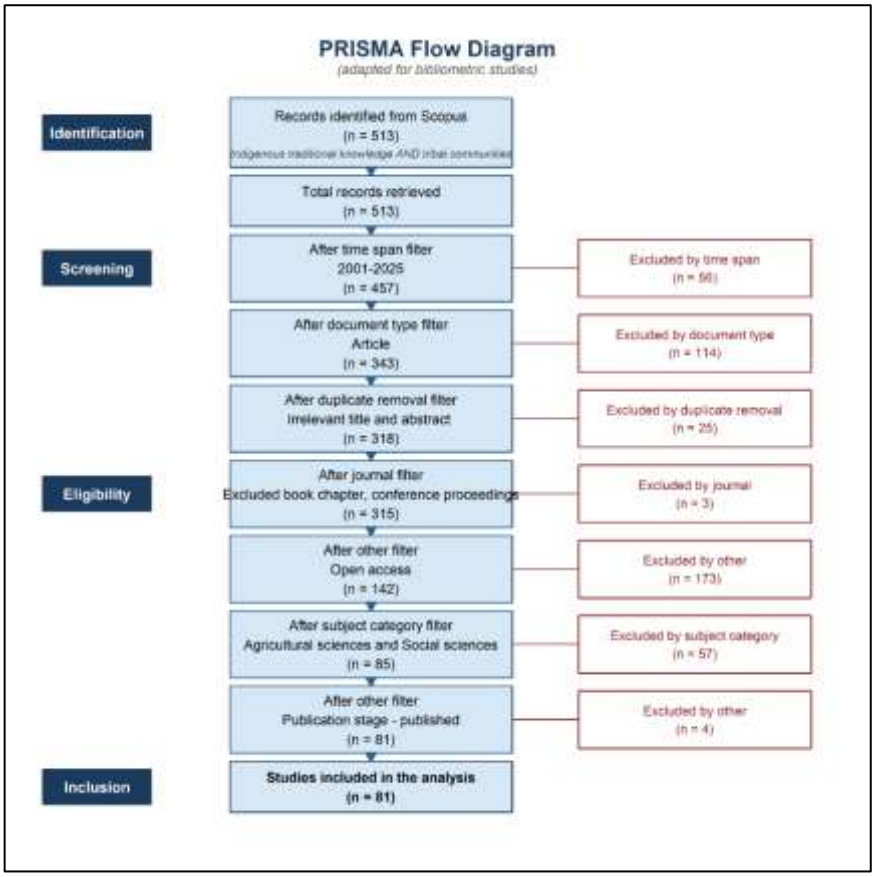

Fig.1. PRISMA Flow Chart

Data Analysis

Bibliometric analysis was done through VOS viewer version 1.6.20 to identify thematic clusters and R studio (Bibliometrix) version of 4.6.0 to examine identify annual scientific production, most relevant sources, most relevant authors, countries scientific production over time, trending topics, concurrence network. By using the aforementioned tools, a comprehensive quantitative overview of the previous literatures was gathered. Further, qualitative insights about the role of indigenous knowledge in agriculture, biodiversity conservation, conservation of environment, climate change adaptation were gathered through systematic literature review for better understanding.

RESULTS AND DISCUSSION

Annual Scientific Production

Through Biblioshiny of R studio, the annual scientific production of relevant articles on indigenous knowledge of tribal communities between 2001 to 2025 was analyzed and mapped in Fig.2.

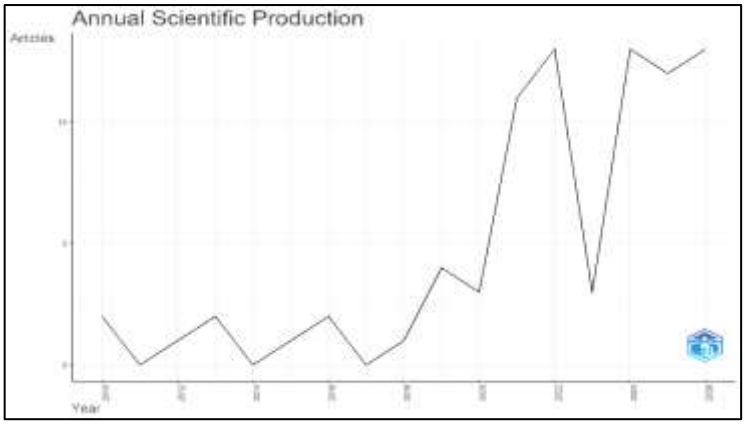

Fig.2. Annual scientific production of articles between 2001-2026

As illustrated in Figure 2, the annual production of articles remained low and stagnant between 2010 and 2017, even dropping to zero in 2011, 2014, and 2017. Fluctuating between zero and two articles annually, this initial period can be categorized as a dormant phase, reflecting a lack of research on the topic at the time. However, scholarly interest surged after 2018, driving publications up from a single article in 2018 to a peak of 13 articles in 2022. This rapid growth was likely catalyzed by new global policy frameworks, increased funding, and emerging environmental challenges. Although the year 2023 experienced a sharp, temporary decline in publications, the field rebounded strongly in 2024 to match its historical peak and maintained a high output throughout 2025 and 2026. Notably, no articles were published before 2010 based on the inclusion criteria of the study.

Most relevant sources

Most relevant sources publishing articles on indigenous knowledge of tribal communities was systemically mapped in Fig.3 using Biblioshiny of R studio.

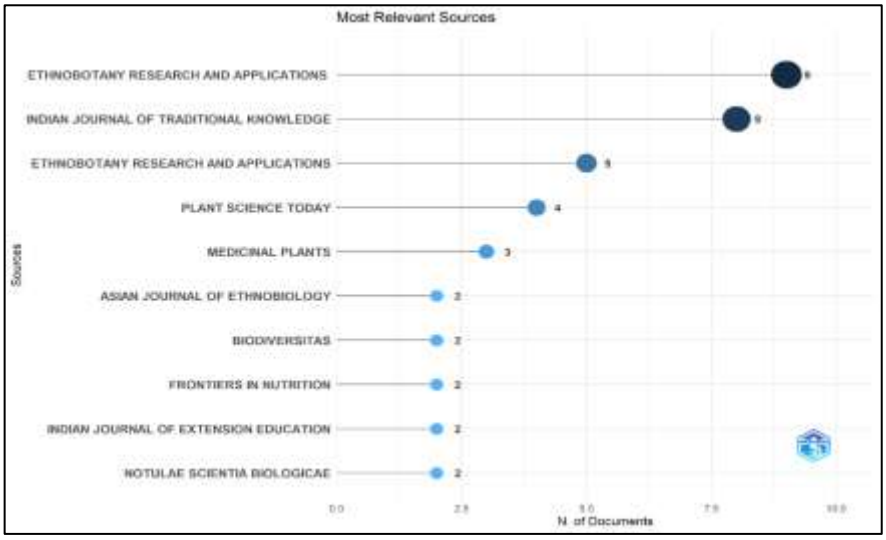

Fig.3. Most relevant sources of articles on indigenous knowledge of tribal communities

The most relevant sources of the articles under study are illustrated in Figure 3. The analysis reveals that the field is predominantly anchored by two core journals: Ethnobotany Research and Applications (9 publications) and the Indian Journal of Traditional Knowledge (8 publications). This high concentration is primarily driven by the close alignment of the research topic with the specific aims and scopes of these journals. Additionally, Plant Science Today (4 publications) and Medicinal Plants (3 publications) serve as key secondary contributors, publishing articles that connect indigenous knowledge with broader botanical and pharmacological contexts. Finally, several other journals, including the Asian Journal of Ethnobiology, Biodiversitas, Frontiers in Nutrition, Indian Journal of Extension Education, and Notulae Scientia Biologicae, contributed exactly two articles each. This distribution highlights the interdisciplinary nature of the field and the widespread application of indigenous knowledge across nutrition, biology, biodiversity, and agricultural extension education.

Sources production over time

For better understanding of cumulative publication growth over time (2001-2025), sources production over time was examined through Biblioshiny of R studio and the observed map is presented in Fig.4, detailing the temporal evolution and historical shifts within the research domain.

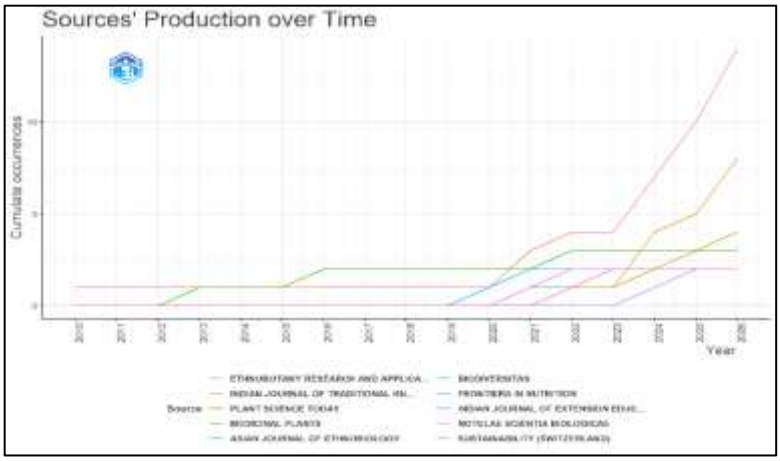

Fig.4. Source dynamics of articles over 2001-2026

The line graph depicts the sources' production over time based on their cumulative occurrences from 2010 to 2026. Though the present study assessed source production from 2001, no sources published articles before 2010 according to the inclusion criteria of the study. It can be observed that Biodiversitas was one of the earliest active journals, publishing its first article in 2012 and reaching its plateau in 2016 with a total of 2 articles. On the other hand, the journal Ethnobotany Research and Applications increased its cumulative publications from 4 articles in 2023 to nearly 14 articles in 2026. Similarly, the Indian Journal of Traditional Knowledge also increased its publication count from 1 article in 2023 to 8 articles in 2026. These findings emphasize the increased interest of researchers in the indigenous knowledge of tribal communities, spurred by funding and policy frameworks.

Countries scientific production

Countries publishing articles on indigenous knowledge of tribal communities was systemically mapped in Fig.4 and Fig.5 using Biblioshiny of R studio based on its production dynamics of compiled articles under study.

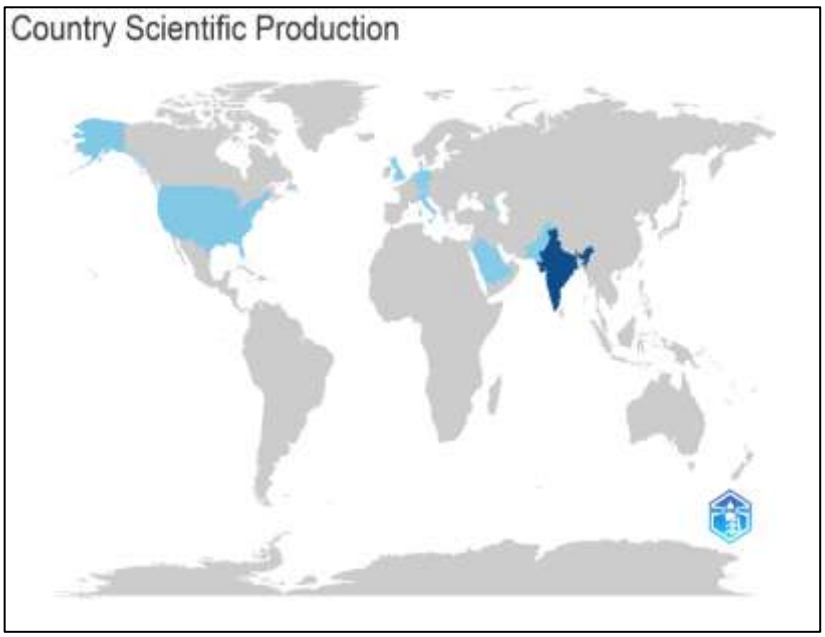

Fig. 5. Countries scientific production on indigenous knowledge of tribal communities

Figure 4 illustrates global scientific production based on the volume of publications generated by each country. India acts as the dominant powerhouse in this research domain, commanding the highest concentration of publications, as indicated by the deep blue shading. In contrast, scattered regions across the globe shaded in light blue reveal moderate publication activity across North America, Western Europe, and the Middle East. Finally, the remaining grey regions on the global map indicate a complete absence of recorded publication output within this specific dataset. This geographic imbalance highlights a critical need for expanded research and cross-border collaborations in underrepresented regions. This research focus aligns with India's efforts to safeguard its heritage; the presence of distinct Scheduled Tribes and the Traditional Knowledge Digital Library highlights the importance of indigenous knowledge and its legal protection from biopiracy.

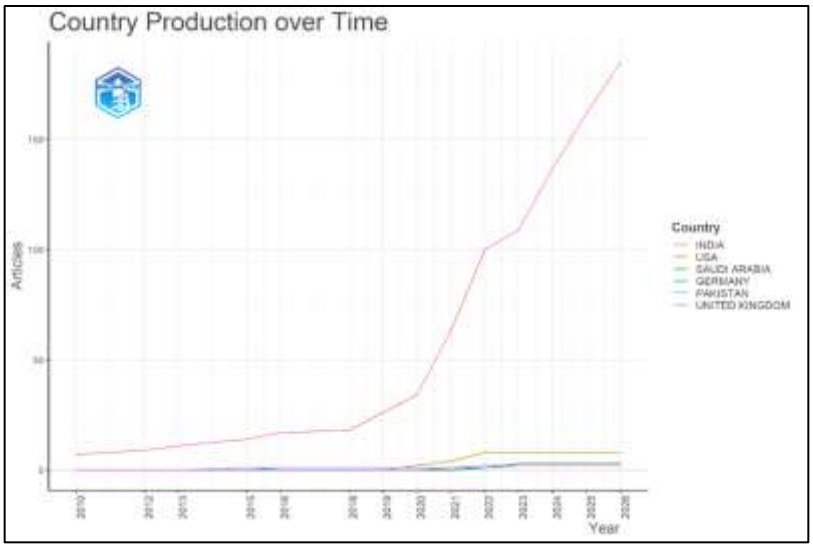

Fig. 6. Volume of production by country over time

Figure 5 illustrates the annual volume of scientific publications on Indigenous Traditional Knowledge among tribal communities across various countries over time. As shown, India exhibits an exponential surge in research output compared to all other nations. Although India maintained a slow, steady publication rate between 2010 and 2018—fluctuating below 20 articles annually—an exponential increase in publications began in the 2018–19 period. Output subsequently rose from 35 articles in 2020 to 100 articles in 2022, eventually surpassing 180 articles by 2026. Conversely, other nations, including the USA, Saudi Arabia, Germany, Pakistan, and the United Kingdom, exhibited flatline, overlapping publication trajectories, with each publishing fewer than 10 articles per year.

Keyword analysis

To map the intellectual core of the dataset, a keyword frequency analysis was conducted using RStudio to generate a word cloud visualization (Figure 6). This approach effectively identifies the dominant research pillars, foundational technical methodologies, and emerging sub-themes that characterize the conceptual boundaries of the literature.

Fig. 7. Keyword cloud representing dominant research areas and emerging sub-themes

The word cloud in Figure 6 displays terms whose physical size corresponds directly to their frequency of occurrence, mapping out the intellectual structure of the domain. The largest and most dominant terms are "traditional knowledge," "ethnobotany," and "medicinal plants." Their central placement reveals their importance as the foundational pillars of indigenous knowledge, illustrating how these communities identify, categorize, and utilize natural resources. Additionally, the prominence of the word "India" highlights the country's geographical importance as the dominant contributor to this research field.

Other prominent keywords, such as "indigenous knowledge," "tribal communities," and "indigenous people," highlight the human subjects and primary study populations. Furthermore, terms like "article," "human," "non-human," "adult," and "semi-structured interview" reveal the standard methodologies of this domain, which relies heavily on qualitative fieldwork, ethnographic data collection, and structured interviews. Finally, terms such as "biodiversity conservation," "food security," "ethnomedicine," "traditional healer," and "sustainable development" indicate the broader socio-ecological implications of the domain, reflecting the real-world applications of indigenous knowledge in conservation policy, public health, and climate adaptation.

Further, Keyword Co-occurrence Network maps the actual intellectual architecture of a field by linking words that frequently appear together in the same papers. This network analysis identifies distinct thematic subdivisions (clusters) and highlights structural nodes that act as conceptual bridges across the literature. Figure 7 displays the co-occurrence network generated from the dataset, mapping the primary research domains through color-coded community clusters.

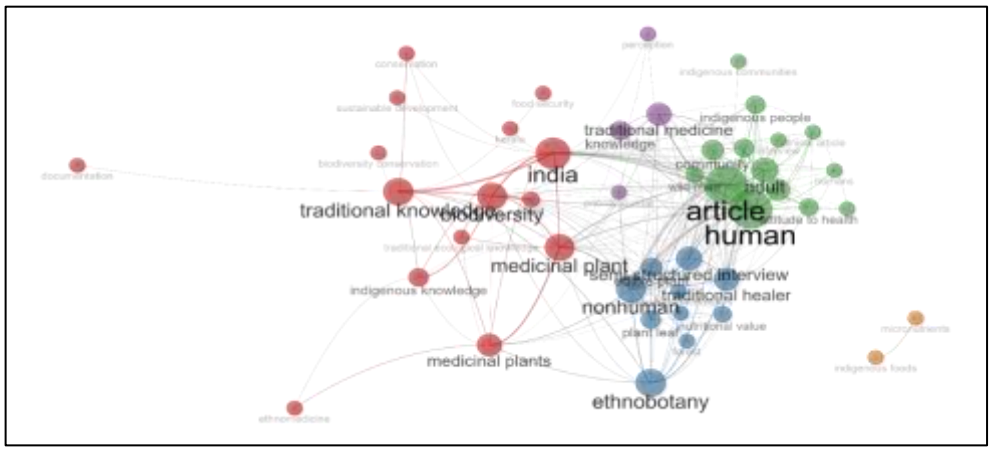

Fig.8. Keyword Concurrence network map indicating intellectual framework and thematic subdivisions of the selected articles

The red cluster is heavily dominated by "traditional knowledge," "India," "biodiversity," "medicinal plants," and "indigenous knowledge," representing the core structural backbone of the entire dataset. This grouping highlights how academic literature fundamentally evaluates traditional knowledge systems within the geographic context of India. In addition, the terms "biodiversity conservation," "sustainable development," "conservation," and "food security" reflect a direct analytical link between localized tribal knowledge and global environmental policy objectives. Meanwhile, the inclusion of "Kerala" underscores a specific regional hotspot or concentrated sub-body of literature within the broader Indian research ecosystem.

The green cluster maps out human-centric fields, publication typologies, and study demographics using the terms "article," "human," "adult," and "community." Keywords such as "indigenous people" and "indigenous communities" explicitly isolate the primary human populations under investigation. Furthermore, the inclusion of "attitude to health" introduces a behavioral science perspective, demonstrating how indigenous populations perceive, interact with, and trust their legacy health practices.

The blue cluster reflects ethnobotanical field methodologies through terms such as "ethnobotany," "semi-structured interview," "traditional healer," and "nonhuman." This grouping illustrates the operational mechanics and fieldwork methods used by researchers to collect data, with the central placement of "semi-structured interview" highlighting qualitative ethnography as a primary tool. Additionally, terms like "plant leaf," "forest," and "edible plant" highlight the specific biological resources being extracted, catalogued, and indexed from tribal lands. Lastly, the purple cluster represents the traditional medicine interface. This cluster acts as a conceptual bridge between the core Indian traditional frameworks and clinical human methodologies, focusing heavily on standardizing local healing wisdom into recognized alternative medicine systems.

Thematic Treemap

Thematic Treemap offers a precise hierarchical and fractional breakdown of the conceptual space by grouping keywords into proportional tiles based on their exact occurrence counts and percentage share within the corpus. As it helps to quickly map out the dominant thematic pillars versus the minor sub-themes shaping the field. Figure 8 presents the thematic treemap of author keywords generated from the dataset.

Fig. 9. Thematic treemap of author keywords

Figure 8 displays a thematic treemap chart illustrating keyword occurrence frequencies and their proportional contribution to the total research volume. The single largest block is occupied by the term "traditional knowledge" (19 counts), which acts as the macro-level conceptual umbrella dominating this academic domain. This is closely followed by "ethnobotany" (15 counts), confirming that ethnobotanical inventories serve as the primary operational avenue utilized by researchers. Concurrently, the prominent appearance of "India" (13 counts) and "medicinal plants" (13 counts) validates the strong geographical concentration of this literature and the primary focus on indigenous phytotherapy.

A structural analysis of the treemap reveals three primary thematic categories: core conceptual frameworks (traditional knowledge, ethnobotany), demographic focus areas (indigenous, tribal, gender), and field-level operational metrics (interviews, specific plant structures). While standard database indexing terms like "article" (12 counts), "human" (11 counts), and "non-human" (7 counts) reflect general demographic boundaries, the specific co-occurrence of "indigenous knowledge" (11 counts), "indigenous people" (5 counts), and "tribal communities" (5 counts) emphasizes a deliberate research focus on populations retaining distinct ancestral lineages. Furthermore, the inclusion of "adult" (6 counts), "female" (5 counts), and "male" (4 counts) highlights a clear trend toward demographic stratification during field data collection.

At a more granular level, smaller blocks such as "semi-structured interview" (5 counts), "plant leaf" (4 counts), "forest" (3 counts), and "wild plant" (3 counts) capture the exact empirical methodologies and material focus of the underlying fieldwork. Conversely, broader developmental and socio-ecological targets are represented by keywords like "biodiversity" (10 counts), "conservation" (4 counts), "food security" (3 counts), and "sustainable development" (2 counts). Finally, highly localized points of scientific interest emerge through specific regional and taxonomic indicators, as demonstrated by the occurrence of "Kerala" (3 counts) and the therapeutic species Asparagus racemosus (2 counts).

Thematic map

Thematic map assesses the maturity and structural importance of a research domain by plotting keyword clusters based on Callon's bibliometric indicators, viz., Centrality (external relevance) and Density (internal development). Figure 9 illustrates the thematic strategic mapping of the literature under study.

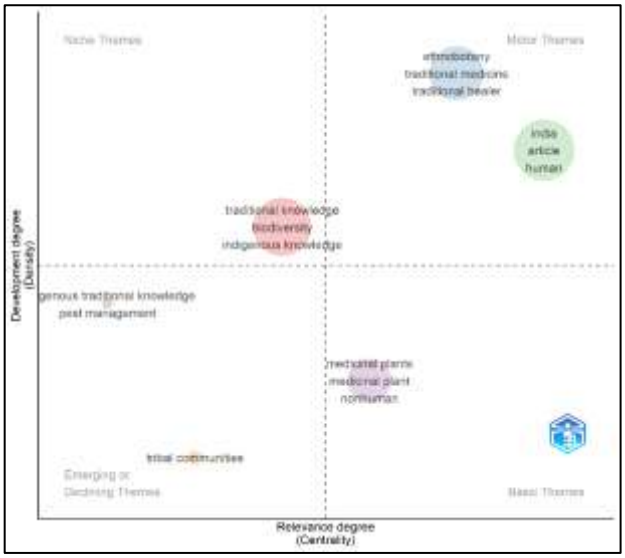

Fig. 10. Thematic map (strategic diagram) of articles under study

The strategic diagram illustrates the conceptual framework of the research domain by mapping themes according to their relevance (centrality) and development (density), which signify the strength of a topic's external network connections and its internal cohesion or maturity within an isolated cluster, respectively. Within the motor themes quadrant (high centrality, high density), terms such as "ethnobotany," "traditional medicine," and "traditional healer" constitute the core operational machinery of the domain, demonstrating a highly specialized focus that is thoroughly integrated with indigenous health-practitioner frameworks. Similarly, the co-occurrence of "India" alongside database metadata filters like "article" and "human" confirms that human-centric ethnobotanical field studies based in India form the dominant structural engine of the existing literature.

Regarding the foundational themes (high centrality, low density), descriptors such as "medicinal plants" and "non-human" are demonstrated to be highly relevant and fundamental to the field, yet they lack internal specialized development. Conversely, the emerging or declining themes quadrant (low centrality, low density) reflects peripheral concepts that remain weakly connected to the main body of literature and lack robust structural development; within this quadrant, the term "tribal communities" captures the explicit demographic focus of the studies, while the intersection of "indigenous traditional knowledge" and "pest management" highlights the growing, newly emerging importance of traditional knowledge in agricultural pest management activities. Finally, macro-level concepts like "traditional knowledge," "biodiversity," and "indigenous knowledge" function as vital transversal bridging nodes across the quadrants, serving as thematic gateways that link the foundational baseline of the discipline with active motor domains and evolving peripheral concepts.

Importance of Indigenous Knowledge

Indigenous peoples' traditional model of education offers a balanced and complementary framework acceptable to local communities that promotes constructive, rather than destructive, dependence (Senanayake, 2006). This knowledge encompasses not only the practical aspects of resource management but also deep cultural, spiritual, and social dimensions (Jakes, 2024). It advocates for local development based on co-evolution with the environment while operating strictly within the carrying capacity of the ecosystem (Mazzocchi, 2006), as exemplified by the diverse herbs and spices utilized by tribal communities for culinary and therapeutic purposes (Ahirwar et al., 2024). Consequently, traditional knowledge contributes directly to sustainable development by fostering community cohesion and social capital. These indigenous practices frequently emphasize collective action, cooperation, and resource sharing, which strengthen social bonds and enhance overall community resilience (Jakes, 2024).

Furthermore, the active documentation of indigenous knowledge promotes the conservation of natural biodiversity and the intergenerational transmission of grassroots wisdom (Sudhakar & Kannan, 2026). This process safeguards biocultural heritage (Medisetti et al., 2026) and ensures long-term cultural preservation and ecological balance for future generations (Shandilya & Chaudhary, 2026) by securing sustainable livelihoods (Verma et al., 2026). Structurally, this repository acts as a valuable inventory of ethnobotanical insights that provide potential pathways for discovering novel alternative drugs (Mondal et al., 2026; Sam & Ponnusamy, 2026). It highlights the critical importance of threatened species and the urgent need to protect them (Mondal et al., 2026). Integrating indigenous knowledge with modern biodiversity protection frameworks enables the targeted restoration of Rare, Endangered, and Threatened (RET) plant species while simultaneously promoting equitable resource management, cultural preservation, and social equity (Oza et al., 2026).

To maximize these benefits, a hybrid model that systematically blends tradition with innovation offers actionable pathways to achieve food security, livelihood resilience, and gender equity in tribal regions (Chapke et al., 2026), while fostering robust, community-based conservation initiatives (Raj, 2026). Because localized ecological knowledge helps tribal communities adapt to rapid socio-ecological changes through ecosystem alignment, it ultimately secures the long-term sustainability of their livelihoods and bolsters socio-ecological resilience (Haq et al., 2023). Ultimately, preserving tribal identity is essential to ensure broader community wellness and conserve the biosphere (Veliah, 2025). This requires structural frameworks that protect indigenous sovereignty and legal dignity rather than reducing traditional knowledge to mere economic branding (Sumit, 2025).

Indigenous knowledge in Ethnobotany

India serves as a globally critical reservoir of ethnomedicinal knowledge, with its diverse tribal communities possessing a deep, empirical understanding of local flora utilized in traditional healing practices (Mondal et al., 2026). Beyond therapeutics, these wild plant species serve as vital food supplements that play a key role in eradicating malnutrition and promoting rural food security (Humane, 2026; Verma et al., 2026). Tribal and rural populations living in and around forest peripheries heavily rely on wild flora for both sustenance and primary healthcare (Sanu et al., 2023) due to their dense nutritional and biochemical benefits (Patil et al., 2026).

Rigorous scientific validation of this indigenous knowledge is essential, as it accelerates the formulation of less toxic, highly potent alternative drugs derived directly from traditional phytotherapy (Giri & Parida, 2026). For instance, recent investigations highlight the efficacy of specific indigenous plants in enhancing memory and boosting cognitive performance (Bhukta et al., 2026). Ultimately, bridging traditional botanical applications with modern pharmacology provides a dual benefit: it preserves vulnerable tacit knowledge systems while actively driving local biodiversity conservation frameworks (Kerketta et al., 2026).

Indigenous knowledge in Health care

Indigenous tribal communities rely heavily on localized natural resources—such as wild berries, edible forest produce, and therapeutic plants—cultivating an extensive repository of ethnomedicinal knowledge over generations (Akhtar et al., 2025; Thakur et al., 2024). These frameworks serve as primary storehouses of traditional therapeutic values integrated into daily cultural practices (Pradhan et al., 2025), providing affordable healthcare solutions in remote areas where modern biomedical facilities remain scarce (Begum et al., 2024). Historically, native flora have been deployed by local health practitioners to treat diverse diseases (Phondani et al., 2010) and complex physiological ailments (Dhiman et al., 2025; Pandey et al., 2024).

Ethnopharmacological applications of these plants span multiple clinical domains, including:

Respiratory and Systemic Conditions: Management of coughs, colds, sore throats, fevers, and rheumatic pain through specialized phytotherapy (Dey & De, 2012; Patil et al., 2026).

Gastrointestinal Disorders: Relief from abdominal pain, dysentery, constipation, piles, and hemorrhoids (Patil et al., 2026; Valluru et al., 2025), often utilizing specific flora as laxatives, astringents, stomachics, and appetite stimulants (Patil et al., 2026).

Dermatological and Chronic Diseases: Treatments for severe skin diseases (Giri & Parida, 2026; Patil et al., 2026), jaundice (Patil et al., 2026), gynecological disorders (Bagartee et al., 2025), and targeted protocols for cancer management (Jena et al., 2026).

Furthermore, this traditional knowledge acts as a critical template for modern drug discovery, as seen in the formulation of novel antimalarial drugs derived directly from indigenous plants (Shankar et al., 2012). Consequently, safeguarding this traditional medicinal intelligence is imperative not only to preserve the historical legacy of tribal populations but also to sustain eco-friendly, resilient healthcare habits globally (Kumari et al., 2024).

Indigenous Knowledge in Agriculture

Indigenous knowledge plays a major role in supporting livelihoods particularly in tribal populations through indigenous methods like seed preservation and water conservation (Suman et al., 2025). The traditional farming methods use by tribes are closely linked to ecological balance and cultural identify (Rout et al., 2026). Tribal communities have adopted various traditional practices such as crop rotation, planting forestry species, applying farm yard manure, burning of crop residues (Kala, 2013) that promotes sustainable management of natural resources and biodiversity conservation (Rawat et al., 2010). By aligning traditional knowledge into seasonal festivals that guide agricultural practices and promotes biodiversity conservation (Raj, 2026).

Incorporation of both indigenous and new knowledge can develop collaborative and culturally appropriate solutions (Rout et al., 2026). Traditional ecological knowledge helps in restoring the soil fertility along with conservation and management (Kala, 2013). Traditional ecological knowledge engrained into their socio-cultural ecosystems offers resilience against stress (Ghosh-Jerath et al., 2024). Promote biodiversity, enhance soil health, reduce dependency on chemical inputs (Jakes, 2024). Celebrate plants festival which helps in conservation of plant species (Lata et al., 2024). Improves soil fertility, reduce pest pressures (Altieri, 2018); Medicinal, fodder, timber and ornamental applications (Oza et al., 2026). Adaptive strategies such as building flood resistant structures, diversifying crops and managing water resources for enhancing resilience to climate change. Several climate resilient crops used by the tribes were found to ensure food security and resilience (Anju and Kumar, 2024).

Reasons for loss of Indigenous Knowledge

The preservation and continuity of Indigenous Traditional Knowledge (ITK) are increasingly threatened by intersecting socio-economic, environmental, and institutional pressures. At a macro level, compounding environmental changes, poverty, and pervasive globalization have systematically eroded traditional ways of life (Sudhakar & Kannan, 2026). This loss is further compounded by a lack of interest among younger generations, persistent superstitions, and the mechanical extraction of ethnobotanical principles by allopathic sciences, which strips indigenous insights of their holistic cultural context (Pooja et al., 2025). Concurrently, severe habitat destruction, overexploitation, and rising market demands have led to the rapid depletion of preferred economic plant species (Lata & Paul, 2024). This ecological degradation is driven by rapid agricultural expansion, urbanization, indiscriminate deforestation, and uncontrolled plant harvesting, which collectively eliminate critical plant species vital to traditional frameworks (Das et al., 2013).

Beyond environmental destruction, modern structural shifts have accelerated the loss of indigenous intelligence through reduced forest access, accelerating modernization, and a lack of standardized documentation systems (Palanikumar et al., 2025). On a socio-cultural level, modern mobile technologies and digital media consumption have contributed significantly to cultural disorientation among tribal youth, distancing them from traditional ecological practices (Veliah et al., 2025). This generational divide is worsened by acute climate vulnerabilities and a historic lack of indigenous representation in local environmental governance frameworks.

Furthermore, formal legal frameworks often fail to safeguard these communities; for instance, India's Geographical Indication (GI) protection models remain structurally unfit to recognize or protect the deeply spiritual, cultural, and communal dimensions of tribal creativity (Sumit, 2025). This multi-layered erosion has ultimately reduced both the perceived importance and the active preservation of wild edible vegetables within tribal diets (Dhadse & Kardbhajne, 2026). Because preserving a distinct tribal identity is inherently tied to broader community wellness, the systematic identification and digital documentation of traditional ecological knowledge is imperative to safeguard these ancient practices and restore ways to live in harmony with the changing environment

CONCLUSION

Indigenous knowledge intrinsically highlights the symbiotic relationship linking humanity and the natural environment. Consequently, this study underscores the critical importance of recognizing and integrating traditional knowledge systems with modern sustainability practices. Such structural integration facilitates the design of highly effective, culturally appropriate strategies that guarantee the active participation of indigenous communities in local decision-making processes while protecting their intellectual property rights. By establishing these inclusive and equitable sustainability frameworks, policymakers can simultaneously enhance regional food security and safeguard vulnerable ecosystems. Furthermore, combining indigenous agricultural insights with modern nutritional science offers innovative, scalable pathways to combat malnutrition and lingering public health challenges. Capitalizing on the positive, empirical dimensions of traditional wisdom while addressing its baseline limitations through conventional science-based inputs will ease the complex process of securing long-term community participation in global environmental conservation.

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