



The scholarly publishing landscape of ethnobotany in the Philippines

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Review

Abstract

Background: Ethnobotany deals with the investigation on the interaction and inter-relationship between plants and human societies. Owing to the research priorities in finding new drugs, conserving plant biodiversity, and documentation of vanishing indigenous cultures, bibliometric analysis on ethnobotany had been conducted in various countries to assess its research productivity. This bibliometric analysis purposively summarizes the current scholarly publishing state of ethnobotany in the Philippines.

Methods: All published primary articles on ethnobotany that has been conducted in the Philippines from 2001 to 2022 and available in Google Scholar were retrieved, screened, and analyzed using three bibliometric indicators namely quantity, performance, and structural.

Results: A total of 163 articles has been retrieved related to Philippine ethnobotany published in 106 journals. The journal Biodiversitas was shown to have the highest number of articles published (4.91%) while the Journal of Ethnopharmacology was the most cited. Contributors included 370 authors and co-authors affiliated to more than 100 local and foreign institutions. Of these, G.J. Alejandro was identified as the most prolific author (18 articles, 343 citations) while the University of Santo Tomas was the most productive institution (22 articles). International collaboration revealed that Filipino researchers collaborated with 13 different institutions located in seven countries. In terms of funding, only less than half of the total articles examined (46.01%) declared to received financial support. The main research theme in the entire study period centered around medicinal plants while the most recent focused on the different indigenous communities in Mindanao Island and the field of ethnophycology.

Conclusions: Despite these developments, potential predatory publishing practices and parachute science are documented. The former can threaten the quality and credibility of research outputs whereas the latter can be exacerbated when local scientists and Indigenous Peoples are not empowered to participate in the scholarly process. Moving forward, we call for the participation of current and future researchers in the field of Philippine ethnobotany and all fields to raise the bar of scholarly publishing high. Carrying the best practices should be adopted across all publishing landscape.

Keywords: Bibliometric Analysis, Scientometrics, Google Scholar, Ethnobotany, Philippines

Background

Ethnobotany has been originally defined as the study of plants used by the aboriginal peoples (Harshberger 1896). Several definitions have emerged with the most recent stating it is an investigation on the interaction and inter-relationship between all human societies and plants (Bennett 2005; Rahman et al. 2019). Plant-human interaction in this context, pertains to the utilization of plants for food, clothing, ornamentation, hunting, medicine, or religious rituals (Rahman et al. 2019).

Ethnobotany as an interdisciplinary field synthesizes concepts available not just from anthropology and botany but also from chemistry, pharmacology, medicine, logic, philosophy, mathematics, and economics (Bennett 2005; Prance 1991; Rahman et al. 2019). Its growth has been increasing in the recent years which have been driven by the exploration of novel drug sources, conservation of plant biodiversity and the documentation of vanishing indigenous cultures (Pei et al. 2020; Rahman et al. 2019; Ramirez 2007).

The growth of ethnobotany research has been rampantly seen in developing countries as revealed in different bibliometric-approached studies (González-Rivadeneira et al. 2018; Hidayati et al. 2015; Pathak and Bharati 2020; Ritter et al. 2015). One of the latest bibliometric studies was conducted by Ritter et al. (2015) in Brazil and by Pathak and Bharati (2020) in India. Ritter et al. (2015) explored the primary ethnobotanical literature indexed in Scopus by using only the keywords “Ethnobotany” + “Brazil” from 1988 to 2013 while Pathak and Bharati (2020) explored all types of literature by using “ethnobotany” and other synonymous terminologies in the Web of Science (WoS) from 1974 to 2018.

In the Philippines, Madulid and Gaerlan (1994) were able to compile bibliometric references on ethnobotanical and ethnopharmacological works. Bibliometric analysis of the discipline was briefly summarized by Dapar and Alejandro (2020) based on the limited and mostly unpublished literature available from Philippine government agencies and academic institutions. The present study focused solely on all available published primary literature on ethnobotany from 2001 to 2022. It is the aim of this study to (1) analyze the output trajectory of published ethnobotanical literature in the Philippines for the past 22 years, (2) identify the journals publishing Philippine ethnobotany including the leading and the most cited, (3) identify the most productive institutions and prolific authors, (4) explore the research collaboration among local and foreign institutions, and (5) detect established and emerging research themes. We want to highlight that examining the publishing landscape of ethnobotany in the Philippines can help define its current scope and practice which may help address any existing local threats and issues that will be faced by existing and future scholars.

Materials and Methods

Articles used in this present study were retrieved from those available in Google Scholar. Though Scopus and/or WoS have been the recommended index databases in retrieving quality-oriented articles (Falagas et al. 2008, Mongeon & Paul-Hus 2016) in most bibliometric analysis studies (González-Rivadeneira et al. 2018; Pathak and Bharati 2020; Ritter et al. 2015), there have been only few papers concerning Philippine ethnobotany indexed in Scopus (Dapar & Alejandro 2020) while a quick check in the WoS revealed there are only 44 unscreened documents indexed from 2003-2022. In addition, majority of the journals, particularly publishers based in the Philippines have not been indexed yet by Scopus and/or WoS (Tecson-Mendoza 2015).

Using Google Scholar, we used the keyword “ethnobotan*” and refined it to the country of interest by adding “+ Philippines” with the specific date being set individually (e.g., 2001-2002, 2002-2003) to narrow down the searches on each year. Results produced by Google Scholar were pre-selected by immediately ignoring documents irrelevant to ethnobotany. The tentative selections were stored and compiled in Microsoft Excel. From this compilation, we screened the paper with a set of criteria. First, the study must be conducted in the Philippines. Papers that did not include the Philippines as one of the study areas were excluded. Next, we only considered those papers that have primary data and excluded review papers. Conference papers, abstracts, technical reports, theses, and dissertations were also excluded despite having primary data. The justification for such is because often their content had been published elsewhere in a journal. To avoid false positive results, these documents were not considered.

For the research direction, only articles that explicitly studied human-plant interaction (Bennet 2005; Rahman et al. 2019) were included. Papers concerning phytochemical screening, antimicrobial activities, and other clinical research on plants were excluded. However, comprehensive papers that provide details from sample collection using ethnobotanical methods, to bioassays were included. Consequently, we excluded in the screening process those articles concerning fungi due to being evolutionarily distant to plants. However, algae being plant-like in appearance were included. At the same time lichens were also included, due the presence of the plant-like algae in this special symbiosis.

Initial use of “ethnobotan*” in the screening led to few results. Due to this, we expanded the keywords considering other synonymous ethnobotanical terminologies such as “ethnophycolog*”, “ethnopharmacolog*”, “ethnopharmaceutical”,

“ethnomedicin*”, “plant utilization”, “plant use”, “wood use” “medicinal plant”, “forest product”, “indigenous knowledge” and “traditional knowledge” while maintaining the other criteria for screening. These synonymous ethnobotanical terminologies were also used together with “Philippines” in retrieving specific results from Google Scholar. Both retrieval and screening were carried out on April 2022-August 2022 and November 2023, and were repeatedly check to make sure no articles were missed. We acknowledged that the collated articles might not be that comprehensive where only 163 English-written journal articles met the criteria for analysis.

Extraction of the following information were performed from the screened articles, which included: (1) publication year; (2) journal name; (3) funding source/s; (3) institution/s involved; (4) author/s; and (5) keywords. The extracted information was used to determine quantity (number of articles, journals, institutions, and authors); performance (impact and citation of top journals); and structural indicators (collaboration among countries and between local and foreign institutions). Emerging research themes were also determined based on the author keywords. Flow chart of the entire methodology is shown in Figure 1.

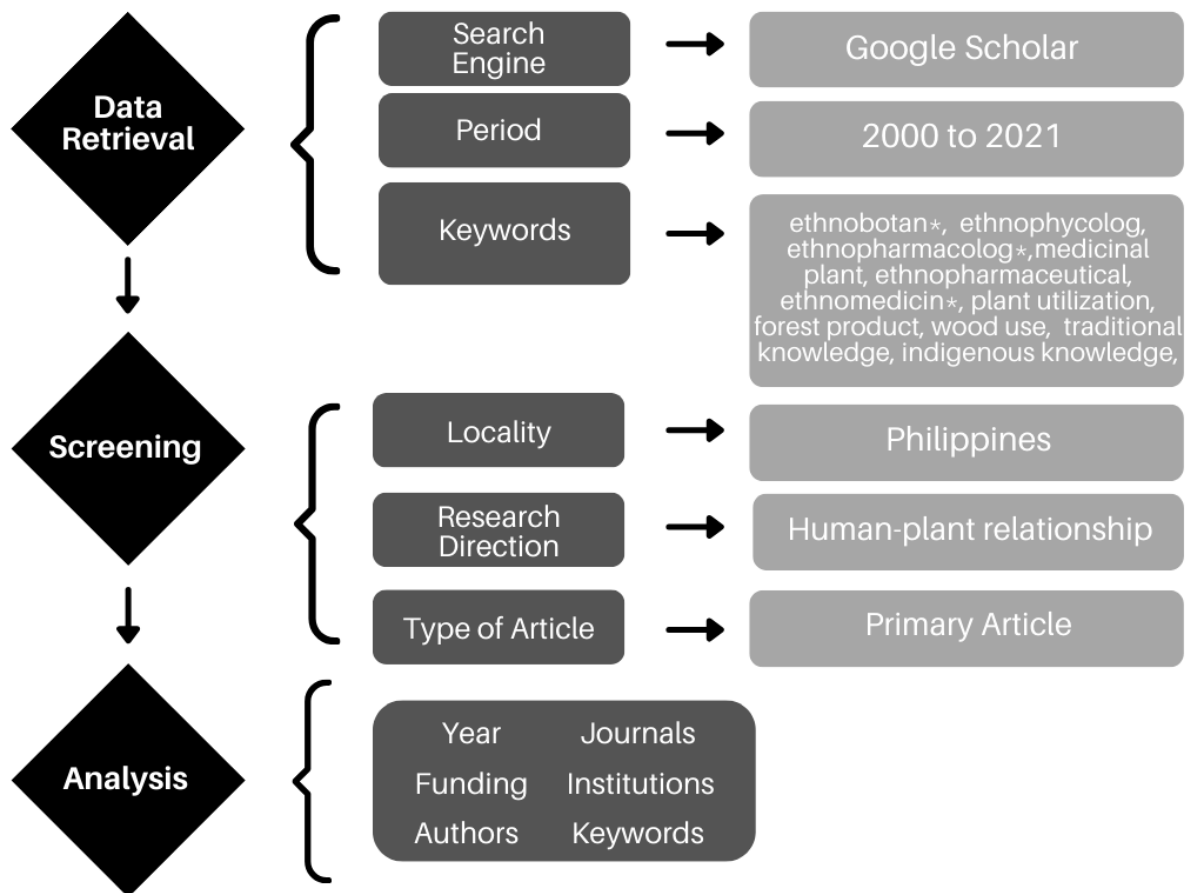


Figure 1. Flowchart showing the retrieval, screening, and analysis of data.

Retrieve data exported in comma-separated values format was used in co-authorship analysis among countries and keyword co-occurrence analysis using VOSviewer software (van Eck & Waltman, 2010). Co-authorship analysis involved the collaboration of foreign countries with the Philippines that resulted to at least one publication whereas for the keyword co-occurrence analysis involved author keywords with the minimum occurrence was limit to two. Different syntactic variation and misspelling of keywords were treated as equivalent (e.g., ethno-botanical/ethnobotanical; Manobo/Manobo tribe).

Results

Volume and annual trend of publication

A total of 163 articles that dealt with Philippine ethnobotany were retrieved in Google Scholar from 2001 to 2022. Shown in Figure 2 is the volume and trend of publication concerning Philippine ethnobotany for 22 years. The highest number of articles produced was the year 2022 having 21 articles while the lowest was the year 2001 having 0 articles.

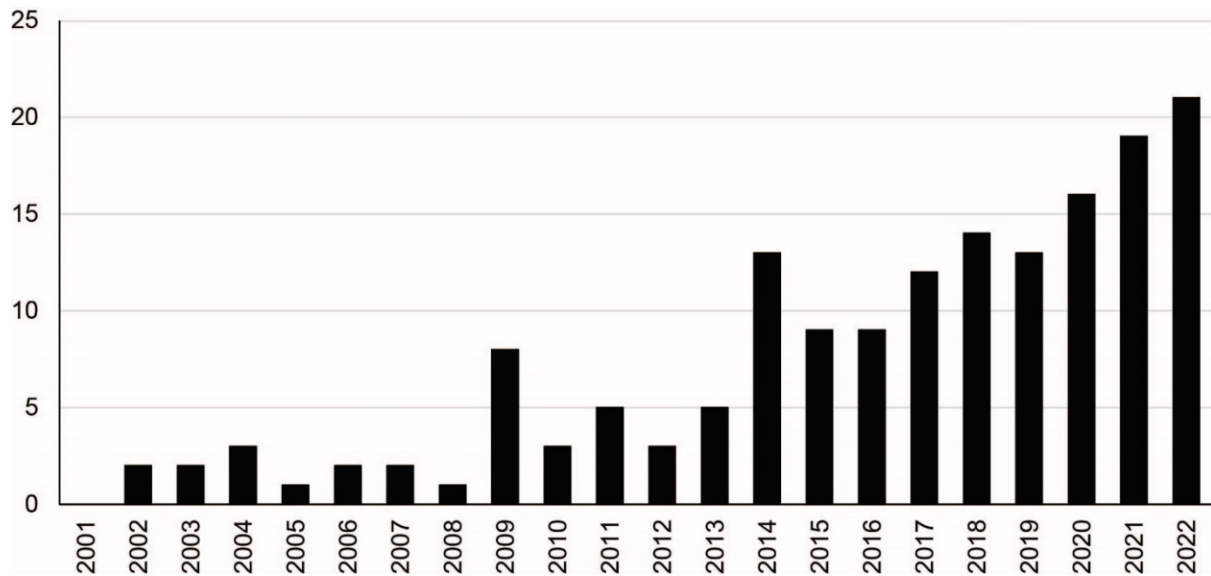


Figure 2. Annual publications regarding Philippine ethnobotany based on collated published primary articles available in Google Scholar from 2001 to 2022.

From 2001 to 2013, relatively few published articles about ethnobotany were retrieved, with only 37 articles present at that time period. Starting 2014, the number of retrieved articles had risen more than two-fold compared to that of the previous year. The last five years (2018-2022) accounted to about 50.92% (n=83) of the total published articles that is available in Google Scholar from 2001 to 2022.

Journals

A total of 106 journals were identified to publish articles regarding ethnobotany in the Philippines. Journals with a minimum productivity of three documents are listed in Table 1 which accounted to 32.51% of the total primary articles retrieved in Google Scholar from 2001-2022. Of these journals, five are published by Philippine publishers while the rest are from the India (n=3), United States (n=2), Indonesia (n=1), Ireland (n=1), and Thailand (n=1). The top journal based on the number of articles published was Biodiversitas while the most cited was the Journal of Ethnopharmacology. Out of the 106 journals, 36 are indexed in Scopus, while 20 are either Science Citation Index Expanded (SCIE), Social Science Citation Index (SSCI), or Arts & Humanities Citation Index (AHCI). Interestingly, few journals are listed in the controversial Beall's list of potential predatory journals which included journals that have been delisted by Scopus due to publication concerns. Lastly, one document containing similar ethnobotanical content was found to have been published in two journals.

Table 1. Top journals that published three or more Philippine ethnobotany articles. N = number of primary articles examined; C = number of citations received (as of March 1, 2024); C/n = Total number of citations divided by the number of articles.

Journal	Publisher/Country	Scopus	SCIE	N	C	C/n
Biodiversitas	Society for Indonesia Biodiversity (Indonesia)	✓		8	89	11.13
Indian Journal of Traditional Knowledge	National Institute of Science Communication and Policy Research (India)	✓	✓	6	179	29.83
Economic Botany	The New York Botanical Garden (United States)	✓	✓	6	263	52.60
Philippine Journal of Science	Department of Science and Technology (Philippines)	✓		5	75	15.00
International Journal of Agricultural Technology	Association of Agricultural Technology in Southeast Asia (Philippines)	✓		4	37	9.25
Journal of Complementary Medicine Research (formerly Journal of Intercultural Ethnopharmacology)	Sukasiree Publication (United States)			4	69	17.25
Asia Life Sciences	University of the Philippines Los Baños (Philippines)			3	11	3.67

Asia Pacific Journal of Multidisciplinary Research	Lyceum of the Philippines University (Philippines)	3	24	8.00
Asian Journal of Biodiversity	Liceo De Cagayan University (Philippines)	3	16	5.33
Asian Journal of Biological and Life Sciences	Pharmaceutical and Biological Society (India)	3	39	13.00
International Journal of Pure & Applied Bioscience	Vital Biotech Research and Training Institute (India)	3	56	18.67
Journal of Ethnopharmacology	Elsevier (Ireland)	3	515	171.67
Journal of Nature Studies	Philippine Society for the Study of Nature (Philippines)	3	55	18.33

Funding agencies

More than 40 funding agencies were identified to have provided financial support to 75 articles (46.01%) examined from 2001 to 2022. Of these, 16 articles received funding from more than one agency. Only one article declared to have not been provided financial support while the majority of the articles that were accessed and examined (51.53%) from 2001 to 2022 did not mention nor declare any funding source.

The Department of Science and Technology (DOST) was identified as one of the most important funding agencies in this study where it was responsible for financially supporting 17 primary articles. Other government funding agencies were the Commission on Higher Education (CHED) and Department of Health (DOH) that were declared in 15 and eight primary articles, respectively. Not common but present as well were local institutional support provided by academic research institutions to their faculty-researchers.

International funding which includes not limited to the Japan Society for the Promotion of Science (JSPS), National Science Foundation (NSF), and Academy of Finland were primarily given to foreign researchers that conducted ethnobotanical research in the Philippines. International financial support given to Filipino researchers were also documented in the form of specific institutional scholarships, grants, and fellowships.

Institutional Contribution

More than 100 institutions both from the Philippines and abroad contributed towards the advancement of Philippine ethnobotany research. Most of these institutions are concentrated in the island of Luzon. The institutions that were able to publish three or more articles are shown in Table 2. The University of Santo Tomas was ranked first in terms of total number of publications (22 articles, 13.50%), followed by Mindanao State University – Iligan Institute of Technology (14 articles, 8.59%), and the University of the Philippines Los Baños (10 articles, 6.13%).

Table 2. The top institutions that contributed to Philippine ethnobotany during the period 2001-2022 based on collated primary articles. N= number of articles examined.

Institution	N
University of Santo Tomas	22
Mindanao State University – Iligan Institute of Technology	14
University of the Philippines Los Baños	10
Central Mindanao University	9
University of the Philippines Baguio	7
University of Bayreuth (Germany)	6
Virgen Milagros University Foundation	5
University of the Philippines Manila	5
University of the Philippines Diliman	5
University of Joensuu (Finland)	4
Cagayan State University	4
De La Salle University	4
Isabela State University	4
St. Dominic College of Asia	4

Foreign institutions also contributed to the advancement of Philippine ethnobotany. A total of 26 foreign institution had published or co-published 39 articles. These institutions are from the countries of Japan (n=7), United States (n=6), Australia (n=2), China (n=2), Germany (n=2), South Korea (n=2), United Kingdom (n=2), Canada (n=1), Finland (n=1), and Sri Lanka

(n=1). Among them, the University of Bayreuth (Germany) sustained an active collaboration with the University of Santo Tomas since 2020. Other institutions that collaborated with Philippine or local institutions include Hiroshima University (Japan) in 2023, Bangor University (United Kingdom) in 2023, Seton Hall University (United States) in 2023, Chinese Academy of Sciences (China) and University of Chinese Academy of Sciences (China) in 2021, University of Sri Jayewardenepura (Sri Lanka) in 2016-2017, Curtin University (Australia) and Murdoch University (Australia) in 2014, National Museum of Ethnology (Japan) in 2012, Seoul National University (Korea) in 2009, and the University of Hohenheim (Germany) in 2009. These institutions coming from seven countries collaborated with scientists based in the Philippines (Figure 3). However, thirteen foreign institutions from three developed countries were found to have not created a collaborative linkage to any Philippine institution or Filipino researcher.

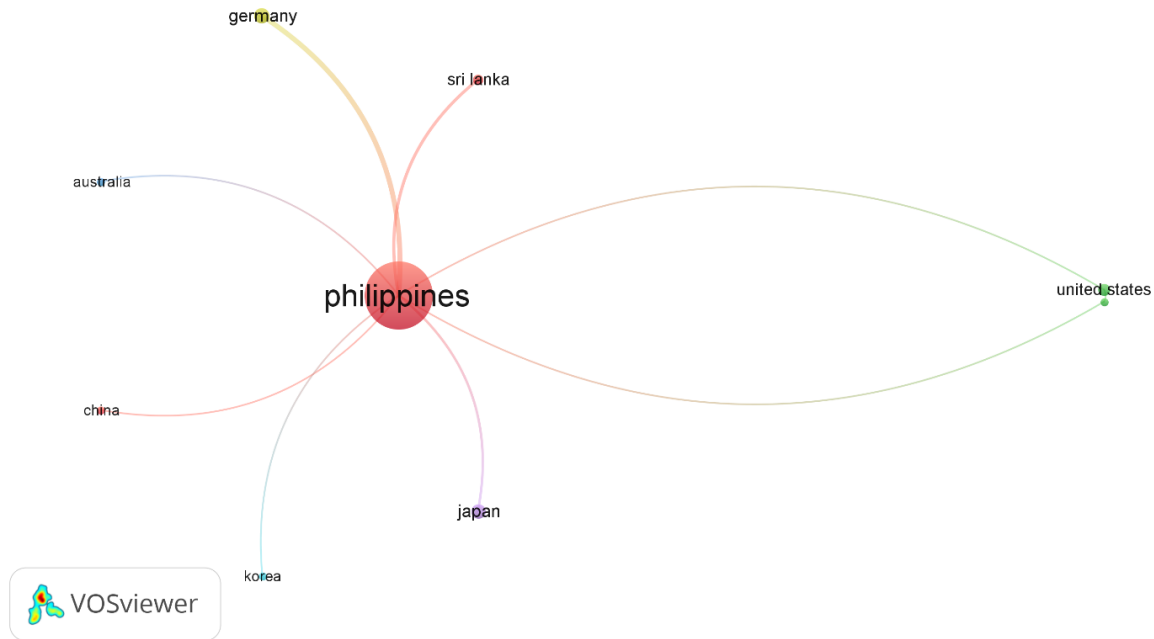


Figure 3. Country collaboration network based on co-authorships of published primary articles related to ethnobotany research in the Philippines.

Authors

Examined articles on Philippine ethnobotany were contributed by at least 370 authors and co-authors. Of these, only 25 authors (6.76%) were able to publish more than three articles on ethnobotany while the majority (315 authors, 85.13%) only published one article. The top authors based on the number of articles produced are listed in Table 3 where the most prolific was G.J. Alejandro with 18 examined articles, followed by M.L. Dapar and T. Balangcod with eight and seven examined articles, respectively. In terms of the number of citations, G.J. Alejandro similarly led the list with 343 citations followed by T. Balangcod with 215 citations. Table 3 shows the present affiliation of the top authors; hence it is noteworthy to mention that the authors M.L. Dapar and C. Cordero were previously affiliated with the University of Santo Tomas while G. de Guzman was multi-affiliated with the University of Santo Tomas and Virgen Milagros University Foundation.

Table 3. Top authors with highest number of published primary articles in the field of ethnobotany in the Philippines and their present or latest known affiliation. N = number of articles examined; C = total number of citations received (as of March 1, 2024).

Author	Affiliation	N	N
Grecebio Jonathan Alejandro	University of Santo Tomas	18	343
Mark Lloyd Dapar	Central Mindanao University	8	185
Teodora Balangcod	University of the Philippines Baguio	7	215
Gerard de Guzman	Adamson University	6	100
Cesar Demayo	Mindanao State University - Iligan Institute of Technology	6	177
Ulrich Meve	University of Bayreuth (Germany)	6	172
Celeste Lacuna-Richman	University of Joensuu (Finland)	5	188
Olga Nuneza	Mindanao State University - Iligan Institute of Technology	5	101

Teresa Haide Belgica	Sorsogon State University	4	37
Inocencio Buot	University of the Philippines Los Baños	4	49
Cecilia Cordero	University of the Philippines Visayas	4	41
Richard Dumilag	Sorsogon State University	4	31
Sigrid Liede-Schumann	University of Bayreuth (Germany)	4	159

Research Themes

A total of 410 keywords were retrieved from 151 articles. Apart from 'ethnobotany' (56 occurrence times), 'medicinal plants' (47 occurrence times), and 'Philippines' (35 occurrence times), the keywords 'ethnomedicine' (17 occurrence times), 'traditional medicine' (10 occurrence times), 'indigenous knowledge' (nine occurrence times), "ethnobotanical" (nine occurrence times), 'biodiversity' (eight occurrence times), 'conservation' (eight occurrence times), and 'traditional knowledge' (eight occurrence times) were preferably used and studied.

The changes in the foci of ethnobotany research in the Philippines is presented in Figure 4. Colors denoted by blue represent keywords used in articles that were published in the early years while those in yellow highlighted keywords used in articles that were published in the latest years. To determine the established and emerging research hotspots, the study period was divided into two phases: Phase I (2001-2011) and Phase II (2012-2022).

Based on the distribution of keywords, major emphasis in both phases were focused on terrestrial plants as exemplified by the keywords "non-wood forest products (NWFPs)", "pteridophytes", "Asteraceae", "Zingiberaceae", "Euphorbia hirta", and "herbs." Starting in the later years of Phase II, research focus further expanded towards "medicinal seaweed" and "edible seaweed" bringing "ethnophycology" into the spotlight. In terms of indigenous communities studied, there was a shift of focus from the different Indigenous Peoples (IPs) (i.e. "Kalanguya") in the province of "Ifugao" during Phase I to the understudied IPs in "Mindanao," particularly "Manobo" and "Higaonon" during Phase II.

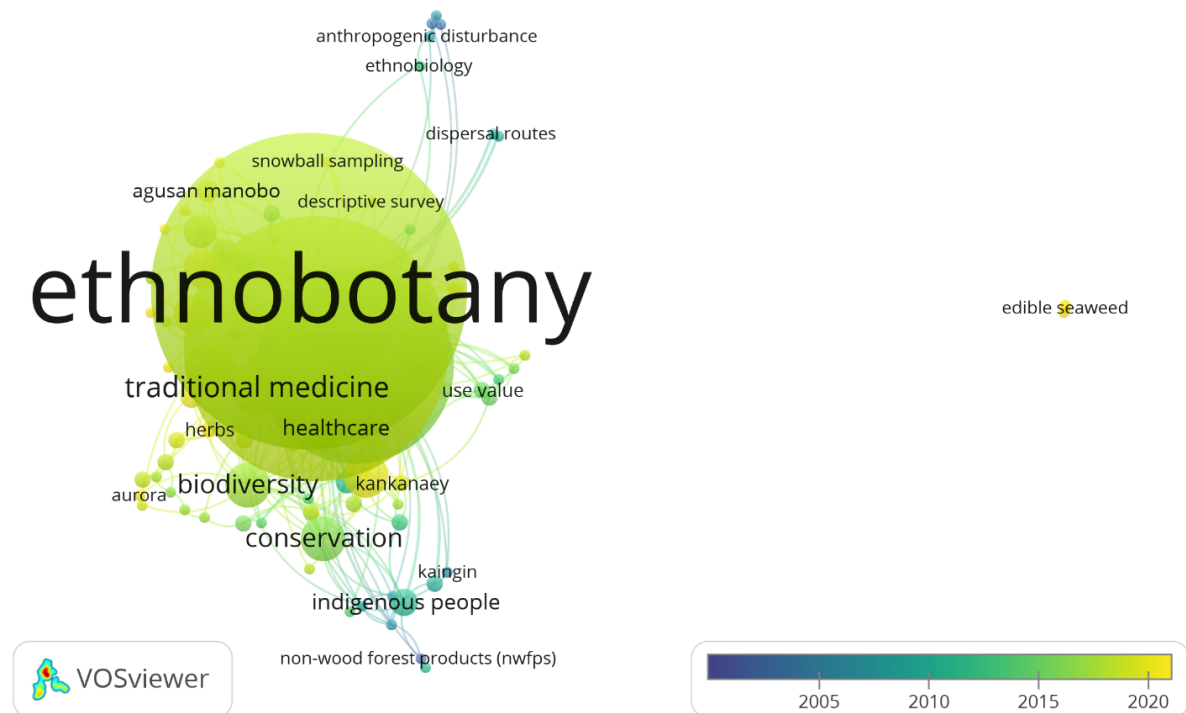


Figure 4. Overlay visualization of keywords in the primary articles related to ethnobotany research in the Philippines using VOSviewer.

Discussion

Analysis of the volume and trend of publication

We revealed that primary literature with regards to Philippine ethnobotany has been increasing similar to Brazil (Ritter et al. 2015), India (Pathak & Bharati 2020), and Ecuador (González-Rivadeneira et al. 2018). The dramatic increase of ethnobotany research in the Philippines can be attributed to the attention given towards drug discovery coming from indigenous plant sources (Belgica et al. 2021; Cordero et al. 2020; Dapar et al. 2020a) and the urgent documentation of vanishing indigenous knowledge (Dapar et al. 2020b; Villanueva 2016). The small number of publications in the earlier years can be due to research undertakings that were either in the form of theses, technical reports, or other write-ups that went unpublished (see unpublished works in Dapar & Alejandro 2020).

Analysis of published sources

No major journal was found to be hosting the bulk of Philippine ethnobotany articles where the top journal *Biodiversitas* only accounted for 4.91% of the total articles published. This is similar to Indian ethnobotany where the *Indian Journal of Traditional Knowledge* only accounted to 17.33% of the 2123 papers examined (Pathak & Bharati 2020). The *Journal of Ethnopharmacology* which is the most impactful journal in this present study also has the highest citation count in the bibliometric analyses conducted in Indian ethnobotany (Pathak & Bharati 2020), African medicinal plants (Okaiyeto & Oguntibeju 2021), and the field of ethnopharmacology (Yeung et al. 2018). Together with *Economic Botany*, these respected journals are known to publish high-quality papers on medicinal plants (Stepp 2018).

While public dissemination of findings in a journal is important, the accessibility of such may pose a challenge to a Filipino researcher having modest resources as some of the articles examined in this study are protected by paywalls. A movement to have equity in publishing ethnobiological literature have been recommended which includes publishing in open access (OA) journals with reduced article processing charges (APCs) or in OA journals with no associated costs (e.g., *Ethnobotany Research & Applications*, *Ethnobiology Letters*) (McAlvay et al. 2021).

Supporting open-access with APCs especially those published by scholarly societies (e.g., *Economic Botany*, *Journal of Ethnobiology*) can help support their goals such as providing travel grants and scholarships (McAlvay et al. 2021). However, some journals are known to exploit the OA publishing system and may try to mimic the publication titles of established ethnobiological journals which pay little to no interest to publication quality standards and peer-review (Stepp, 2018). While the use of Beall's List remains controversial, this tool revealed that few ethnobotanical articles in the Philippines are published in suspiciously illegitimate journals. Information drive on predatory journals and conferences such as those initiated by DOST (2016) remains crucial as Filipino researchers lacking awareness about predatory outlets can be easily targeted (Kurt 2018; Marina & Sterligov 2021).

Current and future researchers are advised to be vigilant and used available tools at its disposal (e.g., Committee on Publication Ethics (COPE), Directory of Open Access Journals (DOAJ), Scopus, WoS, Beall's List of Potential Predatory Journals, etc.) to help identify potential predatory journals which do not adhere to the best practices. Researchers doing Philippine ethnobotany should publish their priceless ethnobotanical findings to journals that gives utmost consideration to ethical publishing as this will help shape the direction of the scholarly publishing landscape (Lepofsky et al. 2021).

Analysis of institutions, authors and funding agencies

The scholarships, projects and programs provided by various funding agencies, mainly government greatly impact authors and the institutions where they are affiliated with. Under DOST, the research and development (R&D) arm of the Philippine government, two sectoral planning councils such as the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) and the Philippine Council for Health Research and Development (PCHRD) provided research grants to ethnobotanical research in hopes of opportunities for drug discovery (PCHRD 2019, PCIEERD 2013/2014). Back in 2012, the PCHRD also established the Tuklas Lunas Center (TLC) which have now been established in 29 research institutions throughout the Philippines. Seven of these institutions are listed in Table 2 where each TLC has a specific role related to the exploration of endemic natural resources, such as plants for drug discovery (Dapar & Alejandro 2020).

The current study showed that majority of the productive authors belong to the top institutions that are mainly located in the island of Luzon where Manila, the capital city of the Philippines is situated. For decades, research funding in the Philippines had been skewed towards research institutions situated in this area. To give emphasis, 93% of the 2014 DOST R&D budget were mainly appropriated to institutions found in Metro Manila and its neighboring regions while only 7% were allocated to the rest of the 14 regions of the Philippines (de la Peña 2020).

Further, most of these top institutions acknowledged DOST, DOH, and CHED in their declarations while those institutions that produced less articles often showed no funding statement implying that no financial support was obtained. Similarly, findings of Lepofsky et al. (2021) revealed that ~37% of the *Journal of Ethnobiology* articles do not mention a funding agency when publishing. This indicates that other than unequitable distribution of research funds in the Philippines, research on ethnobiology is generally less well-funded when compared to other scientific disciplines (Anderson, 2011). While the unwavering support of funding agencies and continuous ethnobotanical interest of researchers are important for the development of the field. The decentralization of the R&D budget can favorably support researchers and institutions in other areas aiding in the equitable generation of increased research outputs.

Lastly, we want to bring into the light the practice of parachute science or the practice of researchers from the developed world to conduct research activities, typically field work and sample collection in the developing world without effective engagement and collaboration with local scientists (Harris 2004; Stefanoudis et al. 2020). It is recognized that much of the earlier works on Philippine ethnobotany in the 20th century were conducted by Spanish and American botanists (Madulid 1992 as cited in Chiong-Javier 1996). Despite no longer being colonized, the practice of parachute science continued in the early 2000s. This is similar to Brazil wherein Ritter et al. (2015) revealed that much of the earlier ethnobotanical works in Amazon were made by foreign ethnobotanists.

Despite the absence of an existing legal framework on parachute science in the Philippines, such practice should not be tolerated. The current study revealed that there is still a presence of foreign researchers practicing parachute science in the 21st century but not as rampant as those seen in the discipline of Philippine marine science (Stefanoudis et al. 2020). McAlvay et al. (2021) brought a series of discussion on how to decolonize the practice such as inclusive co-authorship with community members and other affiliates that helped in the contribution of ethnobotanical knowledge. In particular, the *Journal of Ethnobiology* strongly advocates for the inclusion of IPs as co-authors in the publication process (Lepofsky et al. 2021).

Analysis of research themes

The general pattern reveals that researchers working in Philippine ethnobotany mainly focused on the documentation of medicinal plants, coinciding similar trend reported in the quantitative study of ethnobiology literature in Ecuador (González-Rivadeneira et al. 2018). The shift in the dominance of Manobo in Mindanao as the most studied IPs during Phase II reflects the growing interest of researchers towards understudied IPs, where majority of previously conducted ethnobotanical work focused on the IPs situated in Luzon (Dapar & Alejandro 2020). While most studies concentrated on terrestrial plants, ethnobotanical works on seaweed in the archipelagic country have been scarce primarily brought by limited funding (Dumilag & Javier 2022). It is suggested that more studies should be conducted towards seaweeds to significantly advance the field of ethnophycology. One area can be in the context of food security, where the documentation of the traditional knowledge possessed by Filipino farmers in eucheumatoid seaweed cultivation are warranted (Dumilag et al. 2023).

Future ethnobotanical studies investigating the existing knowledge gaps would require implementation of standardized data collection protocols, compliance with ethical clearance procedures, and acquisition of wildlife permits (Dapar & Alejandro 2020). Crucial yet often overlooked by many Filipino researchers is the correct identification of studied plant species as verified by taxonomic authorities (Magtalas et al. 2023a, 2023b, 2023c). Correct botanical information, which includes the scientific name of the plant, who identified the plant samples, and deposition of voucher specimens in an accessible herbarium should be taken into account (Culley 2013; Dapar & Alejandro 2020) as this has been the requirement of reputable ethnobotanical journals such as the *Journal of Ethnopharmacology*, *Economic Botany*, and *Ethnobotany Research and Applications*, to name a few, prior to publication.

Conclusion

This study demonstrated that using Google Scholar in a bibliometric analysis can be an effective tool when literature for an investigated topic is limited. Here we reveal that the scholarly publishing landscape of ethnobotanical research in the Philippines is growing due to an inclination of research focus towards finding new drugs and documenting vanishing indigenous knowledge. A total of 163 articles were examined and found to have been published in 106 journals where currently 36 are indexed in Scopus and 20 in the core indices of the WoS. Biodiversitas was shown to have the highest number of articles published while the *Journal of Ethnopharmacology* was the most cited. Using the controversial Beall's list, few ethnobotanical articles are published in potential predatory journals. Contributors included 370 authors and co-authors affiliated to more than 100 local and foreign institutions. The University of Santo Tomas was the most productive institution followed majorly by institutions that are found in Luzon. Research funding in the Philippines had been concentrated towards institutions situated in this area. A need to decentralize the research budget may be proposed to help institutions in other

areas cope up with their R&D agenda and can aid in the equitable generation of increased research outputs. Foreign institutions are also participating in the advancement of Philippine ethnobotany where parachute science was prevalent in the early 2000s and still present in the 2010s. Based on keyword analysis, medicinal importance of terrestrial plants was the most investigated research theme during the entire study period while ethnophycology and IPs in Mindanao, particularly Manobo and Higaonon Tribes emerged during the later years. Moving forward, we call for the participation of current and future researchers in the field of Philippine ethnobotany and all fields to raise the bar of scholarly publishing high. Carrying the best practices should be adopted across all publishing landscape.

Declarations

List of abbreviations: WoS - Web of Science; SCIE - Science Citation Index Expanded; SSCI - Social Science Citation Index; AHCI - Arts & Humanities Citation Index; DOST - Department of Science and Technology; CHED - Commission on Higher Education; DOH - Department of Health; JSPS - Japan Society for the Promotion of Science; NSF - National Science Foundation; COPE - Committee on Publication Ethics; DOAJ - Directory of Open Access Journals; R&D - Research and Development; IPs - Indigenous Peoples; PCIEERD - Philippine Council for Industry, Energy and Emerging Technology Research and Development, PCHRD - Philippine Council for Health Research and Development; TLC - Tuklas Lunas Center.

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