Quantification in ethnobotanical research[1]: an overview of indices used from 1995 to 2009

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Abstract – Over the last few decades, local knowledge has begun to be studied by ethnobotanists using quantitative analyses to assess the relationship between biological and cultural diversity, and the relative importance of natural resources for the local population. A considerable number of published articles have proposed these quantitative analyses, necessitating discussion and analysis of the commonly employed quantitative techniques. This study examines two central issues: the nature of quantitative research in ethnobotany and the use of quantitative indices in ethnobotanical research. A literature review was completed consisting of books, reviews, articles and editorials in the main international periodicals in the areas of ethnobiology and ethnoecology. Scientific search sites were consulted, and a database was compiled and analyzed. The analysis of 64 papers and four books constituted the basis for this work. The United States produce the greatest number of publications in journals in this field (65%). A total of 87 different quantitative techniques was recorded. This work does not claim to provide a census of all the publications on the subject, but rather intends to present a panorama on the current state of quantification in ethnobotany.
Additional key words: literature research, ethnobiology, quantitative scientific production.

Resumo (Quantificação na pesquisa etnobotânica: um panorama sobre os índices usados de 1995 a 2009) **–** A forma pela qual o conhecimento local passou a ser pesquisado pelos etnobotânicos incorporou, nas últimas décadas, instrumentos de análise quantitativa usados para estimar a relação entre diversidade biológica e cultural, bem como a importância de recursos naturais para as populações locais. Desde então, um considerável número de artigos publicados propõem análises quantitativas. Em decorrência desta adesão por parte dos pesquisadores, se faz necessário uma discussão e análise das técnicas usualmente empregadas. Em vista disto, este estudo tem como base o desenvolvimento de duas ideias centrais: a natureza das pesquisas quantitativas em Etnobotânica e o emprego de índices quantitativos nas pesquisas Etnobotânicas. Com este propósito de descortinar o cenário da quantificação na Etnobotânica, através da análise dos índices quantitativos amplamente difundidos nestas produções, realizou-se uma revisão da literatura para se detectar pesquisas em Etnobotânica que tenham aplicado índices quantitativos. Assim, neste trabalho, são discutidos os tipos de informações que podem ser obtidas por meio da análise de um acervo constituído por livros, revisões, artigos e editoriais de algumas das principais revistas científicas na área de Etnobiologia e Etnoecologia. O material bibliográfico foi localizado por meio de consultas a sites de busca científica. As informações integraram um banco de dados e foram analisadas com base em 64 artigos e quatro livros. Os Estados Unidos concentraram 65% das publicações em periódicos. Ao todo, 87 técnicas quantitativas diferentes foram identificadas. Este trabalho tem como intuito final abrir espaço para uma reflexão acerca do que vem sendo realizado em termos de quantificação na etnobotânica.
Palavras-chave adicionais: Etnobiologia, pesquisa documental, produção científica quantitativa.

Since its introduction by Harshberger in 1896, ethnobotany has undergone modifications in its definition, objectives and methods, due to its multifaceted nature. It encompasses areas of scientific knowledge as diverse as botany, anthropology and ecology, to name a few (Albuquerque & Hurrell 2010). Each of these disciplines uses different paradigms and techniques, resulting in different possibilities for study. Hence, ethnobotanical investigation presents significant challenges. The ethnobotanist must frequently manage multiple concepts and techniques from the natural and social sciences (Albuquerque & Hanazaki 2009). The different approaches of each of these areas result in ethnobotany's different methods for addressing the interrelation between the people in a culture and the plants in its environment.

Over the years, debates about the methods and purpose of ethnobotany have increased in scientific research, specialized publications, associations and scientific events related to aspects of local knowledge. These scientific debates in ethnobotany have naturally modified the perspective of work in this field. From the end of the nineteenth century through the middle of the twentieth century, ethnobotanists were concerned with recording uses and common names in a locality and emphasized a

[1] *Quantification in Ethnobotany* encompasses aspects related to the analysis of people's knowledge of the uses of plant species. It includes the use of indices or quantitative techniques and/or the application of statistical analyses. It should be noted that quantification in ethnobotany is not necessarily associated with the hypothetical-deductive method.

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utilitarian approach. From the 1950s through the 1980s, the cognitive and classificatory approach was concerned with how the people of a certain region classify and order the plants of their environment. Finally, after the 1980s, the focus of ethnobotanical research turned to its socio-ecological aspects, which incorporated ecological tools, techniques and statistical measurements (Clemént 1998; Oliveira et al. 2010).

Methodological tools have been developed to respond to questions about the interrelation between people and plants, both qualitatively and quantitatively. The criteria for quantitative inferences by ethnobotanists are varied and are presented in a considerable number of published documents (for example, Friedman et al. 1986; Troter & Logan 1986; Phillips & Gentry 1993a,b; Bennett & Prance 2000; Byg & Balslev 2001; Gomez-Beloz 2002; Castañeda & Stepp 2007). Phillips (1996) studied 41 documents published between 1966 and 1994. This review examined the techniques used in ethnobotanical research to address the various uses and importance of plant species for communities. Phillips (1996) verified that the quantitative approach benefits the academic study of ethnobotany. Moreover, this approach gives the science of ethnobotany a greater impact on conservation by providing insights about the importance of different vegetation types for people and the effect of anthropogenic pressure on these environments.

A study of this nature was also carried out by Hoffman & Gallaher (2007), using the term Relative Cultural Importance (RCI) to refer to some of the data analysis techniques used by Phillips (1996) and others. Silva et al. (2008) opened a discussion about the appropriate selection of quantitative techniques by ethnobotanists, highlighting the need for studies that evaluate the quality of the widely used quantitative techniques in current work.

The incorporation of different methodologies and approaches by ethnobotanical researchers highlights the need for systematization and consolidation of current studies and practices. Until recently, data analysis from a quantitative perspective gave ethnobotany a subjective and descriptive character in inventories of useful plants, but this analysis has gradually assumed a less subjective and more experimental character. Quantification gave researchers the ability to assess people's knowledge of plant resources and incorporate the perspective of a large number of informants, as noted by Fraser & Junqueira (2010).

First cited by Balée (1987), the term "quantitative ethnobotany" has appeared in various studies as a way to confer greater robustness on the analyzed data (Albuquerque 2009). However, for quantification to be effective, it is necessary to trace the objectives of the work and to define adequate methods for the questions; otherwise, an unreliable interpretation of the data could be generated. Albuquerque (2009) analyzed the evolution of the use of the term "quantitative ethnobotany" and found that this approach generally contributed to methodological advances in ethnobotany. However, the term has become synonymous with ethnobotanical quantification that is not necessarily associated with the hypothetical-deductive method of testing hypotheses, as in the original conception of Phillips & Gentry (1993a,b).

The study of how local knowledge has been measured is important to take conscientiousness about the ethnobotanical research that applies quantitative indices. This study analyzed documents from ethnobotany that used quantification in an attempt to show the scope of this approach, pointing the used quantitative techniques that were not always analyzed by previous reviews. To achieve this, the study examines two central issues: the nature of quantitative research in ethnobotany and the use of quantitative indices in ethnobotanical research. The questions used as criteria for analysis for the selected documents included the following: 1- What periodicals publish this type of approach? 2- Are there scientific societies that publish quantitative work in ethnobotany? 3- Which countries are involved in these types of studies? 4- Which institutions work in this area? 5- Is there an objective standard for the research carried out by various authors? 6- Are the indices applied by the authors adapted from previous studies or were they developed for the current study? 7- What categories of use receive the greatest attention from these authors?

This research is designed to examine quantification scenarios in ethnobotany through an analysis of widely used quantitative indices in these studies. The literature review focused on ethnobotanical research that applies quantitative methods. Although this work aims to provide a good example of the indices used to measure local knowledge, it has not the intention to evaluate all the existent literature that has been done about the subject. The documents were retrieved from the following scientific search sites: Scopus (http://www.scopus.com), Web of Science (http://www.isiknowledge.com/webofscience), BIOSIS Previews (http://thomsonreuters.com), Medline (http://www.ncbi.nlm.nih.gov/pubmed/), BioOne (http://www.bioone.org), SpringerLink (http://www.springerlink.com) and Wiley Interscience (http://www.interscience.wiley.com). Article selection was completed by using the keywords "quantitative ethnobotany" and "quantification in ethnobotany." The article selection also used the keyword "ethnobotany" with the connector AND for the following phrases: quantitative methods, quantitative methodology, quantitative techniques, quantitative approach and quantitative analysis. The criteria adopted for the selection of the documents omitted works that were not indexed. Even though the articles selection might be biased (for example, the English as the major language of the publications), this review primordially points the utilization of quantitative indices for analyzing ethnobotanical knowledge. In total, 64 articles and reviews and four books published between 1995 and 2009 were considered.

The Nature of Quantitative Research in Ethnobotany

The analysis of articles and books constituted the basis for this work. The consulted books address different ethnobotanical subjects using the quantitative method. In Martin (1995), Cotton (1996), Alexiades (1996) and Albuquerque et al. (2008), the quantitative techniques are presented in chapters that discuss the indices used to assess knowledge about the use of plant resources. These techniques are also discussed in chapters related to quantitative analyses from cognitive or ecological perspectives that combine ethnobotany with analytical tools derived from anthropology (such as *preference ranking* or *pile sorting*) or other ecological techniques, such as diversity measurements and wealth estimators.

The United States and the United Kingdom (the American and European continents) produce the greatest number of publications in periodicals in this field (65% and 15% for the countries mentioned above and 72% and 25% for the continents). The following periodicals predominate as means of propagating information in this area: *Journal of Ethnopharmacology* (34%), *Economic Botany* (15%), *Journal of Ethnobiology and Ethnomedicine* (11%), *Biodiversity and Conservation* (7%) and *Acta Botanica Brasilica* (7%) (Table 1). These statistics do not imply that there is a greater advantage in publishing in these periodicals, but rather reflects a general tendency of researchers to concentrate their publications on these particular periodicals. A firmly established publication, the *Journal of Ethnopharmacology*, first appeared through the International Society for Ethnopharmacology in 1979 in the United Kingdom. The fact that this journal publishes the largest number of ethnobotanical papers is an interesting data, since it has its focus on evaluation of traditional drugs via bio-pharmacological essays and not principally on ehtnobotanical surveys. *Economic Botany* was published through the Society for Economic Botany in 1947 in the United States. *Biodiversity and Conservation* was first published in 1992 in Holland, and *Acta Botanica Brasilica* was first published through the Brazilian Botanical Society (BBS) in 1987. Among the recently established publications is the *Journal of Ethnobiology and Ethnomedicine*, which first appeared in 2005 in the United Kingdom and is among the journals that publish a large numbers of articles on this subject.

The analyzed publications in periodicals date from 1995 to 2009. The oldest publication examined was from Leaman et al. (1995), which searched for remedies that were efficient for fighting malaria, according to local consensus. Within the publication period considered in this study, the periodicals *Journal of Ethnopharmacology* and *Economic Botany* were emphasized, with publications from eight years and six years, respectively. Throughout the entire period (1995-2009), the largest number of publications appeared from 2006 to 2009, when the integration of qualitative and quantitative methods became more apparent in ethnobotanical studies. This predominance of recent studies is due to our methodological cut-off, wich favored most recent publications. During this time, two reviews (Hoffman & Gallaher 2007; Reyes-García et al. 2007; Heinrich et al. 2009) and one editorial (Albuquerque 2009), as it was

Table 1. Some periodicals that published studies applying quantitative techniques in ethnobotany (1995–2009). w/inf. = without information.

Journal	Abreviation	Published by	Year of Initial Publication	Country	Region	Number of papers
Journal of Ethnopharmacology	-	International Society for Ethnopharmacology	1979	United States	America	21
Economic Botany	-	Society for Economic Botany	1947	United States	America	9
Journal of Ethnobiology and Ethnomedicine	-	-	2005	United Kingdom	Europe	7
Biodiversity and Conservation	-	-	1992	Holland	Europe	4
Acta Botanica Brasilica	Acta Bot. Bras.	Sociedade Botânica do Brasil (SBB, Botanical Society of Brazil)	1987	Brazil	America	4
Ethnobotany Research & Applications	ERA	-	2003	United States	America	3
Environmental Monitoring and Assessment	Environ. Monit. Assess.	-	1981	United States	America	2
Human Ecology	Hum. Ecol.	-	1972	United States	America	1
Field Methods	-	-	1989	United States	America	1
Journal of Ethnobiology	-	Society of Ethnobiology	1981	United States	America	1
Perspectives in Plant Ecology, Evolution and Systematics	-	-	1998	Swiss	Europe	1
Phytotherapy Research	Phytother. Res.	-	1987	United Kingdom	Europe	1
Social Science & Medicine	Soc. Sci. Med.	-	1967	United Kingdom	Europe	1
African Journal of Ecology	Afr. J. Ecol.	East African Wildlife Society	1963	Kenya	Africa	1
African Study Monographs	-	-	2002	Nigeria	Africa	1
Environment, Development and Sustainability	Environ. Dev. Sustain.	-	1999	w/inf.	w/inf.	1
Forest Ecology and Management	-	-	1976	w/inf.	w/inf.	1
Journal of Environmental Management	-	-	1976	w/inf.	w/inf.	1

already mentioned, were published on quantification in ethnobotanical research, each one with different goals and adopting different boundaries for the search and the analysis of the reviewed papers.

The languages used in these publications were English (97% of publications) and Portuguese (3%). No publications were encountered in any other languages. English has become the universal language of science, replacing French and Latin. This leads authors to choose to publish their data in English, regardless of the language of the country of publication. The periodical publications were written by 51 authors from 28 institutions, headquartered in 15 countries on four continents (Europe, America, Africa and Asia). The countries with the greatest number of institutions in this knowledge area were the United States (4), Spain (4), Brazil (3, with one author who did not specify his institution) and Canada (3). Individual institutions from Brazil, Spain and Canada produced, on average, greater numbers of publications. Researchers from Canadian, North American and European institutions frequently established their research outside the country of their home institution. This practice occurred in 32% of the publications; for example, researchers from the University of Ottawa developed their research in Belize, Borneo and East Timor.

Based on this information, it appears that ethnobotanical studies on the application of quantitative data analysis techniques were predominantly completed in developing countries. However, the researchers dedicated to this approach are mainly from institutions foreign to the countries where the work is developed, and they tend to publish their results in journals of developed countries. Reyes-García et al. (2006) corroborated the scarcity of quantitative ethnobotanical studies in developed countries, especially on the European continent.

The Role of Quantitative Indices in Ethnobotanical Research

The overview presented here highlights quantification in ethnobotany pointing the variety of indices used from 1995 to 2009 in an attempt to show how the ethnobotanical knowledge has been analysed through this methodological approach. According to Martin (1995), one of the most important efforts in ethnobotany would be the quantitative evaluation of the use and handling of botanical resources. However, the objectives of the ethnobotanical researcher are very different when using quantitative indices. In this context, the documents show different Relative Cultural Importance (RCI) techniques (for example, Hoffman & Gallaher 2007) that assess the relative importance of plants in a culture. These studies analyzed the standard use and selection of medicinal species, the influence of socio-economic variables in the use of plant species, evaluation of the conservation status and use of the vegetation types and the discussion and application of quantitative tools (Lykke 2000; Camejo-Rodrigues et al. 2003; Albuquerque et al. 2006; Andrade-Cetto et al. 2006; Estomba et al. 2006; Reyes-García et al. 2006; Albuquerque & Oliveira 2007; Caluwé et al. 2009; Pei et al. 2009).

A total of 87 different quantitative techniques was recorded examining the importance of each use of plant species according to three principal categories: the **informant consensus**, the **subjective allocation** (by means of which the researcher designates the importance of each species) and the **uses totaled** in the categories, taxons or vegetation types (Figure 1; Appendix). The quantitative techniques [or, as Hoffman & Gallaher (2007) named them, the Relative Cultural Importance (RCI) indices] purport to "estimate the relative importance of a plant for a determined culture" (Silva et al. 2008). Emphasizing the medicinal use category, the objectives outlined by quantitative ethnobotanical studies assess the importance that a plant species has for human society. To this end, Amorozo (1996: 63) argues:

> If a plant is universally utilized in a community for similar purposes, it is most probable that it contains some active composition that justifies this use. This would then be a type of ethnobotanical *screening*, which would function as the basis for plant selection, for the next steps of pharmacological and phytochemical investigation, besides being useful in the establishment of conservation priorities.

Although we might say that some plants used as medicine might not have an active compound and its effect can be caused by placebo effect, or "meaning effect", Amiguet et al. (2005) also believe that the consensus between the informants, who reveal the "relative importance of each use through the direct calculation of the degree of consensus between the informers' answers" (Phillips 1996: 173), can indicate the effectiveness of a plant for a medicinal application. The indication signals the importance of studying the plant in biomedical studies to validate its local use. Included in this category of consensus among informants are some of the applied techniques that are most used in ethnobotanical studies, such as the *Ethnobotanicity Index*, published by Portères (1970) and used by Camejo-Rodrigues et al. (2003), Akerreta et al. (2007), Rigat et al. (2007), Parada et al. (2009) and Agelet & Vallès (2001) (Appendix). The *Use Value Index (UVs)* is another technique for assessing human use and knowledge of plant species. Originally published by Phillips & Gentry (1993a,b), the Use Value Index has been used by authors such as Torre-Cuadros & Islebe (2003), Albuquerque et al. (2005), Molares & Ladio (2009) and Thomas et al. (2009a) (Appendix). Despite having a wide application, the Use Value Index assesses people's knowledge about the uses of plants

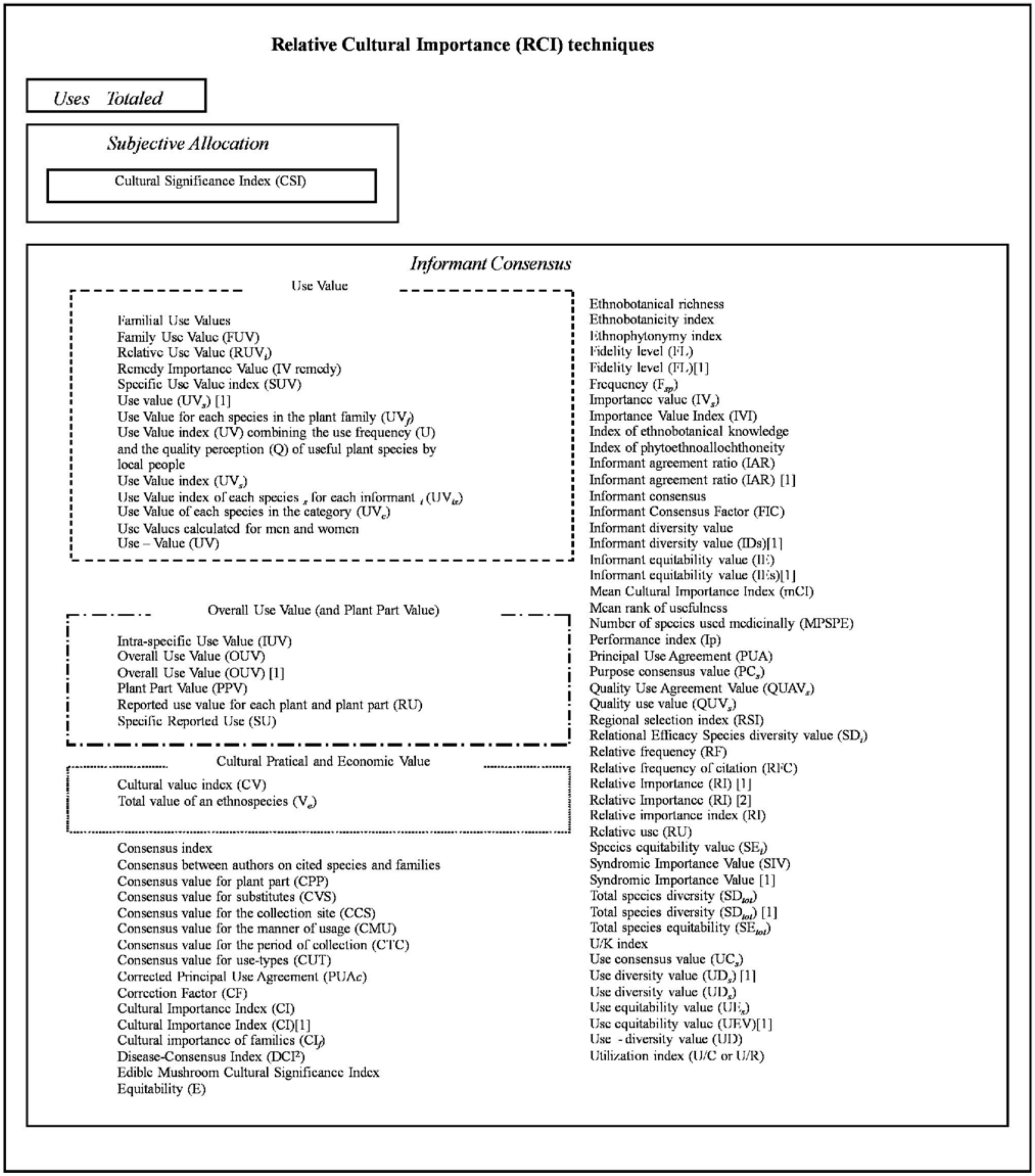

Figure 1. Relative Cultural Importance (RCI) techniques used in ethnobotanical publications in the period from 1995 to 2009, according to three principal categories (Uses Totaled, Subjective Allocation and Informant Consensus).

and not necessarily the actual uses of these resources. For this reason, the data generated through this technique must be analyzed with caution.

In the subjective allocation category, "the relative importance of each use is subjectively designated by the researcher" (Phillips 1996, p. 173). Consequently, by virtue of the pre-established values, the use value techniques, total plant value (Prance et al. 1987) and Cultural Significance Index (CSI) are subjective (Turner 1988; Stoffle et al. 1990; Silva et al. 2006).

Quantifying the relative importance of each use is accomplished through the "simple summation of the numbers of the uses (or activities) per use category, taxon or type of vegetation" (Phillips 1996, p. 174). The acquired values are objective, as can be seen in Balée (1986), Balée & Gély (1989) and Prance et al. (1997). Phillips (1996) stresses that this method is a useful tool for a first analysis of the data because it takes into account the relative importance of the species and their general uses, and the results can be influenced by the data collection. Thus, it can obtain results about the use of plant species that do not reflect reality, drawing upon an incomplete inventory of the significant cultural uses.

Authors use the quantitative indices to approximate their analyses of the reality of the knowledge and/or uses of the plant diversity. In thirty-three (56%) of the analyzed works, the authors opted to use only one method to analyze the collected data. Other studies applied more than one quantitative method: nine studies (15%) used two indices; five studies each used three and four indices (9%); four studies (7%) used five indices; one study (2%) used ten indices; and one publication (2%) by Byg & Balslev (2001) used thirteen indices. The most commonly used indices in the works examined were the Informant Consensus Factor (ICF, 9% of the studies), also used frequently in ethnozoological studies (Alves et al. 2009a,b; Ferreira et al., 2009), the Use Value (UV, 5%) and the Ethnobotanicity index (4%) (Appendix). In addition to the increasing popularity of these methods, this also evidences a trend in similar objectives among the studies.

The majority of the studies (55%) applied quantitative indices exclusively to analyze plant use in the medicinal category. Another 32% presented data related to the different use categories, 6% examined the food-related uses, 3% considered lumber uses, and two others used these indices to analyze data on aromatic and magical plants (2% each). As observed in Medeiros et al.'s (2008) study on the application of visual stimuli in ethnobotanical research, this concentration of studies directed toward the medicinal use of plant species reveals the researchers' preference for this subject. Thus, Oliveira et al. (2009) also showed that, in Brazil, more than 60% of the ethnobotanical research is directed towards medicinal plants.

Among the analyzed works, some authors proposed unique ethnobotanical indices. However, as Monteiro (2009) stated, it should be carefully considered whether the proposed recent ethnobotanical indices are really new ways to analyze the local knowledge of plant species or if these proposals are already included in previously distributed and used indices. The analyzed studies, which include new proposals, confirm similarities in the variables between these new indices as well as similarities with the existing indices.

There were 42 new indices proposed for the first time in the consulted publications by authors such as Byg & Balslev (2001) who presented 11 indices, Monteiro et al. (2006) who proposed 6 indices, and Gomez-Beloz (2002), with 5 proposed indices (Appendix). Among the new indices that have similar variables are, for example, the *Ethnophytonymy Index* by Bonet et al. (1999), which is a calculation related to cultural erosion, and the *Regional Selection Index (RSI)* by Pardo-de-Santayana et al. (2007) that refers to the process of nourishing species selection between distinct regions. These indices are similar in that both use as variables a division of the number of species with popular names or species consumed in a locale by the number of flora species from the region in question. Among the new indices proposed by the authors were some proposals that were already included in other indices. This was the case with the Betti (2002) proposal of the *Performance Index (Ip)*. This index, similar to the Relative Importance technique, quantifies the importance of a medicinal plant by its number of indications (cf. Bennett & Prance 2000).

It was also noted that, in the publications, 14 indices were adaptations of already existing ones, such as the Byg & Balslev (2001) adaptation of the *Use Value index (UVs)*, originally proposed by Phillips & Gentry (1993a), and the Silva et al. (2006) adaptation of the *Index of Cultural Significance (ICS)* from Turner (1988) (Appendix). Eight quantitative indices can be observed in the consulted publications that provide adaptations by authors of other works than the original indices as, for example, the adaptations by Rossato et al. (1999) of the *Use Value index (UVs)* (Appendix). The needs of the authors are different when proposing these adaptations. *The Index of Cultural Significance (ICS)* of a plant, developed by Turner (1988), is one such example. It was initially estimated through a subjective significance scale determined by the researcher and not by the informants. The ICS underwent slight alterations in the proposal presented by Stoffle et al. (1990). However, it was in 2006 that Silva and collaborators suggested a more striking modification of the ICS to make the assessment of the importance of a species less subjective. These adaptations show the authors' need to adjust existing indices to their accumulated data to obtain more reliable results for their studies.

Final Reflections

The literature survey and evaluation of the quantitative techniques presented here expand the space of discussion on this important theme for the ethnobotany field. Working with quantitative indices was a way of conceptual remodeling and redirecting the research focus within ethnobotany in an attempt to diminish researcher subjectivity. Research that applies quantitative indices is becoming increasingly abundant, requiring dialogue with other scientific disciplines, as might be expected from the interdisciplinary nature of ethnobotany.

Relating local knowledge to the use of medicinal plants is the most prominent objective of investigators using quantitative indices in their studies. Thus, a concentration of studies related to the medicinal category can be observed. There is a consensus among different authors in the application of the indices in similar ways, particularly in terms of the search for plants with medicinal qualities determined by the local human population. It is interesting that the International Society for Ethnopharmacology publishes the *Journal of Ethnopharmacology*, which was the principal publication for disseminating quantitative research in ethnobotany that focused on the study of medicinal plants. Moreover, the United Kingdom, where this scientific society is headquartered, is one of the leaders in the development of pharmacologicals.

In general, the use of quantitative indices has found increasing popularity among ethnobotanists. However, for Silva et al. (2008) and Heinrich et al. (2009), its application was not always accompanied by reflection on the topic of each new index. Kvist et al. (2001) noted that any quantitative or qualitative method represents a combination of advantages and disadvantages. Therefore, the objectives of the work must be clearly defined so that the appropriate methods can be employed. It is of the utmost importance to consider the theoretical and practical dimensions of traditional knowledge and its conditions, so that the choice of quantitative method can effectively address the issues at stake. Therefore, quantitative techniques must be adopted in order to test the efficiency of these methods in addressing the questions raised by the authors. Finally, it is suggested that in the future, studies that share the same objective can provide a comparative analysis, thereby standardizing quantitative techniques in ethnobotany.

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Appendix. Description of the quantitative techniques used in ethnobotanical publications in the period from 1995 to 2009, ordered according to the total number of studies that used the techniques.

Legend: * = Already existing quantitative techniques used in ethnobotanical publications (2000–2009). ** = Quantitative techniques that adapt the existing indices in ethnobotanical publications (2001–2009), with formulas and descriptions completely extracted from the consulted works. *** = Quantitative techniques used in ethnobotanical publications (1999–2009), with adaptations of the original indices in other works. **** = Quantitative techniques proposed for the first time in the ethnobotanical publications consulted by the present work (1995–2009), with their respective formulas and descriptions completely extracted from the consulted works.

Indices / Original reference	Calculation	Description	References
*****Informant Consensus Factor (FIC)** / Originally developed by Trotter & Logan (1986) and readapted by Heinrich et al. (1998)	$F_{ic} = n_{ur} – n_t/n_{ur} - 1$ (where: n_{ur} = number of use-reports in each category; n_t = number of taxa used) Provides a range of 0 to 1, where a high value acts as a good indicator for a high rate of informant consensus.	This indicates how homogenous the ethnobotanical information is.	Heinrich (2000) Camejo-Rodrigues et al. (2003) Amiguet et al. (2005) Akerreta et al. (2007) Bourbonnais-Spear et al. (2005) Rigat et al. (2007) Ragupathy et al. (2008) Molares & Ladio (2009) Andrade-Cetto (2009) Parada et al. (2009) Ragupathy & Newmaster (2009) Teklehaymanot (2009)
*****Use-Value (UV)** / Rossato et al. (1999), modified from Phillips and Gentry (1993a,b)	$UV = \Sigma U/n$ (where: U = sum of uses mentioned by the informant; n = total number of informants)	Indicate the species that are considered most important by a given population.	Stagegaard et al. (2002) Ferraz et al. (2005) Cunha & Albuquerque (2006) Albuquerque et al. (2006) Albuquerque & Oliveira (2007) Lucena et al. (2007a,b) Thomas et al. (2009b)
***Ethnobotanicity index** / Portères (1970)	Ratio between reported useful plants and the flora of an area, expressed as a percentage	-	Camejo-Rodrigues et al. (2003) Parada et al. (2009) Akerreta et al. (2007) Rigat et al. (2007) Agelet & Vallès (2001)
***Fidelity level (FL)** / Friedman et al. (1986)	$FL(\%) = N_p/N \times 100$ (where: N_p = number of informants that claim a use of a plant species to treat a particular disease; N = number of informants that use the plants as a medicine to treat any given disease)	Used to quantify the percentage of informants claiming the use of a certain plant for the same major purpose.	Caluwé et al. (2009) Estomba et al. (2006) Andrade-Cetto (2009) Teklehaymanot (2009)
*****Utilization index (U/C or U/R)** / Proposed by Muntané, (1991) and modified by Parada (1997)	Obtained by dividing the number of plants used by the number of plants reported, expressed as a percentage	Provides only but still an idea of the degree of decline of popular plant use.	Bonet et al. (1999) Agelet & Vallès (2001) Rigat et al. (2007) Parada et al. (2009)
***Use Value index (UVs)** / Phillips & Gentry (1993a,b)	$UV_s = \sum_i UV_{is} / n_s$ (where: UV_{is} = number of uses registered by an informant $_i$ for the species $_s$, n_s = number of informants who mention the species $_s$).	Quantify the importance of each species for each informant.	Thomas et al. (2009a) Torre-Cuadros & Islebe (2003) Molares & Ladio (2009) Albuquerque et al. (2005)
***Informant agreement ratio (IAR)** [1] / Trotter & Logan (1986)	$IAR = n_{ur} – n_t/n_{ur} - 1$ (where: n_{ur} = number of mentions in each usage category; n_t = number of taxa used in each usage category) Values for the factor range from 0 to 1. A value of 1 indicates few taxa are used by informants, thus inferring a high degree of consensus and a well-defined medicinal plant tradition.	Is a measure of the agreement between informants concerning what plants to use for specific usage categories.	Collins et al. (2006) Thomas et al. (2009b) Zheng & Xing (2009)
***Relative Importance (RI)** [2] / Bennett and Prance (2000)	RI = NSC + NP; NCS = NCSS/NCSV, NP = NPS/NPSV (where: NCS = relative number of corporal systems; calculated by dividing the number of corporal systems treated by a given species [NCSS] by the total number of corporal systems treated by the most versatile species [NCSV]. NP = relative number of properties; calculated by dividing the number of properties attributed to a given species [NPS] by the number of properties attributed to the most versatile species [NPSV])	Emphasizes a plant's importance in relation to its versatility.	Albuquerque et al. (2007a) Albuquerque et al. (2007b) Silva & Albuquerque (2005)
****Cultural Importance Index (CI)**[1] / Based on previous indices from Reyes-García et al. (2006) and Phillips & Gentry (1993), published by Pardo-de-Santayana et al. (2007)	$CI_s = \sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} UR_{ui}/N$ Maximum value of the index is the total number of different use-categories ($_{NC}$), reached in the unlikely case that all the informants would mention the use of the species in all the use categories considered in the survey	Can be seen as the sum of the proportion of informants that mention each species use.	Ali-Shtayeh et al. (2008) Tardío & Pardo-de-Santayana (2008)

Cultural importance of families (CIf) / Galeano (2000)	Obtained by the sum of the CI of the species from each family	To highlight more diverse families which would otherwise be underestimated.	Pardo-de-Santayana et al. (2007) Ali-Shtayeh et al. (2008)
*; ****Ethnophytonymy index** / ****Bonet et al. (1999)	Ratio between the number of plant species from a territory that have common popular names and the total number of species from the flora of the area multiplied per 100, as it is a percentage The higher the number of taxa with popular phytonyms, the better plant knowledge and use is conserved in the region	Indicative of the richness of popular knowledge of plants, and of the attachment between human beings and plants, since naming a plant (or an animal) is one of the very first activities undertaken in human societies regarding the systems in which they live and which they manage.	*Parada et al. (2009)
***Ethnobotanical richness** / Begossi (1996)	*R* = number of useful species Can be done through different approaches, like the ratios between medicinal plants and km^2 or medicinal plants and inhabitant	Different parameters used to evaluate the ethnobotanical richness.	Camejo-Rodrigues et al. (2003) Rigat et al. (2007)
*; ****Importance value (IV_s)** / ****Byg & Balslev (2001)	$IV_s = n_{is}/n$ (where: n_{is} = number of informants who consider species $_s$ most important; n = total number of informants) Values range between 0 and 1	Measures the proportion of informants who regard a species as most important.	*Nascimento et al. (2009)
*; ****Mean Cultural Importance Index (mCI)** / ****Pardo-de-Santayana et al. (2007)	Takes into consideration the Cultural Importance Index (CI). Since a null value may be due to either the species not growing in the area or growing but not being consumed, the mean value preferably needs to be calculated by considering only regions where the species grows. Thus, the mean value takes into account species selection or rejection and availability.	Useful in evaluating CI differences among the various sites.	*Ali-Shtayeh et al. (2008)
***Relative Use Value (RUV_i)** / Phillips & Gentry (1993b)	$RUV_i = [(\_UV_{is} / UV_s)]/n$ (where: UV_{is} = number of uses that informant $_i$ knows for species $_s$; UV_s = use value of species $_s$, that is equal to the average number of uses that informants know for species $_s$; n = number of useful species)	Measures how RUV_i many plant uses one informant knows relative to the average knowledge among all informants.	Kristensen & Balslev (2003) Byg & Balslev (2001)
***Relative frequency (RF)** / without information	Use three, four or five citations from different informants to establish consensus among the community that is being study	The relative frequency (RF) of each plant from the interviews is calculated to determine a “remedy of choice”.	Case et al. (2006) Ragupathy & Newmaster (2009)
*; ****Total species equitability (SEtot)** / ****Byg & Balslev (2001)	$SE_{tot} = SD_{tot}/n$ (where: n = number of species used) Values range between 0 and 1.	Measures how evenly different palm species contribute to total palm use, independently of the number of species used.	*Nascimento et al. (2009)
*; ****Use consensus value (UCs)** / ****Byg & Balslev (2001)	$UC_s = 2n_s/n-1$ (where: n_s = number of people using a species $_s$; n = total number of informants) Values range between - 1 and +1.	Measures how large the degree of accordance is between informants concerning whether they regard a species as useful or not.	*Nascimento et al. (2009)
***Principal Use Agreement (PUA)** / Amorozo & Gély (1988)	Use the number of informants that cited the principal use, multiplied per 100 and divided by the number of informants that mentioned the species	Based in the number of infotmants who cited the species x.	Botrel et al. (2006)
***Corrected Principal Use Agreement (PUAc)** / Amorozo & Gély (1988)	To calculate the CUPc it is used the multiplication of the Principal Use Agreement (PUA) by the Correction Factor (CF)	Based in the number of infotmants who cited the species x with respect the total number of all cited species	Botrel et al. (2006)
****Consensus between authors on cited species and families** / Molares & Ladio (2009)	Number of authors who cite the specie $_i$ (or family $_i$)×100/ total number of authors	Estimate the frequency of species and families.	Molares & Ladio (2009)
****Consensus index** / Lozada et al. (2006)	Count the number of people who cited a plant species as useful	Evaluate consensus among individuals.	Lozada et al. (2006)
****Consensus value for plant part (CPP)** / Monteiro et al. (2006)	$CPP = Px/Pt$ (where: *P*x = number of times a given plant part was cited; *P*t = total number of citations of all parts)	Measures the degree of agreement among informants concerning the plant part used.	Monteiro et al. (2006)
****Consensus value for substitutes (CVS)** / Monteiro et al. (2006)	$CVS = Sx/St$ (where: *S*x = number of uses cited for a given substitute; *S*t = total number of citations for all possible substitutes)	Measures the degree of agreement among informants concerning the possible substitutes for the plants used.	Monteiro et al. (2006)
****Consensus value for the collection site (CCS)** / Monteiro et al. (2006)	$CCS = Sx/St$ (where: *S*x = number of times a given site was mentioned; *S*t = total citations of all localities)	Measures the degree of agreement among the informants concerning the collection site of the plant used.	Monteiro et al. (2006)
****Consensus value for the manner of usage (CMU)** / Monteiro et al. (2006)	$CMU=Mx/Mt$ (where: *M*x = number of citations for a given manner of usage; *M*t = total citations for all manners)	Measures the degree of agreement among the informants concerning the manner of usage of the plant used.	Monteiro et al. (2006)

******Consensus value for the period of collection (CTC)** / Monteiro et al. (2006)	CTC = *C*x/*C*t (where: *C*x = number of citations for a given period of collection; *C*t = total number of citations for all periods)	Measures the degree of agreement among the informants concerning the period of collection of the plants studied.	Monteiro et al. (2006)
******Consensus value for use-types (CUT)** / Monteiro et al. (2006)	CUT = (TU/*U*t)/*S* (where: TU = number of times a given use was reported; *U*t = total number of uses; *S* = types of uses separated into categories)	Measures the degree of agreement among the informants concerning species' uses.	Monteiro et al. (2006)
****Cultural Importance Index (CI)** / Based on previous indices from Reyes-García et al. (2006) and Phillips & Gentry (1993)	$CI = \sum_{i=1}^{i=NU} UR_i/N$ Obtained by adding the *UR* in every use-category (*i*, varying from only one use to the total number of uses, *NU*) mentioned for a species, divided by the number of informants in the survey (*N*). The theoretical maximum value of the index is the total number of different edible use categories.	To estimate the cultural significance of each species.	Pardo-de-Santayana et al. (2007)
****Cultural Significance Index (CSI)** / Turner (1988)	CSI = ∑ (*i* x *e* x *c*) x *CF* (where: *i = species management*. Species management considers the plant's impact on the community's daily life. The value of 2 is given for species that are cultivated, managed, or manipulated in any way, even if in an incipient manner; the value of 1 is given for species found in the area yet free from any kind of management or conservation practices. *e = use preference*. This represents the preference given to the use of one species in relation to another for any given purpose. The numerical value of 2 is suggested for a species preferentially used for a given purpose, and value 1 is suggested for other available species not chosen preferentially for that purpose. *c = use frequency*. This considers plants effectively used. In accordance with the values designated by Stoffle et al. (1990:418), a value of 2 is attributed to plants effectively known and used, and 1 is attributed to plants rarely cited. *CF = correction factor (informant consensus)*. This considers the degree of consensus among informants. Its value comes from the number of citations of a given species divided by the number of citations of the most mentioned species).	The option of only two possible attribute values for each variable and the insertion of the CF (which represents the informants' consensus) allows the CSI to reflect with less subjectivity the importance of a species and its roles for each group.	Silva et al. (2006)
***Cultural value index (CV)** / Reyes-García et al. (2006)	$CV_s=[NU_s/NC]x[FC_s/N]x[\sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} UR_{ui}/N]$ (where: NU_s = number of distint uses reported for the species; NC = total number of use-categories considered in the study; FC_s = relative frequency of citation of the species (previously defined); N = number of informants; Ultimate Factor = somatory of all UR to the species, i.e., the sum of number of participants who mentioned each use of the species)	Estimate the cultural significance of each species.	Tardío & Pardo-de-Santayana (2008)
******Disease-Consensus Index (DCI²)** / Andrade-Cetto et al. (2006)	$DCI = (\sum_{i=1}^{\infty} Vxi/ Cc \times mVx)\ Pm^{-0.1}$ (where: *x* = any species; (∑*Vxi*) = sum of the individual values obtained for one species within the community. Evaluates: (Knowledge, Mentions); *mVx* = statistical mean of the individual values, for one plant. Evaluates: (Knowledge); Cc = correlation coefficient, defined as the maximal number of informants whom refer a plant. Evaluates: (Mentions); $Pm^{-0.1}$ = compensation factor, and analyses the dispersion for one plant, considering the mode of preparation and parts used)	Select species which are relevant for the treatment of one specific disease.	Andrade-Cetto et al. (2006)
*****Edible Mushroom Cultural Significance Index** / Modified from Pieroni (2001) by Garibay-Orijel et al. (2007)	EMCSI, includes the Mention Index (QI), Perceived Abundance Index (PAI), Frequency of Use Index (FUI), Taste Score Appreciation Index (TSAI) and Multifunctional Food Index (MFFI) (detailes can be see in Garibay-Orijel et al. 2007)	This index divides the cultural significance into several cultural domains and shows the causes that underlie this phenomenon. This approach can be used in cross-cultural studies because it brings a list with the relative position of species among a cultural significance gradient.	Garibay-Orijel et al. (2007)

***Equitability (E)** / Begossi (1996)	$E = H/H_{max}$ (where: H = - _(pi ln pi), where "pi" is the proportion between the number of citations for each species and the total number of citations; H_{max} = ln R, where R is the number of useful species)	Indicates in an area major ethnobotanical knowledge that is important to the region that is being studied.	Camejo-Rodrigues et al. (2003)
******Familial Use Values** / Lets?ela et al. (2003)	Calculated by totaling the number of species mentioned under each family across all the use categories.	Measures the use importance of a family.	Letsela et al. (2003)
***Family use value (FUV)** / Phillips & Gentry (1993b)	FUV = $\sum UVis/nf$ (where: UV*is* = average use value for each species in the family; n*f* = number of species in the family)	Calculates the use importance of a family.	Stagegaard et al. (2002)
***Correction Factor (CF)** / Amorozo & Gély (1988)	To calculate the Correction Factor (CF) is used the number of informants that mentioned uses for the species, divided by the the number of informants that cited the principal species, that is, with the major number of reported uses	Based in the number of people who cited the species x.	Botrel et al. (2006)
****Fidelity level (FL)**[1] / Friedman et al. (1986)	FL = ratio between number of localities reported for the primary use of one species and number of localities where is reported use of this species	-	Guarrera (2004)
****Frequency (Fsp)**	Fsp = total number of residences in which species X is used / total number of fence maintainers (or residences) x 100	Measures the frequency with which each of the species is encountered in the fences.	Nascimetno et al. (2009)
*****Importance Value Index (IVI)** / Modified by Dhar et al. (2000)	IVI = RI + SI (where: RI = relative importance of a species, all ready explained in this table (RI[2]); SI = sensitivity index (SI = [(SR x NR) / (SR x NR)] x 100, where SR = sensitivity rank, considers attributes related to the manner in which a species is harvested and the degree of anthropogenic pressure to which it is subjected; NR = naturalness rank, concerns the origin of the species that are used as raw materials in industry, values varying from 1 to 3)	In order to establish conservation priorities based on indicators from pharmaceutical products.	Melo et al. (2009)
***Index of ethnobotanical knowledge** / Phillips & Gentry (1993a,b)	$Mg_j = (1/n)\ \Sigma V_i$ (where: Mg_j = mean degree of traditional knowledge held by members of group $_j$; n = numbers of members in the group $_j$; V_i = the amount of traditional knowledge help by member $_i$ from group $_j$)	Can be assessed from people's knowledge of the classification, identification, naming and ecology of plants. Quantitative assessments are possible and can be applied to the whole community or to sub-groups, for instance based on age and gender.	Pei et al. (2009)
***Index of phytoethnoallochthoneity** / Mesa-Jiménez (1996)	Ratio between the number of allochthonous plants used in a territory and the total number of used taxa	-	Parada et al. (2009)
***Informant agreement ratio (IAR)** / Trotter & Logan (1986)	IAR = (total cases for ailment) – (number of separate remedies for ailment) / (total cases for ailment) – 1 Scores range from 0 to 1, 1 indicating that every time an illness was mentioned, interviewees would cite the same plant to treat it.	This formula is based on the model that consensus among informants predicts a higher potential for bioactivity in ethnomedical research.	Case et al. (2006)
***Informant consensus** / Martin (1995) e Alexiades (1996)	Calculated directly from the number of informants who mentioned the species	The importance of each species for each specified category.	Lykke (2000)
****Informant diversity value** / Byg and Baslev (2001)	ID =Ux/Ut (where: Ux = number of uses cited by a given informant; Ut = number of total uses).	Measures how many informants use the species and how this species is distributed among the informants.	Monteiro et al. (2006)
******Informant diversity value (IDs)**[1] / Byg and Balslev (2001)	$ID_s = 1/\sum P_i^2$ (where: P_i = contribution of informant $_i$ to the total knowledge pool of species $_s$; where ID_s = number of reports of use of species $_s$ by informant $_i$ divided by the total number of reports of use of species $_s$) Values range between 0 and the number of informants using it	Measures how many informants use a species and how its use is distributed among them.	Byg and Balslev (2001)
****Informant equitability value (IE)** / Byg and Balslev (2001)	IE = ID/ IDmax (where: ID = informant diversity value; IDmax = this index's maximum value)	Measures the degree of homogeneity of the informant's knowledge.	Monteiro et al. (2006)
******Informant equitability value (IEs)**[1] / Byg and Balslev (2001)	$IE_s = ID_s / ID_s\ max$ (where: ID_s max = maximum informant diversity value for a species $_s$ which is known by a given number of informants) Values range between 0 and 1	Measures how the use of a species is distributed among informants independently of the number of informants using it.	Byg and Balslev (2001)
******Intra-specific Use Value (IUV)** / Gomez-Beloz (2002)	IUV = SU[plant part]/ RU[plant part] (where: SU = specific use for the plant part; RU = reported use for the plant part)	Allows the ordering of use importance within a specific plant part.	Gomez-Beloz (2002)

********Mean rank of usefulness** / Lykke et al. (2004)	Calculated for each species as the average answer, ranging from 0 (no informants found it useful) to 2 (all informants found it very useful), and a ranking of the species is constructed in each use-category. Total use -value for each species is calculated as the sum of mean ranks for all requested use-categories	In order to identify key species for local use, the species were ranked according to their total use-value.	Lykke et al. (2004)
***Number of species used medicinally (MPSPE)** / Moerman (1991)	MPSPE = A + (B * FBSPE) (where: A = intercept; B = slope; FBSPE = total number of species per family. It consists of a regression of the number of species in families that are used medicinally on the total number of species available per family in the total flora. The constant and the coefficient are determined using a standard linear least-squares regression (SYSTATt). Subsequently, residual values are calculated for each family by subtracting the predicted value from the actual value. Negative residuals indicate that the families are underused, whereas positive values suggest overuse, or preferential selection)	Used to assess whether certain plant families were preferentially selected by the healers for neurological or mental disorders, thus indicating potential biological activity of the plants within these botanical families.	Bourbonnais-Spear et al. (2005)
******Overall Use Value (OUV)** / Gomez-Beloz (2002)	It is the ratio of specific uses (SU) and total number of reported uses (∑RU) for the whole plant and is calculated as follows: (1) OUV = (PPV X IUV), (2) OUV = ((RU[plant part]/∑ RU) X (SU[plant part]/RU[plant part])), (3) OUV = (SU[plant part]/∑ RU)	Allows comparisons of uses within a group of plants and is used to compare use importance for this group of plants.	Gomez-Beloz (2002)
******Overall Use Value (OUV)** [1] / Camou-Guerrero et al. (2008)	$OUV_{spp1} = \sum (MWU_{spp1}) \times \sum (MWQ_{spp1})$ (where: MWU_{spp1} = men's and women's values of plant species frequency of use; MWQ_{spp1} = men and women values of plant species quality; we multiplied the U and Q components in order to amplify variations)	The use value index defined through use frequency and quality perception allows identification of the relative importance of useful plant species among a group.	Camou-Guerrero et al. (2008)
******Performance index (Ip)** / Betti (2002)	The proportions used are calculated from the ratios of number of citation for diseases. The proportion of citations (records) for a specific disease to the total number of citation is considered as a theoretical proportion (P2). This proportion is compared to the proportion of observed number of citation of a plant for a specific disease to the total number of citations for the same plants for all diseases (P1). The difference (D) between the two proportions is then used to define a performance index (Ip). Values ranges from 0 to 3 according to the following scale: P1 - P2 < 0, Ip = 0 (the plants concerned are rejected, not significant); 0 < P1 - P2 1/3, Ip = 1 (average performance); 1/3 < P1 - P2 2/3, Ip = 2 (high performance); P1 - P2 > 2/3, Ip = 3 (very high performance)	Evaluate the relative importance of the medicinal plant species.	Betti (2002)
******Plant Part Value (PPV)** / Gomez-Beloz (2002)	PPV = (RU[plant part]/∑RU) (where: RU = number of total reported uses for each plant part; RU = total number of reported uses for that plant)	Is a value given for a specific plant part.	Gomez-Beloz (2002)
******Purpose consensus value (PC_s)** / Byg & Balslev (2001)	$PC_s = \sum P^2u / S$ (where: P^2u = proportional contribution of use *u* to the total utility of a species $_s$, that is equal to the number of times use *u* was reported for species $_s$; *S* = total number of types of uses of species $_s$) Values range between 0 and 1	Measures how large the degree of accordance is among informants using it concerning what purposes they use it for.	Byg & Balslev (2001)
******Quality Use Agreement Value ($QUAV_s$)** / Thomas et al. (2009b)	$QUAV_s = QUV_s \times IAR_s$	The proposal is to combine both parameters (the emic perception of therapeutic qualities [QUV_s] and the informant consensus [IAR_s]) into the 'Quality Use Agreement Value' ($QUAV_s$).	Thomas et al. (2009b)

****__Quality use value (QUV_s)__ / Thomas et al. (2009b)	$QUV_s = \sum_{i=1}^{n} QU_{is}/n_s$ (where: QU_{is} equals _Q_{is} = sum of the qualities of all medicinal uses assigned to species $_s$ by informant $_i$; n_s = number of participants interviewed for species $_s$) This implies that the quality of each medicinal use mentioned is to be assessed by each individual participant. Qualities are appraised on an ordinal scale, choosing between (a) good to excellent, (b) fair, or (c) bad, to which values of 1, 0.5 and 0.25 were attributed, respectively.	Medicinal QUV_s values appear to be more sensitive to the number of ethnomedical applications per plant species and incorporate the emic perception of therapeutic qualities, whereas IAR_s values address informant consensus.	Thomas et al. (2009b)
****__Regional selection index (RSI)__ / Pardo-de-Santayana et al. (2007)	It is obtained by dividing the number of species consumed at a site by the number of species growing there.	When comparing the edible floras of different regions, it is crucial to differentiate between plants growing in the area but not consumed and those which cannot be consumed because they are absent. This index was created to assess differences in edible species selection or rejection among regions.	Pardo-de-Santayana et al. (2007)
****__Relational Efficacy__ / Bletter (2007)	The hypothesis is that in a database with N_s species, N_d diseases, and N_c cultures, the potential of a certain species $_s$, from one culture $_c$, to treat a certain disease $_d$, ($P_{s,d,c}$) should increase with greater phylogenetic proximity of other plants $_{s'}$ used to treat related diseases ($R_{s,s'}$), increase with greater etiological proximity of the disease $_{d'}$ treated by related plants ($R_{d,d'}$), and increase with less phylogenetic proximity of cultures $_{c'}$ using related plants to treat related diseases ($R_{c,c'}$), but it should not increase solely by increasing the size of the dataset. The basic formula for the potential $P_{s,d,c}$ of species $_s$ to treat disease $_d$ in culture $_c$ proposed to meet these conditions is: $P_{s,d,c} = 1/ N_sN_dN_c \sum_{s',d',c'} R_{s,s'}R_{d,d'}/ R_{c,c'}$ (where the relatedness factors are summed over all species, diseases, and cultures where species $_s$ is used to treat disease $_d$ in culture $_c$ and species $_{s'}$ is used to treat disease $_{d'}$ in culture $_{c'}$; N_s = number of species; N_d = number of diseases; N_c = number of cultures) These relatedness factors, would be 1 for two plants, diseases, or cultures that are exactly the same, and would decrease towards 0 as they became less related	One assumption of this technique is that the less related or connected two cultures are, the more likely their discovery of related plants to treat related diseases is an independent event and these plants should therefore be considered to have a higher potential than other plants that may be used for that disease in only one culture.	Bletter (2007)
*__Relative frequency of citation (RFC)__ / without information	$RFC_s = FC_s/N = \sum_{i=i_1}^{i_N} UR_i/N$ (where: FC_s = number of informants who mention the use of the species, also known as frequency of citation; N = number of informants participating in the survey). This index, which does not consider the variable u (use-category) This index theoretically varies from 0, when nobody refers to the plant as useful, to 1 in the unlikely case that all the informants would mention the use of the species.	Measures the plants that were the most frequently mentioned as useful.	Tardío & Pardo-de-Santayana (2008)
**__Relative Importance (RI)__ [1] / Adapted from Bennett and Prance (2000)	RI = NUC + NT (where: NUC = number of use-categories of a given species (NUCS) divided by the total number of use-categories of the most versatile species (NUCVS); NT = number of types of uses attributed to a given species (NTS) divided by the total number of types of uses attributed to the most important taxon (NTMIT), independent of the number of informants that cite the species)	Developed primarily for measuring the usefulness of medicinal plants.	Albuquerque et al. (2006)

***Relative importance index (RI)** / Pardo-de-Santayana (2003a)	$RIs = RFC_{s(max)} + RNU_{s(max)}/ 2$ (where: $RFC_{s(max)}$ = relative frequency of citation over the maximum, i.e., it is obtained by dividing FC_s by the maximum value in all the species of the survey [$RFC_{s(max)} = FC_s/max (FC)$]; $RNU_{s(max)}$ = relative number of use-categories over the maximum, obtained dividing the number of uses of the species [$NU_s = \sum_{u=u_1}^{u=u_{NC}} UR_u$]by the maximum value in all the species of the survey [$RN_{s(max)} = NU_s /max (NU)$]) The RI index theoretically varies from 0, when nobody mentions any use of the plant, to 1 in the case where the plant was the most frequently mentioned as useful and in the maximum number of use-categories. Takes into account only the use-categories— not the subcategories	Measures the plants that were the most frequently mentioned as useful and in the maximum number of use-categories.	Tardío & Pardo-de-Santayana (2008)
****Relative use (RU)** / Stagegaard et al. (2002)	The relative use (RU) of extracted species is calculate as the frequency by which the species was recorded within a certain subcategory, i.g., in the flood plain communities 191 posts were recorded, of which 164 were identified as *Minquartia guianensis*, thus resulting in a RU of *M. guianensis* for posts on 85.9%	Allows identifying species actually extracted by people living in or close to the vegetation, providing a realistic estimation of the present use and importance of the individual species.	Stagegaard et al. (2002)
****Remedy Importance Value (IVremedy)** / Leaman et al. (1995)	The importance value for malaria (IVmal) = 1 for remedies reported once during the survey; IVmal = 2 for remedies reported twice in one community; IVmal = 3 for remedies reported at least three times in one community; and IVmal = 4 for remedies reported in more than one community.	Quantify the degree of confirmation among respondents within and between the communities surveyed.	Leaman et al. (1995)
****Reported use value for each plant and plant part (RU)** / Gomez-Beloz (2002)	It is similar to the use value of a species as reported by Phillips and Gentry (1993). Theirs is a ratio of the number of uses reported in each event by an informant in relation to number of events for that species. For the RU, the number of events, the process of asking one informant on one day about the uses they know for one species, is one because the respondents were interviewed only once. Reported use values were broken down by number of uses reported for each plant part (SRU[plant part])	Is the total number of uses reported for each plant.	Gomez-Beloz (2002)
****Species diversity value (SD_i)** / Byg & Balslev (2001)	$SD_i = 1/\sum P^2_s$ (where: P^2_s = contribution of a species $_s$ to informant $_i$'s total use of palms, that is equal to the number of times species $_s$ was mentioned by informant $_i$ divided by the total number of informant $_i$'s answers) Values range between 0 and the number of species used by the informant.	Measures how many species an informant uses and how evenly his uses are distributed among the species.	Byg & Balslev (2001)
****Species equitability value (SE_i)** / Byg & Balslev (2001)	$SE_i = SD_i/ SD_{i\ max}$ (where: $SD_{i\ max}$ = maximum possible species diversity value for an informant $_i$ who uses a given number of species) Values range between 0 and 1	Measures how evenly an informant makes use of the palms he knows, independently of the number of palms used.	Byg & Balslev (2001)
****Specific Reported Use (SU)** / Gomez-Beloz (2002)	The SU value refers to the number of times a specific reported use is reported by the respondent	Is the use as described by the respondent. The use descriptions are simplified to facilitate analysis.	Gomez-Beloz (2002)
****Specific Use Value index (SUV)** / Camou-Guerrero et al. (2008)	Calculated, taking into account men's and women's U and Q values, independently for each plant species specific uses described	To find relevant plant species at the level of specific uses.	Camou-Guerrero et al. (2008)

****Syndromic Importance Value (SIV) / Leduc et al. (2006)	SIV = [$\sum ws/ S$] + [$\sum wf/ SF$]/ 2 = $\sum ws$ + [$\sum wf/ F$] (where: *w* = the weight of the symptom; *s* = the symptom contribution for the species; *f* = the frequency of citation for the species; *S* = the total number of symptoms used for the survey; *F* = the total number of interviews in the survey; the equation is divided by 2 since the SIV represents an average value equally dependent on both frequency and symptom contribution) The weight of the symptom, *w*, is the degree of association converted to a number between 0 and 1, where $\sum w = 1$. The symptom contribution, *s*, is either 1 or 0, based on the plant species being cited for the particular symptom or not, respectively, where $\sum s = S = 15$, in the case where the species is cited for all symptoms. The frequency of citation, *f*, refers to the total number of instances the plantwas cited for one of the symptoms, where a maximum $\sum f = SF = 15\times23 = 345$, if all informants were to cite the plant species for all 15 symptoms	In order to prioritize plant species for pharmacological investigation.	Leduc et al. (2006)
****Total species diversity (SD_{tot}) / Byg & Balslev (2001)	$SD_{tot} = 1/ \sum P^2_s$ (where: P^2_s = contribution of species $_s$ to the total use of palms in the study communities, that is equal to the number of times species $_s$ was mentioned divided by the total number of reports of palm uses) Values range between 0 and *n*	Measures how many species are used and how evenly they contribute to total palm use.	Byg & Balslev (2001)
**Total species diversity (SD_{tot}) [1] / Byg and Balslev (2001)	$SD_{tot} = 1/ \sum P^2_s$ (where: P^2_s = number of times that a species appears divided by the number of times that all species appear)	Evaluates the contribution of each species to the total diversity seen in the fences.	Nascimento et al. (2009)
****Total value of an ethnospecies (V_e) / Reyes-García et al. (2006)	To calculate the cultural value of an ethnospecies: $CV_e = Uc_e * Ic_e * \sum IUc_e$ (where: CV_e = the cultural value of ethnospecies $_e$; Uc_e = the total number of uses reported for ethnospecies $_e$ divided by the six potential uses of an ethnospecies considered in the study (i.e., medicine, firewood, construction, tools, food, and other); Ic_e = the number of participants who listed the ethnospecies $_e$ as useful divided by the total number of people participating in free listing; IUc_e = the number of participants who mentioned each use of the ethnospecies $_e$ divided by the total number of participants) To calculate the practical value of an ethnospecies: $PV_e = Up_e * Ip_e * DUp_e$ (where: PV_e = the practical value of ethnospecies $_e$; Up_e = the number of different uses observed for ethnospecies $_e$ during scan observations divided by the six potential uses of an ethnospecies considered in the study; Ip_e = the number of times ethnospecies $_e$ was brought to a household divided by the total number of informants participating in scan observations; the variable captures the share of participants who use the ethnospecies; Dup_e = captures the duration of each use) To calculate the economic value of an ethnospecies is used the village price of the ethnospecies. For ethnospecies without a price, is used estimations in which is asked villagers how much time it took them to find the good, multiplied the amount of time by the prevailing daily wage in the village, and assigned the resulting value to the ethnospecies. Is used this formula: $EV_e = Oe_e * Pe_e$ (where: EV_e = the economic value of ethnospecies $_e$; Oe_e = the number of	Calculate the cultural value of an ethnospecies using information from free listing, and calculate the practical and economic values using observational information from scans.	Reyes-García et al. (2006)

	ethnospecies $_e$; Oe_e = the number of observations for ethnospecies $_e$, i.e., the total number of times the ethnospecies was brought to any household in the sample; Pe_e = the price of the ethnospecies) Then is calculate the total value of an ethnospecies (V_e), as the sum of its cultural, practical, and economic values: $V_e = CV_e + PV_e + EV_e$ To calculate the total value, is assigned a practical and economic value of "0" to ethnospecies that people mentioned in free listing but did not bring into their households during scan observations.		
***U/K index** / Muntané (1991)	Is calculate as the ratio between the number of local names not yet documented and the total number of reported useful species; or the ratio between the mean number of medicinal and aromatic plants used (U, for use) and known (K, for knowledge) by the informants	Evaluates the degree of novelty in local names, or identify local names not yet published; or appraises the persistence of plant uses.	Camejo-Rodrigues et al. (2003)
****Use diversity value (UD_s)** / Byg & Balslev (2001)	$UD_s = 1/\sum P^2_c$ (where: P^2_c = contribution of use category $_c$ to the total utility of a species $_s$, calculate as the number of times species $_s$ was mentioned within each use category, divided by the total number of reports of use of species *s* across all use categories) Values range between 0 and number of use categories for which it is used.	Measures for how many use categories a species is used and how evenly these contribute to its total use.	Byg & Balslev (2001)
****Use diversity value (UD_s)** [1] / Byg and Balslev (2001)	$UD_s = Ucx/Uct$ (where: *U*cx = number of indications recorded by category; *U*ct = total number of indications for all of the categories)	Measures the importance of use categories and how they contribute to the total value of uses.	Monteiro et al. (2006)
*****Use equitability value (UE_s)** / Byg and Balslev (2001)	$UE_s = UD_s/UD_{smax}$ (where: UD_{smax} = maximum possible use diversity value for a species $_s$ with uses occurring in a given number of categories) Values range between 0 and 1.	Measures how evenly the different uses contribute to the total use of a species independent of the number of use categories.	Byg & Balslev (2001)
****Use equitability value (UEV)**[1] / Byg and Baslev (2001)	$UEV = UD/UD_{\mathbf{max}}$ (where: UD = use-diversity value; $UD_{\mathbf{max}}$ = the index's maximum value)	Measures the degree of homogeneity of the knowledge about use categories.	Monteiro et al. (2006)
****Use value (UV_s)** [1] / Phillips & Gentry (1993a)	$UV_s = \sum UV_{is}/n$ (where: UV_{is} = number of uses informant $_i$ knows for species $_s$)	Measures the average number of uses informants know for a species.	Byg & Balslev (2001)
*****Use Value for each species in the plant family (UV_f)** / Modified by Rossato et al. (1999)	$UV_f = \sum UV/n_f$ (where: UV = number of uses informants knows for species $_s$; n_f = number of species in the family)	Measures the average number of uses informants know for each species in the plant family.	Lucena et al. (2007)
******Use Value index (UV) combining the use frequency (U) and the quality perception (Q) of useful plant species by local people** / Camou-Guerrero et al. (2008)	To assess plant species use value is considered the frequency of use (U) and the local perception of quality (Q). The U is defined as the proportion of positive mentions of plant species for a particular use, divided by the total number of interviews. The local perception of quality (Q) of plant species is calculated as the proportion of positive mentions of quality with respect to the total number of interviews	The product of men and women's U and Q values of plant species.	Camou-Guerrero et al. (2008)
***Use Value index of each species $_s$ for each informant $_i$ (UV_{is})** / Phillips and Gentry (1993a,b)	$UV_{is} = \sum U_{is}/n_{is}$ (where: U_{is} = number of uses quoted in each interview (event) by informant $_i$; n_{is} = number of quotations for species $_s$ given by informant $_i$. An 'event' is defined as the process of asking one informant on 1 day about the uses they know for one given species)	Quantify the importance of each species for each informant.	Torre-Cuadros & Islebe (2003)
*****Use Value of each species in the category (UV_c)** / Modified by Rossato et al. (1999)	$UV_c = \sum UV/n_c$ (where: UV_c = the use value of each species in the category; n_c = number of species in the category)	Measures the average number of uses informants know for each species in the category.	Lucena et al. (2007)
*****Use Values calculated for men and women** / Modified by Rossato et al. (1999)	$UV = \sum U_{m,w}/n_{m,w}$ (where: $\sum U_{m,w}$ = sum of all the use citations of the men or of the women and $n_{m,w}$ = total number of men or women)	Measures the average number of uses men or women knows for plant species.	Lucena et al. (2007)

****Use-diversity value (UD)** / Modified from Byg and Baslev (2001) by Monteiro et al. (2006)	UD = *U*cx/ *U*ct (where: *U*cx = number of indications recorded by category; *U*ct = total number of indications for all of the categories)	Measures the importance of use categories and how they contribute to the total value of uses.	Monteiro et al. (2006)
****Syndromic Importance Value** [1] / Leduc et al. (2006)	SIV = (Σp × s) + ((Σp × f) /F) / 2 (where: p = weight of each indication, based on the greatest probability of a given indication being associated with the activities cited, using a weight of 1 for highly associated; 0.75 for moderately associated; 0.5 little associated; and 0.25 weakly associated; s = is the contribution of the local therapeutic indication for each species; f = is the number of informants that indicated the species; F = is the total number of interviewees)	The selection of plants based on their SIV (that associated local knowledge with scientific knowledge) allows identifying plants with high levels of bioactive substances, diminishing phytochemical and/or pharmacological research costs and time investments.	Araújo et al. (2008)