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Short communication

# Ethnobotany of Mallorca (Balearic Islands): A Multidisciplinary Approach

**Esperança Carrió and Joan Vallès**

University of Barcelona, Faculty of Pharmacy, Laboratory of Botany, Catalonia, Barcelona, Spain

**A B S T R A C T**

*In this communication, we provide some basic methodological and practical ideas for plant knowledge comparisons among different predefined natural regions of the Mediterranean island of Mallorca, in the frame of an ongoing project in this area. The final goal of this work is to present a tool to find out to what extent plant knowledge is similar in the different regions. We use an uncommon approach to ethnobotanical studies in terms of multidisciplinary methodology. We base our arguments on social anthropology methods, using a diversity index (the Sørensen similarity coefficient), and we also explain the botanical part of the investigation. Our preliminary results reveal few differences among the three natural regions considered on the island, which we believe could find their explanation in geographic, botanical and cultural aspects.*

***Key words**: Catalan-speaking territories, ethnobotany, folk plant knowledge, interdisciplinary tools, ethnobotanical research methods*

## Introduction

Over the past years, people who study the relationships between humans and plants in any field (medicine, food, forestry, for example), and at any level (local, regional and so on) recognize that the approach to ethnobotanical studies has gone through outstanding conceptual and methodological changes since the classical works[1–6], starting from the coining of the name Ethnobotany by Harshberger in 1896[7]. It is argued that the emphasis of ethnobotanical studies has shifted from the mere compilation of names and uses of plants in so-called primitive human groups to the study of the relations of any human society with the plant world from a holistic perspective (this means using qualitative and quantitative methods)[8,9]. In fact, as a response to academic criticism to ethnobotany as a »soft science«, new works have been designed to quantify local botanical knowledge including popular indices of relative or cultural importance[6].

Likewise, to systematize the work, well-defined methodologies are used, which should permit the comparison of work done in different areas and different communities. The shared ethnobotanical knowledge (regarding the species used repetitively over time and/or geographical space) reinforces the scientific evidence of information and opens further possibilities to the study of transcultural ethnobotany as well as to the study of ethnobotanical heritage within communities themselves[10]. A solid ethnographic basis, which includes a comprehensive contextualization of the study area, brings meaningful results and makes easier the intellectual challenge of returning to the society the research findings in an understandable way[11].

Furthermore, the calculation of diversity indices is a very useful tool for ethnobotanical studies, which helps researchers to ask questions and analyze data obtained through this method, besides permitting comparisons among different communities in different or similar environments[2]. As Begossi[12] stated, »it is important to have quantitative studies in ethnobotany reporting data on informants, because those data can be very useful for macro scale comparisons. These macro scale studies are particularly important when we observe that both biological and cultural biodiversity are seriously threatened in many parts of the world«.

A comparative analysis in ethnobotanical studies allows us to recognise differences and similarities of plant uses among different areas. In fact, other works have assessed these comparisons locally[13,14] and even national-

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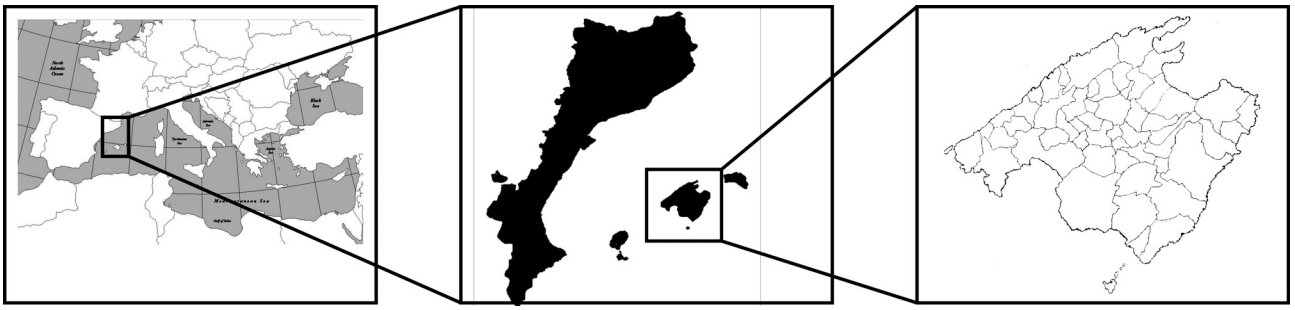

*Fig. 1. Location of the studied island in the Mediterranean Sea and the Catalan linguistic area.*

ly[15,16]. We highlight, on a Mediterranean level, the meta-national comparison of González-Tejero et al.[17] for having used a similar index to Sørensen, Jaccard's index. In the end, the results of this Mediterranean comparison do not demonstrate a common ethnobotanical heritage, but there are many factors involved in such a comparison. This Mediterranean behaviour influences our study, because we are finding dissimilarities among regions within the same island, so it is logically conceivable to find them among countries.

In the frame of what has been introduced, our research group has developed a web-format database on ethnobotany of Catalan-speaking territories (www.etnobotanica.cat) to keep quantitative and qualitative information together, as systematized as possible, and compare the variability of results obtained within our field studies[18,19], and the references therein. The present work is part of this wider project.

### *Objectives and hypotheses*

In our research, we have always paid special attention to quantitative ethnobotany[18,20–22]. In these cases, our main focus was the quantitative data assessment and analysis using methods and indices mostly (almost uniquely) proceeding from botanical (or biological) tradition and publications[12,23–29]. In recent times, ethnobotanists, even those coming from strictly botanical schools, have focused on the use of ethnological or social anthropological methods of analysis[30] to complement the above-mentioned quantitative data assessments and to turn more towards cultural and social aspects of traditional plant knowledge. Along these lines, the main objective of this work is to put into practice some concepts and methods of the disciplines of social anthropology, applied to an ongoing ethnobotanical study in Mallorca. Also, tools from the branch of ecology, such as Sørensen's similarity coefficient, have been used. We aim to provide basic methodological and practical ideas for plant knowledge comparisons among different predefined natural regions of the Mediterranean island of Mallorca, with the final goal of presenting an anthropological tool to be applied to ethnobotanical studies to evaluate the degree of differentiation of plant knowledge among interviewees in different regions.

In particular, we hypothesize that the ethnobotanical knowledge of Mallorca is reasonably homogeneous, so we can talk about the general ethnobotany of the island (there is a recognised Mallorcan culture, which should be reflected in the knowledge related to plants). At the same time, we would expect at least some differences between people interviewed in the different natural regions of Mallorca (see the subheading Study area), because of geographical and ecological diversity (mountain areas as opposed to plain and/or marine ones, for instance). These hypotheses, especially the second one, will be tested with the above-mentioned anthropological tool applied to the ethnobotanical research in this paper.

### *Study area*

Mallorca, with approximately 3,600 km$^2$, is the largest island in the Mediterranean Balearic archipelago, and the seventh largest in the Mediterranean, located to the east of the Iberian Peninsula (Figure 1). The climate in Mallorca is typically Mediterranean[31].

The Balearic archipelago constitutes an Autonomous Community of Spain[32]. Mallorca is divided into districts (or the so-called »comarques« in the Mallorcan language) which are not officially recognised; instead it is formally divided into 53 municipalities. The areas considered for analysis in this study are taken from Rullan[33], due to its geobotanical but not political divisions. These three main natural regions in Mallorca are: (T) *Tramuntana* mountain range, to the NW, with a rugged relief, humid-subhumid climate, and north-facing oak (*Quercus ilex* L.) forests, (C) centre and N/NE, with a varied relief and less abrupt than the previous one, with dry weather, covered by oaks and maquis; (S) south plains, with a semiarid climate, covered by maquis, thicket and Aleppo pine (*Pinus halepensis* Mill.) forest (Figure 2).

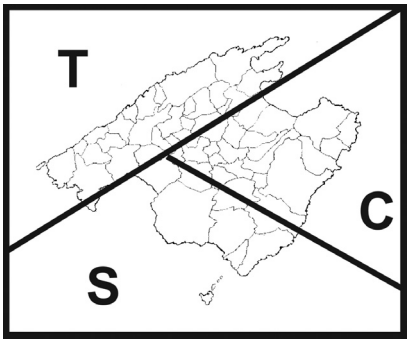


*Fig. 2. The three main natural regions in Mallorca considered for analysis[33].*

According to the classification of Llorens et al.[34] based on Bolòs[35], the following plant landscapes are found on the island: (1) forest and fruticose communities, (2) non-ruderal herbaceous and perennial vegetation, (3) communities of craggy rocks and cliffs, (4) salt-marsh vegetation, (5) beach and rocky littoral vegetation, (6) communities of streams and wet places (hygrophilous and aquatic vegetation), (7) marine communities and (8) herbaceous and fruticose ruderal vegetation, which includes e.g. gardens, fields, plots, paths, road edges and, in general, the proximities of human habitation, where plant-people interaction has been most studied.

In fact, throughout the history of Mallorca many cultures have left their mark on the island: ancient sailors (the most ancient settlers recorded, around 7,000 BC), Talayots, Carthaginians, Romans, Byzantines, Muslims, Catalans and Castilians, and all of them have contributed to some extent their culture and civilization[36,37]. It is from the Catalans that Mallorcans still preserve their core language and culture (they speak a variant of Catalan called Mallorcan). With the passing of time, multiculturalism has gradually gained speed and, although the entrance of new people due to tourism has given much dynamism to Mallorcan society, it has implied (apart from overcrowded coastal areas) a series of negative consequences that currently need to be addressed: land speculation, impact on the environment, social imbalance, outside pressure to their own culture and language, depletion of scarce resources and so on; issues affecting the welfare of Mallorca in both present and future[38–40].

In terms of the socioeconomic context, around 850,000 inhabitants live in Mallorca, of which 470,000 are natives the archipelago and 380,000 were born outside, either in other regions of Spain (185,000) or abroad (190,000), among which the German population stands out, with 28,000 registered migrants (data from IBESTAT[38]). Since the 1960's Mallorca has depended on tourism as the main monoculture economy, having quickly left aside the primary sectors of agriculture and livestock, these now a mere witness of what had once been the main activities throughout its history. The primary sector has gone through several stages, but nowadays it mainly produces forage crops, cereals, vegetables, tubers and nuts (specially almonds), as well as growing olives and grapes (data from the Govern de les Illes Balears[39]). Sheep and pigs are the main products of the livestock industry in Mallorca. Currently, the percentage of people actively engaged in this sector (data from INE[40] and IBESTAT[38]) is 1.24%. A relevant part of Mallorcan peasants are retired people who continue to cultivate some extension of land not far from the place where they live; these people constitute the most important source of informants for this study. Organic farming is growing importance, with a total of 23,738.1 cultivated hectares (data from the Govern de les Illes Balears[39]).

## Methods

The classical methodology of ethnobotany[27,28,41–44] already considers the methods from the field of botany and the ones derived from ethnology. Here we look at some tools from the discipline of social anthropology, considering as a conceptual starting point the so-called anthropological triangle (involving fieldwork, comparison and finally contextualization, which includes both personal history and socioeconomic and cultural context of the informant and his or her environment)[45,46]. Specifically, we have placed a greater emphasis on the techniques and consequences of ethnobotanical data comparison.

### *Design and interviews*

To obtain information, we conducted semistructured interviews following the same workflow as all the other studies carried out in the Catalan linguistic area[18]. We asked about uses of medicinal and edible plants, as well as other uses such as popular literature, handcrafts, cosmetics, farming and domestic uses. The interviews were developed as general conversations in which we kept coming back to the theme of plant uses. We avoided the use of direct questions so as not to orientate or condition the informants' answers, in order to maintaining in this way a degree of spontaneity when broaching the research theme.

For analysis, we have taken into account the three above-mentioned natural regions of Mallorca: *Tramuntana* mountain range, Centre and N/NE, and the South plains; for convenience reasons we have named these areas T, C and S respectively (Figure 2). T, C and S are used in the study figures and for a better and quicker understanding of the discussion of the results. Of these, we selected six informants to test the method, which is the minimum number of informants for the calculation of the Sørensen index[47].

The profile of the selected respondents is almost identical, but above all we have set as a ground of choice that all of them were »very good« informants (quantitatively speaking, more than 70 use reports *per* person) and we chose two from each area. So, in terms of quantitative statistics, we are working with more than 420 items (more than 70 use reports *per* 6 persons). The mean age of informants is 78 and they have lived all their lives in the same area of the island, close to plants because of their occupations (all of them farmers and gardeners).

Although the present work is basically focused, as regards design and results treatment, on the anthropological side of ethnobotanical research, we have in no way ignored the botanical aspects of this investigation. We have recognized, determined and collected the plant species mentioned by informants, and made the corresponding herbarium vouchers, which have been deposited in the herbarium BCN, of the Centre de Documentació de Biodiversitat Vegetal, Universitat de Barcelona. In this first part of our prospect we have recorded 228 plant species for the 80 informants. For plant nomenclature, we follow Bolòs et al.[48].

### *Analysis*

The working procedure for carrying out the numerical calculations, using Microsoft Office Excel® 2003, is as follows. First, we performed a binary matrix (0 and 1) of

the uses of the plants cited (1) or not mentioned (0) by informants. The construction of the matrix was manually filled; first introducing all the collected use-reports for all the informants, and then revising them when mentioned (1) or not (0). Information was collected on knowledge of plants. Then, we calculated the Sørensen similarity coefficient or Sørensen index (SI) among all respondents, with all possible combinations, and we also calculated SI among regions. SI is the product of the double of the total of shared use reports (from X and Y) between the sum of the use reports of X and the use reports of Y, referring X and Y as the couple of respondents. This is a statistic used for comparing how similar two samples are[47,49], and we have taken it from the methodology of ecology (still used in recent scientific literature for ecological community analysis)[50–53].

In this study, we have taken into account the question of positive similarity, where both informants have cited the plant-use binomial. We have not considered similarity of knowledge in the case where neither of the respondents refer to the plant use-report. Finally, we made the comparison among the three areas defined, and we have evaluated the possible trends for discussion.

## Results and Discussion

We worked with use reports from informants referring to medicinal, edible and other uses of plants (such as popular literature, handcraft, and domestic or farming uses) at a ratio of 55%, 27% and 18%. The similarity index (Figure 3, using a scale of grey tones: the more similar, the more intense[17] and also the SI numbers) shows that the informants from the three areas share similar knowledge. However, considering 0.01 as analyzable differences, area C informants share more ethnobotanical information those from area S. Informants from area T share more plant knowledge with respondents from area C, rather than with those of area S. As discussed later, geographical and cultural characteristics may provide explanations for this pattern.

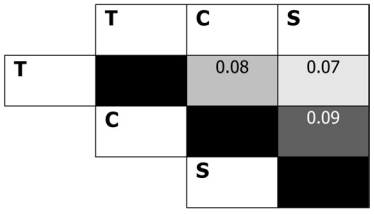


*Fig. 3. Comparison among regions. T: Tramuntana mountain range; C: centre and N/NE; S: southern plains. Numbers refer to SI. The scale of grey indicates the intensity of similarity: the more similar, the more shadowed.*

Comparison between interviewees (Figure 4) does not follow any concrete pattern and for further discussion we should include more people, but this is a first occasion to test this method in ethnobotanical studies. In any case, the highest similarity appears between MT2 and MC1, perhaps because both informants have a similar age (66)

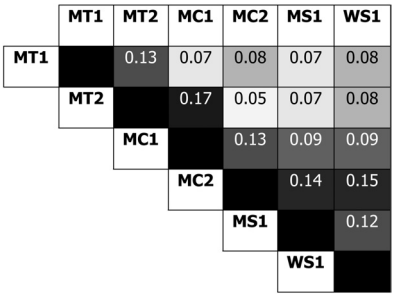


*Fig. 4. Comparison among informants. The first letter of the code indicates the gender of the informant, and the second refers to the region (T, C or S). Numbers refer to SI. The scale of grey indicates the intensity of similarity: the more similar, the more shadowed.*

and personal experience (both gardeners). Similarity of ethnobotanical knowledge among respondents from the same region (MT1 and MT2, MC1 and MC2, MS1 and WS1) is always relevant.

Although establishing some affinities, the present results do not fully permit the distinction of similarities on plant knowledge among informants from different natural regions – although they do quantitatively –; the personal background of each respondent can vary a lot and the comparison of the ethnobotanical knowledge of informants depends on many variables related to the informants. We suggest several factors such as their job, their family position, their family living movements (for marriage or work), their proximity to the land and their economic possibilities. We have taken these items into account when choosing the respondents, but we think that, for further research in this field, we would need to study these variables independently, in the same way as other authors have done[54–57].

We find more plausible, however, the comparison between regions, since it can be explained by more objective factors such as geography of the area, vegetation type and cultural traditions. In fact, the results agree with these three variables: the regions of centre and N/NE (C) and southern plains (C) are closer culturally[33,58–66], and show a high similarity in our study. Also, the regions of the mountains (T) and centre and N/NE (C) are more similar than the *Tramuntana* mountains (T) and the southern plains (S), which is understandable when taking into account that regions T and C are mountainous and share geographical and floristic characteristics[34,35,67]. Some examples that help to explain the link between higher similarity of plant-use reports and plant landscape type among the mountainous areas are the citation of more and analogous uses for *Quercus* sp. and *Juniperus* sp. (wild species), as well as *Lonicera implexa* Ait. The citation of more cultivated taxa in the C and S areas, such as *Triticum* sp., *Allium* sp. and *Prunus* sp., could also explain their similarities. Use reports cited only in a particular area do not represent a high number of citations, such that they would not influence the differences between areas. For example, *Crithmum maritimum* L.

has only been cited in C area, *Taxus baccata* L. in T area, and no unique species has been cited only in S area. On the other hand, the most cited species considering all the areas and all the informants are *Santolina chamaecyparissus* L. subsp. *chamaecyparissus* for digestive diseases, *Vicia faba* L. as a traditional legume for cooking, and *Olea europaea* L. var. *europaea* as antihypertensive, for oil preparation and used as an excipient for folk remedies.

## Conclusions

In this first attempt of a comparative study of ethnobotanical data in Mallorca we have departed from the following premises: (1) working in the same research domain (useful plants), (2) judging the same research dimension (knowledge), (3) using the same method for data collection (semistructured interviews), and (4) analysing our data with the same method (Sørensen index). The preliminary results have revealed qualitative differences among three natural regions of the island, so we cannot predict a completely homogeneous Mallorcan ethnobotanical knowledge.

Although further efforts are needed, the chosen multidisciplinary methodology guides us to an interesting path towards understanding differences of ethnobotanical knowledge in a territory. We consider this methodology an innovative tool in ethnobotanical research, constituted by an anthropological method (which in fact, as an additional indication of multidisciplinarity, is partly based on an ecological index).

Theoretically, we could state that the potential use of all of the plants is the same throughout a given region (plants are what they are and their use possibilities all over would be similar). Consequently, what does differentiate the plant use in any place, even on a small-scale level, is the difference of the particular history, the social characteristics, and the living conditions of the area (apart from floristic aspects, among which plant presence and availability is the most evident one).

In order to reinforce the conclusions of this approach with a general methodological focus, the comparison should be extended to other informants and to other regions of the same linguistic and cultural area. The ongoing projects[19,44] and the database mentioned above on ethnobotany of Catalan-speaking territories will allow us to test the method presented here on a much larger scale.

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*E. Carrio*

*University of Barcelona, Faculty of Pharmacy, Laboratory of Botany, Av. Joan XXIII s/n, 08028 Barcelona, Catalonia, Spain*
*e-mail: e.carrio@ub.edu*

## ETNOBOTANIKA MALLORKE (OTOCI BALEARA): MULTIDISCIPLINARNI PRISTUP

## S A Ž E T A K

U ovom radu pružili smo neke osnovne metodološke i praktične ideje o usporedbi znanja o bilju među različitim prethodno određenim prirodnim regijama mediteranskog otoka Mallorce, u okviru tekućeg projekta u ovom području. Konačni cilj ovog rada je ponuditi alata za otkrivanje do koje je mjere znanje o o bilju slično u različitim regijama. Koristili smo neuobičajen pristup etnobotaničkim studijama u smislu multidisciplinarne tehnologije. Naše argumente temeljimo na metodama socijalne antropologije, koristeći indeks različitosti (Sørensenov koeficijent sličnosti), i objašnjavamo botaničku stranu istraživanja. Naši preliminarni rezultati otkrili su nekoliko razlika među tri prirodne regije na otoku, za koje vjerujemo da se objašnjenje može pronaći u geografskom, botaničkom i kulturalnom aspektu.