Research Signpost
37/661 (2), Fort P.O.
Trivandrum-695 023
Kerala, India

Recent Advances in Pharmaceutical Sciences IV, 2014: 119-132 ISBN: 978-81-308-0554-2
Editors: Diego Muñoz-Torrero, Manuel Vázquez-Carrera and Joan Estelrich

8. Back to the island of calm: Mallorcan human traditional medicine and ethnobotany

Esperança Carrió and Joan Vallès[1]
[1]*Laboratori de Botànica, Facultat de Farmàcia, Universitat de Barcelona, Av. Joan XXIII sn, 08028-Barcelona, Catalonia, Spain*

[…] segueix-me a una illa que et diré, a una illa on sempre hi fa calma, on els homes mai porten pressa, on les dones no es fan mai velles, on no es malgasten ni paraules, on el sol hi fa més estada i on fins la senyora Lluna camina més a poc a poc, encomanada de la mandra. [1]

Abstract. This study reveals that a successful ethnobotanical survey can take place still nowadays, even close to one of the hotspots of tourism in the Mediterranean coast. This is the first approach in this field entirely based on interviews with local people in Mallorca. An amount of 235 informants has been inquired from all the 53 municipalities of the island. The data collected have been analyzed from the botanical and ethnographical points of view, and managed using the online platform of our research team (details at www.etnobiofic.cat). The Mallorcan ethnopharmacopoeia includes 255 plant taxa referring more than 150 medicinal use categories. Ethnomedical queries as the one here presented contribute to the knowledge of the traditional use of plants of the island and appreciate the benefits of this knowledge, applied to the present and future of its society.

Correspondence/Reprint request: Dr. E. Carrió, Laboratori de Botànica, Facultat de Farmàcia, Universitat de Barcelona. E-mail: esperanca@mallorcaweb.net

Introduction

In 1922, Santiago Rusiñol, a Catalan painter and writer, published a book called *L'illa de la calma* (the island of calm) [1], describing Mallorca as a paradise for peace and seclusion. Those days, Mallorca was turning from being one of the Spain's poorest regions to one of the classiest vacation spots on the Mediterranean. It exploded in the 1970s as a package-tourism destination, and nowadays is one of the most expensive parts of Spain, a favourite hangout for film stars and celebrities. With the island's identity shifting so dramatically, would it not be hard to get to know the "real" Mallorca? One of the answers can be found looking into the ethnobotanical keyhole.

Since its first definition [2], ethnobotanical research was targeted to tropical and subtropical cultures, sometimes as a consequence of colonial interests, but surely due to their floristic richness and their tightened relationship between ethnic groups and natural environment [3-6]. There is a fact, though, that overcame to the expansion of ethnobotanical surveys horizons: traditional societies from developed and touristic countries are keeping and preserving valuable plant use knowledge (orally transmitted across generations). Recent investigations of our research group (details available at www. etnobiofic.cat) pay attention to environments closer at hand for Europeans, which are also rich and varied in biodiversity as well as in cultural traditions [7].

Although over the last few years a significant number of contributions have been made in the Mediterranean basin (for instance, [8-12]), the current Mediterranean ethnobotany (and specifically the ethnopharmacological knowledge) is still an outstanding study item, despite the growing acculturation on this topic among citizens. Likewise, there is a need for urgent action to rescue traditional plant medicines before they are forever forgotten [13]. For that reason, the establishment of ethnofloristic catalogues or plant ethnopharmacopoeias could well help citizens and scientific communities to acquire further knowledge (as well as security and efficacy) about their traditional therapies, which are sometimes combined with conventional drugs. The shared ethnobotanical knowledge (regarding the species used repetitively over time and/or geographical space) provides a part of the scientific evidence of information and opens further possibilities to the study of transcultural ethnobotany as well as to that of ethnobotanical heritage within communities themselves [14]. A solid ethnographic basis brings meaningful results and makes easier the intellectual challenge of returning to the society the research findings in an understandable way [15, 16].

This paper summarizes the (re)discovery of Mallorca from the ethnobotanical point of view, summing up the outstanding ideas of a PhD

project carried out from 2008 to 2013 [17]. This work belongs to a series of ethnobotanical studies on Catalan-speaking territories linked to the Etnobiofic research group [7, 10, 18, 19]. These studies share the common objective of contributing to the existing knowledge on plant biodiversity (taking into account that the biological diversity also concerns the human awareness about uses, applications and natural resources conservation) and making it available for further social and scientific interventions.

1. The study area and the ethnobotanical context

The present ethnobotanical study takes place in Mallorca, the largest island in the Mediterranean Balearic archipelago and the seventh largest in the Mediterranean, located towards the east of the Iberian Peninsula (Fig. 1). The climate in Mallorca is typically Mediterranean [20]. Rullan [21] divides the island in three main natural (geobotanical) regions: (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 (Fig. 1).

Around 870,000 inhabitants live in Mallorca [22]. Since the 1960's Mallorca has depended on tourism as the main 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 the percentage of people actively engaged in this sector (data from [22, 23]) 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.

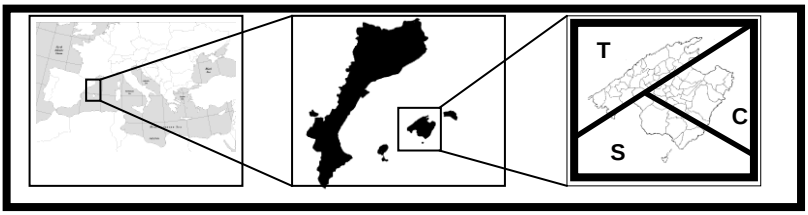

Figure 1. Location of the studied island in the Mediterranean Sea and the Catalan linguistic area, and the three main natural regions in Mallorca proposed by [21].

Ethnobotanical studies in Mallorca were practically lacking before this work. Distinguished botanists around the world have visited Mallorca at least since 1711 [24, 25] and its flora and vegetation have been described in many publications [26]; recent catalogues refer the complete list of plant species known so far from the island [27, 28]. Although ethnobotanical notes in the aforementioned floristic works are scarce, two of the classical Mallorcan floras include bibliographic information (and, in a few cases, data from popular knowledge) on useful Mallorcan plants [29, 30]. There is also an outstanding selection of 152 taxa of Balearic medicinal plants from a Catalan pharmacist established in Mallorca [31] and an informative dossier of 150 useful plants from a local botanical garden [32]. Also, some contributions, mostly from the linguistic and anthropological side, have been published [32-35], and they broadly address the use of plants in the field of health (medicine and/or food). Thus, the present work is intended to represent a starting point for the first systematic ethnobotanical study in the island, addressing the traditional use of medicinal plants in Mallorca.

2. Data collection procedures, management and analysis

Information has been gathered using semi-structured, focalized interviews with people who work and live close to plants. Data have been compiled from 235 non-specialist informants queried in all the 53 municipalities of the island, some of them in small groups, but normally through one-to-one meetings. Of those interviewed, 43% are women and 57% are men. The interviewee's mean age was 76, born mainly between 1931 and 1940. Almost all the informants were autochthonous of the island (97%), 89% of them retired. Methodological details, including herbarium vouchers - deposited in the herbarium BCN, Centre de Documentació de Biodiversitat Vegetal, Universitat de Barcelona -, are provided in [16, 17].

The medical issues dealt with informants during interviews were: (1) plants or preparations still used nowadays, (2) plants or preparations used in the past, (3) plants or preparations linked to festivities, (4) toxic plants or preparations, and finally (5) specific disorders and their treatment with plants. Other items, apart from human medicinal uses, were also treated: veterinary ailments, food and aromatic plants, and other applications of plants (such as in popular literature, handcraft, domestic uses, etc.).

To ensure an organized pool of the gathered information from interviews, our research group's online internal database has been used, permitting the systematization of data entry and further analysis. This database has been designed as an open source interface, a constantly growing platform for ethnobotanical data collected in Catalan-speaking

territories. Information for the descriptive quantitative analysis was handled using the R software (r-project.com).

Some classical quantitative ethnobotanical indices have been calculated (see all indices and definitions in [7] and [10]). The cultural importance index (CI) has also been determined [36]. Each taxon referred by an informant within a medical use-category has been counted as a use-report (UR). The use of popular indices of relative or cultural importance in Ethnobotany [4] has been designed to quantify local botanical knowledge, and it has been valuable giving an ethnographical shift to deepen into plant traditional knowledge understanding.

Finally, to determine the degree of originality and novelty of the medicinal uses claimed by the informants, a review of the literature referring to Ethnopharmacology in the Mediterranean region has been carried out. International online databases (pfaf.org/index.php and ars-grin.gov/duke/) have also been consulted (last access to online databases 14.10.2011).

3. The Mallorcan ethnopharmacopoeia

General catalogue: Botanical and galenic aspects

The whole ethnobotanical catalogue of Mallorca includes 517 plant taxa. Referring to human medicine, a total of 1811 remedies involving 255 plant taxa were collected as traditionally used in human healing (cited for at least three independent informants; [37, 38]). Wild species predominate (137), but the presence of plants cultivated or bought through commerce is significant. The 517 plant taxa of the whole catalogue belong to 114 botanical families, and the three most relevant families much contributing to the medicinal flora of Mallorca are the Lamiaceae (10%), Rutaceae (9.8%, especially owing to cultivated species) and Asteraceae (9%), which at the same time represent the most common botanical families, apart from Poaceae, of the Mediterranean flora [28]. This statement connects with the idea that the closer to civilization a plant grows, the more it is used by local people [10, 38, 39, 40]. The complete ethnofloristic catalogue and most remarkable human and veterinary medicinal uses are provided in [7, 16, 17]. Here we will discuss general aspects of this dataset and we will provide, as a complement, the uses of Mallorcan endemic plants (Table 1 and subheading 5).

For the whole island, the ethnobotanicity index (EI) is 28%, 1674 taxa being an approximate count of the vascular flora [27]. Compared with other Catalan-speaking territories, this EI value is higher than in Cerdanya, Conflent, High River Ter Valley and Guilleries [41-44], but lower than in Alt Empordà, Montseny, Pallars and Castelló [45-48].

Table 1. Names and ethnobotanical knowledge or uses of Mallorcan endemic plants.

Taxon (family)	Catalan names	Knowledge / Uses
Arum pictum L. (Araceae)	-	The informants only know the occurrence and the habitat of this plant
Astragalus balearicus Chater (Fabaceae)	Coixinet de monja	The informants only know the occurrence and the morphology of this plant
Buxus balearica Lam. (Buxaceae)	Boix	Appetiser, refreshing. Melliferous. Ornamental. For home implements elaboration
Digitalis minor L. (Plantaginaceae)	Didalera	Cardiotonic. Toxic
Erodium reichardii (Murray) DC. (Geraniaceae)	Eròdium	The informants only know the occurrence and the habitat of this plant
Euphorbia maresii Knoche (Euhorbiaceae)	-	The informants only know the occurrence and the habitat of this plant
Hippocrepis balearica Jacq. (Fabaceae)	Viola de penyal. Violeta de penyal	Used in folk literature. Used as a nitrogen fixative in cultivated fields
Hypericum balearicum L. (Clusiaceae)	Estepa joana	Antirheumatic, hypoglycemiant, antidepressive. Insect repellent
Launaea cervicornis (Boiss.) F. Q. et Rothm. (Asteraceae)	Gatovell	For domestic uses (to prevent animals to enter water reservoirs and to filter its water for big particles)
Paeonia mascula (L.) Mill. subsp. *cambessedesii* (Willk.) O. Bolòs et J. Vigo (Paeoniaceae)	Palònia de Boca. Peònia	Used in folk literature
Phlomis italica L. (Lamiaceae)	Estepa blenera	To clean teeth. To substitute wicks in old oil lights
Pinus halepensis Mill. var. *ceciliae* (A. et L. Llorens) L. Llorens (Pinaceae)	Pi	The informants only know the occurrence and the habitat of this plant
Rhamnus ludovici-salvatoris Chodat (Rhamnaceae)	Aladern. Llampúdol. Llampúdol bord. Rotaboc	Ornamental
Rosmarinus officinalis L. var. *palaui* O. Bolòs et Molinier (Lamiaceae)	Romaní	Ornamental
Santolina chamaecyparissus L. subsp. *magonica* O. Bolòs, Molinier et P. Monts. (Asteraceae)	Camamil·la. Camamil·la de Maó. Camamil·la de sa muntanya. Camamil·la mallorquina. Mançanilla.	Analgesic, antiamenorrhoeal, antidiarrhoeal, antidysmenorrhoeal, antieczematose, antispasmodical, antiinfluenzal, antihelminthic, antihypertensive, gastric anti-inflammatory, antiseptic (ocular, puerperal, urinary) antitussigene, digestive, renal lithotripter, stomachic, salutiferous, tranquilliser, vulnerary. Toxic. Used to prepare herb liquors and refreshing beverages. Condiment. Ritual religious use. Air perfuming. Insect repellent. Used to separate zones in the homegarden
Scabiosa cretica L. (Dipsacaceae)	Col de penyal	The informants only know the occurrence and the habitat of this plant, and its endemic character
Smilax aspera L. subsp. *balearica* Willk. (Smilacaceae)	Aritja	Used in pig-killing to singe lightly. Used as filling to elaborate mattresses

The top five medicinal species cited with the greatest number of use-reports (in brackets) are *Olea europaea* L. subsp. *europaea* (78), *Santolina chamaecyparissus* L. (76), *Eucalyptus globulus* Labill. (65), *Ruta chalepensis* L. (61) and *Allium sativum* L. (54). This order also corresponds to the CI index global values for these top five species: 1.09, 0.99, 0.45, 0.68 and 0.78 respectively. Although not all the papers include CI values, a quick review of other works [35, 49], shows that top species have CI 0.6 – 0.7, so *Olea europaea* subsp. *europaea* and *Santolina chamaecyparissus* are for the local people culturally more important than top species in other territories. It is outstanding that an endemism appears as one of the top species of the ethnomedical catalogue of the island. Table 1 includes detailed results for all the useful endemic plants collected for this study.

When compared with previous ethnobotanical research in Catalan territories [39, 40, 50-53], several medicinal species appear at the top of the most cited medicinal plants in every territory studied (generally *Thymus vulgaris* L., *Matricaria chamomilla* L. and *Sambucus nigra* L.) [10]. This assertion leads us to conclude that general ethnobotanical results cannot be extended to all the Catalan-speaking areas. Other studies in the Mediterranean region have earlier concluded that it is hard to demonstrate a common ethnobotanical heritage throughout the whole Mediterranean without considering floristic or bioclimatic characteristics [17, 18, 54, 55].

Plant organs most commonly used for remedy preparation are leaves (20%), aerial parts (15%) and fruits (9%). Generally these are the plant parts that allow an easier identification to informants, so that they feel more confident to start with preparation.

The commonest methods of preparation in Mallorca are infusion and decoction, generally known as *bullidures* (by boiling in water), and the widest pharmaceutical form is tisane (42%), followed by the direct application of the plant part (14.5%) and then poultices and cataplasms (14%). The preferred administration way for traditional remedies is intern (69.13%). This pattern of preparations is generally the same as many previous Catalan ethnobotanical works [10].

Plant uses and informants' knowledge about popular medicine

A total of 158 use categories have been recorded for the 255 medicinal plants, according to the thesauri of the Etnobiofic database created by our research group, which was constructed following Cook's classification [56], emended and adapted to our field areas of study. The most frequent type of

medicinal use recorded, having calculated the index of medicinal importance (MI, the ratio between the number of use-reports referring to a category and the total of taxa that are used for a specific indication; [7]), is the antihelmintic (for intestinal worms) (8.64), followed by the tranquillizer (6.65), the gastric anti-inflammatory (6.40), the anticatarrhal (5.13), the antihypertensive (4.98) and the renal litothripter (3.54).

These are slightly different results from other studied areas of the Iberian Peninsula and the Mediterranean territory, which explain that the majority of remedies described by the interviewees refers to the treatment of mild ailments related to the skin, the respiratory and digestive systems [49], and also from very recent works in Turkey, where respiratory and throat diseases, gastrointestinal diseases, and kidney stones and urinary diseases represent more than 50% of use citations [57]. For the top categories in Mallorca, dermatological references are lacking.

Apart from the aforementioned quantitative information, there are also many data not included in the ethnopharmacological catalogue that also explain the Mallorcan ethnomedical cosmovision. This knowledge has been reported by the informants during interviews, and managed apart from the plant use-reports pool. It mainly refers the popular process of medical aid in the rural Mallorca. It does not only include plant knowledge, but also the use of animal and mineral derivatives (such as lard, all kind of waxes, seashells, etc.). The whole process against illness has been exposed by several informants of the study and also by Galmés [34] as a stepped and casuistic timeline: first the most well-known remedies were applied, the ones that were at hand and everyone knew. If the first option was unclear, they asked a neighbour or a relative that could know it. The next step of query was the local healer, sometimes the doctor, and if it still did not work, they went for a healer from another village or from the capital town, specialized with the particular ailment. Depending on the disease, it was told to a wizard or sorcerer. If nothing was successful, the last hope was to entrust to the saint specific for the ailment; it was a pray or a promise. Religion, after all, and the catholic beliefs in Mallorca, had an outstanding significance during the curative process of an illness.

4. In addition to traditional medicine: Edible plants and other uses

A total of 199 plant taxa were cited as human food plants and 72 for other uses such as crafts, popular literature and religious beliefs. Out of all taxa mentioned as food in humans (199), 67% are grown or purchased and

the remaining are wild. An amount of 714 use-reports was unique. The most cited species is *Foeniculum vulgare* Mill., due to its properties for cooking, followed by fruits of *Arbutus unedo* L., usually consumed fresh without preparation, *Capsicum annuum* L. and *Laurus nobilis* L. as condiments and *Rubus ulmifolius* Schott and *Cichorium intybus* L., eaten fresh or in pies and salads.

There is a remarkable amount of plants (146 taxa) claimed to be useful both for food and medicine, and 19% of medicinal plants are also used as condiment. The coincidence with the data on food plants in previous works is almost complete, there is very little new in Mallorca, with the exception of species that are endemic to the island or that grow more abundantly than in other studied areas; it is worth mentioning *Ampelodesmos mauritanica* (Poiret) T. Durand et Schinz, some mallows (*Lavatera arborea* L. and *L. cretica* L.), *Allium triquetrum* L. and *Salvia microphylla* Humb., Bonpl. & Kunth. Numerous citations (103) were also collected for 62 taxa for plant use in animal feed. The above-mentioned plants refer to the fattening of pigs - which in turn is one of the main food products in Mallorca - and are *Ceratonia siliqua* L., *Opuntia maxima* A.Berger and *Ficus carica* L.. The gathering of information on wild edible plants served as the starting point for a wider study (Iberian Peninsula and Balearic Islands) in preparation, the hypothesis of which is that the socio-cultural factors (rather than ecological) are responsible of changes in consumption patterns, harvesting and marketing of wildlife plants.

Informants cited 72 taxa for which one must be careful when using them, both as medicine and food, with a total of 323 reports. Most of the information is related to the taking of the plant internally with a low degree of toxicity. After the ethnobotanical literature review of previous works, we conclude that the local knowledge of harmful or toxic plants is quite uniform and does not vary much with respect to the current bibliographic knowledge.

For uses that are neither food nor medicine (including toxicity), informants cited 351 taxa and 1142 unique use-reports. The most repeated use subcategory is horticultural and agricultural handling, and the most notable species is *Asphodelus aestivus* Brot., especially linked to the production of reeds for drying fruits of *Ficus carica*. Twenty seven taxa are shared when comparing the results of other uses in Mallorca with some of the studies carried out in Catalonia [43, 45, 46]. The inclusion of such different uses for food and medicinal ethnobotanical studies gives an idea of the social importance of plants in the past, at least partly surviving nowadays.

5. The relevance of insularity and the basis for a meta-analysis of ethnobotanical data in the Catalan linguistic area

There are two aspects to be considered when assessing the relevance of insularity. First, the traditional use of endemic taxa among the autochthonous population and, second, the singularity of the plant knowledge (new or scarcely cited plant uses compared with other studies previously documented in closer territories, especially Mediterranean in this case).

The degree of knowledge or use of endemic local taxa in Mallorca has been calculated using the index of phytoethnoendemicity (PEEI), proposed by Mesa [58]; it determines the ratio between the endemic plants and the total ethnoflora. PEEI calculation allows the evaluation of the singularity of the plant use along the study area and also the isolation of population (the more endemic taxa are used, the most knowledgeable the inhabitants are about their closest environment). The PEEI of this study is 3.29%, a low value compared to [59] - 11.37% -, taking into account that in Mallorca more than 100 endemic plant taxa are known and the insularity factor benefits self-management. Apart from values of the mentioned index, it is worthy of mention that the absolute value of known and used endemic species (Table 1), 17, is rather high. The percentage of this kind of plants that the informants know or use as compared with the total amount of endemic insular taxa (ca. 15%) is not negligible - even less taking into account that some endemic taxa have an extremely restricted distribution are, so that they are *a priori* not suitable as objects of popular use - and indicates remarkable level of knowledge on the proper specific island's flora among their inhabitants.

The set of novelty of Mallorcan ethnobotany, based on the consult of more than 200 works with ethnobotanical information mostly in the Mediterranean area (see [17], for details), is composed by 38 rarely reported taxa and 306 use-reports not appearing in the literature considered or recorded in less than three works.

6. Conclusions and future prospects

This work summarizes the first comprehensive ethnobotanical study in Mallorca based on the PhD thesis titled "Contribution to the ethnobotany of Mallorca. Plant biodiversity and its management in a Mediterranean island" [17]. It is an important contribution to increase the ethnobotanical data available of the Catalan-speaking territories, and it will be part of further

analysis covering all the information of our research group. Ethnobotanical studies like this are, on the one hand, a useful tool for public health authorities to facilitate and enhance the detection and prevention of interactions and other problems resulting from combined medicinal plants and synthetic drugs, as well as to ensure accurate pharmaceutical advice and prescription by health professionals. On the other hand, they constitute the first step of a bioprospecting process, which may be the basis for new drug research and development.

Informants continue to use natural therapies learned from past times, especially for minor ailments (digestive, respiratory, etc.), and are receptive to learn new ones. The natural therapies are taken, in most cases, as a complement to conventional drugs. However, many of the collected use reports have stopped their usage in the present social setting due to sociocultural changes. Therefore, their collection prior their loss is very important, not only as cultural heritage, but also as a possible source of new medicines both for animals and for people.

The collected information, which may open new perspectives of plant use, is a good starting point for future studies, in both applied scientific research (especially related to ethnopharmacological activities of plants) and social research. In Mallorca, ethnobotanical intergenerational dialogue among citizens is necessary because the pressure of acculturation on the subject of plants, their names and their traditional uses is very remarkable.

Acknowledgements

Thanks to all the informants who were willing to share with us their time and knowledge of plants. E.C. benefited from a pre-doctoral grant from the Spanish Ministry for Education, Culture and Sport (AP2007-00766). Both authors are members of GReB (from the abbreviation in Catalan of: Plant Biodiversity and Biosystematics Research Group), from which they received some funding (project 2009SGR0439, Generalitat de Catalunya, Catalan government). This research has also been funded by the Spanish Ministry for Economy and Competitiveness (project CSO2011-27565).

References

1. Rusiñol, S., 1922 (ed. 2002), *L'illa de la calma*, Impremta Politècnica, Palma.
2. Harshberger, J.W. 1896, *Bot. Gaz.*, 21, 146.
3. Centre d'Information et de Réflexion sur l'Environnement Végétal, 1979, *Enquête sur la médecine populaire par les plantes. Le questionnaire et son*

emploi. Annexes explicatives pour un bon usage des fiches, bibliographie. Imprimerie des petites affiches, Digne.
4. Martin, G.J., 1995, *Ethnobotany: a methods manual*. Chapman and Hall, London.
5. Schultes, R.E., von Reis, S., 1995, *Ethnobotany: Evolution of a discipline*. Chapman and Hall, London.
6. Alexiades, M., 1996, *Selected guidelines for ethnobotanical research. A field manual.* New York Botanical Garden, Bronx (NY).
7. Carrió, E., Vallès, J., 2012a, *J Ethnopharmacol*, 141(3), 1021, and references therein.
8. Şimşek, I., Aytekin, F., Yeşilada, E., Yıldırımlı, Ş., 2004, *Econ. Bot.*, 58, 705.
9. Pieroni, A., Quave, C. L., 2005, *J. Ethnopharmacol.*, 101, 258.
10. Parada, M., Carrió, E., Bonet M.A., Vallès, J., 2009, *J. Ethnopharmacol.*, 124, 609.
11. Benítez, G., González-Tejero, M. R., Molero-Mesa, J., 2010, *J. Ethnopharmacol.*, 129, 87.
12. Leonti, M., Cabras, S., Weckerle, C.S., Solinas, M.N., Casu, L., 2010, *J. Ethnopharmacol.*, 130, 379, and references therein.
13. Ramírez, C.R., 2007, *Ethnobot. Res. Appl.*, 5, 241.
14. Reyes-García, V., Martí, N., Macdade, T.W., Tanner, S., Vadez, V., 2007, *J. Ethnobiol.*, 27, 182.
15. Berlin, E.A., Berlin, B., 2005, *Field Methods*, 17, 3:235.
16. Carrió, E., Vallès, J., 2012, *Col. Antropol.*, 36, 1027.
17. Carrió, 2013, *PhD thesis*, Universitat de Barcelona, Barcelona.
18. Parada, M., Carrió, E., Vallès, J., 2011, *J. Appl. Bot. & Food Qual.*, 84, 11.
19. Carrió, E., Rigat, M., Garnatje, T., Mayans, M., Parada, M., Vallès, J., 2012, *EB Compl. Alt. Med.*, 896295.
20. Riba, O., De Bolòs, O., Panareda, J.M., Nuet, J., Gosàlbez, J.,1979, *Geografia física dels Països Catalans: Principat de Catalunya, País Valencià, Illes Balears*, Ketres, Barcelona.
21. Rullan, O., 2002, *La construcció territorial de Mallorca*, Editorial Moll, Palma.
22. IBESTAT, 2010, *Les Illes Balears en cifres*, Institut d'Estadística de les Illes Balears, Palma.
23. INE, 2010, *Instituto Nacional de Estadística*, Madrid.
24. Ibáñez, N., Montserrat, J.M., Soriano, I., Camarasa, J.M., 2006, *Notes & Rec. Royal Soc.*, 60, 241.
25. Payeras, A., 2006. *But. Soc. Hist. Nat. Bal.*, 49, 155.
26. Rosselló, J.A., Sáez, L., 2000, *Collect. Bot.*, 25, 3, and references therein.
27. Pla, V, Sastre, B., Llorens, L., 1992. *Aproximació al catàleg de la flora vascular de les Illes Balears*, Universitat de les Illes Balears, Jardí Botànic de Sóller, Palma.
28. Bolòs, O. de, Vigo, J., Masalles, R.M., Ninot, J.M., 2005, *Flora manual dels Països Catalans*. Ed. Pòrtic, Barcelona, 3rd ed.
29. Barceló, F., 1879-1881. *Flora de las islas baleares seguida de un diccionario de los nombres baleares, castellanos y botánicos de las plantas espontáneas y de las cultivadas*. Gelabert, Palma.

30. Bonafè, F., 1977-1980. *Flora de Mallorca* (volums I, II, III, IV). Editorial Moll, Palma.
31. Palau, P.C., 2005, *Les plantes medicinals baleàriques*. Editorial Moll, Palma.
32. Sóller Botanical Garden, 1999, *Plantes de les Balears: 150 espècies útils per a l'home*. Edited by Sóller Botanical Garden and distributed by Diario de Mallorca, Sóller.
33. Aguiló, C., 1975, *Remeis d'un temps. Almanac per a l'any 1976-1979*. Edicions Fundació Mossèn Cosme Bauçà, Felanitx.
34. Galmés, A., 1976, *La medicina popular a Mallorca*, Al Mayurqa, Palma.
35. Gelabert, M., Niell, F., Ramis, A., Sureda, J., Sureda, P., 1990, *L'obra de palma: cistelles, graneres i cordats*, Edicions Sa Nostra, Caixa de Balears and Conselleria de Comerç, Indústria del Govern Balear, Palma.
36. Tardío, J., Pardo de Santayana, M., 2008, *Econ. Bot.*, 62, 24.
37. Le Grand, A., Wondergem, P. A., 1987, *J. Ethnopharmacol.*, 21, 109.
38. Johns, T., Kokwaro, J.O., Kimanani, E.K., 1990, *Econ. Bot.*, 44, 369.
39. Bonet, M.À., Parada, M., Selga, A., Vallès, J., 1999, *J. Ethnopharmacol.*, 68, 145.
40. Bonet, M.À., Vallès, J., 2003, *J. Pharm. Pharmacol.*, 55, 259.
41. Muntané, J., 1991, *PhD thesis*, Universitat de Barcelona, Barcelona.
42. Muntané, J., 2005, *PhD thesis*, Universitat de Barcelona, Barcelona.
43. Rigat, M., 2005, *MSc thesis*, Universitat de Barcelona, Barcelona.
44. Selga, A., 1998, *MSc thesis*, Universitat de Barcelona, Barcelona.
45. Parada, M., 2007, *PhD thesis*, Universitat de Barcelona, Barcelona.
46. Bonet, M.À., 2001, *PhD thesis*, Universitat de Barcelona, Barcelona.
47. Agelet, A., 1999, *PhD thesis*, Universitat de Barcelona, Barcelona.
48. Mulet, L., 1991, *Estudio etnobotánico de la provincia de Castellón*, Diputació de Castelló, Castelló de la Plana.
49. González, J.A., García-Barriuso, M., Amich, F., 2010, *J. Ethnopharmacol.*, 131, 343.
50. Agelet, A., Vallès, J., 2001, *J. Ethnopharmacol.*, 77, 57.
51. Agelet, A., Vallès, J., 2003, *J. Ethnopharmacol.*, 84, 211.
52. Agelet, A., Vallès, J., 2003, *J. Ethnopharmacol.*, 84, 229.
53. Rigat, M., Bonet, M.À., Garcia, S., Garnatje, T., Vallès, J., 2007, *J. Ethnopharmacol.*, 113, 267.
54. Pieroni, A., Giusti, M.E., de Pasquale, C., Lenzarini, C., Censorii, E., Gonzáles-Tejero, M., Sánchez-Rojas, C.P., Ramiro-Gutiérrez, J.M., Skoula, M., Johnson, C., Sarpaki, A., Della, A., Paraskeva-Hadijchambi, D., Hadjichambis, A., Hmamouchi, M., El-Jorhi, S., El-Demerdash, M., El-Zayat, M., Al-Shahaby, O., Houmani, Z., Scherazed, M., 2006, *J. Ethnobiol. Ethnomed.*, 2:16.
55. González-Tejero, M.R., Casares-Porcel, M., Sánchez-Rojas, C.P., Ramiro-Gutiérrez, J.M., Molero-Mesa, J., Pieroni, A., Giusti, M.E., Censorii, E., de Pasquale, C., Della, A., Paraskeva-Hadijchambi, D., Hadjichambis, A., Houmani, Z., El-Demerdash, M., El-Zayat, M., Hmamouchi, M., ElJohrig, S., 2008, *J. Ethnopharmacol.*, 116, 341.

56. Cook, F., 1995, *Economic Botany Data Collection Standard*. Royal Botanic Gardens, Kew.
57. Cakilcioglu, U., Khatun, S., Turkoglu, I., Hayta, S., 2011, *J. Ethnopharmacol.*, 137, 469.
58. Mesa, S., 1996, *Mon. Jard. Bot. Córd.*, 3, 69.
59. Benítez, G. 2009, PhD thesis, Universidad de Granada, Granada.