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Traditional Knowledge and Biocultural Heritage about Medicinal Plants in a European Transboundary Area (La Raya: Extremadura, Spain—Alentejo, Portugal): Transdisciplinary Research for Curriculum Design in Health Sciences

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Abstract: Traditional knowledge about medicinal plants, and the biocultural heritage derived from them, can be a useful tool for curricular design in health sciences. Research on this topic oriented toward university students has an interesting potential from a multidisciplinary or transdisciplinary treatment. This field allows for establishing relationships between socioeconomic and environmental problems and the health and well-being of people from the perspective of the intangible heritage of rural communities. On the other hand, traditional knowledge draws from very diverse sources such as empirical, magical, and religious components, primitive medicines, and even from academic medicine itself when it ceases to be scientific. Methodological triangulation is used in terms of data (times, spaces, and people), as well as researchers from different areas of knowledge integrating approaches with an interpretive purpose. Located in a European transboundary territory, the study area contains the mountain ranges of Alor (Spain) and São Mamede (Portugal), two cross-border areas where key informants have been interviewed. The observation unit is people who perform traditional practices to gather natural products, and other randomly selected informants. The study was completed with information collected from the undergraduates of the Escola Superior de Saúde de Portalegre (Portugal). The purpose of this work was to highlight the application of traditional knowledge based on medicinal plants in university studies of health sciences. Based on the results obtained and an epistemological discussion, we propose an educational intervention to broaden the professional mindset from a biocultural perspective. Our proposal directs the student's gaze toward the investigation of medical history and biocultural heritage to understand the determinants of health and to respect the idiosyncrasies of their communities.

Keywords: ethnomedicine; cultural history; philosophy of science; culture of care; education in health sciences; history of science

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1. Introduction

Traditional knowledge about medicinal plants, and the biocultural heritage derived from them throughout history, can be a useful tool for curriculum design in health sciences. Moreover, they represent a pathway closely related to self-care, self-medication, and even pharmaceutical preparation in magistral formulas as an alternative to medicines and their collection in the field, which is not without risk [1–3]. In this sense, research on this topic oriented toward the teaching and learning processes of secondary school or university students has an interesting potential from a multidisciplinary or interdisciplinary and transdisciplinary approach [4–8]. It must be considered that its teaching and study enable the development of key transversal competencies to achieve sustainable development goals. On the other hand, it allows work on the context, reflection, and action from critical positions, establishing interrelationships with social, economic, environmental, local, and global problems from the perspective of the health and well-being of people based on the intangible heritage of the communities themselves [9–14].

Thus, within the healthcare system, there are controversies and professional discussions around consumption, such as the dispensing and prescription of medicines or the application of therapies, which converge in self-care policies and pharmacovigilance. This includes the emergence of observatories to combat or understand pseudotherapies and pseudoscientific approaches from different fields, including understanding and comprehending what traditional knowledge is [15–19]. Thus, for several decades, there have been constant references ranging from holistic thinking to contrary mentalities that must be properly analyzed for health planning [20–25]. In this sense, it cannot be forgotten that there is a historical trend that has even been studied in nurses' attitudes during the Baroque [26]. Therefore, in a historical sketch through the philosophy of medicine or nursing, we find that the humanities can help solve this problem.

The important role of the history of science in understanding the crossroads between health and society using medicinal plants or holistic and complementary means, as well as in the teaching of health professionals, is evident [26–28]. Thus, for example, the history of nursing presents great professional identities with this profile, including Florence Nightingale, Eunice Inghan, Marta Rogers, Marie-Françoise Collière, Madeleine Leininger, Margaret Newman, Jean Watson, Dolores Krieguer, Rosemarie Rizzo Parse, and Rosette Poletti [29–31], which can be models on which to work in university classrooms to stimulate understanding of these social phenomena.

From this perspective, we justify an epistemological approach in university teaching in the field of health sciences and at the same time in the field of intangible cultural heritage. More explicitly, can models of heritage education with a transdisciplinary approach contribute to the professional identity and training of health professionals in the use of medicinal plants? Would it be appropriate to implement these contents in undergraduate and postgraduate courses? In our opinion, yes, especially considering the evolution that society is undergoing, and the ethnomedicine characteristics being a structure in continuous change and evolution through history.

In this way, updating this field should be an objective in all health professions. Thus, for example, professionals must assimilate the fact that medical records must record questions about patients' consumption habits of phytomedicines in a specialized way, and not in a generic or circumstantial way. Especially when it comes to dealing with the consumption of plants collected in the countryside, a practice that is still current and has increased as a consequence of the pandemic and with a rediscovery of traditional rural values. The return to the village, "the return to the roots as a source of health," must be considered from an epidemiological point of view, taking into account public health policies and assets. Thus, exploring the knowledge provided by plural medical systems can play an important role not only in health planning but also by incorporating an added value in health education or in improving the health of our elders by collaborating in active aging [32,33].

In any case, in line with these approaches, understanding the social and health value of herbal products collected in the field could contribute to strengthening the teaching and

learning processes in health sciences. Therefore, the purpose of this work was to highlight the application of biocultural heritage in these university studies. In addition, we have two specific objectives: (i) to contribute to the development of interdisciplinary approaches that pay attention to the dialogue of knowledge between science and traditions throughout history, and (ii) to propose an educational intervention that generates respectful attitudes toward different ways of understanding health and people's idiosyncrasies.

2. Materials and Methods

In a research work, it is necessary that the methodology that will accompany the study will allow researchers to achieve the objectives proposed. For this reason, our aims and interests have led us to use different types of procedures, sampling with strategies that do not correspond to quantitative or qualitative methods and instruments, but rather, we have carried out a methodological triangulation based on our objectives. It is important to highlight that studies based on methodological triangulation have experienced a boom in recent decades and their use in the field of scientific research represents a way of solving problems from a polyhedral view. Such triangulation refers both to the data (time, space, and people) and to researchers from different areas of knowledge, to a triangulation of various theoretical frameworks with an interpretative purpose or to the methods for obtaining the data [34–41].

To carry out this approach, a multidisciplinary team was formed with specialists in the health sciences, pharmacology, anthropology, ethnobiology, education, philosophy, and history of science. It should be noted that, following interdisciplinary and transdisciplinary approaches, the group formed, in turn, interacted with local communities, not as objects of study but as agents of knowledge in favor of well-being and health [6,7]. Consequently, the techniques employed are part of disciplines framed within cultural, epidemiological, anthropological, historical, and ethnobiological studies. Thus, this work requires the use of documentary sources from municipal archives, herbaria, and oral sources such as questionnaires and open, closed, semi-structured, and individual interviews in an integrated and transdisciplinary manner.

Based on this approach, a research project has been developed from November 2021 to October 2023 with the participation of an international multidisciplinary team [42]. It should be noted that the present work has as a background the studies on ethnobiology and ethnomedicine carried out in the Faculty of Medicine of the University of Extremadura (Badajoz, Spain) for the mapping of regional ethnomedicinal resources [43–49]. In this way, the questions that have guided this work have a transdisciplinary character and it is focused on the diagnosis of the type of knowledge that could be useful to a health professional based on their biocultural roots. Thus, the following scientific questions were fundamental:

1. How have rural communities arrived at the knowledge they have about the medicinal plants in their environment?
2. How are medicinal plants perceived, classified, used, and administered by these communities?
3. Do they establish traditional healing strategies with the plants in their environment?
4. What traditional knowledge would help strengthen curriculum designs in university health sciences studies?

Therefore, as stated above, the resolution of these questions requires participant observation, ethnographic recording, and the use of biological techniques from a transdisciplinary perspective. Thus, in the area under study, which is described in the following section, there are two protected enclaves of special interest: the Sierra de Alor (Spain) and the Serra de São Mamede (Portugal). In these areas, specialized informants were interviewed, the unit of observation being the people who carry out traditional work or frequent the mountain range to collect products from the fields.

In addition, we oriented our vision toward a learner-centered model of Heritage Education [50,51] and involved researchers from several careers, academics, and professions. In this way, the study was completed with ideas from students of the Escola Superior de

Saúde de Portalegre–ESS–(Portugal) through a questionnaire that included knowledge related to public health, self-care, consumption, and knowledge of medicinal plants.

2.1. Research Context and Participants

2.1.1. La Raya: Alor and São Mamede Mountain Ranges and Cross-Border Localities

In terms of the natural environment, our work has been carried out in two mountain ranges with great natural and cultural value: the Sierra de Alor, located in a cross-border area around La Raya, very close to the Spanish town of Olivenza (Badajoz, Extremadura) and the Portuguese town of Elvas (Portalegre, Alentejo), and the Serra de São Mamede, also on the Spanish-Portuguese border, near Valencia de Alcántara (Cáceres, Spain) and Portalegre (Alentejo, Portugal) (Figure 1).

Figure 1. Research geographical context. General map of the Transboundary Area (La Raya: Extremadura, Spain–Alentejo, Portugal): Sierra de Alor (Spain), Serra de São Mamede (Portugal) and selected cross-border localities.

The Sierra de Alor is included on the National List of the Natura 2000 Network (Dir. 92/43 EEC), specifically in the area known as "Sierras de Alor and Monte Longo." This is a territory designated as a Site of Community Interest (SCI), and which was also proposed as a Special Protection Area for Birds and Special Areas of Conservation according to the official forms of the Natura 2000 Network drawn up by the Directorate General for Nature Conservation of the Spanish Ministry of the Environment (DGCN-MIMAM) (see the Sierras de Alor and Monte Longo SCI at http://extremambiente.juntaex.es/, accessed on 13 October 2023).

The Serra de São Mamede is a mountain range protected as a Natural Park, the only one of its kind in the north of Alentejo, and it was created by Decree-Law no. 121/89 of 14 April 1989, with the aim of guaranteeing nature conservation. Its role is relevant as a model for making human activities compatible with the dynamics of ecosystems. It is the most important of the Alentejo, with a rich landscape, an enormous geological diversity, and an important floristic richness (see https://icnf.pt/, accessed on 13 October 2023).

The selected cross-border localities were the towns of Elvas, Campo Maior, Portalegre, Caia, Badajoz, Olivenza and its districts (San Benito de la Contienda, San Jorge de Alor, Santo Domingo de Guzmán, Villarreal, San Francisco, and San Rafael), La Codosera, and San Vicente of Alcántara (see Figure 1).

2.1.2. The Higher School of Health (Portalegre, Portugal)

The Escola Superior de Saúde of Portalegre (ESS-Higher School of Health), currently integrated with the Instituto Politécnico de Portalegre (IPP) (personal communication 2022, Prof. Sofia Roque), had its genesis in 1971 under Ordinance No. 232/71, which recognizes the need to increase the network of nursing schools in Portugal. It was inaugurated in 1972 with training for nursing assistants, being currently a school with an offer in training in health sciences that has 50 years of existence. It has 487 students in the current school year in different courses, the Undergraduate in Nursing being the most considerable group. After half a century of training in the health area, the historical heritage of nursing at the school is very strong, starting in 1975 with the General Nursing Course, passing through the Higher Nursing Education Course in 1990, also opening specialization courses in 1996, as well as the complementary year of training in nursing in 1999, verifying the transformation of the nursing teaching to the Degree Course in Nursing, also in 1999. This was preceded by the integration of the polytechnic higher education with the nursing training in 1998, but only since 2001 has the ESS been part of the IPP.

The school evolved from a building with a capacity for 60 students, with a boarding school for 40, with esthetic and artistic value thanks to the works of art by sculptors António Paiva and João Cutileiro, to a building with the original characteristics, but with internal restructuring that allowed a larger number of students to be accommodated. However, the growth was great, with several postgraduate degrees, higher professional technical courses, and a new degree in Oral Hygiene in 2010. The small "housing," as many called it, was already too small for the training given at the school. There was a need to change facilities so that it was not a lack of physical space that limited the growth, quality, or success of the ESS of Portalegre. This change was made to the Campus of the IPP in 2019. The school aimed at new qualifications in the area of health, such as master's degrees in nursing and professional higher technical courses, which are currently underway: 2 professional higher technical courses, 2 bachelor's degrees, 1 postgraduate degree, 1 Master's degree with 5 specializations and another with one, also allowing for a frequency of isolated curricular units (personal communication 2022, Prof. Sofia Roque).

2.1.3. The Informants

This research has involved 55 informants in various cross-border localities, of whom 20 were interviewed individually, with 11 expert informants selected through previous studies on folk medicine, 14 interviewed through random encounters, and the rest were recorded in groups of family or friends in bars and senior centers. It should be noted that among the quality, expert, or specialized informants, four people have been selected who are urban and have always lived in the city, because current ethnobotanical studies have paid little attention to urban spaces. Both individual and group interview responses were recorded in the field notebook. Information could be collected through annotations in the field notebook or through audio or video recording, always with the prior consent of the informant. In these cases, and in line with the objectives set out, we listened to and collected accounts of current self-care practices, identifying the resources used and associated symbolism.

Samples of biological resources were photographed, identified, and deposited (*exsiccata*, voucher specimen, etc.). Auxiliary field records of a biological nature were taken, and we considered as valid testimonies or witnesses the plants collected in the field in the presence of the informant, those collected by ourselves that were later used in the interviews with plants, or the samples of traditional medicinal plants that we have at home. It should be borne in mind that in ethnobotanical work the main witness is the herbarium

vouchers. However, when protected taxa were involved, photographs and geographical coordinates were taken, but no herbarium vouchers were prepared as the purpose of the work did not require it. The vouchers of the non-protected species collected were deposited in the current Ethnomedicine and Ethnopharmacology Laboratory of the History of Science Area (University of Cadiz). All of the vouchers included very common anthropic, ruderal, and arborescent species, which will be used in the seminars and practical sessions, except for one control, which will be kept (Figure 2). Thus, the institutional, national, and international guidelines on the collection of plant material have been strictly adhered to, complying with the Convention on Biological Diversity (CBD) and the Convention on the Trade in Endangered Species of Wild Fauna and Flora (CITES).

Figure 2. Plant species have been collected or photographed according to their protection category and medical importance. Thus, in this collage, the unprotected species *Verbascum sinuatum* L. appears, photographed in the Portalegre ESS from which vouchers have been prepared (photos by J.R. Vallejo).

The botanical determination was based mainly on classical works such as *Flora iberica* [52] and illustrated keys and works on vegetation and flora of Extremadura [53,54]. Regional herbaria have been consulted, and the Spanish plant information system known as *Anthos* [55]. For Portugal, the *Flora-On* portal on native or naturalized vascular plants of the Portuguese flora [56], as well as documentation available at the ESS, the Escola Superior de Educação e Ciências Sociais (ESECS), the Escola Superior de Tecnologia e Gestão (ESTG) in the IPP of Portalegre, and the Escola Superior Agrária (ESAE-IPP) in Elvas (Portugal) were consulted.

The informants included 53 students belonging to the IPP. Their participation was carried out by means of convenience sampling, of which 43 students gave their answers in class during the 2021–2022 academic year and 10 more students at the beginning of the 2022–2023 academic year.

Appendix A details the questionnaire used with the students, which comprises two blocs with closed questions on attitudes toward ailments and on confidence and safety in the use of medicinal plants. As you can see, this questionnaire can be used in other, larger studies to investigate knowledge about the consumption of medicinal plants with different objectives and involving other areas. A series of open-ended questions was also used for discussion with the rest of the informants.

3. Results: Data Collection and Analysis

3.1. Worldview of Informants in La Raya

3.1.1. Individual Interviews

Biocultural and ethnomedical knowledge has historically helped to maintain the collective cohesion of our society, especially in rural communities. However, many European folk medicine practices are falling into disuse due to the strength and influence of

biomedicine. From an ethnopharmacological framework, the interviews were approached by looking at the current lifestyle that is probably causing a new territorial, social, and economic order that influences health, and especially, whether there is knowledge about the environment, which should be considered as a resource for emotional well-being and community healthcare.

In Appendix B, we transcribe as an example part of the story of a shepherd, already retired, who is now 70 years old (Figure A1). This appendix also includes the vernacular names provided by the informants and their taxonomic identification (Table A1), and examples of eyewitness illustrations and other examples of collected botanical materials (Figures A2–A5). In 90% of the cases, the narrative about the different species is associated with a naturalistic symbolism based on ecological knowledge, transmitted from empirical knowledge. Symbolic narration associated with beliefs accounts for the remaining 10%. Knowledge about medicinal plants comes mainly from the mother and grandmother, who passed on the use of "plants for the nerves." However, ecological knowledge is clearly identified as a paternal legacy and an important source of balance and self-esteem. It can be seen that a new territorial order and new uses of the sierras are being experienced, in which tradition is even being replaced by the incorporation of new ways of understanding nature.

Among the plant species relevant to the worldview of informants in the cross-border area known as La Raya, *Hypericum perforatum* L. and *Crataegus monogyna* Jacq. stand out for their medicinal and cultural importance, although there are others that are relevant due to the risk of confusion (i.e., *Carlina gummifera* (L.) Less.) [57]. The hawthorn (*C. monogyna*) is a very interesting species for healthcare personnel to understand the problems deriving from the popular nomenclature of plants gathered in our countryside. Thus, this species is known locally as *galapero* [55,58] (see 58, pp. 249–253) and is used as a tranquilizer. It is important to point out that this same name is used in other parts of Spain for the wild pear (*Pyrus bourgaeana* Decne.) [55]. Moreover, it is significant that *C. monogyna* is known as *tila* in other parts of Extremadura and Andalusia [55,58] (see 58, pp. 249–253). So, in a medical consultation, a health professional could confuse this species with large-leaved linden (*Tilia* spp.), overlooking its action on the heart, and an interaction with anthracene derivatives is possible. Actually, the scientific evidence shows that the benefit–risk assessment of an extract from hawthorn leaves with flowers (4–6.6:1), extraction solvent of ethanol 45% (*w*/*w*), adjusted to 17.3–20.1% of oligomeric procyanidins, has a very favorable safety profile [59]. However, there are expert opinions that consider it unsuitable for self-measurement [58] (pp. 249–253). On the other hand, these risks could be increased by borrowing, interference, exposure, or loss of linguistic diversity [60], or species association errors due to a loss of traditional knowledge related to biodiversity. For example, we have detected names such as *cardanzol*, *cardazol*, or *cardazoli* that can be used for a species such as *Centaurea ornata* Willd. or generically for the root of any thistle. In any case, the phytonyms and zoonyms of the traditional languages of the frontier constitute a rich biocultural heritage that must be preserved and revitalized. González Salgado (2019) reviews this topic from a philological point of view [61]. Thus, this author, in line with others [62–64], points out the difficulty involved due to depopulation and the progressive loss of the differential elements of speech, with the consequent tendency toward leveling imposed by the Spanish and Portuguese languages [61].

3.1.2. Group Interviews

The ethnographic method necessarily required establishing social relations, first in the nearest locality of the Sierra de Alor and that of São Mamede. Thus, in the initial process followed during the first weeks, we selected Olivenza because it is a town with many districts and whose locality has belonged to Spain or Portugal at different historical times. We located the bar most frequently visited by country people, farmers, and stockbreeders, and we had coffee, tried to interact with people by asking about the mountains, walked around, took botanical notes, said hello, returned to the bar, and had a drink, trying to interact, and so the process was repeated on a weekly basis. In such a way, going to the bar

where farmers, ranchers, and people from the village gathered, was generating a network of contacts and a small social network. People would ask questions and you would ask them. You would get into the subject. You could say that you encountered the value system of the "people of the mountains" in the bar frequented by the people who were related to them, who went to collect plants, hunted, or worked in the mountains. It was somewhat complex to establish personal contacts and talk to people, as the fieldwork took place in the La Raya, at a crossroad of cultures, on the border between Spain and Portugal.

Participant observation has been the structuring axis of the whole project from the beginning, from the contact with the object of study to the selection of informants and then the interviews. The plant species where the collective interviews coincided with the data of at least three of the informants selected for individual interviews were 11 taxa: *Centaurea calcitrapa* L., *Cynara tournefortii* Boiss. & Reuter., *Helichrysum stoechas* (L.) Moench, *Hypericum perforatum* L., *Lavandula stoechas* L., *Oxalis pes-caprae* L., *Pistacia lentiscus* L., *Rosmarinus officinalis* L., *Scolymus hispanicus* L., *Senecio vulgaris* L., and *Thymus mastichina* (L.) L. It should be noted that during the fieldwork, some populations of the species *Cynara tournefortii* [54,65] were located (see Appendix B, Figure A5), as well as new data on its gastronomic use provided by informants, and its medicinal use was documented.

In any case, the species *Hypericum perforatum* (Hypericaceae) would be the most medicinally important for use, mainly for wounds, bruises and contractures.

3.1.3. Student Responses

The questions posed to the students of the ESS of Portalegre allowed us to confirm that the concept of intangible heritage is not only linked to cultural heritage but is living and adaptive knowledge [58,66–68]. In this way, it is observed that students potentially or explicitly possess heritage knowledge that can be developed, transformed, and changed. Moreover, the integration of this knowledge is conditioned first by their way of understanding health.

BLOC 1—Students' Behavior When Faced with a Health Problem

When faced with a health problem, students mostly wait without taking anything, and if improvement does not occur, they go to their health center (51.9%). Another 13.5% self-medicate with medicines or medicinal plants depending on the type of ailment; however, in the same proportion, there are students who think that it is not good to abuse medications because they can create resistance, and that is why they usually consume alternative substances; 11.5%, when it is a small ailment, resort to home remedies, including medicinal plants. It is notable that 10% go to the emergency department or see a doctor immediately.

Regarding behavior in a medical consultation, 86.6% of the students indicate that in their medical center, the doctor always prescribes medications. However, almost 10% indicate that the same doctor can prescribe plants or medications regardless of the illness, and 2% indicate that in certain illnesses, there is only a recommendation to use medicinal plants. On the other hand, 87.2% of the students would report the use of complementary means if the doctor asked. However, 4.3% would not discuss it much because they see it as unnecessary or because of beliefs related to medical prejudices about complementary therapies, while 8.5% indicate that depending on the doctor, they would discuss it or hide it. Both questions, conditioned by the doctor–patient relationship, are quite relevant, since according to the students, 88.5% of doctors do not introduce these questions during the medical history.

BLOC 2—Consumption, Knowledge, and Cultural Transmission of Medicinal Plants

The data on student consumption reinforces the fact that students link health assets to synthetic drugs and medications. Therefore, 64.2% of students do not use medicinal plants, although there may be non-therapeutic recreational or social consumption (drinking tea) and 35.8% have never consumed them. Among the reasons why they do not use them, the majority is due to lack of knowledge about them (63.4%), 12.2% because they believe

that they take longer to take effect than medications, and 9.8% because they are not as effective. There are other, less significant reasons, such as not having time to prepare them or believing that their effect is a placebo.

Only 14.6% of students collect plants in the countryside, although the same proportion buy them at herbalists. Students mainly consume plants to relieve pain (26.3%). A smaller proportion uses them as an anti-inflammatory device (18.4%), followed by their use against ailments or digestive disorders (13.2%), and treatment of infections and problems of the genitourinary system in the same percentage (10.5%). Contrary to expectations, the treatment of skin lesions or wounds with medicinal plants is rare (5.3%).

The plant part used is the leaf (57.9%), followed by presentations of phytomedicines (18.4%) and the rest of the botanical structures in lower proportions. Note that students refer to infusions in the case of leaves and decoctions in the case of roots or rhizomes.

To detect knowledge about species in the environment, photographs for identification of plants with their characteristic appearance in the field were shown to the students. Although they acknowledge having seen them in the field, most of them do not know their uses and names. For example, 32.6% identify *Hypericum perforatum*, but only 4% know its medicinal use, and only in two cases did they associate the species with a vernacular name: *hypericão* or *erva de São João* (St. John's Wort).

A notable fact is that 46% of undergraduates consider that using medicinal plants is a method that can work as well as pharmaceutical medications.

It is also notable that 30% think that healing with herbs is healthier since they do not have significant side effects and are effective for minor problems. Another 16% think that consuming them implies no important risks, but consider that it is a pseudoscientific practice, with some even thinking that it is a myth (4%), compared to only 2% who consider it a good practice.

Approximately 58% of the students know people who collect medicinal plants for their consumption. Specifically, they refer to the mother (29.4%), the grandmother (17.6%), the father (11.8%), or the grandfather (17.6%). Other types of relatives have a very low representation and are at the level of friends. Regardless of the collection, the cultural transmission of knowledge to the students is clearly linked to grandmothers (24%), who, in the case of having abandoned the collection, remember and talk about their traditional knowledge. It is also interesting to note that 25% have rural interests, and there is a tendency to relate to nature within ecologist (23.1%), naturist (9.6%), or environmentalist (14%) attitudes, which determines a potential consumer. However, 16% indicate that his/her knowledge has not been influenced by people who hold naturalist, ecologist, or even traditional positions, and it has an impersonal, circumstantial, and non-motivational origin.

Finally, it is remarkable that more than half of the students rely on professional sources for reliable information on medicinal plants, without discriminating their background: 10% rely exclusively on medical professionals; however, 23.5% give more credibility to knowledge acquired within the family, and, in very low proportions, some point to other sources such as television, radio, the internet, and remedies disseminated in the mass media. Confidence in the safety, quality, and efficacy of the information provided on commercial plants is indifferent to the place or establishment. This means that there is also no difference in these parameters of the same plants purchased, including those sold at markets from collections from the countryside.

4. Discussion and Intervention Proposal

4.1. The Development of Competences and Professional Identity Working Ethnomedical Heritage

The need to train citizens capable of facing the challenges and opportunities of the 21st century has led to new ways of understanding education. Thus, a competency-based learning model has emerged, currently implemented in European, Latin American, and other educational systems [69–73]. In the university context, competencies have been defined as "the body of knowledge, skills, abilities or skills acquired, which results in a good level of development and performance" [74]. It is an idea highly valued for decades,

whose great challenge remains to bring it to university teaching, also considering the social and cultural needs and the professional context of the moment [72,74,75]. In this last aspect, it is important to consider that a profession is based on its history and knowledge, in a philosophical context where values, beliefs, postulates, deontology, and ethics are included. In the case of nursing, it is necessary to understand these phenomena from a vision that focuses on the person, his/her environmental context, health, and care [76–78]. Thus, the renowned nurse Marie-Françoise Collière emphasized that one can live without treatment, but one cannot live without care, and addressing nurses and nursing students she added:

> *From what I have been able to see, from my experience of life leading me to death, that it only takes one behavioral or gestural break in the continuity of care for the whole quality of a team's work to be destroyed. All it takes is one "black sheep" for the fragility of what takes life to be confronted with the most abrupt despair. The best professional technical skills are nullified by the breakdown of interpersonal respect and deprives the cared-for person of a voice to defend him/herself, because the realities of retaliation and persecution in care then appear. To all, I ask you to focus on life forces, to mobilize your vital resources in respect of the individual and humanity, to promote care and to promote life* (taken from Pineda 2010) [79].

Collière's approach is now very much in line with the mobilization of health assets, self-care, and the use of phytotherapeutics. It should be recalled that the use of herbal preparations in nursing practice is historically confined to the so-called "American Botanical Medical Movement" [30]. Nowadays medicinal plants are considered by holistic nursing. However, texts dedicated to the use of medicinal plants for nursing professionals are rare [80–82]. Libster in 2012 offered this model as a solution for nurses with a critique of current healthcare systems, which according to the author are plagued by over-prescription, and that alternatives to the dehumanization of care are needed [82].

From a conceptual point of view, it should be noted that the role of the nursing professional might be conceptually mediated by the terms to which the use of holistic means refers [80–82]. In fact, it may influence their competencies, since it is not the same to understand these practices from concepts such as alternative medicine, complementary medicine, therapies, means, or instruments [83–86]. In this sense, the prescriptive uses of medicinal plants, as well as health education and promotion around them, present the same problems.

University policy, the regulation of holistic practices, and the attitude of professionals are difficulties for the teaching of this type of care in official undergraduate studies. However, in the case of medicinal plants, a very peculiar difficulty arises since these products may not be commercial but, as discussed in this work, collected in nature, including not only in the countryside but also in traditional and urban gardens, which are currently enjoying great popularity due to the approach of "new users" to these practices [87]. Therefore, in order to implement these contents, a basis in botanical taxonomy is necessary, but from the cultural importance of the plant, so that this complex discipline can be assimilated by health personnel.

In the context under study, the most suitable species for students to study is *Hypericum perforatum*. Firstly, because it has been widely used throughout history to heal wounds, bruises, and contractures, and it has been included in ointments from folk medicine to official medicine and nursing. Secondly, because of its current cultural importance as a healing plant in rural communities in a large part of Spain [87]. Thirdly, because it is an easily identifiable plant, whose oily preparations are also marketed by the pharmaceutical industry as a healing agent, and they are sold in pharmacies, parapharmacies, and herbalists. However, it should be noted that from a biomedical point of view, it is mainly used due to the level of evidence it has for treating mild depression [88–92]. In addition, recent research results suggest promising anticancer properties of *H. perforatum* extracts [93].

Nevertheless, based on the work carried out in the Sierra de Alor (Spain), in the Serra de São Mamede (Portugal), and in cross-border areas, other criteria could be used to select model or prototype plants to work with. For example, following the criterion of relevance to

public health, such as the case of a toxic and medicinal species—i.e., *Carlina gummifera* (L.) Less. [47] or hawthorn (*Crataegus monogyna*)—for the potential risks mentioned above, or even for the importance of the conservation of species biodiversity consumed by its gastronomic interest (*Cynara tournefortii*) [94]. In a more general or inclusive sense, they can be made into cosmopolitan species of cultural importance shared with other biogeographic zones. Thus, species could be added from the exchange and diffusion of plants between the New and the Old World carried out by researchers or naturalists for their inclusive, global character and build bridges across the Iberian Peninsula, Europe, Latin America, and Africa [95,96].

In the different activities of educational intervention, one would work with the central arguments of Vygotsky's social interactionism (1979) [97] and the situated cognition of Brown, Collins, and Duguid (1989) [98]. The purpose is for students to feel like protagonists of an investigation. In general, social interactionism maintains that learning processes occur in relationships between individuals and their environments over time and are influenced by cultures, in an active and interpersonal way, and cannot, therefore, be considered as a mere acquisition of information that is stored in people's minds for a short period. For Vygotsky, he or she can learn (potential knowledge) under the guidance of or in collaboration with more experienced partners. Vygotsky calls the time interval between actual and potential knowledge the zone of proximal development (ZPD) [97]. So, the richness and diversity of the interactions determine the potential knowledge to be achieved. The role of the teacher, which we believe they have in any formal educational environment (schools and/or universities) is to create spaces for dialogue between different ways of knowing, as a path of interaction between what they already know and what they will know. However, it is important and necessary to pay attention to the contexts in which these interactions occur. Brown et al. agree with Vygotsky's central arguments that learning is not an isolated mental process but is profoundly influenced by the context in which it occurs [98]. Thus, these authors propose that it is necessary to generate opportunities for students to experience authentic situations in contexts in which meanings are attributed because learning occurs in a situated activity that has social, cultural, and physical contexts. For the theory of situated cognition, knowing is inseparable from doing, since all knowledge is situated in activities linked to social, cultural, and physical contexts. For Brown, Collins, and Duguid, knowing and doing should not be separated, as if knowledge were self-sufficient and independent of the situations in which it is learned and used, since the knowledge that a person possesses is shaped by their context and culture [98]. Therefore, in the formation of a health professional identity—from nursing, medicine, or other university studies involved in the health and well-being of people—we believe that students need to understand the existence of different forms of knowledge, both academic and traditional, of the localities that surround them, including their historical and social aspects. Preferably in community learning, as we maintain that students can learn best from each other and in different contexts. The teacher will always be the cultural mediator between scientific knowledge and other knowledge that is cultural. However, we must not lose sight of the fact that teaching science as culture-specific situates learning as an interaction of cultural boundaries [99].

4.2. Tables of Contextual Cognition: The Student as a Researcher of Cultural and Intangible Heritage of Ethnomedical Character

The didactic and pedagogical intervention proposal we have advanced above is based on discovering and exploring the cultural and intangible heritage in the context of the students, contrasting it with the scientific knowledge of care and health. To do this, we have established four cyclical phases based on fieldwork, followed by classroom work, socialization of knowledge, and finally, an intercultural dialogue (Figure 3). The pedagogical engine of the process is the development of contextual cognition tables (CCTs) proposed by Baptista in 2018 [100]. A CCT, as we will discuss later, is a research tool and a model for facilitating intercultural dialogue in the teaching of science [100].

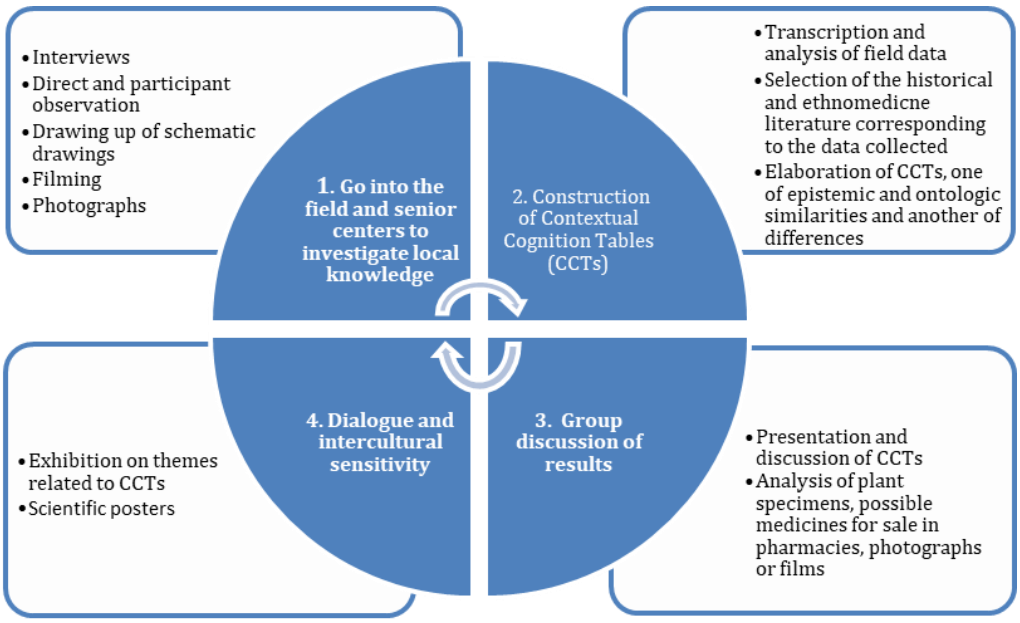

Figure 3. Outline of the proposed intervention in four phases, and the procedures to be carried out in each phase.

4.2.1. Fieldwork on Local Knowledge about Medicinal Plants

In this first phase, the aim is for students to get involved in community health by establishing links with their environment in order to go beyond academic knowledge. It is therefore important that they investigate local aspects such as the vernacular names of the plants, how they are collected, the parts used, their function or medicinal use, the method of preparation and application, dosage, or reactions in the organism. Depending on the context and type of community, you can go out into the countryside directly or access knowledge in centers or homes for the elderly and then walk along trails, paths, and areas to recognize things for oneself. This would be modeled on the approaches taken in this study with a focus on medical, social, and cultural anthropology, or on ethnobiology [101–104]. Thus, students will be able to use interviews, preferably semi-structured, as they allow the use of questions of interest to the research and, at the same time, give a voice to the subjects, according to their own logic [101–104]. Direct and participant observation can also be carried out, seeking to capture in the actions of the subjects their traditional knowledge and practices, remembering a prolonged coexistence with the social actors, as foreseen in ethnographic research [101–104].

In addition, you can request the creation of schematic drawings, photographs, or filming by the subjects themselves, as a form of complementarity, if the subjects agree. In order to identify participants, "snowball sampling" can be used, which consists of seeking indications from the community under study as to who the local knowledgeable person is and having them indicate to other members of the community that they can participate in the research. It is important that interviews are carried out in twos or threes, to avoid communication problems with community members (informants). A voice recorder could be used, if participants agree, or notes in a diary, if participants do not agree to recording their voices, or both instruments [101–104].

4.2.2. Construction of Contextual Cognition Tables (CCTs)

In class, students will transcribe the data, always taking care that the informants' statements are literal. In addition, they should carry out selective bibliographic searches using the current wide range of possibilities, but discriminating what kind of information is relevant and valid. It should be noted that the *Inventario Español de los Conocimientos Tradicionales relativos a la Biodiversidad* (IECTB) ("The Spanish Inventory of Traditional Knowledge relat-

ing to Biodiversity"), elaborated to comply with Law 42/2007, of 13 December, on Natural Heritage and Biodiversity, is an ideal tool and can be a point of reference to elaborate the CCTs and other didactic materials to help to better understand the cultural brotherhood of both countries that share culture and biogeography, and therefore biodiversity.

Students can use a cloud-based text editor to facilitate the construction of both bibliographic content cards and CCTs [100]. Fundamentally, CCTs are a tool that helps students understand the similarities and differences between the knowledge inherent in their cultural environments and scientific knowledge in such a way that it would be a matter of contrasting the knowledge worked on in formal spaces, such as the university, from an epistemological and ontological perspective. Baptista proposed that two tables be created, one with a list of similarities and another with a list of differences. Therefore, the purpose is never judgment or a hierarchy of values, but rather the investigation and understanding of the contexts of origin, meanings, and application of each of these forms of knowledge in a culturally sensitive dialogue. Nevertheless, students should analyze the significance of the results, making a general assessment of the validity of traditional knowledge about the species, current interest, and possible future trends (see the methodology used in the elaboration of the IECTB). It should be discussed whether the use is very local or widespread, whether the species is still used a lot, little, or not at all, whether it is traded informally, whether only certain uses have been lost, whether there are historical references to indicate how long we know the practices have been in use, its efficacy, and possible health risks. Finally, comment on possible health risks [1–3].

It is important to note that the CCTs can be composed of only three columns, one with the traditional and scientific name of the plant, one with the local knowledge researched, and one with the knowledge inherent in academic contexts. However, students need to understand the historical uses, current uses, and how current science does not develop in watertight compartments [102,105]. We therefore propose to include columns focusing on the historical part and on scientific knowledge [105]. This adaptation to the initial model allows us to deepen our aims by situating knowledge through history, different medical systems, and intangible heritage as a transversal axis of a cognitive and cultural dialogue project.

The proposal is designed so that the tables are created by the students with their own data from their fieldwork. This is because we consider context, experience, and subsequent group reflection to be very relevant as facilitating elements in the construction of knowledge; and also, because it facilitates the analysis of the meanings attributed by the informants. However, it is necessary to direct students toward species with cultural and/or historical importance in their environment and to train them in the efficient search for biocultural and biomedical information. Furthermore, it would be essential to direct students' gaze toward works where they can see how the construction of knowledge is possible between disciplines from distant fields [57,102,105,106].

The following is an example of a similarity CCT based on *Hypericum perforatum*, the species that has been considered most suitable according to the previous study carried out for the reasons mentioned above (Tables 1–3; see Appendix C, Table A2).

4.2.3. Group Discussion of Results

Students, in groups and in class, will present their CCTs by discussing their findings with their peers and other students. At this point, it is important to cite scientific and traditional or local information, always being careful not to be judgmental, no matter how absurd and contradictory the information may seem. It is important to bring plant specimens, as well as possible medicines for sale in pharmacies and photographs or films obtained in the field to contextualize the local and scientific information. The socialization of CCTs should help to resolve the question of how important biocultural heritage is for a student of health sciences.

Table 1. CCT on the medicinal use of *Hypericum perforatum* to establish a dialogue among the three types of knowledge (traditional, historical, and academic) on trauma, injuries, and wounds.

TREATED AILMENT	TRADITIONAL KNOWLEDGE (ETHNOMEDICIN]	HISTORICAL KNOWLEDGE	SCIENTIFIC OR ACADEMIC KNOWLEDGE		
	Recorded information on empirical or magical uses		*Main constituents*	*Academic validations*	*Pharmacological action*
Trauma, injuries and wounds	*Present study and IECTB* Healing wounds, bumps and inflammations, nappy rash, rashes, chafing, burns, bumps, sprains, strains, sprains, blood and bruises It is prepared by macerating the flowers in alcohol or wine, or by frying them in lard or decoctions [68,87] (see 68, pp. 145–154) *Present study and IECTB* In general, to treat all types of skin conditions. St. John's wort oil has also been applied to diaper rash [68] (pp. 145–154)	Documented by ancient Greek medicals for the healing of burns and superficial wounds [107,108]. The most relevants were Hippocrates (ca. 460-370 b.C.), Theophrastus (371-286 b.C.), Dioscorides (first century) and Galen (ca. 130–220) [107,108]. In the Renaissance, Paracelsus (1493- 1541 AD) stands out for his Theory of Signatures and the works Gerard (1597, 1633) and Culpeper (1652) [107,108]. Soldier's or military Weed: the military had to wear it in wars [107–109]. In the 18th century, it was used by European surgeons, and was part of the drugs taught at the Royal Colleges of Surgery as the surgical college of the Navy of Cadiz. Included in Pharmacopoeia of the Spanish Navy by D. Leandro de Vega [110] and the first London Pharmacopoeia [107–109]	Dianthronol and anthranolic derivative pigments, flavonoids in the flowers and essential oil, especially rich in α-pinene (monoterpenes) Naphthodi-anthrones (hypericin), pseudohypericin, isohypericin and protohypericin. Hyperforin, a prenylated derivative of floroglucinol Flavones and flavonols (quercetin, quercetin, isoquercitrin and rutin) Catechin tannins, xanthones and biflavonoids, phenolic acids (caffeic acid, chlorogenic acid and ferulic acid) [111–113]	Approved for use of oil extracts in skin inflammations (sunburn) and in the healing of minor or superficial wounds by Commission E as ESCOP monograph and EMA [111,114–123] Scientifically validated oil preparations and essential oil as antibacterial. Anti-inflammatory, antifungal and antiviral activity [111,123]	Vulnerate effect due to its tannin and essence content. Reduces the inflammatory reaction in the wound or bruise. Hyperforin is the component responsible for its anti-inflammatory activity. Mechanism: Inhibits both protein kinase C and NF-kB (nuclear factor kappa light chain enhancer of activated B cells) activation and inhibition of arachidonic acid and leukotriene B4 release. Strengthening the skin's barrier function by reducing radical formation and collagen synthesis in vitro. Antiseptic and antimicrobial action due to hypericin and hyperforin [111,124]

Table 2. CCT about emotional disorders and mental illnesses.

TREATED AILMENT	TRADITIONAL KNOWLEDGE (ETH-NOMEDICINE)	HISTORICAL KNOWLEDGE	SCIENTIFIC OR ACADEMIC KNOWLEDGE	
	Recorded information on empirical or magical uses		*Main constituents*	*Academic validations*	*Pharmacological action*
Emotional disorders and mental illnesses	*Present study* Depression and mood disorders *IECTB* Treat depression, nerves and anxiety by infusing a handful of flowers. They are also used together with the dried fruit [68] (pp. 145–154)	Ancient Greek medicals: Treatment for depression or melancholy [107–109] Middle Ages: "Fuga daemonum" (see Gulielmus van Limborch, 1679), it frightened the demons (in Spain: "espanta diablillos"), their dried bundles were burnt, which were hated by the demons. Used in the inquisition to force confessions of guilt [107–109]	Hyperforin and adhyperforin stand out above all. In addition, there are other interesting components such as hypericin [89–93,114,115,125]	Level of evidence for mild depression: "strong scientific evidence" [89–93,125] Various medical associations recommend its use for mild to moderate depression (see for example, American College of Physicians recommendations, the World Federation of Societies of Biological Psychiatry and Canadian Network for Mood and Anxiety Treatments, CANMAT). The European Medicines Agency [125] updated its monograph and documentation about St. John's wort in 2021. This readjustment highlights the updated drug assessment report [120] and a document listing the references analyzes [121].	Mechanism: Suspension of monoamine oxidase (MAO) and serotonin reuptake suspension [109]

Table 3. CCT on various health problems with no data available for some types of knowledge.

TREATED AILMENT	TRADITIONAL KNOWLEDGE (ETHNOMEDICINE)	HISTORICAL KNOWLEDGE	SCIENTIFIC OR ACADEMIC KNOWLEDGE
Circulatory disorders	*Data in the IECTB* Lowering blood pressure on its own or with other spices, and as a cardiac tonic [68] (pp. 145–154) *Present study and IECTB* Anti-hemorrhoidal use [68] (pp. 145–154)	—	—

Table 3. *Cont.*

TREATED AILMENT	TRADITIONAL KNOWLEDGE (ETHNOMEDICINE)	HISTORICAL KNOWLEDGE	SCIENTIFIC OR ACADEMIC KNOWLEDGE
Digestive diseases	*Data in the IECTB* Oral antiseptic and toothache with rinsing or chewing. Spirits and infusions with digestive properties. Treats diarrhoea and stomach pains caused by nerves. It is also said to have the opposite properties (laxative) and to cleanse the liver [68] (pp. 145–154)	Ancient Greek medicals as Galen, recommended it as treatment for gastrointestinal distress [107,108]	—
Genito-urinary diseases	*Data in the IECTB* Incontinence in the elderly, treatment of kidney stone, to "clear the urine" Recommended to be taken together with horsetail (*Equisetum* sp.), to treat urinary tract infections. Infusions have been taken to relieve menstrual cramps [68] (pp. 145–154)	Ancient Greek medicals recommended it as treatment for diuretic and menstrual cramping. [107,108]	—
Respiratory disorders	*Data in the IECTB* Bronchial remedy, as an anticatarrhal and anti-influenza, sometimes mixed with mallow flower (*Malva sylvestris* L.) [68] (pp. 145–154)	—	—
Ailments in sense organs	*Data in the IECTB* Cure otitis with macerated flowers. with Infusion of the inflorescence used in eye drops as an ocular antiseptic [68] (pp. 145–154)	—	—
Parasitic diseases	*Data in the IECTB* The infusion of the flowers has been used to treat intestinal worms [68] (pp. 145–154)	Ancient Greek medicals recommended it as treatment for intestinal worms [107,108]	—
Poisonings and intoxications	*Data in the IECTB* Insect bites are treated with St. John's wort oil [68] (pp. 145–154)	Ancient Greek medicals recommended it as treatment for snake or reptile bites. In the 16th and 17th century for stings and bites of poisonous animals (see Gerard, 1597 and 1633, Culpeper, 1652) [107,108]	—

4.2.4. Dialogue and Intercultural Sensitivity

Immediately after the presentation of the CCTs, the teacher mediator will conduct a circular dialogue. For this, the class can be organized in a semicircle, where everyone can see each other and participate. It is possible that at this point, some topics or contents related to the concept of cultural or intangible heritage, the history of science, methodological discussion, and professional identity can be introduced. At this point, it would make sense to study the great nurses who adopted the holistic system and who were mentioned in the introduction. Their study would be focused on the history of science and should therefore include a biographical profile with the aim of creating a chronology of the main aspects of their life. Firstly, some biographical features would be presented, such as their date of

birth, a narration of their childhood and youth, and their human, ethical, and scientific qualities. Thus, the student must situate the science and society of the character's time, studying briefly the social and political context in which the nurse's life took place and describing the scientific, historical, philosophical, and social context of her time. Similarly, it is important to analyze the character's scientific training and to comment on his/her nursing studies, what nursing and medical mentalities existed in his/her time, how they contributed to his/her training, and who his/her professors and teachers were. There is no doubt that another important topic is to describe the contributions to science and civil society made by the nurse under study, his/her scientific work, and the usefulness and relevance of his/her research or professional activities. Comment on the state of the art before his/her scientific contributions, analyze his/her social or professional contributions, and mention the problems or limitations he/she had. In general, provide references about his/her life and work, as well as describe the relationships he/she maintained with other scientists or with other relevant people in the culture of his/her time. Finally, students should highlight the value of his/her work, as well as the social significance of his/her figure as a nurse or scientist.

Logically, this work requires students to include their own objectives and to explain the advanced research strategies that will result in the work presented. All of this is done by making critical comments on the sources used to interpret the life and work of the nurse and the society of his/her time.

The proposal can end with an exhibition that reflects the dialogue between health sciences from different disciplines and intangible heritage. From our experience, we suggest the elaboration of scientific posters. Although we have focused on nursing, this type of work can form part of seminars and workshops in any of the health science studies. Thus, this development is very feasible for subjects such as the history of nursing, history of medicine, initiation to research in medicine, or methodology in biomedical research, which have an interdisciplinary profile. Undoubtedly, one of the biggest handicaps may be the time available to students; however, we think that the key points are to select the context of the work and above all that the species have cultural and historical importance and implications for health. In addition, it is necessary to generate a collaborative environment among the faculty, form research teams, and have adequate space and infrastructure.

5. Final Considerations

As has been mentioned, in the face of the challenges and opportunities of the 21st century, there is a need to provide new forms of education. Fundamentally, what is sought is to promote opportunities for individuals to develop skills that will enable them to make their own decisions. In universities and nursing, and other health-related courses, we understand that these opportunities require the consideration and inclusion of historical, natural, and cultural diversities. This is why we propose to involve academic and traditional knowledge from ethnomedicine. However, from the context and the data obtained from both traditional users and university students in the La Raya area (Spain–Portugal), the evolutionary and adaptive nature of the ethnomedical heritage is clear. Therefore, the inclusion of content and activities in the field of popular and scientific phytotherapy is relevant, as the bearers of both types of knowledge can generate new forms of self-care by coexisting and interrelating with each other. In this sense, the value of biocultural knowledge is not necessarily linked to the knowledge itself, but rather to the social, cultural, historical, and/or political circumstances that accompany the communities. This subjective and relative character must be considered and studied by health professionals.

Moreover, future health professionals must be sensitized and competent to become decisive actors in the valuation and management of these health assets. Thus, introducing university students as researchers in the classroom would allow them to understand and work on health assets by discovering ways of understanding health and the needs of the people around them.

The cognition grid model is based on competency-based learning and allows for an approach that can involve numerous disciplines related to a nursing degree and to health sciences in general. On the other hand, this approach is also in line with salutogenesis models understood as the reflection and application of behaviors that enable individuals, families, living groups, and communities to become empowered in health. It is about using health-related biocultural heritage as a means to enhance individual and community control over and improvement of their health.

Moreover, it is also an approach consistent with prevention by identifying risks and problems arising from inappropriate uses of plants or how they can improve overall health [126–129]. Therefore, this approach also allows us to value the plant world within cultural landscapes as generators not only of health but also in relation to economic elements and sustainable tourism by groups outside the rural communities. In this way, we also highlight novel approaches to fix our ideas, such as the use of interactions between people and the environment to understand health in contexts of poverty [130]. By influencing teaching and learning processes, the systematized incorporation of traditional knowledge and phytotherapy into the competencies of health professionals can make it possible to work in the zone of proximal development learning. That is, to work in the interests of both undergraduates and teachers. Instead, approaching other medical systems means coming into contact with a valuable cultural legacy with self-care and health promotion policies, always bearing in mind that the idiosyncrasies of each community, culture, and person must be respected.

Therefore, we hope that models of heritage education that focus on training health professionals in the dialogue between culture and science can help to improve community health. Finally, we wish to reinforce the idea of a dialogue and communicative approach to the diversity of knowledge about human healthcare in such a way that the future professional becomes a researcher, able to establish complementary relationships between different types of knowledge, without neglecting their epistemological and ontological aspects, origins, meanings, or practices.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Below are the questions of the questionnaire applied to students respecting the original Portuguese language. It is offered to interested researchers as a validated model, internally and externally, and supported by other studies that have analyzed phytothera-

peutic knowledge [131–134]. The readability of the questionnaire was validated through the INFLESZ v1.0 program, which applies Szigriszt's Perspicuity formula as follows: INFZ = 206.835–62.3 × (syllables/words—words/phrases) [135]. Its design was carried out in Spanish and it was adjusted to Portuguese at a normal reading difficulty, considering that the program performs an analysis in five stages from "very difficult" to "very easy." Subsequently, the clarity of the text was analyzed by the second-year seminar groups of the Faculty of Medicine of the University of Cadiz in the History of Medicine course during the academic year 2020–2021. The questionnaire was also validated by the management of the ESS of Portalegre, and finally authorized by the Conselho Técnico-Científico of the IPP and the Unidade de Investigação do IPP-VALORIZA, as well as by its ethics committee.

(A) DADOS SOCIOCULTURAIS E FORMAÇÃO DOS INFORMADORES
1. Sexo:
(1 = Mulher 2 = Homem)
2. Ano de nascimento:
3. Origem:
3.1. Em que país foi criado?
1 = Espanha
2 = Portugal
3 = Outro país. Qual?
3.2. Em que tipo de população foi criado?
1 = Meio urbano
2 = Meio rural
3.3.1. Em relação ao progenitor 1 (mãe biológica), em que país cresceu?
1 = Espanha
2 = Portugal
3 = Outro país. Qual?
3.3.2. Em que tipo de população o progenitor 1 (mãe biológica) foi criado?
1 = Meio urbano
2 = Meio rural
3.3.3. Ano de nascimento do progenitor 1 (mãe biológica):
3.4.1. Em relação ao progenitor 2 (pai biológico ou outro parente em linha reta ascendente): em que país cresceu?
1 = Espanha
2 = Portugal
3 = Outro país. Qual?
3.4.2. Em que tipo de população o progenitor 2 foi criado (pai biológico ou outro parente em linha reta ascendente)?
1 = Meio urbano
2 = Meio rural
3.4.3. Ano de nascimento do progenitor 2 (pai biológico ou outro parente em linha reta ascendente):
4. Educação:
4.1. O que é que está a estudar?
1 = Enfermagem
2 = Higiene Oral
3 = Medicina
4 = Fisioterapia
5 = Outros (favor indicar)
4.2. Em que ano do curso está?
(1º, 2º, 3º, 4º, 5º)
4.3. Já realizou algum curso superior, cursos de formação profissional ou outros estudos anteriormente?
1 = Sim 0 = Não
Se sim, quais?
Indique o local, onde os cursou?
5. Os estudos são compatíveis com o trabalho?
0 = Não 1 = Sim

(B) QUESTÕES PARA CONHECER O COMPORTAMENTO FRENTE A UM PROBLEMA DE SAÚDE E OS MOTIVOS QUE JUSTIFICAM O USO DE PLANTAS MEDICINAIS (PM)

6. Perante um problema de saúde, com qual ou quais destas afirmações concorda mais?
   1 = Espero que passe sem tomar nada, e se não vou ao médico
   2 = Vou às urgências ou a uma consulta médica imediatamente
   3 = Quando se trata de uma doença ligeira eu costumo recorrer a remédios caseiros, incluindo plantas medicinais
   4 = Não é bom abusar dos medicamentos porque podemos criar resistências e por isso costumo consumir remédios alternativos
   5 = Uso medicamentos ou plantas medicinais de acordo com o tipo de doença
7. Com qual ou quais destas afirmações está mais de acordo?
   1 = Eu acho que não é uma boa prática consumir PM (plantas medicinais) para o tratamento de doenças
   2 = Curar-se com PM ou com medicamentos são dois métodos que podem funcionar de forma igual
   3 = Curar-se com PM é mais saudável, não possuem efeitos secundários significativos e são eficazes para problemas menores
   4 = O consumo de PM não envolve riscos importantes, mas a crença na sua eficácia curativa é um mito
   5 = O consumo de PM não implica riscos importantes, mas acreditar que as plantas podem resolver problemas de saúde é uma atitude pseudocientífica
8. No posto de saúde, o médico:
   1 = Receita-me sempre medicamentos
   2 = Receita-me tanto medicamentos como PM
   3 = Já me recomendou PM
9. Se utiliza terapias alternativas ou complementares, esconde do médico que as usa?
   0 = Não. Porquê?
   1 = Sim. Porquê?
   2 = Depende. Quando?
10. Ao fazer o historial, o médico pergunta-lhe:
   1 = Sobre o consumo de terapias alternativas ou complementares
   2 = Se consome plantas medicinais colhidas no campo
   3 = Se consome plantas medicinais, e onde as compro
   4 = Se consome plantas medicinais, mas não de onde procedem
   5 = Não me faz perguntas sobre terapias alternativas ou complementares
11. Costuma usar PM ou os seus derivados?
   0 = Não
   1 = Sim
12. Entre os motivos pelos quais NÃO usa plantas medicinais estão:
   1 = Falta de conhecimento sobre elas
   2 = Acho que curar com PM é mais saudável, e algumas curam pequenos problemas de saúde, mas não tenho tempo para preparar
   3 = Acho que usar PM é mais saudável e podem até curar problemas de saúde complicados, mas não tenho tempo para preparar
   4 = O efeito não é tão rápido como o dos medicamentos
   5 = São menos eficazes do que os medicamentos
   6 = São mais caras do que os medicamentos
   7 = Acho que não são eficazes, são apenas um placebo
   8 = Acho que podem ser eficazes para alguns problemas de saúde, mas a sua utilização envolve riscos para a saúde e não as uso
   9 = Outras razões (por favor indicar)
13. Com que frequência toma plantas medicinais (PM) ou outros remédios caseiros (RC)?
   1 = Às vezes (uso pouco, costumo usar remédios)
   2 = Frequentemente (uso muito, mas não por rotina)
   3 = Geralmente (para prevenir e sempre que tenho dores)
   4 = Nunca consumo plantas medicinais para fins terapêuticos
14. Além de fins terapêuticos, toma PM e / ou RC por outros motivos?
   0 = Bebidas sociais (por exemplo, para tomar um chá, chá de hortelã, etc. com os amigos)
   1 = Para prevenir doenças

Outros: Não

15. As plantas medicinais beneficiam a saúde humana porque:
    1 = Têm poderes, mesmo que não estejam comprovados
    2 = Têm princípios ativos com atividade farmacológica
    3 = Outras causas, quais?

(C) PERGUNTAS PARA CONHECER A ORIGEM DE COMPORTAMENTOS POSITIVOS FRENTE ÀS PLANTAS MEDICINAIS

16. Quem ou o que influenciou seu conhecimento sobre PM e RC?
    0 = Mãe 1 = Pai 2 = Avó 3 = Avô 4 = Outros parentes 5 = Professores 6 = Amigos 7 = Ninguém 8 = Internet 9 = Televisão 10 = Livros 11 = Acampamentos 12 = Cursos 13 = Outras atividades que lhe fizeram sair ao campo 14 = Nada
17. Pertence a alguma associação que o influenciou neste assunto?
    0 = Sim 1 = Não
18. Pense na maneira como normalmente se relaciona com o meio ambiente e como usa os recursos da natureza. Com qual das seguintes tendências se identifica?
    1 = Tradicional: integrado nos costumes rurais
    2 = Naturista: tendência em que são usados terapias e estilos de vida alternativos
    3 = Ecologista: pessoa que se preocupa ativamente com o meio ambiente
    4 = Pessoa que tem interesse no meio ambiente
    5 = Outro (por favor indicar):
    6 = Nenhuma

(D) PERGUNTAS SOBRE A CONFIANÇA, QUALIDADE E SEGURANÇA NO USO DE PLANTAS MEDICINAIS

19. Quais as fontes que lhe dão mais confiança ao usar PM?
    1 = Parentes ou conhecidos (remédios transmitidos por conhecimentos tradicionais)
    2 = Televisão, rádio, Internet. . . (remédios disseminados pelos meios de comunicação, meios de comunicação)
    3 = Somente profissionais de saúde formados em medicina
    4 = Todos os tipos de profissionais de saúde ou qualificados cientificamente
    5 = Profissionais paramédicos (fitoterapeutas, quiropráticos, etc.)
    6 = Outros (indique)
    7 = Ninguém ou nada
20. Numa escala de um a 10, qual o grau de qualidade e segurança que acha que têm as plantas medicinais compradas nas farmácias?
21. Numa escala de um a 10, qual o grau de qualidade e segurança que acha que têm as plantas medicinais compradas em parafarmácias e fitoterapeutas?
22. Numa escala de um a 10, qual o grau de qualidade e segurança que acha que têm as plantas medicinais compradas em feiras de colheita silvestre?

(E) PERGUNTAS PARA SABER QUAIS MEDICAMENTOS USAM, QUEM RECOMENDA, COMO OBTER, QUEM RECOMENDA E A SUA UTILIDADE

23. Conhece pessoas que colhem PM para consumo?
    0 = Não, 1 = Sim
    Qual é a sua relação com eles?
    1 = Mãe, 2 = Pai, 3 = Outros parentes (especifique o membro da família), 5 = Outros
24. Como se abastece com PM?
    1 = Eu não os consumos e, portanto não os compro
    2 = Farmácias
    3 = Supermercados
    4 = Ervanárias, herbalistas
    5 = Mercados ou bancas de rua
    6 = Recolho-as no campo
    7 = Recolho-as no pomar ou jardim
25. Das plantas que tomou, algumas agem para prevenir, curar ou fortalecer o corpo em caso de:
    1 = Infecções, infestações
    2 = Inflamações
    3 = Dores
    4 = Distúrbios nutricionais
    5 = Sistema respiratório
    6 = Sistema digestivo

7 = Sistema circulatório
8 = Pele, úlceras, feridas, tecidos subcutâneos
9 = Sistema músculoesquelético, traumatismos
10 = Sistema genito-urinário
11 = Sistema sensorial
12 = Sistema nervoso, doenças mentais
13 = Gravidez, parto, doenças puerperais
14 = Sistema endócrino, doenças metabólicas
15 = Sistema imunitário
16 = Doenças não específicas

26. As partes das plantas que já tomou para prevenir, curar ou fortalecer o corpo são:
1 = Folha
2 = Caule
3 = Raiz
4 = Flores e estruturas florais
5 = Parte aérea
6 = Fruto
7 = Semente
8 = Outros
27. Como prepara ou preparou plantas medicinais?
1 = Infusão
2 = Cataplasma
3 = Antídoto
4 = Supositórios
5 = Tablete
6 = Irrigação
7 = Gotas
8 = Inalador
9 = Poção
10 = Clister (enema)
11 = Pomada
12 = Colírio
13 = Xarope
14 = Gargarejo
15 = Banho
16 = Linimento
17 = Emplastro
18 = Ingestão oral simples
19 = Lavagem
20 = Outro
28. Com que frequência usa as plantas medicinais?
1= Eu não as uso
2= Muito raramente
3= Raramente
4= Ocasionalmente
5= Frequentemente
6= Muito frequentemente

(F) RECONHECIMENTO DE PLANTAS MEDICINAIS ATRAVÉS DE IMAGENS

Serão mostradas as espécies de maior importância cultural (e.g., Hypericum perforatum)

29. Olhe esta imagem, já viu esta planta alguma vez?
0 = Não
1 = Sim
30. Sabe o seu nome?
0 = Não
1 = Sim
2 = Como se chama?
31. Conhece o seu uso medicinal?
0 = Não
1 = Sim

2 = Para que é usada?
(G) QUESTIONÁRIO ABERTO
32. Quais são as plantas medicinais ou remédios caseiros que usa para tratar ou prevenir doenças? Para que servem cada um deles?
33. Descreva brevemente as plantas que conhece e onde podem ser encontradas
34. Como se preparam as plantas medicinais que conhece? (por exemplo: infusão, sumo, cozimento, etc.)
35. De que forma aplica essas plantas? (por exemplo: cataplasma, banhos, infusão de bebida, vapor, etc.)
36. Como é que conheceu estas plantas? De onde era a pessoa que lhe deu a conhecê-las? Que relação tinha consigo (pai, mãe, avós, amigos, vizinhos, companheiros, etc.)? Já teve conversas sobre o uso tradicional das plantas medicinais que conhece?
37. Gostaria de participar, como investigador júnior, num projeto sobre recuperação de conhecimentos tradicionais? Em caso afirmativo, faz favor contacte
(e-mail: joseramon.vallejo@uca.es)

Appendix B

As an example of the interviews conducted, we transcribed part of the account of a shepherd from the study area (Figure A1).

Figure A1. The observation unit was people who performed traditional work (i.e., a goatherd, a turkey breeder, a farmer, or a shepherd). In the photo appears one of the quality informants of the shepherd profession (photo by J.R. Vallejo).

This quality informant tells us that the plant species is *yerba* if it becomes grass and *matojo* if it becomes firewood, such as *coscoja*, *ogarso* or *cornicabra*. He refers to the excursions they make to see what he has been told is now called the rose of Alexandria, which he calls *albardera*. He also tells us about a mountain race he did, which was the first ascent to the Sierra de Alor; he says that it does not bother him but that he likes the tranquility. He appreciates very much the *azahuche* for the hook or *garabato* of a shepherd. Sometimes he has made it of *atarfe*, and then he must wet it so that it makes *correa* and is flexible. He tells us that his fruit the *azehuchino* is very much liked by the birds and that he remembers that his father told him that with the *azahuche* there is no one who fights.

During the outing, we insist that the shepherd tell us about medicinal plants, and he mentions that he has used *arruerra* when he has had injured gums; that he boils its leaves and washes his mouth with the liquid obtained. It is for when you have sore gums or

pyorrhea. He says that he uses *manzanilla brava* for tummy ache and for nerves, and he knows that *ruda fina* is medicinal after pouring the seed, but he does not remember for what ailment. Before pouring it is abortive, he states. The *galapero* for nerves has a very well-known saying: In February, the *galapero* sprouts, and the goat says to the goatherd, "drink your milk, I don't want it." There is also the *cardo liebrero*, which is put in the hat and cures infections. There is the *arruerra blanda*, which is eaten by domestic animals, and the *arruerra dura*, which has the hardest wood and is also eaten. The *bufa de lobo* has the same effect as penicillin and the *cardiazoli*, whose name is difficult to transcribe because of its clear pronunciation with Portuguese influence, or *cardo la olla,* which is very well eaten by cattle and its cooked root is used for stomach ulcers. He tells us about the great medicinal power of scorpions that if you put them in alcohol and your finger hurts, when you dip them in the alcohol, it calms you down a lot.

Our informant is a great connoisseur of the countryside and a conversationalist, and he continues to tell us about his ethnobotanical knowledge. He tells us how the *albolaga* is used for slaughter, to scorch the pigs, and that it burns very well. It is also used to bind *chiveros* (as he calls the goats), to make fire, and that it came with the earth to make one of the tracks that now cross the mountains. It reminds us of how the *agrio* or *canario* came with the migratory birds.

The Sierra de Alor is a real paradise for orchids and our informant tells us how the big orchid is never pollinated; therefore, as he tells us, it is not edible for animals. The *albaca* is a type of *berza brava*, which is eaten by livestock; the *alcarria* and the *bayón* are used to cover huts. Cork oaks are not abundant, but they are used all over Extremadura, providing firewood, cork, and acorns for the animals. The *alfileres* are one of the favorite grasses of cattle. Passing through a field of *argamulas* or *chupamieles* reminded us of the proverb "lo que no va a la era, va a la feria" ("what doesn't go to the threshing floor goes to the trade fair"). Flowers and leaves of the *bellotero*, the *berza brava*, the *siserón bravo*, the *cardo borriquero*, and the *cañafresa* are usually eaten by the animals in the territory.

The *cártamo* gives oil for cooking but is no longer used and is said to be like sunflower oil. The *coscoja* gives a chestnut-colored acorn for animals. The hemlock is veiny and rare, as we have not been able to see it. In addition, on one of the walks we were surprised by the curious vernacular name *cojones de burro* ("donkey balls"), a weed that is "good for nothing" and that not even the cattle eat it. He tells us that the *charquero* is like a holm oak, but the trunk is like that of a eucalyptus, soft, but it does not give acorns. The *cardo de liga* is poisonous, which is why animals are ringed so that they do not eat its root, because if they were to eat it, they would die. The *cuenicabra* is soft and hard, depending on the wood, and is eaten by goats. Holm oak provides acorns for the pigs, firewood, and charcoal as everywhere else, adds the shepherd. The *charquero* is used for firewood and does not give acorns. The *ferreñas, espárragos blancos*, and *trigueros* are very abundant and good to eat. The *gordolobo* is for catching fish or making *ramajos*.

The informant also surprises us with the hot chili pepper with which he used to play jokes in his childhood. He throws it into the brazier and the people around him start coughing and then want to snort, while our informant laughs uproariously. A representative Extremadurean plant, the rockrose, is called by the shepherd *ogarso*, and he uses it as a combustible, formerly to heat the bread ovens. The yellow and white *jaramago* is eaten by the cattle, and the *jopo silvestre* is consumed by goats and sheep. Sedges and rushes are the other group of plants that are brought in from outside to cover huts and the *naira* (rick). The *lechuguino* is eaten by cattle and rabbits.

We have had the opportunity to see the *lentisco* made into a broom and it is eaten by goats, as our informant also pointed out on the walk. According to our informant, the *madroño* has a very bad wood. He appreciates its fruit, although he does not abuse it as it is not good to do so. He tells us about several types of *magarza*: one is eaten by animals, and another is prepared as an infusion, and the *maravilla* is eaten by livestock when it is green, as when it dries it is considered a weed. During one of our walks, we asked him about a small yellow flower: he told us that there are plants that are not useful, but it is

a *matapulga* ("flea killer"). The *pimpirrio* is another plant used to make brooms and the *picaporca* is also called *picaguarra*; he told me: "you know, don't you, it is also used for *ramajos*." We also passed near a walnut tree, and he told us about its uses, such as feeding pigs and making sweets, and it was a very good area for collecting thyme and oregano for local stews, he says. We also saw the *jiel de la tierra*, good for the liver and bile, and the remains of a *sudalamano* thistle, of which it is said that it is not the heat of summer that scares the *segaores* but the *sudalamano* thistle.

As can be seen in this narrative, biocultural knowledge has helped maintain the collective cohesion in rural communities. This informant offers us a wide knowledge related to folk medicine, and as a relevant fact, it is his mother who influences the transmission of traditional knowledge. However, according to his grandmother, she was also involved. It is noted that the "people from the mountains" are experiencing a new territorial order in which tradition is being replaced by the incorporation of new ways of understanding nature due to the great natural values of the transboundary area (Figure A2).

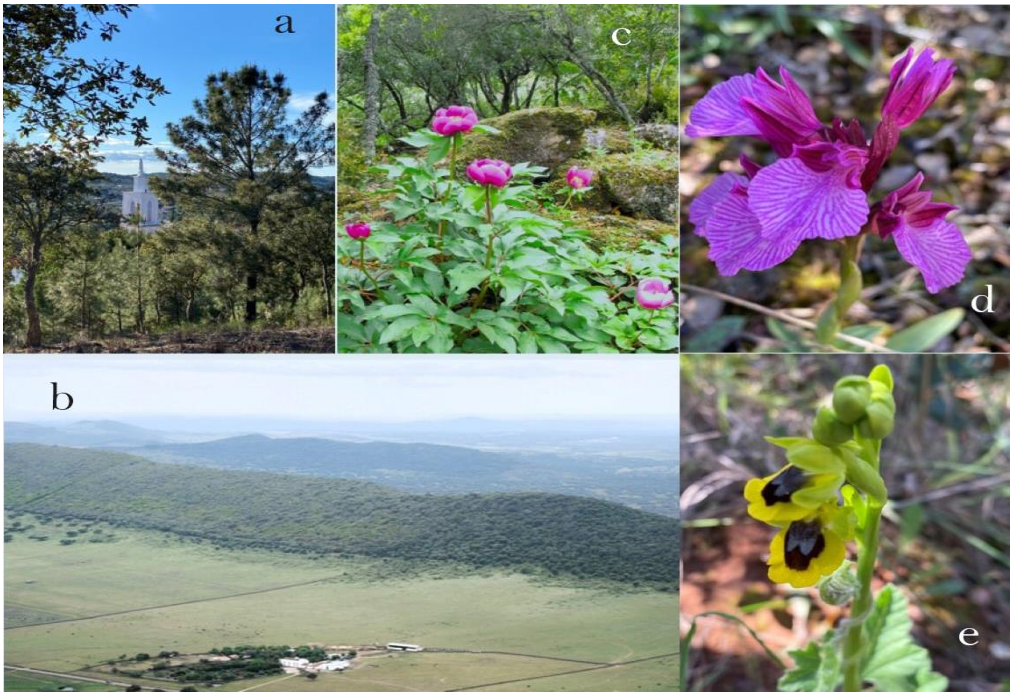

Figure A2. Miradoiro da Serra in Portalegre (**a**) and an overview from the Sierra de Alor (**b**) with one of its emblematic species (*Paeonia broteri* Boiss. & Reut.) (**c**). Some species of orchids are shown as a sample of the wealth and extraordinary botanical beauty of the area: *Orchis papilionacea* L. (**d**) and *Ophrys lutea* Cav. (**e**) (photos by J.R. Vallejo).

On the other hand, the story of the shepherd highlights the great linguistic wealth existing in Sierra de Alor, which coincides with other informants throughout the area (Table A1).

Table A1. List of the most used vernacular names of species by Extremadurean informants who work in the mountains or collect products there in a traditional way *vs.* Alentejo informants.

SCIENTIFIC NAME	VERNACULAR NAMES	
	EXTREMADURA	ALENTEJO
Aegilops geniculata Roth	Trigo de perdiz	Trigo de perdiz
Asparagus acutifolius L.	Ferreña, Espárrago ferreño, Espárrago negro	Espargo menor do monte

Table A1. *Cont.*

SCIENTIFIC NAME	VERNACULAR NAMES	
	EXTREMADURA	ALENTEJO
Asparagus albus L.	Esparraguera blanca, Espárrago blanco	Espargo branco, bravo
Asteriscus aquaticus (L.) Less.	Yerbajo malo	-
Avena barbata Pott ex Link	Palanco, Vena loca	Balanco bravo
Barlia robertiana (Loisel.) Greuter	Orquídea grande	-
Bryonia dioica Jacq.	Parral bravo	-
Carlina gummifera L.	Cardo la liga, Cardoliga, Liga	Cardo do visco
Carthamus lanatus L.	Cártamo, cáncamo	-
Centaurea calcitrapa L.	Cardo curalotó	-
Centaurea melitensis L.	Cardo sudalamano	-
Centaurea ornata Willd.	Cardazol, Cardazoli, cardanzol, Cardo la olla	Cardazol, Lavapé
Centaurium erythraea Rafn.	Jiel de la tierra	Fel da-terra
Cistus albidus L.	Ogarso blanco	Roselha grande
Cistus crispus L.	Ogarso	-
Cistus ladanifer L.	Ogarso negro	Roselha, Xara
Crataegus monogyna Jacq.	Tila, Galapero	-
Cynara cardunculus L.	Cardo	Cardo-do-coalho
Cynara tournefortii Boiss.	Alcachofa, Alcachofa de las buenas	Alcachofra rastreira
Daphne gnidium L.	Travisca, travista	Trovisco, Trovisqueira
Daucus carota L.	Sindiente	Cenoura
Dittrichia viscosa (L.) Greuter	Pegajosa	-
Helichrysum stoechas (L.) Moench	Manzanilla brava, Manzanilla	Macela-real
Hypericum perforatum L.	Yerba de San Juan, Pericón, Árnica	Erva-de-São-João, Hipericão
Lavandula stoechas L.	Tomillo borriquero	Rosmaninho
Lavatera cretica L.	Malva	Malva bastarda
Lonicera implexa Aiton	Madreselva	Madresilva
Mentha aquatica L.	Menta	-
Mentha pulegium L.	Poleo	Poejo
Nasturtium officinale W.T. Aiton	Agrión, Berro de agua	Agrião
Olea europaea var. *sylvestris* Brot.	Azahuche, Aceuche	-
Origanum vulgare subsp. *virens* (Hoffmanns. & Link) Ietswaart	Orégano	Orégão
Oxalis pes-caprae L.	Agrio, canario	Erva-canária
Papaver rhoeas L.	Amapola mansa	Papoila
Pistacia lentiscus L.	Lentisco, Aruera, Aruera blanda	Aroeira
Pistacia terebinthus L.	Cuernicabra duro, Aruera dura	-
Quercus coccifera L.	Coscoja	-
Rosmarinus officinalis L.	Romero bravo	Alecrim
Ruta graveolens L.	Ruda basta	-
Ruta montana L.	Ruda, Ruda fina	Arrudão
Salvia officinalis L.	Salva	Salva
Sambucus nigra L.	Sauco	Sabugueiro
Scolymus hispanicus L.	Tagarnina	-
Senecio vulgaris L.	Tagna fuerte	Tasna
Thymus mastichina L.	Tomillo	Erva-ursa
Trifolium angustifolium L.	Trebol, Traballem	Trevo, Fofa
Trifolium campestre Schreb. in Sturm	Trebol, Traballem	-
Triticum turgidum L.	Sietespiguín	Trigo-duro
Verbascum sinuatum L.	Gordolobo	Verbasco

Figure A3. Botanical voucher, document, and photograph of *Hypericum perforatum* collected in the ESS of Portalegre (Portugal) and the surrounding area where a typical reddish oil is prepared (photos by J.R. Vallejo).

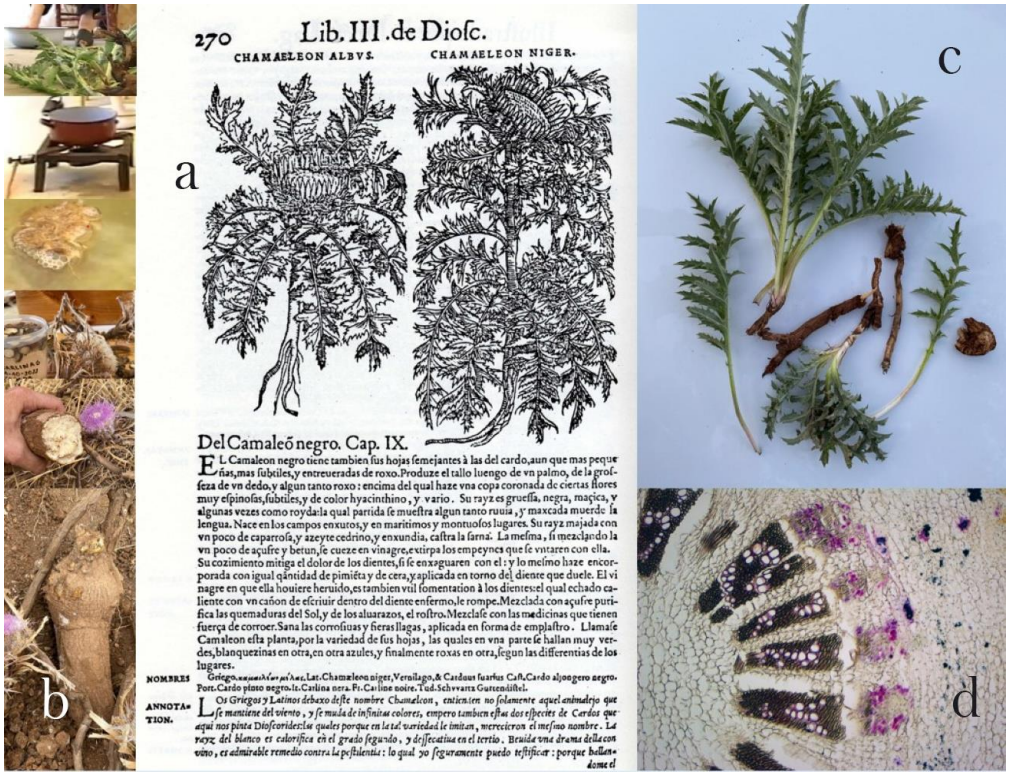

Figure A4. *Carlina gummifera* is a species of interest that can be studied from many points of view, including health risks [57]. In the middle of the picture: (**a**) we can see this plant in *De materia medica* ("On Medical Material") written by Pedanius Dioscorides (c. 40–90 AD) see [108]; (**b**,**c**) the species and its medicinal uses photographed by J.R. Vallejo; (**d**) histological section of the same specimen by J.M. López-Cepero.

Figure A5. Specimens of *Cynara tournefortii* observed and documented during the present study (photos by J.R. Vallejo).

Appendix C

For the medicinal use of *Hypericum perforatum* on trauma, injuries, and wounds there is no risk of reduced effects in cases of concomitant medication. Hypericin is photosensitizing (avoid prolonged exposure to ultraviolet rays). May cause skin reactions after sun exposure. There are no data on its safety during pregnancy and lactation [111–123]. Its use in nursing is congruent with its use in folk medicine as a healing and antibacterial agent. Oil preparations are marketed by the pharmaceutical industry and are sold in pharmacies, drugstores, and herbalists. However, there are serious interactions when it is taken orally to treat emotional problems (Table A2).

Table A2. Serious interactions with St. John's wort and risks in oral treatment.

SERIOUS DRUG INTERACTIONS
(see Natural Medicines Database) [114,115,123]
• Alprazolam (Xanax, Trankimazin)
• Birth control pills (contraceptive drugs)
• Cyclosporine (Neoral, Sandimmune)
• Digoxin (Lanoxin)
• Docetaxel (Taxotere)
• Imatinib (Gleevec)
• Irinotecan (Camptosar)
• Ketamine (Ketalar)
• Medications changed by the liver (cytochrome P450 3A4 (CYP3A4) substrates)
• Medications changed by the liver (cytochrome P450 3A4 (CYP3A4) substrates)
• Medications for HIV/AIDS (nonnucleoside reverse transcriptase inhibitors (NNRTIs))
• Medications for HIV/AIDS (protease inhibitors)
• Medications for HIV/AIDS (nonnucleoside reverse transcriptase inhibitors (NNRTIs))
• Medications for HIV/AIDS (nonnucleoside reverse transcriptase inhibitors (NNRTIs))

Table A2. *Cont.*

SERIOUS DRUG INTERACTIONS
• Omeprazole (Prilosec) • Oxycodone (Oxycontin) • Phenobarbital (Luminal) • Phenprocoumon (Marcoumar, others) • Phenytoin (Dilantin) • Rivaroxaban (Xarelto) • Tacrolimus (Prograf) • Warfarin (Coumadin)
RISKS (see Natural Medicines Database) [114,115,123] It is complex to verify the effectiveness and safety of products based on this species due to differences in content related to the time of year, the climate, and the location of the crop. The CANMAT Taskforce recommends standardized formulations (0.2–0.3% hypericin and/or 5–6% hyperforin). • Pregnancy: This medicinal plant may not be safe when taken by mouth. It may cause birth defects in babies. •Breastfeeding: It may not be safe when taken by mouth. Babies may experience colic, drowsiness, and irritability. • Children: It is possibly safe when taken orally for up to 8 weeks in children aged 6 to 17 years. •Alzheimer's disease: It may worsen dementia. •Bipolar disorder: It may cause mania. It may also speed up the cycle between depression and mania. • Schizophrenia: St. John's wort may cause psychosis. • Surgery: St. John's wort may affect serotonin levels in the brain, which could interfere with surgical procedures. Also, in people who have used it, anesthesia can cause serious heart complications during surgery.

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