Medicinal and local food plants in the south of Alava (Basque Country, Spain)

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Abstract

Ethnobotanical relevance: Medicinal and food plants in the Basque Country are an integral part of a fast changing culture. With a distinct tradition and language, this region of Europe provides an important example demonstrating the changing role of local and traditional knowledge in industrial countries. As other Mediterranean regions it preserves a rich heritage of using plants as medicine and food, offering a unique opportunity for studying the medicine food interface in an ethnopharmacological context. Therefore, the key goal of this study has been to contribute to an understanding of local and traditional plant usage, to evaluate their uses as food and medicine as well as to critically assess the role of these plants in the south of the Basque Country contributing to an understanding of how foods and medicines are used.

Methods: A mixed methods approach, including participant observation; open and semi structured interviews was used. Ethnobotanical field work included 183 people, ages ranged from 24 to 98 years old with a majority being between 70 and 80 years old (mean age 71) from 31 towns of three different regions. The basic interview was a one-to-one meeting, which often included field walking and collection of samples as directed by the informants. 700 voucher specimens (most of them with duplicates) were collected for the data obtained.

Using SPSS version 20 the gathered information was processed and the replies of the different informants were subsequently organised in variables like medicine and food plants, part of the plants used, forms of preparations, zones preferred for collecting these plants. The data were analysed based on the frequency of records. This type of approach allows us to understand the way the informant's categorize the species, and how these categories are distributed along the sample. In order to analyse the data three main categories of use were distinguished: Medicine (M), Food (F) and an intermediate Health-Food (H-F). The three categories were divided in 27 subcategories (common uses).

Results and discussion: The informants recognise and use a total of 184 species from 49 families. During interviews, 5658 individual use-reports were collected relating to three use-categories – as medicines, food and health-food. The two main groups with almost the same number of species each are health-food (75 species) and (locally gathered) food only (73), with medicinal uses only (36) being the smallest group. This highlights the important overlap between food and medicines.

Overall, three core families were identified (based on the number of use reports and in the number of species): Asteraceae (25 species), Lamiaceae and Rosaceae (24 each). The most frequently reported species are Jasonia glutinosa, Chamaemelum nobile, Prunus spinosa and Quercus ilex subsp. ballota. The most important general use-subcategories are as raw vegetables (27.43% of the use-reports and including 81 species), infusions (14.74%/42) and gastrointestinal (12.53%/42). Conceptually foods and medicines are clearly distinguished but the intermediate group of health-food is more ambiguous.

Conclusion: Food and medicinal uses of plants are culturally closely linked. A wide range of plants are known and many still used. The analysis shows that the Basques use a wide range of species which are typical for Western European cultures. In comparison to other studies in the Mediterranean countries there are many similarities in the uses of different families, species of plants and their use and

Abbreviations: F, food; H-F, Health food; I, Izki; M, medicinal; V, Valderejo; VA, Valle de Arana; VIVA area, the combined area of Izki, Valderejo and Valle de Arana.

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1. Introduction

“... to draw the attention of ethnomycologists to the dietary dimension of plant utilisation. The conventional approach in ethnopharmacology is to focus on the medicinal properties of plants without adequately exploring other categories of use. As a result, we are unduly circumscribed in our understanding of the extra-nutritive aspects of food phytochemistry” (Etkin and Ross, 1991, p. 25).

Nearly a quarter of a century has passed since Nina Etkin and Paul J. Ross led the ethnomycological discussion towards a (renewed) emphasis on the interface of food and medicine. It has been argued convincingly that we should set aside a place for food and try to understand its health promoting effects (Pieroni and Price, 2006).

Health(y) food has also entered mainstream discussions in many countries and the idea of “let food be your medicine” (attributed to Hippocrates, 460–377 BCA) is again a popular concept. An important aspect that is being highlighted in this discussion is the importance of today’s interest, from the markets and people, in functional foods, tailor-made to suit specific groups (e.g. the elderly, the young, physically active people, and people with specific conditions). The quest for diets which allow for a healthy ageing is strongly linked with increased life expectancy and larger financial assets of some sectors of the population (e.g. Heinrich and Prieto-García, 2008; Keating et al., 2010).

Indeed one of the well-known benefits of the Mediterranean diet is its long life expectancy (Willett et al., 1995) and many ethnobotanical surveys around the region show the importance of wild plants and specifically wild vegetables in the Mediterranean diet (e.g., Pieroni et al., 2005; Rivera et al., 2005; Tardío et al., 2006; Leonti, 2012). Several authors have highlighted that one of the reasons that explain the prevalence of its consumption is that they have a clear positive influence on health (Leonti et al., 2006; Sánchez-Mata et al., 2012). For instance, a review of the wild vegetables traditionally used in Spain showed that 23 % of them were also orally taken as medicinal plants. They were mainly used to prepare infusions drunk to cure many different complaints, but some species were eaten with a specific medicinal purpose (Tardío, 2010). Urtica dioica leaves are for instance taken in omelettes against hoarseness (Pardo-de-Santayana, 2008) or hypertension (Bonet and Vallès, 2002). In the case of Southern Spain, a study made in Sierra de Alcaraz and Serranía de Cuenca showed an even higher rate, since 58% of wild foods had also medicinal uses (Rivera et al., 2005).

Besides its role for curing, they also play a major role as preventive remedies. People for instance consume many herbal teas such as Chamaemelum nobile L. or Mentha pulegium L. after meal to prevent indigestion (Pardo-de-Santayana et al., 2005; Menendez-Baceta et al., 2014). Other examples of valuable species are olive, garlic and lemon (Rivera and Obón, 1993).

Besides the local perception of the health benefits of wild foods, the high nutritional interest of many of these species is also well-known (e.g. Flyman and Afolayan, 2006; Guarrera and Savo, 2013; Morales et al., 2013). Many contain high amounts of vitamins and other antioxidants such as flavonoids, carotenoids of polyphenols, minerals, fibres and essentials fatty acids, commonly in higher amounts than their cultivated relatives (Tardío, 2011). For instance, Zeghichi et al. (2003) found high antioxidant and mineral levels in the 25 Cretan species studied. The phenolic content was remarkably high in Crepis vesticina L. Another interesting species is Montia fontana L., with appreciable amounts of vitamin C, Mn, and very high lipid content being one of the richest source of omega-3 fatty acids among leafy vegetables (Tardío et al., 2006). The young shoots of Asparagus acutifolius L., Humulus lupulus L., Bryonia dioica Jacq. and Tamus communis L. are richer sources of carotenoids than many of the commercially available leafy vegetables (García-Herrera et al., 2014).

Therefore, local pharmacopoeias and gastronomies of Mediterranean industrialised countries have received growing attention (e.g. Pieroni et al., 2002, 2004; Hanlidou et al., 2004; Scherrer et al., 2005; Maxia et al., 2007; Hadjichambis et al., 2008; Nebel and Heinrich, 2009; Novais et al., 2004; Pardo-de-Santayana and Macía, 2015) and this has been linked to the impact of written traditions which have facilitated the dissemination and continued use of these medicinal plants (Leonti, 2011). Spain being one of the regions where more such ethnobotanical studies have been conducted because of its high biological and cultural diversity (e.g. Rivera et al., 2005, 2006; Tardío et al., 2005; Pardo-de-Santayana et al., 2007; Parada et al., 2009; Rigat et al., 2009; Benítez et al., 2010; González et al., 2010, 2011a,b; Carrió and Vallès, 2012; Viteri Alarcon, 2012; Rigat et al., 2013).

There is therefore relatively abundant information on inventories of medicinal and wild food taxa in Spain, but there are still poorly studied regions such as the Basque Country Autonomous Community (also known as Euskadi). Euskadi is one of the regions of the Basque Country (also called Basque Country greater region in order to differentiate it from the Basque Country Autonomous Community). The Basque Country comprises territories in northeastern Spain and southwestern France with a total population of 2,900,000 inhabitants (Barandiaran and Manterola, 2004). Its geographical position, at the interface of the Mediterranean and Eurosiberian botanical regions, offers a variety of climates and a diversity of ecosystems with a resulting high level of biological diversity.

Moreover Euskadi cultural diversity is very high, with two languages (Basque or Euskara) spoken within only 7234 km². Given its ethnic and cultural singularities, it has a long tradition of ethnographic studies e.g. (Barandiaran and Manterola, 1990, 2004) but its medicinal and food plants have been only recently addressed with an ethnobotanical perspective (Menendez-Baceta, 2015; Menendez-Baceta et al., 2012, 2014, 2015). In the last years several studies have been conducted in the adjacent regions Navarre and Cantabria: including Akerreta et al. (2007a,b, 2010), Calvo et al. (2011, 2013), Calvo and Cavero (2014, 2015), Cavero et al. (2011a,b) and Cavero and Calvo (2014, 2015), on Navarre; Pardo-de-Santayana (2004), on Cantabria. None of these studies provides comparative information on the use of food and medicinal species with the exception of a study carried out in the south of Biscay (Menendez-Baceta et al., 2012). The paper states that wild foods have not a clearly perceived medicinal role in the region. An exception was the use of mints for seasoning milk since this flavoured milk was recommended against intestinal worms. On the other side herbal teas were mainly perceived as medicines, and only few people drunk Chamaemelum nobile tea besides its medicinal function. The use of herbal teas in food contexts is locally not considered traditional and as Basque people are a pre-Indo-European ethnic group with marked differences with the surrounding regions they are not very permeable to such kind of new customs (Soukand et al., 2013). Maybe one of the costumes of chewing leaves might be a missing link in the food-medicine...
How do the inhabitants in three regions of Alava in the Basque Country use the local flora especially as it relates to their use as food and medicine? In this study, we wanted to investigate the question: How do the inhabitants in three regions of Alava in the Basque Country use the local flora especially as it relates to their use as food and medicine? This study focuses on the use and knowledge of food and medicinal plants of Alava. The specific aims of this work were: (1) to describe the domain of medicinal and wild food plants, (2) to assess the cultural importance of the different species and food and medicinal categories and (3) to compare with other Mediterranean regions and see if the plant species and uses were similar.

2. Geographical and cultural background

2.1. Region of study

Research was conducted in communities of regions with high levels of biodiversity where forest and undisturbed areas remain. We selected three mountainous regions of the south of Euskadi in the province of Alava: Valdegovía, Valle de Arana and Izki (Fig. 1). They belong to two different geographical regions, Valdegovía to the Valles Alaveses (Alavan valleys) and Valle de Arana and Izki to the Montaña Alavesa (Alavan mountains). They are situated on the transition between the Mediterranean and Eurosiberian biogeographical regions. The main forest communities are dominated by oaks (Quercus pyrenaica, Q. faginea and Q. ilex), beeches (Fagus sylvatica), pines (Pinus sylvestris) and boxes (Buxus sempervirens L.), Izki including the largest reserve in Europe of Quercus pyrenaica forests (Marañón and Quintana, 1993). Two nature reserves are included in the study area, Valderejo in Valdegovía and Izki, which gives the name to one of the regions.

AIMS: Given the lack of ethnobotanical research on the interface food and medicine and using the Basque Country as an example, we wanted to investigate the question: How do the inhabitants in three regions of Alava in the Basque Country use the local flora especially as it relates to their use as food and medicine? This study focuses on the use and knowledge of food and medicinal plants of Alava. The specific aims of this work were: (1) to describe the domain of medicinal and wild food plants, (2) to assess the cultural importance of the different species and food and medicinal categories and (3) to compare with other Mediterranean regions and see if the plant species and uses were similar.

2.2. Valdegovía (in Valles Alaveses)

Valdegovía has an area of 238.5 km² and its average altitude is 552 m above the sea level. There is a population of 1148 inhabitants scattered in 24 different villages and hamlets, most of them with
only 30 or 40 occupants due to migration. The area’s inhabitants are highly dependent on agriculture as a source of main income. The main crops are wheat, barley, oats, rye, various other grains, potatoes, apples, cherries, pears, legumes and various vegetables. The area also has a vast amount of livestock, poultry and horses. Aside from agriculture the area receives some income as a result of tourism activities related to hunting (González, 2003). The Natural Park of Valderejo which opened in 1992 has become a very important part of the area’s economy and life. Given the strong personal, historical and cultural links of Valdegovía with the people of the surrounding villages of the province of Burgos (see Fig. 1), seven villages from Burgos were also included in Valdegovía.

2.3. Izki and Valle de Arana (in Montaña Álavesa)

This region is made up of six municipalities (Arraya-Maeztu, Bernedo, Campezo, Valle de Arana, Lagrán and Peñacerrada-Urizaharra) covering an area of 534 km². Four of these six municipalities were selected for the study: Arraia-Maeztu, Bernedo, and Campezo forming the Izki area and Valle de Arana. The population (3181 inhabitants) is concentrated in small villages which are in close proximity to each other, only Maeztu and Santa Cruz de Campezo having more than 250 inhabitants while in the rest 30 out of the 46 have less than 50 inhabitants. In this region people tend to be specialized in agricultural activities and the majority of the population are pensioners. The construction and services sector is only important in Campezo and Maeztu. There are very few large businesses and a moderate number of micro-enterprises. Some specialise in forestry and others in producing asphalt and chemicals. Rural tourism is increasing its importance, especially because of people visiting the Izki Natural Park (PRO-Izki, 2015). Many people commute every day for work in Vitoria, the main city and capital of Álava.

3. Methods

3.1. Ethnobotanical data collection

Ethnobotanical fieldwork included 183 consented interviews (75 male and 108 female) conducted between November 2006 and November 2009. Informant age ranged from 24 to 98 years old with a majority being between 70 and 80 years old (mean age 71). They were selected using a snowball sampling technique since in close proximity to each other, only Maeztu and Santa Cruz de Campezo having more than 250 inhabitants while in the rest 30 out of the 46 have less than 50 inhabitants. In this region people tend to be specialized in agricultural activities and the majority of the population are pensioners. The construction and services sector is only important in Campezo and Maeztu. There are very few large businesses and a moderate number of micro-enterprises. Some specialise in forestry and others in producing asphalt and chemicals. Rural tourism is increasing its importance, especially because of people visiting the Izki Natural Park (PRO-Izki, 2015). Many people commute every day for work in Vitoria, the main city and capital of Álava.

The main goal of the interviews was to understand traditional food and medicinal uses practiced in the area and how these categories overlap. The basic interview was a one-to-one meeting. The interviews were conducted in Spanish and had two main parts:

- A fixed structured part were the same questions were always asked focusing on: (a) local socio-economic environment, (b) plants and plant parts used in the past and nowadays as medicines and/or food; how were they prepared, (c) local plant names, and (d) habitat where each species grow and places of collection.
- A semi-structured free and fluent conversation, where the participants were encouraged to explore tangent aspects and details which often reveal very useful information about the area that provides precision and reliability to the information.

Interviews often included field walks and collection of samples as directed by the informants, depending on the physical condition and time availability of the participant. Walks through allotments, gardens, managed woodlands, farms, grasslands, marshlands and cliffs were essential for providing botanical samples and identification. During these walks first-hand knowledge could be obtained from watching the participant interact with their surroundings. Open ended questions arose from watching their actions.

In most of the cases after the first interview, other meetings were agreed for providing deeper information on the plants collected and their food and medicinal uses. A collection of plants (ambulant herbarium, medicinal plant samples) was made to show to the informants. Books and photos of plants and landscapes where also used to help informants remember locations where the plant grew and to help in the identification of the species. Finally, practical activities such as cooking the dishes or preparing the medicinal plants were also organised.

The vouchers collected during the walks were dried and preserved in the herbarium of the Centre for Pharmacognosy and Phytotherapy, UCL School of Pharmacy following standard botanical techniques (Martin, 1995; Alexiades, 1996) and mostly also deposited at the Museo de Ciencias Naturales de Álava (VIT). Identification is largely based on Aizpuru et al. (2003), García López and Allue Camacho (2004), as well as López de Guereñu (1975). For botanical nomenclature we follow Flora iberica (Castroviejo et al., 1986–2014) for families included therein, and Flora Europaea (Tutin et al., 1964–1980) for the rest.

3.2. Data analysis

The data collected in the field were organised in a database. Information was structured in use-reports (UR) (Ankli et al., 1999). URs are commonly defined as the informant i, mentions the use of the species s in the use-group u, (Tardío and Pardo-de-Santayana, 2008). As we found important differences within the regions of study on the plant parts used and the preparation and administration methods we included both aspects in our definition of a UR. Therefore in our study a UR was defined as the event in which informant i, mentions the use of the plant part p of the species s prepared and administered with the method m in the use-group u.

Three main use-categories were considered: Medicine (M), Food (F) and Health-Food (H-F):

- The group of medicinal plants (M) contains those species that were used in the area only for medicinal proposes, to prevent, heal and recover from different health conditions.
- Food plants class (F) includes the species that were ingested daily, but were not reported to be used medicinally in the area.
- The category of Health-Food plants (H-F) includes the species that have food and medicinal uses in the area.

The three categories were further divided in 27 subcategories each that account for the local concepts, views and experiences. For instance, burns, furuncles, acne, warts, herpes, wounds, skin ulcers were grouped in the medicinal group dermatological disorders. The quantitative analysis of uses is based on species with three or more URs and we have only focused on data, where a specific use has been reported, i.e. generic responses like “as a tonic”, “food use” were not considered.

Data collected were compared with unpublished (Puentes Ames toy, c. 1960) and published information from Basque ethnobotanical studies (Menéndez-Baceta et al., 2012; Cavero et al., 2011a,b; Calvo et al., 2011), other Iberian works (Tardío et al., 2006; Pardo-de-Santayana, 2004; Rivera et al., 2006) and from Italy (Nebel, 2005; Nebel et al., 2006; Nebel and Heinrich, 2009; Lentini and Venza, 2007).
Table 1
Top 25 food and medicinal species according to the number of use-reports.

<table>
<thead>
<tr>
<th>Species</th>
<th>Local names</th>
<th>Use-category and mode of use</th>
<th>Number of use-reports</th>
<th>Use-category number of use-reports (percentage of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jasonia glutinosa (L.) DC. Asteraceae; 593 T</td>
<td>té, té de monte, té de roca, té de puerto</td>
<td>Herbal tea: flower, infusion, alone or with <em>Chamaemelum nobile</em>, Illicium verum, Prunus spinosa, Thymus vulgaris or with milk</td>
<td>269</td>
<td>H-F 375 (6.63%)</td>
</tr>
<tr>
<td>Chamaemelum nobile (L.) All. Asteraceae; 743 T, PA</td>
<td>manzanilla, manzanilla amarga, manzanilla de altura, manzanilla de la sierra, manzanilla del monte, manzanilla fina, manzanilla pequeña, manzanilla real</td>
<td>Herbal tea: inflorescences, infusion, alone or with anisette, <em>Malva sylvestris</em>, <em>Helichrysum stoechas</em></td>
<td>147</td>
<td>H-F 352 (6.22%)</td>
</tr>
<tr>
<td>Prunus spinosa L. Rosaceae; 322 T, M, PA</td>
<td>fruit: arán, escaramujo, endrino, arañón, churli, ciruela, endrina, carcarachi</td>
<td>Herbal tea: fruit, infusion; fruits, decoction; fruits, liqueur, <em>patxaran</em></td>
<td>45</td>
<td>H-F 268 (4.74%)</td>
</tr>
<tr>
<td>Quercus ilex subsp. ballota (Desf.) Samp. Fagaceae; 472 T</td>
<td>carrasca, encina; fruit: bellota</td>
<td>Herbal tea: fruits, toasted and ground into flour</td>
<td>105</td>
<td>H-F 242 (4.28%)</td>
</tr>
<tr>
<td>Santolina chamaecyparissus L. Asteraceae; 352 TPA</td>
<td>manzanilla, manzanilla de buey, manzanilla de burro, manzanilla de caballo, manzanilla basta, manzanilla de campo, manzanilla gorda, santolina</td>
<td>Herbal tea: inflorescences, infusion, alone or with <em>Helichrysum stoechas</em>, <em>Prunus spinosa</em></td>
<td>85</td>
<td>H-F 210 (3.71%)</td>
</tr>
<tr>
<td>Thymus vulgaris L. Lamiaceae; 111 T</td>
<td>tomillo</td>
<td>Herbal tea: flowering shoot, infusion, alone or with <em>Jasminum officinale</em> or with <em>Jasonia glutinosa</em> and <em>Chamaemelum nobile</em></td>
<td>42</td>
<td>H-F 168 (2.97%)</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Common Name</td>
<td>Uses</td>
<td></td>
<td></td>
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<tr>
<td>------------</td>
<td>-------------</td>
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<td></td>
<td></td>
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<tr>
<td><em>Sambucus nigra</em> L.</td>
<td>Sabuco, saúco</td>
<td>Colds, bronchitis, sore throat: flowers, infusion, alone or with Malva sylvestris; flowering branches, burnt, smoke inhalations; stems, fruits; steam inhalations; asthma and chest infections: flowers, fried with egg, eaten.</td>
<td>87 H-F 156 (2.76%)</td>
<td></td>
</tr>
<tr>
<td><em>Juglans regia</em> L.</td>
<td>Nogal</td>
<td>Prevent high cholesterol, heart problems: fruits, raw; immature fruits and young shoots, liqueur.</td>
<td>7 H-F 156 (2.76%)</td>
<td></td>
</tr>
<tr>
<td><em>Rubus ulmifolius</em> Schott</td>
<td>Mora, zarzamora; fruit: mora del alto; young shoot: carnero, chispío, mato</td>
<td>Coughs and colds, sore throat: flowers, infusion, alone or with Origanum vulgare or <em>Sambucus nigra</em>; leaves, decoction; bronchitis and asthma: leaves, decoction, steam inhalations.</td>
<td>57 H-F 95 (1.68%)</td>
<td></td>
</tr>
<tr>
<td><em>Castanea sativa</em> Mill.</td>
<td>Castaño</td>
<td>Coffee substitute: fruits, toasted and ground into flour, infusion.</td>
<td>101 F 125 (2.21%)</td>
<td></td>
</tr>
<tr>
<td><em>Sorbus domestica</em> L.</td>
<td>Malva, jurbal, fruit: gerbal, poma</td>
<td>Vegetables: young shoots, peeled, raw</td>
<td>39 F 89 (1.57%)</td>
<td></td>
</tr>
<tr>
<td><em>Rubus castroviejoi</em></td>
<td>Mora, zarzamora, zarza; young shoot: mato</td>
<td>Fruits: raw, jam</td>
<td>58 F 97 (1.71%)</td>
<td></td>
</tr>
<tr>
<td><em>Rubus caesius</em> L.</td>
<td>Mora rastrera, zarza, zarzamora; fruit: mora; young shoot:</td>
<td>Fruits: raw</td>
<td>54 F 89 (1.57%)</td>
<td></td>
</tr>
<tr>
<td>Plant Name</td>
<td>Family</td>
<td>Use</td>
<td>Part Used</td>
<td>Preparation</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>Carnero, chispío</td>
<td>Rosaceae; 426</td>
<td>T</td>
<td>young shoots, peeled, raw</td>
<td>35</td>
</tr>
<tr>
<td>Obe, haya; fruit: hayuco</td>
<td>Fagaceae; 195</td>
<td>T,M</td>
<td>leaves, raw, chewed</td>
<td>11</td>
</tr>
<tr>
<td>Floor: fruits, toasted and ground into flour, mixed with wheat or other cereals, bread</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moriza, manzanilla, manzanilla de huerta, manzanilla de jardín</td>
<td>Asteraceae; 354</td>
<td>T</td>
<td>flowering shoots, infusion</td>
<td>37</td>
</tr>
<tr>
<td>Herbal tea: flowering shoots, infusion</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxant: flowering shoots, infusion</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits: raw, jam</td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liqueur: fruits, macerated in anisette</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Romero</td>
<td>Rosmarinus officinalis L.</td>
<td>T,M,PA</td>
<td>flowering shoots, infusion</td>
<td>24</td>
</tr>
<tr>
<td>Herbal tea: flowering shoots, infusion</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits, macerated in anmbra</td>
<td>69 F 88 (1.56%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cien flores, manzanilla, milfiores, milenfora, milenrama</td>
<td>Asteraceae; 18</td>
<td>T</td>
<td>flowering shoots, infusion, alone or with syrhum salicaria</td>
<td>27</td>
</tr>
<tr>
<td>Herbal tea: flowering shoots, infusion</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herbs: flowering shoots, infusion, alone or with honey</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rheumatism and arthritis pain: flowering shoots, tincture in alcohol or oil infusion with Cupressus sp., frictions</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sore throat, colds and phlegm: flowering shoots, infusion, alone or with honey</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxant: flowering shoots, infusion</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits, macerated in anisette</td>
<td>69 F 88 (1.56%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avena</td>
<td>Betulaceae; 379</td>
<td>T,M</td>
<td>raw, toasted</td>
<td>59 F 68 (1.20%)</td>
</tr>
<tr>
<td>Liqueur: fruits, macerated in anisette</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerezo; fruit: cereza, cereza silvestre</td>
<td>Rosaceae; 277</td>
<td>T</td>
<td>fruits, raw</td>
<td>45</td>
</tr>
<tr>
<td>Liqueur: fruits, macerated in anisette or liquor</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digestive: fruits, liqueur in anisette or liquor</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oregano</td>
<td>Lamiaceae; 44</td>
<td>T</td>
<td>flowering shoots, infusion</td>
<td>27</td>
</tr>
<tr>
<td>Fruits, macerated in anisette</td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sore throat, colds and phlegm: flowering shoots, infusion</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rheumatism and arthritis pain: flowering shoots, tincture in alcohol or oil infusion with Cupressus sp., frictions</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxant: flowering shoots, infusion</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herbal tea: flowering shoots, infusion</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits, macerated in anisette</td>
<td>69 F 88 (1.56%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membrillo</td>
<td>Rosaceae; 542</td>
<td>T</td>
<td>fruits, macerated in water with salt until the bitter flavour has left. Then they are macerated in cold water, garlic, thyme and rosemary for two years</td>
<td>35</td>
</tr>
<tr>
<td>Depressión: fruits, liqueur in wine</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liqueur: fruits, macerated in wine</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyes inflammation: fruits, decoction, washings</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits: raw, boiled with sugar and wine</td>
<td>60 F 60 (1.06%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Patuxur. Prunus spinosa fruits are macerated in anisette for five or six months with coffee beans, cinnamon bark and Chamaemelum nobile inflorescences.
* Pomada sanjuanera. Ointment prepared frying together many plants such as: Achillea millefolium, Allium ampeloprasum, Anagallis arvensis, Calendula officinalis, Chamaemelum nobile, Cruciata glabra, Eleocharis quinque, Eleocharis obtusa, Euphorbia helios, Hypericum hirsutum, Hypericum perforatum, Inula montana, Jasonia tuberosa, Lavandula latifolia, Malva sylvestris, Mentha × piperita, Pinus sylvestris, Plantago lanceolata, Plantago major, Potentilla erecta, Potentilla reptans, Primula veris, Pulmonaria longifolia, Ranunculus ficaria, Rumex sp., Sambucus nigra, Santolina chamaecyparissus, Symphytum tuberosum, Thymus vulgaris, Tussilago farfara, Verbascum thapsus and Verbena officinalis.
* *Olives in brine: olives are macerated in water with salt until the bitter flavour has left. Then they are macerated in cold water, garlic, thyme and rosemary for two years

a Unless indicated by a cross (†) all species are non-cultivated; species which are both cultivated and non cultivated are indicated with two crosses (‡).
b Collector: Rocío Alarcón.

- [Tardío et al., 2006] - [Menendez-Baceta et al., 2012] - [PA (Puente Amestoy, c. 1960)].
- Use-category: H-F (health-food), F (food), M (medicine).
4. Results and discussion

4.1. Food, health foods and medicines

Table 1 presents the top 25 species according to their number of UR and the rest of the species with three or more URs are included in Appendix 1. Species with less than three URs were not included in the Appendix, since it is commonly accepted that they are less reliable (Johns et al., 1990; Le Grand and Wondergem, 1987). Overall, 184 species of 49 families have been recorded in the different regions of study based on a total of 5658 individual URs. The vast majority of all species are used for food purposes, i.e. exclusively as a food or as a health food, respectively (food, F: 73 species; health food, H-F: 75) while medicinal uses (M) account only for 36 species.

Almost 40% of the all species are in the complex group of health foods. These species are in essence food plants with a locally acclaimed health claim. This highlights the important overlap between food and medicines (Etkin and Ross, 1982). Scientifically they have often been classified as either a medicine or a health food, but the interconnectivities are complex and in these cases we classified these species as H-F. These resources may have different roles or functions in the study area:

1. Most plant uses are classified in essence by function, i.e. a certain preparation is used as a health food and as such as part of the regular diet or it is used for a specific medicinal purpose (difference by function). For instance, Juglans regia fruits are usually consumed raw before lunch or as an afternoon snack without any conscious medicinal use, but are also consumed specifically to prevent high cholesterol and heart problems.

2. In other cases the function is different in terms of what plant parts are used, the fruit may be a healthy snack and the leaves a medicine with a specific role (difference based on the botanical drug used). For instance, Sambucus nigra berries are eaten raw or used to prepare jams, while the infusion of the flowers is taken for colds, and its branches are burnt for inhalations against colds.

3. In some cases the difference is based on the form of preparation of the product to be consumed (difference based on the form of preparation). For instance, Hypericum perforatum flowering shoots are used to prepare a herbal tea, and also to prepare an ointment called pomada sanjuanera, that is prepared frying them together with many other plants.

A very large share (39.66%) of all species used belong to three families: Asteraceae (25 species), Lamiaceae and Rosaceae (24 each). This is similar to other studies in the Mediterranean (Pieroni et al., 2002, 2004; Novais et al., 2004; Guerra et al., 2005; Rivera et al., 2005; Scherrer et al., 2005; Leonti et al., 2006; Nebel, 2005; Rivera et al., 2006; González-Tejero et al., 2007; Maxia et al., 2007; Guerra et al., 2008; Parada et al., 2009; Calvo et al., 2011) and in other parts of the world such as North America (Moerman et al., 1999). Menendez-Baceta et al. (2014) also reiterate the importance of Asteraceae and Rosaceae in the local pharmacopoeia of other Basque regions in Alava and Biscay. Menendez-Baceta et al. (2012) reported on the importance of the Rosaceae and Fagaceae in human food, too.

4.2. Plants used as food and medicine

Plants in this group have a double usage or one use which is clearly at the food-medicine interface and include foods and beverages with specific acclaimed health benefits. In essence this functionalistic distinction is one which is linked to the perceived (i.e. emic) benefits, but at the same time this group also is somewhat artificial, since it is not recognised by people as a distinct group. Also included are species which have dual uses, both more in a food context and one which is medicine-centred.

Most of the top 25 species according to their number of UR are H-F. Jasonia glutinosa (5.6% of the UR), Chamaemelum nobile (6.2%), Prunus spinosa (4.7%), Quercus ilex subsp. ballota (4.3%), Santolina chamaecyparissus (3.7%) and Thymus vulgaris (3.0%) stand out as being central to the inhabitants of the region (Table 1). Seven species are food only (Castanea sativa, Rubus castroviejoe, Rubus caesius, Fagus sylvatica, Arbutus unedo, Corylus and Frangaria vesca). These species are widely used and have a high cultural salience.

This calls into question an important paradigm in ethnomedicine, and we need to consider ways to present medicinal and food properties in an integrated way (cf. Etkin and Ross, 1991; Rivera et al., 2005). Our informants generally do not draw a very strict line between food and medicinal plants, highlighting the ambivalent nature of these two categories. The majority of the informants recognise that food plants can prevent or heal disease or “cleanse” the body.

Plants are used according to the needs of the people and different preparations, uses, applications, etc. Culturally speaking, people will manage the plants with proactively focusing on their uses for ailments, diseases, as food, beverages, etc., with the intention of preventing health problems from emerging, or subsequent treatment, if they do emerge.

The challenges of the borderline between food and medicines is well illustrated by Jasonia glutinosa (té de roca) and Chamaemelum nobile (manzanilla) which are common and important social beverages reported in the VIVA regions and generally prepared as infusions or macerations. An infusion of J. glutinosa, is the most popular local tea and in many Spanish regions is widely available as a specialty beverage, also served in restaurants (Pardo-de-Santayana and Morales, 2004; Pasep-ef-Saouaaza fu am., 2005). Consequently, its importance in local Basque phytotherapy and as a health food is not surprising. It is used both as an herbal tea for general use and specifically to help with digestion, in case of stomach pain or diarrhoea. There clearly is an overlap between these uses and there can be no sharp dividing line between a general use just as a food (i.e. without any health-related expectations), as a health food or as a specific medication to treat stomach pain, or diarrhoea (i.e. they are medicinal by function). Both its use as a general herbal tea and as an herbal medicine have a high number of use reports. Its popularity is linked to the chemical profile of the species and especially the high content of essential oil rich in camphor, borneol and cis-nerolidol (Pardo-de-Santayana et al., 2005) and one can link these constituents both to its use as a food and as a medicine.

The situation is very similar in the case of Chamaemelum nobile, the second most popular species again with uses as a medicine in case of gastrointestinal disorders, as a general digestive or as a herbal tea with a more general usage. In another region in the Basque Country, C. nobile is the most commonly used species used for stomach-aches and digestive pains and disorders (Menendez-Baceta et al., 2014). The uses and names of the species have remained important in the area at least since 500 years ago as mentioned by Puente Amestoy (c. 1960) in his study of the inedited manuscript Libro de plantas (Plants book) of Fray Juan de Vitoria written in 1587. These two species, along with Santolina chamaeyparissus (1.5%) and Anthemis arvensis (2.0%) stand as an example of aromatic plants important in local Basque culture as herbal teas and digestive infusions. The three species are called manzanilla (chamomile), a generic term that has been used in Spain to refer to many species used for treating digestive conditions (Pardo-de-Santayana and Morales, 2006). Many other species including Lithospermum officinale, Artemisia alba and Jasonia tuberosa are used to prepare non-alcoholic beverages, mainly herbal teas.

The third most cited species is Prunus spinosa which fruits are mainly used for preparing a very popular liqueur called patxaran or pacharán. Many of its uses were also mentioned in the manuscript of Juan de Vitoria (Puente Amestoy, c. 1960). Liqueurs, like
herbal teas are important social beverages. They are generally prepared by combining several herbs, fruits and nuts with 17 species being used (3.98%). The most quoted were the fruits of Prunus spinosa, Prunus avium, Malus sylvestris, Rubus ulmifolius, Cytisus oblonga (all Rosaceae) and of Arbutus unedo, Quercus ilex subsp. ballota, Juniperus communis, Juniperus oxycedrus and Juglans regia. Important herbs were Chamaemelum nobile, Helichrysum italicum, or Berberis vulgaris. These liqueurs again are health foods, since they are drunk while socializing after meals, but also with the expectation of being a digestive, and they are used to manage minor gastrointestinal complaints.

Another key group of products are the various fruits processed in a variety of ways. The forth most cited species is Quercus ilex. subsp. ballota, widely used as a snack (toasted fruit) and as a coffee substitute. In this case explicit medicinal uses are much rarer and are specifically for treating herpes. Many other species may be used as ‘coffee substitutes’ including Hordeum vulgare (0.6% of UR), Castanea sativa (0.4%), Quercus ilex subsp. ilex (0.3%), Cichorium intybus (0.2%), Quercus faginea x Quercus pyrenaica (0.2%), Quercus faginea, Quercus sp., Vicia faba (0.1%). The choice is generally based on flavour of the processed fruit or seed which can vary between sweet, bitter and astringent. Combinations and variations of the flavour make the beverages unique and special. For example, the seeds of Castanea sativa are toasted then ground and boiled or infused in hot water. The roasted roots of Cichorium intybus are widely used combined with different species of Quercus. During and after the Spanish civil war Cichorium intybus was an important coffee substitute and its use is still remembered throughout Spain. (Guzmán, 1997; Triano et al., 1998; Fernández Ocaña, 2000; Bonet and Vallés 2002; Tardío et al., 2005). Other species, such as Vicia faba are used in a similar way to the Ecuadorian Highlands (runner-bean coffee or café de haba).

Condiments are also represented in the top 25 species. Thymus vulgaris is the sixth most cited species, being mainly used for treating respiratory disorders and for seasoning meat and olives. Oregano vulgar and Rosmarinus officinalis are also highly valued. People in the VIVA region have a wider preference for plants used for seasonings than in other Basque regions where people do not consider the use of spices as a Basque tradition since they associate condiments with immigrant populations from central and southern Spain (Menendez-Baceta et al., 2012; Menendez-Baceta, 2015).

A large number of species have a use as a general “tonic” or because they are simply considered to be healthy. However, this group is not discussed further and the following analysis concentrates on preparations with specific health claims.

Most key species (Prunus spinosa, Quercus ilex subsp. ballota, Santolina chamaecyparissus, Thymus vulgaris, Sambucus nigra, Juglans regia or Rubus ulmifolius) are also important food and/or medicinal plants in many other Spanish regions (Leonti et al., 2006; Tardío et al., 2006; Quave et al., 2012). Obviously the similarity is higher with the neighbouring regions. The highest similarity was found with Middle Navarra, an area that borders VIVA and not having a medicinal report. The most popular species are Chelidonium majus (0.8% of URs), Castanea sativa and Prunus spinosa. Other Navarran regions are not so similar. For instance in Middle Navarra only three of its top 3 medicinal species (S. chamaecyparissus, Thymus vulgaris, and Rosmarinus officinalis) are among the top 25 of VIVA (Calvo et al., 2011), and only two in Northern Navarra (C. nobile, and Tanacetum parthenium) (Cavero et al., 2011a). The similarity with the wild food plants consumed in other areas of Euskadi (southern Biscay and northern Alava) is also quite high, since four of the top 5 wild food species (P. spinosa, R. ulmifolius, Castanea sativa and Fagus sylvatica) are in the TOP 25 of VIVA. More differences appear when the medicinal plants of southern Biscay and northern Alava are compared. None of the top 5 medicinal species are in the top 25 of VIVA (Menendez-Baceta et al., 2014). Nearly half of the wild food plants mentioned in Gorbeialdea, are shared with VIVA area (Menendez-Baceta et al., 2012).

Such similarities may either be based on an exchange of practise or on parallel developments. Keeping the interconnected histories of the people in Northern Spain in mind, an exchange of practice seems to be the most plausible explanation. A standardisation of the knowledge is based on historical events that can strengthen or weaken the knowledge of plants, according to the needs of the people for a given time period. For example, Weckerle et al. (2009) argues that under Mao’s government important information and books were distributed in order to improve the health care system. Herbs have exerted a strong influence increasing the similarity of plant knowledge among rural populations in China. However, distinct local use of plants also exists, indicating that plant knowledge, specific to each rural community, is alive and practised. In the Basque Country, after the civil war in 1936, much of the traditional knowledge of species was lost (Barandiaran and Manterola, 2004). This is an indicator that political currents have a strong influence on whether people preserve their knowledge, or whether the knowledge is lost (Menendez-Baceta et al., 2015).

Overall, this study highlights that due to centuries of interconnectivities, there is a strong overlap in practices and there are many instances of shared practice, pointing both the usefulness of these species and to the active sharing of knowledge and practice. Interestingly, the similarity of the area with the rest of the Iberian Peninsula is higher than in Basque areas where Basque is still the main language (Menendez-Baceta et al., 2015).

4.3. Medicinal plants: Identifying key species for common health conditions

There is a group of 36 species used only for specific medicinal purposes (M) that are not used as food plants. These species are ingested only for specific health conditions. The lack of any usage as a health food is linked both to the taste and other sensory characteristics of products derived from these species but also to their often very strong pharmacological effects (for example as a purgative). As reported in many studies (e.g. Heinrich et al., 1998; Cavero et al., 2013) dermatological conditions have the highest percentage of URs (3.3%, 21 species). The most popular species in this group are Tilia platyphyllos (0.8% of URs), Chelidonium majus (0.7%), Verbena officinalis (0.4%), Rhamnus alaternus (0.6%), Plantago major (0.3%) and Cistus salviifolius (0.3%). Interestingly, Verbena officinalis is also highlighted by Menendez-Baceta et al. (2014).

The second largest subgroup is “emotional problems” with 1.2% of the UR and four species employed; most notably Tilia platyphyllos (0.9%) and T. cordata (0.2%). Another key subcategories are respiratory conditions, (1.1%) with 9 species included, most importantly Verbena officinalis (0.5%). A range of plants is used for cleansing the body (0.80% of) and their use is limited to special health conditions, like for example purging with Rhamnus alaternus and Centaurium erythraea (0.3%). In the case of urogenital conditions (0.8%), Equisetum arvense (0.4%) and Lepidium latifolium (0.3%) stand out as the most important species. In the case of gastrointestinal conditions (28%), the most relevant species are Periaria judaica (0.1%), used as a decoction to “cleanse the liver”, and Ilicium verum and Mentha pulegium (0.07%, 4) that are used for its digestive properties. No species stands out in the small cardiovascular subgroup (0.30%), with Rhamnus alaternus (0.2%), Verbena officinalis and Plantago major (0.1%) each.

4.4. Food plants: Identifying key species for collected food consumption

We documented 73 locally collected species used only as a food and not having a medicinal report. The most popular species are
Castanea sativa (2.2%), Rubus castroviejoi (1.7%), Rubus caesius (1.6%), Fagus sylvatica (1.6%), Arbutus unedo (1.3%) (Table 1). Prepared foods include Castanea sativa (0.8%), Cynara cardunculus (0.2%), Ruscus aculeatus and Sonchus oleraceus (0.2% both). Salads are made with fresh leaves, adding vinegar, olive oil and salt. Some people bring all these elements to the field and when they find different species they prepare the salad in the field and eat it as a snack, or sometimes they eat them without preparations.

Only eight species were recorded as infusions without any medical claim (0.8%) most notably Mentha aquatica (0.2%), Taxus baccata and Marrubium vulgare (both 0.1%), highlighting that infusions generally are seen as a food with a medical purpose. Interestingly we only recorded very few reports for uses in jams, (0.3%), most importantly Arbutus unedo (0.1%, 4), Rubus rubrum, Ribes nigrum, Rubus castroviejoi (0.1% each).

4.5. Plant parts and life forms

In the overall sample, fruits were used most commonly (33.7% of the UR), followed by dry inflorescences (13.6%), dry flowering aerial parts (7.2%), flowering shoots (6.6%), with the remainder accounting for less than 6% of the total UR. Herbs are the most popular life form used accounting for 55.8% of all uses, followed by trees 28.1% and shrubs 16.2%. Fruits (18.5%) represent the most widely used plant part in the H-F group, followed by dry inflorescences, (13.5%) and dry flowering aerial parts (7.1%). In the group of local food plants (F), fruits (15.1%) were the part most frequently reported, followed by tender leaves (2.5%) and tender shoots (1.3%). In the case of medicinal plants (M), dry flowers (1.4%) represent the most widely used plant part; followed by fresh leaves and latex (both 1.0%).

4.6. Methods of preparation

Infusions (38.5%), crude plant materials (33.7% of the UR), decoctions (10.2%) and macerations (7.3%) are the most widely used methods. In case of preparations used both as a food and a medicine, infusions are the most popular form of preparation (33.9%), followed by raw plants (15.9%), boiling (6.9%), maceration (6.2%), roasted (2.1%), decoction and fried (1.8% both) and burning (0.4%).

Infusion is also the preferred method for M (4.0%), followed by direct application of the crude drug (2.0%), frying (1.1%), decoction (0.7%), boiling (0.4%), macerating (0.4%) and burning (0.1%). According to the 25 most important species, the species are prepared between eight and two different ways, pointing to a high degree of versatility of these species. Some species stand out for having a very versatile range of modes of preparation: Sambucus nigra and Thymus vulgaris (6 methods of preparations); Urtica dioica, Quercus ilex subsp. ballota, Juglans regia, and Prunus spinosa (5 each), in all cases linked to both their cultural importance as such and the diversity of uses they get.

The use of unprocessed fruits is of particular importance, with 15 species yielding fruits including berries and nuts such as Sambucus nigra, Rubus ulmifolius, Castanea sativa, and different species of acorns. All are consumed when they are ripe. A unique case is Sorbus domestica which needs to be ripened near the point when it becomes putrid (Table 1).

Another interesting group are chewable stems, leaves and barks called masticantes and used to obtain juices, fibres of the plants. For instance, the stems of Rubus species (called carreros) are peeled and chewed, the leaves of Quercus ilex subsp. ballota and Fagus sylvatica, are eaten or the seeds of Triticum aestivum are eaten immature and raw. The role of masticants as a source of phytochemicals has been previously highlighted (Johns et al., 1996; Leonti et al., 2006; Meneñez-Baceta et al., 2012), since it might be related with the prophylactic effect of secondary chemicals.

The seeds of five species (0.7%) are roasted and ground into flour, sometimes mixed with corn flour (Zea mays) to be used for baking bread: Quercus ilex subsp. ballota, Fagus sylvatica, Castanea sativa and Triticum aestivum. Again this is a widespread tradition in Spain with a long history of use and species may be used interchangeably. In periods of scarcity, acorns were prepared as flour to make bread and other dishes (Triano et al., 1998; Tardío et al., 2006; Blanco and Cuadrado, 2000; Fernández Ocaña, 2000) a food use which can be traced back to prehistoric Spanish settlers (Tardío et al., 2006).

Other remarkable modes of preparation are jams and desserts (e.g. Sambucus nigra, Rubus ulmifolius and Vaccinium myrtillus), and liqueurs (e.g. Prunus spinosa, Sideritis hyssopifolia), some of them marketed as quality local produce as in other Spanish regions (Pardo-de-Santayana et al., 2007).

The latex of several Euphorbia species is applied directly against verruca and moles but also as cheese rennet. Presently some families still collect the latex when it is very thick for preparing the cheese. They maintain the practice because “the taste is different” and it keeps the cheese for a longer time without it rotting. The need to find new tastes, new dishes, and to break the routine of the same dishes, having multiple preparations allows a wide variation in flavours for the same species.

4.7. The sources of locally used plants

An ongoing debate has focused on the zones where such resources are gathered. Basoa (forest and other uncultivated places further away from the farmhouse) account for 46.9% of the total UR, an interesting result since other studies (Frei et al., 2000; Stepp and Moerman, 2001; Kujawska and Pardo-de-Santayana, 2015) had shown that zones close to the house tend to be the main sources of such products. Certain species that require social gatherings for their collection are usually found within this ecozone. When people collect plants they undertake other activities such as caring for animals, hunting and sharing time with other people. Fincas (cultivated fields) were the second most important zone (20.1%), followed by house garden (10.8%) and food garden (10.5%).

5. Conclusion

There is no sharp line dividing local food and medicine. This is a culturally constructed division and also influenced by environmental conditions, cultural background, traditional knowledge of the natural resources (useful plants in this case), education, economy, political movements, etc. (Colleen et al. 2015). From the analysis it also becomes apparent that these categories are dynamic. The preparations are characterized by having multiple methods of preparations and flexibility to use under subcategories of food and medicinal properties.

From the biogeographical location, it is clear that the Basque Country does not belong to the western Mediterranean region; however it shares with the latter a similar biodiversity and bio-cultural aspects. In comparison with other studies in the Mediterranean there are many similarities in the uses and preparations of different species of plants. Our study demonstrates that some of these plants are key Mediterranean species, used as food and medicine. Consequently, the study leads to new conceptual and practical implications in the way of understanding the meaning of Mediterranean regions, Mediterranean species, which involve more than the geographical location.

In all human cultures food diversity and diet are strongly linked to health. Such plant products may form a basis for developing novel useful products (like health foods) from this biocultural diversity. The present research provides baseline information that offers the possibility of further research into the traditional knowledge of the local people of the VIVA regions in the Basque Country. It is possible
and necessary to maintain and further develop the information for future local and global uses which is a basis for conservation and sustaining and using these resources. If society’s desire is for new products which are sustainable, then much of what has been found in this research will provide the basis for potential new nutraceuticals. This information may even lead to economically profitable applications at a local, national and international level.

In the Basque Country further research on local and traditional knowledge regarding medicinal plants and food plants is needed. This study is just a stepping stone in trying to fulfil this need.

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Appendix A

Medicinal and food uses of plants in VIVA area with three or more use-reports.

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Collection number</th>
<th>Local names</th>
<th>Use-category and mode of use</th>
</tr>
</thead>
</table>
| APIACEAE | Apium graveolens | 629 | apio | Clean the blood: tender leaves and stems, boiled
Vegetables: tender leaves and stems, boiled alone or with other vegetables; boiled or raw, in salads

| | Daucus carota | 33 | zanahoria | Clean the blood: roots, boiled
Clean the skin: seeds, macerated in olive oil, frictions
Vegetables: raw, alone or salads; boiled, stews
Würtz: roots juice that rise when salt is added in a hole made at the top of the root, topical

| | Foeniculum vulgare | 620 | anís, anís basto, hinojo | Colds and sore throat: leaves, infusion, alone or with Thymus vulgaris
Digestive: leaves, infusion, alone or with Thymus vulgaris; or with Illicium verum, Mentha arvensis and Glycyrrhiza glabra
Vegetables: young shoots, raw, snack, salads

| | Heracleum sphondylium | 673 | hoja agria | Vegetables: tender leaves, raw, salads; soup
Conjunctivitis: leaves, infusion, washings
Seasoning: leaves, flavour salads, meat, stews

| | Petroselinum crispum | 133 | perejil | Digestive, stomach pain: flowering shoots, infusion

| | ARALIACEAE | Hedera helix | 774 | hiedra | Skin burns, cellulitis: tender leaves and flowers, ointment, pomada sanjuanera**

| | ASTERACEAE | Anacyclus clavatus | 660 | manzanilla, manzanilla de burro, manzanilla loca | Herbal tea: inflorescences, infusion
Relaxant: dry flowers, infusion
Stomach pain: inflorescences, infusion
Vegetables: tender leaves, boiled

| | Arctium minus | 579 | bardana | Coffee substitute: roots, roasted and ground into flour, infusion
Vegetables: leaves, raw, salads
Vegetables: leaf stalks and midribs, raw, boiled

| | Artemisia alba | 523 | manzanilla | Herbal tea: flowering shoots, infusion
Skin inflammations or infections, burns, eczema: in florescences, oil infusion, topical; infected wounds: in florescences, ointment, pomada sanjuanera**
Sweet: in florescences, raw

| | Calendula officinalis | 303 | caléndula | Herbal tea: flowering shoots, infusion

| | Cichorium intybus | 212a | achicoria | Coffee substitute: roots, roasted and ground into flour, infusion
Vegetables: leaves, raw, salads
Vegetables: leaf stalks and midribs, raw, boiled

| | Cynara cardunculus | 30 | cardo | Vegetables: stem stalks and midribs, raw, boiled
Digestive: in florescences, infusion
Herbal tea: in florescences, infusion
Liqueurs: in florescences, macerated in anisette with coffee and immature walnuts

| | Helichrysum italicum | 528 | manzanilla, perpetua | Digestive in florescences, infusion alone or with Chamaemelum nobile
Herbal tea: in florescences, infusion alone or with Chamaemelum nobile
Relaxant: in florescences, infusion alone or with Chamaemelum nobile

| | Helichrysum stoechas | 188 | manzanilla, manzanilla perpetua | Digestive in florescences, infusion alone or with Chamaemelum nobile
Relaxant: in florescences, infusion alone or with Chamaemelum nobile

| | Inula montana | 148 | árnica | Skin infections, wounds: flowering shoots, ointment, pomada sanjuanera**
Digestive: flowering shoots, infusion
Herbal tea: flowering shoots, infusion
Rheumatism and arthritis pain, bruises: flowering shoots, ointment, pomada sanjuanera**

| | Jasonia tuberosa | 755 | té de tierra | Digestive, stomach pain, sickness: in florescences, infusion

| | Lactuca sativa | 381 | lechuga | Vegetables: leaves, raw in salad
Digestive, stomach pain, sickness: in florescences, infusion
Liver pain: leaf stalks and midribs, boiled

| | Matricaria discoidea | 614 | manzanilla | Vegetables: tender leaves, soup

| | Onopordum acanthium | 166 | cardo, toba | Digestive, stomach pain, sickness: in florescences, infusion

This research was funded through a BBSRC Case award (BBS/S/N/2006/13083) to the Centre for Pharmacognosy and Phytotherapy at The School of Pharmacy, Univ. London and additional funding by GSK Consumer Healthcare is gratefully acknowledged.
Lithospermum de tos y resfriados
Tanacetum corymbosum
Sonchus tenerrimus
Berberis vulgaris (L.; 122 agraz, agranzón)
BRBERIDACEAE
Convolvulus arvensis
CHENOPODIACEAE
(T, PA) pulmonaria
Pulmonaria longifolia (L.) Huds.
BRASSICACEAE
Lithospermum officinale L.; 592 PA
Tanacetum vulgare L.; 17 lechosino
Sonchus oleraceus
Taraxacum de raices, sangre, sifilis
Hylotelephium telephium
CRASSULACEAE
Hypericum perforatum
CLUSIACEAE
Internal ulcers
Beta vulgaris var. conditiva Alef.; 211 remolacha
Sambucus ebulus L.; 216 PA
Silene vulgaris (Moench) Garcke; 287 cololeja
CARYOPHYLLACEAE
Beta vulgaris var. maritima (L.) Moq.; 219 acelga silvestre
T
CISTACEAE
Cistus albidus L.; 613 hierba lobera
PA
Cistus salvifolius L.; 594 hierba lobera, jara, lobera
PA
CLUSIACEAE
Hypericum perforatum L.; 105 golondrina, flor de San Juan, hipérico, hierba de San Juan
T, PA
CONVOLVULACEAE
Convulvulus arvensis L.; 671 amapolita de carihuela
T
CRASSULACEAE
Hylotelephium telephium (L.) H.Ohba; 405 básamo, siempreviva
Sedum spurium M. Bieb.; 729 básamo
UMBILICACEAE
Umbilicus rupestris (Salisb.) Dandy; 342 básamo, campanilla, chirpamateria, hierba callera, ombligo de Venus, sacamatía

Vegetables: tender leaves and stems, boiled with potatoes, soup; boiled, in salads
Colds: leaves, infusion
Clean the blood: leaves, infusion
Stomach pain: inflorescences, infusion
Clean the blood: leaves, infusion; thin the blood: leaves, boiled; cholesterol lowering: leaves, raw
Clean the liver: leaves, raw; infusion
Vegetables: leaves, raw, snack, salads
Skin inflammations and infections, wounds: leaves, ointment, pomada sanjuanera
Vegetables: leaves, raw, salad
Clean the blood and body: leaves, raw, salads
Vegetables: leaves, raw, salad
Skin inflammations: flowers, burnt, smoke bath
Vegetables: tender leaves and stems, salted with egg; boiled
Clean and thin the blood: roots boiled
Vegetables: roots, boiled, salad
Diabetes: young shoots, boiled, stews, soups
Vegetables: fresh shoots, dipper in batter, fried; boiled, stews
Skin infections, wounds: aerial parts, decoction, washings
Kidneys problems: aerial parts, decoction
Skin infections: aerial parts, decoction
Clean the kidney: flowering shoots, infusion, alone or with Melissa officinalis or Cistus sp.
Diarrhea: flowering shoots, infusion
Insomnia, relaxant, sadness: flowering shoots, infusion with Melissa officinalis; depression: inflorescence, oil infusion, frictions
Herbal tea: flowering shoots, infusion, alone or with Melissa officinalis
Skin infections and inflammations: flowering shoots, ointment, pomada sanjuanera
Vegetables: tender leaves and flowers, raw
Infected wounds, skin inflammation: peeled leaves (without epidermis), topical
Infected wounds, skin inflammations: peeled leaves (without epidermis), topical
Infected wounds, skin inflammations, corns, hard skin, warts: peeled leaves (without epidermis), topical
Vegetables: leaves, raw, salads; boiled with Urtica dioica, Medicago sativa and other vegetables, soups, sometimes bottled
CUCURBITACEAE
Cucurbita ficifolia Bouche.; 365
calabaza, calabazo, calabaza de cabillo de ángel
Fruits: jam (cabello de ángel), boiled with sugar
Vegetables: tender stems, seeds raw; flowers, dipper in batter, fried

CUPRESSACEAE
Juniperus communis L.; 49
ebro
Digestive: cones, raw
Earache: cones, almond oil infusion, warmed in a bain marie, ear drops
Liqueur: cones, macerated in anisette, liqueur or gin
Rheumatism and arthritis pain: cones, oil infusion with Rosmarinus officinalis, frictions
Skin infections: cones, ground, poultice; warts: cones, boiled with salt, compresses; same number of cones as warts in a piece of cloth, buried in the ground

DIOSCOREACEAE
Tamus communis L.; 656
cola de raposo, cola de ratón, cola de zorro
PA.
Bruises: aerial parts, ground, poultice
Clean the blood: fertile aerial parts, decoction with Taraxacum officinale leaves
Diuretic, kidney problems: aerial parts, infusion

ERICACEAE
Arctostaphylos uva-ursi (L.) Spreng.; 200
gayuba
Prostate inflammations, cystitis: fruits and leaves, infusion; kidney infections, diuretic: fruits and leaves, infusion with Erica vagans
Fruits: raw

EUPHORBIACEAE
Euphorbia peplus L.
lechetrezna
Warts: latex, topical
Warts: latex, topical
Warts: latex, topical

FABACEAE
Glycyrrhiza glabra L. †; 789
regaliz
Herbal tea: aerial parts and roots, infusion
Herbal tea: aerial parts and roots, infusion; stem chewed
Diabetes: seeds, infusion
Fruits: seeds, stews
Vegetables: fruits, shoots, raw, soups, stews
Vegetables: seeds, soups, stews
Anemia: immature seeds, boiled; seeds, toasted and ground, infusion
Coffee substitute: seeds, toasted and ground into flour, infusion
Vegetables: immature seeds, boiled and salted or puree

FAGACEAE
Quercus faginea Lam.; 44
roble encina; leave: pasto de roble
Coffee substitute: fruits, toasted and ground into flour, infusion
Flavouring cheese: fruits, olive oil infusion with Juniperus communis cones and Lavandula latifolia
Fruits: raw, toasted
Skin infections, wounds: bark, poultice

Quercus faginea x Q. pyrenaica; 516
roble
Fruits: raw, toasted

Quercus ilex L. subsp. ilex; 515
encina
Coffee substitute: fruits, toasted and ground into flour, infusion
Fruits: raw, toasted

Quercus sp.; 676; 158
roble
Coffee substitute: fruits, toasted and ground into flour, infusion
Fruits: raw, toasted

CENTANACEAE
Centaurium erythraea Rafn.; 479
centaura, centaurea menor, sanguinaria
Clean the blood: flowering shoots, infusion
Depression: flowering shoots, infusion
Digestive: flowering shoots, infusion
Vegetables: flowering shoots, raw

GENTIANACEAE
Gentiana acaulis L.
pan de cuco

GROSSULARIACEAE
Ribes alpinum L.; 543
grosellero; fruit: abubilla, agrace, grosella
Fruits: raw

Ribes nigrum L.; 683
PA.
Fruits: raw; jam

Ribes nigra L., 543
roble encina; leave: pasto de roble
Coffee substitute: fruits, toasted and ground into flour, infusion
Flavouring cheese: fruits, olive oil infusion with Juniperus communis cones and Lavandula latifolia
Fruits: raw, toasted
Skin infections, wounds: bark, poultice

Ribes rubrum L.; 370
T
Ribes uva-crispa L.; 727
T

**ILLICIACEAE**

*Ilicium verum* Hook. f.; 773

anís

Digestive: frui, infusion, alone or with *Foeniculum vulgare* and *Glycyrrhiza glabra*; liqueur, fruits macerated in anisette with *Prunus spinosa*


**LAMIACEAE**

*Calamintha nepeta* (L.) Savi; 440
T
Menta, menta del monte, orégano del monte

Herbal tea: aerial parts, infusion

Relaxant: aerial parts, infusion

Relaxant: inflorescences, infusion; flowering shoots, oil infusion, frictions

Flavouring cheese: inflorescences, olive oil infusion with *Juniperus communis* cones and acorns

Skin infections: flowering shoots, ointment, pomada sanjuanera**


*Marrubium vulgare* L.; 596
PA
menta hedionda

Herbal tea: aerial parts, infusion


*Melissa officinalis* L.; 474
T, PA
melisa

Bronchitis: aerial parts, infusion

Herbal tea: aerial parts, infusion, alone or with *Hypericum perforatum*

Relaxant, depression: aerial parts, infusion, alone or with *Hypericum perforatum*

Stomat pain: aerial parts, infusion


*Menega aquatica* L.; 719
T, M, PA
menta, menta poleo

Seasoning: leaves, flavour rice pudding, meat, soups

Herbal tea: leaves, infusion


*Mentha arvensis* L.; 721
PA
hierbabuena, hierba santa, menta

Herbal tea: leaves, infusion, alone or *Lathyrus cicera*

Seasoning: leaves, flavour rice pudding


*Mentha longifolia* (L.) Huds. T

hierba santa, menta silvestre

Digestive: leaves, infusion

Seasoning: leaves, flavour rice pudding


*Mentha x piperita* L. †

††

hierbabuena, hierba santa, menta

Digestive, stomach pain: leaves, infusion

Herbal tea: leaves, infusion

Relaxant: leaves, infusion

Seasoning: leaves, flavour rice pudding


*Mentha pulegium* L.; 265
T, PA
batán, menta lombricera, menta poleo

Digestive, stomach pain: leaves, infusion; liqueur, macerated in anisette with *Prunus spinosa* fruits, *Rosmarinus officinalis* and *Thymus vulgaris*

Intestinal worms: leaves, infusion


*Mentha spicata* L.; 338
T
hierbabuena

Digestive, stomach pain: leaves, infusion

Herbal tea: leaves, infusion

Relaxant: leaves, infusion

Seasoning: leaves, flavour meat, soups, rice pudding

Digestive: leaves, infusion with *Thymus vulgaris*

Relaxant: leaves, infusion, alone or with *Thymus vulgaris*

Seasoning: leaves, flavour, meat, pasta, stews


*Ocimum basilicum* L.††; 407
Albahaca

Digestive: leaves, infusion with *Thymus vulgaris*

Relaxant: leaves, infusion, alone or with *Thymus vulgaris*

Clean the stomach: flowering shoots, infusion


*Phlomis lychnitis* L.; 598
T, PA
candilera

Herbal tea: flowering shoots, infusion


*Salvia lavandulifolia* Vahl; 332
T, PA
salvia

Herbal tea: leaves, infusion

Relaxant: leaves, infusion

Seasoning: leaves, flavour meat, stews

*Teucrium capitatum* L.; 599
sanguinaria

Herbal tea: flowering shoots, infusion


*Thymus mastichina* (L.) L.; 9
T
Tomillo

Colds and respiratory problems: flowering shoots, infusion with lemon


*Thymus praecox* Opiz; 600
T
orégano silvestre

Herbal tea: flowering shoots, infusion

Headache: flowering shoots, infusion

Colds and chest infections: flowering shoots, infusion

Seasoning: leaves, flavour meat, stews


*Thymus zygis* L.; 172
T
Tomillo


*LAURACEAE*

*Laurus nobilis* L.; 128
M
laurel

Digestive: leaves, infusion

Seasoning: leaves, flavour meat, sausages, snails, fish, stews


*LILIACEAE s.l. (incl. Alliaceae, etc.)*

*Allium ampeloprasum* L.; 562
ajete, ajo silvestre, puero, puero silvestre

Seasoning: bulb and pseudostem, flavour meat, stews soups

Skin inflammations and infections: second layer of the bulb, heated, poultice; skin burns: first layer of the bulb, fried, put in a piece of cloth, poultice

Vegetables: pseudostems, boiled, stews

Colds and phlegm: bulbs, raw

Digestive: bulbs, macerated in olive oil

Flavouring: bulbs, flavour, meat, stews

Prevent infections: bulbs, soup with bread (*sopa de ajo*)

Rheumatism and arthritis pain: bulbs, macerated in olive oil

Vegetables: bulbs, raw


*Allium porrum* L.; 235
puerto

Vegetables: young shoots, raw


*Allium sativum* L.; 334
ajo

Vegetables: young shoots, raw


*Asparagus officinalis* L. PA
young shoot: espárrago

Vegetables: young shoots, raw


*Asparagus officinalis* L. PA
esparaguera; young shoot: espárrago

Vegetables: young shoots, raw


*Merendera montana* (L.) Lange; 405
quitameriendas

Seasoning: starness, flavour rice (colourant)
T. Ruscus aculeatus L.; 571
MALVACEAE
Aimthosa officinalis L.; 454
T, PA
Malva moschata L.; 437
Malva neglecta Wallr.; 438
T, PA
MYRTACEAE
Eucalyptus globulus Labill.; † 780
PRIMULACEAE
Anagallis arvensis L.; 227
M
OLEACEAE
Ficus carica Labill.
PA
OLYRNIACEAE
Chelidonium majus L.; 115
PA
PINACEAE
Pinus sylvestris L.; 314
T, M
PISTACIACEAE
Plantago major L.; 384
M
POACEAE
Hordeum vulgare L. †; 776
Triticum aestivum L. †
Zea mays L. ¶
POLYGONACEAE
Plantago lanceolata L.; 288
T, M, PA
Plantago major L.; 384
T, PA
RANUNCULACEAE
Ranunculus ficaria L.; 527
RHAMNACEAE
Rhamnus alaternus L.; 375
T, PA
ROSACEAE
Amelanchier ovalis Medik.; 552
T
Prunus avium (L.) Mill. †; 125
Crataegus monogyna Jacq.; 698
TM
Malus domestica L. †; 312
Malus sylvestris Mill.; 738
T, M
Mespilus germanica L.; 785
T, M
Potentilla reptans L.; 101
PA
Prunus avium (L.) L.; 227
T, M
Prunus insititia L.; 314
T, M
Prunus mahaleb L.; 539
T
Pyrus communis L.; † 228
Rosa canina L.; 697

Vegetable: young shoots, raw; boiled or salted
Colds: flowering shoots, infusion; roots, syrup
Colds: flowering shoots, infusion
Fruits: immature fruit, raw
Colds: flowering shoots, infusion
Fruits: immature fruit, raw
Vegetables: tender leaves, raw, salad
Colds: shoots, infusión
Fruits: seeds, raw, toasted
Vegetables: tender leaves, raw, salad
Fruits: seeds, raw, toasted
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Fruits: raw, jam
Coffee substitute: fruits toasted and ground into flour, infusion
Flour: fruits, ground into flour, bread
Flour: fruits, ground into flour, bread (talo o moraqui)
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Fruits: raw, jam
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Relaxant: flowering branches, infusion
Fruits: raw
Liqueur: fruits, macerated in anisette or liquor, alone or with Melissa officinalis
Fruits: raw

Vegetable: young shoots, raw; boiled or salted
Colds: flowering shoots, infusion; roots, syrup
Fruits: immature fruit, raw
Colds: flowering shoots, infusion
Fruits: immature fruit, raw
Vegetables: tender leaves, raw, salad
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Fruits: raw, jam
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Relaxant: flowering branches, infusion, alone or with Melissa officinalis
Fruits: raw
Liqueur: fruits, macerated in anisette
Fruits: raw
Fruits: raw

Vegetables: tender leaves, raw, salad
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Fruits: raw, jam
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Relaxant: flowering branches, infusion, alone or with Melissa officinalis
Fruits: raw
Liqueur: fruits, macerated in anisette
Fruits: raw
Fruits: raw

Vegetables: tender leaves, raw, salad
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Fruits: raw, jam
Colds, sore throat; flowering branches, infusion
High blood pressure, thin the blood; flowering branches, infusion
Relaxant: flowering branches, infusion, alone or with Melissa officinalis
Fruits: raw
Liqueur: fruits, macerated in anisette
Fruits: raw
Fruits: raw
<table>
<thead>
<tr>
<th>Latin Name</th>
<th>Common Name</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tilia platyphyllos</strong> (L.; 558)</td>
<td>Tilia</td>
<td>Relaxant: flowers, infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toothache: flowers, infusion</td>
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<tr>
<td><strong>Tilia cordata Mill.; 452</strong></td>
<td>Tilia</td>
<td>Liver pain and clean: aerial parts, infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circulatory conditions, thin the blood: tender leaves and stems, boiled, soup; raw, frictions</td>
</tr>
<tr>
<td><strong>Tilia dioica L.; 153</strong></td>
<td>Tilia</td>
<td>Herbal tea: aerial parts, infusion</td>
</tr>
<tr>
<td><strong>Tilia judaica L.; 561</strong></td>
<td>Parietaria</td>
<td>Rheumatism and arthritis pain: tender leaves and stems, boiled, soup; raw, frictions</td>
</tr>
<tr>
<td><strong>Urtica dioica L.; 153</strong></td>
<td>Ortiga</td>
<td>Stimulate immune system: tender leaves and stems, boiled, soup</td>
</tr>
<tr>
<td><strong>Urtica urens L.; 117</strong></td>
<td>Ortiga</td>
<td>Vegetables: tender leaves and stems, boiled, soup, salted</td>
</tr>
<tr>
<td><strong>Verbena officinalis</strong> L.</td>
<td>Verbena</td>
<td>Colds, sore throat: aerial parts, decoction; sinusitis: aerial parts, fried with egg, poultice</td>
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<td>Skin infections and inflammations: aerial parts, decoction, washings;</td>
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<tr>
<td></td>
<td></td>
<td>aerial parts, ointment, pomada sanjuanera**</td>
</tr>
<tr>
<td><strong>Vitis vinifera</strong> L.; 787</td>
<td>Vidi</td>
<td>Vegetables: Young shoots, raw</td>
</tr>
</tbody>
</table>

**For symbols and acronyms, see also Table 1.**

* Patxaron: Prunus spinosa fruits are macerated in anisette for five or six months with coffee beans, cinnamon bark and Chamaemelum nobile inflorescences.

** Pomada sanjuanera: Ointment prepared frying together many plants such as: Achillea millefolium, Allium ampeloprasum, Anagallis arvensis, Calendula officinalis, Chamaemelum nobile, Crucia glabra, Eleocharis quinquenervia, Glycyrrhiza glabra, Hedera helix, Hypericum hirsutum, Hypericum perforatum, Inula montana, Jasminia tuberosa, Lavandula latifolia, Malva sylvestris, Mentha × piperita, Pinus sylvestris, Plantago lanceolata, Plantago major, Potentilla erecta, Potentilla reptans, Primula veris, Pulmonaria longifolia, Ranunculus ficaria, Rumex sp., Sambucus nigra, Santolina chamaecyparissus, Symplyium tuberosum, Thymus vulgaris, Tussilago farfara, Verbascum thapsus and Verbena officinalis.

*** Olives in brine: olives are macerated in water with salt until the bitter flavour has left. Then they are macerated in cold water, garlic, thyme and rosemary for two months.

* Unless indicated by a cross (†) all species are non-cultivated; species which are both cultivated and non cultivated are indicated with two crosses (‡†).

† Collector: Rocío Alarcón.

‡ Comparison with other authors: T (Tardío et al., 2006), M (Menendez-Baceta et al., 2012), PA (Puente Amestoy, c. 1960).


Viteri Alarcón, R., 2012. Medicinal and Food Plants of the Province of Teruel with emphasis on the Guadalaviar and Turia Rivers (Ph.D. dissertation). School of Pharmacy UCL.

