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## Ethnobotanical study of medicinal plants traditionally used in the Arribes del Duero, western Spain

José A. González<sup>a,c</sup>, Mónica García-Barruso<sup>b,c</sup>, Francisco Amich<sup>b,c,\*</sup>

<sup>a</sup> Departamento de Biología Animal, Universidad de Salamanca, E-37071 Salamanca, Spain

<sup>b</sup> Departamento de Botánica, Universidad de Salamanca, E-37071 Salamanca, Spain

<sup>c</sup> Participating Group (Salamanca, Spain) in "Red Iberoamericana de Saberes y Prácticas Locales sobre el Entorno Vegetal" (RISAPRET, CYTED)

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### ABSTRACT

**Aim of the study:** We studied traditional knowledge (TK) and current uses of medicinal plants among the inhabitants of the Arribes del Duero-ARD-(Spain), documenting traditional medical practices.

**Materials and methods:** We interviewed 80 key informants (44 men and 36 women). Their average age was 72 years (range 48–98 years). We calculated the cultural importance for each species cited. To analyze how TK varies with the characteristics of the different informants, we performed an ANCOVA, taking the number of use-reports (URs) provided by each informant as a variable to model, and age and gender as explanatory variables.

**Results and conclusions:** 156 medicinal remedies were recorded; they were based on a single species and were cited by at least three independent informants, and half of them are still in use today. These remedies are related to nine major organ systems and 54 therapeutic uses, and 70 species (belonging to 39 families) are used, most of which are herbs (64%). The most relevant family is the Lamiaceae (23 remedies, 8 species) and the species employed in the greatest number of remedies (8) is *Urtica dioica* L. However, the taxon with the greatest cultural value is *Hypericum perforatum* L. (CI=0.71). 31% of the variability of the TK can be explained in terms of the age and gender of the informants ( $R^2 = 0.315$ ), the age factor having a positive effect. Most of the remedies are related to the treatment of unimportant ailments, referring to disorders of the skin, and the respiratory and digestive systems. The leaves and fruits are the most frequently sought plant parts (40 and 17% of the plants mentioned, respectively), and infusions (34%) and decoctions (28%) are the main methods used for preparing the remedies. Likewise, we recorded remedies based on plant mixtures and ethnomedicinal novelties or rare uses, and comment on the influence exerted by superstition.

Currently, many people preserve a rich TK about medicinal plants, and it may be affirmed that the folk medicine is still very much alive in the ARD, above all as regards the treatment of certain common afflictions or unimportant ailments.

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### 1. Introduction

Owing to secular isolation and the scarcity of health services and doctors, until half way through the last century medicine in the rural communities of western Spain was tightly linked to natural resources (see Blanco Castro, 2000). In times when reaching the attentions of a physician was not as simple as it is today people had to use their vast store of knowledge about the natural environment to prevent or cure their afflictions, especially in the case of only mild ailments.

Furthermore, in these rural areas the process of emigration initiated in Spain in those years has had important repercussions, especially as regards the crisis of traditional agrarian systems (Gómez Benito and González Rodríguez, 2002). Depopulation, population ageing and social disarticulation have led to a loss of biodiversity and cultural heritage. The process of oral transmission has broken down and most traditional knowledge (TK) is only to be found in the memories of elderly people, and of course it is being progressively lost as such people pass away.

In light of these circumstances, towards the end of 2007 the Spanish parliament passed the first law addressing Natural Heritage and Biodiversity (Spanish law 42/2007). Section IV, concerning the sustainable use of our natural heritage and biodiversity, and in particular article 70, includes the statement "According to the norms, resolutions and principles of the Agreement on Biological Diversity and of the World Intellectual Property Organization,

\* Corresponding author at: Departamento de Botánica, Universidad de Salamanca, E-37071 Salamanca, Spain. Tel.: +34 923 294469; fax: +34 923 294484.

E-mail addresses: [ja.gonzalez@usal.es](mailto:ja.gonzalez@usal.es) (J.A. González), [mgbarruso@usal.es](mailto:mgbarruso@usal.es) (M. García-Barruso), [amich@usal.es](mailto:amich@usal.es) (F. Amich).

Public Administrations will promote the creation of inventories of TK relevant to the conservation and sustainable use of biodiversity, with special interest on ethnobotanical knowledge”.

Nevertheless, in Spain there are still many unexplored areas in the sphere of Ethnobotany. In the present work, within the different fields in which plants are involved in the material culture we considered those used in the folk medicine of the Arribes del Duero area (henceforth “the ARD”), located to the west of the provinces of Zamora and Salamanca (western Spain). This study is encompassed within a global ethnobotanical project (González et al., unpublished results), and although there are isolated data concerning plants used for medicinal purposes in the ARD in provincial ethnobotanical publications (Blanco, 1985; Granzow de la Cerda, 1993) and in some recent reference books (Gallego et al., 2005; Panero, 2005; Santos et al., 2006; Amich and Bernardos, 2008; Gallego and Gallego, 2008) this is the first study to address the traditional use of medicinal plants in these part of the Iberian Peninsula in exhaustively.

Thus, the aims of the present work were as follows: (i) to document and analyse the knowledge and use of medicinal plants by people from the ARD; (ii) to contribute to the dissemination of the results within the scientific community in order to open a door to research in other disciplines; (iii) to document the vascular plants that have not been cited previously as medicinal and that could be assessed in future pharmacological studies, and (iv) to contribute to the knowledge and conservational possibilities of plant biodiversity, bearing in mind that biological diversity is also related to the use and applications of natural resources.

## 2. Methodology

### 2.1. Description of the study area

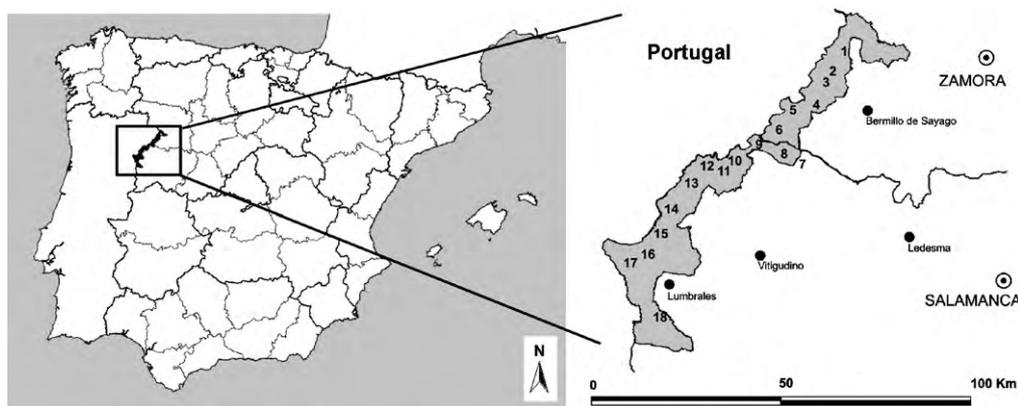
The territory of the ARD forms the administrative border between Spain and Portugal along a stretch of some 120 km (40°50' to 41°35'N, 6°00' to 6°41'W) (Fig. 1). It is a high-quality protected area (Arribes del Duero Natural Park, declared a Site of Community Importance) with singular floristic, ecological and geomorphological traits. The morphological homogeneity of the surrounding peniplain, whose altitude ranges between 700 and 800 m a.s.l. is broken up by the gorges of the region. The river Duero and its tributaries run through an extraordinary labyrinth of canyons and gorges—arribes—(Sanz et al., 2003) with rocky cliffs that often exceed 400 m. The climate is characterised by fairly mild annual temperatures (11 °C mean for the whole area), an almost complete absence of frosts during the year, and a rainfall of

about 700 mm/year, characteristic of a Mediterranean mesoclimate (Calonge-Cano, 1990).

The north–south orientation, along with the marked altitudinal differences in the Duero valley, with protection from winds and marked insolation, has led to the development of a profuse diversity of plants. This has enabled the persistence of highly significant, relict plant communities, characterised by an abundance of typically Mediterranean species (e.g. Amich et al., 2004; Bernardos et al., 2004), where formations of holm oak, *Quercus pyrenaica* oak, and cork oak are predominant. Owing to their greater rainfall and higher temperatures, the valleys host many cultivated species such as olives, almonds and citrus fruits, which are not normal at these latitudes. In contrast, on the plains, with a more extreme climate but easier to work, free-range livestock rearing is the main activity, alternating with cereal cropping and orchards (García Feced et al., 2007; Calabuig, 2008). Traditionally, the population has been based on a subsistence economy that, owing to the limited potential of the soils of the region, has mainly focused on livestock rearing. Therefore, this territory can be said to be a good example of a very heterogeneous landscape with a marked alternation of habitats and land uses (García Feced et al., 2007).

Likewise, the territory is also characterised by a strong demographic regression, which started half-way through the last century, with losses of almost 60% of the local population, a high ageing rate (almost 40% of people over 65), an imbalance in the sex ratio (with large numbers of unmarried men), a very low population density (8.60 inhabitants/km<sup>2</sup>) and a low cultural level (47% with only elementary schooling) (Morales Rodríguez and Caballero Fernández, 2003).

The history of human settlement in the zone dates back to 500,000 years ago, during the Palaeolithic, when it was populated by nomadic and hunting tribes. With time, these were superseded by crop- and livestock-raising tribes, until the Celtic invasion and domination of the area, around the 9th century BCE, brought with them a “standardization” and an increase in the population. In the 3rd century BCE, the first Carthaginians arrived, followed by the Romans, but the lack of deposits rich in minerals and the complicated orography of the region were sufficient to deter the Empire from paying special attention to this territory. After the Roman influence had dissipated, there were some years of a power vacuum, during which the zone was abandoned. Neither the Visigoths nor the Arabs colonized it, and it fell into oblivion until the 10th century CE: the beginning of the Reconquest. With the expulsion of the Arabs, the area began to be repopulated by the Galicians and the Leonese. Since that time, the population began to increase, up to the 15th and 16th centuries, when a drop in the population



**Fig. 1.** Geographic location of the region of the Arribes del Duero and the villages where interviews were held. Province of Zamora: 1. Torregamones, 2. Badilla, 3. Fariza de Sayago, 4. Formariz, 5. Pinilla de Fermoselle, 6. Fermoselle. Province of Salamanca: 7. Almendra, 8. Trabanca, 9. Villarino de los Aires, 10. Pereña de la Ribera, 11. Masueco, 12. Aldeadvila de la Ribera, 13. Mieza, 14. Vilvestre, 15. Saucelle, 16. Hinojosa de Duero, 17. La Fregeneda, 18. San Felices de los Gallegos. The edge of the Arribes del Duero Natural Park is shaded.

**Table 1**

Indications cited for treatment with medicinal plants, according to the informants interviewed in the rural community of the Arribes del Duero (Spain).

1. Circulatory system	7. Integumentary system (skin and its appendages)
1.1. Cardiac tonic	7.1. Injuries – cuts, scratches, etc. – (vulnerary, antiseptic)
1.2. Regulation of blood	7.2. Haemorrhaging
1.3. Varicose veins (vein tonic)	7.3. Mouth ulcers
1.4. Antihæmorrhoidal	7.4. Burns
1.5. Blood depurative	7.5. Chaps (sore patches)
2. Digestive system	7.6. Lip blisters (lip herpes)
2.1. Stomach ache	7.7. Nettle stings
2.2. Laxative	7.8. Boils (or furuncles)
2.3. Constipation in breast-fed babies	7.9. Calluses (hyperkeratosis)
2.4. Antidiarrhoeal	7.10. Eczema
2.5. Antispasmodic	7.11. Acne
2.6. Carminative	7.12. Warts
2.7. Cholagogue	7.13. Chilblains
3. Respiratory system	7.14. Alopecia
3.1. Anticatarrhal	8. Nervous system
3.2. Antitussive	8.1. Headache
3.3. Sore throat	8.2. Nervousness and insomnia (sedative)
3.4. Tonsillitis	8.3. Cerebellar ataxia
3.5. Dysphonia (laryngitis)	9. Sensorial system (eye/ear)
3.6. Expectorant and mucolitic	9.1. Conjunctivitis
3.7. Pneumonia	9.2. Styes (or hordeolum)
4. Urinary system	9.3. Foreign bodies in the eye
4.1. Diuretic	9.4. Earache
4.2. Kidney stones (renal calculi)	10. Others
5. Reproductive system	10.1. Fever (febrifuge, antipyretic)
5.1. Emmenagogue	10.2. Toothache
5.2. Menstrual pain (dysmenorrhoea)	10.3. Paludism
5.3. Abortifacient	10.4. Antihelminthic (enterobiasis, pinworm)
5.4. Aphrodisiac	
6. Musculoskeletal system	
6.1. Contusions and bruises (anti-inflammatory)	
6.2. Calcaneal spur	
6.3. Arthrosis	
6.4. Rheumatism (antirheumatic)	

occurred owing to border and independentist skirmishes (Martín, 1996). After three centuries of instability, an intense task of tilling the land began, still present today.

Finally, the fact that it was a border area has allowed the possibility today not only of its enjoying an excellent environmental health but also of harbouring deep-rooted traditions, customs and autochthonous peculiarities (Falcón, 2005; Blanco, 2009). Likewise, an interesting aspect is the persistence – to a greater or lesser extent – of the “leonés” language, which is still seen in the daily use of certain words, idioms, and expressions typical of this language (Herrero Ingelmo, 2008; González, 2009).

## 2.2. Data-collection procedures

The incidence and social context of the use of different plants for medicinal purposes was studied as part of an ethnobotanical research carried out in the ARD. Key informants with a sound TK of useful plants who were born in the region and who were mostly elderly, long-time residents were interviewed. Information was obtained in 116 semi-structured interviews of 80 non-specialist people (44 men and 36 women; age range, 45–98 years; mean age, 72) from 18 localities: 6 in the province of Zamora (localities 1–6) and 12 in the province of Salamanca (localities 7–18) (Fig. 1). Interviews were conducted from 2005 to 2009. Open questions were asked about the use of medicinal plants sought to ascertain knowledge about past and present use.

Regarding plant taxonomy and nomenclature we followed the “Flora iberica” (Castroviejo, 1986–2010) for the families included therein and “Flora Europaea” (Tutin et al., 1964–1993) for the remaining ones. Voucher specimens are deposited at SALA (the Herbarium of the University of Salamanca, Spain). Most of them corresponded to the area studied and on some occasions the plants were collected in territories close to the ARD. In the case of some

species for which no voucher was available, a digital photography number is included.

## 2.3. Data analysis

For quantitative analysis of the data, each plant species mentioned by an informant within a use-category (defined attending to the major organ systems) and a subcategory (Table 1) was counted as a “use-report” (UR). Also, to obtain information about the relative importance of the different species cited, the cultural importance index (CI) provided by Tardío and Pardo-de-Santayana (2008), with the following formula, was used:

$$CI_s = \frac{\sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} UR_{ui}}{N}$$

The index was obtained by adding firstly the UR of all the informants (from  $i_1$  to  $i_N$ ) in each use-subcategory mentioned for a species ( $s$ ) and finally adding all the UR of each subcategory (from  $u_1$ , only one use, to  $u_{NC}$ , the total number of subcategories,  $NC$ ), divided by the number of informants in the survey ( $N$ ). This additive index takes into account not only the spread of use (number of informants) for each species, but also its versatility, i.e., the diversity of its uses. In this case, the theoretical maximum value of the index is the total number of different subcategories.

Additionally, in order to analyze how TK varied according to the characteristics of the different informants, we performed an analysis of covariance (ANCOVA), taking “UR” as the variable to model (number of use-reports provided by each informant) and using the XLSTAT 2009 program. Likewise, as explanatory variables we took the two items of personal data requested: “age” (a quantitative variable) and “gender” (a qualitative variable that takes values of m = male or f = female).

**Table 2**  
List of plants used in the traditional medicine of the Arribes del Duero (Spain) whose uses were mentioned by at least three independent informants. FC=frequency of citation; CI=cultural importance index.

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI
<b>PTERIDOPSISIDA (=FILICOPSISIDA)</b>								
<i>Ceterach officinarum</i> Willd. (SALA 17238)	Doradilla	W	Hypertension	Aspleniaceae Fronds	Infusion	Oral	3	0.18
			Antidiarrhoeal (*)	Fronds	Infusion	Oral	3	
			Cholagogue (*)	Fronds	Infusion	Oral	3	
			Antitussive (*)	Fronds	Infusion	Oral	5	
<b>CONIFEROPSISIDA</b>								
<i>Juniperus oxycedrus</i> L. (SALA 102358)	Enebro, nebro, jimbros, jumbrios, joimbros	W	Rheumatism	Cupressaceae Leaves	Infusion	External	4	0.09
			Earache (*)	Fruits	Fried in olive oil	External (a few drops)	3	
<b>MAGNOLIOPSISIDA</b>								
<i>Foeniculum vulgare</i> Mill. subsp. <i>piperitum</i> (Ucria) Bég. (SALA 16434)	Hinojo, linojo, fenojo	W	Carminative (*)	Apiaceae Leaves and fruits	Infusion	Oral	13	0.16
<i>Petroselinum crispum</i> (Mill.) Fuss (SALA 25902)	Perejil	C	Abortifacient	Leaves	Decoction	Oral	4	0.10
			Toothache (*)	Leaves	Poultice (with salt and olive oil)	External	4	
<b>Araliaceae</b>								
<i>Hedera helix</i> L. (PHO 59)	Hiedra, yedra	W, C	Calluses	Leaves	Poultice (with vinegar)	External	4	0.05
<b>Asteraceae</b>								
<i>Centaurea ornata</i> Willd. (SALA 59507)	Arzolla, cardo amarillo	W	Alopecia	Whole plant	Decoction (in wine)	External	5	0.21
			Nervousness and insomnia (*)	Root	Decoction	Oral	12	
<i>Chamaemelum nobile</i> (L.) All. (SALA 15069)	Manzanilla, manzanilla romana, magarza fina	W	Laxative (*)	Inflorescence (dried)	Infusion	Oral	3	0.47
			Sore throat (*)	Inflorescence (dried)	Infusion (with honey)	Gargle	3	
			Conjunctivitis (*)	Inflorescence (dried)	Infusion	External	27	
			Styes (*)	Inflorescence (dried)	Infusion	External	5	
<i>Chondrilla juncea</i> L. (PHO 47)	Ajinjera, ajonjera, ajujera, jinjeriña, baleo, balaguera, baleguera	W	Haemorrhaging	Latex	Fresh	External	3	0.04
<i>Silybum marianum</i> (L.) Gaertner (SALA 15105)	Cardo mariano	W	Injuries	Root	Decoction	External	3	0.04
<i>Taraxacum officinale</i> Weber ex F.H. Wigg. (SALA 15194)	Diente de león	W	Warts (*)	Latex	Fresh	External	3	0.04
<b>Brassicaceae</b>								
<i>Lepidium latifolium</i> L. (SALA 18676)	Rompepedras	W, C	Kidney stones (*)	Aerial part flowered (dry)	Decoction	Oral	12	0.15
<i>Rorippa nasturtium-aquaticum</i> (L.) Hayek (SALA 18673)	Berros, agriones	W	Diuretic (*)	Tender leaves and stems	Eaten raw in salads	Oral	13	0.16
<b>Cactaceae</b>								
<i>Opuntia maxima</i> Mill. (PHO 17)	Chumbera	C, SC	Stomach ache (*)	Flowers (dried)	Infusion	Oral	4	0.09
			Antidiarrhoeal (*)	Flowers (dried)	Infusion	Oral	3	
<b>Caprifoliaceae</b>								
<i>Sambucus nigra</i> L. (SALA 17435)	Saúco, sabugo, canillero	W	Antihaemorrhoidal (*)	Leaves	Decoction	External (hip bath)	4	0.36
			Diuretic	Medulla	Decoction	Oral	4	
			Contusions and bruises	Flowers or medulla	Infusion/decoction	External	15	
			Conjunctivitis (*)	Flowers (dried)	Infusion	External	6	
<b>Caryophyllaceae</b>								
<i>Paronychia argentea</i> Lam. (SALA 18531)	Sanguinaria	W	Hypertension (*)	Aerial part	Infusion	Oral (to be taken on an empty stomach)	23	0.38
			Blood depurative (*)	Aerial part	Infusion	Oral	4	
			Lengthy haemorrhaging (*)	Aerial part	Decoction	External	3	

Table 2 (Continued)

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI
<b>Cistaceae</b> <i>Cistus ladanifer</i> L. (SALA 18145)	Jara, jara pringosa	W	Chilblains	Branches	Decoction	External	3	0.04
<b>Crassulaceae</b> <i>Umbilicus rupestris</i> (Salisb.) Dandy (PHO 78)	Basilios, vasillos, hoja de llaga	W	Injuries	Leaves	Poultice (removing the abaxial or lower epidermis) Ointment (boiled and with lard) As oil used to fry the leaves	External	19	0.44
			Burns	Leaves	Poultice (removing the abaxial or lower epidermis)	External	10	
			Acne (*)	Leaves	Infusion	External	3	
			Warts (*)	Leaves	Infusion	External	3	
<b>Cucurbitaceae</b> <i>Bryonia dioica</i> Jacq. (SALA 15531)	Parra de bastardo, parra de culebra, nuerza, yerba raposera	W	Injuries	Fruits	Maceration in alcohol (in small doses)	External	4	0.05
<b>Dioscoreaceae</b> <i>Tamus communis</i> L. (SALA 17529)	Espárragos bastarderos, yerba raposera	W	Injuries	Fruits	Maceration in alcohol	External	12	0.15
<b>Ericaceae</b> <i>Arbutus unedo</i> L. (SALA 16324)	Madroño, madroñera	W	Diuretic	Leaves and fruits	Infusion/eaten raw	Oral	4	0.09
			Rheumatism	Leaves	Infusion	External	3	
<b>Euphorbiaceae</b> <i>Euphorbia characias</i> L. (SALA 17557)	Lechiriega mayor, euforbia roja	W	Warts	Latex	Fresh	External	4	0.05
<i>Euphorbia helioscopia</i> L. (SALA 17556)	Carajera, untapijas	W	Aphrodisiac	Latex	Fresh	External (on the penis)	10	0.12
<i>Euphorbia oxypylla</i> Boiss. (SALA 17559)	Lechetrezna, leche griega, lechiriega	W	Warts	Latex	Fresh	External	3	0.04
<b>Fabaceae</b> <i>Coronilla repanda</i> (Poir.) Guss. subsp. <i>dura</i> (Cav.) Cout. (SALA 16656)	Hierba cólica, yerba del cólico	W	Cholagogue (*)	Whole plant	Decoction	Oral	4	0.05
<i>Cytisus multiflorus</i> (L'Hér.) Sweet (SALA 19214)	Escoba blanca	W	Chilblains	Branches	Burned (to make smoke)	External	5	0.06
<i>Cytisus scoparius</i> (L.) Link (SALA 19202)	Escoba amarilla, escoba rubia	W	Haemorrhaging	Bark	Fresh	External	4	0.05
<b>Fagaceae</b> <i>Quercus ilex</i> L. subsp. <i>ballota</i> (Desf.) Samp. (SALA 16331)	Encina, ancina, carrasco	W	Hypotension	Leaves	Infusion	Oral	6	0.22
			Antidiarrhoeal	Fruits (acorns)	Eaten raw	Oral	3	
			Sore throat	Bark	Decoction	Gargle	4	
			Chaps	Bark	Boiled	External	5	
<b>Geraniaceae</b> <i>Pelargonium</i> sp. pl. (PHO 55/56/57)	Geranios	C	Constipation in breast-fed babies (*)	Petiole	Fresh	Anal	3	0.04
<b>Guttiferae</b> <i>Hypericum perforatum</i> L. (SALA 17785)	Pericón, hipérico, corazoncillo, hierba de San Juan	W	Injuries (*)	Aerial part (flowered)	Maceration or fried in olive oil ("aceite de pericón")	External	22	0.71
			Burns (*)	Aerial part (flowered)	Maceration or fried in olive oil	External	24	
			Chaps (*)	Aerial part (flowered)	Maceration or fried in olive oil	External	11	
<b>Iridaceae</b> <i>Crocus sativus</i> L. (PHO 130)	Azafrán	M	Toothache (*)	Stigmas (dried)	Poultice (with the doughy part of bread)	External	3	0.04
<b>Juglandaceae</b> <i>Juglans regia</i> L. (PHO 20)	Nogal	C	Antispasmodic (*)	Immature fruits	Maceration in "aguardiente"	Oral	6	0.11
			Boils (or furuncles)	Leaflets of the leaf	Poultice (with lard)	External	3	

Table 2 (Continued)

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI
<b>Lamiaceae</b>								
<i>Lavandula pedunculata</i> L. (SALA 63374)	Tomillo, tomillo de burro, tomillo moro, tomillo morao	W	Anticatarrhal	Inflorescence	Infusion/in boiling water	Oral/inhalation	15	0.41
			Dysphonia	Inflorescence	Infusion	Oral	8	
			Injuries of the foot	Branches	Decoction	External	3	
			Chilblains	Branches	Burned (to make smoke)	External	4	
<i>Marrubium vulgare</i> L. (SALA 16233)	Malrubio, majacanes	W	Toothache	Inflorescence	Infusion	Gargle	3	
			Injuries (*)	Leaves of the stems not flowered	Poultice	External	3	0.04
<i>Mentha pulegium</i> L. (SALA 17794)	Poleo, polego	W	Stomach ache (*)	Aerial part	Infusion	Oral	8	0.25
			Carminative (*)	Aerial part	Infusion	Oral	5	
			Anticatarrhal (*)	Aerial part	In boiling water	Inhalation	7	
<i>Mentha suaveolens</i> L. (SALA 16286)	Hortelana, hortelana de perro, menta de burro, mestranzo	W	Anticatarrhal (*)	Aerial part	Infusion	Oral	5	0.10
			Enterobiasis	Root	Decoction	Oral	3	
<i>Origanum vulgare</i> L. subsp. <i>virens</i> (Hoffmanns. & Link) Bonnier & Layens (SALA 16243)	Orégano, oriégano, urégano	W	Stomach ache (*)	Leaves and bracts (dried)	Infusion	Oral	4	0.36
			Anticatarrhal (*)	Leaves and bracts (dried)	Infusion (two spoonfuls)	Oral	14	
			Sore throat (*)	Leaves and bracts (dried)	Infusion (with honey)	Oral	11	
<i>Rosmarinus officinalis</i> L. (SALA 16225)	Romero	C, SC	Varicose veins (*)	Branches	Maceration in alcohol ("alcohol de romero")	External	16	0.46
			Contusions and bruises	Branches	Maceration in olive oil or alcohol, or boiled in wine	External	6	
			Rheumatism (*)	Branches	Maceration in olive oil	External	6	
			Eczema (*)	Branches	Decoction (20 min)	External	3	
			Warts (*)	Branches	Decoction (20 min)	External	3	
			Alopecia (*)	Branches	Maceration in alcohol ("alcohol de romero")	External	3	
<i>Salvia verbenaca</i> L. (SALA 17719)	Gallocresta, calicrista, alecrista	W	Foreign bodies in the eye (*)	Fruits (nuts)	Fresh	External	36	0.45
<i>Thymus mastichina</i> (L.) L. (SALA 16251)	Tomillo blanco, ansero, alegría, tomilleja, tomillo de poleo, senserina de San Juan	W	Anticatarrhal (*)	Branches (unflowered)	Decoction	Oral	3	0.09
			Sore throat (*)	Inflorescence (dried)	Infusion (with honey)	Oral	4	
<b>Lauraceae</b>								
<i>Laurus nobilis</i> L. (PHO 79)	Laurel, aurel	C, SC	Antispasmodic	Leaves (dried)	Infusion	Oral	3	0.12
			Expectorant and mucolitic	Leaves (dried)	Infusion	Oral	3	
			Emmenagogue	Leaves (dried)	Infusion	Oral	4	
<b>Liliaceae</b>								
<i>Allium cepa</i> L. (PHO 104)	Cebolla	C	Anticatarrhal	Bulb	Decoction	Oral (to be taken on an empty stomach)	5	0.16
			Diuretic (*)	Bulb	Decoction	Oral	5	
			Boils (or furuncles)	Bulb	Heated, hollowed-out (like a suction pad) and filled with olive oil	External	3	
<i>Allium sativum</i> L. (PHO 103)	Ajo	C	Chilblains	Bulb	Barbecued	External	5	0.12
			Toothache (*)	Bulb	Fresh (a clove of garlic)	External	5	
<i>Ruscus aculeatus</i> L. (SALA 15691)	Rusco, cornicabra	W	Varicose veins	Rhizome	Decoction	External	5	0.14
			Diuretic	Rhizome	Decoction	Oral	6	
<i>Urginea maritima</i> (L.) Baker (SALA 15664)	Cebolla albarrana, cebolla chirle	W	Menstrual pain	Bulb	Cataplasm (with lard)	External	7	0.09

Table 2 (Continued)

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI
<b>Lythraceae</b> <i>Lythrum salicaria</i> L. (SALA 17811)	Salicaria	W	Antidiarrhoeal (*)	Aerial part (dried)	Decoction	Oral	5	0.06
<b>Malvaceae</b> <i>Malva nicaeensis</i> All. (SALA 16300)	Malva, malva rastrera	W	Anticatarrhal (*)	Flowers (dried)	Infusion	Oral	3	0.04
<i>Malva sylvestris</i> L. (SALA 16302)	Malva	W	Stomach ache (*)	Aerial part or flowers	Cataplasm (with lard) or infusion	External/oral	5	0.54
			Laxative (*)	Aerial part	Decoction	Oral	5	
			Contusions and bruises	Leaves	Ointment (with lard)	External	20	
			Nettle stings (*)	Leaves	Fresh	External	3	
			Boils (or furuncles)	Aerial part (boiled)	Poultice	External	6	
			Fever (*)	Root	Decoction	Oral	4	
<b>Moraceae</b> <i>Ficus carica</i> L. (PHO 21)	Higuera, gígal	C, SC	Antihemorrhoidal (*)	Leaves	Decoction	External (hip bath)	3	0.31
			Anticatarrhal	Fruits (figs)	Decoction (with wine)	Oral	3	
			Warts (*)	Latex	Fresh	External	19	
<b>Oleaceae</b> <i>Olea europaea</i> L. (SALA 17872)	Olivo, oliva	C (W)	Hypertension (*)	Leaves	Infusion	Oral (to be taken on an empty stomach)	32	0.45
			Injuries	Leaves	Infusion	External	4	
<i>Phillyrea angustifolia</i> L. (SALA 17870)	Olivilla, labiérnago	W	Mouth ulcers	Leaves and fruits	Decoction	Gargle	3	0.04
<b>Paeoniaceae</b> <i>Paeonia broteri</i> Boiss. & Reut. (SALA 18241)	Rosa gedionda, rosa ferregosa, rosa fedegosa, flor maldita, rosa de monte	W	Arthrosis	Root	Fried in olive oil	External	5	0.06
<b>Papaveraceae</b> <i>Chelidonium majus</i> L. (SALA 18267)	Hierba verruguera, cirigüeña, celedonia	W	Sore throat	Aerial part	Poultice (with lard)	External (neck)	3	0.51
			Injuries (*)	Latex	Fresh	External	7	
			Lip blisters (lip herpes)	Aerial part	Fried in lard	External	3	
			Warts (*)	Latex	Fresh	External (3 times/day)	28	
<i>Papaver rhoeas</i> L. (SALA 16180)	Amapola	W	Antitussive (*)	Petals (dried)	Infusion	Oral	5	0.12
			Nervousness and insomnia (*)	Petals (dried)	Infusion	Oral	5	
<b>Plantaginaceae</b> <i>Plantago lanceolata</i> L. (SALA 18195)	Llantén, llentén, hierba de las cinco sangrías	W	Stomach ache (*)	Leaves	Cataplasm (with lard)	External	4	0.30
			Sore throat (*)	Whole plant (dried)	Decoction	Gargle	6	
			Tonsillitis (*)	Whole plant (dried)	Decoction	Gargle	5	
			Mouth ulcers	Whole plant (dried)	Decoction	Gargle	4	
			Boils (or furuncles)	Leaves	Poultice	External	5	
<b>Poaceae</b> <i>Cynodon dactylon</i> (L.) Pers. (SALA 16857)	Gramma	W	Diuretic (*)	Whole plant	Decoction	Oral	5	0.10
			Rheumatism (*)	Whole plant	Decoction (resulting water mixed with alcohol in equal proportions)	External	3	
<b>Ranunculaceae</b> <i>Clematis campaniflora</i> Brot. (SALA 2605)	Zarpaparrilla, zarpaparrilla	W	Pneumonia	Aerial part	Decoction	Oral	3	0.04
<b>Rosaceae</b> <i>Crataegus monogyna</i> Jacq. (SALA 15394)	Espinero, espinera, espino albar, majuelo, escambrión, galapero	W	Cardiac tonic (*)	Flowers (dried)	Infusion	Oral (2 cupfuls/day. 14–15 days)	11	0.39

Table 2 (Continued)

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI				
<i>Prunus dulcis</i> (Mill.) D. A. Webb var. <i>amara</i> (L. ex C.F. Ludw.) Buch. (SALA 15392)	Almendro (almendras amargas)	C	Headache (*)	Leaves	Cataplasm (with olive oil)	External	8	0.04				
			Nervousness	Flowers	Infusion	Oral	12					
			Earache (*)	Seeds	Fried in olive oil	External (a few drops)	3					
<i>Rosa canina</i> L. (SALA 15380)	Rosal silvestre, rosal bravío, gabancera	W	Anticatarrhal (*)	Fruits	Infusion	Oral	12	0.19				
<i>Rubus ulmifolius</i> Schott (SALA 17950)	Zarza, zarzal, zarzamora	W	Diuretic (*)	Fruits	Infusion	Oral (7 days running)	3	0.21				
			Hypotension	Leaves	Infusion	Oral	5					
<i>Sanguisorba minor</i> Scop. (SALA 15391)	Pimpinela	W	Anticatarrhal (*)	Tender ítems (dried)	Infusion	Oral	3	0.26				
			Sore throat (*)	Leaves	Infusion	Gargle	4					
			Mouth ulcers	Leaves	Infusion	Gargle	5					
			Contusions and bruises	Leaves	Ointment (with lard)	External	17					
Rutaceae <i>Ruta montana</i> (L.) L. (SALA 17983)	Ruda	W	Paludism	Whole plant	Decoction	Oral	4	0.36				
			Emmenagogue	Branches	Decoction	Oral (in small doses)	13					
			Abortifacient	Branches	Decoction	Oral (in large doses)	10					
			Contusions and bruises	Branches	Maceration in olive oil (40 days)	External	3					
Scrophulariaceae <i>Digitalis thapsi</i> L. (SALA 15336)	Dedalera, chupera, chupamieles, restrallos	W	Cerebellar ataxia	Branches	Boiled	Oral	3	0.20				
			Boils (or furuncles) (*)	Basal leaves	Poultice (with lard)	External	16					
			Antihemorrhoidal	Leaves	Fresh	External (for cleaning)	7					
<i>Verbascum pulverulentum</i> Vill. (PHO 44)	Gordolobo, gordillo, patilobo	W	Stomach ache (*)	Leaves	Infusion (very strained)	Oral	3	0.18				
			Injuries	Leaves	Poultice	External	4					
<i>Verbascum thapsus</i> L. (SALA 63653)	Gordolobo, gordolobo chico	W	Antitussive (*)	Flowers (dried)	Infusion	Oral	4	0.10				
			Boils (or furuncles)	Leaves	Poultice	External	4					
Urticaceae <i>Parietaria judaica</i> L. (SALA 18059)	Parietaria	W	Diuretic (*)	Aerial part	Decoction	Oral	11	0.14				
			<i>Urtica dioica</i> L. (SALA 18034)	Ortiga, ortiga mayor, ortigón	W	Blood depurative	Root		Decoction	Oral	4	0.70
						Stomach ache (*)	Aerial part		Cataplasm (with lard)	External	4	
			<i>Urtica urens</i> L. (SALA 16755)	Ortiga, ortiga menor	W	Antidiarrhoeal (*)	Aerial part		Decoction	Oral	3	0.33
						Diuretic (*)	Aerial part		Decoction	Oral	8	
						Rheumatism (*)	Aerial part		Fresh	External	10	
						Injuries	Aerial part		Poultice (with salt)	External	16	
						Alopecia (*)	Aerial part		Decoction	External	7	
						Nervousness (*)	Leaves		Infusion	Oral	4	
						Blood depurative (*)	Aerial part		Infusion	Oral (3–5 cupfuls/day)	3	
						Contusions and bruises	Aerial part		Poultice	External	10	
Calcaneal spur	Aerial part	Decoction (with salt and vinegar)				External	4					
Paludism	Aerial part	Infusion	Oral	9								
Verbenaceae <i>Verbena officinalis</i> L. (SALA 16734)	Verbena	W	Contusions and bruises	Leaves	Poultice	External	7	0.09				
Vitaceae <i>Vitis vinifera</i> L. (PHO 13)	Vid, parra	C	Conjunctivitis	Sap	Fresh	External	6	0.08				

W = wild; C = cultivated; SC = semi-cultivated; M = market.

Finally, emphasis was also placed on those species that were novelties in the list of medicinal plants. The international online database PFAF (Plants For A Future: Edible, medicinal and useful plants for a healthier world, <http://www.pfaf.org/index.php>)

and Dr. Duke's. Phytochemical and Ethnobotanical Databases (<http://www.ars-grin.gov/duke/>) were consulted (last accessed June 18, 2010), and also a review of the literature referring to the Ethnopharmacology in the Iberian Peninsula were performed.

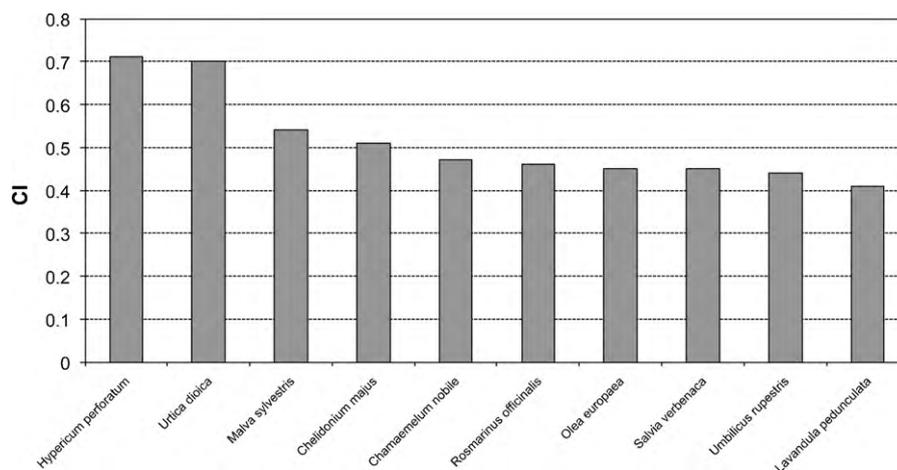


Fig. 2. Cultural importance value (CI) of the 10 most relevant species in the study.

### 3. Results and discussion

#### 3.1. Quantitative ethnobotanical analyses

A total of 156 medicinal remedies based on the use of a single plant species and cited by at least three independent informants were recorded; a very high number compared with the results of other studies carried out recently in the Iberian Peninsula (e.g. Parada et al., 2009). Also, from an analysis performed in zones close to the area studied here (Neves et al., 2009), we can cite a total of 10 new families that those authors do not cite in their research (Cupressaceae, Cactaceae, Caryophyllaceae, Dioscoreaceae, Liliaceae, Lythraceae, Moraceae, Paeoniaceae, Ranunculaceae and Vitaceae), and a total of 42 new species more than those cited by those authors.

The remedies refer to 54 subcategories of therapeutic use and nine major organ systems or use-categories (Table 1). We observed the use of 70 species of vascular plants, belonging to 39 botanical families (Table 2). The taxa obtained were mainly wild (83%) and comprised approximately 6% of the 1200 known species in the territory of the ARD.

According to species habit, most of the taxa cited are herbs (45, 64% of the total). Shrubs represent 16% of the species and trees 13%. Five climbers were reported (7%).

The five most relevant families as regards their contribution to the medicinal flora of the ARD are the Lamiaceae (23 remedies, 8 species), Urticaceae (13 remedies, 3 species), Rosaceae (12 remedies, 5 species), Asteraceae (9 remedies, 5 species), and Malvaceae (7 remedies, 2 species).

At species level, the three species used in the greatest number of remedies (in brackets) are *Urtica dioica* (8), *Malva sylvestris* (6) and *Rosmarinus officinalis* (6). This order of relative importance varies if the values reached by the species for the CI index is taken into account (Fig. 2). However, only slight surpassing *Urtica dioica* by a hundredth of a unit, the species with the greatest cultural values in the ARD is *Hypericum perforatum* (CI=0.71). Farther behind are the other two species mentioned above: *Malva sylvestris* (CI=0.54) and *Rosmarinus officinalis* (CI=0.46). Current uses of plants totalled 84 out of 156 (53.8%), i.e., more than half of all uses or remedies recorded have survived.

#### 3.2. Plant parts used

Leaves and fruits (including seeds) are the most frequently sought plant parts, accounting for 40 and 17% of the claimed medicinal plants, respectively. Of a total of 12 species (17%) the aerial part

is used (flowered or not); of 11 species, their flowers/inflorescences (16%), and of seven (10%), their latex. Few were harvested for their stems/bark (6%), roots (9%) and bulbs/rhizomes (6%). The majority of remedies were harvested for immediate uses: 77% are prepared and administered while fresh, and 16% are prepared and administered after quick-drying. Small proportions (7%) were reported to be dried and stored for future uses.

#### 3.3. Methods of preparation and routes of administration

The empirical basis of the medicinal use of plants is the presence of substances with physiological activity: namely, the active principles. Each active principle has a certain physiological action on a given organ or biological activity, such that the method used in the preparation and the route of administration of a given medicinal plant varies according to which kind of ailment they are destined for (e.g. Hitner and Nagle, 2004; Dennehy and Tsourounis, 2007).

The commonest method of preparation in the ARD is that commonly known as *cocimientos* (boiling in water), where the residual liquid is applied externally or is drunk as a tisane (Table 2). Tisanes encompass infusions (the method of preparation of 53 of the remedies recorded (34%)) and decoctions (44 remedies, 28%). In the former, the plant parts are not subjected to boiling water; extraction is accomplished by allowing the material to steep in very hot water. The soft parts, such as the flowers or leaves, are used. In the case of decoctions, or for more intense extractions, the harder parts of the plant are boiled. Such tisanes are used internally to cure digestive, renal, etc, ailments, and also externally for wounds, contusions, etc, using the liquid both directly and soaked in pieces of cloth. For respiratory processes, as well as infusions, people inhale *vahos* (inhalations), the vapours given off by certain plants when in water at boiling point.

Another way of applying the active principles of plants is in poultices, where the plant is ground down and is applied directly as a paste to the affected area (injuries, burns, etc). Sometimes the plant is mixed with vinegar, salt, olive oil or lard. Likewise, cataplasms for calming pain (e.g. bellyache) and the elaboration of certain ointments with lard were documented. As many as 24 remedies (15%) are related to these methods of preparation.

Two species are very important in the ARD owing to their use as excipients, apart from having their own medicinal properties. These are *Olea europaea* (olive oil) and *Vitis vinifera* (alcohol, vinegar, wine, *aguardiente*), the two most extensively cultivated ligneous species in the territory and of great economic importance (Calabuig, 2008). In six remedies, the parts used are macerated in olive oil; in eight they are fried in olive oil; in four they are macerated in ethyl alcohol,

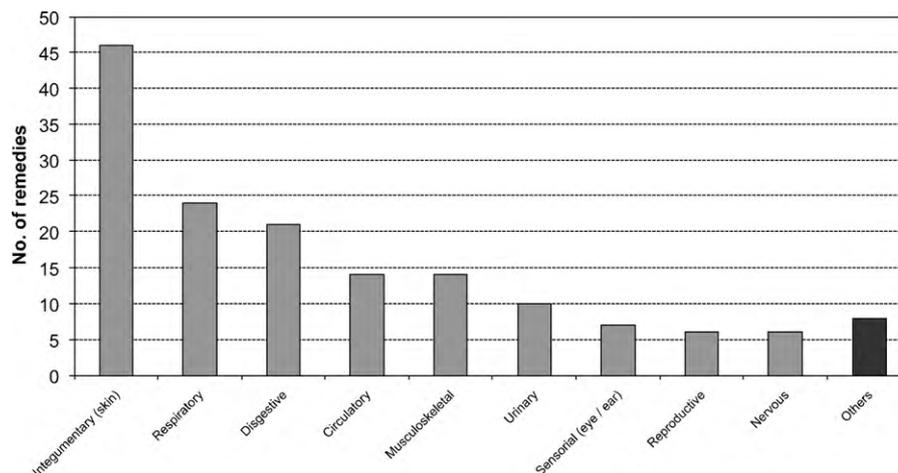


Fig. 3. Number of remedies per category of medicinal uses.

and in one they are macerated in *aguardiente* (distilled from *orujo*, a subproduct of the elaboration of wine: i.e., grape remains).

Regarding the route of administration, 78 of the remedies recorded are for external use – i.e., 50% of the total – and 67 (43%) are administered orally. Also, nine remedies based on gargling were recorded, another two for inhalation, and one for rectal administration.

#### 3.4. Indications for the use of medicinal plants

Regarding the therapeutic groups considered, and coinciding with the results obtained by other authors for the Iberian Peninsula (e.g. Agelet and Vallès, 2001; Neves et al., 2009) and circum-Mediterranean areas (e.g. Pieroni and Quave, 2005; Maxia et al., 2008), most of the remedies described by the interviewees referred to the treatment of mild ailments related to the skin and the respiratory and digestive systems (Fig. 3).

A total of 46 remedies (29%) are related to affectations of the skin, in particular the cleaning and treatment of injuries – cuts, scratches, etc. – (11 remedies). Of outstanding interest for the treatment of wounds, burns and chapped skin is the use of the well-known *aceite de pericón* (St. John's wort oil), a balsamic oil for external use obtained by macerating the flowers of *Hypericum perforatum* in olive oil (some informants fry it or also use the stems and leaves). The cultural importance of this oil in the ARD is unquestionable. Gallego and Gallego (2008) recorded the following saying: *Lo que no cura el hipérico, no lo cura el médico* (Lit: "What *Hypericum* doesn't cure the doctor certainly won't").

Even today it is still frequent to see the lancing and cleaning of *divisios* (furuncles) by applying a poultice of *hojas lagarteras* (Lit: lizard's leaves), the basal leaves of *Digitalis thapsi*. The procedure consists of heating one side of the leaf and spreading lard over it; this is then placed over the affected zone and is left for 2–3 h. The infected boil is softened and is opened. Then, the leaf is turned over so that it can draw out the pus and the wound can heal.

The second most important group of therapeutic remedies, with 24 (15%) examples, comprises those related to the respiratory system. Of special interest are anticatarrhal remedies (10). In this sense, some very popular remedies involve infusions of *Lavandula pedunculata* and *Origanum vulgare*. For example, two spoonfuls of oregano (dried) are added to boiling water and the beverage is strained and drunk hot, sweetened with honey.

Remedies related to ailments of the digestive system occupy the third place in importance, with a total of 21 remedies recorded (13%). As an example, there is a popular thirst for infusions with the carminative properties of *Mentha pulegium* and *Foeniculum vul-*

*gare*. Similarly, owing to its high content in tannins, decoctions of *Lythrum salicaria* are used as an antidiarrhoeal remedy. The whole flowered plant is dried, chopped up, and boiled.

In the "others" category, of particular interest is the treatment of problems of the eyes or ears. In particular, the remedy reported by 36 informants that is used to clean eyes. When a foreign body (an eye lash, dust, straw, etc.) enters the eye a nut of *Salvia verbenaca* is placed under the lid to force it out. This remedy was especially important in past decades when hand threshing and winnowing were still carried out in the ARD. These fruits are known as *limpioojos* (Lit: eye-cleaners) and still today people of 80 or older keep a box of nuts in their houses "for when they might be needed".

#### 3.5. Plant mixtures

The informants reported information about 17 plant mixtures (11 for internal administration; five for external use and one for inhalation), in which 24 different plant species are used. Table 3 shows a list of 10 taxa used in these mixtures that are not included in Table 2.

Most of the informants attribute the pharmacological action to the synergy among plants. As reported by different authors (e.g. Parada et al., 2009), recognition of the contribution of each plant to the final effect is difficult. Some cases are of a certain importance in the traditional medicine of the ARD, such as for example poultices made with *Urtica dioica* and *Malva nicaeensis*, used to rupture furuncles (cited by eight informants as in ancient use) or the infusion resulting from adding 4–5 fruits of *Rosa canina* and three leaves and several flowers of *Malva sylvestris* to boiling water as a remedy for flu' and colds (cited by 10 informants as being in current use). After this tisane has been strained, a spoonful of honey is added.

#### 3.6. Analysis of informants' knowledge

The informants interviewed at the different representative localities of the ARD provided a total of 1072 UR (mean 13 UR/informant; max = 55, from a woman of 90). The results for the exploratory analysis conducted in relation to the TK amassed by the different informants in terms of their characteristics show that 31% of the variability of the TK can be explained by age and gender ( $R^2 = 0.315$ ). The remainder of the variability is due to certain effects (other explanatory variables) that have not been or that could not be measured during this study. We surmise that some social and cultural effects would be involved, although attending to the results of the analysis of variance we can conclude with confidence that the two explanatory variables do bring a significant

**Table 3**

List of plants used in mixtures to treat different ailments in the Arribes del Duero (Spain). FC = frequency of citation; CI = cultural importance index.

Scientific names, families (voucher or photograph number)	Local name(s)	Status	Popular use(s) (* = current uses)	Part(s) used	Method of preparation	Route of administration	FC	CI
Boraginaceae <i>Borago officinalis</i> L. (SALA 15425)	Borraja	W, C	Expectorant and mucolitic	Flowers dried)	Infusion (together with flowers of mallow, <i>Malva sylvestris</i> )	Oral	3	0.04
Brassicaceae <i>Sinapis alba</i> L. (SALA 56524)	Mostaza	W, SC	Antitussive	Seeds (mustard)	Cataplasm together with linseed (on the chest and back)	External	10	0.13
Fagaceae <i>Quercus faginea</i> Lam. (SALA 16309)	Quejigo	W	Expectorant and mucolitic	Leaves	Infusion (together with leaves of olive tree and <i>Juniperus oxycedrus</i> )	Oral	3	0.04
Lamiaceae <i>Thymus zygis</i> Loeff. ex L. (SALA 17737)	Tomillo sansero, sanserino, senserino, sinsirino, sensero, senserina fina, carqueja	W	Anticatarrhal (*)	Branches	Decoction (together with branches of <i>Thymus mastichina</i> and <i>Lavandula pedunculata</i> )	Oral	4	0.25
			Dysphonia (*)	Branches	Decoction (together with branches of <i>Thymus mastichina</i> and <i>Lavandula pedunculata</i> )	Oral	4	
			Expectorant and mucolitic (*)	Branches	Infusion (together with oregano, <i>Origanum vulgare</i> )	Oral	6	
			Injuries of the foot (*)	Branches	Decoction (together with branches of <i>Thymus mastichina</i> and <i>Lavandula pedunculata</i> )	External	6	
Linaceae <i>Linum usitatissimum</i> L. (PHO 11)	Lino	C	Antitussive	Seeds (linseed)	Cataplasm together with mustard (on the chest and back)	External	10	0.13
Myrtaceae <i>Eucalyptus globulus</i> Labill. (PHO 70)	Eucalpto, ucalito	C	Anticatarrhal (*)	Leaves (dried)	In boiling water (added to pennyroyal, <i>Mentha pulegium</i> )	Inhalation	4	0.05
Oleaceae <i>Fraxinus angustifolia</i> Vahl (SALA 17874)	Fresno	W	Rheumatism	Leaves	Decoction (together with <i>Cynodon dactylon</i> )	External	3	0.04
Rosaceae <i>Rosa</i> sp. pl. (PHO 52/53)	Rosal	C	Sore throat (*)	Petals (dried)	Infusion (together with ribwort plantain, <i>Plantago lanceolata</i> )	Oral	4	0.05
Rutaceae <i>Citrus x limon</i> (L.) Burm. (PHO 19)	Limonero	C	Dysphonia (*)	Fruits (3) (juice)	Beverage (with three spoonfuls of honey and a onion, <i>Allium cepa</i> )	Oral (to be taken on an empty stomach)	4	0.05
Solanaceae <i>Capsicum frutescens</i> L. (PHO 94)	Guindilla	C	Anticatarrhal (*)	Fruits (3)	Beverage (with Port wine and a head of garlic, <i>Allium sativum</i> )	Oral (to be taken on an empty stomach)	3	0.04

W = wild; C = cultivated; SC = semi-cultivated.

amount of information to the model ( $F_{2,77} = 17.707, P < 0.0001$ , confidence interval = 95%). Table 4 gives the details of the model. Only the age parameter is seen to have a positive effect.

### 3.7. Influence of superstition

To end, it should be noted that in many of the remedies catalogued there is an associated component of superstition, such as the need to collect the plant in question on the night of St. John, or use of an odd number of plant elements. In 1952, D. Ramón Hernández, the priest of Hinojosa del Duero (Salamanca), wrote "The early hours of St. John, before the sun has risen, are the most miraculous

among to people for collecting plants that conserve their medicinal properties along the year" (Hernández, 1952). Examples persist to the present: (1) for *aceite de pericón* to have effect, some informants recommended that the plant should be collected on the morn of St. John before sunup, or that it should be administered with a feather; (2) a popular remedy is a liqueur with antispasmodic properties resulting from the maceration (over 28 days) of the immature fruits of *Juglans regia*, locally known as *licor de nueces verdes* (Lit: liqueur of green walnuts). Twelve fruits are macerated in *aguardiente* before midnight on the eve of St. John and sugar is added.

Regarding numbers, among the inhabitants of the ARD it is considered that odd numbers always have positive connotations. For

**Table 4**

ANCOVA results for the traditional knowledge and model parameters.

Parameter	Value	SD	Student's t	Pr > t
Intercept	-45.182	10.049	-4.496	<0.0001
Age	0.791	0.138	5.722	<0.0001
Gender – m	0.000	-	-	-
Gender – f	4.434	2.808	1.579	0.119

example, for hypertension infusions are prepared with an odd number of olive leaves (5, 7, 9 or 11). However, three is the most revered number, alluding to the three components of the Holy Trinity, the 3 days that Jesus was in the sepulchre, and the three Christian theological virtues (Martín Herrero, 1990). The following remedy against dysphonia recorded at La Fregeneda (Salamanca) suffices as an example: one onion, the juice of three lemons and three spoonfuls of honey; this is ground in a blender, left to stand, strained and three spoonfuls are taken in the morning, while fasting.

### 3.8. New and scarcely reported medicinal plants

Of the total of 70 species cited in the present study, two do not appear in the on-line databases consulted (PFAF and Dr. Duke's) or in the literature for the Iberian Peninsula: (a) the external use of the latex from *Euphorbia oxyphylla* (fresh) to remove warts, and (b) *Clematis campaniflora* for the treatment of pneumonia via the ingestion of tisanes obtained from the decoction of their aerial part.

Moreover, note should be taken of the use in the ARD of three scarcely cited species; namely: *Phillyrea angustifolia*, used in the area to treat mouth ulcers by gargling with the tisane resulting from the decoction of the leaves and fruits of this species, has only been cited previously for medicinal use in Andalusia (see Alcalá-Martínez et al., 1996).

Likewise, we confirm the use of *Coronilla repanda* subsp. *dura* in the ARD for the treatment of digestive ailments through the use of tisanes elaborated from the whole plant (see Blanco, 1985; Blanco Castro, 2004). This plant, typically found in pastures and crops sown on sandy soils, has rarely been quoted as being useful in the central-western part of the Iberian Peninsula (e.g. Blanco Castro and Cuadrado, 2000).

Finally, as mentioned above, the basal leaves of *Digitalis thapsi* are used for the lancing and cleaning of furuncles, and their use and the procedure employed are similar to those reported for the centre of Portugal (Camejo-Rodrigues, 2002).

## 4. Conclusions

The present study shows that even today in the ARD many people retain a rich TK about the use of different medicinal plants. Not so long ago, this TK was crucial for solving the health problems of local communities. Moreover, in this Iberian territory folk medicine, especially as regards the curing of certain common afflictions (colds and snuffles) and mild ailments (small wounds, haemorrhoids, . . .), can be said to be very much alive. Nevertheless, with a view to obtaining optimum yield from all the data collected we believe that it is necessary to continue studying the TK of the people inhabiting the ARD, in particular with respect to socio-economic and cultural aspects, since these should be taken into account when attempting to understand why some plant remedies continue to be used while others are not.

Finally, in order to preserve this TK, an urgent and priority task is to return it to the people of the ARD. It should never be forgotten that the first beneficiaries of ethnobotanical studies should be the repositories themselves of such knowledge. As scientists we should be mere collectors of ethnobotanical data and we should be elaborating written material and giving talks or training courses to diffuse all this knowledge among the inhabitants of the area studied. With this, the scientific inventory will gain value within local communities.

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