



Studies on pharmaceutical ethnobotany in the region of Pallars (Pyrenees, Catalonia, Iberian Peninsula). Part III. Medicinal uses of non-vascular plants

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Abstract

An ethnobotanical survey was carried out in the region called Pallars—constituted by two districts, Pallars Sobirà and Pallars Jussà—, situated in the Central Pyrenees, in North West Catalonia (Iberian Peninsula), with an approximate area of 2530 km² and a population of 19000. Through interviews with 264 people, we obtained data on 437 plant species used for health care. We detected 867 unreported or uncommon uses corresponding to 272 plant species, 52 of which had never or very rarely been cited as medicinal. This is the third paper of a series intended to present the most important findings concerning the ethnopharmacology of the area studied; it includes information on 18 pharmaceutical uses of 16 non-vascular plant species (two algae, eight fungi, five lichens and one moss). Two previous papers reported the general results and the new or very scarcely reported medicinal vascular plants, and the unreported or very uncommon uses of already known medicinal plants.

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1. Introduction

Non-vascular plants, and particularly algae and fungi, have been traditionally used by human communities for different purposes, among which food occupies a specially relevant position. In addition, some of them are largely used in food, pharmaceutical and other kind of industries, whereas some others are causative of allergy, toxicity or other kind of noxious effects (Ozenda and Clauzade, 1970; Hoppe et al., 1979; Hoppe and Tanaka, 1982; Richardson, 1988; Llimona, 1985, 1991; Piqueras, 1993; Calvo, 1995; Calvo et al., 1999; Conesa, 2000).

In the last two decades, an important amount of ethnobotanical investigation has been carried out in different territories of the Iberian Peninsula (see Raja et al., 1997; Bonet et al., 1999; Agelet and Vallès, 2001, 2003 for references). Within this frame, we are conducting in the last 15 years researches in different regions of

Catalonia, with the twofold purpose of contributing to the knowledge and the preservation of a part of the national cultural heritage, thereby finding out new or rare uses of medicinal plants, which could lead to the use of new plant-based medicines. Vascular plants largely predominate in the results of all these studies, in which almost absolute lack of data related to non-vascular plants is remarkable. A similar situation has been described by authors having published data on popular uses of fungi (Gispert et al., 1984) or lichens (González-Tejero et al., 1995). During our present work in the region—conducted with both above stated objectives—we could find out ethnobotanical information about some algae, fungi, lichens and mosses. We believe that the scarcity of ethnobotanical data concerning these plant groups makes it worth publishing these results. This paper follows two previous studies in the same territory (Agelet and Vallès, 2001, 2003) and presents the ethnopharmacological findings concerning non-vascular plants. In our first paper we had treated the plants which were not previously mentioned as medicinal in the literature and in the second one we dealt with the newer

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or very rare uses of already known medicinal plants. The territory studied is called Pallars, constituted by two mountain districts ('comarca', in plural 'comarques', in Catalan) situated in the Pyrenees: el Pallars Jussà (or el Baix Pallars) and el Pallars Sobirà (or l'Alt Pallars). The geographical and socioeconomic description of the area considered is given in Agelet and Vallès (2001).

2. Methodology

Information was obtained by the method of the ethnobotanical interview, as detailed in Agelet and Vallès (2001, 2003), and in the Doctoral Thesis of one of the authors (Agelet, 1999). Voucher herbarium specimens of every taxon cited were prepared and deposited in the Herbarium of the Laboratory of Botany, Faculty of Pharmacy, University of Barcelona (BCF). In one case concerning fungi (*Scleroderma*), very fragmentary plant material did not allow us to determine it at specific level, but just at generic one. For plant nomenclature, we followed Bourrely (1985), Gerhardt et al. (2000), Casas et al. (2001), Limona et al. (2001). Complete citation, including authorities, of the taxa is given in Table 1, and the first time that they appeared in the text for the species was not listed in this table.

To establish the originality of our research, we compared our results with the literature corpus cited in Agelet and Vallès (2001, 2003), and with some specific works containing information on applied aspects of non-vascular plants, which have been cited in the discussion.

3. Results and discussion

The complete catalogue of the useful plants of the areas studied is given in Agelet (1999), and data on medicinal vascular plants are reported in Agelet et al. (2000), Agelet and Vallès (2001, 2003), Bonet et al. (2001). We collected information on 16 non-vascular plant species claimed to have medicinal properties (18 different pharmaceutical uses, 17 strictly medicinal and one toxic): two algae, eight fungi, five lichens and one moss. Their scientific and Catalan names, part used, form of preparation and uses are summarized in Table 1. Following the reliability criterion of Le Grand and Wondergem (1987), Johns et al. (1990), the plants with uses cited by at least three independent informants are indicated by an asterisk (*). The four fungi and one lichen species meeting this requirement are, according to the cited authors, the best suited candidates for further phytochemical or pharmacological studies in order to confirm the claimed activities and to obtain new useful products.

The most used part of non-vascular plant species is the whole thallus (more than 50% of cases, and more than 65% if we include the fungal carpophore, analogous to the aerial part in the case of a vascular plant). Fungal spore mass is also used extensively (more than 30%, mostly as cicatrizing and vulnerary). Tisanes (around 30%) and poultice (ca. 20%) are the two most common preparation forms, whereas direct use, without any pharmaceutical form, is also very extended (ca. 30%). Some informants submit some lichens to a process of double decoction to prepare the tisane; they boil the plant material, reject the first decoction water, boil again the material and consume the product of the second decoction. Prepared in different ways, tisanes are the preferred form for lichen use in Pallars, as in other regions, although Richardson (1988) noted that at least some lichen antibiotics are insoluble in water. Internal use (57%) predominates over topical one (43%). The use in human medicine (67%) is much higher than veterinary utilization (33%). Antiasthmatic, anticatarrhal, antipyretic and cicatrizing and/or vulnerary uses represent more than half (54.6%) of the total.

We must stress that medicinal uses of non-vascular medicinal plants are quite strictly restricted to some of our oldest informants. Most of the uses are accumulated in the group of around 80-year-old (often reaching or overpassing 90) people, basically women, or men with professions linked to forestry. Fungi and lichens have, in addition, a geographical restriction. Their uses are limited, in Pallars, to two montane to alpine regions (Boumort and Vallferrera, in subalpine meadows or in *Pinus mugo* Turra or *Abies alba* Mill. communities); particularly the uses of one of the lichen species have been reported by a woman living in Tor, the village situated at the highest altitude in the Catalan Pyrenees. Both the restricted area of use and the high age of the informants suggest the urgency in collecting information on the traditional uses of this kind of plants.

3.1. Algae

The two only algae with a folk use in the territory studied, *Nostoc sphaericum* and *Spirogyra mirabilis*, are edaphic and are claimed to have the same property: they are externally used against burns. *N. sphaericum*'s Catalan popular name ('matafoc', fire killer) is allusive to its properties. This taxon is eaten in the Andes (Castillo et al., 1980). Another species of the genus, *N. commune* Vauch., is well known in Catalonia, where it also has a popular name, but not a use (Limona, 1985). Other taxa have been used in agriculture for their nitrogen-fixing ability (Metting et al., 1988), and for food purposes (Abbott, 1988). The genus was used in the Middle Ages for gout, cancer and fistula (Hoppe, 1979), and antibiotic production was investigated in one of its taxa (Glombitza, 1979), but we did not find references to

Table 1
Non-vascular plant species used in folk phytotherapy

Scientific name (voucher specimen)	Local Catalan name	Part used	Popular use	Preparation	Administration	Type of use (Peters, 1987)	Frequency of citation
<i>Algae</i>							
<i>Nostoc sphaericum</i> Vauch. (BCF 38281)	Matafoc	Thallus	Antipyrotic	Direct use	Topical	Curative	1
<i>Spirogyra mirabilis</i> (Hasall) Kützing (BCF 39207)	Verdet	Thallus	Antipyrotic	Embrocation	Topical	Curative	1
<i>Fungi</i>							
<i>Calocybe gambosa</i> (Fr.) Donk (BCF 40769, 40769)*	Moixarró	Basidiocarp	Antidiarrhoeal Intestinal antiseptic	Tisane	Oral	Curative	3
<i>Calvatia utriformis</i> (Bull.: Pers.) Jaap. (BCF 38285)	Llufa de llop	Spore mass	Intestinal antiseptic	Direct ingestion	Topical	Curative	1
<i>Hygrophorus latitabundus</i> Britzelm. [<i>H. limacinus</i> Scop. ex Fr. (Ss. K. & R.)] (BCF 38282)	Mocosa negra	Basidiocarp	Cicatrizing, vulnerary	Direct use	Oral	Curative and prophylactic	1
<i>Lactarius zonarius</i> (Bull) Fr. (BCF 40423)	Lletreró	Basidiocarp	Abortive in sheep	Direct ingestion	Oral	Toxic	1
<i>Lycoperdon molle</i> Pers.:Pers. (BCF 38283)* and other species of the genus	Bufa de llop	Spore mass	Antierythematous	Direct use, embrocation	Topical	Curative	1
<i>Rhizopus stolonifer</i> Ehr. (R. nigricans Her.) (BCF 46585)*	Llufa de llop Pet de llop Pet pudent		Antipyrotic Cicatrizing, vulnerary Antiparasitic				2 10 1
<i>Rhizopus stolonifer</i> Ehr. (R. nigricans Her.) (BCF 46585)*	Florit, florit del	Thallus	Homeostatic Antiseptic	Direct use or ingestion	Topical	Palliative Curative	1 1
<i>Saccharomyces cerevisiae</i> Hansen (BCF 40511)*	Pa	Cell mass	Hematocathartic Anthelmintic	Poultice	Oral Topical	Palliative Curative and diagenostic	3 2
<i>Scleroderma</i> sp. (BCF 38284)	Pet de llop	Spore mass	Antipyretic Antiseptic	Water suspension Direct use	Oral Topical	Palliative Curative	2 1
<i>Lichens</i>							
<i>Alectoria sarmentosa</i> (Ach.) Ach. (BCF 38994)	Cabellera de pi	Thallus	Antiasthmatic Anticatarrrhal	Tisane	Oral	Symptomatic	1
<i>Cetraria cucullata</i> (Bellardi) Ach. (BCF 38991)	Liquen	Thallus	Antiasthmatic	Tisane	Oral	Palliative	1
<i>C. islandica</i> (L.) Ach. (BCF 37270, 38286)*	Liquen, liquen de bosc	Thallus	Anticatarrrhal	Tisane	Oral	Palliative and symptomatic	3
<i>Pseudevernia furfuracea</i> (L.) Zopf (BCF 37269)	Liquen	Thallus	Antituberculous Hypotensive Antiasthmatic	Tisane	Oral	Symptomatic, prophylactic	1 1 2
<i>Ramalina capitata</i> (Ach.) Nyl. (BCF 38990)	Liquen	Thallus	Anticatarrrhal Hypotensive Antiasthmatic	Tisane	Oral	Palliative Palliative	1 1 2
<i>Mosses</i>							
<i>Polytrichum alpinum</i> Hedw. (BCF 40801)	Resplendor de nit	Whole plant	Anticatarrrhal	Tisane	Oral	Symptomatic	1

any currently used medicinal species. Several *Spirogyra* species are edible (Soeder, 1980; Jassby, 1988), and different medicinal activities, such as antibacterial, antiviral, antipyretic or vulnerary, have been reported in the genus (Misra and Sinha, 1979; Glombitza, 1979; Mshigeni, 1982), but we did not find any reference to the burn healing use reported by our informants, although a vulnerary plant can be used in a burn healing process.

3.2. Fungi

Fungi are known and appreciated by people in several parts of the world (Font, 1961; Fericgla, 1985; Blanco, 1998), where they are considered minor or alternative forest products (Simanov, 1997; Conesa, 2000). Catalonia is a mycophilous and mycophagous country, in which some 150 fungal species are known as edible and 60 are considered non-edible or even clearly toxic (Llimona, 1991). Nevertheless, as stated by Gispert et al. (1984) for Mexico, ethnomycological data are rather scarce. We can add that, among them, those related to medicinal properties are almost absolutely lacking, if we exclude the works devoted to psychotropic fungi, such as Schultes and Hofmann (1980), Wasson (1983), Fericgla (1985), Saar (1991a).

To our knowledge, most of fungi presented in this paper have not been previously reported as medicinal, or have new uses in respect of the few that are reported in the literature. The genus *Saccharomyces* has been used against furuncles, and as antityphic, digestive (Font, 1961) and antihelminthic (Bonet, 2001), but we did not find earlier reports of antipyretic and antiseptic activities. As an antihelminthic, it is used together with *Nicotiana tabacum* L. and *Artemisia absinthium* L., two vascular plants sharing this property. As an antipyretic, it is mixed with *Brassica nigra* (L.) Koch. in Roehl, *B. oleracea* L. subsp. *oleracea* and *Linum usitatissimum* L., three taxa very commonly used for poultice preparation. Finally, as an antiseptic it is also associated with *N. tabacum*. Another fungus, *Inonotus obliquus*, is used for antihelminthic purposes in Russia (Saar, 1991b). The utilization of *Lycoperdon* spore mass for skin wounds was already known (Font, 1961); we can add as new the antipyretic and antiparasitic uses of this genus and the vulnerary use of *Scleroderma* and *Calvatia* spores. Concerning homeostatic activity of *Lycoperdon* spores, those of *Fomes fomentarius* (L.) Fr. have been claimed to have the same use (Font, 1961; Saar, 1991b). *Calocybe gambosa* and *Hygrophorus latitabundus* (*H. limacinus*) are two of the most appreciated edible mushrooms in Catalonia. Our informants also reported their medicinal activities, all of them linked to digestive system troubles: intestinal antiseptic, antidiarrhoeal or antiulcerous. In fact the administration form, for all these medicinal purposes, consists of the ingestion of the mushroom in form of soup (elaborated with a fungus

decoction), omelet or stew. This shows that in popular phytotherapy the borders between food and drug are not well defined. Saar (1991b) reported some similar activities for *I. obliquus* and two unidentified fungal species. *C. gambosa* is used in medicine only in a very restricted geographic zone (Montsec d'Ares and Ribera de Bòsia, in calcareous pasture lands with *Buxus sempervirens* L.) by informants linked to pastoralism including seasonal migration, whereas in the rest of the territory studied it is only consumed as food. *Lactarius zonarius* has been reported to induce abortion in sheep, which have eaten an excessive amount of this mushroom. It is not considered strictly toxic for humans, but its consumption is not advised (Llimona, 1991). Mouldy bread is directly put on wounded skin as an antiseptic; the same mould *Rhizopus stolonifer* (*R. nigricans*) is consumed with the bread or with quince jelly in which it grows, as blood depurative. We did not find previous reports of these uses of this genus.

3.3. Lichens

Although they have been used from ancient times for different purposes (food, medicine, dye, perfume) in several industries (Ozenda and Clauzade, 1970; Richardson, 1988; Conesa, 2000), folk utilization of lichens is rather scarce. Different authors having worked in Iberian areas, such as Andalusia, Aragon, Catalonia or Murcia (Font, 1961; Muntané, 1991, 1994; Villar et al., 1992; González-Tejero et al., 1995; Rivera and Obón, 1995; Fernández, 2000), report from one to three medicinal lichen species. In Pallars, our informants reported medicinal uses for five taxa. All these species (*Alectoria sarmentosa*, *Cetraria cucullata*, *Cetraria islandica*, *Pseudevernia furfuracea* and *Ramalina capitata*) are claimed to be antiasthmatic. *P. furfuracea* has, in addition, anticatarrhal and hypotensive uses, and the latter activity is also claimed for *C. islandica*. One of our informants remembered that *C. islandica* had been used by precedent generations in the region against tuberculosis. The administration pattern called 'novena' (9 days taking the medicine and 9 days without it, or 9 days increasing and 9 days decreasing the doses, or other similar models) is very frequent in lichens. This model, which often concerns plants considered of high activity by the informants, is also widespread in vascular plants (Agelet and Vallès, 2001, 2003); conversely, it has not been reported in other non-vascular plants. *P. furfuracea* is known and used as medicinal (without more precision) and for respiratory complaints (which, in a large sense, may include both anticatarrhal and anti-tuberculous activities) in Andalusia (González-Tejero et al., 1995; Fernández, 2000), and *C. islandica* has been also reported as useful against respiratory ailments (Font, 1961; Richardson, 1988; Conesa, 2000), and as antiasthmatic in another Pyrenean region, Cerdanya

(Muntané, 1991, 1994). The genus *Ramalina* has been used as spice, a substance with antitumor activity has been extracted from *R. almqvistii* (Richardson, 1988), and *R. reticulata* yielded antibiotic compounds (Ozenda and Clauzade, 1970). In Andalusia, *R. bourgeana* Mout. ex Nyl. is used as antidiuretic and renal antilithiasic (González-Tejero et al., 1995). We did not find in the literature any citation of medicinal activities for the genus *Alectoria*, which has only been reported as containing edible taxa (Ozenda and Clauzade, 1970). To our knowledge hypotensive activity had not been reported to date for any lichen species.

3.4. Mosses

The moss *Polytrichum alpinum* is used as anticatarhal together with vascular plants [*Sambucus nigra* L. and *Ramonda myconi* (L.) Reichenb.], for which this activity has been largely reported (Agelet, 1999). It is worth noting that this use has been reported by informants linked to the world of herbalism. It is not a use inherited by tradition, but tried first by the informants themselves. To our knowledge, it is the first citation of a medicinal use of this moss. Concerning bryophytes in general, we only found reports on medicinal activities of the liverwort *Marchantia polymorpha* L. and the moss *Fontinalis antipyretica* L. (Font, 1961; Llimona, 1985).

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