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THE ETHNOBOTANICAL STUDY OF LOCAL MEDITERRANEAN FOOD PLANTS AS MEDICINAL RESOURCES IN SOUTHERN SPAIN

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This paper is dedicated to the memory of Dr. Ancel Keys, champion of the benefits of the Mediterranean diet, died 2004, Nov. 20 at his home in Minneapolis at the age of 100.

We studied medicinal and food plant species, recording an extraordinary number of species and uses in Castilla-La Mancha, Murcia and Valencia in Spain. Focusing on two demographically distinct regions - Castilla-La Mancha and Lower Segura Valley. A high proportion of the flora (20 to 30 %) is known for its medicinal properties, and, interestingly, a high number of medicinal-food plants (5 to 7 %) is recorded. The concept of "Local Food" involves the whole repertory of species that characterises the local diet (incl. local cultivars and non-cultivated gathered food plants). The number of food plant species varies between 15 and 25 % of the vascular flora, and for the gathered food plants (GFP) this decreases to a 3 to 8 %. Those GFP that are also used for medicinal purposes are only 2 to 4 % of the total vascular flora. The relevant plant families are very similar in relative numbers along the different areas: Compositae, Rosaceae and Umbelliferae, followed of Boraginaceae, Liliaceae, Cruciferae, and Caryophyllaceae. Chenopodiaceae, Polygonaceae and Gramineae are less unifomly represented or in lesser numbers. The high species diversity does not imply a general dietary relevance of this particular plant family. For instance Caryophyllaceae with a relatively low number of species comprises the "collejas" (*Silene vulgaris*) that have shown to be the more widely consumed species. Information regarding 145 species has been recorded. Among the Gathered Food Plant Species 81 are used in medicine, in double proportion than the cultivated food plants. 61 are orally administered, in the same form as food.

Key words: *ethnobotany, local food, traditional knowledge, functional food, traditional medicine, mediterranean food(s)*

INTRODUCTION

Ethnobotany is very much interested in the traditional knowledge of rural communities in developed countries, where still is kept a high diversity of uses, traditions and genetic resources. However, less research has been conducted in this area as compared to classical ethnobotanical regions of study like the tropical belt. Unfortunately this biocultural diversity is fading very fast. A relevant part of this culture is related with food, and especially “Local Food”.

The concept of "Local Food" when referred to plants involves not only those species that are strictly endemic but also the whole repertory that characterises the local diet. Therefore, within this repertory ethnovarieties (local cultivars or local varieties of cultivated plants) and uncultivated gathered food plants (GFP) are included. This last group (GFP) comprises strictly wild species and not cultivated synanthropic species most of them classified as weeds.

The term "Mediterranean diet" was coined by nutritionist Ancel and Margaret Keys (1). In the 1950s they stayed in Rome, Naples and Madrid, and found that Naples firemen and poor inhabitants of Madrid had a significantly lower blood cholesterol levels than Americans. Also, animal fat represented a smaller percentage of their daily diets. On the other hand, 50 professional men in Madrid (Spain), all of whom had diets comparable to diets in the United States, had cholesterol levels comparable to those of their American counterparts (2, 3).

The Mediterranean-type diet is assumedly rich in vegetables, legumes, fruits and olive oil. In fact it may be more appropriate to speak about ‘diets’, since a variety of different dietary pattern can be found around the Mediterranean. Different trials have shown that this type of diet is associated with a pronounced decline in coronary disease morbidity and mortality, not only in Mediterranean but also in non-Western population of India or Israel (4, 5).

Best known in this area is the Seven Countries Study (6). The Cretan cohort is the only one associated with a striking protective effect of both coronary heart disease and mortality from all causes (4). The traditional Greek diet of Crete is therefore assumed as the prototype of Mediterranean diet (7). According to Kromhout (8) different Mediterranean diets are associated with different mortality rates from coronary heart disease and the lowest rate was observed in Crete. The nutrient content of the Mediterranean diet of Crete have been investigated by Kafatos (9).

The outstanding life expectancy of the Cretan cohort in the Seven Countries Study has been at the centre of intense discussions and could be due to the exceptional climate, the absence of stress and pollution, the after lunch siesta or other factors yet to be discovered (10). Although diet and particularly a-linolenic

acid plays a key role in that protective effect (4). Trichopoulou (11) assessed the relationships between adherence to a Mediterranean Diet and survival in a Greek population (involving 22,043 adults from all regions of Greece). They concluded that greater adherence to traditional Mediterranean diet is directly associated with a significant reduction in total mortality and inversely with both a lower death rate due to coronary heart disease and due to cancer.

Our interest is to determine the minor components of the Mediterranean Diet in terms of local food plant species, especially uncultivated gathered food plants (GFP). Those taxa have often been overlooked by the nutritionists or simply referred to as "greens". There is no clear dividing line between food and medicinal plants especially in indigenous and local traditions. Food can be used as a medicine and vice versa, also certain food are used because of certain assumed health benefits and thus could be called medicinal foods (12, 13) .

Medicinal Food Plants (MFP) may be defined as those food plants whose consumed parts (actually eaten) receive recognition as medicinal either in traditional medicine, ethnomedicine or biomedicine. These are part of the medicinal ethnoflora (generally a 30 % of this in number of taxa, including condiments and spices) (*Figure 1*).

Medicinal Gathered Food Plants (MGFP) form a particular subgroup of the above MFP, restricted to those taxa that are gathered from the wild or among the crops but not purposely cultivated.

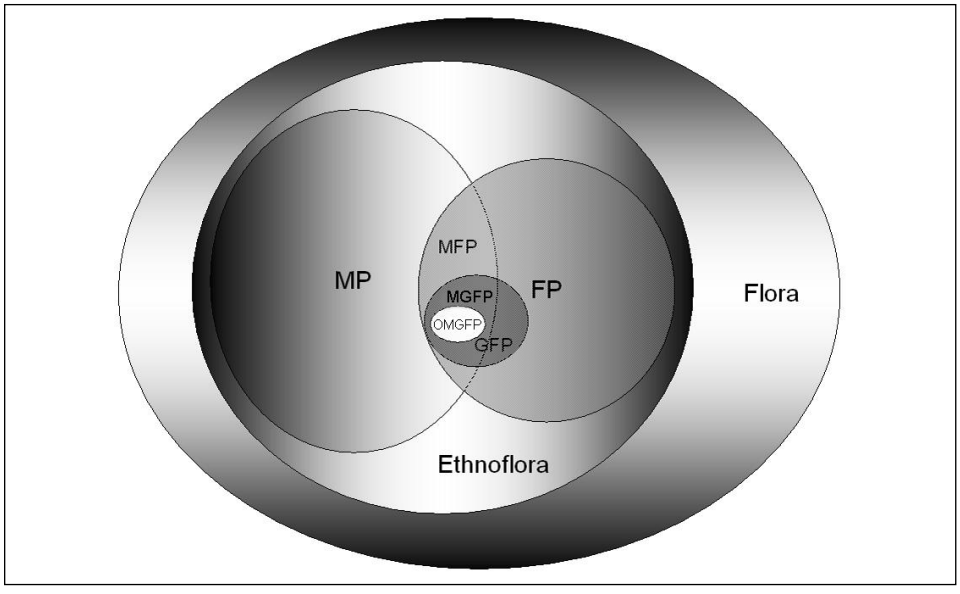

Figure 1. Different categories of the vascular flora according to the uses and their overlappings: MP medicinal plants. FP food plants. MFP medicinal food plants. GFP gathered food plants. MGFP medicinal gathered food plants. OMGFP orally administered medicinal gathered food plants.

This MFP group includes also species whose medicinal uses are remotely related or unrelated with their uses as food. For instance, the part used is different according to the culinary or medicinal purpose, or the plant is administered not orally (through skin, inhalations, etc.) and therefore not comparable with its ingestion as food. Therefore it should be sensible to consider a more restricted subgroup comprising exclusively those taxa in which the medicinal and alimentary uses refer to the same plant part and involve similar processing: Orally administered Medicinal Food Plants (OMFP) and Orally Administered Medicinal Gathered Food Plants (OMGFP).

Many authors, including Fabricant and Farnsworth (14) have demonstrated the potential of locally used medicinal plants as a reliable source of information to selecting higher plants as candidates for drug development (15); the ethnomedicinal use of these GFP makes them a particularly interesting matter for investigation.

BACKGROUND AND METHODS

Selection of the study areas

Our interest in Mediterranean ethnobotany started some 20 years ago focusing on traditional local uses of plants in Castilla-La Mancha, Murcia and Valencia. We focused on local practices involving medicinal and food plant species in rural areas. We have recorded an extraordinary number of species and uses (16, 17, 18, 19, 20, 21).

This earlier research was used as a guide to select four research zones for the study of local food plant uses (both medicinal and general food). These were three in the mountain ranges of Castilla-La Mancha (*Tables 1 and 2*) (22), with life stile more or less comparable to the one of the Cretan cohort in the Seven Countries Study, and the densely populated Lower Segura Valley, known as Vega Baja in Murcia and Baix Segura in Alicante, with a rapidly increasing young population.

The population pyramids reflect the contrasts and coincidences between areas. In general those situated far from the large cities show a strongly inverted pyramid with the largest elderly proportion (Serranía de Cuenca and Montes de Toledo with > 20 % population over 65, and Generational replacement, I=P15-19 / P 60-64, below or equal to 1 in 1986) (22, 23), whereas those near or comprising large cities (Serranía Media de Cuenca, Vega Baja and Baix Segura) display a less inverted pyramid with a good representation of younger population (Generational replacement, I=P15-19 / P 60-64, above 2 in 1986). Immigration is high in Murcia and very low in Serranía de Cuenca (22). This contrast is also clearly shown by the percentage of illiteracy (high in the mountain areas) and the proportion of elderly people (over 65 years) (*Tab. 1*) (23, 24). The differences are in fact simply a matter of time. The differences among areas are similar to those found between the year 2000 Pyramid for Spain and its projection for the year 2050 (25).

Benach (24) defined the Standardised Mortality Ratio at local level (small area studies) for all of Spain and interpreted their results in terms of risk levels. Excess risk is related to deprivation (26). We have extracted from their maps those data referring to our areas (*Tab. 2*). The highest overall risk is found in Murcia Vega Baja whereas lowest levels are detected in the Cuenca's Serrania Alta and Baja.

The impact of different diseases and diseases has been also investigated (24) in terms of their impact on the mortality statistics. We present the noteworthy features for our areas according with

Table 1. General demographic data. D, Demographic density (Persons / 100 sq. Km). T, Average dimensions of towns (Persons / n Towns and cities). R, Proportion of Disperse Habitat (Persons in disperse / Persons in nuclei). N, Number of Towns in 100 sq. Km. S, Percentage of population resident in towns < 2000 habitants. M, Percentage of population resident in towns 2000 < x < 10000 habitants. L, Percentage of population resident in towns and cities over 10000 habitants. I, Percentage of Illiteracy. Eld., Percentage of Elderly Population (over 65 years old) in the different areas (22, 23, 24) (1991 Census).

Area	D	T	R	N	S	M	L	I	Eld.
Cuenca Serrania Alta	4	132	0,001	3	100	0	0	2.6 - 8.7	19.6 - 38.9
Cuenca Serrania Baja	5,6	302	0,009	2	65,4	34,6	0	3.8 - 8.7	19.6 - 38.9
Cuenca Serrania Media	14,5	755	0,019	2	21,9	2,6	75,5	5.8 - 8.7	14.8 - 38.9
Alcaraz	7,9	236	0,074	3	57,5	42,5	0	5.8 - 18.8	19.6 - 38.9
Segura	10,4	296	0,132	3	60,7	39,3	0	5.8 - 18.8	16.9- 23.5
Montes Toledo Norte (Cabañeros)	8,2	754	0,055	1	29,7	70,3	0	5.8 -18.8	19.6 - 38.9
Montes de Navahermosa (Cabañeros)	13,4	1400	0,006	1	9,5	90,5	0	5.8 -18.8	19.6 - 38.9
Murcia Rio Segura (Lower Segura)	223,2	1850	0,113	12	8,3	40,1	51,6	1.8 - 2.6	10.6 - 12.9
Alicante Meridional (Lower Segura)	258,8	4067	0,079	6	4,9	27	68,1	3.8- 8.7	10.6 - 14.8

the mortality data (*Tab. 2*). Again Lower Segura in Murcia displays very high risk for a wide range of diseases. The Sierras show a very high life expectancy and low mortality rates, especially for men. Again this compares favourably with the epidemiological data of Cretan cohort included in the Seven Countries Study (6). This led us to select the Sierras de Alcaraz y Segura and the Serranía de Cuenca (especially Serranía Alta) as the more promising areas for detailed ethnobotanical research addressed at the study of health benefits of local gathered food plants.

Ethnobotanical study

Ethnobotanical semi-structured interviews were conducted and structured questionnaires were administered in the different mountain areas and river valleys in Southern Spain. We also collected samples of c. 80 local food plant taxa for extraction and studies of active compounds. The intensity of research activities for the different areas is reflected in *Tab. 3*.

The bibliographic references analysed in addition include ethnographic (27, 28); ethnobotanical (19, 29, 30, 31) and ethnopharmacological (32, 33) publications.

RESULTS

Medicinal flora and food plants

Due to of climate and topography the number of species in the vascular flora of the different areas varies between 800 and 1800 taxa. We recorded a high percentage of these taxa as medicinal plants (about 20 to 30 % of the vascular flora) and a similar proportion with uses as food (wild and cultivated) (*Tab. 4*). However, more interesting is the proportion of medicinal food plants (MFP), i.e.

Table 2. Variation and interpretation of Standardised Mortality Ratios at local level for the studied areas. Relevant specific diseases and mortality rates (24).

Area	Women	Risk	Men	Risk	Risk of mortal diseases women	Risk of mortal diseases men
Cuenca Serrania Alta	0.89 - 0.99	very low to low	below 0.88 - 0.91	lowest to low	Low risk of ischaemic heart disease.	Low to lowest risk of ischaemic heart disease. Not significant to lowest risk of lung cancer. Not significant to lowest risk of cirrhosis.
Cuenca Serrania Baja	0.89 - 1.04	low to not significant	below 0.88	lowest to very low	High risk of all other heart diseases.	Lowest risk of ischaemic heart disease. Low to lowest risk of lung cancer. Low risk of cirrhosis.
Cuenca Serrania Media	0.89 - 1.09	Low to high	below 0.88 - 1.01	lowest to not significant	High risk of all other heart diseases. Lowest risk of ischaemic heart disease. Very low risk of breast cancer. Lowest risk of dementia and Alzheimer. Lowest risk of diabetes.	Not significant to lowest risk of ischaemic heart disease. Not significant to lowest risk of lung cancer. Very low risk of chronic obstructive pulmonary diseases. Not significant to lowest risk of cirrhosis. Lowest risk of prostate cancer.
Segura	0.89 - 1.44	not significant to high	below 0.88 - 1.07	lowest to not significant	High risk of all other heart diseases. Not significant to very high risk of Acute Respiratory Infections, Pneumonia and Influenza.	Not significant to very low risk of ischaemic Heart Disease. Not significant to lowest risk of lung cancer. Not significant to very high risk of acute respiratory infections, pneumonia and influenza.
Montes Toledo	0.95 - 1.04	not significant	0.88 - 0.91	not significant	-	Not significant to lowest risk of prostate cancer.

Alcaraz	0.99 - 1.44	not significant to high	0.88 - 0.98	low to not significant	High to very high risk of chronic obstructive pulmonary diseases.	Not significant to lowest risk of lung cancer.
Alicante Segura	1.09 - over 1.17	not significant to high	0.88 - 1.07	not significant	Highest risk of cerebrovascular diseases. High risk of breast cancer.	High to highest risk of cerebrovascular diseases.
Murcia Segura	1.09 - 1.16	high	1.07 - 1.14	high	High risk of cerebro-vascular diseases. Low risk of all other heart diseses. High risk of ischaemic heart disease. High risk of diabetes. Lowest risk of atherosclerosis. High risk of breast cancer. High risk of chronic obstructive pulmonary diseases. High risk of dementia and Alzheimer. High risk of Acute Respiratory Infections, Pneumonia and Influenza.	High risk of ischaemic heart disease. High risk of cerebrovascular diseases. Low risk of all other heart diseases. Very high risk of chronic obstructive pulmonary diseases. High risk of cirrhosis. Low risk of stomach cancer.

Table 3. Distribution of intensity of research in the different selected areas (Including specific QLK1-2001-00173 activities, pre-existing knowledge and parallel works). Between brackets late samples collected in 2003.

Areas	Open interviews and Medicinal plant studies	Systematic questionnaires	Socio-nutritional questionnaires	Sampling for extracts and activities
Alicante Baix Segura	48	300	-	3
Murcia Vega Baja	60	707	-	24
Sierra de Alcaraz and Sierra de Segura	212	402	80	24
Serranía de Cuenca	120	598	-	1(20)
Cabañeros	59	0	-	0
Total	**499**	**2007**	**80**	**52(72)**

Table 4. Assessment of plant diversity in the different areas. For GFP and MGFP, (Between brackets numbers including subspontaneous trees and shrubs and uses in surrounding areas) (16, 30, 31).

Areas	Total Vascular Flora	Medicinal Plants	Food Plants (Total)	Medicinal Food Plants (MFP)	Gathered Food Plants (GFP)	Medicinal Gathered Food Plants (MGFP)	Cultivated Food Plants	Medicinal Cultivated Food Plants
Sierra de Alcaraz y Segura	1800	327	297	92	56 (113)	32 (64)	265	60
Serranía de Cuenca	1100	212	228	62	58 (85)	45 (60)	183	17
Cabañeros	990	181	208	57	43	24	151	33
Lower Segura (Baix Segura + Vega Baja)	900	150	160	58	71	24	89	34

those that are used both as food and medicine. These account for about 5 to 7 % of the vascular flora. Between 20 – 30 % of all medicinal plants are consumed as food and therefore are MFP. A similar proportion of all food plants is medicinal (*Tab. 4*) (32, 33).

It is important to highlight the significant role fungi play. Nine genera yield a total of 19 species used in the local diet (4 *Lactarius* spp., 3 *Boletus* spp., 2 *Pleurotus* spp., 2 *Agaricus* spp., 2 *Morchella* spp., 2 *Helvella* spp., 2 *Amanita* spp., 1 *Terfezia* sp., 1 *Picoa* sp.)

The proportion of all food plant species vary between 15 and 25 % of the vascular flora, but for gathered food plants (GFP) this decreases to a 3 to 8 %. Those GFP that are also used for medicinal purposes (MGFP) are only 2 to 4 %

of the total vascular flora. Between 50 and 80 % of the gathered food plants are also medicinal and therefore the proportion of medicinal may in this case be four times higher that among the total edible vascular flora (FP).

In the mountains (Sierras de Alcaraz and Segura, Serranía de Cuenca) we have recorded a total of 145 GFP taxa (33), of these 81 are MGFP, and only 61 are OMGFP, orally administered as medicine (*Tab. 5*). These 61 taxa are consumed commonly in the regular diet of local population and for particular purposes is especially recommended to ingested them as medicinal. For the 20 other MGFP taxa, when used in ethnomedicine the part employed or the processing make not comparable their medicinal use with their consumption as food.

One common analysis in ethnobotany uses to the relative frequency of useful taxa in the various botanical families. In our case the proportion of the taxa used as Medicinal Gathered Food Plant in the larger plant families is more or less similar in the different areas sampled in Castilla-La Mancha: Compositae (23% in Alcaraz-Segura and 17% in Serranía de Cuenca), Rosaceae (11% in Alcaraz-Segura and 26% in Serranía de Cuenca) and Umbelliferae (6% and 7%), followed of Cruciferae (7% and 2%), Boraginaceae (4% and 3%) and Caryophyllaceae (2% and 3%). Chenopodiaceae, Polygonaceae and Gramineae are less uniformly represented or in smaller proportion.

Table 5. Medicinal remedies and species available in absolute values and percentages for the major therapeutic groups in the Serrania de Cuenca and sierras de Segura y Alcaraz. The proportion of Medicinal Gathered Food Plants (MGFP) and orally administered (OMGFP) is represented for the whole area altogether. Abs.: absolute values. Spe.: number of species (32, 33).

	Medicinal Plants Serranía de Cuenca			Medicinal Plants Sierras de Albacete			Medicinal Gathered Food Plants (MGFP)			Orally administered (OMGFP)		
	Remedies		Spe.	Remedies		Spe.	Remedies		Spe.	Remedies		Spe.
Therapeutic groups	Abs.	(%)	Abs.	Abs.	(%)	Abs.	Abs.	(%)	Abs.	Abs.	(%)	Abs.
Respiratory	54	12.45	35	131	15.8	79	38	10.95	24	16	11.2	14
Digestive	147	33.88	86	229	27.6	125	84	24.2	45	52	36.5	34
Cardiovascular	**65**	**14.97**	**54**	**90**	**10.9**	**69**	**64**	**18.44**	**38**	**34**	**23.8**	**28**
Blood and hematopoietic	**14**	**3.25**	**15**	**10**	**1.21**	**10**	**23**	**6.62**	**14**	**18**	**12.6**	**11**
Antiparasitary	5	1.15	5	18	2.17	18	2	0.57	2	0-	0	0
Nervous System	34	7.83	29	116	14	83	39	11,24	26	15	10.5	13
Sensorial organs	12	2.76	12	21	2.6	18	4	1.16	4	0	0	0
Genitourinary	21	4,83	22	36	4.3	25	11	3.17	8	4	2.8	4
Locomotive System	21	4.83	20	54	6.57	40	30	8.65	22	1	0.7	1
Dermatologic	61	14.05	43	123	14.85	82	52	15	30	1	0.7	1
Total	434	100	**212**	828	100	**327**	347	100	**81**	143	100	**61**

Ethnobotanists have often argued that a high rate of useful species in a family is a direct indicator of a family's importance (major plant families) (34) However, the high species diversity of a particular plant family does not imply that these taxa or the family as a whole is of general dietary relevance. For instance, the Caryophyllaceae yield only a few taxa used as food but this includes the "collejas" (*Silene vulgaris*), the most widely consumed species.

In the Lower Segura basin the situation is relatively similar but with some relevant differences: Compositae show again the highest number of species, but now followed of Cruciferae and Labiatae, and then the Rosaceae. Here Boraginaceae, Leguminosae, Caryophyllaceae and Liliaceae are used as food in a lower proportion. The best known gathered food plants are here some taxa of the Compositae which receive the general name of "Camarrojas" (*Cichorium* spp., *Crepis* spp.).

DISCUSSION

The repertory of remedies recorded (formulae with one or several plants for specific diseases) is relatively rich and varied in the ethnomedicine in the Sierras de Alcaraz y Segura (828) twice the number as in Serranía de Cuenca (434) (*Tab. 5*). The highest proportion in both areas of recorded remedies is for digestive (25-35 %), dermatologic (c. 15 %), cardiovascular (10-15 %) and respiratory (12-16 %) diseases, as well as disorders of the nervous system (7-14%). It is supposed that there is a correlation between diversity of remedies and local relevance of the disease treated when considering the whole group of remedies or medicinal plant species. That means a higher incidence of the disease in the area led to a higher proportion of remedies developed. But if a different pattern is found in the several subgroups of remedies (for instance those with GFP) it may be related to the particular medicinal properties of this subgroup.

When referring exclusively to the subgroup of MGFP results are similar (*Tab. 5*) although it is relevant the higher proportion of Cardiovascular remedies (18,44% vs. 10,9% and 14,9 % in the MP). It is even higher in the subgroup of OMGFP (23.8 %). If we analyse those remedies under Blood and hematopoietic category the pattern is similar MGFP (6,6% vs. 1.21% and 3,2%) and OMGFP much higher (12.6%).

Why people prefer to use with preference the OMGFP species for cardiovascular diseases instead of following the common pattern of the whole MP?. These OMGFP are used in similar proportion for digestive complaints as in MP, but in a much lesser proportion for dermatologic, respiratory and locomotive system diseases. Have these active compounds that justify this behaviour? Are these compounds conditioning the health status of the population through the diet?

The specific uses in local ethnomedicine of each one of the 61 OMGFP is presented in *Table 6* with reference to the plant part used. In this subgroup the

Table 6: Medicinal Gathered Food Plant species orally administered for medicinal purposes. Codes for the plant parts: b: bulbs; fl: flowers; fm: male flowers; fr: fruits; ht: young leaves; pat: tender parts, aerial; r: roots; rc: leaf rachis; tb: tubercles; tt: shoots; z: juice (33).

Name	Family	Vernacular name	Part used	Medicinal uses
Allium ampeloprasum L.	Alliaceae	Ajoporros, ajos porros, ajos de víbora	b	Influenza, antihelminthic, analgesic
Allium roseum L.	Alliaceae	Ajos porros, ajosporros, ajos de víbora	b	Influenza, antihelminthic
Aphyllanthes monspeliensis L.	Aphyllanthaceae	Junquillo, junquillo de flor	tt	Antianemic
Asparagus acutifolius L.	Asparagaceae	Espárragos trigueros, espárragos	tt	Diuretic, bile duct lithiasis
Berberis vulgaris L. subsp. seroi O. Bolós & Vigo	Berberidaceae	Alrera, alrro	ht	Appetizer, antipyretic
Anchusa azurea Mill.	Boraginaceae	Lenguazas, aguamielera, chupamieles	fl	Cough remedy
Anchusa azurea Mill.	Boraginaceae	Lenguazas, aguamielera, chupamieles	ht	Disinfectant of urinary tract, antidiarrheal
Borago officinalis L.	Boraginaceae	Borrajas	fl	Diuretic
Echium vulgare L.	Boraginaceae	Chupamieles, melera, lenguaza, aguamieles	ht	Diuretic, rabies postexposure profilaxis
Beta vulgaris L. subsp. maritima (L.) Archangelli	Chenopodiaceae	Acelgas de campo, acelgas bordes. acelgas de Dios	ht	Dyspepsia, stomachic, antiflogistic, laxative
Chenopodium album L.	Chenopodiaceae	Cenizos, armollas	ht	Laxative
Helianthemum syriacum (Jacq.) Dum. Cours.	Cistaceae	Café del campo, té del campo, té moro	pat	Digestive, febrifuge
Arctium minus (Hill.) Bernh.	Compositae	Cedones, gordolobo, ceronera,guardalobo	Rc	Astringent, cold treatment, circulatory stimulant
Centaurea calcitrapa L.	Compositae	Abriojos, cardo abriojos	ht	Diuretic
Cichorium intybus L.	Compositae	Chicorias, achicorias, camarrojas	ht	Laxative, hypoglycemic, diuretic, depurative, febrifuge, disinfectant of urinary tract, hepatoprotective, appetizer

Cichorium intybus L.	Compositae	Chicorias, achicorias, camarrojas	R	Appetizer, cholagogue, hyperglycemic, digestive, antidiabetic
Mantisalca salmantica (L.) Briq. & Caviller	Compositae	Pan de pastor, Camarrojas, escobas de palotes	ht	Hypotensive, hypoglycemic
Silybum marianum (L.) Gaertn.	Compositae	Cardo borriquero, cardenchas	Rc	Circulatory stimulant
Sonchus oleraceus L.	Compositae	Cerrajas, forrajas, borrajas, cerrajilla, crujiera	ht	Depurative, pyrosis
T. obovatum (Wild). DC.	Compositae	Pitones, amargón	ht	Hepatoprotective
T. vulgare (Lam.) Schrank	Compositae	Camarroja, pitones, diente de león, amargón, chicorias, diente de dragón	ht	Cold treatment, hepatoprotective, renal lithiasis, appetizer, febrifuge
Taraxacum laevigatum (Willd.) DC (= T. erythro-spermum Besser)	Compositae	Pitones, amargón	ht	Hepatoprotective
Capsella bursa-pastoris L.	Cruciferae	Devanaeras	pat	Hypotensive, hypocholesterolemic
Rorippa nasturtium aquaticum (L.) Hayeck	Cruciferae	Berros	pat	Detoxifying, bechic, appetizer, diuretic, febrifuge
Juniperus communis L.	Cupressaceae	Enebro	fr	Digestive
Scirpus holoschoenus L.	Cyperaceae	Juncos	tt	Hypotensive
Vaccinium myrtillus L.	Ericaceae	Arándanos	fr	Astringent
Quercus ilex L. subsp. ballota (Desf.) Samp.	Fagaceae	Bellotas, billotas	fr	Astringent, galactogogue
Cynodon dactylon L.	Gramineae	Grama	R	Diuretic, hypoglycemic, antitussive, hypotensive, bechic, oliguria, disinfectant urinary tract
Juglans regia L.	Juglandaceae	Nogal, noguera	fr	Psicoanaleptic
Glycyrrhiza glabra L.	Leguminosae	Palodúz, palidú, palodulce	R	Cold treatment, diuretic
Papaver rhoeas L.	Papaveraceae	Ababoles, babaoles, amapolas	pat	Measles treatment

Pinus pinaster Aiton	Pinaceae	Pino negral, piñuelas (male flowers), pino rodeno, pin rueno	fm	Acute renal colic, depurative
Pinus pinea L.	Pinaceae	Pino doncel, pino piñonero, pin doncel, piñuelas (Flores masculinas)	fr	Astringent, antiscorbutic
Rumex acetosella L subsp. angiocarpus (Murb.) Murb.	Polygonaceae	Vinagreras. agricas, vinagrillos	tt	Antidiarrheal, hypotensive
Rumex crispus L.	Polygonaceae	Romanzas, arnazas, acederones, acedera de burro	ht	Cold treatment, antidiarrheal, digestive, heart tonic
Rumex. pulcher L.	Polygonaceae	Romanzas, arnazas, acederones, acedera de burro	ht	Cold treatment, digestive
Portulaca oleracea L.	Portulacaceae	Verdolaga, verdulaga, emporretos	pat	Diuretic
Amelancheir ovalis Medik.	Rosaceae	Millominas, millomas, guillominas, guillomas	fr	Analgesic
Cydonia oblonga L.	Rosaceae	Membrillo	fr	Astringent
Fragaria vesca L	Rosaceae	Fresas	fr	Gout remedy
Malus segurensis Rivera et al.	Rosaceae	Maguillas	fr	Astringent
Malus sylvestris (L.) Mill.	Rosaceae	Maguillas, maíllas, manzanos bordes, manzanos de pastor, manzanos amargos	fr	Astringent
Prunus avium L.	Rosaceae	Cerezos bordes	fr	Digestive, antispasmodic
Prunus cerasus C. Kock	Rosaceae	Guindos	fr	Digestive
Prunus spinosa L.	Rosaceae	Endrinas, ciruelicas de gato, cirulicas montesinas	fr	Astringent
Pyrus cordata Desv.	Rosaceae	Peras modorras, peras cermeñas	fr	Astringent
Rosa canina L.	Rosaceae	Tapaculos, tallos de zarza, escaramujo, zarza escaramujera	fr	Astringent, cold treatment, antianemic
Rosa canina L.	Rosaceae	Tapaculos, tallos de zarza, escaramujo, zarza escaramujera	tt	Digestive, appetizer, diuretic
Rubus caesius L.	Rosaceae	Moras rateras	fr	Digestive, astringent

Rubus ulmifolius Schott.	Rosaceae	Moras	fr	Astringent, Digestive (intestinal pain)
Rubus ulmifolius Schott.	Rosaceae	Espárragos de zarza, truchas, zarzas	tt	Hypotensive, Digestive, astringent, hypoglycemic, cold treatment, cough remedy
Sorbus aria (L.) Crantz subsp. aria	Rosaceae	Mostajos	fr	Astringent
Sorbus torminalis (L.) Crantz	Rosaceae	Mostajos, espejón	fr	Astringent
Sorbus. domestica L.	Rosaceae	Serbal, sierbas (fruto), arzollas (frutos)	fr	Astringent
Ruscus aculeatus L.	Ruscaceae	Albricias	tt	Febrifuge, diuretic
Veronica anagallisaquatica L.	Scrophulariaceae	Frailes, astillejos	ht	Diuretic
Veronica beccabunga L.	Scrophulariaceae	Astillejos, berro macho, frailes	ht	Diuretic
Celtis australis L.	Ulmaceae	Almez, alatonero, chilindronar, alatones, chilindrones (frutos)	fr	Astringent, diuretic
Apium nodiflorum (L.) Lag.	Umbelliferae	Berras	pat	Digestive
Foeniculum vulgare Mill. subsp. piperitum (Ucria) Cout.	Umbelliferae	Hinojo	pat	Digestive, carminative, bechic, cold treatment, antispasmodic, tranquilizer
Urtica dioica L.	Urticaceae	Ortigas	pat	Hypotensive, hypocholesterolemic, circulatory stimulant, depurative, hypoglycemic, cold treatment, diuretic, bechic
Urtica urens L.	Urticaceae	Ortigas	pat	Hypotensive, depurative, diuretic, hypocholesterolemic, circulatory stimulant, hypoglycemic, cold treatment, diuretic, bechic
Viscum album L. ssp. austriacum (Wiesb.) Vollm.	Viscaceae	Almuérdago	fr	Analgesic, antihelminthic

Vitis vinifera L.	Vitaceae	Vid, tronchos	fr	Cold treatment
Vitis vinifera L.	Vitaceae	Vid, tronchos	tt	Hypotensive
Vitis vinifera L.	Vitaceae	Vid, tronchos	z	Febrifuge

fruits (23 items) and young leaves (16 items) are the plant parts more often consumed for medicinal purposes. The plant families with higher proportion are Rosaceae (17 taxa), Compositae (10 taxa) and Boraginaceae (5 taxa).

We have recorded a total of 145 GFP Species which are consumed by the local population (113 in Alcaraz and Segura and 85 in Serranía de Cuenca). This a relatively high proportion (higher than those from Madrid province or Cyprus) and similar, in the case of Alcaraz with the data from Crete (*Tab. 7*).

Among the 145 Gathered Food Plant Species (GFP), 81 are used in folk medicine, this is a 55,9% (MGFP) (56.6% in Alcaraz and Segura and 70.6% in Serranía de Cuenca) (MGFP). Therefore here we found a very high proportion of medicinal plants, it is twice as in all FP (food plants). The food plants with medicinal use (MFP) represent here a 30 % of the medicinal ethnoflora, with 92 species vs. 327 in Alcaraz and Segura, and 62 vs. 212 in Serranía de Cuenca (*Tab. 4*). Considering that MFP includes the subgroup of MGFP the other subgroup includes the cultivated species. For cultivated food plant species (*Tab. 4*) the proportion of medicinal taxa is much lower 22,6 % in Alcaraz and Segura and 9.2% in Serranía de Cuenca.

Can this high proportion of medicinal uses in the MGFP taxa can be explained in terms of a content of active secondary metabolites higher in wild or scarcely domesticated plant species than in cultivated ones?

Among the 81 MGFP taxa, 61 are orally administered in local ethnomedicine, in the same or similar way as when consumed for food. These are extremely interesting because they are ingested as food in amounts and frequencies that can be considered prophylactics or therapeutics.

The Medicinal Gathered Food Plants, uncultivated, are interpreted by the local population as healthy food, especially for cardiovascular and digestive diseases. This perception of Local Foods could contribute to explain lesser known aspects of the Mediterranean Diet and its origins.

The group of MGFP which is used as remedy for cardiovascular diseases accounts c. 25 species, that simultaneously are consumed as food in the same way. The highest diversity of cardiovascular MGFP is found in areas with the lowest risk of ischaemic heart disease. Is the customary consumption of these plants by the local population of help in the prevention of CVD? It has been shown that a greater adherence to the traditional Mediterranean diet is associated with a significant reduction in total mortality although in the investigation done in Greece associations between individual food groups (vegetables, legumes, fruits and nuts, dairy products, etc.) and total mortality were generally not

Table 7. Comparison of Gathered Food Plant species diversity in areas of Spain and other Mediterranean countries. Sources: numbered references and K: Z. Kypriotakis (pers. com.).

Areas	Total Vascular Flora	Medicinal Plants	Food Plants (Total)	Gathered Food Plants (GFP)	Sources
Lower Segura (Baix Segura + Vega Baja)	900	150	160	71	16
Sierra de Alcaraz + Segura	1800	327	297	113	32
Serranía de Cuenca	1100	212	228	85	32
Cabañeros	990	181	208	43	32
Madrid	2360	c. 300	c. 300	120	35, 36
Cyprus	1760	453	c. 260	76	37, 40
Turkey	8650	c. 500	c. 600	c. 300	38
Crete	1873	-	-	147	K, 39

significant (11). Would have been found more significant associations if GFP where considered as a group?

CONCLUSIONS

We have recorded c. 145 Medicinal Gathered Food Plant Species which are consumed by the local population (113 in Alcaraz and 85 in Cuenca). Among the Gathered Food Plant Species 81 are used in medicine, in double proportion than the cultivated food plants. 61 are orally administered, in the same form as food.

The group which is used as remedy for Cardiovascular diseases accounts c. 25 species. The highest diversity of cardiovascular GFP is found in areas with the lowest risk of ischaemic heart disease. Are these plants of help in the prevention of CVD?

It should be advisable in future population-based studies, that use food-frequency questionnaires, to include as a separate dietary variable the group of GFP in order to verify possible associations with health parameters and mortality.

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