Gathered Food Plants in the Mountains of Castilla–La Mancha (Spain): Ethnobotany and Multivariate Analysis[1]

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Gathered Food Plants in the Mountains of Castilla–La Mancha (Spain): Ethnobotany and Multivariate Analysis. Gathered food plants (GFPs) (wild and weeds) are crucial for understanding traditional Mediterranean diets. Combining open interviews and free–listing questionnaires, we identified 215 GFP items, i.e., 53 fungi and 162 from 154 vascular plant species. The variation in frequency and in salience among the items follows a rectangular hyperbola. Highly salient species were *Silene vulgaris* (Moench) Garcke, *Scolymus hispanicus* L., and *Pleurotus eryngii* (DC.: Fr.) Quélet. Salience and frequency showed no correlation with the expected health benefits of each species. Regional frequency in the Mediterranean and local frequency are directly related. Thus, local food plants are much less "local" than expected.

Different types of culinary preparations provide the most information in the cluster analysis of variables. The cluster analysis of items produced a tree with 10 clusters that form culture–specific logical entities, allowing people to structure their environment. Within each cluster, plant species are replaced and incorporated provided they resemble the general profile. This allows innovation and adaptation on a local level and explains the differences between adjacent localities in the list of species. Two types of clusters or species complexes are described: "species–labeled" and "uses–labeled." Lastly, we discuss the underlying empirical basis of the ethnoclassification in the Mediterranean area.

Key words: Ethnobotany, local food, food plants, traditional knowledge, Mediterranean, biodiversity, statistical analysis, ethnoclassification..

Introduction

The idea of a Mediterranean diet suggests a combination of vegetables, salads, fruits, and spices, often derived from local traditions, including some basic ingredients (pasta, olive oil, and wine). However, most of the ingredients are edible wild plants, mushrooms, and weeds. As always, these plants form part of a complex biocultural network and can only be understood if human cultural and plant–genetic diversity are taken into consideration.

Ethnobotany can help determine precisely which plants currently are consumed by each ethnic group in a particular geographical and cultural

[1] Submitted 05 September 2006; accepted 21 March 2007.

Economic Botany, 61(3), 2007, pp. 000–000.

context. Yet, why is this relevant? In simple terms, the answer is that an edible plant is not necessarily eaten. Many factors determine the choice of a specific species as a food: abundance, availability, cultural preferences such as certain tastes or smells (Brett and Heinrich 1998), processing technologies, and—a very important but hitherto little understood factor—consumers' genetic features (e.g., presence of detoxifying enzymes) that allow the safe consumption of certain species.

Therefore, most potentially "edible" plants are not actually consumed in localities where they are locally abundant. Sometimes they are only used as fodder, as "famine food," or are simply neglected. Ethnobotany shows that this selective profile of foods is found at different levels (local to regional) and, of course, is part of individual Traditional Knowledge Systems (TKS) (Heinrich et al. 2005; Leonti et al. 2006; Rivera and Obón 2005; Rivera et al. 2006).

While cultivated plants come to mind first as elements of food plant diversity, gathered food plants (GFPs) are crucial for understanding the health impact of these diets. Their contribution to the traditional Mediterranean diet, although qualitatively important, is still practically unknown (Rivera et al. 2005; Leonti et al. 2006; Trichopoulou et al. 2000).

In this study, we determine the role of plant species, especially non–cultivated gathered food plants (GFP), as local ingredients in the peoples' diet and how those factors impact on pattern formation in GFPs by assessing correspondences between species, usage profiles, parts used, seasonal availability, habitats, and distribution. In brief, we analyze the role of taxonomy, morphology, ecology, and culture in the complex structure of relationships between GFPs and humans. We also analyze the patterns of GFP salience on a local level and within the wider context of the Mediterranean Region.

Background and Methods

In the mountains of Castilla–La Mancha (Spain), deprivation (poverty, illiteracy, etc.) appears associated with low risk levels, high life expectancy, and low mortality rates (especially for men). It is comparable to the Cretan cohort of the Seven Countries Study (Benach et al. 2001; Benach and Yasui 1999; Keys 1980; Rivera et al. 2005). More ethnobotanical information on the region of study is available as well (Verde et al. 1998; Fajardo et al. 2006).

Ethnobotanical semi–structured interviews were conducted with ca. 200 informants from Spain's Albacete and Cuenca provinces (Fig. 1) and over 1,500 structured food–species–specific questionnaires (FSQs) were administered to ca. 100 informants from the mountainous areas of 20 localities in Albacete and 25 in Cuenca. Usually, the previously interviewed subjects were selected for receiving FSQs and the number of FSQs given was according to the anticipated number of food taxa/items known/used. We asked informants to sequentially fill in the FSQs themselves or, when necessary, with our help. We asked them to recall all GFPs they consume or had consumed before, where and when they collect them, and how they process, cook, and consume them. The subjects filled in the FSQs (one for each item) sequentially in the order preferred by the subjects according to the free list methodology. We did not ask informants to classify or arrange these GFPs in groups. We asked informants to give us the name of the GFPs in local terminology.

Informants were reminded to return the FSQs one month later, during visits to the locality by the research team, and FSQs were directly collected from them or through collaborators in each locality. A total of 1,005 FSQs were completed by 88 informants (return rate of 66.7 %), out of which 973 were complete enough to be analyzed. The average proportion of FSQs per informant was 11.05. Voucher specimens were deposited at ALBA and UMH.

Salience typically reflects contrasts between items. At a community level, the conventional levels of salience are slowly embedded in the sign systems and culture, and they cannot arbitrarily be changed (Murphy et al. 2003; Wikipedia 2006a, 2006b). The salience of each item (S) was calculated according to Sutrop (2001) and Vainik (2004). Using the formula $S = F/(N^{*}mP)$, where F is the frequency of the item in a given free list collection (sequential group of FSQs), N the 88 subjects, and mP is the mean position of the item, calculated as $mP = (\Sigma r_i)/F$, where Σr_i is the sum of all individual ranks (Table 1). Thus, items cited only in interviews were not included in the salience analysis.

Table 1 presents the synthesis of ecological and ethnobotanical data from FSQs and interviews

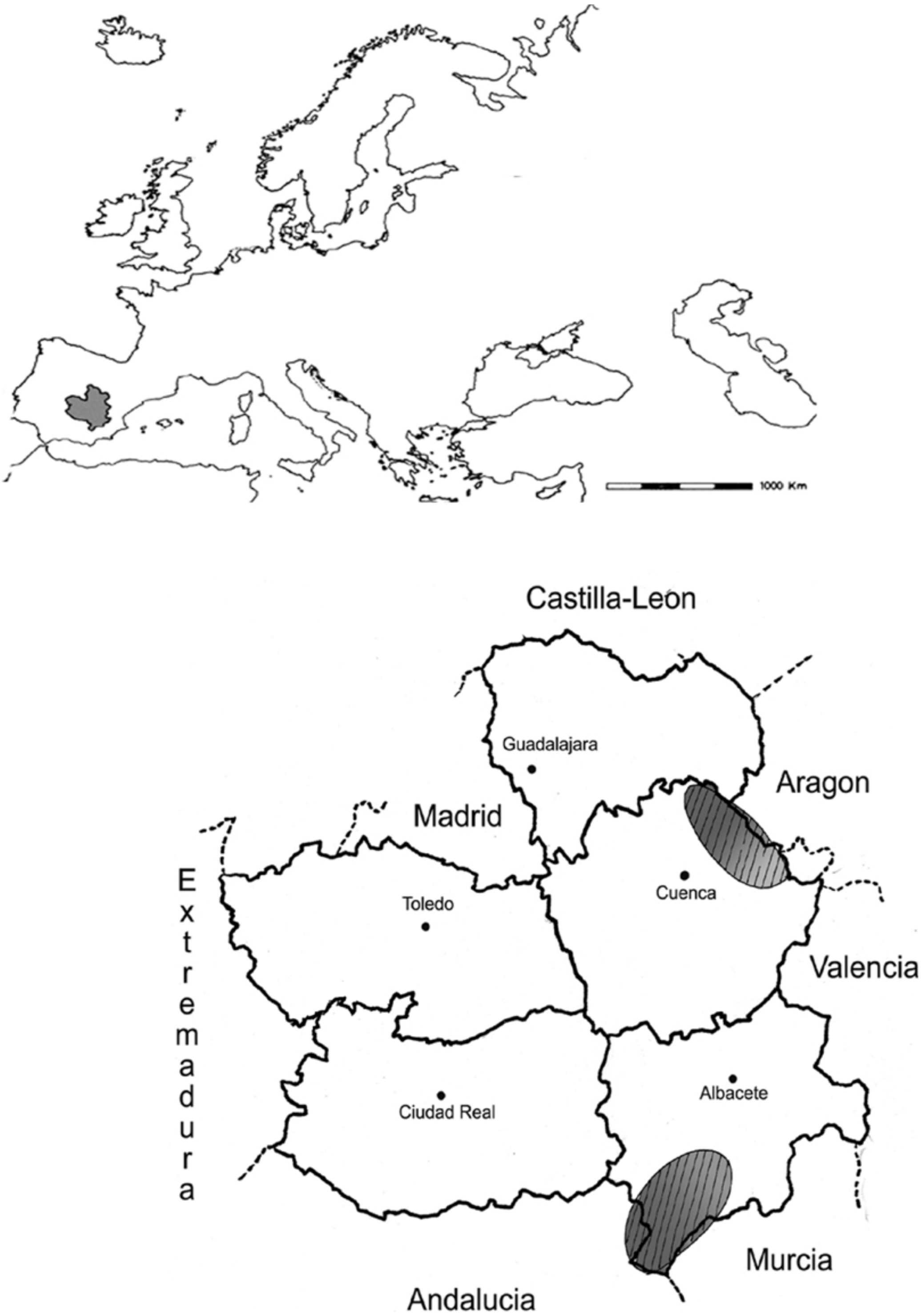

Fig. 1. Location of the area (Albacete and Cuenca) in Spain. Mountains are marked in gray.

TABLE 1. GATHERED FOOD PLANTS AND MUSHROOMS OF ALBACETE AND CUENCA, SPAIN.[1]

Family and Scientific Name	C	S	Part.	Cont.	Fr.	His.	Sea.	Uses	Ar.	Habit at
Agaricaceae										
Agaricus arvensis Schäffer: Fr.	10	C	AC	D	F	T	S–AU	SOU	1–2–3–4	U–X–Y
Others: (10)–*Agaricus bisporus* (J. E. Lange) Pilát, *Agaricus campestris* L., *Agaricus silvicola* (Vittad.) Peck., (9 C*)–*Macrolepiota mastoidea* (Fr.) Sing. *Macrolepiota procera* (Scop.:Fr.) Quél., *Macrolepiota rhacodes* (Bit.) Sing.										
Alliaceae										
Allium ampeloprasum L.	5	D	B	D	FF	T	S–W	SCR	1–2–3–4	U–Y
Others: (5)–*Allium moly* L., *Allium roseum* L.										
Amanitaceae										
Amanita caesarea (Scop. :Fr.) Grév.	9	N	AC	D–C	F	RE	AU	GRI–RAW–SAL	2–3–4	X
Others: (9)–*Amanita vaginata* (Bull.:Fr.) Vitt.										
Aphyllanthaceae										
Aphyllanthes monspeliensis L.	4	D	TS	D	RA	T	S	RAW	4	Y
Others: (4 flowers)–*Aphyllanthes monspeliensis* L.										
Asparagaceae										
Asparagus acutifolius L.	3	C	TS	D	FF	T	S	AJO–FRI–GAZ–SCR	1–2–4	U–Y
Asteraceae										
Anacyclus clavatus (Desf.) Pers.	6	C	TL	D	RA	A	S	FRI–SCR	2	U
Chondrilla juncea L.	7	C	TL	D	RA	T	S	SAL	1–2–4	U–Y
Cichorium intybus L.	5	C	TL	D	F	T	S	SAL	1–2–4	U–Y
Hypochoeris radicata L.	6	C	TL	D	RA	A	S	CAS–SAL	2–4	U–Y
Leontodon longirostris (Finch. & PD. Sell) Talavera	6	C	TL	D	RA	A	S	SAL–SOU	2–1–2	U–Y
Mantisalca salmantica (L.) Briq. & Caviller	6	C	TL	D	RA	A	S	CAS–FRI–SCR–SOU	2–4	U–Y
Scolymus hispanicus L.	7	B	TL	D	FF	T	S	CAS–SAL	1–2–4	U–Y
Scorzonera angustifolia L.	7	C	TA	D	RA	T	S	SAL	1–2–4	U–Y
Scorzonera crispatula (Boiss.) Boiss.	7	C	TA	D	RA	T	S	SAL	1–2	Y
Scorzonera laciniata L. var. *laciniata*	7	C	TL	D	RA	T	S	SAL	1–2–4	U–Y
Sonchus oleraceus L.	7	C	TL	D	RA	T	S	CAS–SAL–SCR	1–2–4	U
Taraxacum laevigatum (Willd.) DC (= *T. erythrospermum* Besser)	7	C	TL	D	RA	T	S	SAL–SCR	1–2	U–Y

Taraxacum obovatum (Willd). DC.	7	C	TL	D	RA	T	S	SAL–SCR	1–2	Y
Taraxacum palustre (Lyons). Symons.	7	C	TL	D	RA	T	S	SAL–SCR	1–2	Y
Taraxacum pyropappum Boiss. & Reut.	7	C	TL	D	RA	T	S	SAL–SCR	1–2	Y
Taraxacum vulgare (Lam.) Schrank	7	C	TL	D	RA	T	S	SAL–SCR	1–2–4	Y

Others: (4)–*Cynara baetica* (Sprengel) Pau, (5C*)–*Helianthus tuberosus* L., (6)–*Anacyclus valentinus* L., *Arctium minus* (Hill.) Bernh., *Centaurea calcitrapa* L., *Crepis vesicaria* L. ssp. *haenseleri* (DC.) P.D. Sell., *Onopordum acanthium* L., *Onopordum acaulon* L. ssp. *uniflorum* (Cav.) Franco, *Onopordum corymbosum* Willk., *Onopordum nervosum* Boiss. (leaf rachis and stems), *Picris comosa* (Boiss.) B. D. Jackson, *Rhagadiolus edulis* Gaertner (N), *Rhagadiolus stellatus* (L.) Gaertner, *Silybum marianum* (L.) Gaertn., (7)–*Cichorium intybus* L. (roots), *Lactuca serriola* L. (C*), *Lactuca tenerrima* Pourret, *Lactuca viminea* (L.) J. & C. Presl. *Sonchus crassifolius* Pourret ex Willd., *Sonchus asper* L. ssp. *asper*

Berberidaceae										
Berberis vulgaris L. ssp. *seroi* (O. Bolós & Vigo) S. Rivas et al.	8	C	TL	D	RA	T	S	RAW–SOU	4	X
Berberis vulgaris L. ssp. *seroi* (O. Bolós & Vigo) S. Rivas et al.	8	C	FR	D	RA	T	S	RAW	4	X

Others: (8 fruits)–*Berberis hispanica* Boiss. & Reut.

Bolbitiaceae										
Agrocybe aegerita (Brig.) Singer	10	C	AC	D	F	T	S–AU	FRI–GRI–SCR	1–2–4	X
Boletaceae										
Boletus aestivalis (Paulet) Fr.	9	D	AC	D–C	RA	RE	SU–AU	SOU	2–4	X

Others: (9)–*Boletus aereus* Bull.: Fr., *Boletus edulis* Bull.: Fr., *Boletus pinophilus* Pilat & Dermek.

Boraginaceae										
Anchusa azurea Mill.	6	D	TL	D	RA	A	S	SOU	2	U–Y

Others: (4 flowers–6 tender leaves)–*Echium creticum* L. ssp. *coincyanum* (Lacaita) R. Fernandes, *Echium plantagineum* L. *Echium vulgare* L., (6)–*Lithospermum arvense* L. (7)–*Borago officinalis* L.

Cannabinaceae										
Humulus lupulus L.	1	D	TS	D	F	T	S	SCR	4	Z

Others: (8, fruits)–*Cannabis sativa* L.

Caprifoliaceae										
Viburnum lantana L.	8	D	FR	D	F	T	SU	RAW	3–4	X

Others: (8)–*Viburnum tinus* L.

Caryophyllaceae										
Silene vulgaris (Moench) Garcke ssp. *vulgaris*	3	A	TL	D–C.	FF	T	S–AU	CAS–FRI–RIC–SCR–SOU	1–2–4	U–Y

Others: (6)–*Stellaria media* (L.) Vill., *Vaccaria hispanica* (Mill.) Rausch.

TABLE 1. CONTINUED

Family and Scientific Name	C	S	Part.	Cont.	Fr.	His.	Sea.	Uses	Ar.	Habit at
Chenopodiaceae										
Beta vulgaris L. ssp. *marítima* (L.) Archangelli	7	D	TL	D	FF	T	S	CAS–FRI–SCR–SOU	1–2	U
Others: (6)–*Chenopodium album* L., *Chenopodium murale* L., (7)–*Atriplex hortensis* L.										
Colchicaceae										
Merendera pyrenaica (Pourret) P. Fourn.	5	D	B	D	RA	A	AU	RAW	2	Y
Coprinaceae										
Coprinus comatus (Müll.:Fr.) Pers.	10	D	AC	D	F	T	AU	SCR	3–4	X
Corylaceae										
Corylus avellana L	8	C	FR	D	FF	T	AU	RAW	2–4	X–Z
Corylus hispanica Mill. ex D. Rivera & cols.	8	C	FR	D	FF	T	AU	RAW	2–4	X–Z
Cruciferae										
Rorippa nasturtium aquaticum (L.) Hayeck	7	B	TA	D	FF	T	S–SU	SAL–SCR	1–2–4	Z
Sisymbrium crassifolium Cav.	7	C	TS	D–C	FF	T	S	SAL–SCR	1–2–4	U–Y
Others: (5)–*Eruca vesicaria* Cav., (6)–*Capsella bursa–pastoris* L.										
Cucurbitaceae										
Bryonia cretica L. ssp. *dioica* (Jacq.) Tutin	1	C	TS	D	FF	T	S	FRI–SCR	1–2–4	X–Z
Cupressaceae										
Juniperus communis L.	8	N	FR	D	F	T	SU	SPI	4	X
Cyperaceae										
Scirpus holoschoenus L.	1	D	TS	D	F	T	S	RAW	2	Z
Cytinaceae										
Cytinus hypocistis (L.) L.	4	D	FL	D	RA	T	S	NEC	2	X–Y
Ericaceae										
Arbutus unedo L.	8	C	FR	D	FF	T	AU–W	RAW–SPI	1–2–4	X
Arctostaphylos uva–ursi (L.) Sprengel	8	C	FR	D	FF	T	SU	RAW	4	Y
Others: (8)–*Vaccinium myrtillus* L.										
Fagaceae										
Quercus ilex L. ssp. *ballota* (Desf.) Samp.	8	B	FR	D	F	T	AU	CAK–GRI–RAW	1–2–3–4	X

Gomphidiaceae										
Chroogomphus rutilus (Schf.: Fr.) O. K. Miller	10	D	AC	D	F	T	AU	FRI–SCR	1–2	X
Gramineae										
Aegilops ovata L. = (*A. geniculata* Roth.)	5	C	FR	D	RA	A	SU	FLO	1–2–4	U–Y
Others: (5)–*Cynodon dactylon* L., *Elytrigia repens* (L.) Nevski.										
Grossulariaceae										
Ribes rubrum L.	8	C	FR	D	RA	T	SU	RAW	4	X
Others: (8) *Ribes alpinum* L. (N), *Ribes uva–crispa* L.										
Helvellaceae										
Helvella lacunosa (Afz.) Fr.	10	C	AC	D	RA	T	S	FRI–SOU	1–2	X
Helvella leucopus Pers	10	C	AC	D	RA	T	S	FRI–SCR–SOU	1–2	X
Others: (3N)–*Picoa lefevrei* Vittad., (10)–*Helvella crispa* (Scop.) Fr., *Paxina costifera* (Nannfeldt) Stangl., *Paxina acetabulum* (L. ex Amans) Kuntze, *Paxina leucomelas* (Pers.) O. Kuntze										
Hygrophoraceae										
Hygrophorus latitabundus Beritzelmayr	10	D	AC	D	RA	T	AU	GRI–SCR	2–3–4	X
Others: (10)–*Hygrophorus ligatus* (Fr.) Fr.										
Iridaceae										
Crocus serotinus Salisb.	5	D	B	D	RA	A	AU	RAW	2	Y
Others: (5)–*Crocus nevadensis* Amo										
Juglandaceae										
Juglans hispanica D. Rivera et al.	8	C	FR	D	F	T	SU	SPI	2–4	X
Juglans regia L.	8	C	FR	D	F	T	SU	SPI	1–2–3–4	X–Z
Labiatae										
Salvia argentea L.	6	C	LR	D	RA	T	S–W	CAS–SOU	2	U–Y
Others: (7N)–*Mentha aquatica* L., *Mentha pulegium* L., (8N)–*Lavandula stoechas* L. ssp. *pedunculata* (Mill.) Rozeira.										
Leguminosae										
Lathyrus cicera L.	8	C	FR	D	F	T	S–SU	RAW–RIC	1–2–4	U–Y
Others: (4N)–*Cercis siliquastrum* L. (4N flowers, 8 fruits)–*Robinia pseudacacia* L. (5)–*Glycyrhiza glabra* L. (8)–*Vicia sativa* L.										
Malvaceae										
Malva sylvestris L.	8	D	FR	D	FF	T	S	RAW	1–2–3–4	U–Y

TABLE 1. CONTINUED

Family and Scientific Name	C	S	Part.	Cont.	Fr.	His.	Sea.	Uses	Ar.	Habit at
Morchellaceae										
Morchella conica Pers.	10	C	AC	D–C	F	T	S	FRI–RIC–SCR	1–2–3–4	X
Morchella elata (Fr.) Boudier	10	C	AC	D–C	F	T	S	SCR–SOU	1–2	X
Morchella esculenta Pers. Ex St. Amans.	10	C	AC	D–C	F	T	S	FRI–RIC–SCR	1–2–4	X
Papaveraceae										
Papaver rhoeas L.	7	D	TA	D	RA	A	S	GAZ–SAL–SCR	1–2–4	U
Others: *Roemeria hybrida* (L.) DC. (6).										
Pezizaceae										
Sarcosphaera crassa (Santi ex Steudel) Pouzar	10	D	AC	D	F	T	S	SOU	2–4	X
Pinaceae										
Pinus pinea L.	3	D	FR	D	FF	T	S–SU	AJO–BRI–CON–RAW	1–2–4	X–Y
Others: (8 flowers)–*Pinus pinaster* Aiton, *Pinus pinea* L.										
Pleurotaceae										
Pleurotus eryngii (DC.: Fr.) Quél	3	B	AC	D–C	FF	T	S–AU	AJO–CAS–FRI–GAZ–GRI–SCR–SOU	1–2–3–4	U–Y
Pleurotus ostreatus (Jacquin: Fr.) Kummer	10	C	AC	D	FF	T	S–AU	FRI–GAZ–SCR	1–2–3–4	X
Others: (10)–*Hohenbuehelia geogenia* (DC. Ex Fr.) Sing.										
Polygonaceae										
Rumex acetosella L ssp. *angiocarpus* (Murb.) Murb.	7	C	TA	D	RA	T	S	SAL	2–4	U–Y
Others: (6)–*Fallopia convolvulus* (L.) Á. Löve, (7)–*Rumex acetosa* L., *Rumex bucephalophorus* L., *Rumex crispus* L., *Rumex induratus* Boiss. & Reut., *Rumex pulcher* L., *Rumex scutatus* L.										
Portulacaceae										
Portulaca oleracea L.	7	D	TA	D	RA	T	S	CAS–SAL	1–2–4	U
Ramariaceae										
Ramaria aurea (Schaeff.:Fr.) Quél.	10	D	AC	D	F	T	AU	FRI–GRI–SCR	3–4	X
Others: (10)–*Ramaria botrytis* (Fr.) Ricken, *Ramaria* sp.										
Ranunculaceae										
Clematis vitalba L.	1	D	TS	D	RA	T	S	SCR	2	X–Z

Rhizopogonaceae									
Rhizopogon luteolus Fr.	10	D	AC	D	RA	T	AU	SCR	1–2–4	U–Y

Others: (10)–*Rhizopogon roseolus* (Corda) Fr., *Rhizopogon vulgaris* (Bit.) M. Lange.

Rosaceae										
Amelanchier ovalis Medik.	8	C	FR	D	RA	T	SU	RAW	2–4	X
Crataegus monogyna Jacq.	8	C	FR	D	RA	T	AU	RAW	1–2–4	X
Prunus avium L.	8	C	FR	D	RA	T	SU	RAW	2–3–4	Z
Prunus spinosa L.	8	C	FR	D	FF	T	AU	RAW–SPI	2–3–4	X–Z
Rosa agrestis Savi.	1	C	TS	D	RA	T	S	RAW	4	X
Rosa canina L.	8	C	FR	D	RA	T	SU–AU	CAK–RAW	2–3–4	X
Rosa canina L.	1	C	TS	D	RA	T	S	RAW	4	X
Rubus caesius L.	8	C	FR	D	FF	T	SU	CAK–RAW	4	Z
Rubus ulmifolius Schott.	1	C	TS	D	RA	A	S	RAW	2–4	Z
Rubus ulmifolius Schott.	8	C	FR	D	FF	T	SU–AU	CAK–RAW–SPI	1–2–3–4	Z
Sorbus domestica L.	8	C	FR	D	RA	T	SU–AU	RAW	2–4	U–Z

Others: (8)–*Crataegus orientalis* M. Bieb. ssp. *presliana* K.I. Christensen *Cydonia oblonga* L., *Fragaria vesca* L., *Fragaria viridis* Duchesne, *Malus pumila* Mill., *Malus segurensis* Rivera et al., *Malus sylvestris* (L.) Mill., *Prunus cerasus* C. Kock, *Prunus* x *fruticans* Weihe, *Prunus insititia* L., *Pyrus pyraster* Burgsd., *Rosa micrantha* Sowerby, *Rosa pouzinii* Tratt., *Rosa sicula* Tratt., *Rubus idaeus* L., *Sorbus aria* (L.) Crantz, *Sorbus torminalis* (L.) Crantz.

Ruscaceae									
Ruscus aculeatus L.	1	N	TS	D	FF	T	S	SCR	4	X–Y
Russulaceae									
Lactarius deliciosus L.:Fr.	3	C	AC	D–C	FF	T	AU	AJO–FRI–GAZ–GRI–MIG–RIC–SOU	1–2–3–4	X
Lactarius sanguifluus (Paulet) Fr.	10	C	AC	D–C	F	T	AU	FRI–GAZ–GRI–SOU	1–2 3–4	X

Others: (10)–*Lactarius quieticolor* Romagn., *Lactarius semisanguifluus* Heim et Lecl., *Lactarius vinosus* Quélet.

Scrophulariaceae									
Veronica anagallis–aquatica L.	7	D	TL	D	RA	T	S	SAL	4	Z

Others: (4N)–*Bellardia trixago* (L.) All., (4)–*Linaria hirta* (L.) Moench, (7)–*Veronica beccabunga* L.

Sparassidaceae									
Sparassis crispa Wulf	10	D	AC	D	F	T	AU	FRI–SCR	2–3–4	X

Others: *Sparassis laminosa* Fr. (10).

Terfeziaceae									
Terfezia claveryi Chatin	3	N	UC	D–C	F	T	S	AJO–SCR	1–2	Y

TABLE 1. CONTINUED

Family and Scientific Name	C	S	Part.	Cont.	Fr.	His.	Sea.	Uses	Ar.	Habit at
Tricholomataceae										
Melanoleuca melaleuca (Pers.: Fr.) Murr. Ss. Kühn.	10	D	AC	D	F	T	S–AU	FRI–GRI–SCR	2	X
Others: (10)–*Calocybe gambosa* (Fr.: Fr.) Donk, *Clitocybe geotropa* (Bulliard ex Fr.) Quélet, (9)–*Marasmius oreades* (Bolton ex Fr.) Fr., *Tricholoma terreum* (Schff.:Fr.) Kummer										
Tuberaceae										
Tuber aestivum Vittad	2	N	UC	C	FF	RE	S	CON	2–4	X
Others: (2)–*Tuber nigrum* Bull.										
Ulmaceae										
Celtis australis L.	8	N	FR	D	FF	T	AU	RAW	1–2	X–Z
Umbelliferae										
Foeniculum vulgare Mill. ssp. *piperitum* (Ucria) Cout.	7	C	TA	D	FF	T	S	FRI–RAW–SAL–SOU–SPI	1–2–3–4	U–Y
Others: (5)–*Conopodium bourgaei* Coss., *Conopodium capillifolium* (Guss.) Boiss., (7)–*Apium nodiflorum* (L.) Lag., *Scandix australis* L. ssp. *australis, Scandix pecten-veneris* L., (8 fruits)–*Foeniculum vulgare* Mill. ssp. *piperitum* (Ucria) Cout.										
Urticaceae										
Urtica urens L.	7	D	TA	D	F	T	S	CAS–SAL–SCR–SOU	2–3–4	U
Others: *Urtica dioica* L. (7).										
Viscaceae										
Viscum album L. ssp. *austriacum* (Wiesb.) Vollm.	5	C*	FR	D	RA	A	W	RAW	4	X
Vitaceae										
Vitis vinifera L.	1	D	TS	D	FF	T	S	BRI–RAW	1–2	Z

[1] Codes. **Descriptive characters: C** *(Cluster Number):* numbers as in Fig. 4. **S** *(Salience Index):* A = S > 0.1, B = 0.05 < S ≤ 0.1, C = 0.01 < S ≤ 0.05, D = S ≤ 0.01, N = only cited in interviews, (*) Cited in one questionnaire alone. **Variables analyzed: Part.** *(Parts used):* AC = Mushroom, B = Bulbs, roots, and rhizomes, FL = Flowers, FR = Fruits, LR = Leaf rachis, TA = Tender aerial parts, TL = Tender leaves, TS = Sprouts, UC = truffle. **Cont.** *(Context):* C = Commercial, D = Household. **Fr.** *(Frequency):* F = Frequently, FF = Very frequently, RA = Rarely. **His.** *(History):* A = Abandoned, RE = Recent, T = Traditional. **Sea.** *(Season):* AU = Autumn, S = Spring, SU = Summer, W = Winter. **Uses** (*Uses recorded):* AJO = *Ajo mulero,* potatoes, bacon, and breadcrumbs or flour; BEB = Coffee substitute; BRI = Brined; CAK = Cakes and marmalades; CAS = *Potajes*, boiled legumes with potatoes; CON = Condiment; FLO = Ground into flour; FRI = Fried in olive oil; GAZ = *Gazpachos*, unleavened flat bread and poultry; GRI = Grilled; MIG = *Migas*, with boiled breadcrumbs or flour; NEC = Floral nectar sucked; RAW = Snack, dessert; RIC = With rice; SAL = Salads; SCR = Scrambled eggs or omelets; SOU = In soups and stews; SPI = Spirits and liquors. **Ar.** *(Areas):* 1 = Plains of Albacete, 2 = Sierras de Alcaraz y Segura, 3 = Plains of Cuenca, 4 = Serranía de Cuenca. **Habitat:** U = Crop fields, X = Woodland, Y = Open areas, tomillar, Z = rivers, springs, and lagoons.

(**) Only frequent and salient (0.01 < S) items within each family are fully described.

(***) For local names, see Rivera et al. (2006). http://www.dipualba.es/iea/digitalizacion/obras.htm (20 May 2007).

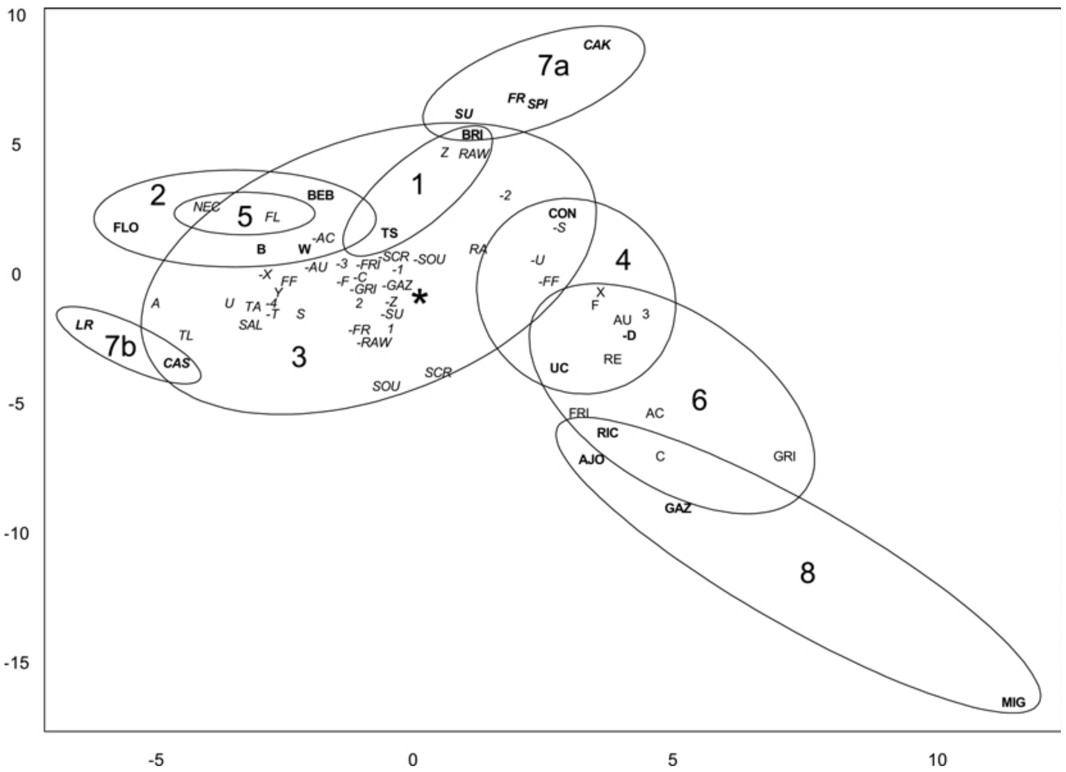

Fig. 2. Scatter diagram of variables represented against the first two axes. Variables coded as in Table 1. Minus = scored 0. Within (*) in CoV3 are: 27 less informative modalities of variables. Ellipses and circles represent clusters as in Fig. 3. Bold, italics, or regular characters are used to distinguish points within each overlapping cluster.

from Albacete and Cuenca. Categorical data (ecological and ethnobotanical) were transformed into a 0–1 matrix. As Table 1, this matrix has 215 rows (items) and 47 columns (categorical variables). Rows correspond to objects (items) and columns to attributes (descriptive state). Different parts of the same species are treated as independent objects, and thus computed in different rows. The cells of the matrix are either "1" if the column is considered to apply to the row or "0" if it is considered not to apply. When at least one response is positive, either in FSQs or the interviews, the corresponding cell is 1. Data on history of use (Table 1) come exclusively from interviews.

Through a Multiple Correspondence Analysis (MCA), which is a principal component analysis with categorical data (Benzecri 1992), the qualitative matrix was used to produce two quantitative matrices. The output matrix for items has 215 rows (items) and 47 columns (coordinates against each one of 47 axes), with columns in decreasing order of explained variance from the original matrix. The output matrix for variables has 94 rows (modalities of variables) and 47 columns (coordinates against the same 47 axes). Thus, distances for variables and items are calculated in the same 47–dimensional Euclidean space. Figure 2 shows the first two axes.

This analysis was performed with "R" software (Ihaka and Gentleman 1997). We used subroutines based on SPAD (Lebart and Morineau 1985) and routines implemented by Palazón and Calvo (1999).

The Hierarchical Cluster Analysis (HCA) (Figures 3 and 4) was done with the objects (items or modalities of variables) of the quantitative matrices above, using only columns 1–4 (since they explain most of the variance), considering the Ward's minimum variance algorithm (Ward 1963; Lebart et al. 1984). This technique optimizes

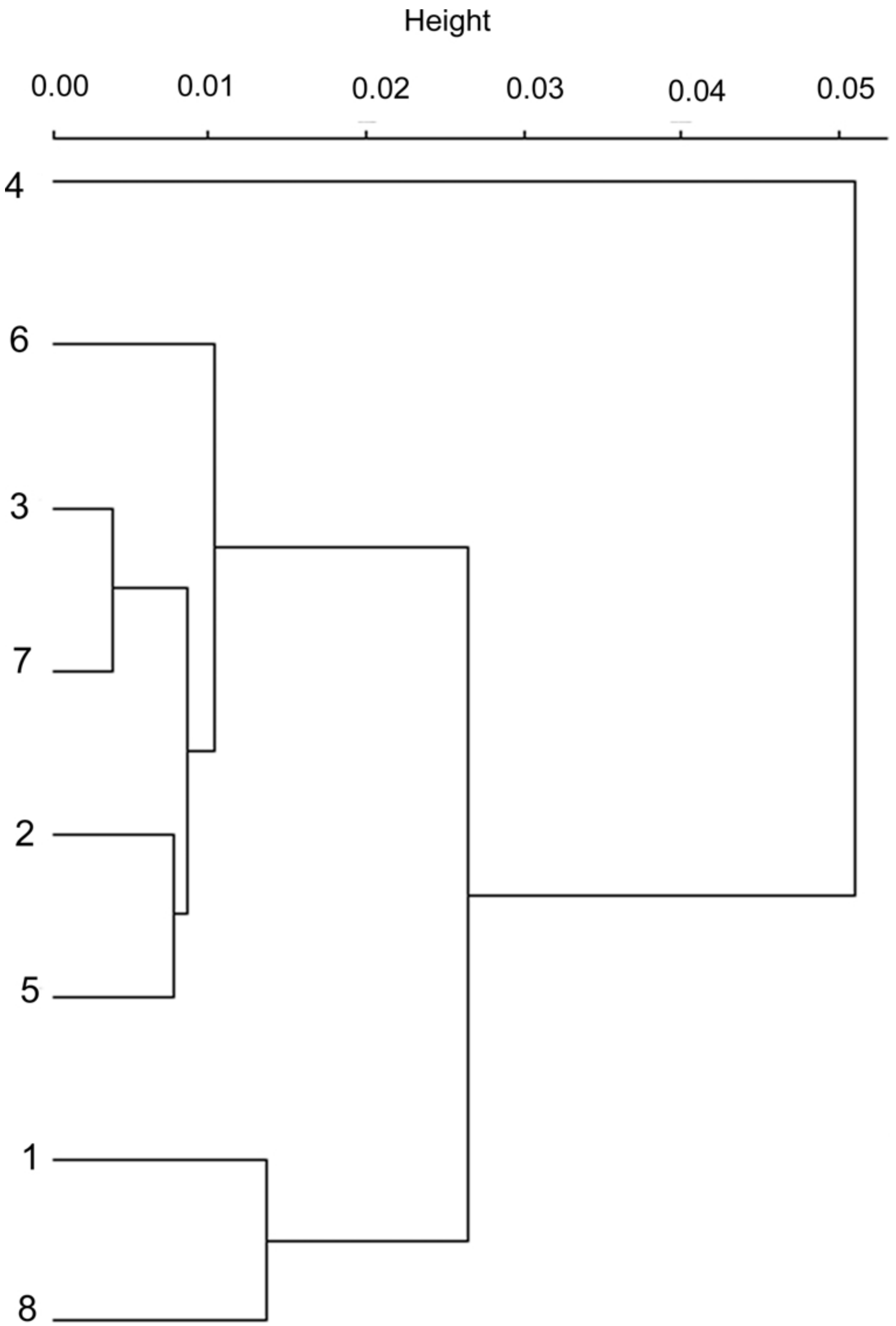

Fig. 3. Tree resulting of the HCA of 94 modalities of variables. Variables within CoV1: BRI, TS. CoV2: B, BEB, FLO, W. CoV3: –2, –4, 4, –A, A, –AJO, FF, –FF, RAW, S, SCR, –S, SAL, SOU, –SU, –T, TA, TL, U, –U, –W, –X, Y, Z and other less informative variables. CoV4: CON, –D, UC. CoV5: FL, NEC. CoV6: 3, AC, AU, C, F, FRI, GRI, RE, X. CoV7: CAK, CAS, FR, LR, SPI, SU. CoV8: AJO, GAZ, MIG, RIC. Variables are coded as in Table 1. Minus = scored 0.

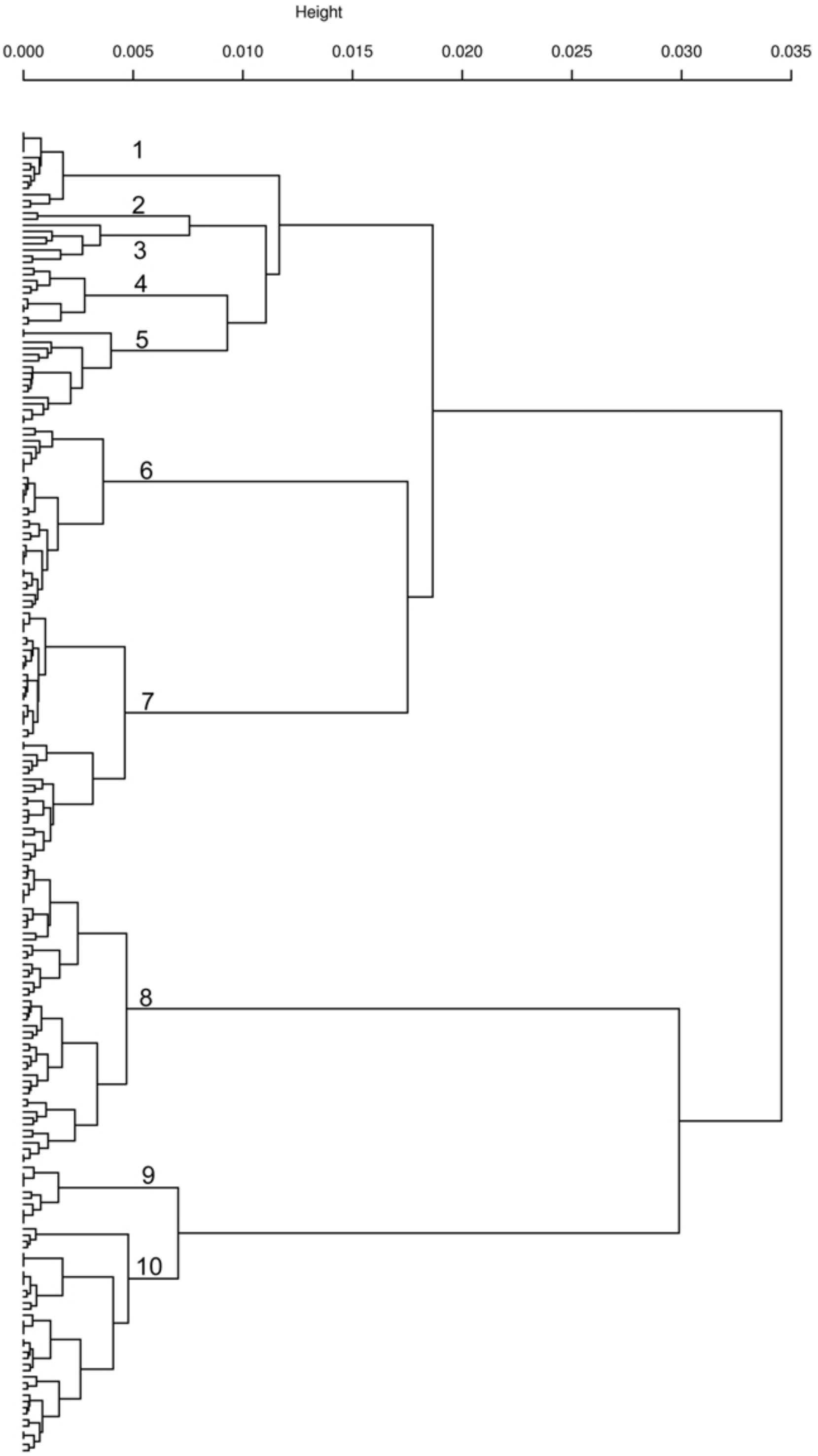

Fig. 4. Tree resulting of the HCA of 215 items. Main clusters numbered on the branches. For items within each cluster see Tab. 1.

the result and assists the researcher in interpreting the single tree produced by the analysis instead of multiple trees.

Results and Discussion

Plant Species, Collection Areas, and Use Categories

The list of GFPs includes 215 items (53 mushrooms and 162 items from 154 vascular plant species, including eight species that yielded two items, e.g., shoots and fruits). GFPs are commonly collected in the mountains (over 162 items) as well as among crops (89 items), forests and thickets (87), open areas such as "tomillares" (low–growing calciphilous Mediterranean scrub) (73), and riparian environments such as lagoons and springs (33).

Asteraceae (37 items, 35 species), Rosaceae (28, 24), and Boraginaceae (9, 7) are the more numerous vascular plant families, followed by Polygonaceae (8, 8), Umbelliferae (7, 6), and Leguminosae (6,5). There is less diversity in fungi: Agaricaceae, Helvellaceae (7 each), Tricholomataceae (5), Russulaceae (5), and Boletaceae (4).

Most items (tender green parts of plants and mushrooms) are collected in the spring (132 items / 612 FSQs). Another peak occurs in autumn (61 / 344); again, tender green parts—especially fruits and mushrooms—are collected. Fewer are collected during summer (42 / 130) and very few in the winter (10 / 13).

The variation of frequency (items vs. FSQs) and salience (items vs. salience index) follows the pattern of rectangular hyperbolas with $x^*y=40$ and $x^*y=0.7$, respectively. Frequent and highly salient species are 5 (salience index >0.05) (Tables 1 and 2). *Silene vulgaris* stands alone with salience index >0.1. On the other hand, 59 items scored salience index $0.01<S\leq 0.05$, and 129 $S\leq 0.01$. Thus, most items are low–salient and infrequent. Twenty items were cited in interviews alone.

A high proportion of GFPs are used in local popular medicine (30–80% versus 10–20% of the entire vascular flora), but salience as a food is not correlated with uses as medicines (Rivera et al. 2005). However, salient items were more active overall in a panel of in vitro screens showing a relatively high total activity score (5 to 5.5, on a 0–9 scale) (LFN 2005). Some low–salient GFP species, such as *Thymus piperella*, *Mantisalca salmantica*, *Onopordum macracanthum*, or *Scandix australis* reach high total activity scores (6 to 7), but especially relevant is the highest score (9) obtained by *Berberis vulgaris* ssp. *seroi* (index 0.0234), which was cited by only 12 informants (LFN 2005). Low salience in very local taxa could be an artifact of the sampling strategy, since the 88 informants were selected from 45 different localities covering a large area. Since consensus and salience indices are calculated over the entire territory, taxa that are more widespread are favored.

For items with a frequency of less than 35% and low and medium salience (Table 2), we do not find correlation with their frequency or diffusion of its use near the Mediterranean (lineal regression with $R^2=0.03$). However, frequency near the Mediterranean (y: as a percentage of localities) vs. frequency in mountains of Albacete and Cuenca (x: as a percentage of FSQs) are related in the proportion of $y=1.6452x–45$, with $R^2=0.8648$, for items with a local frequency above 35%. Therefore, the highest consensus among informants for the mountains of Albacete and Cuenca is found for those taxa widely used in most of the Mediterranean Region. The higher the consensus is on a local level, the wider their use is near the Mediterranean. Thus "local" food plants have a less restricted distribution of use than expected, and the core of Mediterranean GFPs described by Leonti et al. (2006) are closely related with this wider distribution of use.

Most items are used exclusively by local households (192). Only two are collected solely for commercial purposes (*Tuber* spp.) and 18 for commercial and household use. Some items (*Robinia pseudacacia, Amanita caesarea*) seem to have been incorporated into the local food basket only recently. The use of 41 items has nearly been abandoned. Most of the species ranked as abandoned are used in soups (16) and "*potajes*" (13), thus possibly reflecting a change in eating habits. Others ranked as abandoned are nine snacks consumed "in situ."

The items consumed as a snack or as a dessert (68, 40 exclusive) include mostly Rosaceae. Uses in salads, dressed with olive oil, vinegar, and salt, uncooked or lightly parboiled, were recorded for 37 (14 exclusive). The most important family here is the Asteraceae with 19 species. Overall, 54 items are consumed exclusively raw (snack, dessert, salads).

TABLE 2. THE MOST SALIENT GFPS EVALUATED IN TERMS OF FREQUENCY AND SALIENCE.

Most Salient Species	Informants	Salience Index	Percentage of Localities in the Mediterranean	Ranking in the Mediterranean List	Cluster Number	TAS
Silene vulgaris	61	0.105	64.06	5	3	5
Scolymus hispanicus	47	0.072	45.31	23	7	5,5
Rubus ulmifolius	43	0.044	48.43	16	8	5,5
Pleurotus eryngii	40	0.066	25.00	86	3	—
Quercus ilex ssp. *ballota*	38	0.055	26.56	76	8	5
Lactarius deliciosus	37	0.044	25.00	82	3	2
Scorzonera angustifolia	33	0.029	9.37	359	7	—
Rorippa nasturtium–aquaticum	30	0.052	48.43	7	7	1
Crataegus monogyna	26	0.034	43.75	26	8	3
Sonchus oleraceus	21	0.027	70.31	3	7	3
Asparagus acutifolius	20	0.033	54.68	9	3	4
Morchella esculenta	19	0.028	20.31	120	10	—
Prunus spinosa	18	0.019	51.56	12	8	—
Sorbus domestica	18	0.021	21.87	112	8	—
Agrocybe aegerita	18	0.030	17.18	142	10	—
Bryonia cretica ssp. *dioica*	18	0.024	25.00	79	1	3,5
Chondrilla juncea	18	0.021	45.31	20	7	2,5**
Foeniculum vulgare ssp. *piperitum*	17	0.013	79.68	1	7, 8	2,5***
Amelanchier ovalis	14	0.021	15.62	156	8	—
Rosa canina	14	0.019	54.68	11	1, 9	—
Cichorium intybus	13	0.013	68.75	4	5, 7	3
Sisymbrium crassifolium	13	0.016	7.81	475	7	3

* Number of independent informants = 88. Data on ranking and percentage of localities from Rivera et al. 2006 and unpublished database. TAS = Total Activity Score in LFN (2005).
** Italian plants.
*** Greek plants, leaves. Author names as in Table 1.

GFPs are often boiled or simmered. Uses in soups and stews were recorded for 52 items as were 30 legumes. Thirty–two items are consumed exclusively after boiling; frying (often in olive oil) is common (41 items, 21 exclusive). A high proportion of items (60), especially mushrooms, are consumed with scrambled eggs or in omelets. Only 15, with four Rosaceae species and three Labiatae species, are used in spirits and liquors. Five (including three Boraginaceae) furnish floral nectar as a snack.

Although plants are cooked and consumed in different ways, often we have found very simple profiles of use. A total of 118 items are eaten in one manner only. The remaining items are multipurpose, used in different combinations of dishes (Table 1). Two different types of processing are found in 62 items and three types of processing in 19 items. Wide spectrum items, with a high diversity of recipes, are infrequent. The exceptions are *Lactarius deliciosus, Pleurotus eryngii,* and *Silene vulgaris,* all within cluster 3.

MULTIVARIATE ANALYSIS

Multivariate analysis was used to determine patterns in GFP collection and use, and thus for comparing plant profiles that combine ecological and ethnobotanical data. The 94 modalities of variables show a distinct pattern against the first two axes of the Multiple Correspondence Analysis (MCA) (Fig. 2). It has two sets of points, as indicated by the presence/absence of the minus sign. The points with a minus sign represent 0 for each level, the others represent "presence" (= 1). The distance between points is a measure of similarity between column profiles. Therefore, some points are farther from others because their profiles are different. Information is directly related to the distance from the coordinates' origin. In our analysis, the different types of culinary preparations yielded the most meaningful information (Fig. 2).

The cluster analysis of modalities of variables forms the following eight major clusters (Figs. 2 and 3), which represent different combinations of parts used, season of collection, type, and context of use.

1. Plant parts preserved in brine, especially tender shoots (Cluster of variables – CoV1);
2. Fruits, bulbs, roots, and rhizomes, often collected in winter, milled as a substitute for wheat flour, and roasted roots as a coffee substitute (CoV2);
3. Tender leaves consumed in soups, omelets, or raw, whose use is almost abandoned, (CoV3, not clearly defined, Fig. 2);
4. Truffles used as a condiment in households and for commercial purposes (CoV4);
5. Flower nectar consumed as a snack (CoV5);
6. Mushrooms collected in the forests in the autumn, consumed either grilled or fried, in commercial contexts, recently adopted by the local population under the influence of collectors from abroad (CoV6);

7A. Fruits collected in summer for use in cakes, jams and marmalades, and pastries as well as for flavoring spirits and liquors (CoV7a);

7B. Leaf rachises used in casserole–type dishes (CoV7b); and

8. Plants used in "migas" (Table 1), rice dishes, "ajo mulero," or in "gazpachos" (CoV8).

The cluster analysis of the 215 items produced a tree with 10 clusters at height of 0.005 (Fig. 4 and Table 3). The first cluster has items with tender shoots (*Humulus, Clematis, Rubus, Rosa, Bryonia, Vitis*) that are collected mainly in the spring and consumed in omelets (CoI1). It is related with CoV1. A generic label shared by three items of this cluster is "*esparragos de*." However, the prototypic species *Asparagus acutifolius* labeled "*esparragos*" or "*esparragos trigueros*" falls outside of CoI1, in CoI3 and "*esparragos de tamarilla*" (*Sisymbrium crassifolium*) in CoI7. This is due to the three different usage profiles: a general one for low–salience tender shoots (which defines CoI1,) one for wild greens as CoI7, and one for prototypic asparagus (which is much broader and similar to other salient items in CoI3).

Two *Tuber* species ("*trufas*") with considerable commercial value fall within the second cluster (CoI2); yet, these are not cited in the FSQs nor consumed in local households. However, when several subjects were interviewed, they were able to describe patterns for collecting and processing them. Are truffles a resource kept secret or tabooed for economic reasons? This does not seem to be the case since other 18 items were cited only in interviews (Table 1). This is most likely a result of how informants understood the idea of Gathered Food Plants and mushrooms. Underground mushrooms, herbal teas, spices, and condiments are not part of their concept of GFPs.

In the third cluster are seven of the most salient multipurpose mushroom and vascular plant species (CoI3) (Tables 2 and 3) with a wide range of uses, especially those in CoV8, (*Lactarius deliciosus, Pleurotus eryngii, Asparagus acutifolius, Silene vulgaris*) together with a sub–cluster comprising the truffles *Picoa* and *Terfezia,* and pine nut seeds. This cluster shows clearly how this hierarchical classification neither reflects formal plant ethnotaxonomy nor the natural taxonomy of plants and fungi; rather, it shows a pattern of how these are collected and consumed. Labels in this group mark prototypes like the "*esparragos*," or "*collejas*." Only the highly salient *Silene vulgaris*, a prototypic "*collejas,*" falls within CoI3, whereas the related "*collejicas*" (*Hypochaeris*) and "collejones" (*Vaccaria hispanica*) are both within CoI6.

The fourth cluster comprises snacks consumed by children (*Robinia*, *Cercis, Linaria, Echium* and *Cytinus* flowers) (CoI4) related to CoV 5. Here labels such as "*pan y queso*" (*Linaria, Robinia, Cercis*) and "*chupamieles*" (*Echium* spp.) refers not to the whole plant but to the flowers as food.

Sixteen items make up the fifth cluster. They are mostly edible underground organs (*Glycyrhiza, Cynodon, Elytrigia, Allium, Helianthus tuberosus, Conopodium, Crocus, Cichorium intybus* [roots], and *Merendera*) (CoI5). Within this cluster *Eruca, Viscum*, and *Aegilops* (without underground edible organs) also appear. This cluster is related to CoV2. Here five items (*Conopodium* spp., *Merendera*, *Crocus* spp.) bear label "*macucas*" and "*ajoporros*" three (*Allium* spp.).

Items with edible leaf or rachis make up the sixth and sevenths clusters (CoI6, CoI7). CoI6 includes mainly low–salience items with edible leaf rachis, and CoI7 the most salient and frequent (Table 3). Both are related with CoV7b. Five items within CoI6 are labeled "*tobas*" (*Onopordum* spp.) and five in CoI7 "*vinagreras*" (*Rumex* spp.). "*Camarrojas*" is a label for two

TABLE 3. DESCRIPTION OF GROUPS RESULTING FROM THE HIERARCHICAL CLUSTER ANALYSIS OF ITEMS.

Cluster	Nr. of Items	Overall Frequency	Sd. Dev.	Overall Salience*	Sd. Dev.	Frequent & Salient Taxa**	Labels	Variables
CoI1	12	6.55	6.01	0.008	0.007	*Rubus ulmifolius* (8, 0.011), *Bryonia cretica* ssp. *dioica* (18, 0.024)	Espárragos, tallos	Tender shoots, collected in spring and consumed in omelets
CoI2	2	—	—	—	—	*Tuber* spp.	Trufa	Underground mushrooms
CoI3	7	28.34	27.12	0.036	0.039	*Silene vulgaris* ssp. *vulgaris* (67, 0.105), *Pleurotus eryngii* (44, 0.066), *Asparagus acutifolius* (30, 0.033)	Collejas, Seta de cardo, espárragos	Multipurpose mushroom and vascular plants with a wide range of uses
CoI4	10	2.46	1.78	0.003	0.002	*Citynus hypocistis* (4, 0.006), *Liniaria hirta* (4, 0.004)	Meleras, Chupamieles, pan y queso	Flowers consumed as snacks
CoI5	16	5.33	4.04	0.006	0.004	*Conopodium* spp. (7, 0.008) *Aegilops ovata* (8, 0.01)	Macucas, Rompesacos	Edible underground parts and others
CoI6	30	3.61	2.82	0.005	0.005	*Arctium minus* (10, 0.008), *Leontodon longirostris* (7, 0.019), *Mantisalca salmantica* (7, 0.014)	Gordolobos, Lenguazas, Pan de pastor	Edible leaves and leaf rachises
CoI7	41	9.36	10.05	0.012	0.014	*Scolymus hispanicus* (50, 0.072), *Rorippa nasturtium–aquaticum* (33, 0.052), *Chondrilla juncea* (18, 0.021)	Cardillos, berros, lizones, chicorias	Edible leaves and leaf rachises
CoI8	49	7.89	9.91	0.009	0.011	*Rubus ulmifolius* (39, 0.044), *Crataegus monogyna* (26, 0.034), *Quercus ilex* ssp. *ballota* (40, 0.055), *Prunus spinosa* (19, 0.019), *Sorbus domestica* (16, 0.021)	Majuelas, Bellotas, Ciruelicas de pájaro, sierbas	Fruits consumed as jams, marmalades, pastry filling, condiments, or snacks
CoI9	10	3.77	2.19	0.006	0.004	*Tricholoma terreum* (6, 0.006)	Pejines	Epigeal mushrooms
CoI10	37	8.95	7.17	0.008	0.008	*Morchella esculenta* (24, 0.028), *Pleurotus ostreatus* (16, 0.018), *Agrocybe aegerita* (18, 0.03), *Agaricus arvensis* (19, 0.022)	Colmenilla, Cagarria, Seta de chopo, hongo	Epigeal mushrooms

* Overall salience calculated as the average of salience indices for all items in the group.

** Only most frequent and salient items within each group are cited. With (parentheses) number of informants and salience index. Author names as in Table 1.

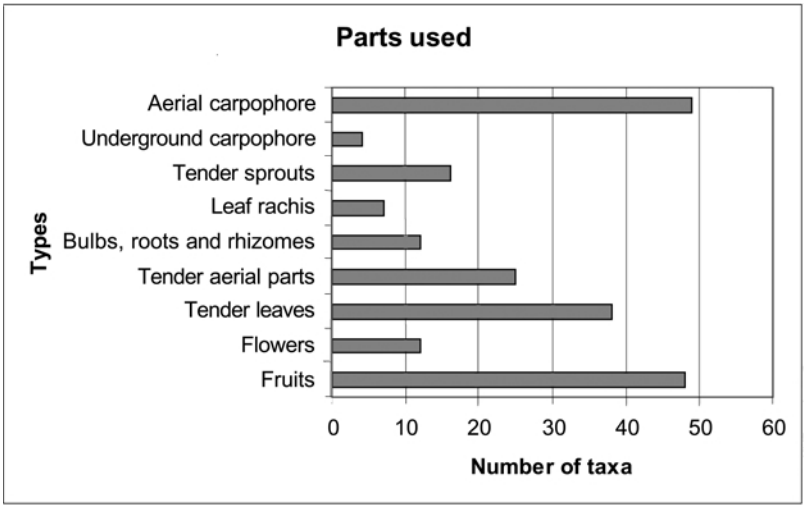

Fig. 5. Frequency of plant parts and fungi types. Bar length represents the number of items (items).

items within CoI6 (*Crepis vesicaria* and *Mantisalca salmantica*) and one in CoI7 (*Taraxacum vulgare*).

Fruits that are consumed as jams, marmalades, fillings for pastries, condiments (*Foeniculum*), or snacks (*Malva*) are in the eighth cluster (CoI8). It is strongly linked with CoV7a. Fruits (48) are immediately after mushrooms (49) the most numerous group of GFPs in this analysis (Fig. 5).

The ninth and tenth clusters (CoI9 and CoI10) are composed of mushrooms (47 items) strongly related with CoV6. CoI9 includes low–salience items with the labels of "*paragüillas*" and "*hongo negro,*" and CoI10 low to medium salient items with labels as "*cagarrias*" (9 items), "*hongos*" and "*mizclos*" (4), and "*patatas de tierra*" and "*puchereles*" (3).

The multivariate analysis shows similarities in parts used, distribution, seasonal availability, frequency, status, context of use, and recipe's profiles. Eynden (2004), using UPGMA analysis of simple matching similarity coefficients, represented the similarity of GFPs, related to plant management events, at the rank of home gardens or villages, in Andean southern Ecuador.

Clustering patterns depend on the part of the plant used, as well as on when and where it is collected and how it is processed and consumed. Therefore, our classification corresponds to a pattern of use and not to underlying principles of categorization of plants and animals in traditional societies (Berlin 1992).

If the parts used differ, a species may belong to different clusters, e.g., *Rubus ulmifolius* fruits and shoots fall in separate clusters (Table 1). Furthermore, different species display similar or identical profiles in the matrix, forming a compact group, i.e., vascular plants and fungi grouped together in CoI3. Therefore, within the cluster they are interchangeable, in a way that is similar to the "medicinal plant complexes" described by Linares and Bye (1987). Plant complexes include different species often sharing common names, morphological and aromatic characteristics, habitats, gathering season, or simply usage patterns. The distribution analysis of the utilization and natural occurrence of plants in each complex in México indicated the presence of a dominant or "label" plant whose use extended beyond its natural range and which had substitutes derived from local plants that were not registered far beyond their respective natural ranges. Similarly, Pardo–de–Santayana et al. (2005) highlighted the importance of "*té*" in Spanish culture. *C. sinensis* tea offered a cognitive context for drinking other infusions without a specific medicinal purpose and, therefore, these plants could be considered part of a plant complex. However, this pattern is found in our analysis only for CoI1, CoI3, CoI7, CoI8, and CoI10, with high standard deviation of frequency and salience values within each cluster (Table 3 and Fig. 6), and with dominant "label" plants. But CoI2, CoI4, CoI6, and CoI9 follow a different pattern with a smaller standard deviation of salience and without dominant "label" plants.

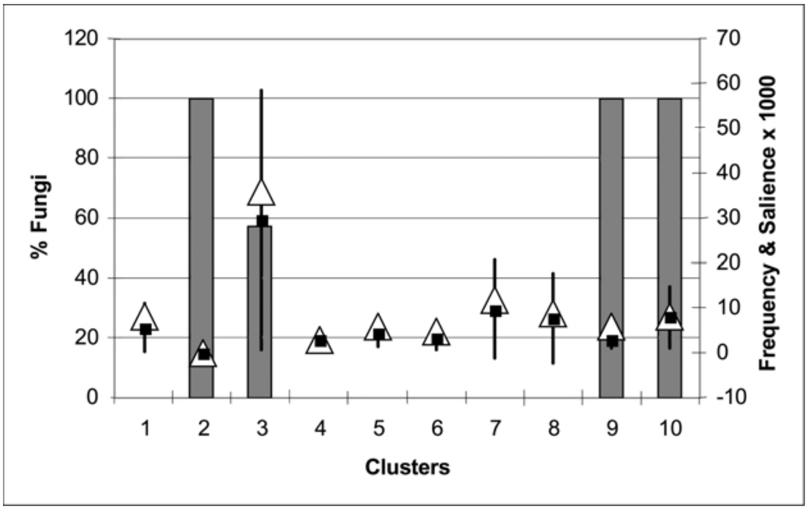

Fig. 6. Within clusters of items: overall salience (+), overall frequency (!),standard deviation for frequency (black bars), and percentage of Fungi (gray bars).

Overall, we found two different types of clusters: A, which is "species labeled," and B, which is "use labeled" (flowers consumed as snacks, underground edible plants, edible leaf rachis, low–salience fungi consumed in omelets). Labeling is independent of taxonomic aspects such as the proportion of Fungi / Vascular Plants in each cluster (Fig. 6). Moreover, CoI3, which on average contains the most salient items, is not clearly "species labeled," being mostly defined by its broad profile of uses. However, fungi and vascular plants are completely separate in 9 of the 10 clusters (Fig. 6).

Markers in the form of labels and most salient items for each complex are presented in Table 3. The clustering shows how morphology and systematics are clearly subordinated to the usage profile, especially in CoI3. Within the MCA and HCA, patterns of use give the highest information values and determine the resulting groups. It was not our goal to analyze ethnotaxonomical aspects. However, our results reverberate the utility vs. classification debate, hence an empirical vs. cognitive basis of ethnoclassification. One aspect is the concept of species in ethnobiology. Our informants do not generally accept the biological concept of species, and often, different plant parts or stages are managed as completely different species, i.e., during fieldwork it was difficult initially to recognize that "*pan de pastor*" and "*escobas de amargos*" refer to the same species (*Mantisalca salmantica*). By the end of winter, rosettes of tender leaves appear and are collected as food; these are "*pan de pastor*." In summer, bitter stems, almost leafless, are collected for making brushes, namely the "*escobas de amargos*." In the local ethnoclassification these are distinct unrelated species. Another example is *Rosa* spp. "*tallos de zarzas*," shoots and "*tapaculos*," fruits.

Conclusions

This paper is part of an ongoing debate about how people classify the environment and its elements, how they make use of certain species and "reject others." An increasing and diverse body of evidence highlights that this selection is in no way random (e.g., Berlin 1992; Moerman 1996; Brett and Heinrich 1998; Leonti et al. 2006; Rivera et al. 2006). The cluster analysis of categories of variables forms eight major clusters, which represent different combinations of parts used, season gathered, type, and context of use.

This analysis provides a novel way of understanding the selection of species from an environment, which offers a much larger number of species than what is needed by a community. Clusters of species form culture–specific logical entities, which allow people to structure and manage their environment, and to select the most relevant resources.

Acknowledgments

The fieldwork forms part of the doctoral theses of A. Verde and J. Fajardo. This research received support from the European Commission (Local Food–Nutraceuticals QLK1–CT–2001–00173) and the Junta de Comunidades of Castilla La Mancha (Estudio Etnobiológico de las áreas de montaña y humedales de Castilla–La Mancha PAC–05–011). We are grateful to Bradley R. Muir for editing the English text as well as to the referees and the editor of *Economic Botany* for valuable comments.

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