

Josep Emili Aura · Yolanda Carrión · Elena Estrelles ·  
Guillem Pérez Jordà

## Plant economy of hunter-gatherer groups at the end of the last Ice Age: plant macroremains from the cave of Santa Maira (Alacant, Spain) ca. 12000–9000 B.P.

Received: 22 October 2004 / Accepted: 13 June 2005 / Published online: 28 October 2005  
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**Abstract** Up till now, plant macroremains of hunter-gatherer groups at the end of the last Ice Age and the very early Holocene have very rarely been investigated on the Iberian Peninsula and elsewhere. The use of systematic recovery techniques at the archaeological cave site of Santa Maira has allowed the recovery of a large amount of plant remains (fruits, seeds and wood) from Upper Palaeolithic and Epipalaeolithic levels (12000–9000 B.P.) Charcoal analysis has allowed us to reconstruct the surrounding vegetation of the site. In the valley bottoms mesophilous woodland with *Quercus* was present even in the lowest layers (Upper Magdalenian) During the Late-glacial *Juniperus* was very important, in the early Holocene *Quercus* (both evergreen and deciduous) took over. Large numbers of macroremains of fruits (*Quercus* sp., *Sorbus* sp., *Olea* sp. and *Vitis* sp.) were found, but a significant quantity of legumes together with a few grass seeds have also been identified. This assemblage most probably represents the gathering of wild plant resources by the inhabitants of the cave, and allows us to reconstruct some of the food gathered from plant resources.

**Keywords** Iberian Peninsula · Epipalaeolithic · Mesolithic · Fruit-gathering · Charcoal analysis · Vegetation reconstruction

### Introduction

Current research carried out on the subsistence of the latest hunter-gatherer groups in the Iberian Peninsula has mainly

concentrated on hunting (Aura et al. 1998) In contrast, seed and fruit analyses of pre-Neolithic contexts are rare (Badal 1990, 1998; Buxó 1997; Zapata 2000; Zapata et al. 2002; Holden et al. 1995), and are concentrated on the northern areas of the peninsula. Therefore, our knowledge of the Palaeolithic and early Mesolithic plant economy is still very limited. Generally speaking, this situation is similar to that in the western Mediterranean where the presence of legumes and fruits in Epipalaeolithic and Mesolithic contexts is documented (Marinval 1988; Vaquer et al. 1986; Costantini et al. 1987) Charcoal analyses are more frequent, so regional vegetation evolution is quite well known in our study area (Badal and Carrión 2001; Carrión 2002).

In this paper we present the results of the archaeobotanical analysis from Santa Maira cave in Alacant. The main aim of this paper is to provide new information on wild plant use during the Upper Magdalenian and Epipalaeolithic. On the one hand, the analyses of the charcoal should provide a picture of the surrounding vegetation and its evolution along time; in addition we wanted to explore the way in which firewood was exploited. On the other hand, we have tried to understand the importance of wild plants in the diet of late Pleistocene and early Holocene hunter-gatherer groups.

In general, the objective of the archaeological research carried out in this area was to study the last prehistoric hunter-gatherers within the context of a mid-montane Mediterranean environment. This investigation is part of a larger project, which focuses on settlement patterns and the use of caves as places for keeping cattle during both the Neolithic and historic periods.

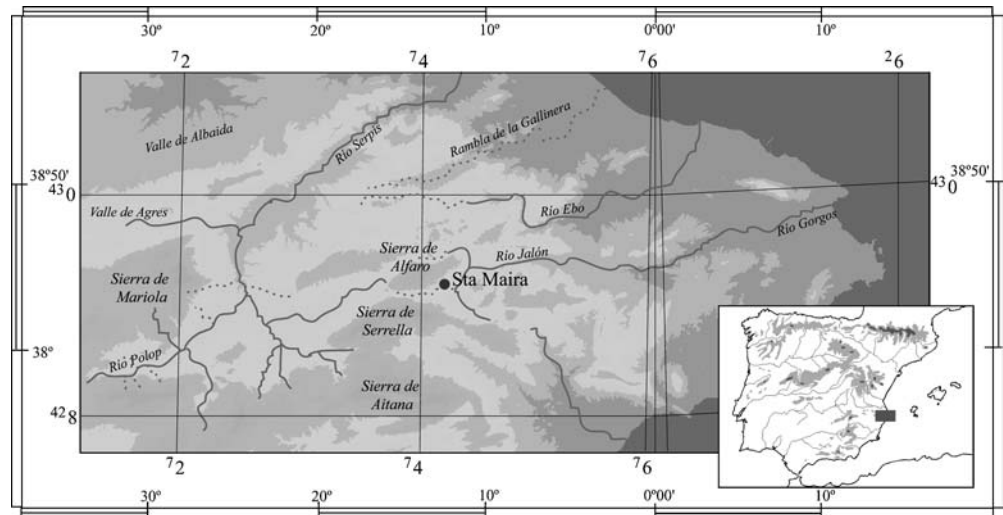
### The site

Santa Maira (Fig. 1) is situated in Castell de Castells (Marina Alta, Alacant) (38 °43'50"N, 03 ° 27'49"E) The cave is located at 600 m a.s.l. on the Serra d'Alfaro some 35 m above the Famorca ravine, cut between the Sierra d'Alfaro (1166 m) and the Serrella (1351 m) The area is part of the Mesozoic range of calcareous mountains belonging to

J. E. Aura · Y. Carrión · G. P. Jordà (✉)  
Departament de Prehistòria i Arqueologia, Facultat de Geografia i Història, Universitat de València,  
Avda Blasco Ibañez 28,  
46010 València, Spain  
e-mail: guillem.perez@uv.es

E. Estrelles  
Jardí Botànic de la Universitat de València,  
C/Quart 80,  
46008 Valencia, Spain

**Fig. 1** Location of the settlement



the outer Prebetic system. Towards the south-east, the high peaks lose altitude, giving way to a more open landscape which extends down to the coast.

The cave is sub-triangular in shape and has a single gallery, ca. 30 m long and 10 m wide, accessible through three entrances. The plant remains discussed here come from the westernmost entrance, where a particularly interesting palaeoenvironmental, chronostratigraphic and cultural sequence, dated between ca 12000 and 5500 B.P., has been uncovered (Table 1).

In this area of the excavation, the deposits showed a strong slope towards the interior of the cave. In addition, the upper layers (1–2) were also disturbed by the presence of animal burrows, so there has been less sampling of these layers, and palaeobiological remains are not well represented. Nevertheless, a good degree of preservation characterizes the remaining layers. In fact, the loamy texture and the absence of the characteristic carbonation processes of karstic sites have indeed helped to avoid the decay of the palaeobiological remains (Verdasco 1999, 2002).

The area excavated shows a stratigraphic sequence from the Upper Magdalenian (levels 4B and 5) to the Neolithic (level 2) with levels assigned to the Epipalaeolithic ‘microlaminar’ worked stone (level 4A) and to the Mesolithic with notches and denticulates (level 3) (Aura et al. 2000; Aura 2001).

The faunal assemblage shows a predominance of *Capra pyrenaica* (ibex), a species well-adapted to the land-

scape around the site (M. Ripoll, personal communication). Whereas the Magdalenian levels are characterized by the presence of *Equus* (horse), the Holocene shows an increase of *Cervus elaphus* (fallow deer), *Sus scrofa* (pig), *Capreolus capreolus* (roe deer) and *Rupicapra rupicapra* (chamois). Hunting of small animals seems to have been a regular activity throughout time. *Lepus* (hare) was the most common species but birds, fish and marine molluscs, the latter brought from long distances, were also found. Amongst the carnivores, *Vulpes vulpes* (fox) and *Felis sylvestris* (wild cat) were common but other species such as *Lynx pardina* (lynx) and *Canis lupus* (wolf) have been also recorded.

## Materials and methods

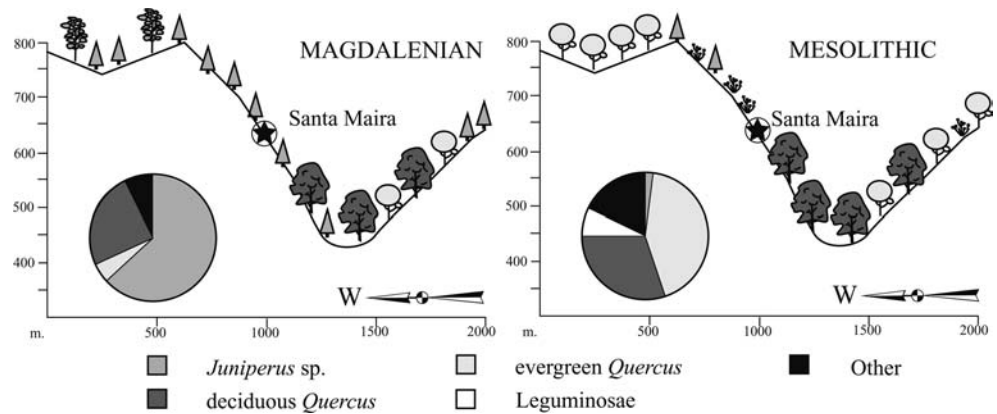
During fieldwork all the sediment was sieved, except the squares affected by the presence of animal burrows. Soil samples were dry-sieved on site using a 5 mm mesh; therefore large remains such as acorns and Pomoideae fruits could be recovered at this point. In addition, soil samples were processed in the laboratory. Soil samples from the first two seasons were wet-sieved through a column of sieves of 5, 1 and 0.5 mm. From 1998 onwards, samples were systematically floated instead, making the recovery of the charred remains easier. The materials were recovered in archaeological layers, and no separate features have been recorded. Differences in the methodological approach

**Table 1** Dating and descriptions of samples analysed

Level	Lab. code	Age uncal B.P.	Period	Method
Boca oeste				
3-1	Beta-149947	80 ± 40	Mesolithic	AMS (bone)
4A-4	Beta-131578	9760 ± 40	Epipalaeolithic	<sup>14</sup> C conventional (charcoal)
4A-5	Beta-156022	9220 ± 40	Epipalaeolithic	AMS (bone)
4A-5	Beta-156021	9370 ± 40	Epipalaeolithic	AMS ( <i>Vicia/Lathyrus</i> seed)
4A-12	Beta-158013	420 ± 40	Epipalaeolithic	AMS ( <i>Olea</i> sp. charcoal)
4A-12	Beta-158014	9820 ± 40	Epipalaeolithic	AMS ( <i>Quercus</i> sp. charcoal)
4B-14	Beta-156023	11920 ± 40	Upper Magdalenian	AMS (bone)
4B-15	Beta-131579	11620 ± 150	Upper Magdalenian	<sup>14</sup> C conventional (charcoal)
4B/5	Beta-149948	11590 ± 70	Upper Magdalenian	AMS (bone)



**Fig. 3** Reconstruction of vegetation in the surroundings of Santa Maira in Magdalenian and Mesolithic times



are related to thermophilous woodlands dominated by *Quercus*, particularly the deciduous species.

Other taxa such as Leguminosae, Labiatae, *Erica* sp., *Buxus sempervirens* and *Rhamnus-Phillyrea* are poorly represented in this layer. The wood charcoal from the Epipalaeolithic levels reveals a similar trend to that of the previous phase. The dominant taxa are again *Juniperus* sp. and both deciduous and evergreen *Quercus*. Juniper describes an irregular curve with peaks reaching 25–50%, whereas the frequencies of deciduous *Quercus* sp. are more or less constant. Again, *Quercus* appears together with *Acer* sp. and *Prunus* sp., which begin to consolidate their presence with constant percentages of ca. 5%. The frequencies of evergreen *Quercus* sp. tend to increase, particularly at the end of this phase, while *Juniperus* sp. starts to decline progressively. Other taxa represented in very low percentages are *Olea europaea*, *Fraxinus* sp., *Rhamnus-Phillyrea*, *Pistacia* sp., *Hedera helix*, *Erica* sp., *Buxus sempervirens*, *Rosmarinus officinalis*, Maloideae and *Viscum* sp.

This tendency marks the beginning of the Holocene transition. The pioneer juniper, which had an important colonizing role and which was the dominant tree in the previous phase, is now replaced by *Quercus* which spread widely at this time. *Quercus* spp. are thermophilous trees and the evergreen species in particular show the distinct Mediterranean character of the vegetation.

The Mesolithic levels correspond to the maximum expansion of *Quercus* sp. associated with a decrease in *Juniperus* sp., which almost disappears at the end of the sequence. The main accompanying taxa are *Prunus* sp., Leguminosae and *Salix-Populus* represented in low percentages. Even less frequent are taxa such as *Olea europaea*, *Hedera helix*, *Fraxinus* sp., Maloideae, *Pistacia* sp. and *Viscum* sp. By now the thermophilous *Quercus* woodlands had developed fully and all the Mediterranean floristic richness is clearly recorded.

The decrease in *Juniperus* sp. may be explained as a consequence of the expansion of *Quercus* sp. woods in areas previously colonized by conifers. On the other hand, it may be also possible that the type of vegetation differed from place to place, with clear distinctions between valley bottoms and slopes, as happens today. So, these differences may just reflect a change in the patterns of wood exploita-

tion or particular strategies of wood collection by human groups.

During the Late-glacial, in the east and south of the Iberian Peninsula, pollen sequences are dominated by signs of steppe-like vegetation with few junipers and pines (Pons and Reille 1988; Carrión and Dupré 1996; Carrión et al. 1998).

Summarizing, according to the wood charcoal analysis of Santa Maira (Fig. 3), most probably two distinct types of environments with their own ecological features coexisted near the cave. Differences in light, moisture and soil requirements of both *Juniperus* and *Quercus* (both well represented) can explain the observed diversity in vegetation, which was initially related to the geographic characteristics of the ravine. Valley bottoms are protected areas through which thermophilous Mediterranean influences coming from the coast reached the interior. These areas are well adapted for the establishment of thermophilous mixed oak woods. On the contrary, on steep slopes pioneer vegetation developed with *Juniperus*, which is well adapted to these conditions.

As far as the plant composition is concerned, there were no major changes during the transition from the Late-glacial to the Holocene. However, if we compare the lower and upper parts of the sequence, we observe that there are changes in frequencies of the taxa, which mirror a development through time: *Quercus* species started their expansion from the valley bottoms where they would have grown during the less favoured climatic periods.

To sum up, the lower part of the sequence still shows a close similarity to the most rigorous periods of the Late-glacial, but the Mesolithic phase is a clear example of the coming Holocene climatic optimum.

#### Seeds and fruits from Santa Maira

A diverse assemblage of charred plant macrofossils, both fruits and seeds, has been recovered from all phases, but there are no significant density differences between them. Density is poor in all phases, between 0.01 seeds/l in the Mesolithic phase, 0.05 in the Epipalaeolithic and 0.07 in the Magdalenian. The results are shown in Table 2.



## Fruits

Fruits are ubiquitous throughout the sequence suggesting a continuous use of these food resources (Table 2) *Quercus* sp. acorns represent the most frequent taxon, as fragments of cotyledons which are the commonest remain (Fig. 4: 5), together with fragments of pericarps and cupules. Identification of these remains has been only achieved to genus level.

Beside acorns, many Rosaceae have also been found. Whole fruits or pomes with seeds still visible are the main type of remains. Many of them have been identified as *Sorbus* sp. (Fig. 4: 2) These fruits have a diameter between 6–10 mm and two different types of outer surface: some specimens have a smooth surface while others show a wrinkled outside which is most probably the result of water loss or carbonisation (Fig. 4: 2) As far as cell pattern is concerned, *Sorbus* fruits are smooth. The inner part has a spongy aspect (Fig. 4: 2) and the pericarp is made up of two lobules containing two seeds each (Fig. 4: 2, right side) Based on these characteristics, such fruits have been identified as either *S. aria* or *S. aucuparia*, although only the first of these grows in the region nowadays.

Beside fruit parts identifiable as *Sorbus*, there were other fruit fragments which presented the same characteristics, but did not preserve either the seeds or their marks. These were identified as Pomoideae.

Several *Rosa* sp. seeds have also been identified from all phases (Fig. 4: 4) In addition, fragments of *Prunus spinosa* fruitstones (Fig. 4: 3) and some fragments that could tentatively be identified as *Cotoneaster* have also been retrieved from the earliest phases.

The remaining species are only present in small numbers. *Vitis vinifera* L. var. *sylvestris* has been only identified in the Epipalaeolithic layers (Fig. 4: 6), whereas *Olea europaea* var. *sylvestris* (Fig. 4: 1) and *Juniperus* cf. *oxycedrus* are present both during the Magdalenian and the Mesolithic periods. More frequent were the *Pistacia* sp. nutlets which were identified throughout the sequence (Fig. 4: 9).

## Legumes

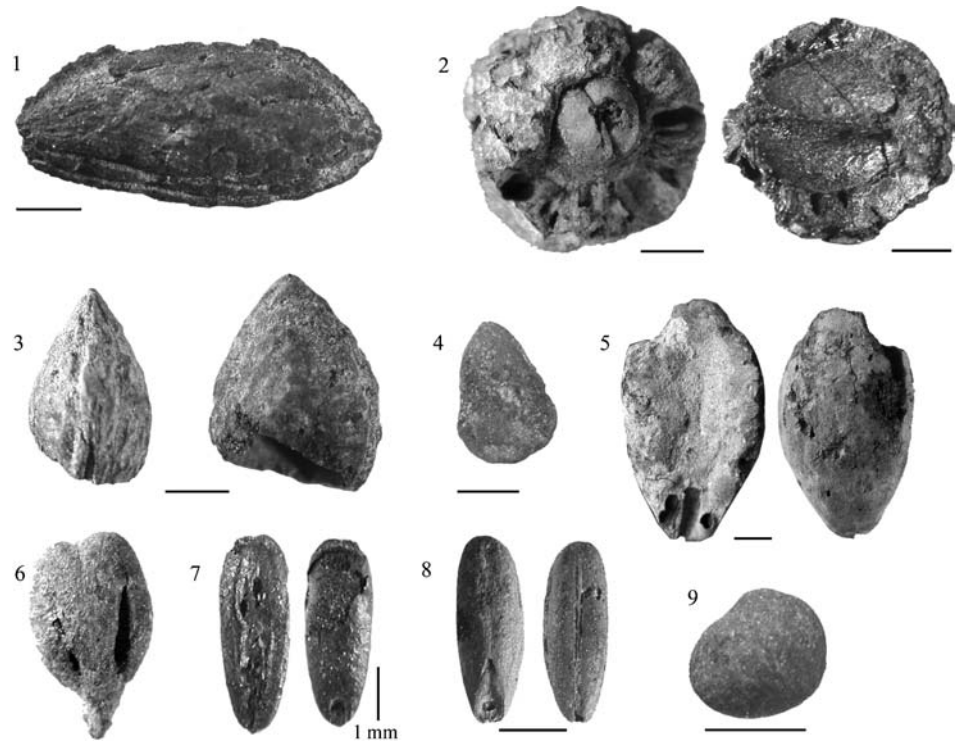
Legume seeds (Fig. 5) were also very abundant but their identification is almost impossible as the testa layer and therefore their surface features, which have a potential taxonomic value, have not been preserved. Remains have been classified into three different groups:

- seeds oval in shape with a well-developed lateral radicle, probably belonging to the genera *Medicago* or *Melilotus* (Fig. 5: 1).

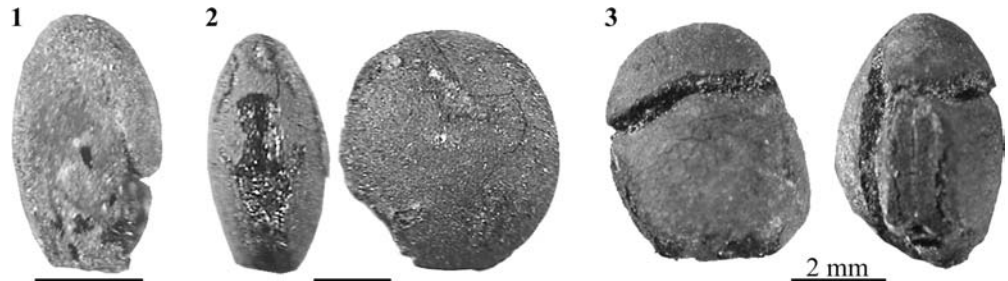
**Table 2** Carbonized fruits and seeds: left column = frequency (number of samples in which a species was present), right column = number of remains recovered

	Magdalenian		Epipalaeolithic		Mesolithic	
	N samples (a)	N seeds/fruits	N samples (a)	N seeds/fruits	N samples (a)	N seeds/fruits
N samples	48		73		24	
Vol. litres	975		1919		1323	
<i>Avena</i> sp.	2	2			1	1
<i>Lolium</i> cf. <i>temulentum</i>	1	1				
Gramineae (wild)	1	1	4	5	1	1
<i>Triticum aestivum/durum</i>				1		
Grasses total		4		6		2
Leguminosae	13	12	13	26	2	2
<i>Medicago/Melilotus</i>			2	2		
<i>Vicia/Lathyrus</i>	5	6	7	7	2	2
<i>Vicia/Lens</i>			3	3	1	1
Legumes total		18		38		5
cf. <i>Cotoneaster</i>	1	1				
<i>Olea europaea</i>					3	3
<i>Pistacia</i> sp.	2	2	3	3	1	1
<i>Prunus spinosa</i>	1	1	1	1		
<i>Quercus</i> sp.	24	18	35	25	19	10
<i>Rosa</i> sp.	3	3	7	7	1	1
<i>Sorbus</i> sp.	3	3	2	2	1	2
Pomoideae fruits	14	14	10	10		
Rapistrum type					1	1
<i>Juniperus</i> cf. <i>oxycedrus</i>	1	1	2	2		
<i>Vitis vinifera</i> var. <i>sylvestris</i>			4	4		
<i>Galium</i> sp.	2	2				
Indet	6	6	9	15	1	1
Total (n)		73		113		26

**Fig. 4** Some examples of fruits and seeds: 1 *Olea europaea*, 2 *Sorbus* sp., 3 *Prunus spinosa*, 4 *Rosa* sp., 5 *Quercus* sp., 6 *Vitis vinifera* ssp. *sylvestris*?, 7 *Lolium* cf. *temulentum*, 8 *Avena* sp., 9 *Pistacia* sp.; scale bars = 2 mm unless otherwise noted



**Fig. 5** Some examples of legume seeds: 1 *Medicago/Melilotus*, 2 *Vicia/Lens*, 3 *Vicia/Lathyrus*; scale bars = 1 mm unless otherwise noted



- seeds lenticular in shape which may be lentils (Fig. 5: 2) Besides, there is a subgroup of more swollen lenticular seeds tentatively classified as *Vicia/Lens*.
- group of ca. 4 mm long seeds, oblong and quadrangular in shape with a narrow and elongated (2.4 mm) hilum extending over almost all of one of the seed sides (visible in just one case, Fig. 5: 3).

Based on these characteristics, these legume seeds have been tentatively classified as either *Vicia* or *Lathyrus*. Even if it is not possible to identify the species, the palaeoecology of the area, shown by charcoal analysis, points towards *Lathyrus latifolia* as the species possibly involved. This is a perennial climber, which develops at the edges of forests. One of the AMS dates was obtained through analysing one of the seeds identified as *Vicia/Lathyrus*,  $9370 \pm 40$  B.P. (Table 1).

#### Grasses

Grasses are continuously present throughout the sequence, but always in very small numbers (Table 2) Remains of *Avena* (Fig. 4: 8) and a possible remain of *Lolium temu-*

*lentum* (Fig. 4: 7), both from the earliest phase, together with seeds identified only as Poaceae (grasses) have been recovered. A grain of *Triticum aestivum/durum* has also been identified. In this layer, no Neolithic intrusions were detected, but some Neolithic materials were found in the layer immediately above it, probably because of disturbance related to one of the animal burrows.

*Avena* and *Lolium* generally grow usually together with crops, so their presence (including that of the naked wheat) in Epipaleolithic levels is most probably due to later intrusions. We have no radiocarbon date on these remains to clarify their chronology. In case they are not the result of intrusions, they do not seem to have been commonly exploited resources.

#### Discussion

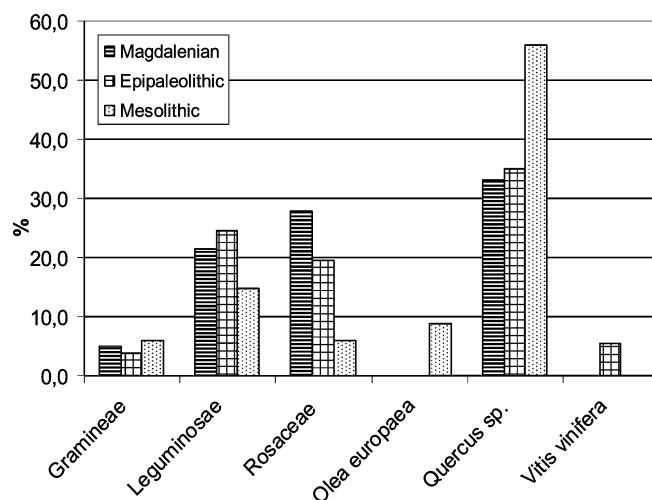
Judging from the overall results in every phase, there are no important changes in the species presence, but some frequency variations are observed throughout the sequence. Nevertheless, we have to be careful when comparing the phases because of the different volumes of the recovered

material and also because of the very low numbers of seeds and fruits that were found. The latter show how important it is to sieve many litres of material from such types of deposits to obtain a reliable result.

The earliest phase is characterized by high percentages of acorns, Rosaceae fruits and legumes, the first being the most frequently represented (Fig. 6) From this phase there is a continuous increase of acorn cotyledons while Rosaceae, and to a lesser extent also the legumes, start to decrease. This pattern has been also detected in the charcoal remains (Fig. 2) demonstrating that *Quercus* was certainly a major resource of the Mediterranean forest from which the human groups of the cave collected a large part of their plant resources. Data from many sites suggest that this is a constant in the southern part of the Iberian Peninsula in both prehistoric times and later periods (Vázquez Pardo et al. 2004, p. 423).

Like cereals, acorns are an important source of carbohydrates, fats and fibres. Collecting acorns is an easy task and it does not require particular harvesting techniques or skills. They are easily stored and their processing is equally very simple. All these factors made acorns a very attractive, accessible and useful resource, particularly as climatic conditions improved and oak woods spread.

As stated earlier, the second important taxa were Rosaceae, including *Sorbus* pomes with an excellent preservation of the fleshy part. This indicates that it is unlikely that they were in contact with a powerful fire, for in that case the fruits would have been less well preserved. However, whether these fruits got incorporated into the fire as part of the wood fuel or whether some kind of drying was carried out in order to store them must remain unknown. Drying is, in any case, a common practice to avoid fungal development, which contributes to a better storage of the product (Wiltshire 1995) That the pomes were part of some animal faeces can be ruled out, for only seeds and not the whole fruits would have been preserved after digestion. Whatever explanation is given for their presence at the site, what seems clear is that *Sorbus* fruits were collected for



**Fig. 6** Percent distribution of the main groups of seeds and fruits.  $(a/n \times 100)$   $a$  = number of samples where the species are present.  $n = \Sigma$  of  $a$

human consumption. Ethnographic data show that they can be directly consumed by humans or dried and ground in order to make flour (Zapata 2000, p. 164).

As far as the legumes are concerned, their presence is well documented in hunter-gatherer sites such as the cave of l'Abeurador (Vaquer et al. 1986) Even if legumes were generally dried prior to storage, charring was probably accidental, because they are usually not in direct contact with fire during their preparation process. As has already been mentioned, the remains from Santa Maira lack the testa with characteristic surface features that may help with taxonomic classification, so identification was very difficult (Butler 1991) In some cases, identification has been achieved to genus level, but on many occasions even the genus has remained unknown. It is likely, however, that the remains retrieved at Santa Maira belong to wild plants growing in the area such as *Lens nigricans*, *Lathyrus latifolia*, etc., which were therefore accessible to the inhabitants of the cave, among other plants. This hypothesis is based on the vegetation reconstruction obtained from the charcoal analysis, which shows an environment favourable to the development of these plants.

The assemblage of seed/fruit remains is closely related to other assemblages from Mediterranean caves such as Franchthi Cave (Hansen and Renfrew 1978), Grotta de l'Uzzo (Costantini et al. 1987), Abeurador and Fontbrégoua (Vaquer et al. 1986; Marinval 1988) Despite this relationship, each area shows peculiarities and specific characteristics that need to be taken into consideration.

Some of the woody species identified from seeds and fruits were also present as charcoal remains. The dynamics of the vegetation in Santa Maira can be compared with those interpreted from other regional charcoal and pollen sequences. During the Late-glacial, in the east and south of the Iberian Peninsula pollen sequences are dominated by steppe-like vegetation with few junipers and pines (Pons and Reille 1988; Carrión and Dupré 1996; Carrión et al. 1998) Charcoal sequences from Tossal de la Roca (Cacho et al. 1995) and Cova de les Cendres (Badal and Carrión Marco 2001) show high percentages of *Pinus nigra* type and a gradual increase of *Quercus* and other thermophilous taxa such as *Acer*, *Prunus*, etc.

This is the context where the Santa Maira sequence begins. By 11500–11000 B.P., the vegetation was dominated by junipers, evergreen oaks and deciduous oaks. In the present sequence, there is no sign of the intensification of cold climatic conditions during the Younger Dryas: on the contrary, deciduous *Quercus* shows a slight rise. In contrast, in pollen sequences, there is a new expansion of steppes, and a reduction of *Quercus* compared with *Pinus* and *Juniperus*. In other charcoal sequences, such as Tossal de la Roca, a mixed vegetation with *Quercus faginea* tp. and *Juniperus* was reconstructed (Cacho et al. 1995) These mixed vegetations at Tossal and Santa Maira could be the result of different rates of spread of vegetation cover on the slopes, compared with valley bottoms where woodlands could develop more easily.

In the Early Holocene, there is an increase of Mediterranean evergreen taxa in the charcoal and pollen sequences

and a fall in the conifer values, probably because of the increase of temperature and moisture. In the pollen sequences, there are still high values of *Pinus*, but montane pine species like *Pinus nigra* or *P. sylvestris* must have been replaced by the warmth demanding ones like *P. halepensis*. In Santa Maira, there is now a predominance of both evergreen and deciduous *Quercus*. From 8000 B.P. onwards, there was the optimal climate for vegetation development. There is a wide range of taxa developing in the *Quercus* wood: *Prunus*, *Sorbus*, *Acer*, etc. and shrub taxa such as Leguminosae, Labiatae, Cistaceae, *Pistacia lentiscus*, and the beginning of continuous curves of *Olea europaea*. The latter is more represented in other more truly Mediterranean sites than in Santa Maira. Olive gradually reduces its presence from the coast to more inland areas, so that in la Falguera it is hardly present in the charcoal record (Carrión Marco 2002).

Based on the available data, it is difficult to ascertain whether the patterns of exploitation of wild plants by the inhabitants of the cave changed through time. For this reason, it is difficult to evaluate the dynamics of wild plant exploitation. There is insufficient information to establish whether wild plant gathering increased or if, instead, the archaeobotanical record reflects a continuum in plant exploitation, partially altered by the changes of the plant cover in this area. As there are no data from other sites comprising the same time-span, nor about Upper Palaeolithic hunter-gatherers in the western Mediterranean area, it is not possible to compare our results in order to resolve these questions at present.

Even if we are aware that there was a large group of plant resources, certainly used and consumed by humans, that have not been archaeologically documented from this site, for example tubers, stems, leaves, roots, etc., gathering seems to have concentrated on a set of fruit taxa that were abundant in the environment, easy to collect and store. Likewise, the abundance of legumes shows that they were being used. In contrast, the scarce representation of grasses does not give any indication as to their uses. The importance of wild plants in human diet is also suggested by analysis of prehistoric diets, which indicate that this type of resource contributed to the food intake of the hunter-gatherer groups (Lubell et al. 1994). Another line of evidence is provided by the ethnoecological models described by Hillman (1989), which show the potential of a particular territory.

Any attempt to compare Santa Maira's assemblage to the Neolithic assemblages of either the same cave, or the first farming sites (Buxó 1997), fails to demonstrate continuity. The collection of wild plants in these Neolithic contexts is visible. Some of the species present in Mesolithic phases were still being used during the Neolithic, but it is also clear that frequencies were greatly reduced. In addition, farming sites show an evident decrease in the diversity of the resources exploited. This fact, however, could be due to different preservation chances of the plants. Cereals, mainly hulled ones, might be much better preserved because of their frequent contact with fire during their processing or cooking. But in fact, the representation of seeds of collected plants is poor in western Mediterranean Neolithic contexts

(Buxó 1997; Peña-Chocarro 1999), even in waterlogged sites such as La Draga (Bosch et al. 2000); this seems to be in contrast to results from central European lake dwellings (Jacomet 2004). So, this might be a pattern in this region. Consequently, it is fair to assume that once agriculture was established, the gathering of wild plants played a secondary role in the diet of the farming communities on the Iberian Peninsula. Unfortunately, in our region there is a lack of information about the latest Mesolithic groups and about hunter-gatherer groups in contact with the first Neolithic communities. In the Serpis valley, no evidence of human occupation in this period has been found and in other nearby valleys, where these levels are present (Juan-Cabanilles and Martí 2002; García Puchol et al. 2003, 2004), we have no seed remains.

When comparing data from Santa Maira to those from the northern part of the Iberian Peninsula (Zapata 2000; Buxó 1997), the main difference is the absence of *Corylus* (hazelnut) remains and perhaps the greater diversity of species in southern sites. This trend has to be verified by further investigations.

The work carried out at the cave of Santa Maira is an excellent example of how the application of an adequate sampling strategy and a systematic recovery allows important data to be obtained on one of the activities that played a key role in human subsistence before the Neolithic and also on the plant cover where human activities took place.

**Acknowledgements** We would like to thank A. Butler for the revision of the legumes studied in this paper and for all her valuable comments. We also want to thank L. Peña Chocarro and L. Zapata for the English translation and for their comments.

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