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ORIGINAL ARTICLE

The agricultural consequences of colonial contacts on the Iberian Peninsula in the first millennium B.C

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Abstract The Iron Age archaeobotanical record on the Iberian Peninsula shows how the Phoenician and Greek colonisers caused the indigenous Iberians to change the management of the agricultural resources and the crops which they grew. These colonisers also brought about the development of viticulture and olive cultivation. The importance of agricultural products in the trade network which was stimulated by the colonisers may have encouraged new farming systems, as well as surplus capacity in the native agriculture in the region.

Keywords Archaeobotanical record · Phoenician and Greek colonisation · Agricultural products · Trade network · Early Iron Age

Introduction

The evolution of Iberian culture cannot be understood without referring to the importance of the contacts with the Greek and Phoenician colonisers who frequented and established colonies along the whole Mediterranean coastline of the Iberian Peninsula. Their presence and activities had a definitive effect in transforming and structuring the region's indigenous Iberian communities. It appears that this led to the use of plant resources in the Iron Age which evolved into an economy which included new cereal products such as oats and millet, and above all, expanded viticulture and olive-growing.

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From the ninth century cal B.C. to the Romanisation of the territory, the Mediterranean coastal area of the Iberian Peninsula was made up of cultural and political zones whose common factor was a largely agricultural economy, with settlements located on the most fertile land (Fig. 1). However, settlement sites varied as they were not chosen just for economic reasons, but also to meet functional, strategic and territorial defence needs.

Palaeoecological conditions

During the late Bronze Age, *Quercus ilex/coccifera* (evergreen oaks) were among the most widespread plants on the Mediterranean coastal plain. However, the same palaeoecological studies show that oaks were on the decline where more xerophytes and pioneer taxa formed the coastal maquis, with wild olive, heather, juniper, lentisc, etc. (Riera and Esteban 1994; Burjachs et al. 2005). The symptoms of change and the transformation of the landscape observed during this period are related to the spread of farming on the coastal plains, although the greatest changes came about later under the colonial influence and with the development of the Iberian settlements.

The most important changes in the landscape occurred during the Iron Age, particularly during the Iberian period from the mid-sixth to the second century B.C., when the secondary vegetation accompanying the evergreen oak began to develop significantly (Burjachs et al. 2005).

During this period the coastal and pre-coastal plains of the northern Iberian Peninsula (present-day Catalonia) were farmland, although there were marshes and wetlands in the area below the pre-coastal mountains (Fig. 2). This type of landscape would have particularly represented the

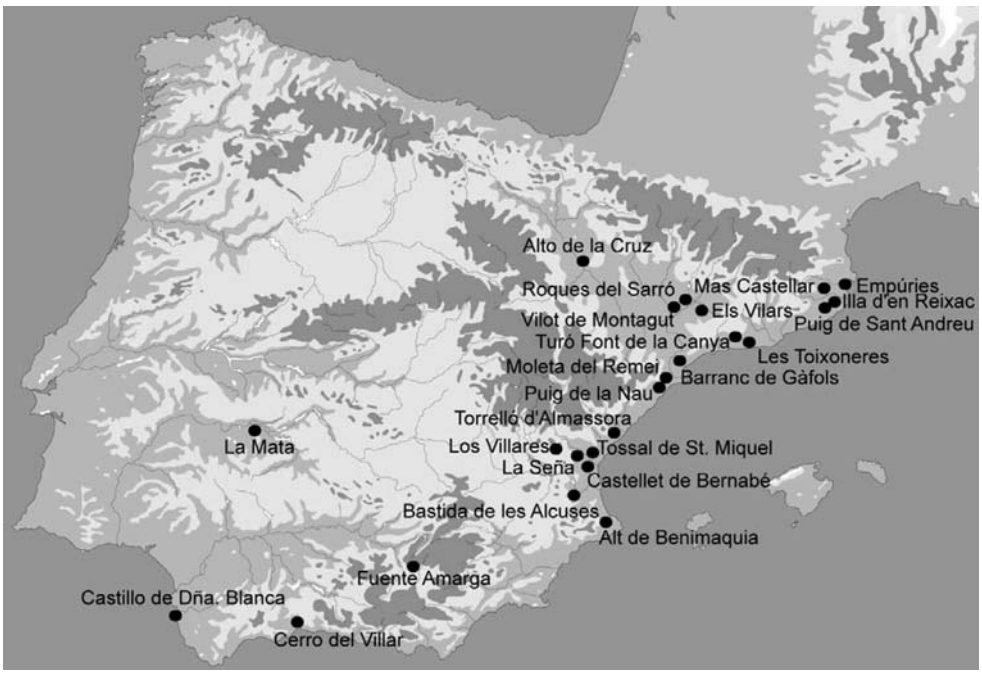

Fig. 1 Map of main archaeological sites with Iron Age archaeobotanical finds of *Olea* and *Vitis*

settlements of Puig de Sant Andreu (Ullastret) and Mas Castellar (Pontós), which were located on the plains formed by the shallow watercourses of the Rivers Ter, Daró and Fluvià in the eastern part of Catalonia, or settlements such as Bòbila Madurell and Ca n'Oliver, located on the plains between the Rivers Ter and Llobregat.

During the Second Iron Age there was an increase in the number of helophytic taxa such as pine, heather, rockrose, juniper, etc. However, sub-Mediterranean taxa also persisted in areas of deciduous oak woods and/or mixed woods of *Quercus ilex/coccifera* (evergreen oaks) and *Quercus* sp. (deciduous oak) and there are sporadic finds of montane taxa such as *Pinus sylvestris/nigra* (Scots pine, black pine) and *Fagus sylvatica* (beech), although these are not present today in the lowland Mediterranean landscape (Riera and Esteban 1994).

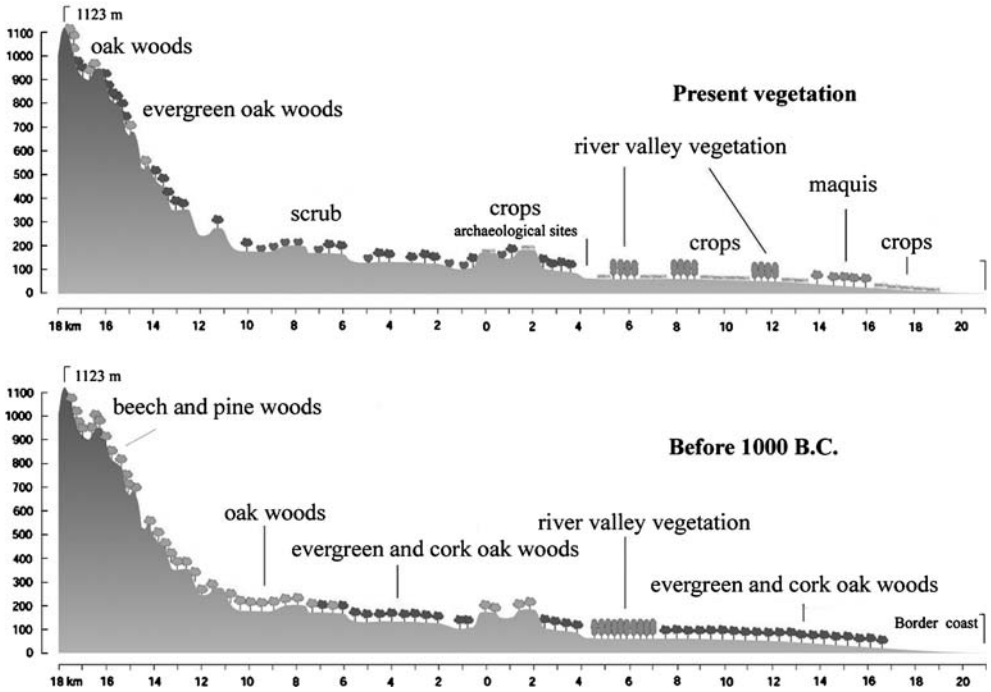

Fig. 2 Comparison between the ancient vegetation before 1000 B.C. and the present vegetation in the area of the Empordà (north-east Catalonia, north-eastern Spain)

Isotopic discrimination studies on carbonised samples of *Triticum aestivum/durum* (free-threshing wheat) and *Hordeum vulgare* (hulled barley) from this period do not show any major alterations. On the other hand, some variations are detected in their environmental growth conditions, as has been demonstrated by recent research (Araus et al. 1997).

Analysis of plant remains also shows that agriculture became more intense and the use of plant resources changed with the introduction of new crops. This required the creation of new farmland, which had a decisive effect on areas that had been wooded until then. However, it appears that marshlands were not yet deliberately modified, as the indigenous peoples' sites were located on high ground or in areas where it was already possible to farm the land.

There are fewer palaeoecological analyses for the Iron Age in the east and south of the Peninsula, although, together with the analysis of seeds, they show the major impact of the development of agriculture, with a tendency to reduce the tree cover, resulting in a more arid environment.

Pollen studies by Ruiz and Molinos (1995) carried out in the settlements of Puntal dels Llops (Olocau, València) and Puente Tablas (Jaén) indicate that the vegetation has changed a great deal since that time. A sondage of the sixth century B.C. level taken in Puente Tablas shows that evergreen oak and pine were the main trees, although they are accompanied by trees characteristic of river valley woods such as tamarisk, willow, poplar, etc. as well as by alder and ash. This research indicates that the available soil moisture was greater than today and that there were therefore many wooded areas in the interior mountains of the southeastern Iberian Peninsula (Ruiz and Molinos 1995), although in the coastal areas an increase in semi-steppe-like vegetation can be observed.

In summary, although we begin to see different kinds of land use in the Iberian period, there are enough common features to suggest that Mediterranean woods still covered much of the land, with more pine and evergreen oak than today.

The archaeobotanical dataset

Distinguishing elements of the Phoenician colonisation

The Phoenician trading posts and colonies were established and developed in the south of the Peninsula from the ninth century cal B.C. onwards, and appear to have engendered considerable trading activity in the region (Aubet 1994). All kinds of Phoenician merchandise and products were traded for oil and probably also wine. The colonisers also recognised the agricultural potential of the area, particularly the fertile alluvial valleys of eastern Andalucía, or the Guadalquivir valley itself. Seed studies carried out in the settlement of El Cerro del Villar (Màlaga) have revealed cereal farming based on *Hordeum vulgare* (hulled barley), *Triticum dicoccum* (hulled wheat), and *Triticum aestivum/durum* (bread and macaroni wheats), together with *Pisum sativum* (pea) and *Lens culinaris* (lentil) (Català 1999).

Wine production seems to be one of the distinguishing elements of the Phoenician colonization. The analysis of phytoliths and the remains of what are believed to be wine containers show that while during the early stages wine may have been imported from the eastern Mediterranean or from other areas with which the Phoenicians traded, such as Egypt, production soon began in the west. The hinterlands of the Phoenician settlements in eastern (Cerro del Villar, Màlaga, Spain) and western Andalucía (Castillo de Doña Blanca, Puerto de Santa Maria, Cadiz, Spain) were planted with vines to produce wine for both internal consumption and trade. In the latter site the seed remains demonstrate that a busy wine producing activity already existed in the eighth and seventh centuries B.C. (Chamorro 1994). In the case of Cerro del Villar, in addition to the seed material, a pottery that produced amphorae for transporting wine (VR-1 or T-10.1.2.1.) has been identified. This type of ware is characteristic of the colonial and Iberian occupation levels in the Mediterranean area of the Iberian Peninsula between 650 and 575 B.C. (Aubet et al. 1999).

Amphorae produced in this region were widely distributed from Andalucía to the south of France and in Ibiza and the central Mediterranean. This shows how much wine production developed during the seventh century B.C. The considerable demand would have encouraged these communities of the early Iron Age and the beginning of the Iberian period to increase their wine production and we can see that at the start of the sixth century some Phoenician-influenced Iberian settlements such as El Torrelló d'Almassora (Castellón) or Alt de Benimaquia (Dènia, Alicante, Spain), chose to begin intensive viticulture aimed at internal and external markets (Gómez Bellard et al. 1993). This can be seen from the machines which they built to press the grapes and macerate the must to transform the juice into wine. Hypothetically we estimate that the territory of Benimaquia could have produced approximately 400 hl of wine annually, which would have needed between 1,300 and 1,600 amphorae to store that amount of wine, meaning that the pottery would have been working all year round just to meet the demand (Gómez Bellard et al. 1993).

This situation appears to have continued during the Iberian period in the south-eastern territories, as shown by the amphora deposit found at La Quejola (San Pedro,

Albacete, Spain) dated to the fifth century cal B.C., and particularly in the east, as we can see from the settlement of Castellet de Bernabé (Llíria, València, Spain) (Pérez Jordà et al. 1999).

In the south of Catalonia, the more recent archaeobotanical evidence suggests that local wine production is indicated in the remains of the seventh century B.C. levels at Turó de la Font de la Canya (Avinyonet del Penedès, Barcelona; López 2004) and in the sixth century B.C. level at Barranc de Gàfols (Ginestar, Tarragona; Cubero 1998) (Figs. 1–3). These remains can be directly related to the Phoenician colonisation from the evidence of imported ware from that culture found at the sites (Table 1).

Olive oil production appears to follow a similar pattern from the time of the Phoenician colonisation, although it was not until the end of the late Iron Age that olive cultivation reached its peak.

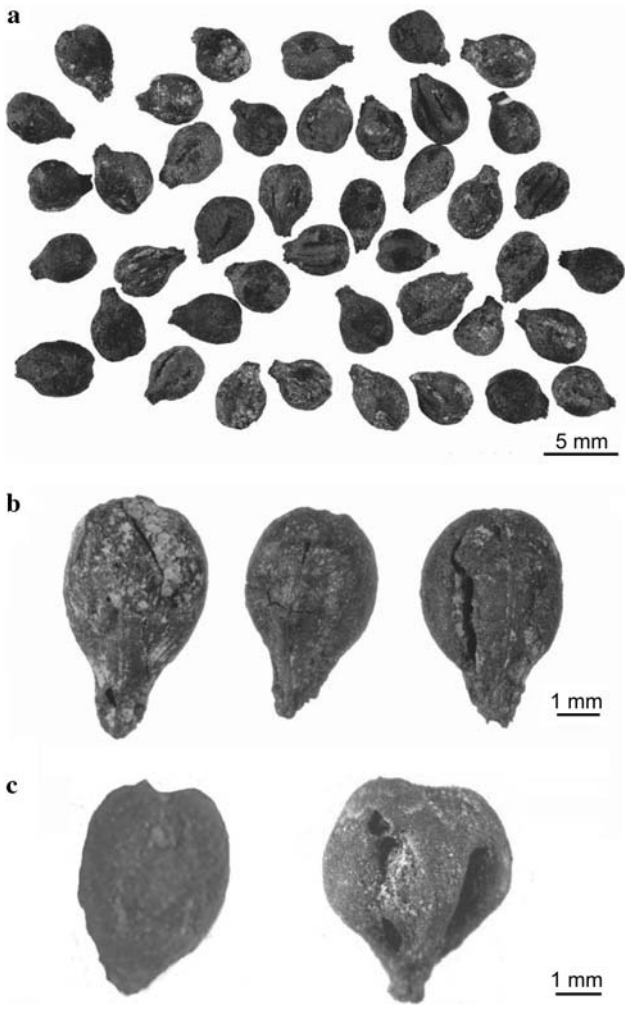

Fig. 3 Cultivated grapes from Turó de la Font de la Canya (Phoenician context); **a** selection of pip grapes; **b** detail (photo: X. Goñi, Servei de Reproducció d'Imatge, UDL); **c** cultivated grapes from Sant Martí d'Empúries (Greek context)

Analysis of the residues show that the Phoenician amphorae (VR-1 type) from the straits of Gibraltar area could have transported olive oil or olives to the Ebro region at the end of the seventh century B.C., either as a basic product or as a preservative (Gracia 2004). Nevertheless, only the archaeobotanical analyses corresponding to Phases II (600–575 B.C.) and I (550–500 B.C.) from Castillo de Doña Blanca show that the olive was cultivated and used in the nearby area (Chamorro 1994).

The Greek colonisation

Starting in the sixth century B.C., we begin to see the distribution of wine from Massalia and Etruria (as well as other types from the Aegean) to places on the Iberian Peninsula.

At Sant Martí d'Empúries we have identified the remains of cultivated vines in a mid-seventh century B.C. context, although the frequency of finds of grapes is significantly higher in the layers corresponding to the period after the fifth and fourth centuries B.C. (Buxó 1999, Fig. 3c).

These grapes came from the vineyards of the neighbouring territory of Empúries or from areas under Iberian control where vines were also grown. Archaeobotanical remains of the same type have also been found at such settlements as Les Toixoneres (Calafell, Tarragona, Spain) (Sanmartí and Santacana 1987), Moleta del Remei (Alcanar, Tarragona, Spain), in all the levels of Mas Castellar de Pontós (Canal 2000), in samples from the first half of the third century B.C. at Puig de Sant Andreu d'Ullastret (Buxó 1997), and in the Neapolis of Empúries (Buxó 1989).

It is possible that at the beginning of the fourth century B.C., as part of the increase in surplus Iberian production fostered by Empúries, viticulture was expanded to include new cultivars. Possible evidence of this is the find of ready-to-plant vine stocks in the cargo of a shipwreck at El Sec (Calvià, Mallorca, Spain), dated to around 375 B.C. (Arribas et al. 1987). The vessel was sailing from the Aegean and Sicily to the Iberian Peninsula and was also carrying various types of wine amphorae from the central and eastern Mediterranean.

In southern Gaul we can also see the influence of the Greek colony of Massalia on the economic structure, and the changes it brought about in the whole Languedoc region (Brun 2003). For example, in the excavations at Lattes we can see how vine cultivation increased in relation to the traditional crops, as well as the cultural changes which it brought about in the second half of the third century B.C. This model allows us to pinpoint the economic strategies of a region in accordance with the external demand and internal political organization, in which the

Table 1 Archaeobotanical remains of *Olea* and *Vitis* finds from the study area

Site	Period	*Olea europaea/ oleaster*	*Olea europaea*	*Vitis vinifera sylvestris*	*Vitis vinifera*	*Vitis* sp.	References
Cova Santa Maira	Epipal	*		*			Aura et al. 2005)
Cova Santa Maira	Meso			*			Aura et al. (2005)
La Draga	Neo			**		*	Buxó et al. (2000)
Can Tintorer	Neo	***		*			Buxó et al. (1991)
Cueva del Toro	Neo	*					Buxó (1997)
Cueva de Nerja	Neo	**					Bernabeu et al. (1993)
Cova de les Cendres	Neo	*					Buxó (1997)
Abric de la Falguera	Neo		*				Pérez Jordà (2006)
Los Castillejos	Neo	*		*			Rovira (2007)
Cova 120	Neo/Chal	*					Agustí et al. (1987)
Campos	Chal	***					Buxó (1997)
Los Millares	Chal	**				*	Buxó (1997)
Las Pilas	Chal	**		*			Rovira (2007)
Los Castillejos	Chal	*		*			Rovira (2007)
Fuente Álamo	BA		*				Stika (1988)
Bauma Serrat del Pont	BA			*			Alcalde et al. (1994)
Bòbila Madurell	BA				*		Buxó (1997)
Castellón Alto	BA	*		**			Buxó (1997, Rovira (2007)
Cuesta del Negro	BA				**		Buxó (1997)
Cova Punta Farisa	BA			*			Alonso and Buxó (1995)
Hoya Quemada	BA			*			Buxó (1997)
Illa d'en Reixac	1st IA		*		*		Buxó (1997)
Bòbila Madurell	1st IA				*		Buxó (1997)
Vilot de Montagut	1st IA			*			Alonso et al. (2002)
Alto de la Cruz	1st IA					*	Cubero (1990)
La Mata	1st IA				**	*	Pérez Jordà (2004)
Castillo de Doña Blanca	1st IA (pc)		*		****		Chamorro (1994)
Cerro del Villar	1st IA (pc)				**		Català (1999)
Alt de Benimaquia	1st IA (pc)				*****		Gómez Bellard et al. (1993)
Torrelló d'Almassora	1st IA (pc)				*		Cubero (1993)
Los Villares	1st IA				**		Pérez Jordà et al. (1999)
Sant Martí d'Empúries	1st IA (gc)		*	*	**		Buxó (1999)
Turó Font de la Canya	1st IA (pc)				***		López (2004)
Les Toixoneres	1st IA (pc)				*		Sanmartí and Santacana (1987)
Barranc de Gàfols	1st IA (pc)					**	Cubero (1998)
Neápolis Empúries	2nd IA (gc)			**			Buxó (1989)
Turó Font de la Canya	2nd IA (ic)				**		López (2004)
Els Vilars	2nd IA (ic)			*		*	Alonso (1999)
Roques del Sarró	2nd IA (ic)			*			Alonso (1999)
Illa d'en Reixac	2nd IA (ic)				***		Buxó (1997)
Ullastret	2nd IA (ic)				*		Buxó (1997)
Mas Castellar	2nd IA (ic)		*		**	****	Canal (2000)
Arxiu Històric de Sitges	2nd IA (ic)				*		Cubero (1998)
Can Xercavins	2nd IA (ic)				*		Alonso (2004)
Moleta del Remei	2nd IA (ic)					*	Cubero (1998)
Castellet de Bernabé	2nd IA (ic)		****		****		Adelantado et al. (2003)
Puig de la Nau	2nd IA (ic)				*		Pérez Jordà et al. (1999)
Los Villares	2nd IA (ic)		*		***		Pérez Jordà et al. (1999)

Table 1 continued

Site	Period	*Olea europaea/ oleaster*	*Olea europaea*	*Vitis vinifera sylvestris*	*Vitis vinifera*	*Vitis* sp.	References
Bastida de les Alcuses	2nd IA (ic)		**		**		Pérez Jordà et al. (1999)
Tossal Sant Miquel Llíria	2nd IA (ic)		**		*		Pérez Jordà et al. (1999)
La Seña	2nd IA (ic)		**				Pérez Jordà et al. (1999)
La Rábita	2nd IA (ic)		*				Pérez Jordà et al. (1999)
Fuente Amarga	2nd IA (ic)		*		*		Buxó (1997)
Alto de la Cruz	2nd IA (ic)				*		Cubero (1990)

pc Phoenician context, *gc* Greek context, *ic* Iberian context; *Epipal* epipaleolithic, *Meso* mesolithic, *Neo* neolithic, *Chal* Chalcolithic, *BA* Bronze Age, *IA* Iron Age

* < 10 remains, ** > 10 remains, *** > 50 remains, **** > 100 remains, ***** > 1,000 remains

monoculture of the vine was a highly significant factor in the development of mass production for speculative purposes (Buxó 1996).

In the sixth century B.C., the Greek colonists of Massalia also introduced olive cultivation as the basis of their trade with southern and central Gaul, as well as with the north of the Iberian Peninsula (Buxó 1999). However, as we mentioned earlier, it would not be until the late Iron Age that this type of cultivation really became important.

In the south of France, archaeobotany tells us that olive trees were being cultivated from the late Iron Age (Brun 2003). However, this practice is mainly related to the Greek colonisation, and olive growing did not become widespread until the Roman period. The number of finds on the Iberian Peninsula is small and we have only identified structures related to olive cultivation in fourth and third century archaeological levels at the sites of Edetània (Camp del Túria, Valencia, Spain), Castellet de Bernabé, and La Seña (Pérez 1993).

It was not unusual for the indigenous peoples of the Iberian Peninsula to pick wild grapes, but we have yet to find any evidence of viticulture before the arrival of the Phoenician colonisers. Finds of *Vitis vinifera* var. *sylvestris* (wild grape) are common in the Iberian archaeobotanical record from the Neolithic period onwards (Table 1). They were consumed in various ways, as fresh or dried fruit, in biscuits, or made into grape flour, etc.

We find wild grapes at various prehistoric sites in Catalonia, from the Neolithic sites at La Draga (Banyoles; Buxó et al. 2000), Cova 120 (Sales de Llierca; Agustí et al. 1987), Bauma del Serrat del Pont (Tortellà; Alcalde et al. 1994) and Can Tintorer (Gavà; Buxó et al. 1991), and from the Chalcolithic–early Bronze Age at Bóbila Madurell (Sabadell) and Cova 120 (Agustí et al. 1987).

In the eastern zone, *Vitis* pollen has been recorded in levels dated to the Upper Palaeolithic in the cave of Les Calaveres (Benidoleig, Alicante; Fumanal and Dupré 1983), and in the cave of Les Mallaetes, between 27,000 and 29,000 B.P. (Barx, València, Spain; Dupré 1980). It has also been identified in Middle Pleistocene contexts in the south of the Peninsula at Padul (Granada; Florschütz et al. 1971), and around 4480 B.P. in a sondage at La Laguna de las Madres (Huelva; Stevenson 1985). Elsewhere, carpological (seed) studies show the presence of grape pips or pedicels in the Chalcolithic levels of Los Millares (Santa Fe de Mondújar, Almeria, Spain), in the Bronze Age contexts at Castellón Alto (Galera, Granada, Spain), and in Iberian levels at Fuente Amarga (Buxó 1997).

The presence of vine charcoal and grape remains in prehistoric archaeological contexts on the Mediterranean coast is reliable proof that grapes were native to the area. In short, we can consider that a long tradition of picking grapes as a fruit is possible, although the extreme dispersion of remains raises doubts as to the regularity of this practice. However, it is not until the Iron Age, or more specifically from the time of the Phoenician colonisation, that the increase in the number of grape pips found at

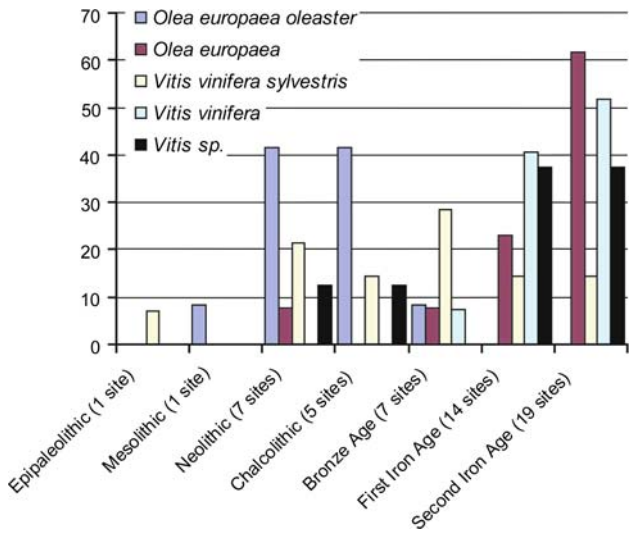

Fig. 4 Proportions of *Olea* and *Vitis* from archaeological sites in Mediterranean Spain, expressed in frequencies

archaeological sites indicates regular consumption and systematic viticulture (Fig. 4).

The variations in size and shape of *Vitis* seeds recorded at the archaeological sites on the Iberian Peninsula in this period may be related to the domestication process. They may also be considered as an intermediate type, somewhere between wild and domesticated or cultivated. Nevertheless, the influence on the domestication of the vine and the subsequent production of wine was one of the main consequences of the contacts between the indigenous peoples of the Iberian Peninsula and the Greek or Phoenician colonisers.

Viticulture appears to have spread rapidly to the interior of the Peninsula. This can be seen from the data collected at Alto de la Cruz (Navarra; Cubero 1990), where there is evidence of viticulture in the Ebro valley from at least the end of the seventh century B.C.

Olea europaea var. *oleaster* (wild olive) is well-documented in prehistoric times, but unlike the vine, it is found in thermo-Mediterranean or lower meso-Mediterranean bioclimatological areas. In addition, with the current techniques, it is extremely difficult to tell if a stone is from a wild or a cultivated olive. Neither is it easy to say whether a once cultivated tree has become wild, thus losing its cultivated characteristics. Neither seed nor pollen evidence can resolve this question.

In the Mediterranean area of the Iberian Peninsula, wild olive charcoal has been found in the Epipalaeolithic levels of the cave of Nerja (10,860 ± 160 B.P.), where it increases up to the beginning of the Neolithic (Bernabeu et al. 1993). It has also been found in Neolithic levels in the south of Catalonia at Can Tintorer (Gavà; Buxó 1997), with a similar evolution to that defined in the eastern zone (for example in Cova de l'Or) during the same period (Vernet et al. 1983). In the southwest of the Peninsula we continue to see it in the layers dating from the middle to the end of the Neolithic in the cave of El Toro, with a subsequent increase in the Chalcolithic period levels at the excavations of Campos, Los Millares and Las Pilas (Rodríguez 1992).

Archaeobotanical analyses also show the presence of wild olive stones in the south of France in the Mesolithic levels of the cave of L'Espérit (Roussillon; Leveau et al. 1991) and in the middle Bronze Age levels in the cave of Montou (Roussillon; Buxó 2006). However, on the Iberian Peninsula, wild olive finds are more abundant and the stones have been found in archaeological sites all along the Mediterranean coast. In the northwestern area, wild olives are found in mid-Neolithic contexts at Can Tintorer (Buxó et al. 1991), Chalcolithic/early Bronze Age contexts in Cova 120 (Agustí et al. 1987), in the eastern area in the early Neolithic at the cave of Les Cendres, in the southeast in the late Neolithic at the cave of El Toro and the cave of Nerja, in the Chalcolithic of Los Millares and Campos (Buxó 1997), Chalcolithic Almizaraque and Las Pilas (Stika and Jurich 1999) and finally, in the Bronze Age levels of Fuente Alamo (Stika 1988), El Argar (Stika and Jurich 1998) and Serra Grossa (Hopf 1971), El Argar, Ifre, Zapata (Hopf 1991) and El Garcel (Buschan, in Hopf 1991).

The introduction of vine and olive cultivation represents great changes in the economic systems of the indigenous societies, which had previously been based mainly on the traditional crops of cereals and legumes. Wine as an element of cultural change was introduced as a luxury item for consumption by the elite classes. In part, it replaced the alcoholic drinks made by fermenting cereals, to the extent that it became a means of cultural dissemination and adaptation of the practices of indigenous societies to ceremonies of Mediterranean origin.

The impact of colonization on the traditional cultivation of cereals and legumes

The social and economic complexity of the Iron Age can also be interpreted by studying the traditional crops of cereals and legumes, as well as the farming practices (Table 2). The Iberian diet was based on cereals and legumes. However, the promotion of the vine as a highly profitable product during the late Iron Age suggests an increase in the amount of land which was used for vineyards, although without affecting the cultivation of cereals for local consumption. Accustomed to a type of agriculture

Table 2 Comparative finds of cultivated plants (cereals, pulses, oil and fibre crops and fruits) from Iron Age sites in Mediterranean Spain: major component (*black colour*) to minor component (*grey colour*)

	1st IA	2nd IA	
Avena sativa			cultivated oats
Hordeum vulgare			hulled barley
Hordeum vulgare var. *nudum*			naked barley
Triticum aestivum/durum			naked wheat
Triticum dicoccum			emmer wheat
Triticum monococcum			einkorn wheat
Panicum miliaceum			common millet
Setaria italica			foxtail millet
Cicer arietinum			chick pea
Lathyrus sativus/cicera			grass pea
Lens culinaris			lentil
Medicago sativa			alfalfa
Pisum sativum			pea
Vicia ervilia			bitter vetch
Vicia faba			faba bean
Vicia sativa			common vetch
Linum usitatissimum			flax
Olea europaea			unclear wild/cultivated olive
Olea europaea/oleaster			cf. wild olive
Vitis vinifera ssp. *sylvestris*			wild grape
Vitis sp.			unclear wild/cultivated vine
Vitis vinifera			cultivated wine

IA Iron Age

with one or two harvests a year, the produce of which was consumed or traded immediately, the locals had to get used to the vine and the olive, which have a long period without any yield, a time during which there was no profit to be shown on the investment, despite having allocated a large area of land and human and material resources to it.

The first Iron Age is characterised by the individualized spread of the new cereal species *Panicum miliaceum* (millet) and *Avena sativa* (oats). The commonest original cereals are *Hordeum vulgare* (hulled barley), *Triticum aestivum/durum* (free-threshing wheat) and *Triticum dicoccum* (emmer wheat). Among the different types of wheat, we can highlight a large proportion of free-threshing wheat, although there is also evidence of an appreciable amount of emmer wheat, at least in certain Mediterranean areas of the Iberian Peninsula (Fig. 5).

This cereal production was supplemented by cultivated legumes such as *Pisum sativum* (pea), *Lens culinaris* (lentil) and *Vicia faba* (bean), and complemented and augmented by *Vicia sativa* (vetch), and possibly *Medicago sativa* (alfalfa). Finally, *Panicum miliaceum* (millet) and later *Avena sativa* (oats) were developed as new crops in the indigenous communities (Buxó et al. 1995). Their expansion continued throughout the period, although millet becomes particularly widespread from the early Iron Age, and is found in the majority of excavations in the Mediterranean area of the Iberian Peninsula (Buxo 1997).

The archaeobotanical records indicate the technical complexity acquired by the agriculture of this period. In addition to the generalised use of metal tools, new techniques in farming practices were introduced, underlining a capacity for surplus cereal production (basically barley and wheat), together with the growing of legumes, the incorporation of new crops (some of them to be used as animal feed), and the spread of vine monoculture. These changes came about as a result of the increasing pressure of population growth that required ever-larger areas of woodland to be cleared, causing it to recede even before the effects of Roman agriculture became evident.

The most representative cultivated plants are those which we commonly find in the Iron Age, although from the Second Iron Age there is a highly significant predominance of hulled barley and free-threshing wheat, and a small amount of hulled wheat, as well as the introduction of millet among the most important cereals.

The historical sources indicate that the new economic strategies did not exclude the use of fibre crops in different settlements, *Linum usitatissimum* (flax) in Empúries or *Stipa tenacissima* (esparto grass) in the Cartagena area. Flax was first cultivated for its oil, but later became progressively more used for its fibres.

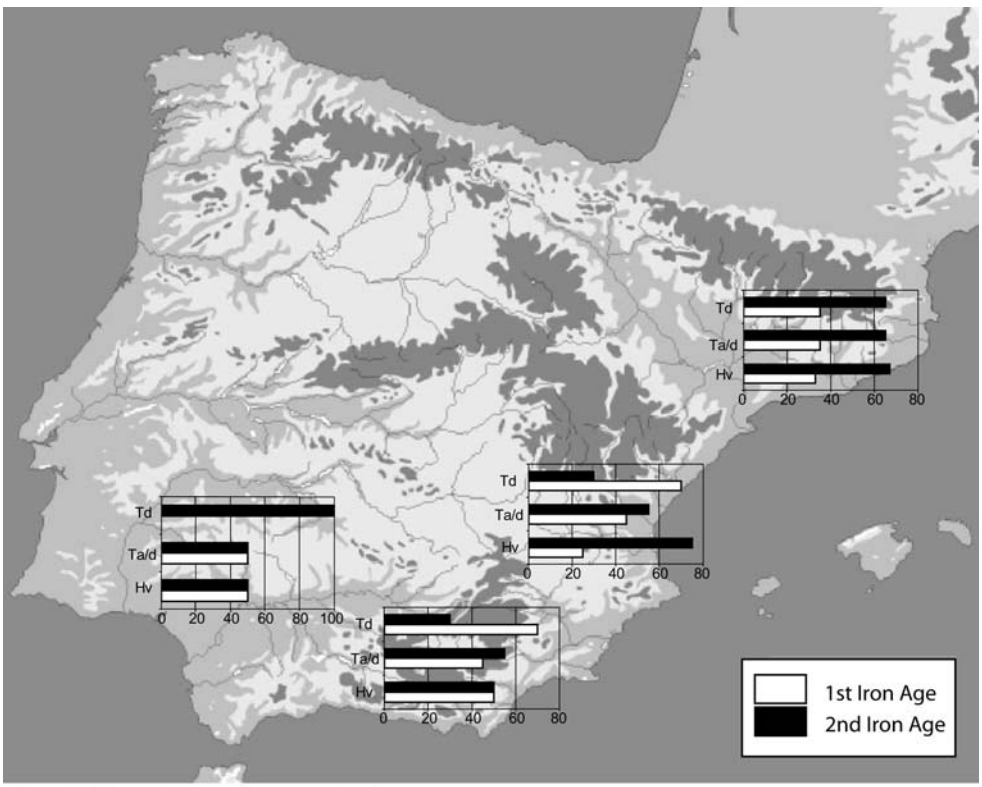

Fig. 5 Proportions of principal cereals from Iron Age sites in Mediterranean Spain, expressed in frequencies

Td *Triticum dicoccum* (emmer wheat)
Ta/d *Triticum aestivum/durum* (free-threshing wheat)
Hv *Hordeum vulgare* (hulled barley)

Conclusion

The first signs of trade between the indigenous societies that subsequently came to make up the Iberian world date back to the seventh century B.C. or, at the earliest, the end of the eighth century. The economy of the Iberian period native settlements is characterised by a combination of different cereals and pulses, although their agriculture was mainly based on cereals. This system was accompanied by livestock rearing, represented by ovicaprids (mainly sheep), although, compared to previous periods, there was decreasing emphasis on pastoralism and an increase in organised pig-rearing (Ruiz and Molinos 1995).

The value of agricultural products, mainly cereals, within the trade network stimulated by the colonists (initially the Phoenicians and Etruscans, and then later the Greeks) could have favoured more intensive farming to increase the production of surpluses by the indigenous Iberians.

However, one of the most interesting aspects of the agriculture of this period is the appearance of vine and olive cultivation. It was the colonisation by Phoenicians and Greeks that stimulated the change to viticulture. The current hypothesis suggests that local wine production began during the seventh century B.C. Proof of this can be found in the remains and the presence of production-related structures recorded at the site of Alt de Benimaquia (Dènia, Alicante, Spain), or more recent evidence of cultivated vines at the site of Turó de la Font de la Canya (southern Catalonia) (Gómez Bellard et al. 1993; López 2004).

The main expansion in olive cultivation took place during the Roman period (Brun 2003). However, several archaeological structures related to olive processing in the third century B.C. have been found in the areas surrounding Edeta (Llíria, Camp de Túria) and Kelin (Caudete de las Fuentes, Plana d'Utiel), although the status of the olive remains is still somewhat contradictory (Pérez Jordà et al. 1999).

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