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The Emergence of Arboriculture in the 1st Millennium BC along the Mediterranean's "Far West"

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Abstract: This paper presents the history of the introduction and expansion of arboriculture during the 1st millennium BC from the South of the Iberian Peninsula to the South of France. The earliest evidence of arboriculture at the beginning of the 1st millennium hails from the south of the Iberia from where it spread northward along the peninsula's eastern edge. The different fruits (grape, olive, fig, almond, pomegranate and apple/pear) arrived together in certain areas in spite of uneven distribution and acceptance by local communities. Grape was the crop with the greatest diffusion. The greater diversity of crops in the southern half of the peninsula is also noteworthy. Their development paved the way for a commercial agricultural model in some territories where fruits and their derivatives, such as wine and oil, played vital roles.

Keywords: Europe; fruit cultivation; Iron Age; colonization; wine

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1. Introduction

The history of agriculture begins in the eastern Mediterranean towards the 9th millennium cal. BC, from where it expanded towards the west. This process was completed in the middle of the 6th millennium cal. BC with the establishment in the Iberian Peninsula of the first farming communities [1–4]. It was an extensive process that led to the implantation of the annual cycle crops (cereals, pulses and oil plants) throughout all the territories of the Mediterranean seaboard.

Widespread cultivation of fruit, however, does not appear to have taken place during the first millennia despite the arguments of certain authors of fig domestication prior to that of cereals and pulses [5–7]. The origin of fruit cultivation is problematic and usually placed in southwest Asia in the 5th millennium cal. BC [8–11]. It only gained relevance in the Near East between the 4th and 2nd millennia BC [12] and in some areas of the Aegean [13,14].

Olives, grapes, figs, dates, almonds and pomegranates were the first domesticated fruits as they are pre-disposed for this process of cultivation due to the ease of their vegetative reproduction. Other fruits such as apple, pear, plum, cherry and peach were incorporated later either by grafting [10] or simply by sowing [15].

Fruits, such as grapes, olives, figs and apples, already grew naturally throughout much of the Mediterranean [10,16–19] and were gathered by the different communities. They are thus taxa that usually appear marginally in the archaeobotanical record prior to their domestication. Although some such as olives or figs are thought to have benefitted from early cultivation in the east of Iberia based on either their frequency or on morphometric criteria [20–22], there is no evidence of their continuous exploitation in this area until the turn of the 1st millennium BC [23]. Overall, however, there are arguments that these crops appear to follow an east—west expansion throughout the Mediterranean, a process similar to that of cereals, pulses and oil crops a few millennia earlier.

The earliest evidence of the cultivation of fruit, towards 1300 BC, in the western Mediterranean, is from Sardinia [24]. However, the most solid evidence of systematic development of arboriculture from the outset of the 1st millennium is from Tunisia [25,26], the south of Iberia [27] and Etruria [28]. Arboriculture coupled with social complexity and urbanisation accompanied the transformation of the communities of the western Mediterranean. This can be viewed as the development of a new world characterised by an increase in contacts and technological [29] and commercial exchanges between local communities and those from the eastern Mediterranean, leading to transformations affecting all of the groups [30–33].

Other indicators besides archaeobotanical finds reinforce the notion of the expansion and the significance of arboriculture. These include evidence of the circulation of amphorae containing different fruit derivatives [31,34,35], the identification of fields attributed to arboriculture [36–38] and finds of features linked to produce goods, such as wine and oil [39–43].

The geographic scope of this study (SE Iberia and S of France) falls within the Thermo, Meso and Supra-Mediterranean bioclimatic zones [44,45], areas bearing similar climatic features characterised by summer drought and irregular rainy periods and high summer and mild winter temperatures. The differences between the various sectors of the study area are along the lines of temperature and precipitation with those of arid zones in Andalusia with rainfall below 200 mm per year compared to territories in eastern Iberia and southern France with rainfall exceeding 1000 mm. Most of the archaeological sites serving as references for this study are along or near the coastline, generally at low elevations. Others are farther inland, generally in river valleys (with the exception of the site of Kelin at 800 m above sea level).

The study area, although extensive, reveals a great degree of heterogeneity as early as the end of the 2nd millennium BC and does not follow a uniform historical process throughout the 1st millennium BC. They share a series of common elements, such as contacts with the Phoenician and Greek colonial worlds and the development of processes of social complexity. However, they are marked by very different realities and different rates of change. This is one of the reasons that this study differentiates the regions and territories in order to reflect their diversity and asynchronicity, which likewise affected their adoption of arboriculture.

The study area since the outset of the 1st millennium became more integrated into Mediterranean commercial and cultural networks [46]. Encounters [47] between local communities and colonial groups and merchants from the Eastern Mediterranean was a new component that favoured the different processes of social and economic transformation, which had certainly already been initiated. These, at times, culminated in urban or proto-urban structures and, in others, different forms of rural communities [31,48–51]. It cannot be forgotten that apart from the influence of certain products, such as metals, on this process of social transformation, all these communities still depended on agriculture for their subsistence. Moreover, a great part of the exchange of commercial and goods, which

led certain members of these communities to acquire power, were products of agriculture and livestock. Therefore, land and its products are one of the fundamental agents serving to found this new social reality.

The local communities that came into contact with the Mediterranean world either through trade or direct contact with the Phoenician and Greek colonial settlements saw different technological developments, which generated a transfer of some of these innovations (wheel-thrown pottery, iron, fruit cultivation, etc.) between the different groups.

The earliest Phoenician colonies along the southern coast of the Iberian Peninsula and the mouth of the Segura River are recorded in the 10th–9th centuries BC [52,53]. Except for the Island of Ibiza, there were no colonial establishments north of the Segura River. There was, nonetheless, from the 8th to 7th centuries BC, an intense contact with the colonial world up to the south of France. Colonies linked to the Greek in the south of France and in the north of Catalonia do appear from the 6th century BC [31,51]. Different communities at this moment coexisted and shared the territory, which in part evolved in parallel, albeit simultaneously maintaining elements confirming their own identities. It is difficult to correlate the few written references to the different Iberian and the Gallic tribes with the archaeological record. Moreover, these sources date to specific moments and cannot be extrapolated to the entire millennium.

The history of the communities occupying this vast territory from the beginning of the millennium to their integration under the Romans did not follow a linear evolution. In any case, these were communities with economies founded on agriculture, although very different realities that nonetheless saw different levels of participation in an intense developing commercial activity, as well as in the orientation of its agricultural activity, as is highlighted by this study.

2. Materials and Methods

This study is founded on published and unpublished archaeobotanical data from 148 sites (Figure 1). Since some reveal multiple levels of occupation, the total can be upped to 208 sites/phases (Table 1).

Most of the archaeobotanical remains are preserved by charring. The waterlogged finds, less common, allow nonetheless to identify taxa that are not among the charred samples. The following five sites yielded waterlogged remains: Huelva (9th–8th c. BC) in Andalusia, Tossal de les Basses (4th c. BC) in the south of the Valencian region, Els Vilars Fortress (5th c. BC) in western Catalonia, and Massalia and Port Arianne (6th–2nd c. BC) in eastern Languedoc (Rhône valley). This current study resorted exclusively to charred materials to quantify the values.

Quantification was carried out following two parameters: (1) the minimal number of individuals (MNI) estimated by adding the number of fragments divided by two to the number of complete remains, and (2) the ubiquity of each of the taxa and that of two of the groups of cultivated plants (cereals and fruit). The reason for comparing the values of the two cultivated plant groups is based on the fact that cereals were more common and generally the staple of human communities since the Neolithic. The intention is to attain a quantitative approach to explore the role of fruits in the economy of each of these communities. In order to notice it, in Figures 3–5, the graphs to the left, representative of each geographic sector, illustrate the total crop's percentage of fruit remains and each site's trend. The middle graph renders the ubiquity of the fruit and each site's trend. Finally, the graph to the right represents the relationship between the ubiquity of fruit and that of cereals which serves to assess the significance of each group in each community's agricultural activity. For this, we subtracted the ubiquity of the cereals from that of fruits so that the remaining value, in the case of equilibrium, approximates zero. If, on the other hand, cereals are dominant, the values would be negative and the opposite when fruits are dominant.

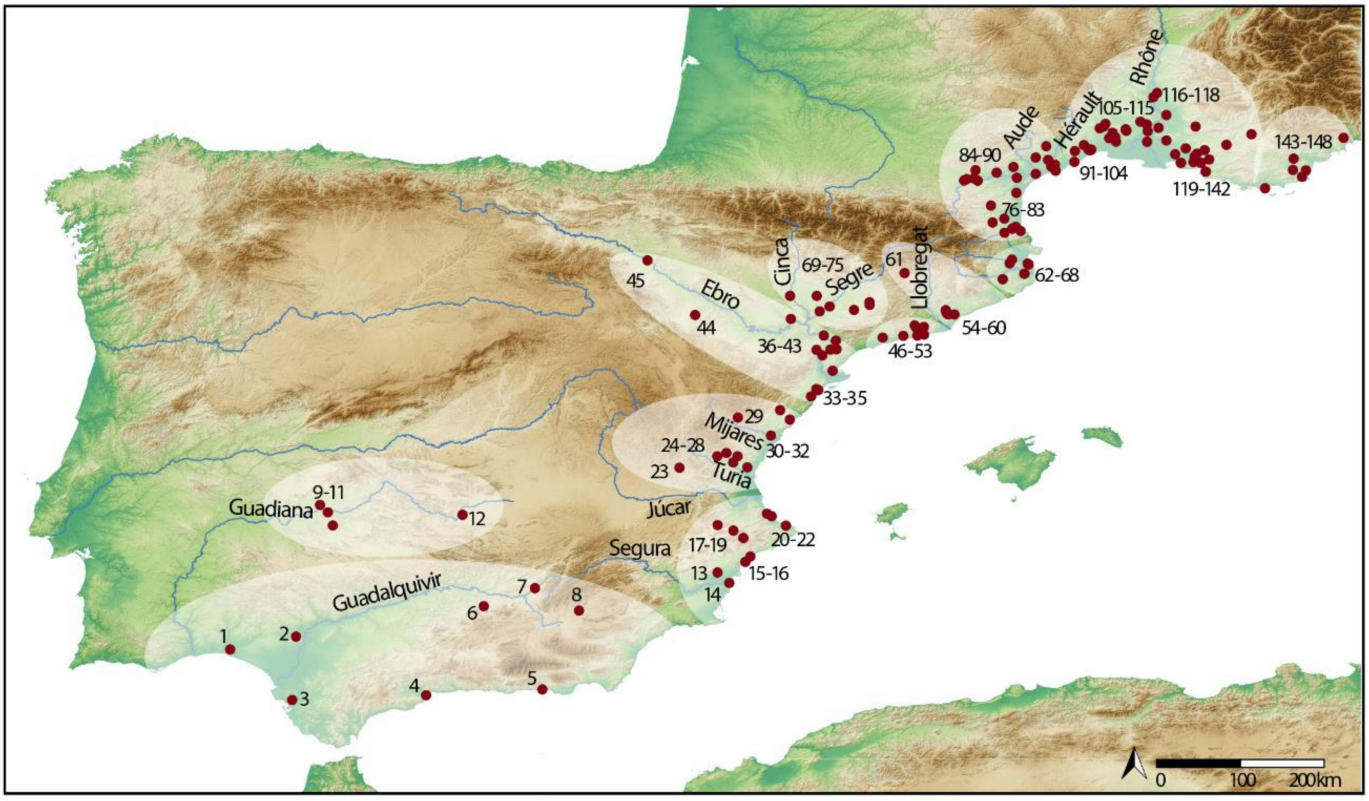

Figure 1. Map of the study area with the position of the archaeological sites and differentiated areas.

Table 1. List of sites corresponding to each area with indication of the phases yielding materials.

		Site	References	10th–9th	8th	7th	6th	5th	4th	3rd	2nd	1st
Andalusia	1	Huelva	[27]	x								
	2	Jardín de Alá	Pérez-Jordà, unpublished	x								
	3	Castillo de Dña. Blanca IV-III	[54]			x	x					
	4	Rebanadilla	Pérez-Jordà, unpublished		x							
	5	Abdera/Cerro de Montecristo	Pérez-Jordà, unpublished			x	x	x				
	6	Puente Tablas	[55,56]						x			
	7	Turruñuelos	[57]					x	x			
	8	Fuente Amarga	[55]						x			
Guadiana	9	Cerro Manzanillo	[58]				x					
	10	La Mata	[59]					x				
	11	Entrerrios	[60]						x			
	12	Alarcos	[61]						x			
S. Valencia	13	Fonteta	[62]			x	x					
	14	El Botx	[63]	x								
	15	Tossal Basses	[63]						x			
	16	Illeta dels Banyets	[63]						x			
	17	El Puig d'Alcoi	[63]						x			
	18	Cova de la Sarsa	[63]	x								
	19	Bastida de les Alcusses	[63]						x			
	20	Alt de Benimaquia	[63]			x						
	21	Barranc de Beniteixir	[63]	x								
	22	La Vital	[63,64]	x								

Table 1. *Cont.*

		Site	References	10th–9th	8th	7th	6th	5th	4th	3rd	2nd	1st
C. Valencia	23	Kelin	[63]			x	x	x				
	24	Castellet Bernabé	[63]					x		x		
	25	Tos Pelat	[63]					x	x			
	26	Edeta	[63]							x		
	27	La Seña	[63]							x		
	28	Puntal dels Llops	[63]							x		
	29	Los Morrones	Pérez-Jordà, unpublished				x					
	30	Torrelló d'Almassora	[65]				x					
	31	Mortorum	Pérez-Jordà, unpublished				x					
	32	Tossal de la Vila	Pérez-Jordà, unpublished			x						
Ebro	33	Puig de la Nau	[66]					x				
	34	Moleta de Remei	[66]					x				
	35	Sant Jaume Mas d'en Serrà	[67]				x					
	36	Bordissal	López Reyes, unpublished							x		
	37	Castellot de la Roca Roja	López Reyes, unpublished							x		
	38	Coll del Moro	López Reyes, unpublished							x		
	39	Barranc Gàfols	[68]		x							
	40	Castellet de Banyoles	López Reyes, unpublished							x		
	41	Calvari del Molar	López Reyes, unpublished			x						
	42	Sebes	López Reyes, unpublished				x					
	43	Tozal de los Regallos	[69]		x							
	44	Cabezo de la Cruz	[70]		x	x	x					
	45	El Castillo	Pérez-Jordà, unpublished					x	x	x		
	46	El Pontarró	[71]					x				
C. Catalan Coast	47	Font de la Canya	[72]				x	x				
	48	Olèrdola	[73]				x		x			x
	49	Santa Maria dels Horts	López Reyes, unpublished				x					
	50	Font de la Canya	[72]					x				
	51	Xalet Nin-Darró	López Reyes, unpublished						x			
	52	Mas d'en Gual 3	López Reyes, unpublished							x		
	53	Biblioteca Sitges	López Reyes, unpublished									x
Vallès-Llobregat	54	Bòbila Madurell	[74]				x					
	55	Ca n'Oliver	[75]; López Reyes, unpublished					x	x		x	
	56	Can Gambús 2	[76]				x					x
	57	Can Xercavins	[75]					x	x			
	58	Malesses	[77]						x			
	59	Medicina	[75]							x		
	60	Sitges UAB	[78]				x					
	61	Sant Esteve	[79]							x		

Table 1. *Cont.*

		Site	References	10th–9th	8th	7th	6th	5th	4th	3rd	2nd	1st
NE Catalonia	62	Sant Martí d'Empúries I	[80]; Buxó & Rovira, unpublished	x		x	x	x				
	63	Empúries	[81]					x	x			
	64	Illa d'en Reixac	[74]					x	x			
	65	Mas Castellar de Pontós	[82]					x		x		
	66	Ullastret	[74]					x	x		x	
	67	Camps de l'Hospital	López Reyes, unpublished							x		
	68	Camps de Can Massot	López Reyes, unpublished							x		
W. Catalonia	69	El Vilot II	[83]	x								
	70	Gebut	Alonso & Tarongi, unpublished			x	x			x		
	71	La Codera	Alonso, unpublished			x						
	72	Vilars	Alonso unpublished			x	x	x				
	73	Estinclells	Alonso & López Reyes, unpublished							x		
	74	Missatges	Alonso, unpublished							x	x	
	75	Roques del Sarró	[69]							x		
Roussillon-W. Languedoc	76	Ravaner 1 (Le)	Marinval, unpublished		x							
	77	Corbières (Rue des)	[84]						x		x	
	78	Colomina d'en Maurell	Bouby, unpublished							x		
	79	Pla de Molas	[85]								x	
	80	Montou (Grotte de)	[86]								x	
	81	Camp del Viver	[87]	x								
	82	Coumo dal Cat	[88]				x					
	83	Pech Maho	[89]; Pinaud-Querrac'h, in progress				x	x		x		
	84	Béragne	[90]									x
	85	Carsac	[91]		x			x				
	86	Gravette (La)	Marinval, unpublished	x			x					
	87	Laouret (Le)	Marinval, unpublished		x							
	88	Monédière (La)	[92] Pinaud-Querrac'h in progress; Pinaud-Querrac'h & Rovira unpublished				x	x				
	89	Montlaurès	Canal, unpublished					x				
	90	Pujals 4	[85]								x	

Table 1. *Cont.*

		Site	References	10th–9th	8th	7th	6th	5th	4th	3rd	2nd	1st
	91	Montfau	[93]				x					
	92	Courtinals	[94]					x				
	93	Garennes (Les)	Figueiral, unpublished				x					
	94	Mont Joui	[95]					x				
	95	Conesa (Place)	[96]					x	x			
	96	Motte (La)	[97]		x							
	97	Fangade (La)	[96,98]	x								
	98	Joncasses (Les)	Figueiral & Ivorra, unpublished			x						
	99	Lycée Technique	[99]			x						
	100	Chemin Saint Pierre	Figueiral, unpublished						x			
	101	Port Ariane	[100]	x		x			x			
	102	Lattara	[101–106]; Rovira et al., unpublished					x	x	x	x	x
	103	Cougourlude (La)	Figueiral & Bouby, unpublished				x					
	104	Mas de Causse	[89]				x	x	x	x		x
	105	Plan Tour	[107]					x	x			
	106	Arriasse	[108]			x						
	107	Jouffe	Marinval, unpublished					x				
E. Languedoc-Rhône	108	Ambrussum - Funéraire	[109,110]							x		x
	109	Liquière (La)	[111]				x					
	110	Doulouzargues	Figueiral, unpublished							x		
	111	Cailar (Le)	[89]					x		x		
	112	Parking Jean Jaurès	Bouchette, unpublished									x
	113	Mas de Vignoles 9	[112]				x					
	114	Mas de Vignoles 10	[96,113]			x						
	115	Mas des Abeilles	Figueiral, unpublished			x						
	116	Le Nogeiret	Pinaud-Querrac'h & Rovira, unpublished; Pinaud-Querrac'h, in progress		x							
	117	Brassières Nord	[96]								x	x
	118	Brassières Sud	[96]			x						
	119	Caisses Saint Jean	[114]					x			x	
	120	Castellan	[96]								x	
	121	Cloche (La)	[114]									x
	122	Condamine 7	[115]					x				
	123	Coudouneu	[96,116]; Marinval, unpublished					x				
	124	Gach	Marinval, unpublished					x				
	125	Gardi	Marinval, unpublished				x					

Table 1. *Cont.*

		Site	References	10th–9th	8th	7th	6th	5th	4th	3rd	2nd	1st
	126	Jardin d'hiver	[114]					x				
	127	Jules Verne 11	[96,117]				x	x			x	
	128	Marduel	[114]	x			x	x			x	
	129	Martigues (île)	[114]Marinval, unpublished						x			
	130	Mourre de la Barque	Marinval, unpublished		x							
	131	Mourre de Sève	[118]Pinaud-Querrac'h, in progress; Pinaud-Querrac'h & Rovira, unpublished					x				
	132	Mourrel-Ferrat	Pinaud-Querrac'h & Rovira unpublished; Pinaud-Querrac'h, in progress							x		
	133	Notre Dame de Pitié	Marinval, unpublished								x	
	134	Pierredon	[114]								x	
	135	Portal Vielh	[96,119]	x								
	136	Roque (La)	[96]									x
	137	Roquepertuse	[120]					x			x	
	138	Sables (Les)	[96]			x						
	139	Sizen-Vigne	[121]							x		
	140	Teste Nègre	[114]								x	
	141	Tremaïe	[114]									x
	142	Val du Fou	[96]				x					
E. Provence	143	Peigros	Marinval, unpublished				x					
	144	Touar (Le)	[122]				x					
	145	Garde Freinet (La)	Pinaud-Querrac'h & Rovira, unpublished					x				
	146	Montjean	[114]					x				
	147	Olbia-de-Provence	Rovira, in press							x	x	x
	148	Buffe Arnaud	Marinval, unpublished								x	

Only sites/phases surpassing 10 or more samples served to estimate ubiquity. Moreover, the estimation of the percentage of each taxon is based on the number of remains from sites/phases comprising more than 50 cultivated plant remains. Unfortunately, it is not possible to compare the data provided by each of the counting systems of each site as they are not always available.

The sites were grouped into 12 zones (Figure 1). Although the criteria serving to define the grouping are diverse, an attempt was made so that each comprises a minimal number of sites and samples. There is nonetheless a marked inequality of archaeobotanical data among the different areas, which yields a certain imbalance. In short, we attempted, when possible, to group a series of sites according to historical–cultural criteria, while others were grouped according to their geographical position.

The study resorted to the century as its chronological unit. The sole exception is the merging of samples from the 10th and 9th centuries BC. As in the case of all artificial criteria, this choice at times led to hurdles as the phases of certain sites either spanned two or more centuries. In these cases, they were organised following two basic criteria: the greatest degree of coincidence or the most recent part of the sequence. In any case, the sites corresponding to the transition of the phases are highlighted in the results section.

Moreover, this study considers *Ficus carica, Malus/Pyrus, Olea europea, Prunus dulcis, Punica granatum* and *Vitis vinifera* as cultivated fruits. It excludes other taxa such as Pinus pinea, a gathered product, and Cucumis melo, a vegetable. Certain fruit such as *Prunus domestica*, *Juglans regia* and *Prunus avium/cerasus* were likewise discarded. The appearance of the first is actually doubtful and limited to a single site. The second is evidenced at only two sites in southern France, with one deemed an import [105,123]. The third is discarded as it is not possible to confirm if it was grown or collected.

3. Results

It is worth highlighting that the distribution of the data is neither spatially nor chronologically homogeneous (Table 2). The initial and final phases are the least represented. The period spanning the 6th–3rd centuries BC, in turn, reveals both the greatest concentration of sites/phases and the number of samples. This timeframe also corresponds to the greatest number of sites/phases with more than 10 samples and to the richest samples. These phases are likewise most representative of the geographical areas. The 6th century BC is specifically the only chronological unit with data from all the territories of the study area.

3.1. Andalusia

The arboricultural record of Andalusia, comprising both charred and waterlogged remains, stands out as the richest for the first chronological period. This territory can be divided into two areas (Figure 1): the first group of five coastal sites ranging from the 10th to the 5th century BC linked for the most part to colonisation and the second group of four inland sites from between the 5th and 3rd centuries BC spread throughout the Guadalquivir River Valley. Andalusia's coastal sites (Figure 2) yield the earliest (10th–9th centuries BC) evidence of both charred (grape and olive) and waterlogged (fig, pomegranate and almond) fruits, as well as vegetables, such as *Cucumis melo* [27]. Almost all fruits (excluding apple/pear) are found in this area since the outset of the 1st millennium BC. Moreover, it is noteworthy that Andalusia saw no new additions. Grapes were the most abundant from the 8th to the 5th centuries BC, while the most frequent was fig (surpassing olive). The evidence of pomegranate and almond appears to a lesser degree. The current data cannot confirm fruit in the Guadalquivir Valley until the 5th century BC. Here, grapes were most abundant, followed by olive and almond.

The number of remains reveals no clear trend (Figure 3) in spite of the fact that there is generally a progressive increase in fruit ubiquity. This evolution is confirmed by the relationship between fruit and cereals that equalises in the 7th century BC and by the fact that the fruit level clearly surpasses that of cereals in 5th century BC levels. Cereals, by contrast, appear to predominate in the 4th–3rd centuries BC, a time when the data stems from inland sites (as opposed to the coast).

3.2. Guadiana River Valley

This territory comprises four sites spread throughout the Guadiana River's Middle and Upper Basin (Figure 1). Most of the finds are nonetheless from the 4th century site of La Mata (Badajoz). Although there is evidence from 6th century BC contexts, its richest phase dates to the 4th century BC [59]. Due to the reduced number of 6th century BC samples, the first concrete evidence of fruit cultivation in this region dates to the 5th century BC (Figure 2). It takes on the form of grape, followed by fig, olive and almond. The situation of the subsequent 4th century BC, although similar, sees an increase in the frequency of the three fruits. This century also offers the first evidence of fruit in the Upper Guadiana

Basin, an area devoid of data for the more recent phases. The comparison of the number of remains and ubiquity of these remains suggests contradictory trends (Figure 3), with a decrease in the first case and an increase in the second. There is, nonetheless, little difference between cereals and fruits in the 5th century BC, a tendency that grows in the 4th century BC.

Table 2. Distribution of sites and samples in the different areas and phases.

	Sites/Phases									**Samples**								
Phases	**10–9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**10–9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Andalusia	2	1	2	3	3	3				48	20	17	11	21	39			
Guadiana				1	1	2							3	168	27			
S. Valencia	3	1	2	1		4				11	2	35	21		138			
C. Valencia			2	4	3	2	4					59	46	17	54	24		
Ebro		3	2	3	3		4				51	37	22	8		59		
W. Catalonia	1		3	2	1		4	1		20		0	119	24		0	14	
C. Coast Catalonia				3	2	4	2		2				16	22	28	13		6
Vallés-Llobregat				4	1	2	1	1	1				73	8	50	36	9	15
NE Catalonia	1		1	1	7	4	3	1		2		5	10	97	56	43	1	
Roussillon-W Languedoc	2	4		4	4	1	2	4	1	2	17		40	45	6	42	16	3
E. Languedoc -Rhône	4	3	8	11	19	9	7	11	8	1	32	21	20	477	185	98	52	65
E. Provence				2	2		1	2	1				3	17		20	34	14
Total	13	12	20	39	46	31	28	20	13	84	122	174	384	904	583	335	126	103
	Sites/Phases ≥ 10 Samples									**Sites + 50**								
Phases	**10–9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**10–9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Andalusia	2	1	1	0	1	2				2	1	1	2	2	3			
Guadiana				0	1	2							0	1	2			
S. Valencia	1		2	1		3				3	1	2	1		4			
C. Valencia			2	3	0	2	1					2	3	1	2	4		
Ebro		1	1	1	0		2				1	2	1	0		3		
W. Catalonia	1		2	1	1		1	1		1		2	1	1		2	1	
C. Coast Catalonia				1	1	2	1	1	0				2	2	2	1		1
Vallés-Llobregat				3	0	2	1	0	1				3	0	1	1	1	0
NE Catalonia	0		0	1	2	2	1	0		1		1	1	6	4	2	0	
Roussillon-W Languedoc	0	0		2	2	0	1	0	0	2	2		2	3	1	1	3	1
E. Languedoc-Rhône	0	1	1	0	5	3	4	1	3	3	2	6	8	16	7	7	8	5
E. Provence				0	0		1	2	1				2	1		1		
Total	4	3	9	13	13	18	13	5	5	12	7	16	26	33	26	22	13	7

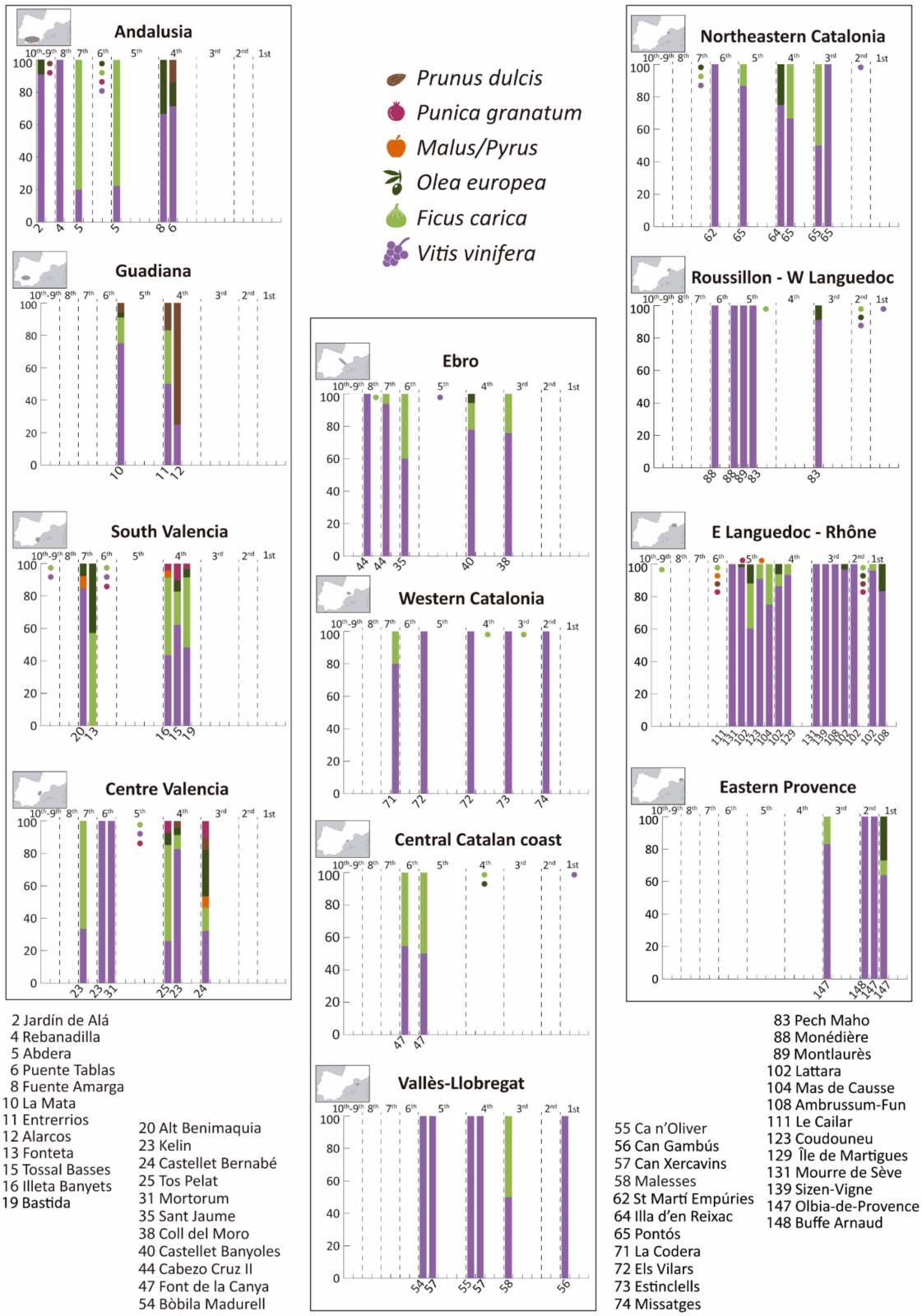

Figure 2. Percentage distribution of the different fruits based on ubiquity in the sites with more than 10 samples. The site numbers correspond to those of Figure 1 and Table 1. The points indicate taxa represented by less than 10 samples.

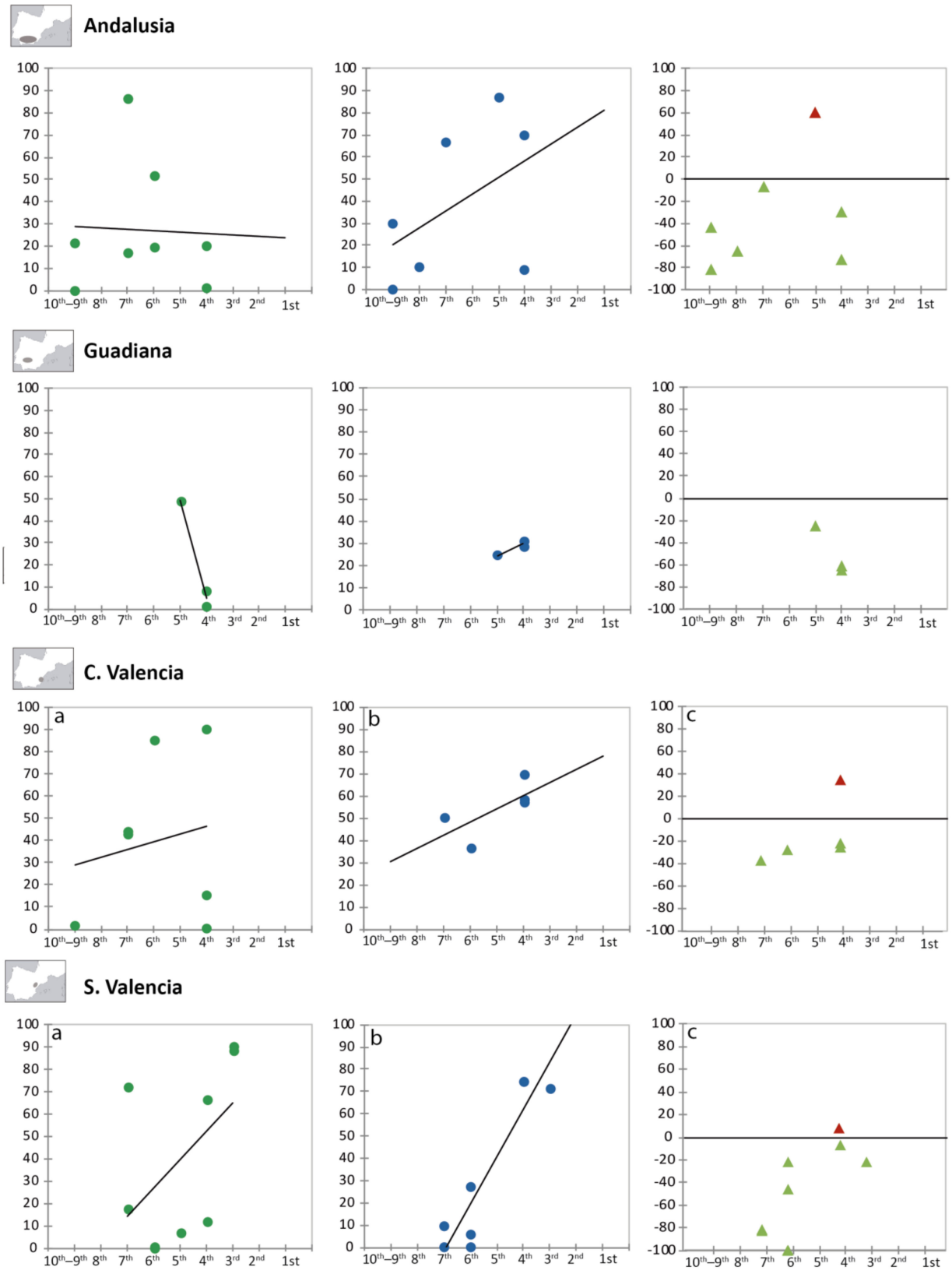

Figure 3. Fruit values (dot = site) and tendencies (line): (**a**) percentage of the number of remains, (**b**) ubiquity, (**c**) relationship between the ubiquity of fruits and cereals (red: sites where the values of fruit are higher than those of cereals).

3.3. South of the Valencian Region

Ten sites are grouped in the southern half of the Valencian area bounded by the Segura River to the south and the Xuquer River to the north (Figure 1). While a few occupy inland valleys, most are along the coast. Although the four sites from the initial phase yield very few samples and cannot be taken into account, they nonetheless reveal the presence of grape and fig in levels corresponding to the transition between the 9th–8th centuries BC (Figure 2). The relevance of grapevine cultivation is confirmed in the 7th century BC by a great frequency of archaeobotanical remains coupled with finds of wine presses [41] at coastal sites such as Fonteta [62] and Alt de Benimaquia [63]. This century also sees the introduction of apple/pear and olive. The 6th century is only represented by a phase from Fonteta where evidence of fig and olive is more common than that of grapes. The materials between the 5th and 4th centuries BC come from coastal sites, such as Illeta dels Banyets and Tossal de les Basses, and inland sites, such as La Bastida de les Alcusses and El Puig d'Alcoi [63]. Fruit, notably grape and fig, stand out far above olive, apple/pear and almond. This area, as of the 3rd century BC, yields no data.

The tendency of both the number of remains and ubiquity is to increase (Figure 3) in spite of the great differences between sites when considering the number of remains from the 4th century BC. This time reveals the greatest presence of cereals in the interior compared to a clear predominance of fruits along the coast at sites such as Tossal de les Basses. This is, in any case, a site where the sampling was carried out in its industrial area and not in a housing area [124].

3.4. Centre of the Valencian Region

This territory extending from the Xuquer River to the south to Millars River to the north comprises 10 sites in different geographical contexts (Figure 1). The five to the south are in the Túria River Basin, while Kelin is farther inland at 800 m above sea level. To the north are four sites either relatively close to the coast or in different inland river valleys. Data from this territory [63] ranges exclusively between the 7th–3rd centuries BC (Figure 2). The 7th century BC only offers information from two sites in the interior, and grape and fig are only recorded at Kelin. Grape continues to be recorded in levels of the 6th century BC in both the interior and along the area's northern limit. Other fruits such as pomegranate do not appear until the 5th century BC in the Turia Valley. The record in the subsequent 4th–3rd centuries BC reveals olives and almonds. The tendency (Figure 3) of this territory points to a difference between sites to the south and the north. The presence of fruits in the north is low, to the point of being absent in certain cases, whereas in the south, fruit appears fairly frequently from the 7th century BC. Therefore, there is a clear progression.

3.5. Ebro River Basin

The Ebro River's southern tributaries and mouth comprise twelve sites (Figure 1). This area's archaeobotanical record begins at the outset of the 8th century BC with evidence of grape and, to a lesser extent, fig collected at three sites between the river's middle course and lower zone (Figure 2). These conditions endured into the 7th and 6th centuries BC with an increase in fig and the introduction of grape at coastal sites. The record from the 5th century BC is poor, represented exclusively by coastal sites to the south of the river mouth with grape exclusively at Moleta del Remei [66]. Only later in the 4th century BC did the repertoire of fruit expand to olive, fig and grape. Grape continued to be the most relevant and coincided with the first wine press at Coll del Moro in the 3rd century BC [125].

A tendency for fruit to increase (Figure 4) is observed by the number of remains and the ubiquity despite its scarcity at some sites between the 7th and 3rd centuries BC. This progressive increase can likewise be observed when comparing the ubiquity of cereals and fruits, with a prevalence of fruits as early as the 3rd century BC.

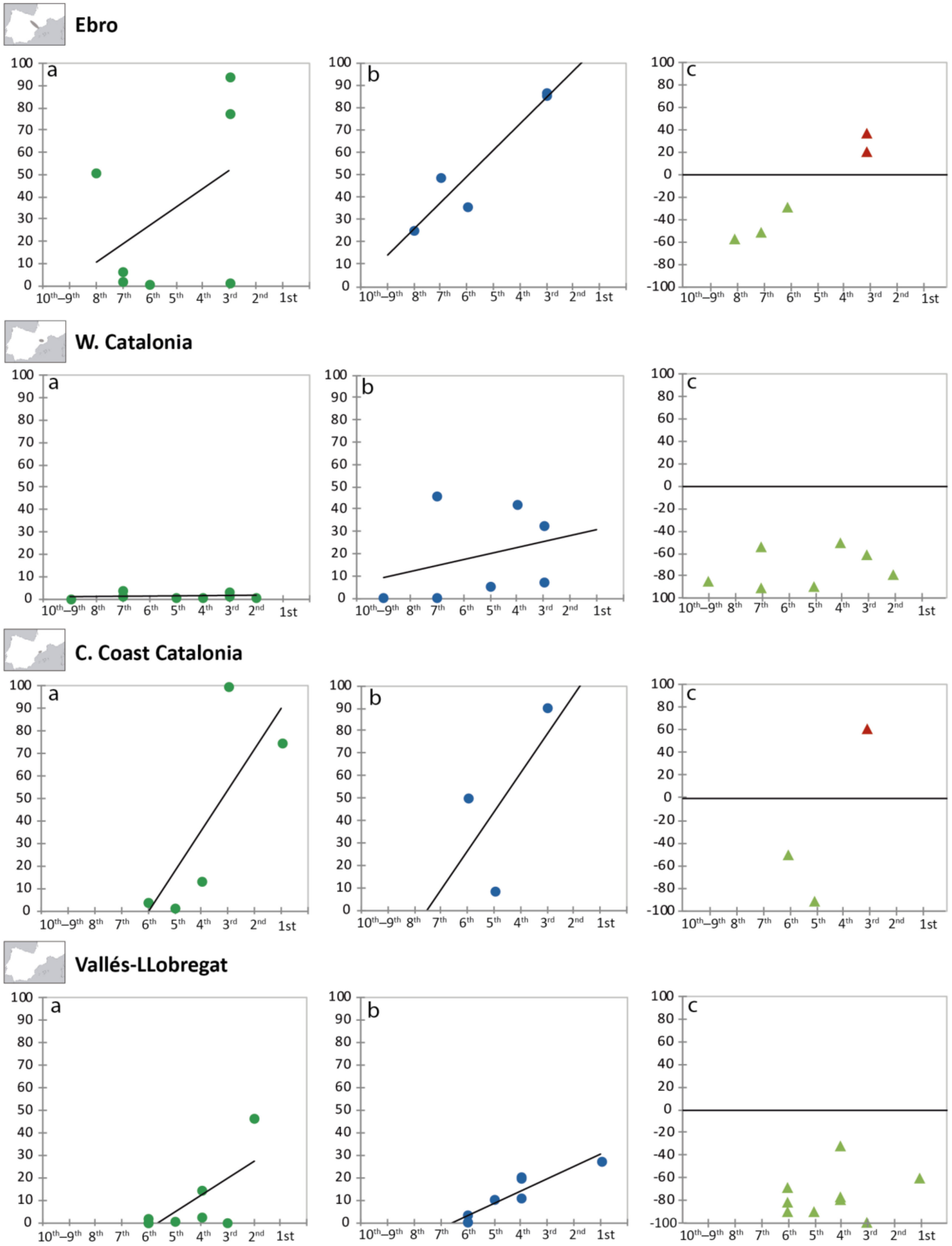

Figure 4. Fruit values (dot = site) and tendencies (line): (**a**) the percentage of the number of remains, (**b**) ubiquity, (**c**) the relationship between the ubiquity of fruits and cereals (red: sites where the values of fruit are higher than those of cereals).

3.6. Western Catalonia

The area, represented by seven sites, equates to the land bounded by the Segre and Cinca River Basins (Figure 1) [69,126]. Samples from the 9th to 8th centuries reveal no evidence of fruits (Figure 2). Grape and fig appear at La Codera from the 7th century BC. Samples from the 5th century BC, by contrast, reveal very low values of grape and no evidence of fig. Their frequency increases, however, in the 4th–3rd centuries BC. Structures linked to wine production are nonetheless known since the end of the 5th or outset of the 4th century BC [127]. The subsequent evidence from the 2nd century BC points to only the presence of grape.

Therefore, the area reveals no major changes throughout the sequence (Figure 4), with only a very modest increase in fruits. Moreover, there is no variation in the relationship between fruits and cereals, with the latter clearly predominant.

3.7. Central Catalan Coast

The Central Catalan coastal strip encompasses seven sites delimited to the south by the mouth of the Ebro and to the north by the Llobregat River (Figure 1). The archaeobotanical record in this area begins in the 7th–6th centuries BC, with fruit at two of the three sites highlighted by the presence of grape and, to a lesser extent, fig (Figure 2). This situation endured, albeit dwindling in number, throughout the 5th century BC. The record of the subsequent 4th–3rd centuries BC is irregular, with outstanding values of grapevine and to a lesser extent fig and olive. Other sites suggest that fruits are either very poorly represented or absent. Wine production is evidenced in these levels for the first time [128]. Finally, levels from the 1st century BC, evidenced by a few samples, only provided grape.

The tendency of the passage from the 7th to the 6th centuries BC (Figure 4) is for the values of fruit to increase in both the number of remains and ubiquity, shifting to fruit domination in 3rd century BC levels.

3.8. Vallès and Llobregat River Valley

The eight sites forming this group in the northern area of the Llobregat River Basin (Figure 1) are in the lowlands near the coast except for Sant Esteve that is farther inland. This group's archaeobotanical record (Figure 2), devoid of evidence of fruits, begins in the 6th century BC. Grape then appears discretely in the 5th century BC. The scarcity of fruit is a trend (Figure 4) that continues throughout the sequence and allows differentiating, in spite of a slight increase in the 2nd century BC, this territory from that of the central coast. Fruits are only present in the basin's lower area, represented exclusively and systematically by grape. Evidence of fig only appears in the 3rd century BC at Les Maleses [77].

3.9. Northeastern Catalonia

This area is represented by seven coastal sites in the interior of the Rosas Gulf (Figure 1). Their situation is unique as they are under the direct influence of *Emporium*, a Greek colony. The 9th century BC levels offer no evidence of fruits. These only appear (Figure 2) in the 7th century BC at Sant Martí d'Empúries [80], where grape stands out above fig and olive. The later levels of the 6th century BC, by contrast, only reveal grape. The archaeobotanical record expands in the 5th century BC with five sites dominated by low grape values and the occasional evidence of fig. The same schema endures into the 4th century BC in spite of the appearance of olive at Illa d'en Reixac [74] and an increase in the 3rd century BC of the values of fruits.

Fruit values are nonetheless very low when taking into account the number of remains (Figure 5) marked by a somewhat higher ubiquity and an upward tendency. This trend does not adhere to that between fruits and cereals as the latter remain prevalent.

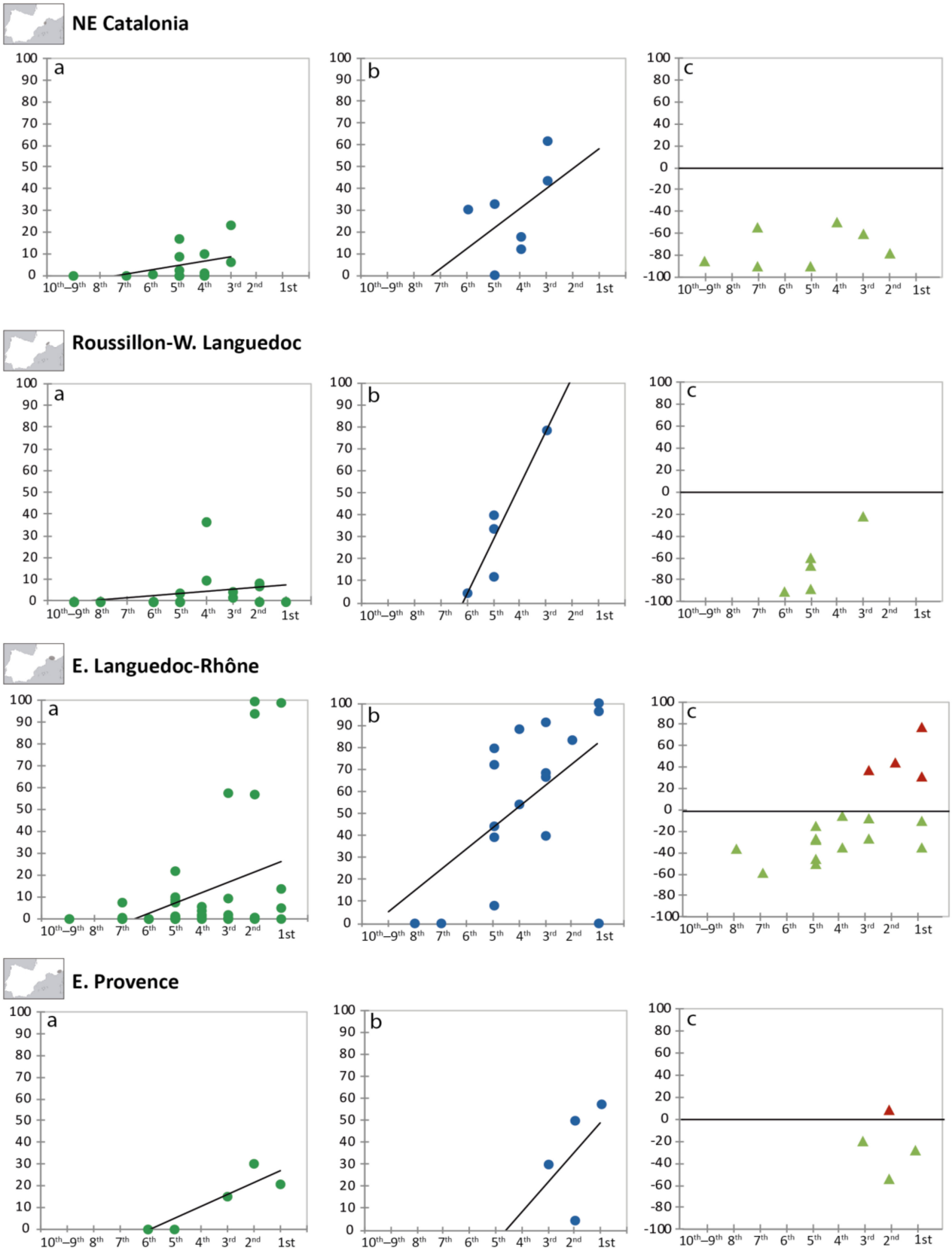

Figure 5. Fruit values (dot = site) and tendencies (line): (**a**) the percentage of the number of remains, (**b**) ubiquity, (**c**) the relationship between the ubiquity of fruits and cereals (red: sites where the values of fruit are higher than those of cereals).

3.10. Roussillon-Western Languedoc

This area englobing 15 sites extends between the northern slopes of the Pyrenees and the Hérault River Basin (Figure 1). The samples hail for the most part from three sites: La Monédière (Pinaud-Querrac'h and Rovira, unpublished), Montlaurès and Pech Maho [89,123]. The record reveals no evidence of fruit between the 10th and 8th centuries BC (Figure 2). Grape is only evidenced, albeit discretely, from the 6th century BC at Coumo dal Cat [88] and La Monédière. Fig only appears during the 4th century BC and olive in the 3rd century BC.

The tendency of fruit to increase (Figure 5) is clearer when taking into account the values of ubiquity, whereas the number of remains does not reveal practically any changes. The increase in fruit in the 3rd century BC attains values close to those of cereals despite the domination of cereals.

3.11. Eastern Languedoc and the Rhône Valley

This vast area between the eastern bank of the Hérault and the Rhône River Basin includes eastern Languedoc and western Provence. Overall, 56 sites yield archaeobotanical remains (Figure 1), although only 11 have more than 10 samples in any of their phases. Evidence of fruit between the 9th–7th centuries BC is extremely rare (Figure 2), limited to a few charred or waterlogged grape pips at La Fangade, La Motte, Lattes Port Ariane and Portal-Vielh, settlements linked to a lagoon environment to the south of the mouth of the Rhone [100,119,129]. Fruit, fundamentally grape and, to a lesser extent, fig and olive, begin to appear more often in levels of the 6th century BC. In addition, pear/apple, almond and pomegranate appear in waterlogged levels in this timeframe at *Massalia* [117,129]. This trend is consolidated in the 5th century BC when taxa, such as almonds, also appear in the charred form, coinciding possibly with the first case of plum (*Prunus* cf. *domestica*) at *Lattara* [104]. Fruits such as almonds and apple/pear only appear later in the 3rd–2nd centuries BC in waterlogged levels at *Massalia*, whereas pomegranate surfaces in the 1st century BC in the charred form at Tremaïe [114].

When considering only the number of remains (Figure 5), most of the sites reveal a very low percentage of fruit. Only *Lattara* [89] in the 3rd century BC and La Cloche [114] and Castellan [96] in the 2nd century BC present notable fruit values. Ubiquity increases in the 5th century BC when the majority of sites offer values of fruit surpassing 50%, a tendency that will increase until the turn of the era. This increase in fruit ubiquity becomes balanced with that of cereals from the 5th century BC. There is even a predominance of fruit ubiquity at Sizen-Vigne [121] from the 3rd century and at *Lattara* from the 2nd century BC onwards.

3.12. Eastern Provence

The record of the seven sites along the eastern fringe of this study area (Figure 1) is relatively poor. The 6th–5th centuries BC reveal no evidence of fruit (Figure 2). The 3rd century BC levels from Olbia [130] were characterised by the introduction of grapevine and fig and endured until the 1st century BC.

The little current data (Figure 5) appear to suggest an increase in the ubiquity and the number of fruit species from the 3rd century BC, with values close to those of cereals, rise even higher in the 2nd century BC.

4. Discussion

The study area of this article is obviously part of a much broader Mediterranean reality. The communities from the Eastern Mediterranean that came into contact with the groups from the 'Far West' had already seen a transformation of their agricultural system, a process incorporating arboriculture. These changes, with the possible exception of parts of Italy, did not take place in the Western Mediterranean until the outset of the 1st millennium BC [131].

Olive cultivation in Italy, based on pollen, anthracological or chemical analyses [8,132–134], is thought to have taken place since the outset of the 2nd millennium BC. However, this evidence is not bolstered by carpological data. A sort of exploitation of the vines is likewise suggested in the north of Italy as early as the 2nd millennium BC [135], whereas viticulture in the south could have been a process framed between the end of the 2nd and the 1st millennium BC [136]. The carpological data from Sardinia from the last third of the 2nd millennium BC do, in turn, certify the presence of different fruit trees, certain of oriental origin [24].

The earliest evidence of the cultivation of fruit trees in Tunisia comes from an inland Mauritanian settlement (Althiburos) [26] dated to the 10th–9th centuries BC. At Carthage, in turn, the first fruit trees appear in the 9th–8th centuries BC [137,138]. The Algerian coast and the Mediterranean sector of Morocco offer no data to date. Only the site of Lixus along the Atlantic coast allows certifying the presence of fruit trees in the 8th–7th centuries BC [139].

4.1. What Is New?

Two groups can be distinguished within the assemblages of fruits identified throughout the 1st millennium BC along the Mediterranean's western fringe. The first correlates with fruit species with wild regional ancestors such as the grapes, fig, olive and apple/pear. The second lines up with domesticated fruits, such as almonds and pomegranates, bereft of wild ancestors in the area. These were presumably introduced by populations from south-western Asia and the eastern Mediterranean [10,11]. The question is whether the first four crops experienced a local development in this or in an earlier timeframe or if they are varieties exclusively introduced from the Eastern Mediterranean.

The natural distribution of these taxa extends throughout most of the study area [10]. Although fig and grape are spread throughout the territory, apple and pears do not grow in much of the eastern and southern edge of Iberia, and the olive only prospers in the Thermo-Mediterranean and in the lower parts of the Meso-Mediterranean zones [8,17]. Therefore, olive distribution is restricted in the coastal areas and even absent along parts of the coasts of Catalonia and the south of France [140]. Moreover, its penetration inland is limited to the lower and middle areas of the Guadalquivir and Guadiana River Valleys.

Based on these parameters (Figure 6), apple/pear remains in the Valencian area are beyond their zone of natural expansion. Olives in the 6th–5th centuries BC are likewise at the limit of their natural distribution area in the eastern Languedoc-Rhône Valley [118].

A discussion as to whether the remains of grapevine, olive, fig and apple/pear correspond to wild or cultivated varieties must also be raised based on other elements of the record. One is their frequency of occurrence and the number of remains. They correspond to taxa that only appear exceptionally throughout the Holocene, although some such as olives and figs appear relatively frequently in the SE of the Iberia throughout the 3rd–2nd millennium BC leading certain authors to suggest they were cultivated [20,141]. Other arguments consider that they actually represent collected wild fruits growing naturally around these sites [8,23]. The situation changed throughout the 1st millennium, evidenced by the systematic recording of abundant remains of the four species. They are likewise accompanied in certain areas by fruits of eastern origin.

A number of studies have likewise attempted to distinguish wild and cultivated fruit species, as well as their different varieties, through morphometric and DNA analyses [24,142–147]. The findings of the morphometric approach to 6th century BC grape pips from the south of France, for example, suggest cultivation [129,148].

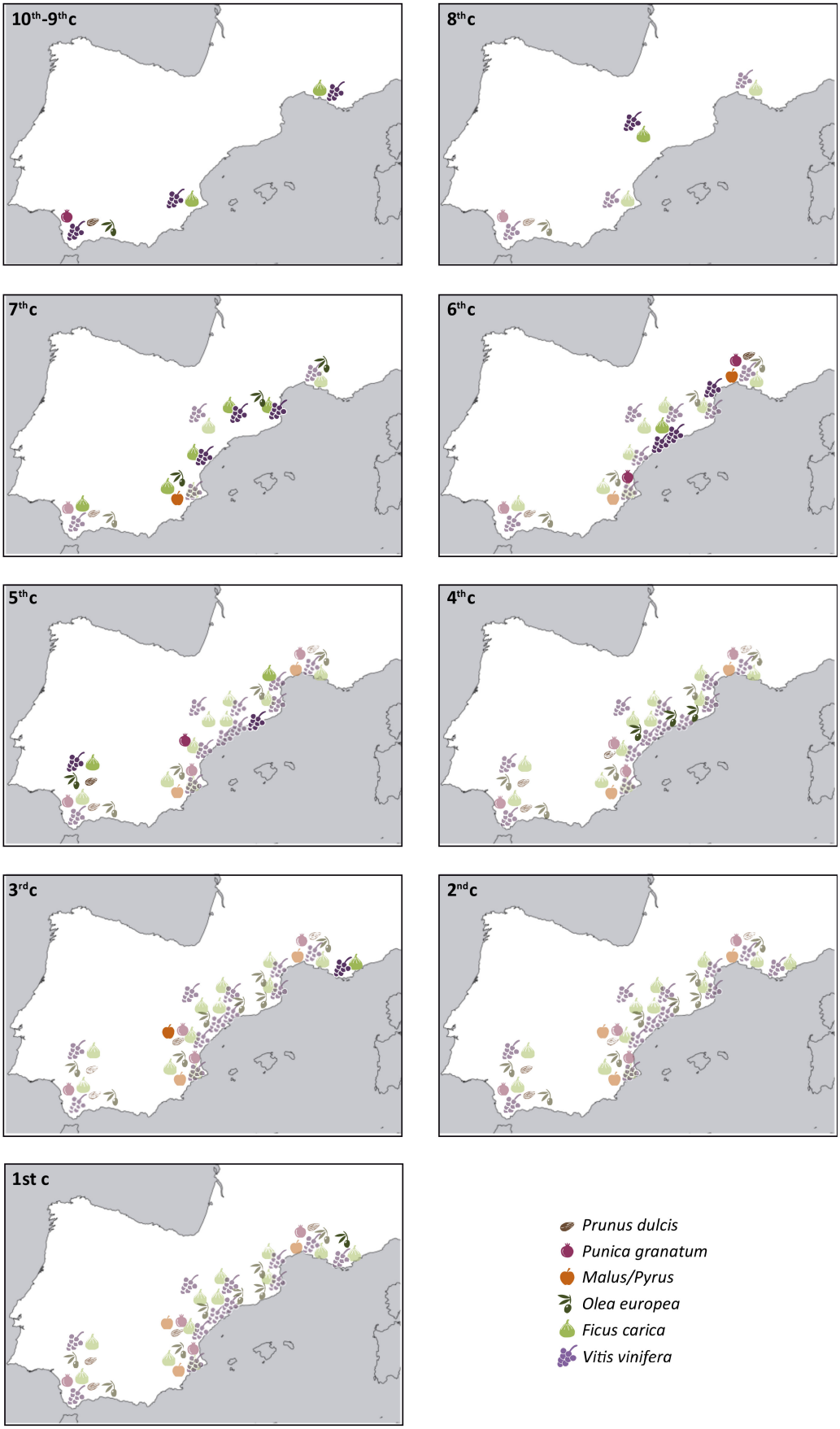

Figure 6. The presence of fruits in each of the areas and phases. Intense-coloured symbols represent the first occurrence of the taxon in the area, and light-coloured symbols represent earlier or contemporary but not new occurrences.

4.2. What, When and Who?

The current data places the introduction of a group of fruit crops into the south of the Iberian Peninsula since at least the 10th–9th centuries BC [131] (Figure 6). This early assemblage includes those growing naturally and others of eastern origin. There is no evidence suggesting progressive cultivation of local wild fruits. The existence of secondary centres of grape domestication in the western half of the Mediterranean is based on genetic data [149,150]. This hypothesis is questioned from the standpoint that genetic exchanges related to introgression must be taken into account [151,152]. The archaeological record nonetheless suggests, at least in this territory, that a complete group of fruits was introduced at once.

Many of the settlements dated between the 10th–8th centuries BC with evidence of the earliest fruits can be linked to Phoenician colonisation. These fruits are likewise detected in this timeframe in neighbouring indigenous settlements. Thus, there appears to be a clear link between the development of these crops, the arrival of populations from the eastern Mediterranean at different points of the Andalusian coast [153] and the adoption by local communities of new products and possibly new agricultural practices.

Fig and grape beyond Andalusia in the earliest phase are limited to Botx and Beniteixir to the south of the Valencian region [63] and Lattes Port Ariane in the eastern Languedoc-Rhône Valley [100]. The morphometric study of the grape pips of Lattes Port Ariane places them among wild varieties [129,148]. This type of study has yet to be carried out on materials from the Valencian region, although it can be noted that these taxa do not usually appear here in the 2nd millennium [23], suggesting that their cultivation was initiated at this time. In any case, none of the fruits of this initial phase of oriental origin are recorded outside of Andalusia.

Therefore, it is possible, based on the current data, to envision a process of expansion of these crops from Andalusia in the south towards the north of the Iberian Peninsula. Between the end of the 9th and the outset of the 8th century, there is evidence of this expansion through the south of the Valencian region into the interior of the Ebro Valley. The data bolstering this idea (Figure 4) is based to a great extent on the quantity and frequency of grape and fig [70]. On the contrary, a gap difficult to explain (state of research?) remains along a great portion of the Mediterranean coast south of the Ebro. In any case, the record from southern France does not suggest the presence of fruits during the 8th century BC, a fact that affects the hypothesis raised for the previous chronological phase as to the exploitation of wild grapes and figs.

The 7th century BC evidences a new peak among these fruits. The presence of grape, fig and olive, which endures in the south, is now abundant throughout the east of the Iberian Peninsula, expanding inland at sites such as Kelin. At the same time, the first two expanded at the transition between the 7th–6th century BC throughout the mouth and the tributaries of the northern bank of the Ebro, as well as along the central Catalan coastline. The first fruits likewise appear in NE Catalonia, and grape reappears beside the olive in the eastern Languedoc-Rhône Valley despite the fact that the morphometric study of the materials from Port Ariane indicates that they belong to wild morphotypes [129]. This is, in fact, a territory maintaining contact with the communities from southern and eastern Iberia and even more intense links with Etruria and the Greek world, leading to the creation of settlements [31,51,154]. Therefore, it is possible that these events were the impulse that triggered the development of tree cultivation.

The subsequent 6th century is the only chronological phase with arboriculture evidence from all the study areas. Fruits, mainly grape, are detected for the first time in most of the study areas except for the inland Guadalquivir and Guadiana Valleys and eastern Provence (zones little sampled). Two fruits, pomegranate and almond (with no wild ancestry in the western Mediterranean), are simultaneously recorded for the first time outside Andalusia at two colonial settlements: Phoenician Fonteta [62] and Greek Massalia [117,129]. Moreover, there is no current evidence linking these two crops to indigenous settlements.

Samples dating to the 5th century BC are known in all territories except for the south of Valencia. Two changes are perceived in the Iberian Peninsula in this timeframe. The first is the spread into indigenous areas for the first time of almond and pomegranate, fruits of oriental origin. The second is the expansion of fruit into new territories. It is at this moment that grape, fig, olive and almond emerge in the interior of the Guadalquivir and Guadiana Valleys. This interior expansion is likewise observed in the Ebro Valley as grape appears in the area of Navarra (Pérez-Jordà, unpublished). Most of the interior and north of Iberia, by contrast, maintained an agricultural model based exclusively on annual yield crops, at least until the change of the era [155].

Another aspect that is becoming evident in the Iberian Peninsula is the greater diversity of fruit in the territories to the south of the Ebro River [156]. The same schema extends to Roussillon-Western Languedoc, whereas the eastern Languedoc-Rhône Valley is marked by an outstanding diversity largely explained by the outstanding assemblage of Lattara [105,157] and the waterlogged finds of Massalia [117,129]. Taxa such as almond, pomegranate and possibly plum only appear occasionally in port enclaves, dominated clearly nonetheless by grape and, to a lesser extent, fig and olive. A feature that differentiates southern France from the Iberian Peninsula is the low penetration of arboriculture into the interior, with the possible exception of the sites of Mourre de Sève [118] and Alba-la-Romaine (Ardeche) in the Rhône Valley where cultivated grapevine is identified by the morphometry of charred wood in 5th–4th centuries BC levels [158]. In any case, examples such as those observed in the interior of the Guadiana, Guadalquivir or Ebro Valleys do not appear in France.

A high-quality archaeobotanical record persists throughout the 4th and 3rd centuries BC in spite of the absence of data in some territories. The previous tendency of greater diversity in the south is maintained without evidence of a progression towards new territories in the Iberian Peninsula. Fruit such as the grape and fig first appear in the 3rd century BC in eastern Provence in spite of the lack of data serving to prove a later development of arboriculture here.

The record of the final centuries (2nd–1st centuries BC) of the study area is modest and limited to the northern areas without evidence of changes related to the presence of new taxa except for olive in eastern Provence and charred pomegranate for the first time at Tremaie [114] in the Rhône Valley.

4.3. The Role of Arboriculture in Agricultural Systems: Diversity of Choice

Apart from the presence of one or another fruit in each of the territories and phases, there is evidence suggesting that these crops held a varied role within the agricultural processes of different communities [156]. In this sense, a return to the quantification of fruits based on number, ubiquity and the relationship between the ubiquity of cereals and fruits serves to illustrate some trends.

There is a general tendency towards an increase in the values of fruit remains that becomes more evident when taking into account ubiquity rather than the number of remains. The second counting system yields distortions possibly stemming from the appearance of concentrations of plant remains, most often cereals. However, it is true that neither the rate of appearance nor the values that fruits attained in each of the territories resemble each other. This has led to a grouping of the different zones into four wider areas bearing similar characteristics.

4.3.1. Area 1: Wagering on Arboricultural Commerce

It is possible to define similar patterns when analysing the coast of Andalusia and the south of the Valencian region, zones marked by Phoenician settlements. The ubiquity of fruit species (Figure 3) begins to stand out with the foundation of the first colonial enclaves in Andalusia as early as the 10th–9th centuries BC. This process is consolidated in the 7th century BC with values above 60% and by greater numbers of remains. A comparable situation is also detected in this timeframe to the south of the Valencian region,

and increases in both territories from the 5th to 4th centuries BC are evidenced by a very high ubiquity, clearly exceeding that of cereal values at specific sites mainly along the coast.

Sites from this timeframe, besides the archaeobotanical finds, yield other archaeological features that confirm the expansion and importance of fruit cultivation, especially grapes, which from the outset of the millennium onwards becomes the most relevant crop. An extensive vineyard dating within the 9th–8th centuries BC was excavated in the city of Huelva. It attained even greater dimensions later in the 7th century BC. This parcel was subsequently partially modified to introduce annual cycle crops before undergoing yet another more profound transformation in the 5th century BC with the construction of a large vineyard plantation occupying most of the surface explored by the excavation (18.6 ha) [38]. The 7th century BC also saw the first wine presses at Alt de Benimaquia [41], while the site of Illeta dels Banyets of the 5th–4th centuries BC offers evidence of a great capacity of production. In any case, there is evidence of a commercial orientation at each of the two [159] as wine was commercialised by amphorae at both [160,161]. These elements, together with the intense traffic of amphorae from the 8th to 7th century BC onwards between Andalusia and the south of the Valencian region [35] up to the Catalan coast [162] and the south of France, where they coexisted with Greek and Etruscan amphorae [31,163], are examples of early commercial wine production in Iberia's southern and eastern areas [164].

4.3.2. Area 2: Adopting a Diversified Arboriculture

Some differences are observed in the peripheral zones of these areas marked by Phoenician settlements. The introduction of a considerable quantity of fruit species into the interior of Andalusia and the Guadiana Valley took place in the 5th century BC in spite of the fact that each of these areas presents higher cereal values. Simultaneously the values of fruit and cereals in the 4th century BC in the Valencian region to the north of the Xúquer River are equivalent (Figure 3). This suggests a nuanced adoption of the new agricultural model in these territories. The Guadiana and Guadalquivir Valleys reveal a diverse type of arboriculture within a model clearly dominated by cereals, whereas the centre of the Valencian region offers evidence of intense investment in fruit production. The poor quality of soil in much of this territory would explain this specialisation in crops adapted to rustic surroundings [63].

4.3.3. Area 3: Wagering on Cereal Production

Different behaviour is recorded between the Ebro and the Hérault Rivers, indicating a lesser diversity of fruits. A clear predominance of cereals has already been highlighted until at least the 3rd century BC when some sites of the Lower Ebro Valley or of the Catalan central coastline reveal a greater ubiquity of fruits than cereals. This coincides with finds of wine presses at Coll del Moro [125] and Font de la Canya [128].

The data from the west and northeast of Catalonia, as well as Roussillon-Western Languedoc, reveal no changes. Despite the finds of stone wine presses, there is a clear predominance of cereals that coincides with an abundance of silos for grain storage [156,165]. Only in the final stages in the 3rd century at Mas Castellar de Pontós [82] in northeastern Catalonia and at Pech Maho [89] in Roussillon-Western Languedoc do the values of fruit increase and their distance with cereals decrease to values between 20 and 30 points (Figure 5), whereas in previous phases they always exceeded 60 points.

4.3.4. Area 4: A Diverse Reality between Port and Inland Sites

The situation in the area extending from eastern Languedoc to the Rhône Valley is more complex. With the exception of eastern Provence (a zone with a very poor record), this area offers high values of fruits since the 6th century BC. A certain balance between cereals and fruits is then detected from the 5th century BC at sites such as *Lattara* (Figure 5), which later, in the 2nd century BC, will be dominated by fruits. The prevalence of fruits is also observed in 3rd century BC levels at Sizen-Vigne [121] and among 1st century BC samples from cemeteries or ritual contexts at Ambrussum [109,110]. The samples collected in these

burial or ritual contexts nonetheless suffer from bias due to the choice of plants chosen as grave goods [166,167]. There is likewise evidence of vineyards in the surroundings of *Massalia* and *Lattara* since the 4th century BC [36,37,168].

This area reveals a behaviour differing partially from that of other territories north of the Ebro River characterised by a greater diversity of fruits (Figures 2 and 6) as its finds are restricted to port settlements—suggesting they originate from commercial exchange. It is a behaviour corresponding to a phenomenon specifically affecting the communities with more intense contact with the Mediterranean world. Evidence of grape is overwhelming at practically all the sites with ubiquity values usually above 60%.

It is an area characterized since the 2nd century BC by an intense olive oil production based on finds of presses linked to oil mills [39,40], although it cannot be excluded that some were actually related to producing wine [42]. The archaeobotanical remains also suggest a growth of olive use in the 2nd–1st centuries BC. The fact that olive endocarps at sites of the Provence are not normally fragmented suggests the consumption of table olives rather than oil production [129].

4.4. Wine and Fruit North of the Ebro River

With the exception of Catalonia's central coastline, fruit cultivation to the north of the Ebro Valley does not appear to develop before the 6th–5th centuries BC. It is an area that basically opted to cultivate grape and, to a lesser extent, fig and olive. Other crops such as almond, pomegranate or apple/pear appear exclusively in port contexts. It is, in any case, an area, possibly with the exception of the surroundings of Massalia, largely committed to cereal production at least until the 3rd century BC.

The arrival of amphorae from both the western Phoenician sphere [35,162] and Etruria and Greece [31,51] during the first half of the millennium coincided with the founding of Massalia with a new agent that flooded much of southern France and, to a lesser extent, Catalonia with wine amphorae [34]. The Greek presence at Massalia and later at Emporion, as well as populations of Etruscan origin at sites such as Lattara [169], besides close contacts with the Phoenician-Punic world, yielded a variety of influences leading to the development of fruit production by the communities of the territory.

Apart from the archaeobotanical record [148,170], there are other elements that also suggest wine production as the main option. These include material evidence of wine presses dating from the 5th to 4th centuries [42,125,127,128,171,172]. Vineyards are likewise observed since the 4th century BC, both around Massalia [36,37] and later at Lattara [168].

In any case, it does not appear that wine production beyond Massalia attained a volume comparable to that reported to the south of the Ebro until at least the end of the 3rd century BC. It is possible to imagine a small-scale production in some enclaves [129] that coexisted with the consumption of the fruits and wines from Massalia in the south and east of the Iberian Peninsula. This could be the case of Lattara based on the percentages of grape pips and imports of amphorae and local dolia and the subsequent decrease in imports of amphorae from Massalia at the end of the 3rd century BC, coinciding with an increase in the values of the grape pips, as well as the production of dolia presumably serving to ferment and store wine [170]. It has already been noted that this data coincides with an increase in the role of viticulture, a notion bolstered by the physical evidence of vineyards in the surroundings of Lattara.

There are several elements that suggest an event during the 3rd century BC that led to fundamental transformations of different areas of the western Mediterranean. Sites such as Illeta dels Banyets or Tossal de les Basses in the south of the Valencian region were abandoned after experiencing a clear commercial orientation in the previous 5th–4th centuries BC. A similar territorial restructuring is detected at sites from Roussillon-Western Languedoc [163], whereas in eastern Languedoc-Rhône, this is materialised by a decline in imports [173]. The different areas to the north of the Ebro likewise differ, as evidenced at this time by a boom in fruit production, mainly due to grape cultivation.

This emergence of arboriculture in areas heretofore largely committed to cereals may have been conditioned by different factors. At Lattara, it could be linked to the decline of imports from Massalia, which initiated the development of local viticulture [170] in territories that until then were largely within a network controlled by the Phocaean colony. Along the central Catalan coast, at this time, there is a local production of amphorae imitating Ebusitan models, which can be interpreted as interest among the Iberian communities to pass their wine off as Punic [174]. A similar phenomenon could have occurred in the surroundings of Agde, in the Mouth of the Hérault River, where there is evidence from the middle of the 2nd century BC of wineries linked to pottery workshops producing Italic amphorae [175]. It is possible to speculate that the rivalry between Rome and Carthage for the control of the western Mediterranean disrupted the commercial circuits that structured agricultural production of different areas leading to local development of fruit production that until then had clearly invested in cereals.

However, it must be noted that this is not a uniform phenomenon. A decrease of imports from Massalia affecting southern France did not affect sites along the Catalan coast as the traffic of amphorae continued mainly from Ibiza [176]. Moreover, sites along the coast of Catalonia simultaneously increased winemaking and even produced amphorae imitating Punic-Ebusitan models. There are problems in attempting to define the content of the amphorae arriving from Ibiza. It is thought that a great part of those produced in Ibiza served to export wine [35] in spite of practically no archaeobotanical data on the island characterising its agricultural activity except the presence of fruit from the 7th to 6th centuries BC [177]. Much of the basis for local wine production stems from the discovery of trenches excavated into the bedrock thought to be linked to planting vines [178,179] despite the problem that the dating of these features is not secure. Oil mills, on the contrary, are abundant since the 5th century BC [180], complicating identification of the nature of Ibiza's exports. All these elements hinder defining whether the boom in grapevine cultivation north of the Ebro River shared common causes or whether there were different factors favouring it in each of the areas.

5. Conclusions

The history of the development of arboriculture along the Mediterranean's western fringe is a tale of success that has survived to the present day. Vast areas of this territory have retained an agricultural economic model with fruit species at its core. Wine, for example, triumphed 3000 years ago as it does today throughout the study area.

This revolution began in the first half of the 1st millennium BC by integrating the communities into an economic and commercial system linking the two extremes of the Mediterranean. Some areas of the western Mediterranean presumably adopted this new agricultural model even earlier. This could be the case of Sardinia [24], where fruit assemblages appear between 1300 and 1200 BC that possibly provoked a similar phenomenon in the south and north of Italy.

This "Mediterraneanisation" [46,181] stems from the arrival of eastern and Etruscan populations to different areas and their contacts with local populations, a process that ended up generating a new reality. Arboriculture, previously developed in the eastern Mediterranean, was embraced by part of this new world, leading to a diverse reality characterised by implementing different production models. There were zones focusing on cereals and pulses, as opposed to others investing heavily in fruit. There were likewise territories where agriculture was fundamentally centred on self-sufficiency, whereas others, restricted to the coast, basically developed a model of commercial agriculture. Whether they were cereals, wine, oil or other fruits derivatives, they were much simpler to transport by boat than on land by cart. Moreover, most of the larger cities associated with these types of products were raised along the coast.

The new social scenario generated in each of the territories developed ways of exploiting land that, over time, as evidenced by this study, were neither uniform nor stable. It is possible to identify two large areas of influence: a Phoenician-Punic sphere between

Andalusia and the Valencian region and a Greek sphere in the south of France and the north of Catalonia. However, this is a simplification that ends up encompassing diverse situations that can only be approached in some cases due to the great limitations of the archaeobotanical record. It is nonetheless possible in general to note an agricultural model more focused on the production of fruits in the south and another more cereal-based model to the north coexisting with wine-growing areas such as those around Massalia. Whether this scheme can be explained by cultural tradition, by economic order determined by local communities founded on the possibilities offered by their territory, or simultaneously conditioned or directed by centres of power such as Carthage or Massalia, are questions difficult to respond to. In any case, it is possible to distinguish a more local and resilient world among the inland settlements that, although not ignoring the Mediterranean, did not clearly condition their economic activity to market rhythms stemming from a more dynamic coastal world comprising of individuals and communities of diverse origin strongly committed to commercial development. Economic cycles existed throughout this millennium, and it is possible to speculate that the conflicts arising between the different powers conditioned the evolution of agricultural activity. Thus, the land and its generated products were one of the sources of wealth and power of the different members of these communities.

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