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ARCHAEOBOTANICAL CONTRIBUTION TO THE HISTORY OF FARMING PRACTICES IN MEDIEVAL NORTHERN CATALONIA (8TH-14TH C.)

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Abstract: The High Middle Ages is considered as a period of major changes for the agricultural world. These changes, which intervene as soon as the 9th c. in Catalonia and reached their full potential between the 12th and the 13th c., had an impact on farming practices and on the exploited landscapes. Although well known through the study of textual sources, agrarian productions and practices were, so far, poorly documented by archaeology in northern Catalonia (Pyrénées-Orientales, France). The increase of archaeobotanical investigations in this region allow us to present a first review of medieval farming practices. Based on the study of fifteen rural sites, this paper aims to document, through archaeobotanical data, the characteristics of northern Catalan agriculture between the 8th and the 14th c. (cultivated crops, prevalence of certain species, farming practices associated, types of exploited landscapes), while detecting some evolutions over the long term.

1. INTRODUCTION

During the High Middle Ages, the Catalan rural world underwent decisive changes. The strong economic and demographic growth that affected the whole of the western Mediterranean, which began in Catalonia in the 9th century, reached its full potential in the 12th and 13th centuries (BONNASSIE 1975-1976). During this period, some urban centres experienced such a rapid expansion that production in the surrounding countryside was no longer sufficient to supply them, forcing them to import food products from other parts of the Mediterranean (for ex. REYERSON 1998; PUIG 2003). In the northern part of medieval Catalonia, corresponding to the current French department of the Pyrénées-Orientales, the extremely rapid growth of the city of Perpignan contributed to the demographic and economic development of the region, the city developing markets through which many common or exotic plant products, sometimes imported (PUIG 2006), circulated, opening the way for the introduction of new plants and foodstuffs into the agricultural and food heritage of this region.

During this period, the Roussillon countryside was reorganized. Thus, from the 9th-10th centuries, a new network of rural farms, isolated or grouped into hamlets, both on the plain and in the foothills, began to emerge (PASSARRIUS *et alii* 2008). Some new occupations last only a few centuries (PASSARRIUS *et alii* 2008), while others, the majority, have survived to the present day, forming the ancient cores of the urbanized areas of the present plain (PASSARRIUS *et alii* 2008: 46). The absence of excavations in these ancient nuclei has long prevented an optimal reading of land-use during the High Middle Ages. The realization of a Collective Research Project¹ and the multiplication of preventive archaeology and pedestrian prospecting operations made it possible to make up for this lack, renewing our knowledge of the occupation of the countryside during this period (for ex. PASSARRIUS and CATAFAU 2013). In parallel with these changes in the rural tenure framework, farming practices underwent major technical changes, leading to the development of new agrarian dynamics. These, essentially documented by textual sources of the end of the period (12th-14th centuries), are manifested by the creation of new terroirs, an increase in drainage movements, the improvement of water control (irrigation techniques, mills), a significant exploitation of wetlands (marshes) for the creation of grasslands and cereal growing, as well as an increase of specialized or even speculative crops (for ex. PUIG 2003).

While research on the evolution of land use and agrarian techniques during this period has been particularly dynamic in recent decades, the question of crop production and medieval food heritage exploited in northern Catalonia has long remained poorly documented. Several pioneering works on written sources have begun to address this theme, highlighting and commenting on crop production and foodstuffs, some throughout Catalonia (BONNASSIE

¹ Collective Research Project «Villages d'hier, villages d'aujourd'hui, Plaine du Roussillon», directed by O. Passarrius and A. Catafau.

1975-1976, 1990), others in Cerdanya (RENDU 1991). Later, the study of other types of texts made it possible to detail the medieval agricultural productions of the Roussillon plain and Cerdanya (PUIG 2003, 2005a, 2005b, 2006, 2012). More recently still, the rise of carpology has made it possible to take a new look at medieval agriculture in Roussillon (ROS 2020), and the obtained data, compared with those from textual sources, made it possible to draw up a first image of the range of produced, marketed and consumed plants in the northern part of Catalonia between the 10th and the 15th centuries (fig. 1) (ROS *et alii* 2016). These various works, of great diversity, pointed out certain shortcomings. There was a lack of data for the 9th-11th centuries, due both to the scarcity of available textual sources and to the lack of studied carpological series for this period. Moreover, if the first interdisciplinary synthesis carried out in northern Catalonia made it possible to draw up a first critical assessment of the available sources and to draw up a list of the region's agricultural productions, it was based only on unquantified carpological data, which did not allow a precise restitution of the agro-horticultural spectrum exploited, of its components, nor the importance of each plant species within medieval agricultural productions. The increase in the number of excavations in medieval rural contexts in recent years, coupled with the implementation of an appropriate sampling strategy, makes it possible to propose a new synthesis, based on a substantial corpus of sites and quantified carpological data. The approach, covering a coherent geographical area (Roussillon plain) over a long chronology (8th-14th centuries), aims to capture the agro-horticultural characteristics of the local agrarian system, namely the main species exploited throughout the period under consideration, and new species, whose rhythms and pathways of introduction can be discussed in the light of carpological and textual sources.

2. MATERIAL AND METHODS

The corpus includes fifteen archaeological sites, covering a chronology from the 8th to the 14th century AD, the 10th-11th centuries being those documented by the largest number of sites (fig. 2, 3). They are spread out from the coast of Roussillon to the first heights of the Vallespir, with a maximum of sites located on the plain between the Têt and Tech rivers. The sites were not investigated in a homogeneous manner, some of them having benefited from long planned operations and others having only been approached by means of surveys as part of preventive operations. Also, the areas excavated vary, ranging from less than 10m² for Place de la Cathédrale (Elne) to more than one hectare for Les Gavarettes (Argelès-sur-Mer).

A total of 64 archaeological contexts were sampled. The 98 samples issued from the 64 contexts were collected by the excavation teams between 1980 and 2016, in contexts of different natures but in relation with habitat or agricultural activities: silos, pits, fireplaces, ovens, planting pits and detritus levels. Often, due to time constraints, the preventive nature, since the aerobic conditions of these sites only maintain carbonized or mineralized seeds. The presence of

charcoal or charred seeds visible during the excavation of the structures was therefore the main criterion for sampling. The average volume is of 10 litres of raw sediment per sample, but varies according to the site, structure and analyses carried out (minimum volume encountered in the corpus: 200 millilitres, maximum volume: 140 litres).

The extraction of archaeobotanical remains was not always adapted to the sought material: in the absence of a specific protocol for the study of carporests, the screening of four of the sites was carried out under water, only through meshes between 2 and 6 mm in diameter. The seeds were then hand-sorted directly from the screening refusals by the excavation teams. This method, which is inefficient in identifying seeds of very different sizes and shapes, has led to several biases in the representativeness of the carpological assemblages that can be preserved (MARINVAL 1999). These sites, which are fortunately in the minority, correspond only to ancient excavations; most of the samples were screened by flotation on fine meshes (0.5 and 2mm) by the excavation teams or by the author. Once the samples were collected, screened, and stored, the carpological material was extracted and analyzed in the laboratory² (sorting and extraction of carporests from the screened sediment, identification, quantification, interpretation). Only samples from the Camp del Rey (Baixas) site have not been the subject of a complete quantified study; the carporests collected and identified, even if they are not counted, however, make it possible to assess the frequency of the cultivated/exploited taxa per context.

3. RESULTS

The 98 samples yielded a total of 111,401 carpological remains, of which 21 taxa considered as cultivated or harvested were identified: 6 cereals, 4 legumes, 2 vegetables, 9 fruit trees and 2 technical/oilseed plants (fig. 4, 5,6).

We have decided, for the whole considered period, to evaluate the frequencies of appearance of cultivated species, by counting the occupations and contexts in which the different taxa are present (fig. 7). The use of this method makes it possible to highlight the main exploited plants by smoothing out the obtained information (POPPER 1988; PEARSALL 2000). Indeed, working from the number of raw remains for each of these taxa, or their percentage and contribution within each assemblage, would have led to an over-representation of certain taxa, favoured by their economic status or by their ability to be preserved during carbonization (e.g. cereals). Working from the presence/absence of taxa helps to mitigate this over-representation effect.

² The work took place partly at the archaeobotanical platform of the UMR 7209 (Muséum national d'Histoire naturelle de Paris) in Paris and partly at the carpological platform of the UMR 5554 (Institut des Sciences de l'Evolution, Université de Montpellier) in Montpellier.

3.1 CEREALS

Hulled barley (*Hordeum vulgare*) and naked wheat (*Triticum aestivum/durum*) are the two cereals most frequently attested in the samples (13 and 12 occurrences on 15 sites), by their grains and, more rarely, by chaff elements (lemmas, rachis) (fig. 4, 7). Barley exceeds naked wheat by its frequency per site but also per context, appearing in 52 of the studied contexts compared to 43 for naked wheat. Despite the presence of naked wheat rachis, it was rarely possible for us, due to their state of conservation, to determine whether the wheat used was a hexaploid (*T. aestivum* l. s., wheat in the broad sense) or tetraploid (*T. durum*, durum wheat, *T. turgidum* poulard wheat) one; only the Vilarnau site delivered a rachis article identified as the hexaploid type. The third cereal is the common millet (*Panicum miliaceum*), present in 7 sites (17 contexts), followed by the foxtail millet (*Setaria italica*), present in 4 sites (5 contexts). The importance of these two cereals is certainly underestimated, as their grains can only be recovered by fine sieving of samples, from which some sites have not benefited.

Indications of rye exploitation remain weak, being identified in only 3 of the sites (5 contexts), by small quantities of grains and rachis articles. Oats (*Avena* sp.) are recorded as grains in 2 sites and 5 contexts. The presence of lemmas at the Royal Castle of Collioure makes it possible to formally identify the presence of the cultivated species (*A. sativa*). However, the low overall grain quantity does not confirm its crop status, as oats can also behave as a weed in other cereal crops. The absence in Roussillon of other hulled cereals, such as emmer (*Triticum dicoccum*), spelt (*T. spelta*) and einkorn (*T. monococcum*), is to be highlighted for the period under consideration.

3.2. LEGUMES

In the corpus, 4 legumes are recorded: faba bean (*Vicia faba* var. *minor*), sweet pea (*Pisum sativum*), lentil (*Lens culinaris*), and common vetch (*Vicia sativa*) (fig. 5, 7). With the exception of faba beans, which occur in 6 sites (7 contexts), other legumes appear very anecdotally, in 1 (lentil, vetch) to 2 sites (sweet pea), and never by a significant amount of remains. This rarity is not related to the preservation of the material, as legumes seeds are as resistant to carbonization as cereals, nor to the extraction methods applied, their seeds being generally larger than or at least equal in size to that of cereals.

3.3. VEGETABLES

The corpus delivered 2 taxa in the vegetable category (fig. 5). A charred bulblet, recorded in one of the samples from the site of the Royal Castle in Collioure dating from the 14th century, has been identified as belonging to the genus *Allium*; however, it was impossible for us to specify whether it was a bulblet of garlic (*Allium sativum*) or onion (*Allium cepa*) due to its state of conservation. The site of Place du Général Foixet in Pézilla-la-Rivière has delivered several

seeds attributed to a taxon recognized for the first time in Roussillon: spinach (*Spinacia oleracea*). The seeds come from 2 contexts dated between the 11th and the middle of the 13th century: a household level characterized by the numerical richness and diversity of the encountered plants, and a soil level, probably linked to a rubéfié area interpreted as a possible second household.

3.4. FRUIT PLANTS

Within the corpus, grapevine (*Vitis vinifera*) is the most frequent fruit plant; it is identified in 12 sites (38 contexts), but its remains are really abundant only in Gavarettes, Argelès-sur-Mer, and Ruscino, Perpignan (fig. 6, 7). The second fruit plant in the corpus is the olive tree (*Olea europaea*), present in 7 sites (13 contexts), only in the form of stones or stone fragments. Mentions of other fruit plants are more sporadic. The fig tree (*Ficus carica*) is present in 4 sites (5 contexts) and the blackberry (*Rubus fruticosus*) in 3 sites (4 contexts). The remains of the other fruit plants, hazelnut (*Corylus avellana*), stone pine (*Pinus pinea*), plum (*Prunus domestica*), hawthorn (*Crataegus* sp.), oak (*Quercus* sp.), appear only occasionally, each in a single context, in the form of few fragments of shells, stones or cotyledons.

3.5. TECHNICAL/OILSEED PLANTS

The studied corpus identified 2 technical/oilseed plants: cultivated flax (*Linum usitatissimum*) and hemp (*Cannabis sativa*) (fig. 6). The first is documented in 5 of the sites (9 contexts) and the second in a single site (1 context) (fig. 7). Their rarity is probably due to the disappearance of these seeds, which are subject to bursting during carbonization.

4. GENERAL DISCUSSION

4.1 WHAT AGRICULTURAL HERITAGE WAS BEING EXPLOITED IN MEDIEVAL NORTHERN CATALONIA?

The convened corpus makes it possible to recognize the existence of an agrarian system based on the exploitation of a wide diversity of annual and perennial species. The carpological data compared to textual sources make it possible to propose a discussion on the exploited plants and the cultural practices associated with them during the High Middle Ages.

4.1.1. An omnipresent cereal production

Cereals, particularly hulled barley and naked wheat, form the basis of the Roussillon agrarian system throughout the period under consideration. Within this cereal pair, classic for the medieval western Mediterranean (for ex. RUAS 2005, 2010; PEÑA-CHOCARRO *et alii* 2018), barley occupies a first-rate position, dominating naked wheat both by its frequency per site and per context. This high frequency had already been highlighted by the carpology in Roussillon

for Antiquity and the first centuries of the Middle Ages (ROS and RUAS 2017; ROS *et alii* 2019, 2020), confirming the important role of the species in local agriculture during historical periods. The exact role of the species is difficult to clarify from carpological assemblages; while being the most referenced cereal in textual documentation from the 12th century onwards, it then seems to be used both for human and animal consumption (PUIG 2003). Naked wheat, the second main cereal crop on the plain, played as versatile a role as hulled barley (human food, fodder) during the first centuries of the Middle Ages (ROS *et alii* 2019, 2020). In the High Middle Ages, there was a duality between textual and carpological sources. According to the written documentation from Roussillon, wheat seemed to be reserved, until the 13th century, to a privileged population, unlike barley, which would constitute the basic food of the people of Roussillon (PUIG 2003). However, the carpological corpus suggests that naked wheat has also played an essential role in the region's peasant diet, with many of the sites delivering grains of this cereal in samples interpreted as domestic consumption rejects. For both barley and naked wheat, the mixed nature of the carpological samples makes it difficult to accurately identify the farming practices associated with them (soils of origin, sowing season, cutting height). If the medieval texts of Roussillon tend to consider wheat as a winter crop (PUIG 2003: 160), barley is recognised by late sources as a spring cereal (PUIG 2003: 228), while the textual sources of Languedoc indicate in the 12th century the existence of winter (escourgeon) and spring (paumelle) barley (DURAND 1998: 313).

The common and foxtail millets occupy a special place in the corpus. Little referenced in Roussillon's written sources, they are among the oldest cereals mentioned in the documentation, from the 10th century onwards (ROS *et alii* 2016). In Roussillon, they flourished significantly from the first centuries of the Middle Ages, with common millet becoming the third most frequent cereal in carpological samples (ROS *et alii* 2020), at least until the 14th century. Being just as versatile as barley, the carpological corpus does not allow us to determine the role played by the common and foxtail millets in Roussillon farming practices (human and/or animal food). It is equally difficult to identify the role of millets in the existing agro-horticultural system, although they seem to be spring crops linked to wet, irrigated or marshy soils (ROS *et alii* 2016: 128). According to Roussillon text sources, plots taxed in millet differ from those taxed in barley and wheat in their location (PUIG 2003: 331), suggesting that millet did not necessarily participate in a crop cycle alternating with winter cereals.

For both rye and oats, their cultivation in the plain is difficult to demonstrate on the basis of carpological data alone. Rye has been identified in the Roussillon plain since the first centuries of the Middle Ages, although it is not possible to determine whether it was cultivated locally or imported from the foothills (PUIG 2003). In the High Middle Ages, its culture was identified by textual sources in Conflent (Taurinya), Ribéral (Ille, Néfiac) and Argelès-sur-Mer (PUIG 2003), and recognised by carpology in the high Capcir and Cerdanya mountains (Ruas and Rendu

2005). Although carpological occurrences of oats multiplied in the Early Middle Ages in the western Mediterranean (for ex. RUAS 2005, 2010; PEÑA-CHOCARRO *et alii* 2018), its status remains unclear; although its exploitation in the region is documented by animal feed legislation (ROS *et alii* 2016).

4.1.2. Annual secondary crops: first carpological indicators of the existence of garden crops in Roussillon?

The corpus of studied sites makes it possible to identify, in addition to cereals, other categories of plants from annual crops, such as legumes (faba beans, peas, lentils, vetches), technical/oilseed plants (flax, hemp) and some vegetables (spinach, garlic/onion). With the exception of spinach, all these taxa are known and exploited in medieval or even ancient Roussillon (ROS and RUAS 2017), some of them flourishing from the 6th century onwards, such as flax for example (ROS 2020; ROS *et alii* 2020). The quantities and registered frequencies of these taxa in carpological samples place them in a secondary position among annual crops. The reasons for the low number of mentions of these different taxa can be varied; if it is not caused by the punctual or secondary nature of their cultivation, it can be related to the consumed part of the plant³ that does not favour its presence in carpological samples (in the case of vegetables), to the way in which the remains are preserved (carbonisation), which disadvantages taxa with fragile seeds (in the case of oilseeds), to the type of contexts sampled, which are too restricted, or to the very status of the sampled sites.

Despite the fact that their presence in the samples is, on the whole, punctual, it seems that some categories, such as legumes and vegetables, are more varied and deliver more remains in the later contexts of the corpus. The case of the site of the Place du Général Foixet in Pézilla-la-Rivière is particularly interesting: the samples dated between the 11th and the middle of the 13th century deliver not only spinach seeds but also cereal grains, mainly foxtail and common millets, as well as hulled barley, faba beans and wild plant seeds considered as classic spring growing weeds (goosefoot, knotweed, wild millets). The joint presence of these different plant categories in the same samples was discussed, and the hypothesis of foxtail millet harvests on a garden plot with several types of crops (legumes, vegetables, spring cereals) was put forward, although the isolated nature of the discovery does not formally confirm the existence or frequency of such a practice.

While the material evidence of the existence of garden crops remains tenuous, the texts provide a more precise account of this. Species cultivated on a plot-by-plot basis do not appear to be fixed and depend on both their location and time of year. The medieval Catalan garden (*hort*) is a small plot of land with a variety of crops: cereals, vegetables (leeks, carrots, onions, turnips,

³ For vegetables, it is often the vegetative parts that are harvested and consumed before the fruits are formed ; they are therefore rarely recorded in archaeological sites.

eggplants, cucumbers, gourds, etc.), legumes, herbs, fruit trees, and textile plants such as hemp and flax (PUIG 2003). These are areas close to the habitat, which would have benefited from the proximity of wetlands or irrigation. The presence of the different plant categories registered at Place du Général Foixet does not therefore contradict the image we can have of the medieval Roussillon garden as it appears through the textual documentation. The data from the carpological corpus, although still fragile concerning this type of crop, seem promising and need to be verified in future studies.

4.1.3. Fruit production difficult to identify

The spectrum of consumed/exploited fruit plants in medieval Roussillon is part of the typical western Mediterranean agri-food heritage known for historical periods. Viticulture, developed during the Antiquity as the main fruit production associated with olive growing (ROS and RUAS 2017; ROS 2020; Ros *et alii* 2020), remains the main crop in the region. In the Gavarettes site in Argelès-sur-Mer, grapevine is present in the form of seeds, berries and pedicels; the composition of the samples suggests that some correspond to wine by-product (crushing or pressing residues) (ROS 2020). Elsewhere, it is mainly identified by small quantities of seeds, which do not allow the identification of their origin (residues from the consumption of fresh or dried fruits, wine by-product). The olive tree, second fruit species of the corpus, is only documented by whole or broken stones, indicating the rejection of fruit consumed for their flesh rather than waste linked to oil production. The other fruit plants, hazelnut, umbrella pine, plum, hawthorn and oak, appear only occasionally in the samples of this period, the remains recorded testifying to the occasional consumption of these fruits.

The Roussillon rural spectrum does not currently display any of the non-native fruits introduced by trade or cultivated in the northwestern Mediterranean area between Antiquity and the Middle Ages, for example blackberries (*Morus nigra*) or cucurbits (*Cucumis melo*, *Cucumis sativus*, *Lagenaria siceraria*). We also note the absence of certain fruits attested at the very beginning of the medieval period in Roussillon: cherries (*Prunus avium* and *P. cerasus*), nuts (*Juglans regia*), lentiscus pistachio nuts (*Pistacia lentiscus*) (ROS *et alii* 2019, 2020; ROS 2020). The absence of mentions of these fruits can be explained by the lack of carpological assemblages from wet (wells) and/or mineralized (latrines) contexts that favour the recording of a greater diversity of fruit trees.

As the data currently stand, it is difficult to provide a satisfactory picture of fruit production in medieval Roussillon. Indeed, although the carpological data show a certain diversity, they do not allow us to understand the places where these different fruit trees are grown⁴, and the

⁴ Only the comparison of carpological data with those from anthracological analyses would make it possible to establish the local origin of fruit trees registered in the corpus sites; this type of analysis is however less developed in Roussillon and a first synthesis remains to be carried out.

punctual nature of the discoveries prevents us from fully grasping the importance of each taxon within the food and peasant cultures at that period. The comparison with data from textual sources is hardly more informative. Indeed, the acts of the practice hardly evoke fruit trees, almost never fruit, outside the main productions of grapes and olives; wild fruit trees, harvested in the context of domestic activities, are thus ignored. While the toponyms indicated in the medieval records suggest the presence of other species (e. g. chestnut, pear) in the local landscape, the main information available is issued from the study of market tariffs (leudes), which only mention fruits that are traded or subject to taxes. In addition, the fruits indicated in these sources may have various origins, sometimes distant, which do not allow local productions to be better documented.

4.2. RHYTHMS AND WAYS OF INTEGRATING "NOVELTIES": CROSSING SOURCES

Various studies have shown that to shed light on the history of a plant, it is necessary to study it over a long period of time, by critically convening and crossing different documentary sources (HAUDRICOURT and HÉDIN 1943; RUAS 1992; COMET 1995; BAKELS, JACOMET 2003; RUAS *et alii* 2015). The “longue durée” and diversity of sources would indeed make it possible to understand the ways and stages of integration of each plant: appearance on urban markets as exotic commodities, integration into food and/or into the “landscape” of the elites (e. g. royal, ecclesial, urban gardens), appropriation by other population strata before integration into the food and agricultural heritage of peasant populations. Within this evolutionary, purely theoretical scheme, some stages may not be followed; some plants, without particular social, symbolic or market values, could thus have entered the peasant agri-food heritage without going through the previous stages, and conversely, others could have been present on the markets without ever reaching the peasant culture stage.

In the context of this work, it seemed interesting to us to return to the introduction of three plants in medieval northern Catalonia: apricot, orange and spinach (fig. 8). Through these three plants, it is possible, in the light of archaeobotanical and textual sources, to question the rhythms and ways of integrating novelty into the agro-horticultural heritage of this region.

4.2.1. The apricot tree: a very late arrival

The history of the apricot tree in Roussillon has so far been little discussed, and despite its role in current agricultural production, the origin of its introduction and cultivation remains unknown. Its culture is documented by textual sources in Spain and Sicily in the 9th-10th centuries, and it was also reportedly introduced “without delay” into Roussillon by the Arabs (ALBERTINI 2013: 243). However, the fruit is not mentioned either in the leudes (trade and customs tariffs) or in the region's capbreus (PUIG 2003, 2006; ROS *et alii* 2016), and has not

yet been the subject of any archaeobotanical discovery in the area (ROS *et alii* 2018; ROS 2020).

The very first mention of apricot trees is issued from a text dating from March 1347, apricot trees being taken from a royal fig grove to create a new pleasure orchard at the south of the royal castle of Perpignan (CATAFAU 2018: 18). A. Catafau notes in this regard that the spelling of the term, also used in 1418, "*aribrecotorum*", indicates a lack of knowledge of the word by the royal notary, probably because of its rarity and the recent introduction of the species. It was mentioned later, at the beginning of the 17th century, by M. Agusti, a Catalan agronomist, who mentioned it among the fruit trees to be planted in the "*huertos*" (AGUSTI 1617).

If apricot cultivation was practised relatively early in al-Andalus, it would not have spread rapidly to Christian northwestern Mediterranean, as the tree only entered the royal gardens of northern Catalonia between the 14th and early 15th centuries. Its integration into the Catalan peasant sphere remains unknown but would occur much later than what the scientific literature proposed until then, possibly during the modern era. In medieval Mediterranean France (Languedoc, Provence), the tree seems to be absent from gardens and cultivation areas (for ex. COULET 1988; STOUFF 1997: 75); only one archaeological stone from a well filling dated from the 14th-15th centuries in Montpellier (FIGUEIRAL 2017) attests to the consumption of the fruit, who was certainly not widespread at the time (RUAS *et alii* 2015: 359).

4.2.2. The slow integration of the orange tree

The first mentions of citrus fruits in Roussillon date back to the 13th century. The second leudaire of Collioure⁵ thus evokes the sale of *limons e pomers e terongers*. If the terms *limons* and *terongers* make it possible to recognize lemon and orange, the term *pomers* is more enigmatic; if the attribution of this term to pomegranate has been considered, it seems to appear more generally in the form of *granarios*. This term would therefore also refer to a citrus fruit, a group with which it is associated in the lists, without it being possible to attribute it precisely to one of the fruits circulating in the Mediterranean Basin at the time (e. g. grapefruit, citron, mandarin, bergamot). Spain, for example, has been cultivating cedar since the 7th century, lemon and bitter orange since the 10th and 11th centuries. Lemons and oranges seem to be fairly recent products on the Collioure market: the leude tariff for them is followed by the sentence that all products that "are neither named nor known to the leuders [responsible for taking the

⁵ Leudaire of Collioure 1298. ADPO 1B69 f°7-12. *Leude de terre de Collioure*, 1300, ADPO 1B69, f°4r-5v°.

leude] are worth according to the previous products"⁶. At that time, these would therefore be new products, but that we know enough to be able to name them⁷.

Although citrus fruits appeared on the urban markets of Collioure and Perpignan between the end of the 13th and the beginning of the 14th century, the first mention of cultivation in Roussillon dates back to March 1347: near the royal apartments of the Royal Castle of Perpignan and the garden that borders them, in the queen's small meadow (*pradet*), orange trees (*torongers*) adorn a flower bed (CATAFAU 2018: 18). In 1419, it is also mentioned the purchase of 37 orange trees and 30 peach trees (*presseguers*) for the king's fig grove (CATAFAU 2018: 17). Later, Jérôme Münzer, a German doctor and geographer going to Spain, mentioned during a stopover in Perpignan between the 17th and 19th of September 1494, the presence of orange trees in the irrigated gardens of the knight Sigebert, located outside the city of Perpignan, near the ramparts (TARAYRE 2006: 42). While in Barcelona on the 21th of September 1494, he also observed orange trees in the cathedral gardens, in several urban gardens and in those of the city's merchant's house (La Loya) (TARAYRE 2006: 44-46). The cultivation of the orange tree seems to have developed in the gardens of the wealthy populations during the 15th century, the tree also being mentioned in the garden of the Aix merchant Guillaume Aymeric in 1427, and in Ollioules in the 15th century (STOUFF 1997: 76). At the beginning of the 17th century, citrus fruits were mentioned by the Catalan agronomist M. Agusti, who stressed out that a "garden" (*huerto*) where no "*naranjos, cidros, limas, limones*" are present could not be called perfect (AGUSTI 1617).

4.2.3. The rapid spread of spinach

Spinach is considered a novelty of the medieval period, with the first mentions of the species in the western Mediterranean appearing between the 10th and the 11th century in the textual sources in al-Andalus. The plant then spreads relatively quickly. Between the end of the 12th and 13th centuries, its carpological mentions multiplied. The oldest in Europe comes from the Pyrenean site of Montailou (Ariège, France), located at an altitude of 1,354 m, where spinach seeds appeared in a fireplace and a pit of one of the village houses (HALLAVANT and RUAS 2014). It has since been discovered in two medieval sites in southern France: a context dating from mid-12th/ mid-13th centuries in the Tarn (HALLAVANT unpublished) and an urban context from the 14th century in Languedoc (FIGUEIRAL unpublished).

In Roussillon, the leudes of the 14th century indicate its sale on the markets, subject to urban regulations, and its production taxed on the same basis as that of other common vegetables (leek, cabbage, carrot, etc.) (PUIG 2003). Following the discovery of spinach carporests in

⁶ Leudaire of Collioure 1298. ADPO 1B69 f°7-12. *Leude de terre de Collioure*, 1300, ADPO 1B69, f°4r-5v°.

⁷ This would also favour the interpretation of *pomers* as a citrus fruit and a fruit that is not native to the northwestern Mediterranean. PUIG 2006

levels dated between the 11th and the middle of the 13th century at Place du Général Foixet (Pézilla-la-Rivière), the question of the date of its introduction and cultivation in the region is raised. Indeed, if the spinach carporestes of Montailou constitute for the moment the oldest mention of this plant in the western Mediterranean, the carporestes of the Roussillon site could constitute an even older mention, contemporary with the first mentions of the plant in al-Andalus and several centuries earlier than the first textual mentions in Roussillon. Unfortunately, the contexts from which these carporests are issued, dated by the associated ceramic material, cover a chronology too wide to allow us to reveal precisely the age of the remains⁸.

However, it is now certain that new type species of vegetables are present in Roussillon at least from the 13th century and that they are quickly integrated into the local agro-horticultural sphere. It is difficult at this point in time to identify the pathways by which spinach appears in the region. In Montailou, the hypothesis is that during the 12th-13th centuries, the Pyrenean shepherds favoured the entry into France of the plant already cultivated in al-Andalus, following regular contacts with the South Pyrenean populations during transhumance in Muslim lands (HALLAVANT and RUAS 2014).

4.3. A COMMON AGRICULTURAL HERITAGE IN MEDIEVAL CATALONIA? FIRST TRANSPYRENEAN COMPARISON

Beyond documenting the share of stability and innovation at the heart of the northern Catalan agri-horticultural system, we wanted to address the issue of space. Due to the strong documentary disparities between the north and south of medieval Catalonia, it was difficult, until very recently, to propose a transpyrenean carpological synthesis; indeed, if the rural sites studied became numerous in northern Catalonia (ROS *et alii* 2018), they remained little addressed in southern Catalonia, with research focusing on urban sites, particularly on Islamic contexts (ALONSO 2005; ALONSO *et alii* 2014). The expansion of rural site analyses over the last decade now makes it possible to propose a first comparative approach, despite a still strong imbalance between these two areas.

The most recent synthesis of carpological data from the ancient and medieval Iberian Peninsula indicates the existence in southern Catalonia of six studies of rural plain sites, located between the current provinces of Girona and Barcelona. The corpus covers a chronology from the 7th to the 13th century AD, with the 9th-11th centuries being those documented by the largest number of sites (fig. 9). A total of 55 samples were analyzed, collecting 4 045 carporests, including 25 taxa considered to be cultivated or harvested: 9 cereals, 6 legumes, 2 vegetables, 8 fruit plants, one oilseed and one aromatic.

⁸ The realization of a radiocarbon dating has been recommended and is currently awaiting completion.

The compilation of data from rural plains sites on either side of the Pyrenees shows that a common agro-horticultural heritage has been exploited (fig. 10). The main species thus seem to be the same, particularly regarding cereals (hulled barley, naked wheat, millets, rye, oats), legumes (faba beans, lentils, peas, vetch) and some fruit plants (vines, fig trees). However, the southern part of the country has a greater diversity, particularly in cereals (presence of hulled wheat, einkorn and emmer, naked barley) and legumes (bitter vetch, chickpea). In the current state of research on textual and carpological documentation, it would seem that hulled wheat, naked barley and bitter vetch, did not form part of the agro-horticultural spectrum exploited in medieval Roussillon (PUIG 2003; ROS 2020), perhaps marking here a regional specificity. Concerning chickpea, it is disturbing that the archaeological sites of Roussillon have not delivered any, although they are mentioned in the leudes (Perpignan, Thuir, Collioure) (PUIG 2003), and that they are attested by carpology in southern Catalonia (PEÑA-CHOCARRO *et alii* 2018) as well as in Languedoc and Provence between the 8th and the 11th centuries (RUAS 1990, 2005).

There is a significant difference between the two studied areas for fruit plants and technical/oilseed crops, which do not seem to share any common species other than grapevine and fig tree. These results should be considered with caution; the punctual nature of the discoveries of fruit remains in the studied rural samples should not lead to an over-interpretation of the data, as some taxa recorded in southern Catalonia appeared in northern Catalonia during this period, but only in certain foothills or high altitude areas. This is the case in particular of strawberry, raspberry and almond, recorded in levels of the 11th-13th centuries of the Château des Angles in Capcir (RUAS and RENDU 2005), and peach, present in 9th-10th centuries levels of the castrum of Ultréra, located in the Alberes foothills (ROS 2020). As far as technical/oilseed plants are concerned, there is a total absence of carpological mentions of hemp in southern Catalonia during historical periods, and conversely a total absence of camelina (*Camelina sativa*) in northern Catalonia. Flax is present in both areas, but is currently only recorded in urban areas in southern Catalonia (PEÑA-CHOCARRO *et alii* 2018).

Overall, this first assessment offers mixed results. While the agro-horticultural exploited heritage seems to be the same for all the rural plain sites, variations within the secondary species exploited can be observed on both sides of the Pyrenees. Due to the disparity of the data, it is difficult to qualify these variations; it is too early to qualify them as specific, and to attribute them to local economic, cultural or environmental adaptations. While the agro-horticultural spectrum of southern Catalonia does not yet offer any new features compared to what is known in this region for the ancient period (PEÑA-CHOCARRO *et alii* 2018), it is important to keep in mind the nascent nature of the studies carried out, as only six rural medieval sites have been the subject of carpological analyses.

5. CONCLUSION

The first assessment carried out (ROS *et alii* 2016) made it possible to sketch a first portrait of the main agricultural plant resources of northern Catalonia, by comparing the available carpological data with textual sources. The new carpological corpus, increased and above all based on quantified data, makes it possible to bring out new results and also new questions regarding agro-horticultural production in this region.

It can be seen that the food-producing agro-horticultural base of Roussillon fully emerged during the first centuries of the Middle Ages and evolved little over time, the main species exploited, whether cereals, legumes, fruit plants or technical/oilseed plants, remaining the same. The frequencies established make it possible to confirm the importance of hulled barley, naked wheat and grapevine in the peasant sphere, as well as that of olive tree, whose absence in the rural contexts of southern Catalonia raises questions. The changes in the rural world, particularly through the emergence of a new network of rural farms during the 9th-10th centuries, do not seem to have had any direct impact on the choice of species exploited; they may, however, have had an effect on the morphology of the terroirs, the archaeobotanical documentation not being able to highlight this at the moment. An evolution of the agri-food heritage seems to have occurred in the last centuries of the period under consideration (13th-14th centuries), resulting in the integration of new plants, and in particular, in this case, of spinach. In the case of spinach, this integration seems to happen quickly, unlike those of perennial species, such as apricot or orange, which seem to occur through different pathways. The differences in treatment between these three species can have multiple origins, related to the social, symbolic or economic status of these plants, but also to the practices associated with their cultivation, annual plants such as spinach being less complex to cultivate than certain "exotic" perennial species requiring particular know-how (use of irrigation, grafting, adaptation to local climate, etc.). The integration of new species also raises the question of the mechanism for its implementation. In the case of the orange tree, it seems to be governed by fashion effects: the exotic and new fruit, first appearing on urban markets before the tree enters the royal gardens, then those of a knight, before passing into the peasant sphere; the question then arises of the transmission of agricultural knowledge and practices related to the cultivation of the species.

Finally, a comparison of the data obtained in medieval Roussillon with those available for southern Catalonia reveals the existence of certain homogeneity regarding the agro-horticultural base exploited on either side of the Pyrenees; with variations in secondary species to be confirmed in future work. If for the same period a similar diversity is recorded in medieval Mediterranean France, it is difficult for us to make comparisons with other parts of the western Mediterranean, for example in Spain, because of the excessive disparities that currently exist in

this research theme. If in the coming years this research on the Catalan rural world is to be continued, it will be necessary to carry out, in parallel, the study of urban contexts, in order to be able to determine whether there are significant and quantifiable differences in terms of the agri-food spectrum consumed and exploited.

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Fig. 1: Plant foods exploited and traded in medieval northern Catalonia, based on textual sources (acts of practice, royal ordinances, commercial archives, terrier censuses) and carpological remains (10th-15th centuries): data as of 2014 (Ros et al. 2016). Conception : J. Ros



Fig. 2: Corpus of rural archaeological sites that have been the subject of a carpological study in Roussillon (Pyrénées-Orientales, France) for the period under consideration (8th-14th centuries)

N° on the map (fig. 3)	Site (city)	Resp. of operation	Dating	Number of contexts (samples)	Number of seed remains
1	Les Gavarettes (Argelès-sur-Mer)	C. Puig	8th-10th c.	11 (12)	1185
2	Ruscino (Perpignan)	I. Rebé	8th c.	6 (11)	16867
3	Camp del rey (Baixas)	O. Passarius	9th-10th c.	5 (5)	not quantified
4	Can Guilhemat (Saleilles)	J. Mantenat	9th-11th c.	9 (16)	82288
5	Le pila (Le Boulou)	J. Kotarba	9th-11th c.	2 (2)	15
6	L'orangeria (Argelès-sur-Mer)	N. Guinaudeau	9th-11th c.	5 (6)	244
7	Saint Julien (Villeneuve-de-la-Raho)	P. Alessandri	10th-11th c.	1 (11)	19
8	Madeleine II (Perpignan)	J. Kotarba	10th-12th c.	1 (3)	137
9	L'Horto (Caramany)	A. Pezin	10th-12th c.	4 (4)	9
10	Maison Philippon (Elne)	J. Kotarba, A. Pezin	10th-14th c.	2 (4)	54
11	Place de la Cathédrale (Elne)	J. Kotarba	10th-14th c.	4 (4)	126
12	Vilarnau d'Amont (Perpignan)	O. Passarius	11th-12th c.	1 (1)	971
13	Place du Général Foixet (Pézilla-la-Rivière)	O. Passarius	11th-13th c.	8 (9)	2031
14	Château royal (Collioure)	O. Passarius	12th-14th c.	4 (9)	7434
15	Orle ouest agraire (Perpignan)	A. Bergeret, J. Kotarba	13th-14th c.	1 (1)	21
				64 (98)	111 401

Fig. 3: Studied area and location of the sites of the corpus (circle = archaeological sites). The site numbers correspond to those shown in Figure 2. Conception : J. Ros

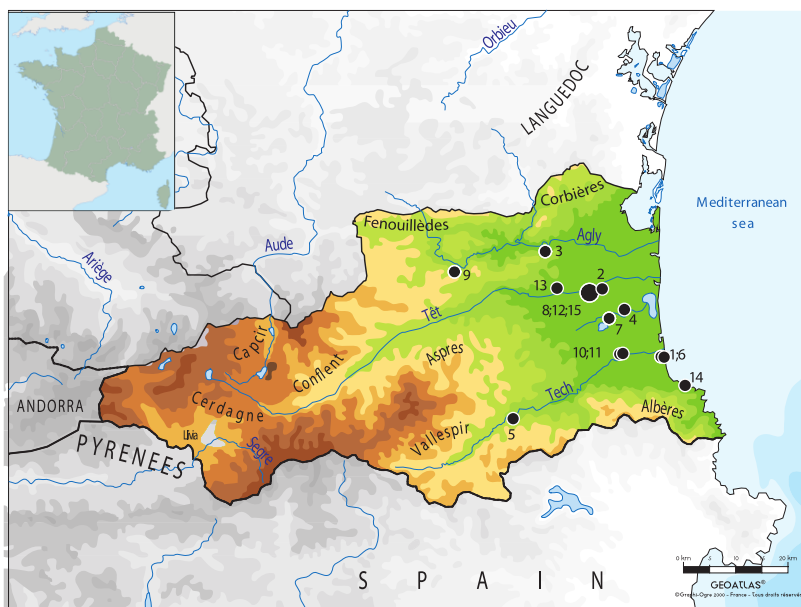


Fig. 4: Identification and enumeration of carpological remains of cereals of the corpus (sem. = seeds; fg. = fragment; X = taxon present)

SITE NUMBER (FIG. 2.3)			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DATATION			7th-10th c.	8th c.	9th-10th c.	9th-11th c.	9th-11th c.	9th-11th c.	10th-11th c.	10th-12th c.	10th-12th c.	10th-14th c.	10th-14th c.	11th-12th c.	11th-13th c.	12th-14th c.	13th-14th c.
NUMBER OF CONTEXTS (SAMPLES)			11 (12)	6 (11)	5 (5)	9 (16)	2 (2)	5 (6)	1 (1)	1 (3)	4 (4)	2 (4)	4 (4)	1 (1)	8 (9)	4 (9)	1 (1)
MESHES USED TO SIEVE THE SAMPLES			0,5mm	4 / 0,5mm	0,5mm	0,5mm	4mm	0,5mm	4mm	4 / 0,5mm	4 / 0,5mm	4mm	4mm	0,5mm	0,5mm	0,5mm	0,5mm
CEREALS, grains																	
<i>Avena</i> sp.	Out	sem.	-	-	-	-	-	-	-	-	-	-	-	-	6	64	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	2	41	-
<i>Hordeum vulgare</i>	Hulled barley	spikelet	-	-	X	-	-	-	-	-	2	36	-	-	3	6	-
		sem.	34	14561	-	47	-	22	5	6	-	98	102	103	1120	-	-
		fg. sem	43	484	-	68	-	8	-	2	-	-	85	134	662	-	-
<i>Panicum milaceum</i>	Common millet	sem.	27	2	X	22	-	-	-	-	-	-	-	6	293	12	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
<i>Panicum/Setaria</i>	Common/Foxtail millet	sem.	-	-	-	2	-	-	-	-	-	-	-	-	7	-	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	37	-	-
<i>Secale cereale</i>	Rye	sem.	-	-	-	-	-	-	-	-	-	-	-	2	-	54	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-
cf. <i>Secale cereale</i>	cf. Rye	fg. sem	-	3	-	-	-	-	1	-	-	-	-	-	-	3	-
<i>Secale/Triticum</i>	Rye/Wheat	sem.	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-
<i>Setaria italica</i>	Foxtail millet	sem.	3	-	-	3	-	-	-	-	-	-	-	-	947	11	-
		fg. sem	1	-	-	-	-	-	-	-	-	-	-	-	27	-	-
cf. <i>Setaria italica</i>	cf. Foxtail millet	sem.	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
<i>Triticum aestivum/durum</i>	Naked wheat	sem.	43	1324	X	84	8	70	-	3	-	11	16	232	3	4090	-
		fg. sem	22	60	-	82	4	21	-	12	-	-	-	40	2	853	-
<i>Triticum cf. aestivum/durum</i>	Wheat cf. Naked	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
<i>Triticum</i> sp.	Wheat	sem.	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
cf. <i>Triticum</i>	cf. Wheat	fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cerealia</i>	Cereal	fg. sem	45	52	-	31	3	1	-	-	-	1	-	14	6	2	-
CEREALS, chaff																	
<i>Avena sativa</i>	Out	lemma base	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-
		spikelet	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
<i>Hordeum vulgare</i>	Hulled barley	rachis article	11	-	X	1	-	-	-	-	-	-	-	15	1	1	-
		spikelet base	-	-	-	-	-	-	-	-	-	-	-	-	1	7	-
		glumes	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
<i>Secale cereale</i>	Rye	rachis article	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Triticum aestivum/durum</i>	Naked wheat	rachis article	18	-	X	-	-	-	-	-	-	-	-	26	-	-	-
<i>Triticum type aestivum</i>	Wheat type hexaploid	rachis article	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Cerealia</i>	Cereal	rachis article	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
TOTAL OF CEREAL REMAINS PER SITE			248	16287	not quantif.	340	15	124	5	34	2	48	115	523	1594	6970	0
TOTAL OF REMAINS PER SITE			1185	16867	not quantif.	82288	15	244	19	137	9	54	126	971	2031	7434	21

Fig. 5: Identification and enumeration of the carpological remains of pulses and vegetables in the corpus (sem. = seeds; fg. = fragment; X = taxon present)

SITE NUMBER (FIG. 2.3)			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DATATION			7th-10th c.	8th c.	9th-10th c.	9th-11th c.	9th-11th c.	9th-11th c.	10th-11th c.	10th-12th c.	10th-12th c.	10th-14th c.	10th-14th c.	11th-12th c.	11th-13th c.	12th-14th c.	13th-14th c.
NUMBER OF CONTEXTS (SAMPLES)			11 (12)	6 (11)	5 (5)	9 (16)	2 (2)	5 (6)	1 (1)	1 (3)	4 (4)	2 (4)	4 (4)	1 (1)	8 (9)	4 (9)	1 (1)
MESHES USED TO SIEVE THE SAMPLES			0,5mm	4 / 0,5mm	0,5mm	0,5mm	4mm	0,5mm	4mm	4 / 0,5mm	4 / 0,5mm	4mm	4mm	0,5mm	0,5mm	0,5mm	0,5mm
LEGUMES																	
cf. <i>Lathyrus</i>	cf. Wild pea	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Lathyrus/Pisum</i>	Peas	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Lens culinaris</i>	Lentil	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
cf. <i>Lens culinaris</i>	cf. Lentil	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-
<i>Pisum sativum</i>	Sweet pea	sem.	-	-	-	-	-	-	-	-	-	-	-	-	1	10	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-
cf. <i>Pisum sativum</i>	cf. Sweet pea	sem.	-	-	-	-	-	-	-	-	-	1	-	1	2	-	-
<i>Vicia faba var. minor</i>	Fava bean	sem.	-	2	-	1	-	-	1	-	-	-	-	1	3	1	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	4	8	1	-
<i>Vicia sativa largo sensu</i>	Common vetch	sem.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
<i>Vicia</i> sp.	Vetch (big seeds)	sem.	-	-	-	-	-	-	-	-	-	2	-	27	-	-	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-
<i>Fabaceae</i>	Fabaceae (big seeds)	sem.	-	-	-	-	-	-	1	-	-	-	2	50	-	32	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	59	-	50	-
VEGETABLES																	
<i>Allium</i> sp.	Onion/Garlic	bulb	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
<i>Atriplex/Spinacia oleracea</i>	Orache/Spinach	sem.	-	-	-	-	-	-	-	-	-	-	-	-	28	-	-
<i>Spinacia oleracea</i>	Spinach	fruit	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-
TOTAL OF LEGUMES AND VEGETABLES REMAINS PER SITE			0	2	0	1	0	0	2	0	0	1	4	115	101	118	0
TOTAL OF SEED REMAINS PER SITE			1185	16867	not quantif.	82288	15	244	19	137	9	54	126	971	2031	7434	21

Fig. 6: Identification and enumeration of carpological remains of fruit plants, technical/oilseed plants and wild plants in the corpus (sem. = seeds; fg. = fragment; X = taxon present)

	SITE NUMBER (FIG. 2, 3)	DATATIONS														
		NUMBER OF CONTEXTS (SAMPLES)														
		1 11b-10th c. 0,5mm	2 8th c. 6 (11) 4 / 0,5mm	3 9th-10th c. 5 (5) 0,5mm	4 9th-11th c. 9 (16) 0,5mm	5 9th-11th c. 2 (2) 4mm	6 9th-11th c. 5 (6) 0,5mm	7 10th-11th c. 1 (1) 4mm	8 10th-12th c. 1 (2) 4 / 0,5mm	9 10th-12th c. 4 (4) 4 / 0,5mm	10 10th-14th c. 2 (4) 4mm	11 10th-14th c. 4 (4) 4mm	12 11th-12th c. 1 (1) 0,5mm	13 11th-13th c. 8 (9) 0,5mm	14 12th-14th c. 4 (9) 0,5mm	15 13th-14th c. 1 (1) 0,5mm
CULTIVATED/WILD FRUITS																
<i>Corylus avellana</i>	Hazelnut	stone fg.	-	-	-	-	-	-	-	-	2	-	-	-	-	-
<i>Crataegus monogyna</i>	Aubépine monogyne	stone fg.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ficus carica</i>	Fig	sem.	1	-	-	-	-	-	1	-	-	-	-	4	3	-
<i>Olea europaea</i>	Olive	stone	-	1	X	-	-	-	9	-	-	-	-	-	1	8
		stone fg.	-	4	-	-	-	-	2	-	-	-	5	34	4	13
		intern almond	-	-	-	-	-	-	-	-	-	-	-	1	-	-
cf. <i>Olea europaea</i>	cf. Olive	stone fg.	-	-	-	-	-	-	-	-	-	-	-	2	-	-
<i>Pinus pinea</i>	Stone pine	fg. de bracte	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Prunus domestica</i>	Plum	stone fg.	-	1	-	-	-	-	-	-	-	-	-	-	-	-
<i>Quercus</i> sp.	Oak	acom	-	10	-	-	-	-	-	-	-	-	-	-	-	-
		acom fg.	-	117	-	-	-	-	-	-	-	-	-	-	-	-
<i>Rubus fruticosus</i>	Blackberry	sem.	2	-	-	-	-	-	-	-	-	-	6	-	-	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Rubus fruticosus/Idaea</i>	Blackberry/Raspberry	fg. sem	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<i>Vitis vinifera</i>	Grapevine	sem.	98	164	X	2	-	2	1	2	1	-	2	5	12	-
		fg. sem	34	94	-	2	-	9	-	18	-	-	-	5	7	13
		fg. sem (beak)	48	-	-	-	-	3	-	1	-	-	-	2	4	-
		immature sem.	-	-	-	-	-	-	-	-	-	-	-	1	-	-
		pedicel	23	-	-	-	-	-	-	-	-	-	-	-	4	-
		stalk	1	-	-	-	-	-	-	-	-	-	-	-	1	-
		fruit	3	-	-	-	-	-	-	-	-	-	-	-	-	-
TECHNICAL/OILSEED PLANTS																
<i>Cannabis sativa</i>	Hemp	sem.	-	-	-	-	-	-	-	-	-	-	-	-	2	-
	Flax	sem.	133	119	X	-	-	5	-	-	-	-	-	3	-	1 (1)
		fg. sem	19	20	-	-	-	-	-	-	-	-	-	-	1	-
cf. <i>Linum usitatissimum</i>	cf. Flax	sem.	-	-	-	-	-	-	-	-	-	-	-	-	2	-
		fg. sem	-	-	-	-	-	-	-	-	-	-	-	-	1	-
TOTAL OF FRUIT REMAINS PER SITE			212	391	X	4	0	14	12	22	3	0	7	5	63	44
TOTAL OF TECHNICAL/OILSEED PLANTS REMAINS PER SITE			133	119	X	0	0	5	0	0	0	0	0	0	3	0
TOTAL OF WILD PLANTS REMAINS PER SITE			77	82	X	0	0	10	0	0	0	0	0	0	0	0
TOTAL OF REMAINS PER SITE			1085	1407	not quantif.	02288	15	244	19	137	3	54	126	971	2031	7438

Fig. 7: Frequencies of cultivated/exploited plants within the corpus. In black, frequencies on the total number of sites (15 sites); in grey, frequencies on the total number of contexts (64 contexts). Taxa identified in a single context of a single site and that are not presented in the histogram: lentil (*Lens culinaris*), common vetch (*Vicia sativa*), hazelnut (*Corylus avellana*), stone pine (*Pinus pinea*), plum (*Prunus domestica*), oak (*Quercus* sp.), hawthorn (*Crataegus monogyna*), hemp (*Cannabis sativa*)

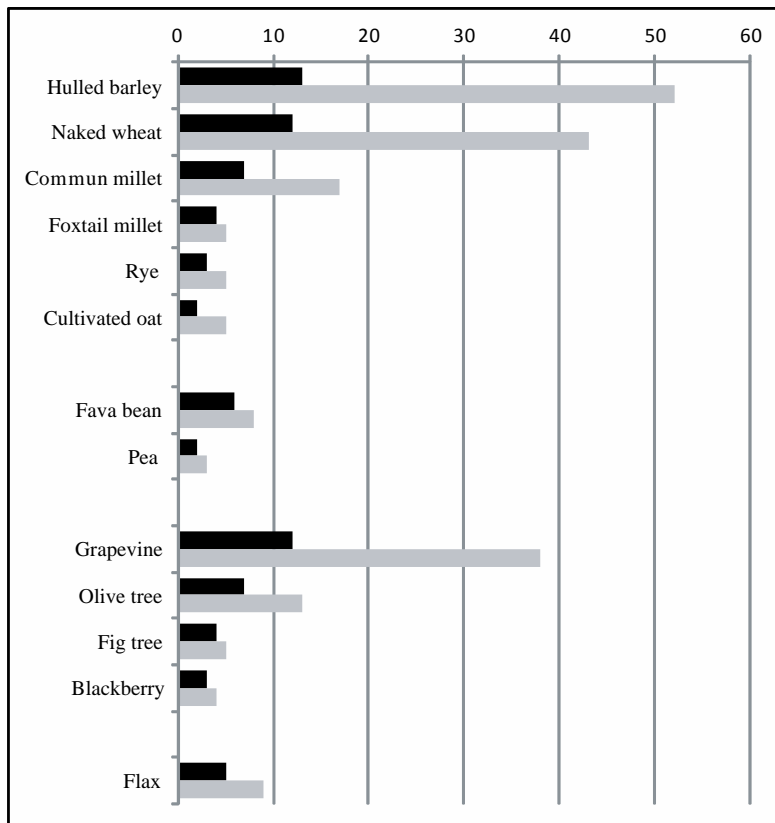


Fig. 8: Apricot, orange and spinach in medieval northern Catalonia: compilation of carpological and textual references (market tariffs, acts of practice, royal ordinances, commercial archives, agronomy treaty) (Agusti 1617 ; Puig 2003 ; Tarayre 2006 ; Catafau 2018 ; Ros unpublished). (the asterisks indicate dates when textual references exist). Conception: J. Ros (logos issued from “the Noun Project”, Conception: Vectors Market, Arif fajar yulianto, Atif Arshad, Maxim Kulikov)

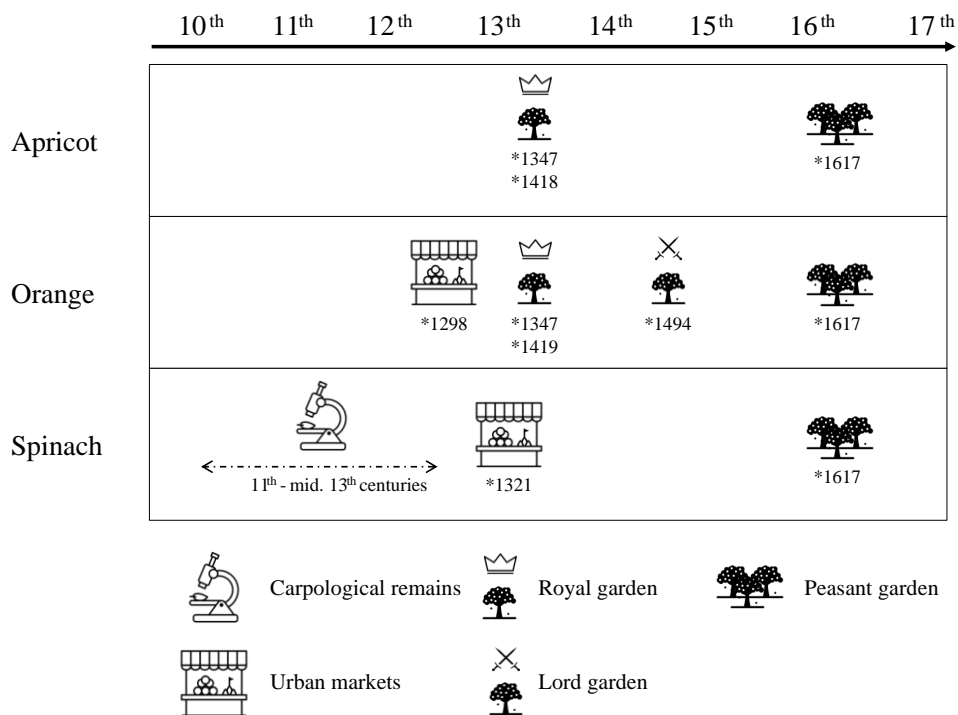


Fig. 9: Corpus of rural archaeological sites that have been the subject of a carpological study in southern Catalonia (Autonomous Community of Catalonia, Spain) for the period under consideration (8th-14th centuries)

Site (city)	Dating	Number of samples	Number of seed remains	Bibliography
Pla del Serrador (Les Franqueses)	7th-10th c.	9	441	López Reyes, unpublished
Camp de Can Massot (Fornells de la Selva)	8th-12th c.	5	174	López Reyes, unpublished
Can Gambús 2 (Sabadell)	8th-12th c.	9	2057	López Reyes, unpublished
Ca n'Oliver (Cerdanyola del Vallès)	9th-10th c.	3	318	Alonso, unpublished
Torrebonica (Terrasa)	9th-11th c.	6	20	López Reyes, unpublished
L'Essquerda (Osona)	13th c.	23	1035	Cubero <i>et al.</i> 2008
		55	4045	

Fig. 10: Comparison of cultivated/exploited taxa documented by carpology in northern and southern Catalonia (data for southern Catalonia synthesized from Peña-Chocarro *et al.* 2018)

	northern Catalonia	southern Catalonia
	15 rural sites (98 samples)	6 rural sites (55 samples)
	111 401 seed remains	4 045 seed remains
Cereals		
<i>Avena</i> sp. (oat)	•	•
<i>Hordeum vulgare</i> sbsp. <i>vulgare</i> (hulled barley)	•	•
<i>Hordeum vulgare</i> sbsp. <i>nudum</i> (naked barley)		•
<i>Panicum miliaceum</i> (common millet)	•	•
<i>Secale cereale</i> (rye)	•	•
<i>Setaria italica</i> (foxtail millet)	•	•
<i>Triticum aestivum/durum</i> (naked wheat)	•	•
<i>Triticum dicoccum</i> (emmer)		•
<i>Triticum monococcum</i> (einkorn)		•
Pulses/Vegetables		
<i>Allium</i> sp. (onion/garlic)	•	
<i>Cicer arietinum</i> (chickpea)		•
<i>Lens culinaris</i> (lentil)	•	•
<i>Pisum sativum</i> (sweet pea)	•	•
<i>Spinacia oleracea</i> (spinach)	•	
<i>Vicia ervilia</i> (bitter vetch)		•
<i>Vicia faba</i> var. <i>minor</i> (fava bean)	•	•
<i>Vicia sativa</i> (common vetch)	•	•
Fruits		
<i>Corylus avellana</i> (hazelnut)	•	
<i>Crataegus monogyna</i> (hawthorn)	•	
<i>Ficus carica</i> (fig)	•	•
<i>Fragaria vesca</i> (strawberry)		•
<i>Olea europaea</i> (olive)	•	
<i>Pinus pinea</i> (stone pine)	•	
<i>Prunus avium</i> (wild cherry)		•
<i>Prunus avium/cerasus</i> (cherries)		•
<i>Prunus domestica</i> (plum)	•	
<i>Prunus dulcis</i> (almond)		•
<i>Prunus persica</i> (peach)		•
<i>Quercus</i> sp. (oak)	•	
<i>Rubus fruticosus</i> (blackberry)	•	
<i>Rubus idaeus</i> (raspberry)		•
<i>Vitis vinifera</i> (grapevine)	•	•
Technical/Oilseed plants		
<i>Camelina sativa</i> (gold-of-pleasure)		•
<i>Cannabis sativa</i> (hemp)	•	
<i>Linum usitatissimum</i> (flax)	•	
Spices		
<i>Verbena officinalis</i> (common vervain)	•	•