Preistoria Alpina

ISSN 0393-0157

homepage: https://www.muse.it/it/Editoria-Muse/Preistoria-Alpina/Pagine/home.aspx

Article

Late Iron Age balanophagy and leaf-fodder in the lower Valpolicella (Verona, Italy)

Renato Nisbet*

Dipartimento di Studi sull'Asia e sull'Africa Mediterranea, Università Ca' Foscari – Dorsoduro 3462, 30123 Venezia, Italia

Parole chiave

- balanofagia
- alberi da foraggio
- archeobotanica
- età del Ferro
- Italia N
- Valpolicella

Keywords

- balanophagy
- fodder trees
- archaeobotany
- Iron Age
- northern Italy
- Valpolicella

* Autore per la corrispondenza:
renato.nisbet@unive.it

Riassunto

L'indagine botanica sui resti carbonizzati contenuti in alcuni edifici della seconda età del Ferro a Gargagnago (Verona) descrive un'economia agricola che ha permesso, assieme a legumi e pochi cereali, la conservazione di alcune centinaia di ghiande carbonizzate che si ritengono raccolte per il consumo alimentare umano. Un incendio dell'edificio forse utilizzato come magazzino ha consentito la conservazione dell'insolito ritrovamento, che viene contestualizzato all'interno della documentazione etnografica ed archeologica regionale ed europea.
L'analisi dei numerosissimi carboni di legno di quercia, la pianta principalmente utilizzata nelle strutture interne degli edifici, evidenzia nella forma e nello spessore degli anelli di crescita delle irregolarità che sono compatibili con un uso periodico delle foglie come foraggio per gli animali. Anche di questo aspetto si prendono in considerazione i riscontri archeologici ed etnografici.

Summary

The charred remains from some late Iron Age houses at Gargagnago (Verona, Italy) point to the existence of a farming economy characterized by few legumes and cereals together with some hundreds of acorns, whose consumption in the human diet is examined in this paper. This unusual discovery is discussed taking some Italian and European ethnographic and archaeological records into consideration. Some of the many oak charcoals found in one of the houses display irregularities in their growth rings, consistent with a periodic use of leaves for feeding livestock. This aspect is also considered in its broader archaeological and ethnographic context.

Redazione: Marco Avanzini, Valeria Lencioni

pdf: *https://www.muse.it/it/Editoria-Muse/Preistoria-Alpina/Pagine/PA/PA_51_2021.aspx*

Introduction

The economic use of woodland by ancient societies is an issue which inspires a large amount of the research amongst naturalists, geographers and historians (Rackham 1976, 1980; Moreno et al*.*1982; Andreolli & Montanari 1990; Vera 2000; Rösch 2012; Bittmann et al. 2014; Mercuri et al. 2015). There is a commonly shared view on the characteristics, extension, economic and ecological importance of the Holocene forests up to the Bronze Age. However, study and interpretation of woodland changes in later periods might be debatable because of the contemporaneous presence of several new factors putting pressure on the ecosystems. Amongst these are: the development of new technologies, which are more aggressive on the environment (above all, iron metallurgy); the demographic expansion and the consequent occupation of new territories by both pastoral and farming groups; possible climatic change effects under increased human pressure (Kaplan et al. 2009).

For these reasons, the last centuries of the first millennium BCE are of particular interest, mostly in an area (*Italia Cisalpina*) on the eve of fundamental social and political changes, descriptions of which are present in the works of Greek and Latin historians, and whose archaeological record is widely presented in numerous recent studies (see, f.i., Salzani 2002; Guidi et al.2008; Migliavacca 2013).

The aim of this paper is to outline some trends in the use of vegetal resources in an Iron Age village ("rhaetian village": Ciurletti & Marzatico 1999; Marzatico 2019) settled on the slopes of the Valpolicella hills (Figure 1) between 400 and 100 BCE and their possible wider implications on the human diet, as shown by the large amount of charred acorns, which explains the use of the word *balanophagy*, the consumption of acorns in the human diet.

Agriculture and wood use in seven Iron Age sites of the lower Valpolicella and nearby areas has been studied in the last thirty years (Castelrotto: Nisbet 1987a; Monte Loffa: Nisbet 1989-90; San Giorgio Valpolicella: Nisbet 1992; Trissino, San Briccio, Montebello Vicentino: Balista et al. 1982; Monte Castelon: Nisbet 2015) (Table 1).

Agriculture was widely practiced in Iron Age Veneto. All known species of wheat were grown, as well as both hulled and naked barley with the former being found in all of the sites. Broomcorn millet is the most common of the small-seeded grasses (or *minor crops)* amongst which, however, rye has not yet been found. Lentils are the most frequent legumes, followed by horse bean. Also in this case, some of the most frequently grown legumes of the northern Italian Iron Age (grass pea, pea, common vetch: Castelletti et al. 2001: 61) were not found in the aforementioned sites.

In spite of agriculture being highly developed, forest fruit collection (hazelnuts, acorns) was also practiced, pursuant to its long-standing tradition. It continued everywhere up to the Middle Ages and to the present day, and is now well documented in the Gargagnago site.

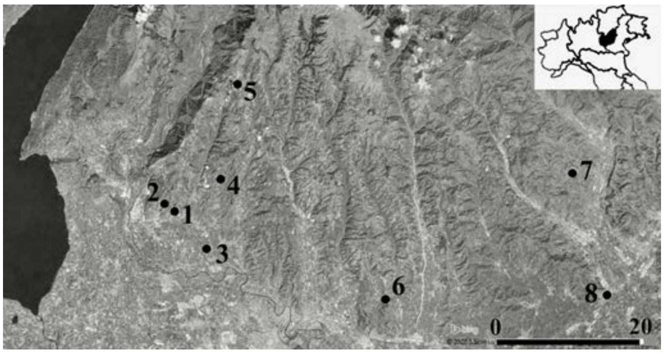

Figure 1*: Map of the Iron Age sites mentioned in the text. 1. Gargagnago; 2; San Giorgio; 3. Castelrotto; 4. Monte Castelon; 5. Monte Loffa; 6. San Briccio; 7. Trissino; 8. Montebello. / Figura 1: Siti dell'età del Ferro con ricerche archeobotaniche menzionati nel testo. 1. Gargagnago; 2. San Giorgio; 3. Castelrotto; 4. Monte Castelon; 5. Monte Loffa; 6. San Briccio; 7. Trissino; 8. Montebello.*

The trees present in these Iron Age sites exhibit a variety of biotopes, whose exploitation partly depended on their proximity (therefore on their immediate availability) and partly on cultural reasons (technological traditions, for instance in the case of the use of non-local conifers). In pollen and charcoal diagrams, Sub-Atlantic forest cover in the Po Plain is mostly formed by associations of *Quercus robur* L., *Carpinus betulus* L., *Fraxinus excelsior* L., *Ulmus minor* Mill., *Tilia cordata* Mill. and several hydrophilous trees (Ravazzi et al. 2013; Valsecchi et al. 2006; Bosi et al. 2019).

Geographical setting

The Gargagnago site (186 m asl), whose archaeobotanical remains are discussed here, is situated at the foothills of Valpolicella (Verona). It lies close to the apex of a terraced fan system of Late Glacial Age formed by the discontinuous activity of small streams draining from the overlying Tertiary limestone. The alluvial deposits, mostly formed by layers of coarse pebbles, sand and clays, have merged to form a gently sloping plain, where water availability and deep soil could have determined the choice for settling and for agriculture. Nowadays, vineyards and orchards cover the whole area,

Table 1*: Trees and vegetables used in the Iron Age sites of the lower Valpolicella and surrounding areas (data from 1987 to 2015). SB: San Briccio; SG: San Giorgio; T: Trissino; M: Montebello; C: Castelrotto; ML: Monte Loffa; MC: Monte Castelon). / Tabella 1: La vegetazione utilizzata nei siti dell'età del Ferro della bassa Valpolicella e aree limitrofe (dati 1987-2015). SB: San Briccio; SG: San Giorgio; T: Trissino; M: Montebello; C: Castelrotto; ML: Monte Loffa; MC: Monte Castelon).*

Crops	**Trees**
Hordeum vulgare, barley (T, M, SB, ML, C, SG, MC)	*Abies alba*, fir (C)
Triticum monococcum, einkorn (T, M, SB, ML, C)	*Picea excelsa*, spruce (ML)
Triticum dicoccum, emmer (T, M, SB, ML, C, MC)	*Quercus* cad., decid. oak (SG, ML, MC, C)
Triticum spelta, spelt (dubious) (C)	*Carpinus betulus,* hornbean (SG)
Triticum aestivum/durum (naked wheat) (ML, SG, MC)	*Ulmus* sp., elm (SG, C)
Panicum miliaceum, broomcorn millet (T, M, C)	*Prunus* sp., prune (MC, C)
Lens culinaris, lentil (T, M, ML, C)	*Populus* sp., poplar (SG)
Vicia ervilia, bitter vetch (T, M, C, SG)	*Corylus avellana* (shells), hazelnut tree (T)
Vicia faba, horsebean (T, M, SB, ML, C)	*Quercus* sp. (acorns), oak (T)
Vitis vinifera, grape (SB, SG, MC, C)	

but woods of deciduous *Quercus* and *Carpinus betulus* together with other broadleaved trees such as *Tilia cordata, Fraxinus excelsior* and *Ulmus* sp. could represent the potential natural vegetation (ISPRA, 2010).

Here, some small "houses", made of stonewall and wooden structures were built, forming part of a larger village covering more than 1500 m^2 (Salzani & Bernardi 2021). Sediment sampling had allowed the study of the charred remains of these structures, called Houses I, II, IV and V.

Materials and methods

The analysis has been carried out on the materials found in three of the buried houses (Houses II, IV and V) and in the larger, more recent structure (House I) (we use the word "house" according to Salzani & Bernardi 2021). The former have been described as dry stonewall buildings enclosing earthen floors. They were built about 450 BCE and abandoned possibly a century later for still unknown reasons (see discussion on this subject in Salzani & Bernardi 2021). The walls were sometimes lined with stone slabs. Fireplaces and postholes were present. House V was divided into two parts by a probable wooden partition.

Some larger postholes inside House IV, together with a fireplace and a particular distribution of stone slabs, may suggest some unknown specific craft activity (furnace, silo?).

House II also contains two fireplaces and some postholes. The abandonment of the three buildings was probably not as a consequence of fire. This accounts for the relatively small quantity of wood charcoals found in the samples. The small size and heterogeneity of the fragments suggest their origin from one or more fireplaces in the inner part of the houses, and not from structural elements.

The larger rectangular House I (about 116 m^2) was built at the half of 2nd century, after the abandonment of the small village, partly on the ruins of House VI, and was still used during the 1st century BCE. It was more extensively sampled for archaeobotany. The house was built following the same techniques previously used: earthen floor, dry stonewalls, standing stone slabs supporting wooden elements of walls. Planks covered a small part of the floor. Also this building contained a sizable amount of wood with different functions. A fire, which probably broke out soon after its construction, produced a remarkable quantity of charcoal and charred fruits.

Sampling concerned 7 stratigraphic units, four of which come from House I, for a total sediment of ca. 19 L. The samples were floated in water and sieved through 4 mm and 2 mm mesh. The fine fraction was subsequently treated at 0,4 mm mesh. Seeds and fruits were found in 6 units (House I, II, IV, V) but 99% of the remains come from House I.

The identifications were made using modern comparative collections and photographic atlases (Schweingruber 1990 for charcoals; Cappers et al. 2006 for seeds and fruits).

Results

Charred wood

All charcoals were collected within the inner part of the houses, providing some indication of the choice and technology of the wood, and of woodland ecology.

The six samples display some similarities, but also a few interesting peculiarities (Table 2). The similarities consist in the constant use of deciduous oak timber, two cases (both in House I) being exclusive use. The difference consists in the heterogeneous composition of some samples, reflecting their non-selective origin (probably a random local firewood collection).

The use of wood in the House I

Sample US 158 provides data on the choice of wood used for some of the inside structures. It consists of 22 sub-samples, containing large pieces (often > 10 cm) of only three *taxa*. Almost all of the samples are made of only one tree genus (elm, oak and pine). They may derive from both structural elements (poles etc.) and inner furniture. There was a long tradition of using oak as timber for building palisades, houses, lake dwellings and monuments during the European (Pétrequin 1996; Rennie 2013; Dufraisse et al. 2015; Knight et al. 2019; Müller-Scheeßel et al. 2020) and Italian (Nisbet & Rottoli 1997) prehistory. It is quite possible that the largest fragments found in four samples (US 158 F, H, S, U), with > 40 growth rings, belonged to oak (most probably *Quercus* gr. *robur*) beams or planks. In particular, sample US 158 U, the only one consisting of two different woods (oak and elm) could be part of a door (Figure 2), as suggested by the presence of nails and a metal hinge. In US 158 the most frequent *taxon* (about 50%) is elm (*Ulmus* sp., probably U. minor Mill.). It was found in lesser quantity only in another context (House IV). The field elm is a large tree, growing on fresh deep soils and sometimes taking over part of oak woodland. According to P. Lieutaghi (1975: 552) its wood, most requested by wheelwrights, is resistant to compression, it is easy to work, and it is often used for structures lying in water or in wet soils. In the case of House I, it could be used to form the wooden portions of the floor. In the northeastern corner a burnt curved alignment, possibly suggesting the presence of a barrel, is made of elm wood (Figure 3A, 3B). However, the recognition of part of a wheel hub in the same spot (Salzani, pers. comm. January 6, 2021) would also qualify the curved structure as a part of a wheel. The presence of elm in the vegetation close to the site could eventually

Table 2*: Charred timber from the houses. Number of analysed fragments are shown, except for US 158, where taxon/sample is shown. / Tabella 2: Essenze legnose carbonizzate nei diversi edifici. Sono indicati i numeri di frammenti analizzati, tranne che per US 158, di cui si è specificato il numero di ogni taxon per campione.*

	US 111 House I	**US137 House I**	**US 158 A-Z House I**	**US 173 House I**	**US 210 House IV**	**US 266 House V**
Taxa/Volume mL	9500	2200	3045	1700	450	650
Taxus sp.						4
Pinus sp.			6			
Fagus sylvatica					6	
Quercus caduc.	> 1000	> 1000	4		28	2
Carpinus betulus sp.				25	2	17
Ulmus sp.			11		2	

be related to its well-known use as vine stakes mentioned by classical authors. The occasional presence of a single grape pip (House IV) would give some support to this assumption. In the same NW corner a concentration of pine charcoal points to the presence of some unidentified structure, possibly related to the supposed barrel.

The occurrence of conifer wood is interesting. Light-demanding pines (belonging to the xylotomic group *P. sylvestris* L., Scots Pine) grow on light soils and could be found on the lower slopes of the surrounding hills. *Carpinus betulus* L., hornbeam, is definitely a local species forming, with oaks, alders and ashes, one of the typical forest associations in the Po Plain. Hornbeam charcoals have been found in US 173, part of a fireplace at the bottom of a structure interpreted as a possible chimney.

Possible evidence of tree fodder

Some of the charcoal fragments exhibit large dimensions, regular growth rings, very wide tree ring curvature in the totality of the cases (Figure 4A) which suggest, on the one hand, their provenance from the collapse of large structural elements (poles etc.) of the inner parts of the houses and, on the other, their origin from well selected adult trees. In several instances (US 111) large oak fragments with > 50 regular growth rings suggest prolonged uniform climate and soil conditions.

In US 137 several occurrences of irregular growth on oak charcoals were found (Figure 4B). A series of large rings (n. 1) is

__Figure 2__: Large charred tabular fragments (Elm, Oak), US 158 U, House I, possibly deriving from a door (phot. courtesy L. Salzani). / Figura 2: Grandi frammenti tabulari di carboni (Olmo, Quercia) US 158 U, Edificio I, forse originati da una porta (foto L. Salzani).

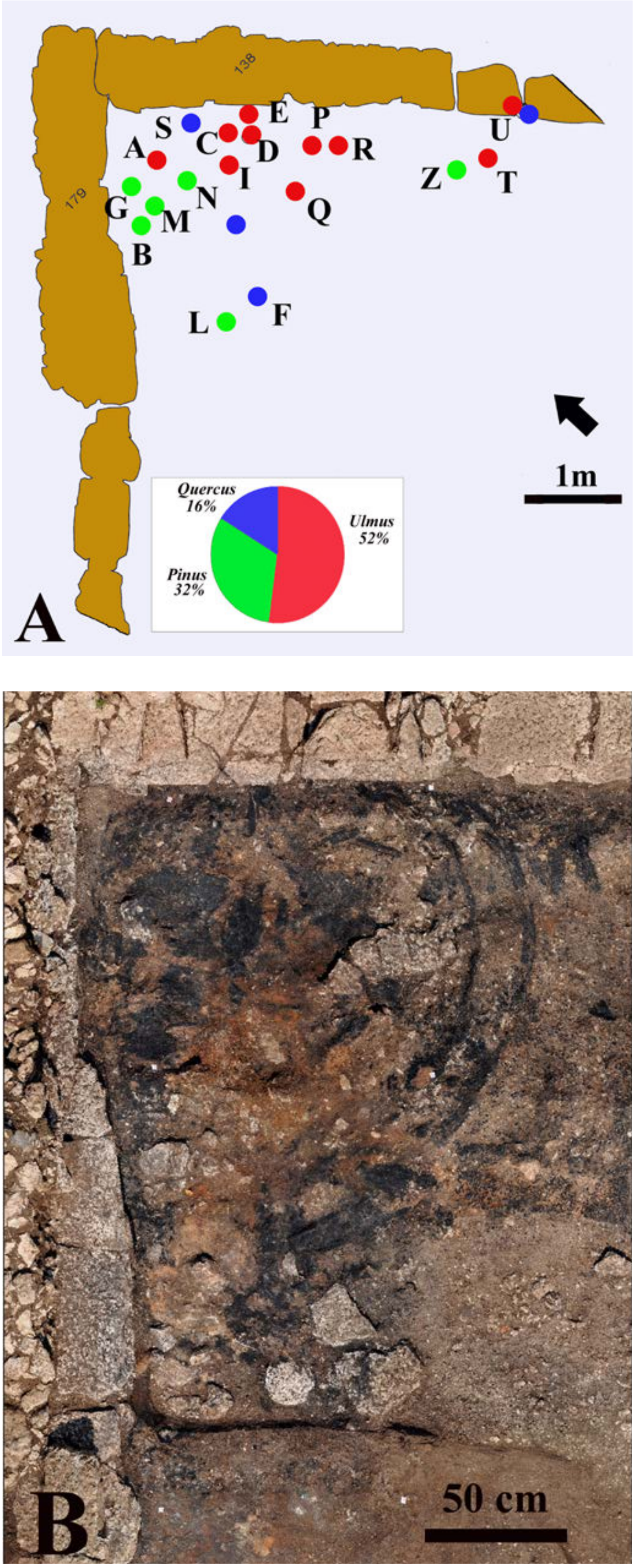

__Figure 3__: House I, NW corner. A: distribution of large fragments (planks, staves) of charred wood. Blue: Quercus sp. (deciduous oak); Green: Pinus sp. (cf. Scots Pine); Red: Ulmus sp. (Elm). C, E, D, I correspond to the curved feature (barrel? wheel?) shown in 2B (courtesy L. Salzani). / __Figura 3__: Edificio I, angolo NW. A: distribuzione di grandi frammenti carbonizzati (da assi o doghe). Blu: Quercus sp. (Quercia caducif.); Verde: Pinus sp. (cf. Pino silvestre); Rosso: Ulmus sp. (Olmo). C, E, D, I corrispondono alla struttura incurvata (botte? ruota?) presente in 2B (fot. L. Salzani).

followed by a sequence of very narrow rings, with greatly reduced summerwood (n. 2-7), after which the growth becomes regular again (n. 8-10). Several factors can affect this anomaly in cambium activity (the embryonic tissue controlling the radial growth of the stem), such as pest attack, prolonged cold spells, onset of drought and leaf fall. This last case can depend on a variety of reasons, among which pastoral woodmanship, resulting in a reduction of leaf cover and, at worst, its total loss during the period of photosynthetic activity (Schweingruber 2007). The ensuing sharp reduction in the reserves stored by the tree, used for the growth in the following year, determines the significant reduction of the ring. We have no clear evidence, in the examined cases, of pathogenic organisms: neither insect galleries nor fungal hyphae were found in the analysed charcoals. A climatic cause seems less probable. Data of diverse origins show that, following the well-known climatic crisis, which started around 1250 BCE, European climate did not have harsh episodes but was stable between 350 BCE and the Roman conquest – the chronological interval of Gargagnago (Zolitschka 2003; Büntgen et al. 2011). What about an anthropogenic origin?

Admittedly, one of the most cited pieces of evidence of trimming/shredding – that is the frequent presence of long and fairly thin branches of similar diameter (Out et al. 2018) – is absent in Gargagnago samples, where large fragment sizes are prevalent. However, the possibility that the observed anomalies in the growth rings be a consequence of human activity on oaks is reinforced when taking into account both the interest shown by the inhabitants in the use of acorns, and the presence, in some samples, of scars/kinks of died-back branches (Figure 4C) and lastly, but not least, the occurrence, amongst the archaeological materials, of a billhook, a tool typically related to the cutting of foliage from trees. Interestingly, the tool was found in the US 137 of House I, containing a large volume of oak charcoal and dozens of whole and split acorns.

According to A. David, the author of a well-documented thesis on agricultural iron tools in France (David 2010), the mechanical properties (shape, weight) of the Iron Age French billhooks (*serpes*) match two categories. The smaller ones represent a tool appropriate *à la taille et l'entretien de plantes arbustives ou à l'ébranchage,* the larger ones could allow *de couper, avec un manche de longueur moyenne ou longue, et par percussion lancée, des branches d'un diamètre moyen* (David 2010: 87). The author suggests a similar use for the large billhooks too, particularly when they are extremely crooked, suitable for pruning and therefore used for feeding animals (op. cit. 89); in this case hafting seems to be of particular importance.

The wood in the other houses

The charcoal in Houses IV and V shows a more varied picture. Oak and elm are present but not exclusively. The fragments are generally small and in lesser quantity. Because of their mixed composition, the samples seem to have originated by the dispersion of charcoal from fires lit on the room floors, mirroring the local wood composition. However, the presence of yew (*Taxus baccata* L.), a shadow-loving species, is worthy of mention, suggesting provenance from a higher vegetation belt. Beech (*Fagus sylvatica* L.), present

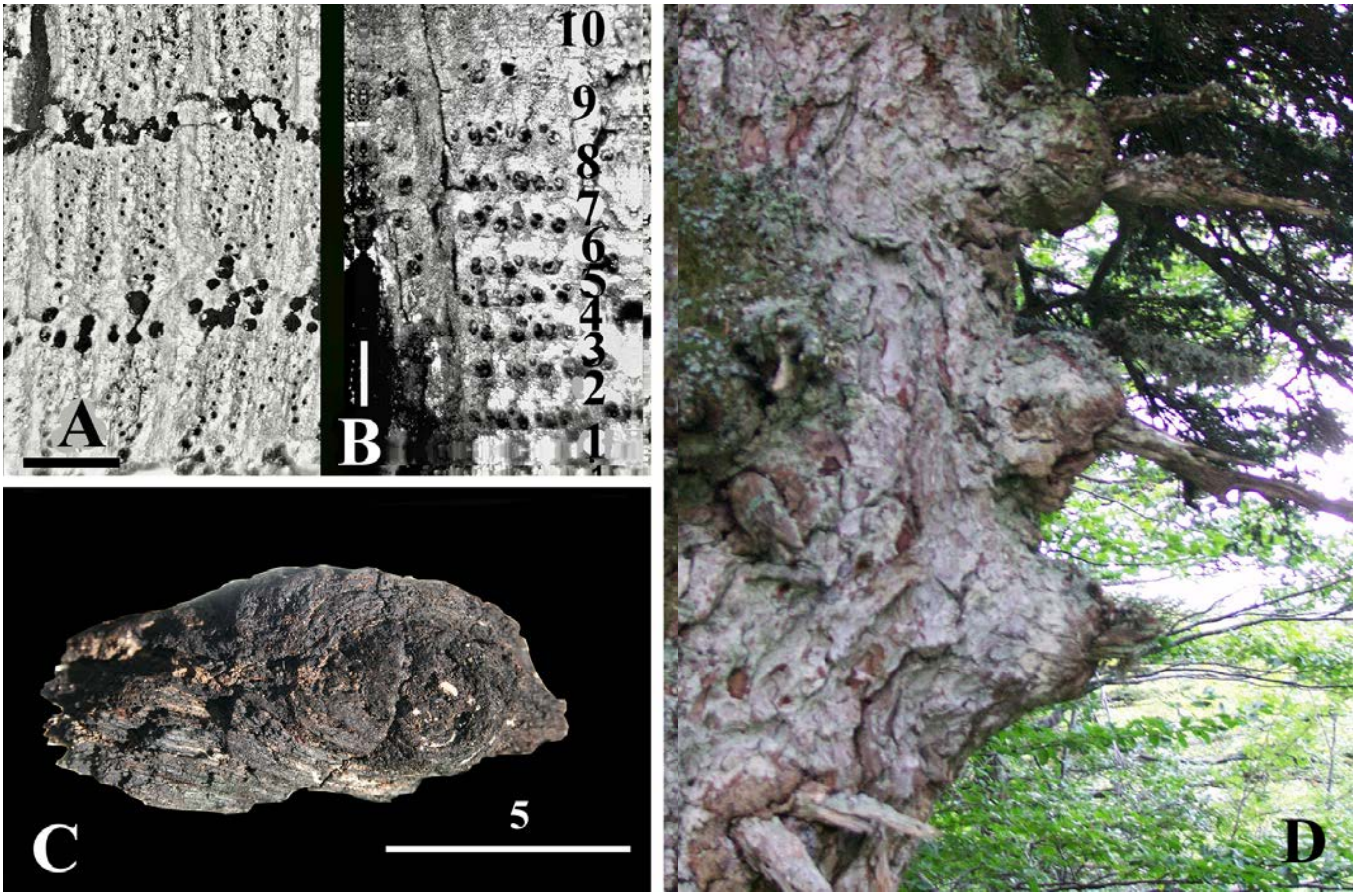

Figure 4*: A: Quercus sp. (deciduous oak) charcoal with regularly spaced tree rings (US 111); B: Quercus sp. (deciduous oak) with narrow rings, US 137. Bar: 0,5 mm. C: Knot in oak wood (US 111), possible evidence of shredding. Scale in cm. D. Knot formation as a consequence of shredding on Q. cerris (photo R. Cevasco 2004, Monte Nero (Ferriere-PC), archive LASA, Genoa Univ.). / Figura 4: A: carbone di Quercus sp. (caducif.) con anelli regolari ed ampi (US 111); B: carbone di Quercus sp. (caducif.) con anelli stretti, US 137). Scala 0,5 mm.C: nodo (su Quercus sp.) da possibile taglio di ramo (scalvatura?), US 111. Scala in cm. D: nodi prodotti da scalvatura su Q. cerris (foto R. Cevasco 2004, Monte Nero (Ferriere-PC) archivio LASA, Università di Genova).*

in US 210, could come from the same, not local, ecological belt.

Seeds and fruits

Out of some 16L of sediment come 1461 seed and fruit remains. Almost all of these were found in House I, with a higher concentration in US 111 (Table 4).

Both distribution and composition of the remains indicate that they are heavily conditioned by the local taphonomy. Firing and charring in House I are responsible for the excellent preservation of the remains (1452 in total), while in the other houses the record is discontinuous and partial (Figure 5).

The acorns

Altogether 1371 acorn remains of one or more undetermined species of deciduous oak(s) were collected from House I (Figure 6). 370 of them are whole nuts; 1001 are kernel halves; few cupules and many thin pericarp fragments are also present.

The morphology of the fruit and its adnexa (Figure 7) does not enable the identification of the oak species growing near the site (*Q. cerris, Q. robur, Q. pubescens, Q. petraea* being the more probable). It would be necessary to verify if the acorn is sessile or not, the element distinguishing *Q. robur* from *Q. petraea* and *Q. pubescens*, but the identification is not possible on isolated acorns. The few cupules do not belong to *Q. cerris*, as they lack the long linear scales.

The largest cupule fragment shows appressed scales. Mean diameters on a sample of 67 acorns are: length (L) 2.4 cm; width (w) 1.3 cm. The index L/w is 1.85. The morphometric variability is high (L_{min}: 1.6; L_{max}: 3.0; w_{min}: 0.9; w_{max}: 1.7) (Figure 8A and 8B, Figure 9).

All acorns are present in House I alone, which makes it plausible that the building served, wholly or partly, as a store or deposit for the crops from woodlands, gardens and fields, as suggested by the presence of cereals, legumes and few weed grains.

US 111 does not contain specific structures, like storage pits or jars, suitable for containing the acorns, which were found scattered on the floor. Since keeping acorns on the ground is not the ideal way of storing them, we can therefore imagine that, as a consequence of a fire that destroyed the wooden structures inside the room, they may have fallen from a shelf, or from the previously mentioned round feature of NW corner, or from a container like a leather or rope bag hanging above the floor, as shown in one French instance at least (Marinval 2008). At Fiavé-Carera (Bronze Age) analyses of a pot containing a few acorns and leather fragments showed the contents to have been treated with tannins (Evans 1994).

Adding together the whole fruits, the halves and the fragments found in US 111 we get a total of at least 550-600 whole nuts. Since the volume of the sediment containing the acorns is less than 10 L, the density is around 60 acorns/L. A lesser concentration is found also in US 137 (41/L); in US 158 it is much higher (265/L). These figures suggest the existence of a storage place where the fruits could dry out to be subsequently prepared for consumption. The acorns charred because of two possible factors: either by chance during crop processing (roasting), a necessity to reduce the effect of tannin that makes the fruit unsuitable for human consumption; or it was the consequence of a devastating fire, which seems congruent with the present archaeological evidence.

In findings of large acorn deposits in pre- and protohistoric archaeology, it is always questioned whether they were intended for feeding pigs or for human diet. It has understandably been observed (f.i., Jørgensen 1977; Deforce et al. 2009) that the shelled nuts, the absence of cupules and pericarp surrounding the seed indicate a lengthy preparation of the crop, which does not match the idea of livestock fodder adequately. Furthermore, swine are usually left to graze freely in the woods. During the early Middle Ages, however, the custom of collecting acorns and preserving them as winter food for pigs was also known (Comba 1988: 58). In Gargagnago only 8 cupules are preserved and the seeds have no pericarp. Some dozens of fragments of the latter were found, possibly due to burning and ensuing fragmentation of these fragile elements.

In northern Italian archaeobotanical records, acorns are present in more than 60 sites since Early Neolithic (Table 5). Acorns were found in many ancient excavations but these are not reported in Table 5, due to their dubious chronology. Frequently what is found are only burnt cotyledons, occasionally whole fruit, and even more rarely, cupules or other fruit parts. Findings with more than 100 acorns are exceptional, but even the ones with more than 10 remains are infrequent. This accounts for the reduced likelihood of preservation of the fruit, except in the special conditions of carbonization or anaerobic environments.

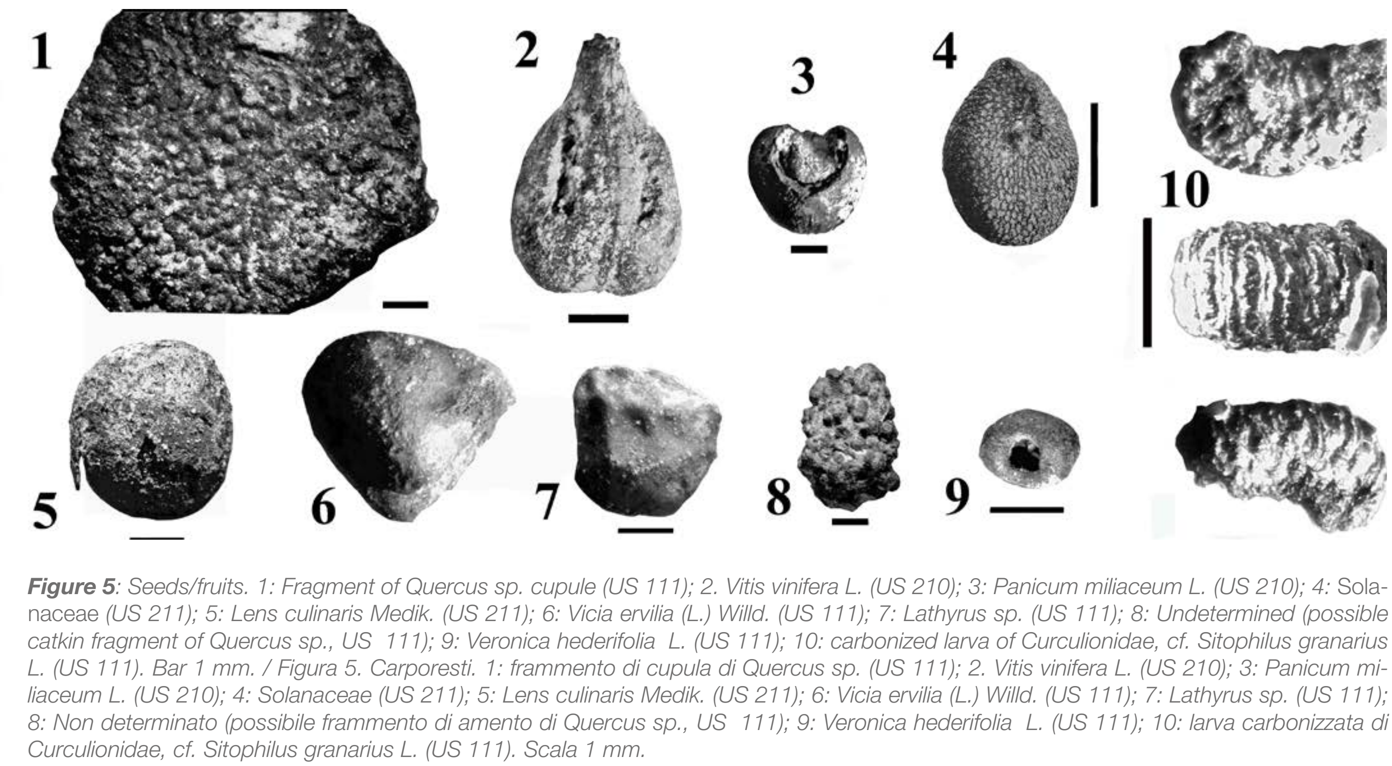

***Figure 5**: Seeds/fruits. 1: Fragment of Quercus sp. cupule (US 111); 2. Vitis vinifera L. (US 210); 3: Panicum miliaceum L. (US 210); 4:* Solanaceae *(US 211); 5: Lens culinaris Medik. (US 211); 6: Vicia ervilia (L.) Willd. (US 111); 7: Lathyrus sp. (US 111); 8: Undetermined (possible catkin fragment of Quercus sp., US 111); 9: Veronica hederifolia L. (US 111); 10: carbonized larva of Curculionidae, cf. Sitophilus granarius L. (US 111). Bar 1 mm. / Figura 5. Carporesti. 1: frammento di cupula di Quercus sp. (US 111); 2. Vitis vinifera L. (US 210); 3: Panicum miliaceum L. (US 210); 4: Solanaceae (US 211); 5: Lens culinaris Medik. (US 211); 6: Vicia ervilia (L.) Willd. (US 111); 7: Lathyrus sp. (US 111); 8: Non determinato (possibile frammento di amento di Quercus sp., US 111); 9: Veronica hederifolia L. (US 111); 10: larva carbonizzata di Curculionidae, cf. Sitophilus granarius L. (US 111). Scala 1 mm.*

***Table 4**: Seed and fruit remains, expressed as number/taxon / E' riportato il numero di elementi per ogni taxon.*

	US 111 House I	**US 137 House I**	**US 158 House I**	**US 147 House II**	**US 210 House IV**	**US 266 House V**
Volume	9500 mL	2200 mL	400 mL	2900 mL	450 mL	650 mL
Quercus sp. whole acorns	316	38	26			
Quercus sp. halves	435	102	163			
Quercus sp. acorn fragm.	276					
Quercus sp. cupula	5		3			
Quercus sp. buds	1	4	2			
Triticum aestivum/durum naked wheat	2			1		
Panicum miliaceum broomcorn millet	1				1	
Lens culinaris lentil	19					
Lens culinaris lentil fragms	38					
Pisum sativum pea	2					
Vicia faba horse bean	1					
Vicia ervilia bitter vetch	4					
Lathyrus sp. grass pea cf.	1					
Medicago lupulina cf black medick	1					
Veronica hederifolia ivy-leaved speedwell	10					
Veronica agrestis green field-speedwell	1					
Solanaceae	1					
Vitis vinifera grape					1	
cf *Sitophilus granarius* larva	1					
Indet				2		3
Total	1,115	144	220	3	2	3

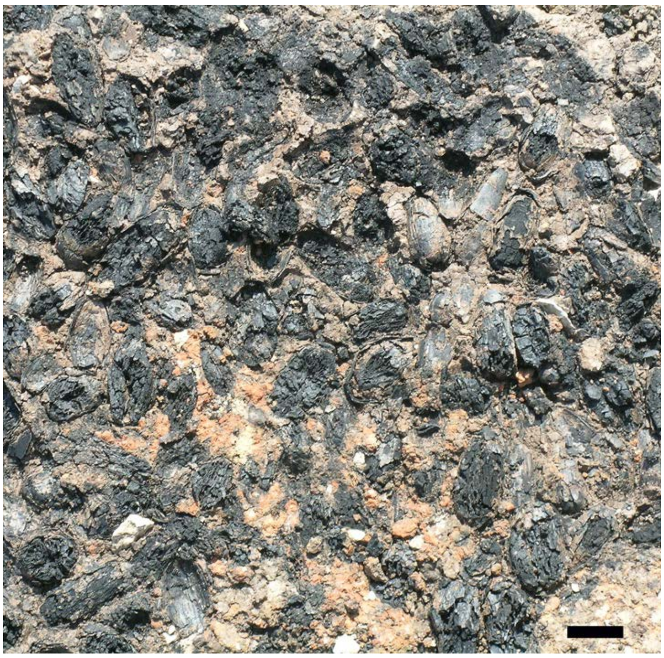

***Figure 6**: US 111 of House I, containing hundreds of charred acorns. Bar: 2 cm. / Figura 6. US 111, Edificio I, contenente centinaia di ghiande bruciate. Scala: 2 cm.*

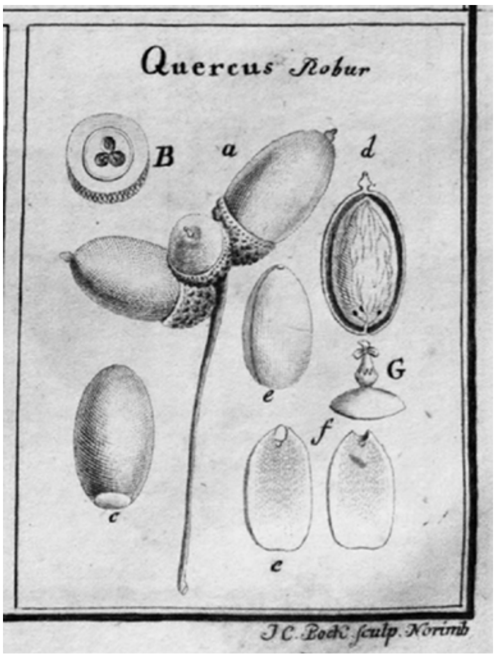

***Figure 7**: Acorn (Quercus robur) morphology, from Gaertner, 1788, Tab. 37. / Figura 7. Morfologia di ghianda di Quercus robur (da Gaertner, 1788), Tab. 37.*

Table 5*: Acorns mentioned in northern Italian archaeological sites from Early Neolithic to Early Middle Ages. / Siti con documentazionearcheologica di ghiande in Italia settentrionale, dal Neolitico antico all'Alto Medioevo*

Age	Sites and reference
Early Neolithic	Lugo di Romagna, Sammardenchia, Piancada (Rottoli & Castiglioni 2009), Lugo di Grezzana (Rottoli et al. 2015)
Middle Neolithic	Bannia Pal. Sopra (Rottoli & Castiglioni 2009), Bazzarola (Carra & Ricciardi 2007), Maserà (Rottoli & Castiglioni 2009), Tosina Monzambano (Castiglioni & Rottoli 2014), Pian del Ciliegio (Arobba & Cara-miello 2009), Arene Candide (Arobba & Vicino 1997-99), Valgrana (Rottoli & Castiglioni 2009)
Late Neolithic	Bannia Pal. Sopra, Mt. Covolo and Maserà (Rottoli & Castiglioni 2009), Palù di Livenza (Corti et al. 1998), Santa Maria di Cuorgné (Cima 1998)
"Neolithic"	Pescale (Mansuelli & Scarani1961), Grotta Farneto (Ruffini 1975),Isolino di Varese and Lagozza (Rot-toli & Castiglioni 2009)
Copper Age	Meduno, Bressanone and Monte Covolo (Rottoli & Castiglioni 2009), Vhò (Castelletti & Maspero 1992), Casatico Marcaria (Biagi 1983)
Early B.A.	Cisano (Nisbet 1996), Canar (Castiglioni et al. 1998), Fimon Molino Casarotto (Broglio & Fasani 1977), Molina di Ledro and Barche di Solferino (Costantini et al. 2003)
Middle B.A.	Ponte S. Quirino (Gerdol & Stacul 1978), Poviglio and Monte Leoni (Costantini et al. 2003), Lagusello (Carra 2012), Monterenzio (Carra 2013), Cisano (Nisbet 1996), Povegliano (Motella De Carlo 1997), Dosso Rotondo (Nicolis et al. 2016), Valeggio sul Mincio (Costantini et al. 2003), Vhò (Rottoli 1997)
Late B.A.	Ponte S. Quirino (Gerdol & Stacul 1978), Poviglio and Monte Leoni (Costantini et al. 2003), Lagusello (Carra 2012), Monterenzio (Carra 2013), Feniletto (Salzani 1982), Belmonte (Nisbet 1986)
"Bronze Age"	Sant'Ambrogio (Malavolti 1950), Parma (Avetta 1909), Lazise (Castelletti et al. 1992), Santuario di La-sino (Costantini et al. 2003), Fiavè (Jones & Rowley-Conwy 1984), Lucone Polpenazze (Simoni 1969), Uscio (Nisbet 1990), Zignago (Castelletti 1974)
First I.A.	Monterenzio (Carra 2013), Trissino (Balista et al. 1982), Monte Trabocchetto (Arobba & Caramiel-lo2004)
Late I.A.	Bergeggi (Nisbet 1987b), Uscio (Nisbet 1990), Bec Berciassa (RittatoreVonwiller1952)
Roman	Aquileia, Campi Riva Garda, Nago Torbole, Combolo-Teglio, Casalla and Desenzano (Bosi et al. 2020), Verucchio (Sala & Rottoli 2018), Cremona (Castiglioni & Rottoli 2017), Manerbio (Rottoli & Castiglioni 2011), Vhò (Castelletti & Maspero1992), Angera and Cerrione (Rottoli & Castiglioni 2011), Pieve del Finale (Arobba & Murialdo1996), Peveragno (Motella De Carlo 1996), Vercelli (Nisbet 1984)
Early Middle Ages	Vercelli (Nisbet 1984)

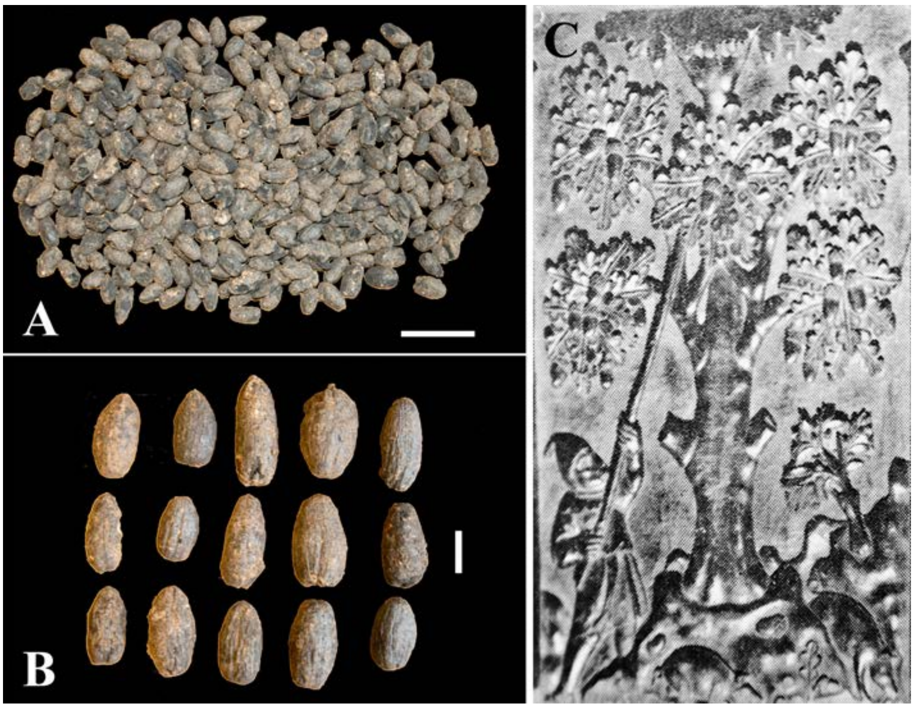

Figure 8*: A: Acorns (Quercus sp.) from US 111. Bar: 5 cm. B: Morphometric variability in acorns, US 111. Bar 1 cm. C: Shaking oak branches with a pole, for collecting acorns and feeding pigs, c. 1470. Panels from the choir, Ivrea cathedral, now in the Museo Civico d'Arte Antica di Torino. From F. Mallé, 1965, Tab. 73. / Figura 8. A: Campioni di ghiande (Quercus sp.) da US 111. Scala 5 cm. B: variabilità dimensionale di ghiande in US 111; scala 1 cm. C: Scuotitura di rami di quercia per la raccolta delle ghiande e la nutrizione dei maiali, c. 1470. Pannelli del coro della Cattedrale d'Ivrea, ora al Museo civico d'arte antica di Torino. Da F. Mallé,1965, Tav. 73.*

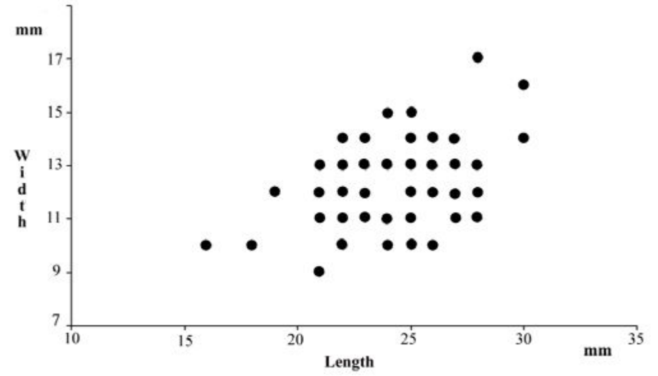

***Figure 9**: Figure 9. L/w index on 40 acorns, US 111.*
/ Indice L/w su un campione di 40 ghiande da US 111.

Other seed/fruit remains

Almost all other seed and fruit remains were found in House I, US 111 (Table 4). They are all carbonized.

Although wheat and broomcorn millet are rare, their presence shows that cereal agriculture was practiced on the site and therefore they were probably also preserved in other village structures. Cereals were commonly grown in the whole region, as shown in Table 1. Almost all studied sites contained cereal remains, even if in different form and quantity, certainly because of the diverse treatment conditions and taphonomy. What makes Gargagnago interesting is the contemporaneous presence of five species of legumes, two of which were found for the first time in the area (peas and grass peas). They are typical horticultural crops, possibly growing close to the houses: hoe agriculture, as an integration to plough crops. Lentils are best represented, while also being present in a large quantity at Monte Loffa, and in numerous other sites.

The only grape pip found is not intact, lacking its beak. It is therefore not possible to identify it as the cultivated or wild form. For only one element, the use of the diverse biometric indexes is not appropriate. In some other Iron Age sites of the region, vine seems to be cultivated (Table 1).

Seeds of the few wild species found in the samples belong to herbs growing on ploughed fields, pastures, meadows (*Medicago* sp.) and on nitrogenous soils (*Veronica* spp., Solanaceae).

In US 111 (House I) a carbonized larva of *Sitophilus granarius* (wheat weevil) was found (Figure 5.10).

The insect develops inside the wheat grains, causing severe damage to crops in the stores. Its presence reinforces the possibility that House I served, at least partly, as a food storehouse for humans and animals.

Conclusions

Fodder tree leaves

The assumption of the prehistoric use of leaf-fodder goes back ca. 80 years. It was advanced by some Scandinavian palynologists (Faegri 1944; Troels-Smith 1960; Iversen 2002 [1967]), trying to explain one of the more controversial problems in wood ecology, i.e. the sudden rarefaction of elm trees in the woods of central and northern Europe around 3000 BCE. It was suggested that the systematic pruning of this tree for feeding cattle would have been such as to inhibit blossoming, therefore preventing pollen formation and causing its absence in the palynological record. Since then, many conclusive data on the prehistoric use of fodder trees have been gathered. Admittedly, in some waterlogged sites, cutting tree branches was a coppicing technique to obtain poles and rods (Knight et al. 2019). However, in many other instances, increasing archaeobotanical evidence points to the use of shredding (it. *sgamollo, scalvatura*) and pollarding (it. c*apitozzatura*) as a long-standing tradition of foddering livestock with leaves, barks and twigs. The evidence generally depends on the presence of small branches and twigs, on growth ring properties, on (goat/sheep) dung-derived plant materials and the joint analyses of pollen/wood in a pastoral site. Ethnographic observations also inspire diverse lines of research, though this practice has disappeared almost everywhere in Europe, and is preserved only in some remote areas of the Near East (Figure 10). On such terrain, this practice has been suggested for the Neolithic in Liguria (Maggi & Nisbet 2000; Arobba et al. 2014) and Lombardy (Castelletti & Maspero 1992), for the Bronze Age in Trentino (Karg 1998) and, dubiously, for the XIV century AD in Udine (Castiglioni & Rottoli 2003). This practice is better and more widely documented in the cave sheepfolds and sheds of southern France and the Pyrenees (Thiébault 2005, 2006; Delhon et al. 2008), in the Swiss (Akeret et al. 1999; Haas et al. 1998) and French lake dwellings at Charavines (Bocquet 2012) and Chalain (Pétrequin et al. 2015; Pétrequin P. and Pétrequin A.M. in press, 2021). Some anomalies (an over-representation of some *taxa*, like ash and hazelnut tree) recorded in pollen and charcoal diagrams could point to a selection of these as fodder trees, and not for the use of their wood or fruits. For a more complete bibliography and notes on the main fodder trees in prehistory and ethnography, see Castelletti (2013).

Fodder tree leaves, as a normal way of feeding herbivores, is much older than hay: scythes were invented only recently. A scythe is a tool used to produce hay for the winter. Out of more than 250 tools described as scythes (Nillesse & Buchsenschutz 2009) none seems to be earlier than V century BCE and those with a reliable date belong to the late Iron Age. (We therefore cannot exclude their use – and that of hay – at Gargagnago). Previously, feeding had to be largely based on tree leaves, whose high nutritive value was well known by ancient shepherds and recently chemically determined (Hejcmanová et al. 2014). The collection could easily be made by hand, or using metal or stone billhooks, and was, in some way, a kind of specialized job. Virgil, who certainly knew the question first-hand, employs the word *frondator* to define who is in charge of cutting the leaves from the trees (Eclogues I, 57). However, even when hay production became the usual way to feed herbivores, adding dry tree leaves to herbs was regarded as a useful, even necessary technique to boost milk production (Kruker & Niederer 1982).

At Gargagnago a practice exclusively linked to oaks and their leaves has been preserved in an exceptional way. However, in the ethnographic record of recent centuries (Brockmann-Jerosch, 1936) herbivores are fed, when necessary, with almost all tree species, including conifers. In some instances, leaves served also as human food. Brockmann-Jerosch mentions the occurrence of Elm leaves ground to make a kind of flour. The use of the acid fermentation of leaves as a preservation technique for human and cattle consumption is described also by A. Maurizio (1932 [2019]), duly commenting on it as an example of the passage from human to animal foodstuff and vice versa (p. 219). Even as late as the XVIII century – but certainly the tradition is rooted in more ancient periods – in the area around Verona “a very broad deep pit” was dug and filled with several alternate layers of dry leaves and branches of unripe grapes. The ensuing fermentation was such as to produce “extraordinary effects” on “horned cattle”, enjoying this treatment “with a greediness which can hardly be conceived”, and sheep “devour it” (Symonds 1790: 209-210). This kind of pits could persist as an archaeological feature, though their field recognition may be difficult due to the probable lack of organic and archaeological remains.

Some authors (Rowley-Conwy 1982; Maggi & Nisbet 2000; Thiébault 2005) have tried to theoretically estimate the impact of ruminants fed with tree leaves on Holocene woods. Even through different approaches, they attain relatively similar results. On the assumption that winter food consists of only tree foliage for ten cows, and taking into account a rotation of 2 to 4 years’ crop, this would require at least between 3 to 5 ha forest. S. Thiébault duly notes that such suggestive data – admittedly to be taken as an extreme case – contrast critically with the widespread idea of the forest as the *horrendum desertum* that, in the Middle Ages perception, would have encircled the abbey of Fulda (Wickham 1990: 482) and, in general, the whole of continental Europe. On the contrary, it would present itself, at least since late prehistory and in particular areas, as a wooded space purposely “cultivated” and “cultural”, whose composition mirrored the economic requisites of the neighbouring farmer/shepherd villages. Even certain species of oak, apparently so rebellious to domestication, have sometimes been pruned in order to produce the maximum acorn yield (Howes 1948: 173).

Acorns

There is a large archaeobotanical record (f.i. Vencl 1996; Deforce et al.2009; Mason & Nesbitt 2009) of the prehistoric food use of acorns, dubiously starting in the Middle East Acheulean (Goren-Inbar et al. 2002), besides the copious mentions in Greek and Latin literature.

In the Mediterranean countries, prehistoric balanophagy was one of the important food resources, often integrated with dairy pastoralism and acorn collection in an agro-pastoral community (Lewthwaite 1982).

This phenomenon was definitely helped by the better food quality of the acorns of *Quercus ilex*, the most frequent Mediterranean oak. Acorn use in Sardinia (Bakels 2002; Lo Schiavo et al., in press) and Apulia (Primavera & Fiorentino 2013) parallels to the large acorn stores in Mediterranean France and in Corsica (Bouby et al. 1999; Bouby 2014; Peche-Quilichini et al.2020). Nevertheless, as shown by the (probably incomplete) data reported in Table 5 referring only to northern Italy, and by many others from central and northern Europe, more oak species have provided a non-negligible food resource to prehistoric human communities.

Historical, iconographic and ethnographic records can supply information on the way acorns were gathered and on their subsequent processing, which unfortunately have not been preserved at Gargagnago. The fallen, ripened acorns could be collected on the ground at the beginning of autumn, or even earlier, by shaking the branches with poles.

Both the unknown author(s) of Antologia palatina (11, 417) (Pontani 1980) and Zenobius in Proverbs (II, 41; III, 58) (Leutsch & Schneidew 1839) use the Greek verb *balanizein* to indicate the action of branch-shaking in order to drop acorns, a widespread practice during the last centuries of the first millennium BCE and later. In the 1400s the technique of shaking branches with a pole, damaging the tree, was still so common in northern Italy to force the forestry authorities to enact rigorous sanctions to prevent it in several districts (Comba 1988) (Figure 8C).

Processing the crop, its use for leather tanning and the value of acorns as food in ethnography are fully referenced in S.L.R. Mason's studies (Mason 1992; 1995). The nutritional value of acorns, mostly rich in carbohydrates, was well known to medieval authors, who recommend them as pig food "imperocché non solamente ingrassano, ma danno dilettevol sapore alla carne" (De' Crescenzi 1304: 9, LXXVII) ["because they not only make pigs gain weight, but make the meat taste good"]. It is examined from the viewpoint of energy output and chemical composition by several authors (Karg & Haas 1996; Hosch 2004; Mason & Nesbitt 2009; Garcia-Gomez et al. 2017), all recognising the importance of acorns in the human diet.

It has frequently been claimed that only in a period of crisis or in peculiar constraining environments, acorns would have contributed to supplying the necessary fat and sugar source to diet. However, experiments on the various ways of processing acorns to obtain flour, bread and biscuits show they are a kind of food not necessarily consumed only in time of famine (Šálková et al. 2011). Furthermore, their use as a coffee substitute is well known. Malt extracted from acorns has been used for producing beer (Howes 1948: 172).

We do not know how the collected acorns were further processed before consumption at Gargagnago, and their relative importance in the human diet. What we know is that they were all shelled, therefore ready for further treatment. Furthermore, the analyses indicate that the distribution and nature of the archaeobotanical remains clearly point to a different use of the houses, with acorns being stored meticulously in a specific place. Additionally, during the late Iron Age, an agro-pastoral economy was well developed on the site, integrated with forest resources. The presence of field and garden crops, together with the numerous data on the agriculture practiced in the region, suggests that the often-submitted idea of prehistoric acorn consumption only or mostly linked to periods of famine does not generally apply. On the contrary, it could have been an important and stable element in the local tradition.

Acknowledgments

I am grateful to L. Salzani who provided the materials and authorized their study. D. Arobba, L. Castelletti, P. S. Henriksen, F. Nicolis, P. Pétrequin and M. Rossi provided bibliographical indications and materials. I am indebted with R. Cevasco and D. Moreno (Archivio CIR-Lasa, Genoa University) for Figure 3D, with L. Salzani for Fig. 2 and 8 and with an anonymous reviewer for useful comments. With R. Maggi and P. Varese I had a fruitful exchange of ideas. I am grateful to T. Nic Mhurchu for the English revision of the text.

Figure 10*: A. Extensive use of shredding in a Quercus infectoria wood, Hakkâri region (Eastern Anatolia). The leafy branches are stored in a conical haystack without any protection. B. Storage of leafy branches in trees, Uludere region (Eastern Anatolia). Phot. R. Nisbet, August 1990. / Figura10. A. Estesa pratica di scalvatura su Quercus infectoria, regione di Hakkâri (Anatolia orientale). Qui le frasche sono accumulate in fienili conici senza protezione. B. Accumulo di frasche da foraggio su alberi, regione di Uludere (Anatolia orientale). Fot. R. Nisbet, agosto 1990.*

References

Akeret Ö., Haas J. N., Leuzinger U. & Jacomet S., 1999 - Plant macrofossils and pollen in goat/sheep faeces from the Neolithic lake-shore settlement Arbon Bleiche 3, Switzerland. *The Holocene,* 9 (2): 175–182.

Andreolli B. & Montanari M. (eds), 1990 - *Il bosco nel Medioevo, CLUEB*, Bologna, 369 pp.

Arobba D. & Caramiello R., 2004 -Monte Trabocchetto (Pietra Ligure, Savona). In: De Marinis R. C. & Spadea G. (eds), *I Liguri. Un antico popolo europeo tra Alpi e Mediterraneo,* Catalogo della mostra, Skira, Milano: 98-99.

Arobba D. & Caramiello R., 2009 - Indagini archeobotaniche sul deposito neolitico del Riparo di Pian Ciliegio. In: Del Lucchese A. (ed.). Il Riparo di Pian Ciliegio, *Quaderni Museo Archeologico Finale* 5, Istituto Internazionale di Studi Liguri: 117–30.

Arobba D., Del Lucchese A., Melli P. & Caramiello R., 2014 - Evidenze di scalvatura in rami di frassino del Neolitico medio a Genova. In: Bernabò Brea M., Maggi R. & Manfredini A. (eds). Il pieno sviluppo del Neolitico in Italia, Atti del convegno di Finale Ligure 8-10 giugno 2009, *Rivista di Studi Liguri*, LXXVII-LXXVIII (2011-2012): 137-141.

Arobba D.& Murialdo G., 1996 - Analisi di macroresti botanici del I sec. d.C. rinvenuti presso la Pieve del Finale (Finale Ligure, Italia), *Allionia*, 34: 55-61.

Arobba D. & Vicino G., 1997-99 -Segnalazione di macro-resti botanici nel sito neolitico di S. Sebastiano di Perti (SV), *Bollettino dei Musei Civici Genovesi*, XIX/XXI, (55/63): 29-37.

Avetta C., 1909 - Avanzi vegetali rinvenuti nella terra di palafitte di Parma, *Annali di Botanica*, VII: 709-712.

Bakels C., 2002 - Plant remains in Sardinia, Italy, with notes on barley and grape, *Vegetation History and Archaeobotany*, 11: 3-8.

Balista C., De Guio A., Leonardi G. & Ruta Serafini A., 1982 - La frequentazione protostorica del territorio vicentino: metodologia analitica ed elementi preliminari di lettura interpretativa, *Dialoghi di Archeologia,* II, 4: 113-136.

Biagi P., 1983 - La stazione di Casatico di Marcaria (Mantova) nel quadro paleoambientale ed ambientale dell'olocene antico della Val Padana centrale. *Studi Archeologici*. Studium Universitatis Bergomensis, 135 pp.

Bittmann F., Gerlach R., Rösch M. & Schier W., 2014 - Farming in the forest. Ecology and economy of fire in prehistoric agriculture, *Vegetation History and Archaeobotany,* 23 (Suppl. 1) S3: 121-133. DOI 10.1007/s00334-014-0454-2

Bocquet A., 2012 -*Les oubliés du Lac de Paladru: ils dormaient depuis 5000 ans en Dauphiné.* Ed. La Fontaine de Siloé, Montmélian-en-Savoie, 186 pp.

Bosi G., Castiglioni E., Rinaldi R. Mazzanti M., Marchesini M. & Rottoli M., 2020 -Archaeobotanical evidence of food plants in Northern Italy during the Roman period. *Vegetation History and Archaeobotany.* https://doi.org/10.1007/s00334-020-00772-4

Bosi G., Labate D., Rinaldi R. & Montecchi M.C., 2019 - A survey of the Late Roman period (3rd-6th century AD): Pollen, NPPs and seeds/fruits for reconstructing environmental and cultural changes after the floods in Northern Italy, *Quaternary International* 499 A: 3-23

Bouby L., 2014 - L'agriculture dans le bassin du Rhône du Bronze final à l'antiquité. Agrobiodiversité, économie, cultures. *Archives d'Ecologie Préhistorique*, Toulouse, 335 pp.

Bouby L., Leroy F. & Carozza L., 1999 -Food plants from late Bronze Age lagoon sites in Languedoc, southern France: reconstruction of farming economy and environment. *Vegetation History and Archaeobotany,* Vol. 8 (1-2): 53-69.

Brockmann-Jerosch H., 1936 - Futterlaubbäume und Speiselaubbäume, *Berichte der Schweizerischen Botanischen Gesellschaft,* 46: 594-613.

Broglio A. & Fasani L., 1977 - *Le Valli di Fimon nella preistoria.* Neri Pozza, Vicenza.

Büntgen U., Tegel W., Nicolussi K., McCormick M., Frank D., Trouet V., Kaplan J.O., Herzig F., Heussner K-U.,Wanner H., Luterbacher J. & Esper J., 2011 - 2500 Years of European Climate Variability and Human Susceptibility. *Science*, vol. 331: 578-582.

Cappers R. T. J., Bekker R. M. & Jans J. E. A., 2006 -*Digital Seed Atlas of the Netherlands* (Groningen Archaeological Studies 4). Eelde: Barkhuis Publishing, 502 pp.

Carra M., 2012 - *Per una storia della cerealicoltura in Italia settentrionale dal Neolitico all'Età del Ferro: strategie adattive e condizionamenti ambientali.* Tesi di dottorato di ricerca in Archeologia, XXIV ciclo, Università di Bologna. 248 pp.

Carra M., 2013 - Le indagini archeobotaniche nell'area dell'Emilia orientale e della Romagna. In: De Grossi Mazzorin J., Curci A. & Giacobini G. (eds), *Economia e ambiente nell'Italia Padana dell'Età del Bronzo. Le indagini Bioarcheologiche*, BACT 11, Bari: 329-356.

Carra, M. & Ricciardi S., 2007 - Il Neolitico della pianura reggiana. Studi archeobotanici dell'insediamento di Bazzarola (Reggio Emilia). Ambiente e Territorio, *Annali Università degli Studi di Ferrara, Museologia scientifica e naturalistica*: 3-6.

Castelletti L., 1974 - Castellaro di Zignago. *Atti XVI Riunione Scientifica in Liguria,* 3-5 nov. 1973. Ist. It. Preist. Protost., Firenze: 175.

Castelletti L., 2013 - Il foraggiamento del bestiame sulle Alpi con particolare riferimento al periodo invernale. *Bulletin d'Etudes Préhistoriques et Archéologiques Alpines,* XXIV, Aosta: 125-147.

Castelletti L., Castiglioni E. & Rottoli M., 1992 -Resti vegetali e alimentari di Lazise. In: Aspes A. (Ed.). *C'era una volta Lazise,* Ed. Neri Pozza, Vincenza: 87-101.

Castelletti L., Castiglioni E. & Rottoli M., 2001 - L'agricoltura dell'Italia settentrionale dal Neolitico al Medioevo. In: Failla O. & Forni G. (eds). *Le piante coltivate e la loro storia*, Franco Angeli, Milano: 33-84.

Castelletti L. & Maspero A., 1992 - Analisi di resti vegetali di Campo Ceresole del Vhò di Piadena e di altri siti neolitici padani. *Natura Bresciana.* Annali Museo Civ. Sc. Nat., Brescia, 27 (1990-91): 289-305.

Castiglioni E., Motella De Carlo S. & Nisbet R., 1998 - Indagini sui resti vegetali macroscopici a Canàr. In: Balista C., Bellintani P. (Ed.). Canàr di San Pietro Polesine. Ricerche archeo-ambientali sul sito palafitticolo, *Padusa Quaderni,* 2: 115-130.

Castiglioni E. & Rottoli M., 2003. Udine – Casa della Confraternita in Castello. I materiali botanici medievali (XIV secolo). *Quaderni Friulani di Archeologia,* XIII: 115-124.

Castiglioni E. & Rottoli M., 2014 - I resti carpologici dall'abitato di Tosina. In: Poggiani Keller R. (ed.). *Contadini, allevatori e artigiani a Tosina di Monzambano (MN) tra V e IV millennio a.C. Una comunità neolitica nei circuiti padani e veneti,* Associazione Culturale Amici di Castellaro: 157-161.

Castiglioni E. & Rottoli M., 2017 - La frutta e i semi. In: Arslan Pitcher L. (ed.). *Amoenissimis… aedificiis. Gli scavi di Piazza Marconi a Cremona. Lo scavo.* All'Insegna del Giglio, Firenze: 121-122.

Cima M., 1998 - L'abitato dell'età del Bronzo finale di Santa Maria – Pont Canavese in Valle Orco. *Atti della XXXII Riunione scientifica – Preistoria e Protostoria del Piemonte,* Ist. It. Preist. Protost., Alba, 29 settembre – 1 ottobre 1995, Firenze: 253-264.

Ciurletti G. & Marzatico F. (eds), 1999 - *I Reti / Die Räter, Atti del simposio 23-25 settembre 1993*, Trento. Archeoalp - Archeologia delle Alpi, 5, Provincia Autonoma di Trento, Servizio Beni Culturali, *Ufficio Beni Archeologici*, 2 vol. (701, 295 pp.).

Comba R., 1988 .*Contadini, signori e mercanti nel Piemonte medievale.* Laterza, Roma-Bari, 231 pp.

Corti P., Martinelli N., Micheli R., Montagnari Kokelj E., Petrucci G., Riedel A., Rottoli M., Visentini P. & Vitri S.,1998 - Siti umidi tardoneolitici: nuovi dati dal Palù di Livenza (Friuli-Venezia Giulia, Italia), *13th International Congress of Prehistoric and Protohistoric Sciences* (Forlì, 8-14 settembre 1996), vol. 3: 263-275.

Costantini L., Lauria M. & Tecchiati U., 2003 - I resti carpologici dell'antica e media età del Bronzo del Riparo del Santuario di Lasino – Trento. Scavi 1996, *Annali del Museo Civico di Rovereto*, 17: 3-40.

David A., 2010 -*Le développement de l'outillage agricole en fer en France (625-25 avant notre ère)*. Paris: Université de Paris 1-Panthéon-Sorbonne, 2010. Mémoire de Master 2 Recherche en Protohistoire européenne. Sous la direction de P. Brun, vol. 1 (texte), 147 pp.

De' Crescenzi P., 1304 -*Trattato della Agricoltura,* trad. dal latino B. Sorio, Verona 1852 (Reprint Forgotten Books, Londra, 2018), 268 pp.

Deforce K., Bastiaens J., Van Calster H. & Vanhoutte S., 2009 - Iron Age acorns from Boezinge (Belgium): the role of acorn consumption in prehistory, *Archäologisches Korrespondenzblatt*, 39: 381-392.

Delhon C., Martin L., Argant J. & Thiébault S., 2008 - Shepherds and plants in the Alps: multi-proxy archaeobotanical analysis of neolithic dung from "La Grande Rivoire" (Isère, France), *Journal of Archaeological Science,* 35(11): 2937-2952. doi: 10.1016/j.jas.2008.06.007 https://archive-ouverte.unige.ch/unige:17529

Dufraisse A., Viellet A., Duplaix-Rata A., Schaal C.& Pétrequin P., 2015 - Territoires et gestion de la foret autour du lac de Clairvaux. In: Pétrequin P., Pétrequin A.M. (eds). *Clairvaux et le "Néolithique Moyen Bourguignon".* Cahiers de la MSHE C.N. Ledoux, Besançon, PUF et CRAVA, vol. 2: 1365-1374.

Evans J., 1994 - Organic residues from Fiavé, Italy. In: Perini R. (ed.). *Scavi archeologici nella zona palafitticola di Fiavé-Carera. Parte III, Campagne 1969-1976. Resti della cultura materiale, ceramica,* vol. 2. Servizio Beni Culturali della Provincia Autonoma di Trento: 1095-1098.

Fægri K, 1944 - On the introduction of agriculture in western Norway, *Geologiska Föreningen i Stockholm Förhandlingar,* 66:3, 449-462, DOI: 10.1080/11035894409445688

Gaertner J., 1788 - *De fructibus et seminibus plantarum,* Stutgardiae typis Academiae Carolinae 391 pp.

García-Gómez E., Pérez-Badia R., Pereira J.& Puri R. K., 2017. The Consumption of Acorns (from *Quercus* spp.) in the Central West of the Iberian Peninsula in the 20th Century. *Economic Botany,* XX(X): 1–13.

Gerdol R. & Stacul G., 1978 - Il castelliere di Ponte S. Quirino presso Cividale. In: I castellieri di Nivize Monte Grisa e Ponte S. Quirino, *Quaderno II delle Monografie di Preistoria,* ACMSAT: 65-98.

Goren-Inbar N., Sharon G., Melamed Y. & Kislev M., 2002 - Nuts, nut cracking, and pitted stones at Gesher Benot Ya'aqov, Israel, *Proceedings of the National Academy of Sciences* 19*,* vol. 99 (4): 2455–2460.

Guidi A., Candelato F., Saracino M., 2008 - Il popolamento del territorio veronese durante l'età del ferro. In: *I Veneti antichi. Novità e aggiornamenti,* Atti del Convegno di Studio, Isola della Scala, 15 ottobre 2005, Verona: 15-45.

Haas J. N., Karg S., Rasmussen P., 1998 - Beech leaves and twigs used as winter fodder: examples from historic and prehistoric times. *Environmental Archaeology* 1: 81–86.

Hejcmanová P., Stejskalová M. & Hejcman M., 2014 - Forage quality of leaf-fodder from the main broad-leaved woody species and its possible consequences for the Holocene development of forest vegetation in Central Europe, *Vegetation History and Archaeobotany* 23:607–613. DOI 10.1007/s00334-013-0414-2

Hosch S., 2004 -*Ackerbau und Sammelwirtschaft in der Neolithischen Seeufersiedlung Arbon Bleiche 3 (3384–3370 v. Chr.) Kanton Thurgau, Schweiz.* Unpublished doctoral thesis, Institute for Prehistory and Archaeological Science, Basel University.

Howes F. N., 1948 - *Nuts. Their Production and Everyday Uses.* London: Faber and Faber, 264 pp.

ISPRA, 2010 - *Carta della Natura del Veneto alla scala 1:50.000.* Rapporti 106/2010. Roma, 122 pp.

Iversen J., 2002 [1967] - Stone Age Man's Transformation and Exploitation of the Primeval Forest. In: Fischer A. & Kristiansen K. (eds). *The Neolithisation of Denmark. 150 years of debate.* J.R. Collis Publ., Sheffield: 197-209 (a translated part of Iversen J 1967, Naturens udvikling siden sidste istid., *Danmarks Natur*): 345-445.

Jones G. & Rowley-Conwy P., 1984 - Plant remains from the North Italian lake dwellings of Fiavé (1400-1200 BC). In: Perini R. (ed.). *Scavi Archeologici nella Zona Palafitticola di Fiavè-Carera. 1: Campagne 1969-1976. Situazione dei depositi e dei resti strutturali,* Provincia Autonoma di Trento, Volume 1, Trento: 323-355.

Jørgensen G., 1977 - Acorns as a food-source in the later stone age. *Acta Archaeologica* (København), 48: 233-238.

Kaplan J.O., Krumhardt K.M. & Zimmermann N., 2009 - The prehistoric and preindustrial deforestation of Europe. *Quaternary Science Reviews,* 28: 3016–3034.

Karg S., 1998 - Winter - and Spring - foddering of Sheep/Goat in the Bronze Age Site of Fiavè-Carera, Northern Italy. *Environmental Archaeology,* 1: 87-94.

Karg S. & Haas J. - N., 1996 - Indizien für Gebrauch von mitteleuropäischen Eicheln als prähistorische Nahrungsressourcen. In: Campen I., Hahn J., Uerpmann M. (eds). *Spuren der Jagd – Die Jagd nach Spuren, Festschrift für Hansjürgen Müller-Beck.* Mo Vince Verlag, Tübingen. Tübinger Monographien zur Urgeschichte, 11: 429-435.

Knight M., Ballantyne R., Robinson Zeki I. & Gibson D., 2019 - The Must Farm pile-dwelling settlement, *Antiquity,* 93 (369): 645–663. https://doi.org/10.15184/aqy.2019.38

Kruker R. & Niederer A., 1982 - Aspects de la cueillette dans les Alpes suisses. *Études rurales*, (87-88). La chasse et la cueillette aujourd'hui: 139-152.doi : 10.3406/rural.1982.2878

Leutsch E. L. & Schneidewin F. G.,1839 (eds), *Corpus paroemiographorum graecorum,* vol. 1, Gottingae, apud Vandenohoeck et Ruprecht, 1-176 p. https://archive.org/details/corpusparoemiogr01leutuoft

Lewthwaite J. G., 1982 - Acorns for Ancestors: the prehistoric exploitation of the woodland in the west Mediterranean.In: Bell M. & Limbray S. (Eds). *Archaeological aspects of the woodland ecology,* Symposia of the Association for Environmental Archaeology n.2, BAR (i.s.) 146: 217-230.

Lieutaghi P., 1975 -*Il libro degli alberi e degli arbusti*. Rizzoli, Milano, 895 p.

Lo Schiavo F., Perra M. & Marinval P., - 2020. Il Pane nella Sardegna Nuragica, *Preistoria del Cibo. L'alimentazione nella preistoria e nella protostoria,* Cinquantesima Riunione Scientifica Istituto Italiano di Preistoria e Protostoria Roma, 5-9 Ottobre 2015. http://preistoriadelcibo.iipp.it/contributi/3_05.pdf

Maggi R. & Nisbet R., 2000 - Alberi da foraggio e scalvatura neolitica: nuovi dati dalle Arene Candide. In: Pessina A. & Muscio (eds). *La Neolitizzazione tra oriente e occidente,* Atti del Convegno di Studi, Udine, 23-24 aprile 1999, Ed. Museo Friul. di Storia Naturale: 289-308.

Malavolti F., 1950 - S. Ambrogio (Modena). *Rivista di Scienze Preistoriche,* V(1-4): 119-120.

Mallé L., 1965 - *Le sculture del Museo d'arte antica.* Museo civico di Torino, 316 pp.

Mansuelli G. A. & Scarani R., 1961 - *L'Emilia prima dei romani.* Il Saggiatore, Milano.

Marinval P., 2008 - Analyse carpologique. In: Coularou J., Jallet F., Colomer A. & Balbure J. (eds). Boussargues. Une enceinte chalcolithique des garrigues du Sud de la France. *Archives d'Ecologie Préhistorique*, Toulouse: 181-198.

Marzatico F., 2019 - I Reti e i popoli delle Alpi orientali. *Preistoria Alpina,* 49bis: 73-82.

Mason S. L. R., 1992 - *Acorns in human subsistence* [unpubl. diss., University College London], 382 pp.

Mason S. L. R., 1995 - Acornutopia? Determining the role of acorns in past human subsistence. In: Wilkins J., Harvey D. & Dobson M. (eds). *Food in Antiquity*. Exeter: University of Exeter Press: 12-24.

Mason S. & Nesbitt M., 2009 - Acorn as food in southeast Turkey: implications for prehistoric subsistence in Southwest Asia. In: Fairbairn A.S. & Weiss E. (eds). *From Foragers to Farmers. Paper in Honor of Gordon C. Hillman,* Oxford: Oxbow Books: 71-85.

Maurizio A., 1932 - *Histoire de l'alimentation végétale depuis la Préhistoire jusqu'à nos jours.* Reprint Vieilles racines & Jeunes pousses, Eds Ulmer 2019, Paris: 663 pp.

Mercuri A. M., Montecchi M. C., Pellacani G., Florenzano A., Rattighieri E. & Cardarelli A., 2015 - Environment, human impact and the role of trees on the Po plain during the Middle and Recent Bronze Age: Pollen evidence from the local influence of the terramare of Baggiovara and Casinalbo. *Review of Palaeobotany and Palynology,* 218: 231–249.

Migliavacca M., 2013 - Le Prealpi venete nell'età del Ferro: analisi e interpretazione di un paesaggio polisemico. *Preistoria Alpina*, 47: 17-30.

Moreno D., Piussi P. & Rackham O. (eds), 1982 - *Boschi: Storia e archeologia, Quaderni Storici*, n. 49, anno XVII(1), aprile 1982.

Motella De Carlo S., 1996 - Sui cereali nel contesto agroforestale subalpino dei secoli II-XIII: nuovi dati dalle ricerche di Peveragno-Castelvecchio e Cherasco-Manzano. In: Comba R. & Panero F. (eds). *Il seme, l'aratro e la messe. Le coltivazioni frumentarie in Piemonte dalla preistoria alla meccanizzazione agricola,* Atti del convegno, Cuneo - Rocca de'Baldi: 23-36.

Motella De Carlo S., 1997 - Studio dei macroresti vegetali. In: Belemmi L., Salzani L. & Squaranti G. (eds). *Povegliano: l'abitato dell'Età del Bronzo della Muraiola,* Associazione Balladoro, Povegliano Veronese: 67-76.

Müller-Scheeßel N., Müller J., Cheben I., Mainusch W., Rassmann K., Rabbel W., Corradini E. & Furholt M., 2020 - A new approach to the temporal significance of house orientations in European Early Neolithic settlements. *PLoS ONE* 15(1): e0226082. https://doi.org/10.1371/journal.pone.0226082

Nicolis F., Mottes E., Bassetti M., Castiglioni E., Rottoli M. & Ziggiotti S., 2016 - Going up the mountain! Exploitation of the Trentino Highlands as summer farms during the Bronze Age: The Dosso Rotondo site at Storo (northern Italy). In: Collis J., Pearce M. & Nicolis F. (eds). *Summer farms: seasonal exploitation of the uplands from prehistory to the present*, J.R. Collis Publications and Equinox Publishing, Ltd. Series: Sheffield archaeological monographs, 16: 109-138.

Nillesse O. & Buchsenschutz O., 2009 - Les faux et la datation de l'outillage agricole des dépôts de l'âge du Fer. In: Honegger M., Ramseyer D., Kaenel G., Béat A. & Kaeser M.-A. (eds). *Le site de La Tène : bilan des connaissances – état de la question.* Neuchâtel: Office et musée cantonal d'archéologie de Neuchâtel. Actes de la Table-ronde internationale de Neuchâtel, 1-3 novembre 2007. *Archéologie neuchâteloise,* 43: 157-165.

Nisbet R., 1984 - Indagine archeologica al "Palazzo Dugentesco", antico ospedale di Sant'Andrea in Vercelli: i macroresti carbonizzati (II-XV secolo). *Quaderni Soprintendenza Archeologica del Piemonte*, 3: 201-203.

Nisbet R., 1986 - Le analisi antracologiche. In: Cima M. (ed.). Belmonte. Alle radici della storia, *Orco Anthropologica,* 5. Ed. CORSAC, Cuorgnè: 69-73.

Nisbet R., 1987a - I vegetali carbonizzati nell'insediamento dell'età del Ferro di Castelrotto (Verona). In: *Prima della storia. Inediti di 10 anni di ricerche a Verona.* Ed. Museo Civico di Storia Naturale, Verona: 121-130.

Nisbet R., 1987b - Bergeggi. Aspetti dell'agricoltura protostorica in Liguria. In: Melli P. & Del Lucchese A. (eds). *Archeologia in Liguria III.1. Scavi e scoperte 1982-86. Preistoria e protostoria,* Soprintendenza Archeologica della Liguria: 116.

Nisbet R., 1989-1990 - I grani carbonizzati dell'età del Ferro a Monte Loffa. *Annuario Storico della Valpolicella:* 21-28.

Nisbet R., 1990 - Uso del legno ed economia agricola al Castellaro di Uscio. In: Maggi R. (ed.). *Archeologia dell'Appennino ligure. Gli scavi del Castellaro di Uscio: un insediamento di crinale occupato dal Neolitico alla conquista romana,* Collezione di Monografie Preistoriche ed Archeologiche, Istituto Internazionale di Studi Liguri, Bordighera: 197-208.

Nisbet R., 1992 - Una nota sull'agricoltura veneta dell'età del Ferro. In: Brugnoli P. & Salzani L. (eds). San Giorgio di Valpolicella. Scavi archeologici e sistemazioni museali, Banca Popolare di Verona: 88-92.

Nisbet R., 1996 - I macroresti vegetali della palafitta di Cisano. In: Belluzzo G. & Salzani L. (eds). *Dalla terra al museo. Mostra di reperti preistorici e protostorici degli ultimi dieci anni di ricerca dal territorio veronese,* Ed. Fondazione Fioroni, Legnago: 161-167.

Nisbet R., 2015 - Analisi archeobotaniche su campioni di terre di rogo. In: Bruno B. & Falezza G. (eds). *Archeologia e storia sul Monte Castelon di Marano di Valpolicella,* SAP, Società Archeologica srl, Mantova: 105-108.

Nisbet R. & Rottoli M., 1997 - Le analisi dei macroresti vegetali dei siti dell'età del bronzo. In: Bernabò Brea M., Cardarelli A. & Cremaschi M. (eds). *Le Terramare. La più antica civiltà padana,* Electa, Milano: 469-474.

Out W. A., Hänninen K. & Vermeeren C., 2018 - Using Branch Age and Diameter to Identify Woodland Management: New Developments. *Environmental Archaeology,* 23:3, 254-266, DOI: 10.1080/14614103.2017.1309805

Peche-Quilichini K., Paolini-Saez H., Martin L., Drieu L. & Arobba D., 2020 - Des balanophages en Corse entre Bronze moyen et premier âge du Fer? Une Protohistoire du gland en contexte insulaire. In: Auxiette G., Mougne C., Peake R. & Toulemonde F. (eds). *Autour de la table: l'alimentation à l'âge du Bronze et au premier âge du Fer,* Actes de la Journée thématique mars 2017, Saint-Germain-en-Laye, Dijon, Association pour la Promotion des Recherches sur l'Age du Bronze, Supplément n° 6 au Bulletin de l'APRAB: 77-91.

Pétrequin P., 1996 -Management of Architectural Woods and Variations in Population Density in the Fourth and Third Millennia B.C. (Lakes Chalain and Clairvaux, Jura, France), *Journal of Anthropological Archaeology,* 15: 1-19.

Pétrequin P., Pétrequin A.M. & Schaal C., 2015 - Introduction: rythmes d'occupation des villages et agriculture céréalière. In Pétrequin P., Pétrequin A.M. (eds). *Clairvaux et le "Néolithique Moyen Bourguignon"*, Cahiers de la MSHE C.N. Ledoux, Besançon, PUF et CRAVA, vol. 2: 1129-1149.

Pétrequin P. & Pétrequin A.M., (2021) -*Préhistoire du Jura: Le Néolithique en 100 mots-clés, 5300-2100 av. J.-C*. Cahiers de la MSHE C.N. Ledoux, Besançon, Presses universitaires de Franche-Comté et Centre de recherche archéologique de la vallée de l'Ain, vol. 1, chapitre 6.

Pontani F.M. (ed.) 1980 - *Antologia Palatina*, Vol. IX-XI Millenni, Einaudi,Torino, 752 pp.

Primavera M. & Fiorentino G., 2013 - Acorn gatherers: fruits storage and processing in south-east Italy during the Bronze Age. *Origini,* 35: 211-227.

Rackham O., 1976 -*Trees and Woodland in the British Landscape.* J.M. Dent, London, 204 pp.

Rackham O., 1980 - *Ancient Woodland, Its History, Vegetation and Uses in England.* Edward Arnold, London, xii + 402 pp.

Ravazzi C., Marchetti M., Zanon M., Perego R., Quirino T., Deaddis M., De Amicis M. & Margaritora D., 2013 - Lake evolution and landscape history in the lower Mincio River valley, unravelling drainage changes in the central Po Plain (N-Italy) since the Bronze Age. *Quaternary International* 288: 195-205.

Rennie C., 2013 - A Room with a View: Excavations at Ravelrig Quarry. *Proceedings of the Society of Antiquaries of Scotland,* Vol. 143: 137-156.

Rittatore Vonwiller F., 1952 - Nuovi scavi alla stazione all'aperto di Bec Berciassa. *Bollettino della Soc. Studi Storici, Archeologici ed Artistici Provincia di Cuneo*, 31: 49-51.

Rösch M., 2012 - Forest, Wood, and Ancient Man. *Interdisciplinaria Archaeologica. Natural Sciences in Archaeology,* Vol. III(2): 247-255.

Rottoli M., 1997 - I resti botanici. In: Frontini P. (ed.). *Castellaro del Vhò. Campagna di scavo 1995*, Scavi delle Civiche Raccolte Archeologiche di Milano. Comune di Milano, Settore Cultura e Spettacolo, Raccolte Archeologiche e Numismatiche: 141-158.

Rottoli M. & Castiglioni E., 2009 - Prehistory of plant growing and collecting in northern Italy, based on seed remains from the early Neolithic to the Chalcolithic (c. 5600–2100 cal B.C.). *Vegetation History and Archaeobotany,* 18: 91–103.

Rottoli M. & Castiglioni E., 2011 - Plant offerings from Roman cremations in northern Italy: a review. *Vegetation History and Archaeobotany,* 20: 495–506.doi 10.1007/s00334-011-0293-3

Rottoli M., Cavulli F. & Pedrotti A., 2015 -L'agricoltura di Lugo di Grezzana (Verona): considerazioni preliminari. In: Leonardi G. & Tiné V. (eds). *Preistoria e protostoria del Veneto, Studi di Preistoria e protostoria 2*. Firenze, pp. 109-116.

Rowley-Conwy P., 1982 - Forest grazing and clearance in temperate Europe with special reference to Denmark: an archaeological view. In: Bell M. & Limbray S. (eds). *Archaeological aspects of the woodland ecology,* Symposia of the Association for Environmental Archaeology n.2, BAR (i.s.) 146: 199-215.

Ruffini E., 1975 - Considerazioni sui vegetali carbonizzati rinvenuti nella grotta del Farneto presso Bologna. *Rivista di Storia dell'Agricoltura,* a. XV, n. 1. Quadrimestrale dell'Accademia Economico-Agraria dei Georgofili: 51-72.

Sala I. & Rottoli M., 2018 - Le offerte vegetali nella tomba 12/2005 della necropoli Lippi di Verucchio (ca. 680-640 a.C.). *ARIMNESTOS. Ricerche di Protostoria Mediterranea:* 47-58.

Šálková T., Divišová M., Kadochová S., Beneš J., Delawská K., Kadlčková E., Němečková L., Pokorná K., Voska V. & Žemličková A., 2011 - Acorns as a Food Resource. An Experiment with Acorn Preparation and Taste. *Interdisciplinaria archaeologica. Natural Sciences in Archaeology,* Volume II(2): 133–141.

Salzani L., 1982 - Feniletto (Verona). In: *Palafitte: mito e realtà. Museo civico di storia naturale,* Verona: 214-216.

Salzani L., 2002 - Età del ferro. In: Aspes A. (ed.). *Preistoria Veronese. Contributi e aggiornamenti,* Memorie del Museo Civico di Storia Naturale di Verona, IIs., 5: 157-215.

Salzani L. & Bernardi G., 2021 - L'abitato dell'età del Ferro di Gargagnago (S. Ambrogio di Valpolicella, Verona). Nota preliminare. *Preistoria Alpina*, 51, pp. 73-102.

Schweingruber F. H., 1990 - *Anatomy of European woods.* Bern: Verlag Paul Haupt, 800 pp.

Schweingruber F. H., 2007 - *Wood Structure and Environment.* Berlin Heidelberg: Springer-Verlag, 279 pp.

Simoni P., 1969 - Ricerche nell'abitato lacustre del Lucone di Polpenazze: le campagne 1967-68. *Annali del Museo, 7*. Notiziario di preistoria e archeologia edito dalla Associazione Civico Museo Gruppo Grotte Gavardo: 37-68.

Symonds J., 1790 - Observations made in Italy on the use of leaves in feeding cattle. In: Young A. (ed.). *Annals of Agriculture and other useful arts, vol. I,* Bury St. Edmund's, London: 207-219. https://www.jstor.org/stable/41830060

Thiébault S., 2005 - L'apport du fourrage d'arbre dans l'élevage depuis le Néolithique. *Anthropozoologica* 40(1): 95-108.

Thiébault S., 2006 - Wood-anatomical evidence of pollarding in ring porous species: a study to develop? In: Dufraisse A. (ed.). *Charcoal analysis: new analytical tools and methods for archaeology.* Papers from the Table-Ronde held in Basel 2004, Oxford, United Kingdom: 95-102.

Troels-Smith J., 1960 - Ivy, mistletoe and elm: Climate indicators – Fodder plants. *Danmarks Geologiske Undersogelse* 4: 1–31.

Valsecchi V., Tinner W., Finsinger W. & Ammann B., 2006 - Human impact during the Bronze Age on the vegetation at Lago Lucone (northern Italy). *Vegetation History and Archaeobotany* 15: 99–113. DOI 10.1007/s00334-005-0026-6

Vencl S., 1996 - Acorns as food: again. *Pamatky archeologické,* LXXXVII: 95-111.

Vera F. W. W., 2000 - *Grazing Ecology and Forest History.* CABI Publ., Oxon, xix + 506 pp.

Wickham C., 1990 - European forests in the Early Middle Ages: Landscape and land-clearance. In: *L'ambiente vegetale nell'Alto Medioevo,* Spoleto: 479-545.

Zolitschka B., Behre K-E. & Schneider J., 2003 - Human and climatic impact on the environment as derived from colluvial, fluvial and lacustrine archives – examples from the Bronze Age to the Migration period, Germany. *Quaternary Science Reviews*, 22: 81–100.