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ARCHAEO-BOTANICAL INVESTIGATIONS INTO AN ETRUSCAN FARMHOUSE AT PIAN D'ALMA (GROSSETO, ITALY)

Abstract - Archaeo-botanical investigations were carried out on an Etruscan building, possibly a farmhouse, which dates back to the 6th century BC. The structure is located on the southwestern slopes of the Poggio Tondo hill that overlooks the valley of the Alma stream, in the province of Grosseto. At present, the building is situated in a clearing in a holm oak wood. Palynological investigations showed that the Etruscan wood had been floristically much richer than the present one: it had presented some characteristics of mesophily. The appearance of plants that had previously been extraneous to the environment indicated human presence. The woods supplied most of the material for the wooden structural parts of the building and some handmade objects, found during the excavation. There were traces of legumes and cereals that might have come from nearby farmed areas: wild growing fruit in the proximity must have been integrated in the diet of the inhabitants.

Key words - Archaeobotany, Carpology, Charcoal analyses, Etruscan site, Palynology, Tuscany.

Riassunto - *Indagini archeobotaniche in una fattoria etrusca a Pian d'Alma (Grosseto, Italia).* Indagini archeobotaniche sono state svolte in un edificio etrusco, forse una fattoria, risalente al VI sec. a.C. e situato sulle pendici sud-occidentali della collina di Poggio Tondo prospicienti la valle del torrente Alma, in provincia di Grosseto. L'edificio è attualmente ubicato in una radura all'interno di una lecceta. Le indagini hanno evidenziato che il bosco etrusco aveva una composizione floristica molto più ricca dell'odierna e presentava caratteristiche di maggior mesofilia. La presenza dell'uomo è indicata dall'introduzione di piante prima estranee all'ambiente. Il bosco forniva gran parte del legname utilizzato per la realizzazione delle parti strutturali dell'edificio e dei manufatti trovati durante lo scavo. Per quanto riguarda i prodotti per uso alimentare, legumi e cereali forse provenivano da coltivazioni non lontane, ma l'alimentazione doveva essere in parte integrata dai frutti spontanei raccolti nel bosco.

Parole chiave - Archeobotanica, Carpologia, Carboni, Etruschi, Palinologia, Toscana.

INTRODUCTION

The Etruscan site of Pian d'Alma (Grosseto, Tuscany) is located on the southwestern slopes of the Poggio Tondo hill that overlooks the valley of the Alma stream (Fig. 1). The ancient inhabited area consists of a quadrangular building divided into rooms. It presumably was a farmhouse (Fig. 2), dating back to the 6th century BC (Paribeni, 2001). Towards the beginning of the 5th century BC, the building was almost entirely destroyed by a fire that caused its roof to collapse (Paribeni, 2001). During the excavation of the archaeological site (1995-2000), by the Soprintendenza ai Beni Archeologici per la Toscana [State Archaeological Superintendency for Tuscany] under the direction of Dr. E. Paribeni, some material of plant origin was found. The material was studied to reconstruct the vegetational context, in which the Etruscan farmhouse was included, and to identify the origin of the materials used in the building of the farmhouse and that of the handmade objects found in it. A study was undertaken to also identify the organic remnants that had presumably been used as food. The results of the study are contained in this contribution.

The data collected has enriched the rather scarce information available on the natural environment of Tuscany during the Etruscan period.

Previous investigations in southern Tuscany have indicated that a period of cool and humid climate existed around the Bronze Age. It favored the development of beech woods at levels of altitude that were considerably lower than at those levels where beech now grows (Negri, 1927). Research carried out in northern Tuscany (Begliomini *et al.*, in press) has shown that the expansion phase of beech growth was followed by the development of mixed oak forests, as the climate improved and became more favorable. Studies carried out during archeological excavations in the area of the Gulf of Follonica (Grosseto) revealed the presence of some types of Mediterranean sclerophyllous evergreen vegetation where *Erica arborea* L. dominated, in the 5th century BC (Mariotti Lippi *et al.*, 2000). Analyses conducted on samples of charcoal, discovered during the first excavation phases of the farmhouse at the Pian d'Alma site, suggest that various species of *Quercus* and *Laurus nobilis* L. were present in the area (Mariotti Lippi *et al.*, 2000).

Current vegetation

The current vegetation that surrounds the excavation site at Pian d'Alma is Mediterranean in type and is primarily made up of sclerophyllous evergreens. At present, it is represented by a holm oak wood derived from woods that have undergone short coppice rotation for the production of charcoal. There are almost no herbaceous plants in the area: shrub and trees pre-

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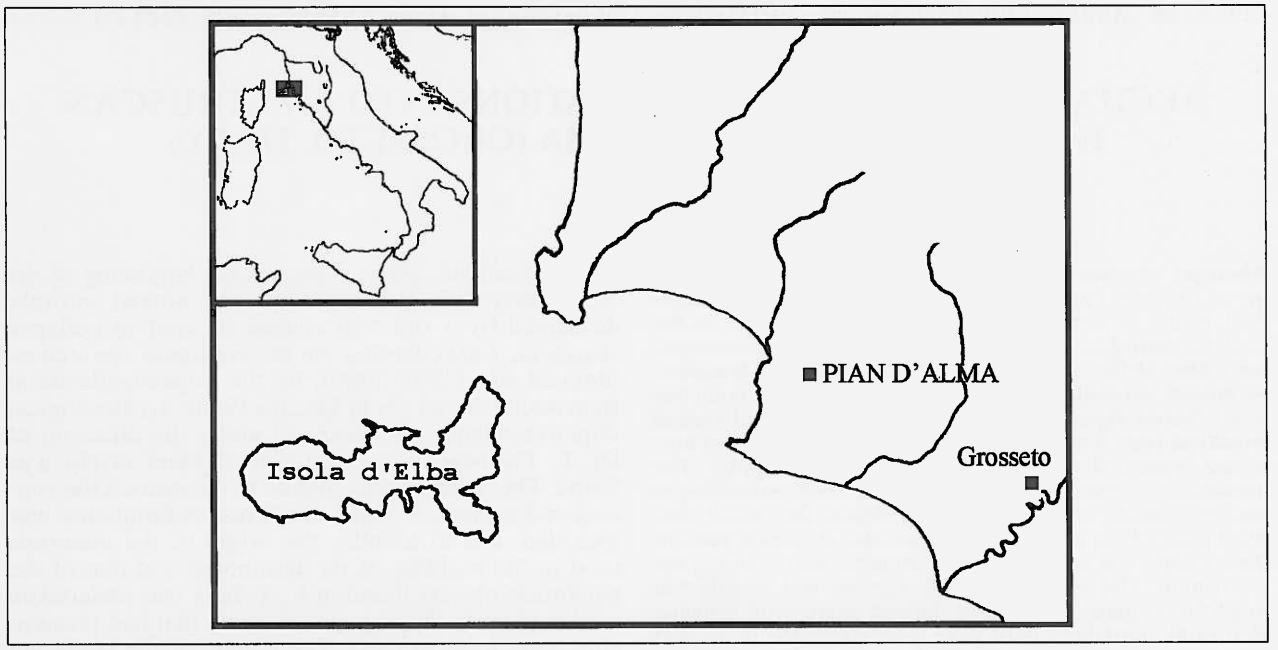

Fig. 1 - The site of Pian d'Alma on Poggio Tondo hill.

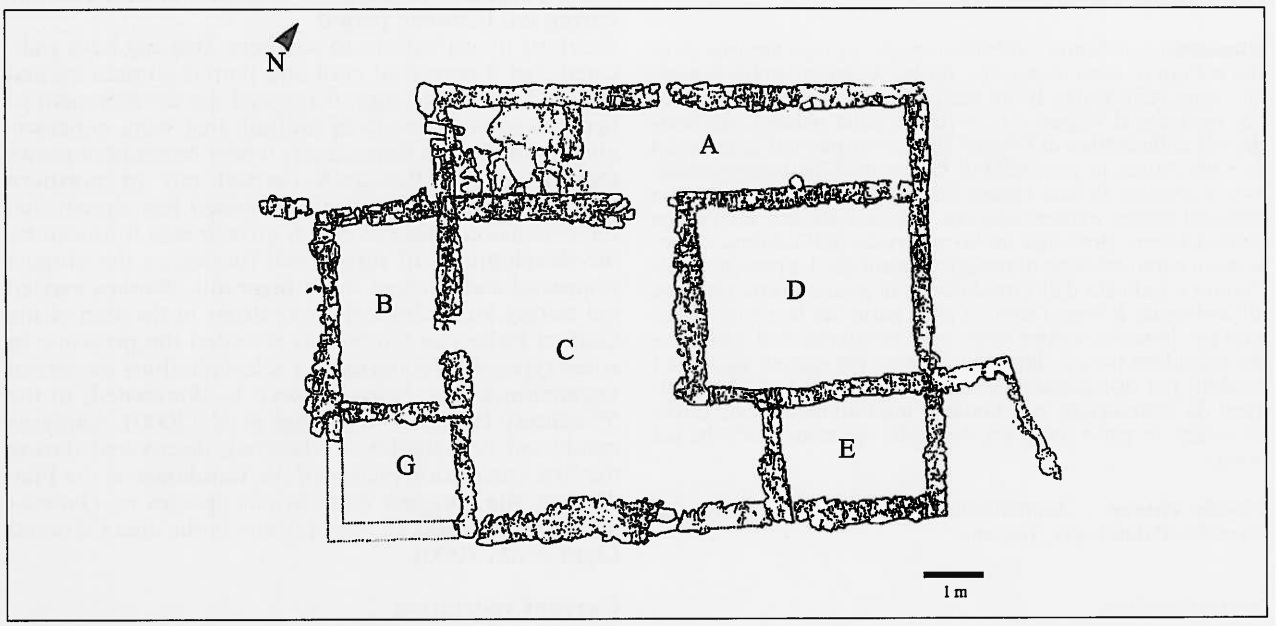

Fig. 2 - The Etruscan farmhouse of Pian d'Alma.

dominate. In the drier areas, *Quercus ilex* L. is mostly found together with *Erica arborea* L. and *Arbutus unedo* L. and, in the cooler ones, with *Fraxinus ornus* L. In relation to the climate of the zone, these aspects can be considered a vegetation near to the 'climax', *i.e.*, the maximum evolution possible of the natural vegetation.

Materials and Methods

Palynology

Palynological analyses were carried out on soil samples collected in rooms C and D of the farmhouse (Fig. 2) (US 245, 268, 285, 295 300) and from a soil layer preceding the existence of the farm (US 103). Each sample (3 g) was treated with cold HCl, HF, hot HCl

and NaOH, sieved (250 μm mesh), and then included in a water/glycerol solution 50% v/v, according to Bertolani Marchetti (1960) with slight modifications (Arobba, 1986). Observations were made at light microscopy (LM). The grains were identified with the aid of the literature (Andersen, 1979; Moore *et al.*, 1991; Punt, 1976; Reille, 1992, 1995) and pollen reference collections. Percentages were calculated on the total number of pollen grains and spores. The pollen concentration (APF = *Absolute Pollen Frequency*) was calculated as the number of grains per gram of dry sediment, according to Accorsi & Rodolfi (1975).

Charcoal analysis

Charcoal fragments were found in different places in the ancient building (Fig. 2). These fragments were cleaned and the sediment was removed by several washes using water, and then dried in an oven at a low temperature (40°C). The diagnostic characters of the samples were observed by means of a scanning electron microscope (SEM). Transverse, tangential longitudinal and radial longitudinal surfaces were obtained by fracturing the charcoal fragments observed at LM. The identification of the wooden species was carried out with the aid of literature (Abbate Edlmann *et al.*, 1994; Giordano, 1981; Greguss, 1955; Jane, 1956; Greguss, 1959; Grosser, 1977; Huber & Rouschal, 1954; Schweingruber, 1978; Schweingruber, 1990).

Carpology

The analyzed fruit specimens and seeds came from soil samples taken in environment D (Fig. 2) and sifted in water. Identification was made at dissection LM with the aid of literature (Bandini Mazzanti & Taroni, 1989; Renfrew, 1973; Van Zeist *et al.*, 1991; Zohary & Hopf, 2000). Sectioning was necessary in order to identify several of the samples.

Results

Palynology

Although sample collection was carried out at short distances, one from the other, the state of grain preservation varied a great deal. The samples collected in US 245 and 300 were sterile. The samples relative to US 268 and 295 abounded in minute fragments of charcoal but they were very poor from a palynological point of view, as the APF was 20-60 grains/gram. Both US 103 sample (sample A), taken from a soil layer that preceded the existence of the farm, and US 285 sample (sample B), which came from the room D, had an APF of about 200 grains/gram.

About fifty pollen morphotypes are listed in the pollen spectra (Tab. 1).

In sample A, the arboreal plant pollen (AP) made up 65% of the total number of grains. Among these, the *Quercus* deciduous group (32.2%) were the best represented trees. Next were *Erica* (13.4%) and *Cornus mas* L. (3.3%); plants attributable to a mixed oak wood, such as *Fraxinus*, *Ulmus*, *Sambucus* cf. *nigra*, and *Tilia*, appeared in even lower percentages. *Quercus* cf. *ilex* appeared in 5.7% of the total. The arboreal hygrophytes *Alnus* and *Salix* were represented by very low percentages (Tab. 1). The non arboreal plant pollen (NAP) was very varied. Ranunculaceae and Labiatae were possibly widespread in the actual sampling site; Cyperaceae were also present.

Tab. 1 - Pollen percentages in the examined samples.

	Sample A	Sample B		Sample A	Sample B
Abies	0.5		*Plantago* cf. *lanceolata*	0.2	0.5
Pinus	1.0	2.2	cf. *Sanguisorba*		0.5
Cupressaceae	0.5	2.5	cf. *Filipendula*	0.4	
Castanea	0.5		*Berberis*		0.5
Ilex	0.2		Ranunculaceae	5.2	
Quercus cf. *ilex*	5.7	3.5	Caryophyllaceae	0.2	
Quercus deciduous group	32.2	11.9	cf. *Centaurea*	0.2	
Fraxinus cf. *ornus*	1.2	1.5	*Artemisia*	0.2	
Viburnum	0.2		Asteroideae	0.5	1.0
Sambucus cf. *nigra*	0.2		Cichorioideae	0.2	0.5
Erica	13.4	16.4	cf. *Knautia*	1.2	
Arbutus	0.7	1.0	Chenopodiaceae	0.5	0.5
Ericales	2.3		Boraginaceae		0.5
Myrtus		0.5	Scrophulariaceae	2.1	0.5
Alnus	0.5	1.0	Labiatae	5.7	3.0
Salix	0.5	1.0	cf. *Lotus*	1.0	0.5
Ulmus	0.5	0.7	Leguminosae	0.2	1.5
Tilia	0.2	1.5	cf. *Osyris*	1.4	1.0
Cornus mas	3.3	0.5	Cruciferae	0.5	1.5
Platanus		0.5	cf. *Ruscus*	0.2	
Rosaceae	0.7	1.0	Liliaceae	0.2	0.5
Cistaceae	0.7	0.5	Cyperaceae	2.9	10.0
Hedera		0.5	*Sparganium* type	0.2	1.5
Gramineae	1.9	11.3	Spore monolete	1.2	
Cerealia		1.0	Spore trilete	1.0	1.0
Urticaceae		5.0	Unidentified	6.7	8.5
Rumex	1.0	2.5	AP	65.0	46.7

In sample B, the AP represented 46.7% of the total number of grains. This value indicated a meager arboreal cover in the immediate surroundings of the site. The floristic composition of the wood was very similar to that of sample A (Tab. 1). On the contrary, quantitative differences were detectable. Particularly, the percentage decrease in the AP was mostly determined by the drop to 11.9% of the *Quercus* deciduous group pollen. The NAP was represented prevalently by Gramineae and Cyperaceae. Cerealia and Urticaceae were among the anthropogenic indicators: their presence was accompanied by a percentage increase in *Rumex*. The pollen percentages of Cyperaceae and *Sparganium* type may have indicated that a body of water, or at least wet substrates, had once been present in the vicinity of the farmhouse.

Analysis of the charcoal findings

Many of the analyzed samples (Tab. 2) corresponded to some structural parts of the rural building such as roof-supporting stakes and the plank roofing. The type of wood selected was most probably dictated by the already known technological characteristics of the timber.

Deciduous oak, *e.g.*, *Q. pubescens* Willd. and *Q. cerris* L. was used to realize the wooden thresholds that divided the rooms, and the wooden plank roofing of room B (Tab. 2). Probably, the same oak wood that was

Tab. 2 - Charcoal fragments found in the ancient building.

Room	US	Possible use	Plant source	N. of samples
B	81/A	plank roofing	*Quercus* sp. (deciduous group)	5
	81/B	plank roofing	*Quercus* sp. (deciduous group)	5
	81/C1	plank roofing	*Quercus cerris* L.	5
	81/C3	plank roofing	*Quercus pubescens* Willd.	5
	81/D1	plank roofing	*Quercus cerris* L.	5
	81/D2	plank roofing	*Quercus* sp. (deciduous group)	5
	81/E	plank roofing	*Quercus pubescens* Willd.	5
	81/F	plank roofing	*Quercus* sp. (deciduous group)	5
	81/G	plank roofing	*Quercus pubescens* Willd.	5
	81/H	plank roofing	*Quercus* sp. (deciduous group)	5
	81/I	plank roofing	*Quercus pubescens* Willd.	5
	81/L	plank roofing	*Quercus* sp. (deciduous group)	5
	81/L1	plank roofing	*Quercus cerris* L.	5
	81/M	plank roofing	*Quercus* sp. (deciduous group)	5
	81/N	plank roofing	*Quercus pubescens* Willd.	5
	81/O1	plank roofing	*Quercus pubescens* Willd.	5
	81/O2	plank roofing	*Quercus* sp. (deciduous group)	5
	81/O3	plank roofing	*Quercus pubescens* Willd.	5
	81/P	plank roofing	*Quercus pubescens* Willd.	5
	81/Q	plank roofing	*Quercus pubescens* Willd.	5
	81/R	plank roofing	*Quercus pubescens* Willd.	5
	81/S	plank roofing	*Quercus* sp. (deciduous group)	5
	81/V	plank roofing	*Quercus* sp. (deciduous group)	5
	115/A		*Erica arborea* L.	20
		Olea sp.	3	
C	221		*Quercus* sp. (deciduous group)	2
	221/A		*Laurus nobilis* L.	1
	221/B		*Quercus* sp. (deciduous group)	11
	221/D		*Erica arborea* L.	12
	vicino 221		*Quercus ilex* L.	2
	222	under tile	*Quercus* sp. (deciduous group)	2
D	277		*Erica arborea* L.	25
	286	under *dolium*	*Erica arborea* L.	7
	287		*Erica arborea* L.	25
	289	threshold	*Quercus* sp. (deciduous group)	3
	302	stake	*Erica arborea* L.	3
	305	roof-supporting stake	*Erica arborea* L.	21
	307A/B/C/D		*Erica arborea* L.	19
	309	stake	*Erica arborea* L.	52
	313A/D/E	furnishing	*Erica arborea* L.	19
	313C	furnishing (?)	*Corylus avellana* L.	1
	315B/F	stake (?)	*Erica arborea* L.	18
	320	stake	*Erica arborea* L.	46
	321		*Erica arborea* L.	11
	331	under *dolium*	*Erica arborea* L.	54
G	327	threshold	*Quercus* sp. (deciduous group)	10

found in courtyard C and that found close to the entrance to room B was also used for part of the roof. Wood from *Erica arborea* was often used to realize support structures (Tab. 2). Its exploitation seems to have been relative to the possibility of its supply in the surroundings of the inhabited area.
Besides *Quercus* deciduous plant and *Erica*, *Corylus avellana* L., *Olea* sp., *Laurus nobilis* L. and *Q. ilex* also appeared among the charcoal fragments in the building (Tab. 2). No handmade items could be coupled with these woods.

Carpological analyses
The analyzed fruit specimens and seeds found showed varied states of preservation. Several of them were so deteriorated that their identification was very difficult. The most recognizable findings (Tab. 3) came from room D (US268/D area A).
In this room, five caryopses of *Triticum aestivum* L. and one of *Hordeum vulgare* L. were found. Among the Leguminosae remains, it was not possible to attribute with any certainty the seeds of *Pisum* to *Pisum elatius* (M.B.) Stev., indigenous to southern Italy, or to *Pisum sativum* L., a cultivated species. One of the *Cicer* seeds was attributable to *Cicer arietinum* L. Another seed was attributed to *Lathyrus sativus* L., a plant that was often cultivated. Due to its small dimensions, it was impossible to affirm with any certainty if this type of seed had come from the harvest of crops or had been collected from wild plants. Three seeds of the genus *Vicia* were found: one of these could not be identified or attributed to any species, due its poor condition of preservation. The others were attributed to *Vicia sativa* L. and *Vicia faba* L., respectively.
Six remains of the fruit of *Cornus mas* were found at the site. They consisted of the stone of the drupes.
The only *Vitis* seed found was almost definitely attributed to a wild growing vine.
The remains of *Rubus* consisted of four stones (that had not been carbonized) of the drupelet of the blackberry.
One seed was almost certainly attributable to *Malus*.
A fragment of the woody pericarp of the fruit of *Corylus avellana* was also found.

Tab. 3 - Fruit and seeds found in room D of the farmhouse.

TAXA	Number of remains
Triticum aestivum L.	5
Hordeum vulgare L.	1
Vicia cf. *sativa*	1
Vicia cf. *faba*	1
Vicia sp.	1
Lathyrus	1
Pisum	3
Cicer	2
Lens	1
Rubus	4
Malus	1
Cornus mas L.	6
Vitis vinifera L. ssp. *Sylvestris* (C.C. Gmelin) Hegi	1
Corylus	1

Numerous traces of Cyperaceae fruit were found in the soil. These were attributed to *Carex* sp., a plant sporadically present in the current holm oak wood.

Discussion

When we consider the overall results of the archaeo-botanical investigations carried out on various kinds of findings, we can imagine that the Etruscan building was located in a clearing in a mixed oak wood. Several xerophilous elements, such as *Q. ilex* and *Erica*, which are among the main components of the current holm oak wood, were present in the ancient forest.
The floristic composition of the Etruscan woodlands was once richer than today's. This was evident from a comparison of the pollen spectra of the ancient sediments with the spectrum of the current pollen rain, detected on a cushion of moss collected a short distance away from the Etruscan farmhouse (Mariotti Lippi *et al.*, 2000). In the latter, the AP was represented by only eight morphotypes; the NAP was less than 10% of the total of grains.
The archaeo-botanical investigations indicated that *Cornus mas*, *Sambucus* cf. *nigra*, *Hedera helix* L., *Ulmus* sp., *Tilia* sp., *Laurus nobilis* and *Corylus avellana* were also present during the Etruscan epoch. The presence of these plants suggested that the vegetation had mesophylous characteristics.
A comparison of the samples examined revealed a decrease in the percentage of the AP. This most probably indicated the absence of any tree coverage in the immediate vicinity of the farm, during its use. The said decrease in the AP was mostly due to the decline in the percentage of *Quercus* deciduous group pollen. This could have been connected to the human utilization of the wood of this plant: many of the structures of the building were made of *Quercus* wood. The choice was appropriate, especially as regards the duramen, given its good resistance to the attack of insects and durability. In particular, the deciduous oak supplies a hard type of wood with high mechanical resistance and vast adaptability. It has been and is still exploited for a wide variety of uses (A.A.V.V., 1989; Abbate Edlmann *et al.*, 1994; Giordano, 1980; for the ancient sources: Di Bérenger, 1965).
Erica must have also been used considerably for the realization of the house support structures. This plant reacts rapidly to deforestation and to fires. It must have once been widespread in the area, as reported in previous investigations (Giachi *et al.*, 1998; Mariotti Lippi *et al.*, 2000).
Human settlement in the area was indicated in the pollen spectrum by the appearance of anthropogenic indicators. These were mainly represented by cereals and Urticaceae and are also indicated by an increase in the pollen percentages of weeds. These plants are not represented in the current pollen rain at the site (Mariotti Lippi *et al.*, 2000). The presence of cereals at the farmhouse was confirmed by the finding of caryopses of *Triticum* and *Hordeum* in room D. *T. aestivum* is a hexaploid naked wheat. It is known as bread wheat

and is still among the most cultivated today. The cultivation of *Hordeum* may have started during the Stone Age (Langer & Hill, 1988).
Remnants of other plants used for food were also found at the site. Several of these, most probably came from cultivated plants. Archeological data attest to the fact that *Pisum* was cultivated in Italy as early as the Bronze Age (Zohary & Hopf, 2000), and *Cicer*, starting in the Iron Age (Van Zeist *et al.*, 1991). Nevertheless, the total number of findings did not directly indicate any storehouses for reserves.
Food had to have been made up in part or integrated with wild growing fruit, such as nuts and blackberries, gathered in the wood.
The fruit of *Cornus mas*, which are rarely utilized today in the food sector, once had various uses. Columella (*De Re Rustica*, XII, 10) indicated how to gather them and preserve them in an infusion exactly in the same way as was done with olives. An alcoholic drink was also made from this fruit: it is believed that it was used before the diffusion of the wine use (Forni, 1990). Traces of its use have been found at Bronze Age archeological sites, in northern Italy (Forni, 1996).
The pollen spectra also showed an increase in hygrophilous plants during the use of the farmhouse, above all in Cyperaceae. Numerous fragments of Cyperaceae fruit were also found in the farmhouse sediment. This suggests the existence of a body of water, or at least some wet substrates, in the vicinity of the farmhouse.

Conclusion

Palynological investigations showed that the Etruscan wood surrounding Pian d'Alma was floristically much richer than the present one: it also was characterized by greater mesophily.
The woods were able to supply most of the different types of wood used in realizing the handcrafted items found during the excavation, starting from those utilized to realize the structural parts of the building. The plank roofing and the wooden thresholds were made of oak; the stakes supporting the roof were made of *Erica*, as were certain parts of what supposed to be furnishings. The woods also supplied fruit that was most probably a part of the diet of the inhabitants.
The presence of man must have altered the natural state of the pre-existing woodlands. The use of timber as a building material, for the production of tools and utensils and for its daily use as fuel, unquestionably produced a decrease in the arboreal covering in the vicinity of the building. Therefore, we might conclude that the space created around the house was manmade and was used for the common outdoor activities of the era. This thinning out of the woods was mirrored in the pollen spectra: there was a reduction in the pollen of the woody plants to the advantage of the herbaceous plants, in the levels corresponding to building use.
Man also introduced new plants that had been previously extraneous to the environment and that subsequently disappeared with him. Among these were cultivated plants (such as cereals), nitrophilous plants and ruderal plants (such as Urticaceae) as well as various weeds. Contemporaneously with the advent of the presence of man at this site, hygrophytes appeared. These plants testify to the presence of an expanse of water or of some small body of water in the vicinity of the building. Certainly, the inhabitants of the house must have had a place to stock up on water or to store it that was not too far away.
The heterogeneous state of preservation of the micro- (pollen and spores) and macro-findings (such as seeds, fruits and pieces of charcoal) collected at brief distances – one from the other – most probably indicates the different impact that the burning of the building had on various parts of the same environment. The fire probably destroyed many of the materials that could have been useful for a more exhaustive reconstruction of the edifice. Even if there are few remains in a sufficiently good state of preservation, their identification has enabled us to extract a sufficiently satisfactory cutaway view of life at the site under examination.

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