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NOTES

ARCHAEOBOTANY IN URBAN SITES: THE CASE OF *MUTINA*

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ABSTRACT – The present paper aims to show the importance of analyzing plant macroremains from urban excavations. Organic materials preserved below the historical city in waterlogged conditions are a fundamental resource, and the study of seeds and fruits gives a good contribution to historical and archaeological research. Archaeobotany in urban contexts provides important results when the examined material comes from several excavations that “photograph” the territory over quite a long period. An overview of archaeobotanical analyses carried out on material from archaeological sites of Modena (Emilia-Romagna), from the 2nd century BC to the 6th century AD, made by the Laboratory of Palynology and Palaeobotany of the University of Modena and Reggio Emilia, is presented. The floristic list of seed/fruit analyses result is reported and interesting subject matters are tackled concerning both cultivated/cultivable plants (fruits and nuts, vegetables/aromatics/spices/medicinal plants, fibre and oil plants, cereals and pulses, flowers and other ornamental plants) and wild plants of no obvious use, together with wetland plants which are rare and endangered species in Emilia-Romagna today.

KEYWORDS: PLANT MACROREMAINS, ROMAN PERIOD, MODENA, NORTHERN ITALY, ETHNOBOTANY, LANDSCAPE

INTRODUCTION

The importance of the analysis of organic remains from urban excavations is well known (e.g. Orser, 2002; Majewski & Gaimster, 2009).

Concerns that previously limited the substantial contribution of Archaeobiology only to studies of prehistoric sites have been overcome, expanding the potentialities of this discipline also to the historical period (e.g. Renfrew, 1973). In particular, innovations in techniques and in the approach of Archaeobotany (e.g. Pearsall, 2008; Cappers & Neef, 2012) have allowed a wider application for all kinds of investigation, from plant domestication problems (e.g. Zohary & Hopf, 2004) to reconstruction of garden history (e.g. Moe et al., 1994; Morel et al., 2006). The organic materials preserved below the historical city in waterlogged conditions are a fundamental resource, also for their potential biomolecular research (Kenward & Hall, 2008). Ancient DNA analyses have become increasingly important, with an

exponential trend in recent years, and waterlogged plant materials from archaeological sites offer many opportunities to be explored, despite their limits (Schlumbaum et al., 2008). Moreover, charred remains can also be found in urban deposits; these provide additional information especially about plants related to human alimentation, in particular cereals and legumes, which are often found only in these conditions (Bandini Mazzanti et al., 2005a). Archaeobotany in an urban context provides important results when the material examined comes from several excavations that “photograph” the territory over a quite long period. There are some significant examples of recent investigations concerning several European cities: a) Agriculture and food in Lleida (Catalonia, Spain) from the Roman Age (2nd century BC) to the Islamic period (11th century AD) (Alonso Martinez, 2005); b) Ethnobotany in Ferrara (Emilia Romagna, Italy) between the Middle Ages and Renaissance (13th – 15th centuries AD) (Bandini Mazzanti et al., 2009; Bosì et al., 2009a); c) Environment and “useful” plants in the

Middle Ages (13th – 14th centuries AD) in Prague (Czech Republic) (Beneš et al., 2002); d) Medieval food traditions (13th – 17th centuries CE) in Northern Europe (Karg, 2007). The reconstruction of an urban area unquestionably depends on the history of the humans who transformed it over time. Moreover, human history is always linked to the “cultural history” of the plants used for food, medicine and much more (Prance & Nesbitt, 2005). In archaeobotanical research, the study of seeds and fruits can support historical and archaeological research providing important information from taphonomic understanding of deposits to information on agriculture and economics, human diet, the esoteric sphere, as well on the environment surrounding the site (e.g. Bandini Mazzanti et al., 2005b).

This contribution refers to the study case of *Mutina* (now Modena), a Roman colony founded in 183 BC, important both for military-strategic and economic reasons, described by Cicero as a “*firmissimam et splendidissimam populi romani coloniam*”. Thanks to the collaboration with the Superintendence of Archaeological Heritage of Emilia Romagna, numerous archaeological sites of the Roman Period which have come to light in Modena have been investigated, both with carpological (Rinaldi, 2010; Bosi et al., 2011), palynological and xilo-anthracological analyses

(Venezia, 2003/2004 and unpublished data).

The information provided by botanical remains from the Roman sites of Modena has allowed the interpretation of palaeoethnobotany, history and knowledge of flora and vegetal landscape of the Modena area during the Roman Age, which are aspects totally in accord with the aims of Archaeobotany (e.g. Van Zeist et al., 1991; Hastorf, 1999).

MATERIALS AND METHODS

Samples were collected and studied from different layers belonging to four sites (Tab. 1) within the *Mutina* settlement. The sites date from the 2nd century BC to the 6th century AD, almost from the foundation of the Roman city to its decline. They were excavated in Modena, both in the present-day town-centre and in the surroundings: three sites (1, 2, and 3) relate to the ancient centre of the Roman town of *Mutina* and one (4) to the immediate suburbs (Fig. 1).

Searching for macroremains (a total of over 1200 l of soil – Tab. 1) were soaked in water and then washed through a bank of three sieves with 10, 0.5 and 0.2 mm meshes.

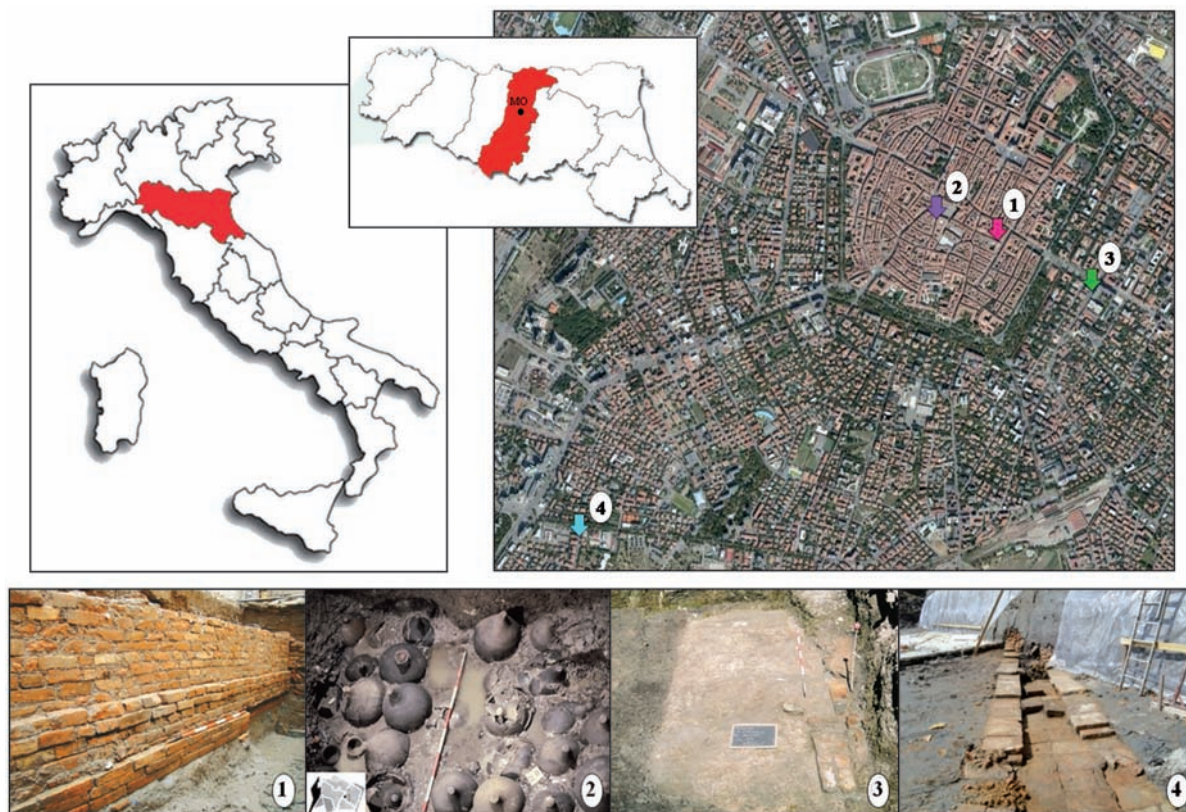


Fig. 1. - Location of the four investigated archaeological sites of ancient *Mutina* in present-day Modena, Emilia Romagna. At the bottom, photographs of the site excavations.

Table 1. - Main features of the four investigated archaeological sites of ancient *Mutina*.

site	1 - ex Cinema Capitol	2 - ex Cassa Risparmio	3 - Palazzo Vaccari	4 - viale Amendola
chronology (* also with radiocarbon date)	2 nd cent BC - 4 th cent. AD	15-40 AD	3 th - 6 th cent. AD	2 nd cent. BC - 2 nd cent. BC.*
archaeological context	<i>domus</i>	channel reclaimed	<i>domus</i> (abandonment)	aqueduct and alluvial deposit
archaeobotanical analysis §	s/f (p)	s/f, w/wt/c	s/f	s/f, w (p)
liter	519	606	48,9	51
carpological sum	10310	167012	17901	17071
references	Rinaldi, 2010	Rinaldi, 2010; Venezia, 2003/2004; Bosi et al., 2012	Rinaldi, 2010; Bosi et al., in litteris	Rinaldi, 2010; Bosi et al., in litteris and unpublished data

§ - s/f = seeds/fruits; w = woods; wt = wood tools; c = charcoal; p = pollen (analysis in progress).

Seeds and fruits from each fraction were sorted and identified (Tab. 2) using a Leica Wild M10 stereomicroscope (up to 80x magnification) and the reference collection, atlases and keys (Beijerinck, 1947; Scurti, 1948; Kiffmann, 1958; Berggren, 1969, 1981; Delorit, 1970; Montégut, 1972; Renfrew, 1973; Häfliger & Brun-Hool, 1981; Frank & Stika, 1988; Jacquat, 1988; Schoch et al. 1988; Jacomet et al., 1991; Viggiani & Angelini, 1991, 2005; Hubbard, 1992; Young & Young, 1992; Davis, 1993; Anderberg, 1994; Spjut, 1994; Pignotti, 1998; Cappers et al., 2006; Nesbitt, 2006). SEM was used for problematic identifications (e.g. *Cucumis melo*). For

scientific plant names several references were used (Tutin et al., 1964 - 93; Pignatti, 1982; Alessandrini et al., 2010). Figure 2 shows photos (taken with a Nikon Digital Sight DS-5M photographic camera) of selected carpological findings; the measurements (length or greater extent) were taken with the software ImageJ. For site 2, we show the results of previous analyses of charcoal, wood and wooden tools (Venezia, 2003/2004) (Tab. 3); for site 4, xilological analyses were carried out (by Marco Marchesini, Superintendent to Archaeological Heritage of Emilia Romagna) though just at a preliminary level (Tab. 3).

Table 2 (a-h). - The carpological record (quantitative).

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
1a - Fruit (cultivated/possibly cultivated)					
<i>Citrullus lanatus</i> (Thunb.) Mansfeld	seed	.	x	.	.
<i>Cucumis melo</i> L.	seed	.	x	.	.
<i>Diospyros lotus</i> L.	calix - c	.	x	.	.
<i>Ficus carica</i> L.	achene	x	x	x	x
<i>Juglans regia</i> L.	endocarp	x	x	x	x
<i>Malus domestica</i> (Borkh.) Borkh.	seed	.	x	.	.
<i>Malus/Pyrus</i>	seed	.	x	x	.
<i>Morus cf. alba</i> L.	endocarp	.	x	.	.
<i>Morus nigra</i> L.	endocarp	.	x	.	.
<i>Olea europaea</i> L.	endocarp, pedicel	x	x	x	.
<i>Pinus cembra</i> L.	seed	.	x	.	.
<i>Pinus pinea</i> L.	seed, scale	.	x	.	.
<i>Prunus avium</i> L.	endocarp	.	x	x	x
<i>Prunus avium/cerasus</i>	endocarp	.	x	.	.
<i>Prunus cerasifera</i> Ehrh.	endocarp	.	x	.	.
<i>Prunus domestica</i> L. subsp. <i>domestica</i>	endocarp	.	x	.	.
<i>Prunus domestica</i> L. subsp. <i>insititia</i>	endocarp	.	x	.	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Prunus dulcis</i> (Mill.) D.A. Webb.	endocarp	.	X	.	.
<i>Prunus persica</i> (L.) Batsch.	endocarp, pedicel	.	X	X	.
<i>Punica granatum</i> L.	seed	.	X	.	.
<i>Pyrus communis</i> L.	seed	.	X	.	X
<i>Rubus idaeus</i> L.	endocarp	.	.	.	X
<i>Sorbus domestica</i> L.	seed	.	X	X	.
<i>Vitis vinifera</i> L. subsp. <i>vinifera</i>	pip, pedicel, grape	X	X	X	X
1b - Fruit (wild)					
<i>Cornus mas</i> L.	endocarp	.	X	X	.
<i>Cornus sanguinea</i> L.	endocarp	.	X	.	X
<i>Corylus avellana</i> L.	nut	X	X	X	X
<i>Fragaria</i> sp.	achenio	.	X	.	.
<i>Fragaria vesca</i> L.	achene	.	X	.	X
<i>Fragaria viridis</i> Duchesne	achene	X	X	X	X
<i>Prunus spinosa</i> L.	endocarp	.	X	.	.
<i>Rubus caesius</i> L. (7)	endocarp, aggregate	X	X	.	X
<i>Rubus fruticosus</i> aggr.	endocarp	X	X	X	X
<i>Sambucus nigra</i> L. (6)	endocarp	X	X	X	X
<i>Sorbus</i> sp.	seed	.	.	X	X
2 - Vegetables and aromatic/spice plants					
<i>Anethum graveolens</i> L.	mericarp	.	X	X	X
<i>Apium graveolens</i> L.	mericarp	X	X	X	.
<i>Atriplex hortensis</i> L.	achene	X	X	X	.
<i>Beta vulgaris</i> L.	seed, cluster pseudocarps, nucule	X	X	X	.
<i>Brassica napus</i> L.	seed	.	X	.	.
<i>Brassica nigra</i> (L.) W.D.J. Koch	seed	.	X	.	.
<i>Brassica rapa</i> L. subsp. <i>rapa</i>	seed	.	X	.	.
<i>Coriandrum sativum</i> L.	mericarp	.	X	.	.
<i>Cyperus esculentus</i> L. (7)	achenio	.	X	.	X
<i>Foeniculum vulgare</i> Mill.	mericarp	.	X	X	.
<i>Lagenaria siceraria</i> (Molina) Standley	seed	.	X	.	.
<i>Leonurus cardiaca</i> L.	mericarp	.	.	X	.
<i>Melissa officinalis</i> L.	mericarp	.	X	X	.
<i>Origanum vulgare</i> L.	mericarp	X	X	X	.
<i>Papaver somniferum</i> L.	seed	.	X	.	.
<i>Petroselinum crispum</i> (Mill.) Fuss	mericarp	.	X	.	.
<i>Pimpinella anisum</i> L.	mericarp	.	X	.	.
<i>Salvia officinalis</i> L.	mericarp	.	X	.	.
<i>Satureja hortensis</i> L.	mericarp	X	X	.	.
<i>Sinapis alba</i> L. (6)	seed	.	X	.	.
3 - Cereal and pulses					
<i>Avena sativa</i> L.	flower base - c	.	X	.	.
Cereal undiff.	caryopsis - c	X	X	X	.
<i>Hordeum vulgare</i> L.	caryopsis, rachis segment - c	X	X	X	.
<i>Lathyrus sativus</i> L.	seed - c	.	X	.	.
Pulses undiff.	seed - c	X	.	X	.
<i>Lens culinaris</i> Medicus	seed - c	X	X	X	.
<i>Panicum miliaceum</i> L.	caryopsis - c	.	.	X	.
<i>Pisum sativum</i> L.	seed - c	.	.	X	.
<i>Secale cereale</i> L.	caryopsis - c	.	X	.	.
<i>Triticum aestivum</i> L.	spikelet base, rachilla - c	X	X	X	.
<i>Triticum aestivum/durum/turgidum</i>	caryopsis - c	X	X	X	.
<i>Triticum dicoccum</i> Schubl	caryopsis, rachis internode - c	X	X	X	.
<i>Triticum durum</i> Desf.	rachis segment - c	.	X	.	.
<i>Triticum monococcum</i> L.	caryopsis, rachis internode - c	X	X	X	.
<i>Triticum</i> sp.	caryopsis, rachis internode - c	.	X	.	.
<i>Vicia faba</i> L. var. <i>minor</i>	seed - c	.	X	.	.
<i>Vicia</i> cf. <i>sativa</i> L. (6)	seed - c	.	.	X	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
4 - Oil/fiber/dyes plants					
<i>Cannabis sativa</i> L.	achene	.	X	X	.
<i>Carthamus</i> cf. <i>tinctorius</i> L.	achene	.	X	.	.
<i>Dipsacus laciniatus</i> L. cf.	cipsela	.	.	X	.
<i>Linum bienne/usitatissimum</i>	seed	.	X	X	.
<i>Reseda luteola</i> L. (6)	seed	X	X	X	.
<i>Rubia tinctorum</i> L. cf.	mericarp	.	.	X	.
5 - Ornamental plants					
<i>Betula pendula</i> Roth	nutlet (with wing)	X	.	.	.
<i>Celtis australis</i> L.	endocarp	.	X	.	.
<i>Cupressus sempervirens</i> L.	twig	X	.	.	.
<i>Juniperus communis</i> L.	seed	.	X	.	.
<i>Myrtus communis</i> L.	seed	X	X	.	.
<i>Physalis alkekengi</i> L. (1b)	seed	X	X	.	.
<i>Picea abies</i> (L.) H. Karst.	leaf	X	X	.	X
<i>Platanus orientalis</i> L.	achene - c	X	.	X	.
<i>Taxus baccata</i> L.	flower (male)	.	.	X	.
6 - Ruderals s.l.					
<i>Agrimonia eupatoria</i> L.	hypanthium	.	X	X	X
<i>Agrostemma githago</i> L.	seed	X	.	.	.
<i>Ajuga chamaepitys</i> (L.) Schreb.	mericarp	.	X	X	.
<i>Amaranthus blitum/graecizans</i>	achene, perianth	X	X	X	.
<i>Anagallis arvensis</i> L.	seed	X	X	X	X
<i>Anthemis arvensis</i> L.	achene	.	.	X	.
<i>Anthemis cotula</i> L.	achene	X	X	X	.
<i>Anthriscus caucalis</i> M. Bieb.	mericarp	.	.	.	X
<i>Arctium lappa</i> L.	achene	.	X	X	.
<i>Arctium minus</i> (Hill) Bernh.	achene	.	X	.	.
<i>Atriplex</i> sp.	achene	X	X	X	X
<i>Ballota nigra</i> L.	mericarp	.	X	.	.
<i>Bifora testiculata</i> (L.) Spreng.	mericarp	.	X	.	.
<i>Borago officinalis</i> L.	mericarp	.	X	.	.
<i>Bothriochloa ischaemum</i> (L.) Keng	caryopsis - c	X	.	.	.
<i>Bromus arvensis</i> L.	caryopsis - c	X	.	.	.
<i>Bromus</i> cf. <i>hordeaceus</i> L.	caryopsis - c	X	.	.	.
<i>Bromus hordeaceus/secalinus</i>	caryopsis - c	.	X	.	.
<i>Bromus secalinus</i> L. (3)	caryopsis - c	.	.	X	.
<i>Bryonia dioica</i> Jacq.	seed	.	X	.	.
<i>Buglossoides arvensis</i> (L.) I.M. Johnst.	mericarp	X	.	.	.
<i>Calepina irregularis</i> (Asso) Thell.	silicle	.	X	.	.
<i>Carthamus lanatus</i> L.	achene	.	X	.	.
<i>Chaerophyllum</i> cf. <i>aureum</i> L.	mericarp	.	X	.	.
<i>Chelidonium majus</i> L.	seed	X	.	.	.
<i>Chenopodium album</i> L.	achene, perianth	X	X	X	X
<i>Chenopodium hybridum</i> L.	achene	.	.	X	.
<i>Chenopodium murale</i> L.	achene	X	.	.	.
<i>Chenopodium polyspermum</i> L. (7)	achene	X	X	X	X
<i>Chenopodium</i> sp.	achene	X	X	X	X
<i>Cichorium intybus</i> L. (2)	achene	X	X	X	X
<i>Cirsium arvense</i> (L.) Scop.	achene	X	X	X	.
<i>Conium maculatum</i> L. (2)	mericarp	X	X	X	.
<i>Conringia orientalis</i> (L.) Andr. ex DC.	seed	.	X	.	.
<i>Convolvulus arvensis</i> L.	seed	.	X	.	.
<i>Crepis biennis</i> L. (7)	cipsela	.	X	.	.
<i>Cuscuta</i> cf. <i>europaea</i> L.	seed	.	.	.	X
<i>Daucus carota</i> L. (2)	mericarp	X	X	X	X
<i>Digitaria sanguinalis</i> (L.) Scop. (7)	spigetta	X	X	.	.
<i>Digitaria</i> sp.	caryopsis	.	.	X	.
<i>Ecballium elaterium</i> (L.) A. Rich.	seed	.	X	.	.
<i>Echinochloa crusgalli</i> (L.) P. Beauv. (7)	caryopsis - c	X	X	X	.
<i>Elymus repens</i> (L.) Gould	caryopsis	X	.	.	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Euphorbia cf. stricta</i> L. (7)	seed	.	.	X	.
<i>Euphorbia cyparissias</i> L.	seed	X	X	X	.
<i>Euphorbia exigua</i> L.	seed	.	.	.	X
<i>Euphorbia helioscopia</i> L.	seed	X	X	X	.
<i>Euphorbia peplus</i> L.	seed	.	.	X	.
<i>Fallopia convolvulus</i> (L.) Á. Löve	achene	X	X	X	X
<i>Fallopia dumetorum</i> (L.) Holub	achene	X	.	X	.
<i>Fumaria officinalis</i> L.	seed	X	X	X	.
<i>Galeopsis angustifolia</i> Hoffm.	mericarp	X	X	.	.
<i>Galeopsis cf. ladanum</i> L.	mericarp	.	X	.	.
<i>Galeopsis speciosa/tetrahit</i>	mericarp	.	X	.	.
<i>Geranium columbinum</i> L.	seed	.	.	X	.
<i>Glebionis segetum</i> (L.) Fourr.	achene	.	X	.	.
<i>Glechoma hederacea</i> L. (7)	mericarp	.	X	.	.
<i>Heliotropium europaeum</i> L.	mericarp	X	X	X	X
<i>Helminthotheca echioides</i> (L.) Holub	achene	X	X	.	.
<i>Hypericum perforatum</i> L.	seed	X	X	X	X
<i>Hyoscyamus niger</i> L. (2)	seed	X	X	.	.
<i>Kickxia spuria</i> (L.) Dumort.	seed	.	X	.	.
<i>Lactuca serriola</i> L.	cypsela	X	.	.	.
<i>Lamium album</i> L.	mericarp	X	X	X	X
<i>Lamium maculatum</i> L.	mericarp	X	X	.	X
<i>Lamium purpureum</i> L.	mericarp	.	.	X	X
<i>Lapsana communis</i> L.	achene	X	X	X	.
<i>Lepidium campestre</i> (L.) R. Br.	seed	.	.	.	X
<i>Lepidium coronopus</i> (L.) Al-Shehbaz	seed	.	X	.	.
<i>Linum catharticum</i> L.	seed	.	.	X	X
<i>Lolium</i> sp.	caryopsis	.	X	.	.
<i>Lotus corniculatus</i> L.	seed	X	.	X	.
<i>Malva cf. alcea</i> L.	seed	.	X	.	.
<i>Malva</i> sp.	seed	.	.	.	X
<i>Malva sylvestris</i> L.	seed	.	X	.	.
<i>Marrubium vulgare</i> L.	mericarp	X	X	X	.
<i>Medicago arabica</i> (L.) Huds.	legume - c	X	X	.	.
<i>Medicago cf. lupulina</i> L.	legume - c	X	.	.	.
<i>Medicago cf. orbicularis</i> (L.) Bartal.	legume	.	X	.	.
<i>Medicago polymorpha</i> L.	legume	.	X	.	.
<i>Melilotus cf. officinalis</i> (L.) Pall.	seed - c	X	.	.	.
<i>Mentha arvensis</i> L.	mericarp	X	X	.	X
<i>Mentha spicata</i> L. (2)	mericarp	.	X	.	.
<i>Mentha suaveolens/longifolia</i> (7)	mericarp	.	X	.	.
<i>Mercurialis annua</i> L.	seed	.	X	X	.
<i>Myagrum perfoliatum</i> L.	silicle	.	X	X	.
<i>Neslia paniculata</i> (L.) Desv.	silicle	.	X	.	.
<i>Parietaria judaica</i> L.	achene	X	.	X	.
<i>Parietaria officinalis</i> L.	achene, perianth	X	.	.	.
<i>Persicaria lapathifolia</i> (L.) Delarbre	achene	X	X	X	.
<i>Persicaria maculosa</i> (L.) Gray	achene	X	X	X	X
<i>Peucedanum officinale</i> L.	mericarp	.	X	.	.
<i>Picris hieracioides</i> L.	achene	.	X	X	X
<i>Plantago lanceolata</i> L.	seed	X	.	X	.
<i>Plantago major</i> L. (7)	seed	.	.	X	.
<i>Plantago media</i> L.	seed	X	.	X	X
<i>Plantago</i> sp.	seed	.	.	X	.
<i>Poa annua</i> L.	caryopsis	X	.	.	.
<i>Polygonum aviculare</i> group	achene	X	X	X	X
<i>Portulaca oleracea</i> L. (2)	seed	X	X	X	X
<i>Potentilla anserina</i> type	achene	.	X	.	.
<i>Potentilla argentea</i> L.	achene	.	X	.	.
<i>Potentilla reptans</i> L. (7)	achene	X	X	X	X
<i>Ranunculus acris</i> L. (7)	achene	X	X	X	X
<i>Ranunculus arvensis</i> L.	achene	.	X	X	X
<i>Ranunculus parviflorus</i> L. (7)	achene	.	X	.	.
<i>Ranunculus sardous</i> Crantz (7)	achene	X	X	X	X
<i>Raphanus raphanistrum</i> L.	silique segment	.	X	.	.
<i>Rapistrum rugosum</i> (L.) Arcang.	silicle	.	X	.	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Rumex acetosella</i> L.	achene	x	x	x	.
<i>Rumex crispus</i> L.	achene with perianth	.	x	.	x
<i>Rumex crispus/obtusifolium</i>	achene, achene with perianth	x	x	x	x
<i>Rumex obtusifolius</i> L. (7)	achene with perianth	.	x	.	.
<i>Salvia pratensis</i> L.	mericarp	.	x	.	.
<i>Salvia verticillata</i> L.	mericarp	.	x	x	.
<i>Sambucus ebulus</i> L.	endocarp	x	x	x	.
<i>Sanguisorba minor</i> Scop.	hypanthium, achene	.	x	.	.
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	caryopsis with lemna/palea	x	x	x	.
<i>Setaria</i> sp.	caryopsis with lemna/palea	.	.	x	.
<i>Setaria verticillata</i> (L.) P. Beauv. (7)	caryopsis with lemna/palea	x	.	.	.
<i>Setaria viridis</i> (L.) P. Beauv.	caryopsis with lemna/palea	x	.	.	.
<i>Setaria viridis/verticillata</i>	caryopsis with lemna/palea	.	x	.	.
<i>Silene alba</i> (Miller) Krause	seed	x	.	.	.
<i>Silene</i> cf. <i>dioica</i> (L.) Clairv.	seed	x	.	.	.
<i>Silene flos-cuculi</i> (L.) Clairv. (7)	seed	x	x	x	x
<i>Silene gallica</i> L.	seed	.	x	.	.
<i>Silene latifolia</i> Poir. subsp. <i>alba</i> (Mill.) Greuter & Burdet	seed	.	x	x	x
<i>Silene vulgaris</i> (Moench) Garcke	seed	x	x	x	.
<i>Silene vulgaris/latifolia</i>	seed	.	x	.	.
<i>Solanum dulcamara</i> L. (7)	seed	x	x	x	x
<i>Solanum nigrum</i> L.	seed	x	x	x	x
<i>Sonchus asper</i> (L.) Hill	achene	.	x	.	x
<i>Sonchus oleraceus</i> L.	achene	x	.	.	.
<i>Sorghum halepense</i> (L.) Pers. (7)	caryopsis	.	.	x	.
<i>Stellaria media</i> (L.) Vill.	seed	x	x	x	x
<i>Stellaria pallida</i> (Dumort.) Crép.	seed	x	.	x	x
<i>Taraxacum officinale</i> group	cipsela	x	x	.	x
<i>Thymelaea passerina</i> (L.) Coss. & Germ.	seed	x	x	x	.
<i>Torilis japonica</i> (Houtt.) DC.	mericarp	.	.	.	x
<i>Torilis nodosa</i> (L.) Gaertn.	mericarp	.	x	x	.
<i>Trifolium arvense</i> L.	seed - c	x	x	x	.
<i>Trifolium campestre</i> Schreb.	legume, seed - c	x	.	.	.
<i>Trifolium pratense</i> L.	seed - c	x	x	x	.
<i>Trifolium repens</i>	seed	x	.	.	.
<i>Urtica dioica</i> L.	achene	x	x	x	x
<i>Urtica urens</i> L.	achene	x	.	x	.
<i>Valerianella dentata</i> (L.) Pollich	nutlet	x	x	x	x
<i>Valerianella eriocarpa</i> Desv.	nutlet	.	x	.	.
<i>Valerianella locusta</i> (L.) Laterr. (2)	nutlet	.	x	.	.
<i>Valerianella rimosa</i> Bastard	nutlet	.	x	x	.
<i>Verbascum</i> cf. <i>blattaria</i> L.	seed	.	.	x	.
<i>Verbascum</i> sp.	seed	.	x	x	x
<i>Verbena officinalis</i> L.	mericarp	x	x	x	x
<i>Veronica</i> cf. <i>verna</i> L.	seed	x	.	.	.
<i>Vicia</i> cf. <i>villosa</i> Roth (3)	seed	.	x	.	.
<i>Viola arvensis/tricolor</i>	seed	.	.	x	.
<i>Xanthium orientale</i> L. subsp. <i>italicum</i> (Moretti) (7)	perianth	.	x	.	x
7 - Wetground plants (h = hydrophyte)					
<i>Alisma plantago-aquatica</i> L. (h)	achene/seed	x	x	x	x
<i>Alisma/Baldellia</i> (h)	achene/seed	.	.	x	.
<i>Alnus glutinosa/incana</i>	achene, axis cone	.	.	.	x
<i>Apium nodiflorum</i> (L.) Lag.	mericarp	.	x	.	x
<i>Baldellia ranunculoides</i> (L.) Parl. (h)	achenio/sem	.	.	x	x
<i>Bolboschoenus maritimus</i> (L.) Palla	achene	.	x	.	.
<i>Callitriche</i> cf. <i>brutia</i> Petagna	mericarp	.	x	.	x
<i>Callitriche</i> cf. <i>stagnalis</i> Scop.	mericarp	.	.	.	x
<i>Carex</i> cf. <i>pseudocyperus</i> L.	achene	.	.	x	.
<i>Carex divisa</i> Huds.	achene	x	.	.	.
<i>Carex divulsa</i> Stokes	achene	x	x	x	.
<i>Carex elata</i> All.	achene	x	x	.	x
<i>Carex flava</i> L.	achene	.	.	x	.
<i>Carex hirta</i> L.	achene	x	x	x	x
<i>Carex otrubae</i> Podp.	achene	x	x	x	x

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Carex panicea</i> L.	achene	X	X	.	.
<i>Carex paniculata</i> L.	achene	X	X	X	.
<i>Carex pendula</i> Huds.	achene	X	.	.	X
<i>Carex punctata</i> Gaudin	achene	.	.	X	.
<i>Carex remota</i> L.	achene	.	.	X	.
<i>Carex riparia</i> Curtis	achene	.	X	.	X
<i>Carex</i> sp.	achene	X	X	X	X
<i>Carex vesicaria</i> L.	achene	X	X	X	.
<i>Carex viridula</i> Michx.	achene	X	.	.	.
<i>Ceratophyllum demersum</i> L. (h)	achene	.	X	.	.
<i>Chara</i> sp.	gyrogonite	.	.	X	X
<i>Cicuta virosa</i> L. (2)	mericarp	X	X	.	X
<i>Cirsium</i> cf. <i>oleraceum</i> (L.) Scop.	achene	X	X	.	.
<i>Cladium mariscus</i> (L.) Pohl	achene	.	X	.	X
<i>Cyperus flavescens</i> L.	achene	X	X	X	X
<i>Cyperus fuscus</i> L.	achene	X	.	.	X
<i>Cyperus longus</i> L.	achene	X	X	X	X
<i>Cyperus</i> sp.	achene	.	X	.	.
<i>Eleocharis palustris/uniglumis</i>	achene	X	X	X	X
<i>Eleocharis</i> sp.	achene	.	X	.	.
<i>Epilobium hirsutum</i> L.	seed	.	.	.	X
<i>Epilobium</i> sp.	seed	.	.	.	X
<i>Eriophorum</i> sp.	achene	.	X	.	.
<i>Euphorbia</i> cf. <i>palustris</i> L.	seed	.	X	.	.
<i>Euphorbia esula</i> L.	seed	X	X	X	.
<i>Galium palustre</i> L.	mericarp	.	.	X	.
<i>Hordeum secalinum</i> Schreb.	caryopsis	X	.	.	.
<i>Hypericum</i> cf. <i>humifusum</i> L.	seed	.	X	.	.
<i>Hypericum tetrapterum</i> Fr.	seed	.	.	.	X
<i>Juncus</i> sp.	seed	.	.	X	.
<i>Leersia oryzoides</i> (L.) Sw.	caryopsis with lemma/palea	X	.	.	.
<i>Lemna minor/gibba</i> (h)	seed	.	.	X	.
<i>Lycopus europaeus</i> L.	mericarp	.	X	X	X
<i>Lysimachia</i> sp.	seed	.	.	.	X
<i>Mentha aquatica</i> L.	mericarp	.	X	X	X
<i>Mentha pulegium</i> L.	mericarp	.	.	X	X
<i>Myriophyllum alterniflorum</i> DC (h)	achene	.	X	.	.
<i>Myriophyllum spicatum</i> L. (h)	achene	.	.	.	X
<i>Najas minor</i> All. (h)	achene	.	X	.	.
<i>Nasturtium officinalis</i> R. Br.	seed	.	.	.	X
<i>Nitella</i> sp.	gyrogonite	X	X	.	X
<i>Persicaria amphibia</i> (L.) Delarbre	achene	X	X	.	.
<i>Persicaria hydropiper</i> (L.) Delarbre	achene	X	X	X	.
<i>Persicaria minor</i> (Hudson) Opiz	achene	.	X	X	X
<i>Populus tremula/nigra</i>	capsula, seme	X	.	.	.
<i>Potamogeton lucens/perfoliatus</i> (h)	achene	.	X	.	X
<i>Potamogeton natans</i> L. (h)	achene	X	X	.	.
<i>Potamogeton perfoliatus</i> L. (h)	achene	.	.	.	X
<i>Potamogeton polygonifolius</i> Pourr. (h)	achene	.	X	.	.
<i>Potamogeton pusillus</i> L. (h)	achene	.	.	.	X
<i>Potamogeton</i> sp. (h)	achene	.	X	X	X
<i>Ranunculus</i> cf. <i>ophioglossifolius</i> Vill.	achene	.	X	.	.
<i>Ranunculus flammula</i> L.	achene	X	X	X	X
<i>Ranunculus repens</i> L.	achene	X	X	X	X
<i>Ranunculus sceleratus</i> L.	achene	X	X	X	X
<i>Ranunculus</i> subgen. <i>Batrachium</i>	achene	X	X	X	X
<i>Rumex palustris</i> Sm.	achene	.	.	X	.
<i>Rumex sanguineus/conglomeratus</i>	achene	X	X	X	.
<i>Salix</i> sp.	seed	.	X	X	X
<i>Sanguisorba officinalis</i> L.	hypanthium, achene	X	.	.	.
<i>Schoenoplectus lacustris</i> (L.) Palla	achene	.	X	X	X
<i>Schoenoplectus tabernaemontani</i> (C.C. Gmel.) Palla	achene	X	X	X	X
<i>Schoenoplectus triquetus</i> (L.) Palla	achene	X	.	.	X
<i>Scirpoides holoschoenus</i> (L.) Soják	achene	.	X	.	.
<i>Scirpus sylvaticus</i> L.	achene	.	X	X	.
<i>Scutellaria galericulata</i> L.	mericarp	X	.	.	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Sparganium erectum</i> L. (h)	endocarp	x	x	x	x
<i>Stachys palustris</i> L.	mericarp	x	.	.	.
<i>Stachys sylvatica</i> L.	mericarp	x	x	x	.
<i>Stellaria aquatica</i> (L.) Scop. (6)	seed	.	x	x	x
<i>Teucrium scordium</i> L.	mericarp	.	x	.	.
<i>Thalictrum flavum</i> L.	achene	.	x	x	.
<i>Typha angustifolia/latifolia</i>	cipsela	.	.	x	.
<i>Valeriana officinalis</i> L.	cipsela	.	.	.	x
<i>Veronica anagallis-aquatica</i> L.	seed	.	.	x	x
<i>Veronica beccabunga</i> L.	seed	x	.	.	.
<i>Zannichellia palustris</i> L. subsp. <i>polycarpa</i> (Nolte) K. Richt (h)	achene	.	x	.	x
8 - alia					
<i>Abies alba</i> Mill.	leaf	.	.	.	x
<i>Ajuga genevensis</i> L.	mericarp	.	x	x	x
<i>Ajuga reptans</i> L.	mericarp	x	x	x	x
<i>Allium</i> sp.	seed	.	x	x	.
<i>Anagallis</i> sp.	seed	.	.	x	.
<i>Anchusa/Borago</i>	mericarp	.	x	.	.
Apiaceae undiff.	mericarp	x	x	x	x
<i>Aster</i> sp.	achene	.	.	x	x
Asteraceae undiff.	achene	.	x	x	x
<i>Avena</i> sp.	caryopsis - c	x	x	x	.
<i>Brassica/Sinapis</i>	seed	.	x	.	.
Brassicaceae undiff.	seed	x	.	.	.
<i>Bromus</i> sp.	caryopsis - c	x	x	x	.
<i>Bupleurum</i> sp.	mericarp	.	x	.	.
<i>Bupleurum tenuissimum</i> L.	mericarp	.	.	.	x
<i>Carex caryophyllea</i> Latourr	achene	.	x	x	x
<i>Carex</i> cf. <i>sylvatica</i> Huds.	achene	.	.	.	x
<i>Carex flacca</i> Schreb.	achene	x	x	x	x
<i>Carex pallescens</i> L.	achene	.	.	.	x
<i>Carex pilulifera</i> L.	achene	.	.	.	x
<i>Carex praecox</i> Schreb.	achene	.	.	x	.
<i>Carex spicata</i> Huds.	achene	x	x	x	.
Caryophyllaceae undiff.	seed, perianth	x	.	.	x
<i>Centaurea</i> sp.	achene	.	.	.	x
<i>Cirsium</i> sp.	achene	.	.	.	x
<i>Clinopodium acinos</i> (L.) Kuntze	mericarp	.	x	x	.
<i>Clinopodium vulgare</i> L.	mericarp	.	x	.	x
<i>Coronilla</i> sp.	seed	x	.	.	.
<i>Crepis</i> sp.	cipsela	.	x	.	.
<i>Cuscuta</i> sp.	seed	.	.	x	.
Dipsacaceae undiff.	cipsela	.	x	.	.
<i>Euonymus europaeus</i> L.	seed	x	.	.	.
<i>Euphorbia</i> sp.	seed	.	x	x	.
<i>Festuca</i> sp.	caryopsis with lemma/palea	x	x	.	.
<i>Galium aparine</i> L.	mericarp	.	.	x	.
<i>Galium mollugo</i> group	mericarp	x	x	x	x
<i>Galium</i> sp.	mericarp	x	x	x	x
<i>Galium sylvaticum</i> type	mericarp	.	.	x	.
<i>Galium verum</i> L.	mericarp	.	x	.	.
<i>Hieracium</i> sp.	achene	.	x	.	x
<i>Hippophae fluviatilis</i> (Soest) Rivas Mart. cf.	achene - c	.	.	x	.
<i>Hypericum hirsutum</i> L.	seed	.	.	x	.
Lamiaceae undiff.	mericarp	.	x	x	x
<i>Lamium</i> sp.	mericarp	.	x	x	.
Leguminosae undiff.	seed - c	x	.	x	.
<i>Leucojum vernum</i> L. cf.	seed	.	.	.	x
Liliaceae undiff.	seed	.	.	x	.
<i>Lotus</i> sp.	seed	.	.	x	.
<i>Luzula campestris</i> group	seed	x	x	x	.
<i>Medicago minima</i> (L.) L.	legume, seed -c	x	x	.	.
<i>Medicago</i> sp.	legume, seed	.	x	.	.
<i>Melilotus</i> sp.	seed	.	x	x	.

taxa	carpological record type (c = charred)	site 1	site 2	site 3	site 4
<i>Mentha</i> sp.	mericarp, flower	.	x	.	x
<i>Moehringia trinervia</i> (L.) Clairv.	seed	x	.	.	.
<i>Onobrychis viciifolia</i> Scop. (3)	legume	x	.	x	.
Panicoideae undiff.	caryopsis - c	.	x	x	.
<i>Persicaria</i> sp.	achene	.	x	.	.
<i>Peucedanum</i> sp.	mericarp	.	x	.	.
<i>Poa</i> sp.	caryopsis	.	.	x	.
Poaceae (wild) undiff.	caryopsis with lemna/palea - c	x	.	x	.
<i>Polygala</i> sp.	seed	.	.	x	.
Polygonaceae undiff.	achene	.	.	x	.
<i>Potentilla erecta</i> (L.) Raeusch	achene	.	x	.	.
<i>Potentilla micrantha</i> Ramond ex DC.	achene	.	x	.	.
<i>Potentilla recta</i> L.	achene	.	.	x	.
<i>Potentilla</i> sp.	achene	.	x	.	.
<i>Potentilla tabernaemontani</i> Asch.	achene	.	x	x	.
<i>Primula</i> cf. <i>vulgaris</i> Huds.	seed	.	x	x	.
Primulaceae undiff.	seed	.	.	x	.
<i>Prunella vulgaris</i> L.	mericarp	.	x	x	x
<i>Prunus</i> sp.	endocarp, pedicel	.	x	x	.
<i>Quercus</i> cf. <i>robur</i> L.	cupule	.	x	.	.
<i>Quercus</i> sp.	scar, cupul, pericarp	.	x	x	x
<i>Ranunculus auricomus</i> type	achene	.	x	.	.
<i>Ranunculus bulbosus</i> L.	achene	.	.	.	x
<i>Ranunculus bulbosus/lanuginosus</i>	achene	x	x	x	x
<i>Ranunculus</i> cf. <i>ficaria</i> L.	achene	.	x	.	x
<i>Ranunculus lanuginosus</i> L.	achene	x	.	.	.
<i>Ranunculus</i> sp.	achene	x	.	x	x
<i>Rumex</i> sp.	achene, perianth	x	x	x	x
<i>Sambucus</i> sp.	endocarp	.	.	x	.
<i>Senecium</i> sp.	achene	.	.	.	x
<i>Silene nutans</i> L.	seed	.	x	.	.
<i>Silene</i> sp.	seed	.	x	.	.
<i>Stachys alpina</i> type	mericarp	.	x	.	.
<i>Stachys recta</i> L.	mericarp	x	x	.	.
<i>Stachys</i> sp.	mericarp	.	.	x	.
<i>Trifolium</i> sp.	calix, seed - c	x	x	x	.
<i>Valerianella</i> sp.	nutlet	x	x	.	.
<i>Veronica</i> sp.	seed	x	.	.	.
<i>Vicia</i> sp.	seed	.	x	.	.
<i>Viola canina</i> tipo	seed	.	x	.	.
<i>Viola</i> cf. <i>reichembachiana</i> Jord. ex Boreau	seed	.	.	x	.
<i>Viola hirta</i> L.	seed	.	x	.	.
<i>Viola odorata/alba</i>	seed	.	.	.	x
<i>Viola riviniana/reichenbachiana</i>	seed	.	x	.	.
<i>Viola</i> sp.	seed	.	x	x	x

In this contribution only the qualitative data of plant macroremains are reported, deferring to previous research (Rinaldi, 2010; Venezia, 2003/2004) and to further work for quantitative data.

Pollen data were not reported because the investigations on the sites where they are present (1 and 4) are still ongoing.

RESULTS AND DISCUSSION

In the four sites, a total amount of 200,000 carpological remains have been isolated (Tab. 1 - Rinaldi, 2010) together with more than 500 xilo-anthracological remains (Venezia, 2003/2004 and unpublished data), mainly waterlogged (several charred), corresponding to more than 400 taxa (Tab. 2). This list is quite long, especially if compared with the list of 175 taxa obtained from the study of about 80 Medieval sites in Northern Europe (Karg, 2007). Paleoeological reconstructions (Rinaldi, 2010) show the presence of wetland environments, peculiar to the Modena area (such as water springs, canals, trenches and wet

Table 3. - The xilo-antracological record (quantitative).

woods & charcoal	site 2			site 4
	w	wt	c	w
<i>Abies alba</i>	.	x	.	.
<i>Acer campestre</i>	.	x	.	.
<i>Acer platanoides</i>	x	x	.	.
<i>Acer</i> sp.	.	x	.	.
<i>Alnus</i> sp.	.	.	.	x
<i>Buxus sempervirens</i>	.	x	.	.
<i>Capparis decidua</i>	.	x	.	.
<i>Celtis australis</i>	.	x	.	.
<i>Cupressus sempervirens</i>	x	x	.	.
<i>Frangula alnus</i>	.	x	.	.
<i>Fraxinus excelsior</i>	x	x	.	.
<i>Fraxinus oxycarpa</i>	x	x	.	.
<i>Fraxinus</i> sp.	x	x	x	x
<i>Juglans regia</i>	.	x	.	.
<i>Larix decidua</i>	.	x	.	.
<i>Morus nigra</i>	.	x	.	.
<i>Pinus</i> sp.	x	x	.	.
<i>Populus</i> sp.	x	x	.	x
<i>Prunus avium</i>	x	x	.	.
<i>Prunus</i> sp.	.	x	.	.
<i>Pyrus communis</i>	.	x	.	.
<i>Pyrus</i> sp.	.	x	.	.
<i>Quercus</i> sp. (deciduos)	x	x	x	x
<i>Quercus cerris</i>	x	x	.	.
<i>Quercus robur</i>	x	x	.	x
<i>Quercus suber</i>	.	x	.	.
<i>Salix</i> sp.	.	x	.	.
<i>Salix/Populus</i>	.	x	x	.
<i>Sorbus</i> sp.	.	x	.	.
<i>Tamarix</i> sp.	x	x	x	.
<i>Taxus baccata</i>	.	x	.	.
<i>Ulmus glabra</i>	x	x	.	.
<i>Ulmus laevis</i>	.	x	.	.
<i>Ulmus minor</i>	x	x	.	.
<i>Ulmus</i> sp.	x	x	x	x
<i>Viburnum</i> sp.	.	x	.	.
<i>Vitis vinifera</i>	x	x	.	.
bark	x	.	.	.
indeterminable	x	x	.	.

w = woods; wt = wood tools; c = charcoal

grasslands). These features are reported by *Appianus* (2nd century AD) in quotations relating to the Civil War, which describe the landscape of Modena as being rich in water, powered by fountains with land cut across by ditches (Calzolari, 2008). Concerning this particular aspect of the wetlands, a study comparing Modena in the Roman Period and in the Middle Ages (Bosi et al., *in litteris*) is in progress. Research has revealed a floristic list (Tab. 2) numerically superior than the one available (almost 300 taxa) for the over 30 Roman sites previously studied from a carpological standpoint in Emilia Romagna (Rinaldi, 2010). The floristic list of the Roman Period, compared with the present floristic list of planitial plants of the Province of Modena (Alessandrini et al., 2010), corresponds to about 1/3 of the



Fig. 2. - Photos of some carpological records: 1) *Dyospyros lotus* (calyx - 1.8 cm - charred); 2) *Morus nigra* (endocarp - 3.4 mm); 3) *Olea europaea* (endocarp - 1.3 cm); 4) *Prunus persica* (endocarp - 2.1 cm); 5) *Cupressus sempervirens* (twig - 5.8 mm); 6) *Vitis vinifera* subsp. *vinifera* (pip - 6.7 mm); 7) *Cornus mas* (endocarp - 1.1 mm); 8) *Lagenaria siceraria* (seed - 14.5 mm); 9) *Celtis australis* (endocarp - 3.2 mm); 10) *Taxus baccata* (male flower - 8.5 mm) (photos: R. Rinaldi & G. Bosi).

latter. The number of taxa shows the great biodiversity present in *Mutina*: the carpological remains cannot be spread for a great distance, the scarce resistance to degradation shown by seeds and fruits even belonging to important families (e.g. Poaceae, Liliaceae s.l.) is known, and all the sites here studied are situated in the town area. Such floristic richness is also supported by the findings of numerous wild species worthy of attention, some of them unknown in earlier sources, others which disappeared during the XX century and many considered rare. This floristic list, together with archaeobotanical reconstructions of environments which have now virtually disappeared, can support the protection and maintenance works of the few surviving “natural” sites, especially wetlands.

Concerning ethnobotanical information, site 1 (a Roman channel dating from the early Roman Empire) provides most of the findings of cultivated plants. This site shows the best evidence of the prosperity of the town. The principal findings of this study are: 1) availability of particular plant products, even imported, such as the fruits of *Diospyros lotus*; 2) availability of luxury goods, such as olives, pomegranates and various condiment plants, including coriander; 3) availability of luxury goods, not fundamental for survival, such as abundant and diverse fruits; 4) evidence of early cultivation of fruit or vegetable species, perhaps recently arrived in the territory, in particular *Prunus persica*, *Cucumis melo*, *Lagenaria siceraria*, *Morus nigra*; 5) evidence of fertile land with a large range of crops both woody and herbaceous. Among these species, others are present that could be used for textile/dyeing purposes and to raise sheep for wool (for which *Mutina* was famous - Calzolari, 2008), and in particular textile plants, such as flax and hemp, together with dyeing plants such as weld, safflower and madder; 6) evidence of ornamental plant species, such as *Myrtus communis*, *Cupressus sempervirens* and *Tamarix*, as well as European nettle tree (*Celtis australis*), plane tree and silver birch. Elsewhere in Emilia Romagna, such prosperity and luxury are indicated only in a rubbish pit (dating from the first half of the 15th century AD) that collected refuse from the Este ducal palace of Ferrara at its moment of greatest splendour (Bosi et al., 2009b).

From the data obtained, some interesting aspects related to site chronology can be shown, even considering the taphonomic diversity of the deposits. In the Roman Republican Period distinctive features of affluence are already present in the city, indicated by ornamental plants such as myrtle, cypress, plane tree and many testimonies of food crops such as walnut, olive tree, vine, cereals. In the Late Roman Period it is possible to observe the evidence of some ornamental species and especially of crops, in particular woody crops such as vine, walnut, cherry tree, fig, peach, which are the first that can be affected by a change in stability. Among these, vine, walnut and cherry tree are

the cultural heritage in the territory of Modena and they have apparently survived even the most critical periods successfully.

Given the lasting evidences of “noble” cereals, such as wheat and barley, and the absence/scarcity of minor cereals, it appears that agriculture continued even during the decay of the Empire, probably concerning the surface area utilized less than before, but not degraded. This fact is probably related to the fertility of the soils surrounding the town and to the abundance of water for irrigation, which is still present after centuries of exploitation. This peculiarity of Emilia is important, especially when we consider the transition towards more rustic crops that took place from the late Roman to early Middle Ages, particularly from a historical-literary viewpoint.

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REFERENCES

- Alessandrini A., Delfini L., Ferrari P., Fiandri F., Gualmini M., Lodesani U., Santini C., 2010. Flora del Modenese. Artestampa, Modena.
- Alonso Martinez N., 2005. Agriculture and food from the Roman to the Islamic Period in the North-East of the Iberian peninsula: archaeobotanical studies in the city of Lleida (Catalonia, Spain). *Vegetation History and Archaeobotany* 14, 341-361.
- Anderberg A.L., 1994. Atlas of Seeds. Part 4. Resedaceae-Umbelliferae. Swedish Museum of Natural History, Stockholm.
- Bandini Mazzanti M., Bosi G., Mercuri M., 2005a. Semi, frutti e annessi floreali: l'archeocarpologia. In: G. Caneva (edited by) *La Biologia Vegetale per i Beni Culturali - volume II: conoscenza e valorizzazione*, pp. 46-56. Nardini Editore, Firenze.
- Bandini Mazzanti M., Bosi G., Mercuri M., Accorsi C.A., Guarnieri C., 2005b. Plant use in a city in Northern Italy

- during the Late Medieval and Renaissance periods: results of the Archaeobotanical Investigation of "The Mirror Pit" (14th-15th century A.D.) in Ferrara. *Vegetation History and Archaeobotany* 14(4), 442-452.
- Bandini Mazzanti M., Bosi G., Guarnieri C., 2009. The useful plants of the city of Ferrara (Late Medieval/Renaissance) based on archaeobotanical records from middens and historical/culinary/ethnobotanical documentation. In: J.P. Morel and A.M. Mercuri (Eds) *Plants and Culture: seeds of the cultural heritage of Europe*, pp. 93-106. Edipuglia, Bari.
- Beijerinck W., 1947. *Zadenatlas der Nederlandsche Flora*. H. Veenman & Zonen Wageningen.
- Beneš J., Kaštovský J., Kočárová R., Kočár P., Kubečková K., Pokorný P., Starec P., 2002. Archaeobotany of the Old Prague Town defence system, Czech Republic: archaeology, macro-remains, pollen, and diatoms. *Vegetation History and Archaeobotany* 11, 107-119.
- Berggren G., 1969. *Atlas of Seeds. Part 2. Cyperaceae*. Swedish Museum of Natural History, Stockholm.
- Berggren G., 1981. *Atlas of Seeds. Part 3. Salicaceae-Cruciferae*. Swedish Museum of Natural History, Stockholm.
- Bosi G., Mercuri A.M., Bandini Mazzanti M., 2009a. Plants and Man in urban environment: the history of the city of Ferrara (10th - 16th cent. AD) through its archaeobotanical records. *Bocconea*, 23, 285-300.
- Bosi G., Mercuri A.M., Guarnieri C., Bandini Mazzanti M., 2009b. Luxury food and ornamental plants at the 15th century A.D. Renaissance court of the Este family (Ferrara, northern Italy). *Vegetation History and Archaeobotany* 18(5), 389-402.
- Bosi G., Rinaldi R., Bandini Mazzanti M., 2011. Flax and weld: archaeobotanical records from Mutina (Emilia Romagna, Northern Italy), dated to the Imperial Age, first half 1st century AD. *Vegetation History and Archaeobotany* 20 (6), 543-548.
- Calzolari M., 2008. *Città dell'Emilia: Mutina*. Le fonti letterarie di Modena romana. Editore G.S.B.M, Modena
- Cappers R.T.J., Bekker R.M., Jans J.E.A., 2006. *Digitale Zadenatlas van Nederland*. Barkhuis Publishing & Groningen University Library, Groningen.
- Cappers R.T.J., Neef R., 2012. *Handbook of Plant Palaeoecology*. Barkhuis Publishing & Groningen University Library, Groningen.
- Davis L.W., 1993. *Weed Seeds of The Great Plains*. University Press of Kansas.
- Delorit R.J., 1970. *An illustrated taxonomy manual of weed seeds*. Wisconsin.
- Frank K.S., Stika H.P., 1988. *Bearbeitung der makroskopischen Pflanzen- und einiger Tierreste des Römerkastells Sablonetum (Ellingen bei Weissenburg in Bayern)*. Materialhefte zur bayerischen Vorgeschichte A61.
- Häflinger E., Brun-Hool J., 1981. *Tavole delle malerbe*. Basilea.
- Hastorf C.A., 1999. Recent Research in Paleoethnobotany. *Journal of Archaeological Research* 7, 55-103.
- Hubbard N.R.L.B., 1992. Dichotomous keys for identification of the major Old World crops. *Review of Palaeobotany and Palynology* 73, 105-115.
- Jacomet S., Brombacher C., Dick M., 1991. *Archäeobotanik am Zürichsee. Makroreste der Jahre 1979-1988*. Zürich.
- Jacquat C., 1988. *Les plantes de l'âge du Bronze. Catalogue des fruits et graines*. Editions du Ruau, Saint-Blaise.
- Karg S. (Ed), 2007. *Medieval Food Traditions in Northern Europe*. PNM, Copenhagen.
- Kenward H., Hall A., 2008. Urban organic archaeology: an irreplaceable palaeoecological archive at risk. *World Archaeology* 40(4), 584-596.
- Kiffman R., 1958. *Bestimmungsatlas für Sämereien der Wiesen - und Weidepflanzen des mitteleuropäischen Flachlandes-Kräuter-Teil D, E, F*. Freising-Weihenstephan.
- Majewski T., Gaimster D. (Eds), 2009. *International Handbook of Historical Archaeology*. Springer, New York.
- Moe D., Dickson J.H., Jørgensen P.M. (Eds), 1994. *Garden History: Garden Plants, Species, Forms and Varieties from Pompeii to 1800*. PACT, 42.
- Montégut J., 1971. *Atlas des Semences De Mauvaises Herbes*. Laboratoire de Botanique, École Nationale Supérieure d'Horticulture de Versailles, Paris.
- Morel J.P., Tresseras J., Matamala J.C. (Eds), 2006. *The Archaeology of Crop Fields and Gardens*. Edipuglia, Bari.
- Nesbitt M., 2006. *Identification Guide for Near Eastern Grass Seeds*. London.
- Orser C.E. (Ed.), 2002. *Encyclopedia on Historical Archaeology*. Routledge, London.
- Pearsall D.M., 2008. *Paleoethnobotany: A Handbook of Procedures (2nd Edition)*. Emerald, Bingley.
- Pignatti S., 1982. *Flora d'Italia*, vols. I, II, III. Edagricole, Bologna.
- Pignotti L., 1998. *Revisione sistematica dei generi Scirpus*

L. Sect. Plur. (*Bolboschoenus*, *Schoenoplectus*, *Actaeteton*, *Isolepis*, *Eleogiton*) e *Blysmus* Panz. (Cyperaceae) in Italia. Doctoral Thesis, Università degli Studi di Firenze.

Prance G., Nesbitt M. (Eds), 2005. *The Cultural History of Plants*. Routledge, New York.

Renfrew J.M., 1973. *Palaeoethnobotany*. Methuen & Co. Ltd, London.

Rinaldi R., 2010. Archeobotanica del Periodo Romano nell'area di Modena nel quadro delle conoscenze archeobotaniche nell'ambito emiliano-romagnolo. Doctoral Thesis, University of Modena and Reggio Emilia

Schlumbaum A., Tensen M., Jaenicke-Després V., 2008. Ancient plant DNA in archaeobotany. *Vegetation History and Archaeobotany* 17, 233-244.

Schoch W.H., Pawlik B., Schweingruber F.H., 1988. *Botanical macro-remains*. Paul Haupt Publishers, Berne.

Scurti J.M., 1948. Chiave analitica per il riconoscimento delle piante infestanti attraverso i semi. *Annali Sperimentazione Agraria* 2(3), 1-45.

Spjut R.W., 1994. A systematic treatment of Fruit Types. *Memoirs of the New York Botanical Garden* 70.

Tutin T.G. et al. 1964-93: *Flora Europaea*, vol. 1 (1964), vol. 2 (1968), vol. 3 (1972), vol. 4 (1976); vol. 5 (1980), vol. 1 (2nd edition - 1993). Cambridge University Press, Cambridge.

Van Zeist W., Wasylikova K., Behre K.E., 1991. Preface. In: W. van Zeist, K. Wasylikova & K.E. Behre (Eds) *Progress in Old World Palaeoethnobotany*, pp. 7-9. Baklema, Rotterdam.

Venezia C.M., 2003-2004. Legni e manufatti di età romana (prima metà I secolo d.C.) provenienti dal sondaggio stratigrafico nella sede centrale della Cassa di Risparmio di Modena. Degree Thesis, Università degli Studi di Bologna.

Viggiani P., Angelini R., 1991. *Dicotiledoni spontanee e infestanti*. Milano.

Viggiani P., Angelini R., 2005. *Graminacee spontanee e infestanti*. Milano.

Young J.A., Young C.G., 1992. *Seeds of Woody Plants in North America*. Oregon.

Zohary D., Hopf M., 2004. *Domestication of Plants in the Old World*. Cambridge University Press, Oxford.