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NOTES

THE ORIGIN OF GRAPEVINE CULTIVATION IN ITALY: THE ARCHAEOBOTANICAL EVIDENCE

MARVELLI S.[1*], DE' SIENA S.[2], RIZZOLI E.[1], MARCHESINI M.[3]

[1]*Laboratorio di Palinologia e Archeobotanica - C.A.A. Giorgio Nicoli, Via Marzocchi n. 17, San Giovanni in Persiceto (Bologna)*
[2]*Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, Via Ercole I d'Este, Ferrara*
[3]*Soprintendenza per i Beni Archeologici dell'Emilia Romagna, Via Belle Arti, 52, Bologna*
[*]*Corresponding author: Telephone: +39 0516871757; e-mail: palinologia@caa.it*

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ABSTRACT – Grapevine remains show that this plant has been important for humans since ancient times. This paper presents a synthesis of archaeobotanical studies on grapevine remains (pollen, wood, charcoal, seed/fruit and other botanical remains) from Epigravettian to Bronze Age sites. Carpological remains are the most important ones, because they often allow to distinguish cultivated and wild grapevines. Grapevine findings are rare in Mesolithic sites, they increase during Neolithic period and become frequent in Bronze Age. Archaeobotanical data show that during Neolithic and in the Early Bronze Age a good level of knowledge concerning grapevine utilization was already acquired; during Middle and Late Bronze Age the grapevine diffusion increases. Based on archaeobotanical data, the wild grapevine evolution by indigenous people was probably accompanied by an input of allochtonous vines from Mycenaean world, and then from Hellenic world. Therefore, the critical period of grapevine domestication can be placed between Bronze Age and Early Iron Age.

KEYWORDS: ARCHAEOBOTANICAL GRAPEVINE REMAINS, *VITIS VINIFERA* L. SSP. *SYLVESTRIS*, *VITIS VINIFERA* L. SSP. *VINIFERA*, DOMESTICATION, CULTIVATION, ITALY

INTRODUCTION

In spite of the abundance of archaeological, archaeobotanical, historical and genetic data, the origins, historical biogeography, identity of ancient grapevine cultivars and mechanisms of domestication are still largely discussed. Archaeobotanical remains seem to confirm the complexity of human contacts, exchanges and migrations which spread cultivation in Europe and in the Mediterranean areas.

Particularly, archaeobotanical researches on the origin of grapevine cultivation have shown that the fruits of this plant have always been harvested by humans even during periods preceding its domestication and before the development of grapevine cultivation systems. It is likely that something similar to the wine has been produced, consumed and exchanged since 8000 years ago, according to the analysis performed on residual traces found in a vase discovered south of Tbilisi – Georgia, in the hills of Shulaveris-Gora (Lordkipanidze, 2010).

Fossils of grapevine ancestors were found in the Bolca basin (Verona, Northern Italy) and assigned to the Middle Eocene (around 50 million years ago). Similar remains of the same age were discovered in the Chiavon basin (Vicenza, Northern Italy) (Paronetto, 1996).

In Italy grapevine - *Vitis vinifera* L. - is present with two subspecies: *Vitis vinifera* L. ssp. *sylvestris* (C.C. Gmelin) Hegi (wild grapevine) and *Vitis vinifera* L. ssp. *vinifera* (cultivated grapevine). As a synonymous of the cultivated form, the name *Vitis vinifera* L. ssp. *sativa* Hegi is commonly used (Webb, 1968; Pignatti, 1982).

The wild grapevine is a heliophilous liana growing generally along river banks and in deciduous and semi-deciduous forest. It is distributed in a wide area from Western Europe to the Trans-Caucasian zone and around the Mediterranean

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Basin, except the southernmost infra-Mediterranean and non-Mediterranean zones (Arnold et al., 1998). The cultivation and domestication of grapevine appears to have occurred between the 7th and the 4th millennium BC, in a geographical area between the Black Sea and Iran. Specifically, its origin is recognized by most authors in the hygrophilous forests located between the Southern coast of the Caspian Sea and the Eastern coast of the Black Sea (McGovern & Rudolph, 1996; Zohary & Hopf, 2000).

From this area, cultivated forms would have been spread by humans in the Near East, Middle East and Central Europe. Grapevine is cultivated in the sub-Mediterranean region, where the average annual temperatures and the average winter temperatures do not go, respectively, below 10°C and 0 °C.

The discrimination between the two subspecies is based on the fact that *Vitis vinifera* ssp. *sylvestris* is dioecious and dimorphic and the presence of hermaphrodite individuals is rare, generally below 5%; on the contrary, *Vitis vinifera* ssp. *vinifera* (the cultivated subspecies) is monoecious with hermaphrodite flowers (Scossiroli, 1988). The hermaphroditism, recognized and selected since the very beginning of the domestication process, represents the botanical trait of main interest from the agronomical point of view. According to the traditional interpretation, the first domestication occurred in the region between Caucasus and Mesopotamia, and resulted in the selection of the more productive subspecies, *V. vinifera* ssp. *vinifera* (Fig. 1).

Many genetic researches are currently in progress in order to examine in depth the evolution of grapevine in Italy (Grassi et al., 2003, Zecca et al., 2012).

This paper presents a synthesis of archaeobotanical data on grapevine remains from Epigravettian to Bronze Age in Italy.

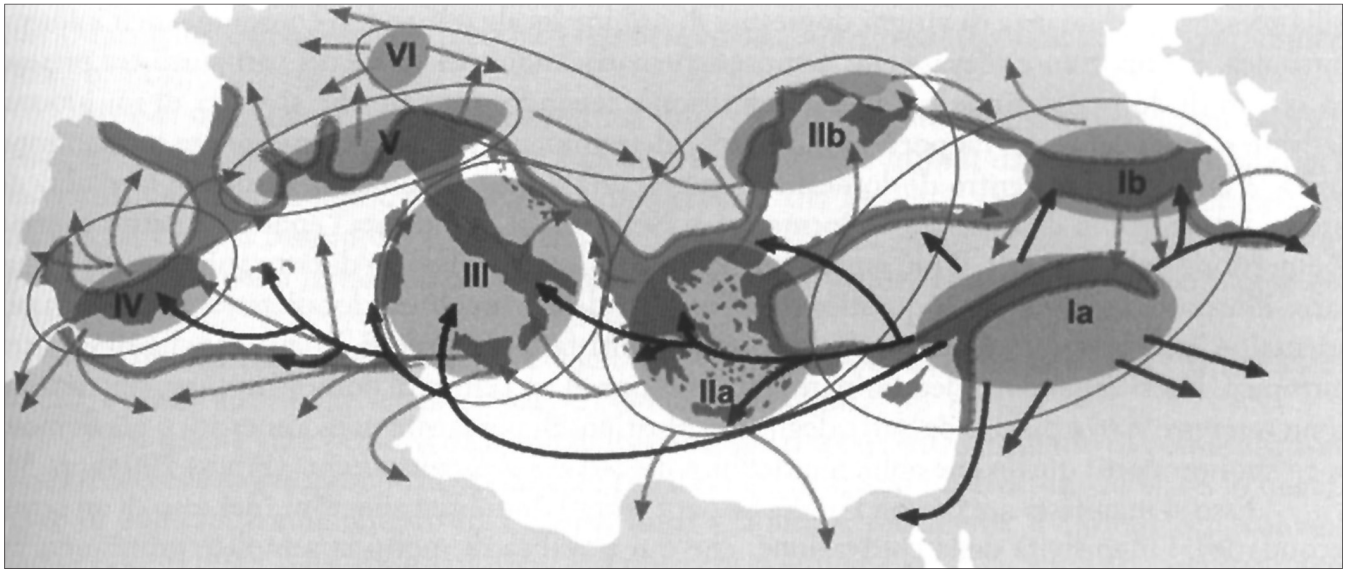

Fig. 1 - Grapevine domestication centers with relative diffusion phases (I-VI) (Forni 2012, modified).

Materials and Methods

In total 112 sites were examined: Epigravettian: 1, Mesolithic: 1, Neolithic: 41, Eneolithic: 7, Bronze Age: 62 (Fig. 2, 3, 4). A detailed list is reported elsewhere (De' Siena et al., in press).

All branches of archaeobotany were involved. Particularly, palynological, carpological and xylo-anthracological analyses were considered in this paper.

Grapevine subspecies identification using pollen is difficult, and single flowers produce small amounts of pollen, whose dispersal is limited to a restricted area around the plant.

In general, xylo-anthracological remains are not abundant,

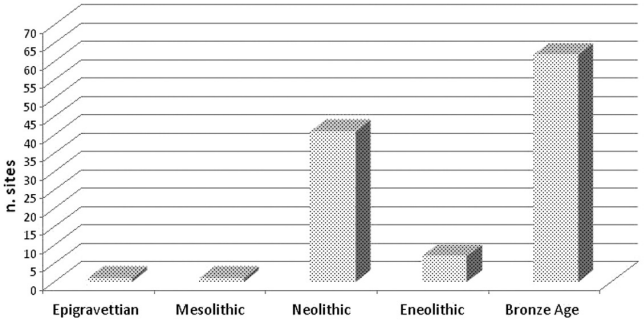

Fig. 2 - Sites with grapevine remains at different ages.

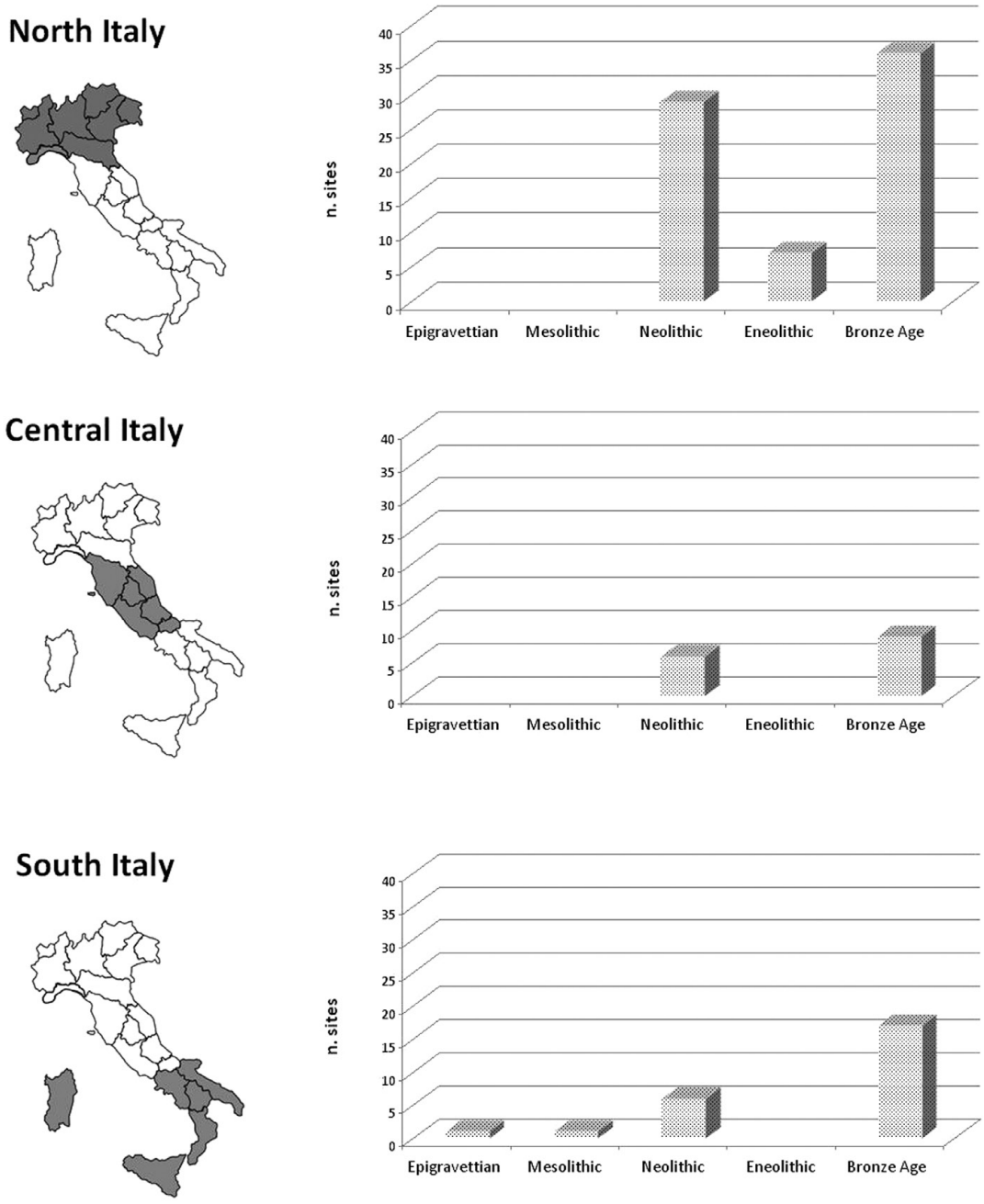

Fig. 3 - Chronological distribution of sites in North, Central and South Italy.

and only rarely, based on the type of assemblage and on the archaeological context, it is possible to advance hypothesis on the belonging subspecies.

Among the macroremains, seeds are the most abundant, while the finding of skins, pedicels, grapes is quite rare. They can be found among charred materials together with seeds. Seeds are the only remains which can ensure the discrimination between wild and cultivated subspecies thanks to their morpho-biometric characteristics. However, in many cases, grape seeds show intermediate features between the differential parameters necessary for subspecies recognition. The seeds of wild species are small, robust and with a rounded outline or cordate, with short stalks and a flat ventral side with sharp angles and a strongly developed chalaza, while those of the cultivated species appear large, elongated, oval or pyriform with an elongated stalk (Orrù et al., 2013).

The use of biometric indices for seed studies has often proved

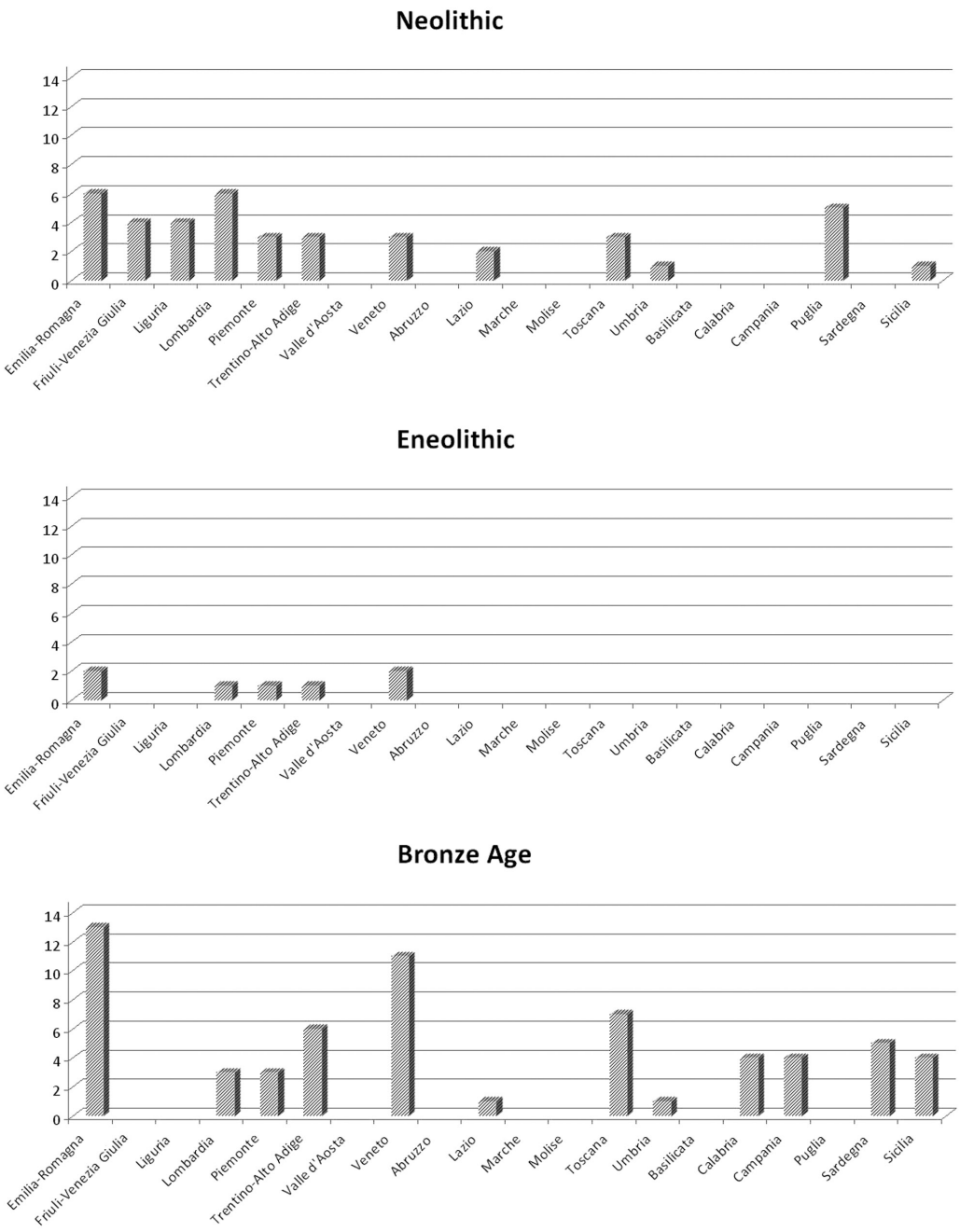

Fig. 4 - Chronological distribution of sites in different Italian regions.

to be of great importance in the understanding of the domestication processes, in taxonomic studies of modern *Vitis*, as well as for the classification of archaeobotanical remains (Rivera et al., 2007).

As regards to the dimensional rate between maximum width and height, the discrimination of grape seeds can be based on the intervals described by the Stummer's Index (Stummer, 1911). Unfortunately, the intervals of the two subspecies widely overlap, and it is not always possible to determine them. Since the '90s, other systems of morpho-biometric characterization to identify the seeds of *Vitis* have been proposed, which are based on more complex parameters (biometric variables, different algebraic formulae) and on the computerized visual analysis (Mangafa & Kotsakis, 1996; Perret, 1997; Castelletti et al., 1998; Terral et al., 2010).

Results and Discussion

The most ancient evidence of wild grapevine in Italy are the findings of the Epigravettian site of Grotta del Romito (Nuppolara near Papasidero, Cosenza, Calabria), where 12 grape seeds of wild grapevine were identified (Cattani et al., 2004). Remains of wild grapevine were found in the Mesolithic site of Grotta dell'Uzzo (Trapani, Sicilia), where one grape seed was identified (Costantini, 1982).

The sites of the Neolithic period, where the remains of grapevine were found, are more than 40. Grape seeds were recognized in the Ancient Neolithic sites of San Sebastiano di Perti - Savona, Liguria (Arobba & Vicino, 2003), Lugo di Romagna - Ravenna, Emilia Romagna (Castelletti & Rottoli, 1996), Sammardenchia - Udine, Friuli Venezia Giulia (Rottoli, 1999), in the Ancient/Middle Neolithic sites of Biancade di Roncade - Treviso, Veneto (Balista et al., 1996), Arene Candide - Savona, Liguria (Arobba et al., 1997), San Marco - Gubbio, Perugia, Umbria (Costantini & Giorgi, 1992), Grotta dell'Uzzo - Trapani, Sicilia (Costantini, 1982), La Marmotta - Roma, Lazio (Rottoli, 1993). In particular, at La Marmotta, the abundance of wild grape seeds allows us to hypothesize a use of this material for the production of a fermented drink, even if its characteristics would be very different from those of what today we refer to as "wine". In the Middle/Late Neolithic grapevine remains were found in about 20 sites: wild grape seeds were collected in all sites, in 2 sites they were found with charred woods (charcoals) and pollen grains, as in Spilamberto - Modena, Emilia Romagna (Marchesini, pers. comm.), Terragne - Taranto, Puglia (Accorsi et al., 1995) and only at Quadrato di Torre Spaccata-Roma both grape seeds and charcoals were identified (Celant, 1995). In Casalnoceto (Alessandria, Piemonte) inside a well, carbonized remains of wild grape seeds were found (Castelletti & Motella De Carlo, 1998). These findings confirm the intense search for this plant during the harvest activity and its role in the land use by the Neolithic populations.

Evidence of the presence of grapevine in the Eneolithic period was found mainly in Northern Italy, where macroremains with seeds and charcoals were identified in Balm'Chanto - Roure, Torino, Piemonte (Rottoli & Castiglioni, 2009), Bressanone - Bolzano, Trentino Alto Adige (Rottoli & Castiglioni, 2009) and Sant'Ilario d'Enza - Reggio Emilia, Emilia Romagna (Barfield et al., 1975). Grapevine pollen grains were found in the site of Stanghella - Padova, Veneto (Marchesini & Marvelli, pers. comm.).

The increased presence of grapevine in Bronze Age remains testifies the importance of this plant, which is present in at least 60 sites in a time slot of 1300 years. In the Early Bronze Age the wild species was still prevailing, as confirmed by the presence of 21.600 grape seeds in the pile-dwelling site of Canàr (San Pietro Polesine, Rovigo, Veneto). The seeds show morphological characteristics typical of the wild grapevine (Castiglioni et al., 1998). The presence of pollen grains can be interpreted at least as a preliminary human activity consisting of taking care of spontaneous plants, if not as a true cultivation. In particular, the increase of its pollen in the central part of the diagram could be related to some biological transformations or increase of the number of plants (Accorsi et al., 1998).

Also in the Filo Braccio site of Ancient Bronze Age, in Filicudi island (Sicilia), 111 fruit fragments, mainly seeds of *Vitis vinifera* (Martinelli et al., 2010) were found. This kind of remains are more common at the beginning of the Middle Bronze Age, when some seeds with intermediate characteristics between the two subspecies *sylvestris* and *vinifera* were found. Grape seeds were found in the settlement of Castello di Annone - Asti, Piemonte (Castelletti & Motella De Carlo, 1998).

In the early Middle Bronze Age, in the site of San Lorenzo a Greve (Firenze, Toscana), 929 seeds were found and more than 300 fragments combined with 324 remains of *Cornus mas*. Morpho-biometrical analysis showed the presence of both the wild and the cultivated grapevine, together with relevant number of seeds with an intermediate length/width rate (Aranguren et al., 2007).

Similar are the findings of the Portella site (Salina island, Sicilia), referring to the Middle Bronze Age (Fiorentino et al., 2011). In the Strepparo and Cento Moggie sites (Capua, Caserta, Campania) of the Middle Bronze, 21 grapevine branches with a diameter of 4-10 mm were found; the abundance of this kind of remains suggests the presence of a developed cultivation system (Castiglioni & Rottoli, 2001).

The identified seeds in Terramara of Montale (Castelnuovo Rangone, Modena, Emilia Romagna), dating to the Recent Bronze Age, testifies the increasing use of the grapevine to produce alcoholic drinks that progressively substituted those prepared with *Cornus mas*, whose presence at the same time dramatically decreased (Accorsi et al., 2004; Mercuri et al., 2006). In Borgo Moretta (Alba, Piemonte) the remarkable pollen percentage of grapevine documents the presence of plants near houses, in a marshy environment probably unsuitable for wild grapevine (Arobba & Caramiello, 1998).

During the Final Bronze Age, fragments of grape seeds and a whole wild grape seed were found in fires of Morano necropolis, in Casale Monferrato – Alessandria, Piemonte (Motella De Carlo, 1999).

In Tuscany, at Forti (Chiusi) and Stagno (Livorno) sites, chronologically referring to the Final Bronze Age, several seeds of *Vitis vinifera* attributable either to the wild and cultivated subspecies were found, respectively, in the drainage channel of houses and in the pile-dwelling site (Aranguren et al., 2007).

In Sardinia, among findings of the Recent and Final Bronze Age period, charred seeds were discovered at Genna Maria Nuraghe (Villanovaforru-Cagliari) and Duos Nuraghes

(Borore-Nuoro) (Bakels, 2002) and some well conserved grapes were identified at Nuraghe Adoni (Villanova Tulo-Cagliari) within a layer dating back to the 12th century BC. At Telavè (Triei, Ogliastra, Sardegna), "askoide" pitcher showed wine residual traces, and pollen from a layer of the same period, dating to 1000 BC (with C^{14} method), confirmed the presence of *Vitis* pollen (Sanges, 2010). Finally, in the course of studies conducted at Sa Osa (Oristano, Sardegna), in a well built in the Recent and Final Bronze Age period, many seeds of cultivated grapevine were found (Orrù et al., 2013). In this case, the occurrence of the pollen grains in the filling up of the well can be considered a proof of its *in loco* cultivation (Marchesini, pers. comm.).

In the Iron Age the archaeobotanical evidence of grapevine cultivation becomes much more frequent, showing a progressive increasing trend from the 9th to the 7th century BC.

Starting from the 8th century BC clear evidence of a semi-intensive grapevine production was known; it testifies the complete domestication of the plant. This process took much advantage from the frequent contacts and commercial activities with the Aegean region, well documented since the 2nd millennium BC (Gambari, 1994).

These findings seem to indicate that the knowledge of grapevine cultivation and wine production has already been a cultural acquisition since the time of Cuma and Pithecusa foundation and since the foundation of the first human settlements in Southern Italy.

As to Italy, natural remains show an interesting diachronism between the confirmation of the presence of domesticated grapevine in the Etruscan settlements in the surrounding area of Bologna (Via D'Azeglio, Bologna, Emilia Romagna, fig. 5) (Marchesini & Marvelli, 2010) and Verucchio - Rimini, Emilia Romagna (Marchesini & Marvelli, pers. comm.), where its cultivation has been demonstrated since the 8th and 7th century BC, while in the area around Verona clear proof of grapevine cultivation were found only one century later (Nisbet, 1987).

Fig. 5 - Cultivated grapevine - *Vitis vinifera* L. subsp. *vinifera*, to the left grape seeds (5,8 mm), to the right pedicels (5 mm), via D'Azeglio (Bologna), Villanovian well.

CONCLUSIONS

Finding the origins of wine-viticulture and the rigorous date of diffusion of the cultivated grapevine are very complicated problems, frantically debated, but substantially still open. Archaeobotanical data collected in Italian sites show that during Neolithic and in the Early Bronze Age the knowledge concerning collection and utilization of grapevine products had already been acquired (Forni, 2012). During Middle and Late Bronze Age the grapevine spread. It is not clear if this was due to new technologies directly acquired or partially imported from the Mycenaean world, and then from the Hellenic world (Scienza, 2009). It is not clear, in the current state of the research, if these contributions had only facilitated the progress of technical knowledge, or if the external input was more radical, implying at some time of the Italic prehistory and protohistory the learning of very innovative techniques with the input of new selected varieties or even replacing the previous ones (Castiglioni & Rottoli, 2001). This hypothesis is also confirmed by genetic researches, which underline the presence of two domestication areas: Middle East and Western Europe (Failla, 2011). In particular, the greater variability of grapevine in Western Europe (Imazio et al., 2006) could be due to the strong contribution of the local wild flora, at least as important as the contribution from the Caucasian area (Imazio, 2007).

According to the data in our possession it is more likely to think that the Italian wild grapevine evolution carried out by indigenous people was accompanied by an input of allochtonous vines from areas in which there was a long-established viticulture, the eastern Mediterranean area where viticulture had already reached a high technological

level (Lentini, 2005; Solinas & Fiorentino, 2010).
What can be inferred from the current data is that there was a critical period between Bronze Age and Early Iron Age. Later on cultivation and wine making appear completely established.

References

Accorsi C.A., Bandini Mazzanti M., Fiorentino G., Gorgoglione M.A., Mercuri A.M., 1995. Archaeological and Archaeobotanical Data on the Mesolithic/Ancient - Medium Neolithic site of Terragne (Taranto-Southern Italy, 96 m a.s.l., 40º24'N 17º38' E). Proceedings of 1st International Congress Science and Technology for Safeguard of Cultural Heritage in the Mediterranean Basin, 1521-1527.

Accorsi C.A., Bandini Mazzanti M., Mercuri A.M., Rivalenti C., Torri P., 1998. Analisi pollinica di saggio per l'insediamento palafitticolo di Canàr - Rovigo, 6,80-7,00 m s.l.m. (Antica età del Bronzo). Canàr di San Pietro Polesine. Ricerche archeo-ambientali sul sito palafitticolo. Padusa Quaderni 2, 131-149.

Accorsi C.A., Bandini Mazzanti M., Bosi G., Mercuri A.M., Trevisan G., 2004. Le evidenze archeobotaniche. In A. Cardarelli (Ed) Parco Archeologico e Museo all'aperto della Terramara di Montale, Modena.

Aranguren B., Bellini C., Mariotti Lippi M., Mori Secci M., Perazzi P., 2007. L'avvio della coltura della vite in Toscana: l'esempio di San Lorenzo a Greve (FI). In A. Ciacci, P. Rendini, A. Zifferero (Eds) Archeologia della vite e del vino in Etruria, Ci.Vin, Siena, 88-97.

Arnold C., Gillet F., Gobat J.M., 1998. Situation de la vigne sauvage *Vitis vinifera* subsp. *sylvestris* en Europe. Vitis 37, 159-170.

Arobba D. & Caramiello C., 1998. Agricoltura e ambiente dal V al I millennio a.C. Ricostruzione su base palinologica. In L. Mercando, M. Venturino Gambari (Eds) Archeologia in Piemonte. La preistoria, Vol. 1, Umberto Allemandi & C., Torino, 57-73.

Arobba D., Deferrari G., Nisbet R., 1997. Carpological investigation at the cave of Arene Candide: an impression of a caryopsis of barley on a ceramic sherd. In R. Maggi (Ed) Arene Candide: a functional and environmental assessment of the Holocene sequence (excavations Bernabò Brea-Cardini 1940-50). Memorie dell'Istituto Italiano di Paleontologia Umana 5, 119-123.

Arobba D., Vicino G., 2003. Segnalazione di macroresti botanici nel sito neolitico di S. Sebastiano di Perti (SV). Bollettino dei Musei Civici Genovesi XIX/XXI, 55/63, 29-37.

Bakels C., 2002. Plant remains from Sardinia, Italy, with notes on barleys and grapevine. Vegetation History and Archaeobotany 11, 3-10.

Balista C., Degasperi N., Bianchin Citton E., Bassetti M., Bazzanella M., Pignatelli O., Rottoli M., Martinelli N., 1996. Indagine interdisciplinare nell'insediamento neolitico di Roncade (Treviso) - Località Biancade. Quaderni di Archeologia del Veneto XII, 94-119.

Barfield L.H., Cremaschi M., Castelletti L., 1975. Stanziamento del vaso campaniforme a Sant'Ilario d'Enza (Reggio Emilia). Preistoria Alpina 11, 155-199.

Castelletti L., Castiglioni E., Cottini M., Di Vora A., 1998. Analisi morfometrica dei vinaccioli di vite (*Vitis vinifera* L.) provenienti da scavi archeologici. In L. Castelletti, M. Cremaschi (Eds), XIII International Congress of Prehistoric and Protohistoric Sciences, Colloquia 3 Palaeoecology, Forlì 8/14 September 1996, 11-24.

Castelletti L., Motella De Carlo S., 1998. L'uomo e le piante nella preistoria. L'analisi dei resti macroscopici vegetali. In L. Mercando, M. Venturino Gambari (Eds) Archeologia in Piemonte. La preistoria, Vol. 1, Umberto Allemandi & C., Torino, 41-56.

Castelletti L., Rottoli M., 1996. Ambiente ed economia. L'insediamento neolitico di fornace Gattelli a Lugo di Romagna, XIII International Congress of Prehistoric and Protohistoric Sciences, Forlì (Italia), 8-14 September 1996, 11.

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

Castiglioni E., Rottoli M., 2001. Capua (Caserta). Località Strepparo e Cento Moggie. Scavi nell'area del CIRA. Resti botanici da un pozzo dell'età del Bronzo. Bollettino di Archeologia 37-38, 62-67.

Cattani L., Colonese A., Ricciardi S., 2004. Ricostruzione climatica e ambientale di Grotta del Romito: analisi palinologiche e malacofaunistiche dei livelli epigravettiani C e D. Atti della XXXVII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria della Calabria - Scalea - Papasidero - Praia a Mare, II, Tortona, 29 settembre/4 ottobre 2002, 637-640.

Celant A., 1995. Macroresti vegetali del livello neolitico dell'insediamento di Quadrato di Torre Spaccata (Roma). Origini, Preistoria e Protostoria delle Civiltà Antiche XIX,

277-286.

Costantini L., 1982. Semi e carboni del Mesolitico e Neolitico della Grotta dell'Uzzo, Trapani. Quaternaria 23, 233-247.

Costantini L., Giorgi J.A., 1992. Botanical remains. In C. Malone, S. Stoddart (Eds) The Neolithic site of San Marco, Gubbio (Perugia), Umbria: survey and excavation 1985-7, Papers of the British School at Rome LX, 43-52.

De' Siena S., Marchesini M., Marvelli S., in press. La civiltà della vite: la cultura del vino in Italia dall'antichità all'età moderna. Carocci, Roma.

Failla O, 2011. Dalla vite selvatica alla vite domestica: un problema ancora aperto. In B. Biagini (Ed) Origini della Viticoltura, Atti Convegno Internazionale, Podere Forte, Castiglione d'Orcia 25/6/2010, 79-93.

Fiorentino G., Colaianni G., Grasso A.M., Stellati A., 2011. Caratteristiche del paleoambiente e modalità di sfruttamento dei vegetali a Salina nel corso dell'Età del Bronzo. In M.C. Martinelli (Ed), Il villaggio dell'età del Bronzo di Portella nelle Isole Eolie (scavi 2006-2008), Rebus Edizioni, Messina, 234-241.

Forni G., 2012. La matrice euromediterranea della nostra viticoltura. La prospettiva pluridisciplinare. In A. Ciacci, P. Rendini, A. Zifferero (Eds) Archeologia della vite e del vino in Toscana e nel Lazio, All'Insegna del Giglio, Firenze, 93-118.

Gambari F.M., 1994. Le origini della viticoltura in Piemonte: la protostoria. In R. Comba (Ed) Vini e vigne nel Piemonte antico, L'Arciere, Cuneo, 17-41.

Grassi F., Imazio S., Failla O., Scienza A., Ocete Rubio R., Lopez M.A., Sala F., Labra M., 2003. Genetic Isolation and Diffusion of Wild Grapevine Italian and Spanish Populations as estimated by Nuclear and Chloroplast SSR Analysis. Plant Biology 5, 608-614.

Lentini A., 2005. Archaeobotany brewing and winemaking in Mediterranean basin and TransCaucasus area. In P. Flourentzos, M.R. Belgiorno, A. Lentini (Eds) Cyprus in the Prehistory of Wine, MAE Ambasciata d'Italia a Nicosia, 11-16.

Lordkipanidze D., 2010. Le antichissime origini della viticoltura in Georgia. In Vinum Nostrum. Arte, scienza e miti del vino nelle civiltà del Mediterraneo antico. Catalogo della mostra, Firenze 20 luglio 2010-30 aprile 2011, Giunti Editore, 32-33.

Imazio M., Labra S., Grassi F., Scienza A., Failla O., 2006. Cloroplast Microsatellites to Investigate the Origin of Grapevine. Genetic Resources and Crop Evolution 53, 1003-1011.

Imazio M., De Mattia F., Grassi F., Labra M., Failla O, Scienza A., 2007. Progettum Vinum: metodi di analisi del genoma e primi risultati. In A. Ciacci, P. Rendini, A. Zifferero (Eds) Archeologia della Vite e del Vino in Etruria, CiVin, Siena, 238-248.

Mangafa M., Kotsakis K., 1996. A new method for the identification of wild and cultivated charred grape seed. Journal of Archaelogical Science 23, 409-418.

Marchesini M., Marvelli S., 2002. Analisi botaniche del contenuto del vaso biconico (Cat. n.8). In P. von Eles (Ed) Guerriero e sacerdote. Autorità e comunità nell'età del ferro a Verucchio. La tomba del Trono, Edizioni All'Insegna del Giglio, Firenze, 299-307.

Marchesini M., Marvelli S., 2010. Paesaggio, ambiente e attività antropica nel Bolognese in età villanoviana: testimonianze da alcuni siti archeologici. In R. Burgio, S. Campagnari, L. Malnati (Eds) Cavalieri etruschi dalle valli al Po. Tra Reno e Panaro, la valle del Samoggia nell'VIII e VII secolo a.C., Edizioni Aspasia, Bologna, 269-277.

Martinelli M.C., Fiorentino G., Prosdocimi B., D'Oronzo C., Levi S.T., Mangano G., Stellati A., Wolff N., 2010. Nuove ricerche nell'insediamento sull'istmo di Filo Braccio a Filicudi. Nota preliminare sugli scavi 2009. Origini XXXII, Nuova Serie IV, 285-314.

McGovern P.E., Rudolph H.M., 1996. The analytical and archaeological challenge of detecting ancient wine: two case studies from the ancient Near East. In: P.E. McGovern, S.J. Fleming, S.H. Katz (Eds) The origins and ancient history of wine. Gordon and Breach, New York, 57-67.

Mercuri A.M, Accorsi C.A., Bandini Mazzanti M., Bosi G., Cardarelli A., Labate D., Marchesini M.,Trevisan Grandi G., 2006. Economy and environment of Bronze Age settlements - Terramaras - in the Po Plain (Northern Italy): first results of the archaeobotanical research at the Terramara di Montale. Vegetation History and Archaeobotany 16, 43-60.

Motella De Carlo S., 1999. I resti vegetali nelle terre di rogo. In: M. Venturino Gambari (Ed) In riva al fiume Eridano. Necropoli dell'età del Bronzo Finale a Morano sul Po, Edizioni dell'Orso, Alessandria, 67-77.

Nisbet R., 1987. I vegetali carbonizzati nell'insediamento dell'età del ferro di Castelrotto (Verona). In: Prima della storia, Catalogo della mostra, Verona, 121-130.

Orrù M., Grillo O., Lovicu G., Venora G., Bacchetta G., 2013. Morphological characterisation of *Vitis vinifera* L. seeds by image analysis and comparison with archaeological remains. Vegetation History and Archaeobotany 22(3), 231-242.

Paronetto L., 1996. Note storiche sulla vitivinicoltura dei Monti Berici e dei Colli Vicentini. In G. Forni, A. Scienza (Eds) 2500 anni di cultura della vite nell'ambito alpino e cisalpino. Istituto Trentino del Vino, Trento, 537-562.

Perret M., 1997. Polymorphisme des génotypes sauvages et cultivés de *Vitis vinifera* L. détecté à l'aide de marqueurs RAPD. Bulletin de la Société Neuchâteloise des Sciences naturelles 120, 45-54.

Pignatti S., 1982. Flora d'Italia, Edagricole, Bologna.

Rivera D., Miralles B., Obo´n C., Carren˜o E., Palazo´n J.A., 2007. Multivariate analysis of *Vitis* subgenus *Vitis* seed morphology. Vitis 46, 158-167.

Rottoli M., 1993. La Marmotta. Anguillara Sabazia (RM). Scavi 1989. Analisi paletnobotaniche: prime risultanze. Bullettino di Paletnologia Italiana 84, 305-315.

Rottoli M., 1999. I resti vegetali di Sammardenchia-Cuˆeis (Udine), insediamento del Neolitico antico. In: A. Ferrari, A. Pessina (Eds) Sammardenchia-Cuˆeis. Contributi per la conoscenza di una comunità del primo Neolitico. Museo Friulano di Storia Naturale 41, 307-326.

Rottoli M., Castiglioni E., 2009. Prehistory of plant growing and collecting in northern Italy, based on seed remains from the early Neolithic to the Calcolithic (c. 5600-2100 cal. BC). Vegetation History and Archaeobotany 18, 91-104.

Sanges M., 2010. La vite e il vino in Sardegna dalla preistoria alla fine del mondo antico. In A. Saderi (Ed) Il vino in Sardegna - 3000 anni di storia, cultura, tradizione e innovazione, Ilisso, Nuoro, 13-20.

Scienza A., 2009. Areali di paradomesticazione viticola ed epicentri di domesticazione. Dalla "Viticoltura embrionale" alla "Proto-viticoltura". In F. Del Zan, O. Failla, A. Scienza (Eds) La vite e l'uomo. Dal Rompicapo delle origini al salvataggio delle reliquie, ERSA, Gorizia, 19-97.

Scossiroli R.E., 1988. Origine ed evoluzione della vite. Atti Ist. Bot. e Lab. Critt. 7 (serie 7), Pavia 1988.

Solinas F., Fiorentino G., 2010. Morpho-and biometrical analysis of grape pips from the Middle Minoan site of Monastiraki (Crete, Greece). 15th Conference of the International Work Group for Palaeoethnobotany, Wilhelmshaven (Germany), May 31-June 5, 2010. Terra Nostra (2), 179.

Stummer A., 1911. Zur Urgeschichte der Reben und des Weinbaues. Mitteilungen der Anthropologischen Gesellschaft in Wien 61, 283-296.

Terral J.F., Tabard E., Bouby L., Ivorra S., Pastor T., Figueiral I., Picq S., Chevance J.B., Jung C., Fabre L., Tardy C., Compan M., Bacilieri R., Lacombe T., This P. 2010. Evolution and history of grapevine (*Vitis vinifera*) under domestication: new morphometric perspectives to understand seed domestication syndrome and reveal origins of ancient European cultivars. Annals of Botany 105, 443-455.

Webb D.A., 1968. Vitacee. In T.G. Tutin, V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters, D.A. Webb (Eds) Flora Europaea 2, Cambridge University Press, Cambridge, 246-247.

Zecca G., Abbott J.R., Sun W.B., Spada A., Sala F., Grassi F., 2012. The timing and the mode of evolution of wild grapes (Vitis). Molecular Phylogenetics and Evolution 62, 736-747.

Zohary D., Hopf M., 2000. Domestication of plants in the Old World, 3rd Ed., Oxford University Press, New York, 151-159.